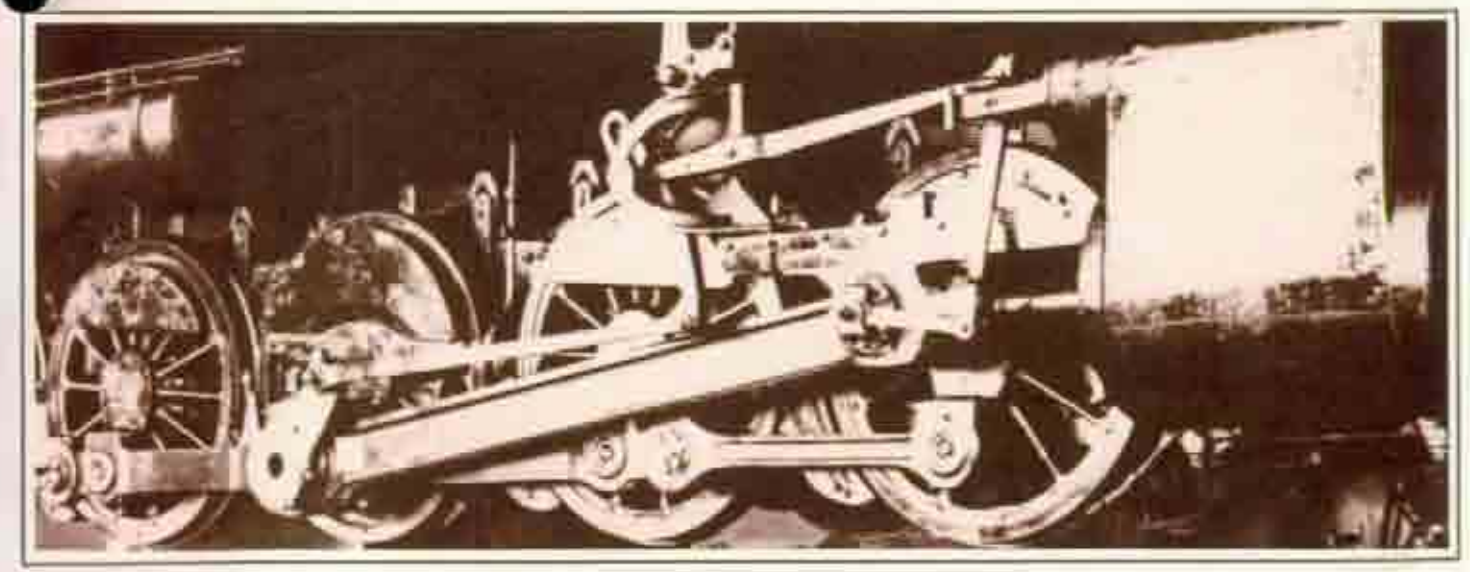
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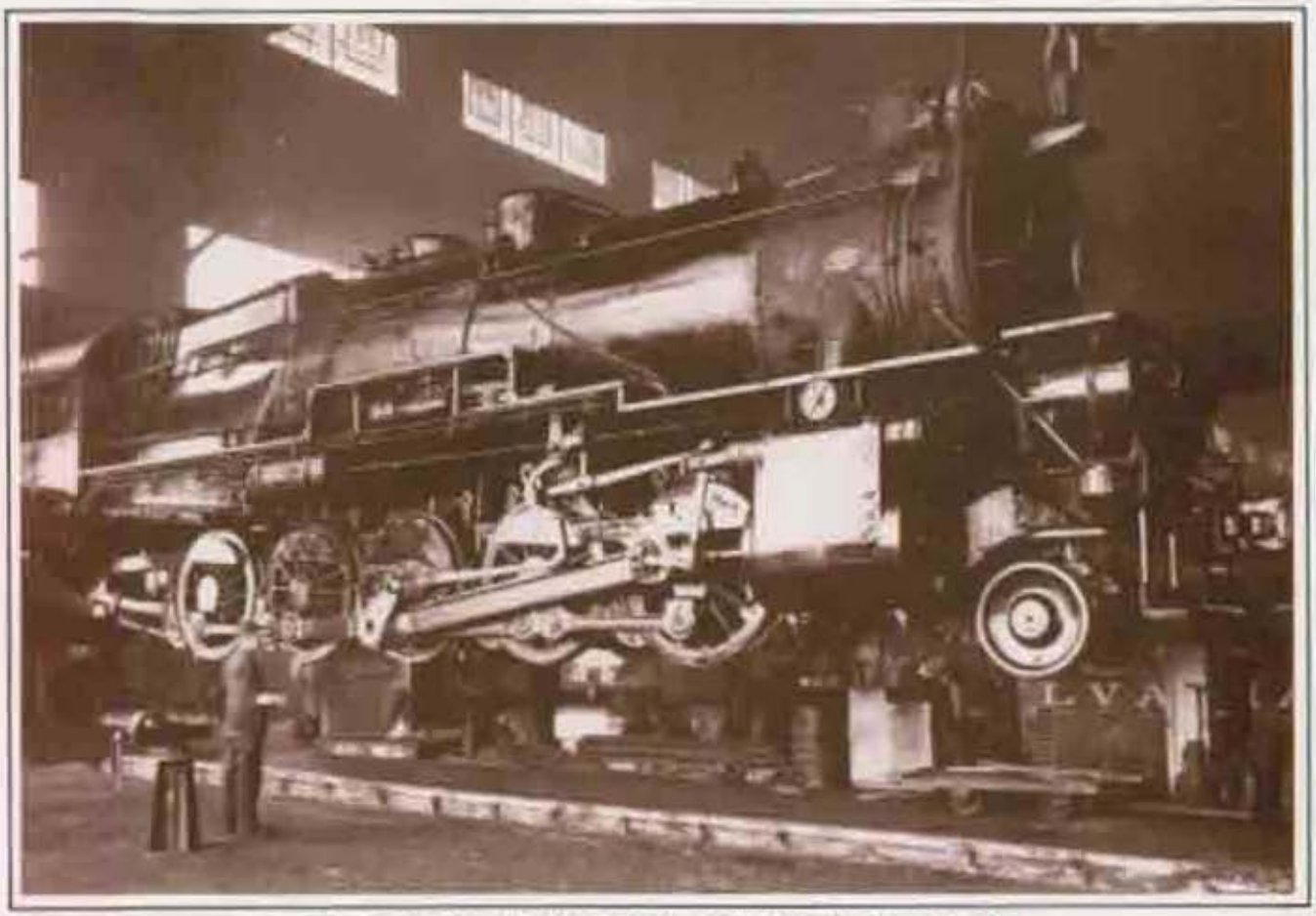
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CHAPTER I. HISTORY OF THE ALTOONA RAILROAD SHOPS

Enthroned amid eternal hills,
Who's walls are living green,
You sit smoke crowned, majestically,
O Appalachian Queen!
Your towering stacks, like sentries stand
To guard your marts of trade.
Steam is your fleetwinged courier
And Din, your serenade[1]

1. THE ALLEGHENY MOUNTAINS PRIOR TO THE COMING OF THE PENNSYLVANIA RAILROAD

The future site of Altoona lay on the eastern side of the Alleghny Mountains. These mountains traverse the states of Pennsylvania, West Virginia, and Virginia from northeast to southwest. Also portions of this mountain range can be found in Ohio and Maryland. They rise above the surrounding land from two to four thousand feet forming a formidable obstacle to trade and commerce from east to west. Dense hardwood forests covered these mountains. Underneath this forest canopy wild animal and Indian trails traversed the mountains.[2]

During the eighteenth century, British colonists gradually began settling near these mountains, where they cleared the land, and established farms. After the American Revolution, the new Americans established iron furnaces to exploit the local deposits of iron ore and charcoal furnaces to use the extensive hardwood forests in the vicinity of the future town of Altoona. These two products proved the raw material for forges opened in the area at the beginning of the nineteenth century. These small furnaces

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1. Robert F. Lantz, *Altoona* (Altoona, Pa.: The Altoona chamber of Commerce, n.d.), p. 2.

2. Karl B. Raitz, Thomas R. Leinback, and Richard Ulack, *Appalachia: A Regional Geography Land, People, and Development* (Boulder, Co: Westview Press, 1984), p. 23.

and forges either produced iron products such as horseshoes and wheel rims for local use or shipped their products by wagon or packhorse to Pittsburgh.

The first permanent settlers in the Altoona vicinity came about 1810, although Thomas and Michael Coleman settled in Logan Township, possibly, as early as 1775 and John Long took up residence in Pleasant Valley in 1788.[3] The growth and development of Blair County exemplified the expansion along the entire American western frontier. This westward growth caused great concern among the Philadelphia merchants, who feared that they must open markets and communications with the West, in particular Pittsburgh, or be outstripped by Baltimore and New York merchants in the quest for the lucrative western trade. They believed that the loss of western markets would leave Philadelphia economically stagnant.

John Stevens in 1823 seemed to offer the merchants hope in reaching the western markets when he obtained a charter from the state to construct a railroad from Philadelphia to Columbia with the intention of later extending this rail line to Pittsburgh. Stevens failed in his efforts to raise enough capital for the new venture and the railway was not constructed. The opening of New York's Erie Canal in 1825 and its success encouraged Philadelphia merchants to take action to remain competitive in the race for western commerce. Their efforts resulted in the Pennsylvania legislature passing a bill in 1826 authorizing the construction of a railroad and canal system extending from Philadelphia to Pittsburgh. This led to construction of the state-operated Allegheny Portage Railroad in the 1830s. The portage railroad followed a combined railroad and canal route known as the Pennsylvania Main Line, which spanned more than 394 miles across the state. The state completed this route in 1834 at a cost of more than twelve million dollars. The portage railway ingeniously surmounted the Allegheny summit through a series of steep inclines over which the passenger and freight cars were hauled up by means of stationary hoisting engines. This picturesque means of travel proved a slow and dangerous method of crossing the mountains, but did open up central Pennsylvania to economic development. By 1855, the New Allegheny Portage Railroad

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3. Charles B. Clark, *A History of Blair County, Pennsylvania* (Altoona, Pa.: Charles B. Clark, 1896), p. 76.

began operations with a combined rail and canal operations which eliminated the need for the incline operations, but still was slow in comparison with a strictly railroad system.[4]

2. THE CREATION AND COMING OF THE PENNSYLVANIA RAILROAD

The Baltimore and Ohio Railroad managers in 1845 petitioned the Pennsylvania State Assembly for the right to construct a railroad from Cumberland, Maryland, to Pittsburgh, Pennsylvania. Once again this provoked the Philadelphia merchants, who believed this an attempt to keep them from trading with the people in the Ohio Valley. They responded by proposing the creation of a Pennsylvania Railroad which would connect Philadelphia with Pittsburgh. Each side campaigned vigorously with the State Assembly to accept its respective proposal. In 1846, the Pennsylvania State Assembly passed an act granting the Baltimore and Ohio Railroad the right to extend their railroad to Pittsburgh. At the same time, the assembly chartered the Pennsylvania Railroad Company on April 13, 1846, to construct and operate a railroad between Harrisburg and Pittsburgh, a distance of 249 miles. A rail link between Philadelphia and Harrisburg already existed. The next year supporters of the Pennsylvania Railroad succeeded in having the Pennsylvania governor declare the Baltimore and Ohio Railroad charter null and void.[5] This left the Pennsylvania Railroad as the only chartered railroad.

The Pennsylvania Railroad charter provided that the railroad be governed by a board of thirteen directors each owning at least twenty shares of the company's capital stock. Railroad stockholders elected the first Board of Directors on March 30, 1847, with Samuel Vaughan Merrick becoming the first President of the Pennsylvania Railroad and John Edgar Thomson selected as the chief engineer. The directors represented a cross section of Philadelphia's elite coming from backgrounds in financing, manufacturing, and merchandising. Thomson as chief engineer immediately undertook surveys to determine the best possible route to Pittsburgh. Prior to this effort in the 1840s, the Pennsylvania State Canal Commission authorized engineer Charles L. Schlatter to survey possible routes from Harrisburg to Pittsburgh. Schlatter conducted three surveys across the

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4. James A. Ward, *J. Edgar Thomson: Master of the Pennsylvania* (Westport, Connecticut: Greenwood Press, 1980), p. 70.

5. Ibid.; and Sylvester K. Stevens, *Pennsylvania: Titan of Industry* (3 Vols.; New York: Lewis Historical Publishing Company, Inc. , 1948), III: 562.

Alleghenies. Thomson examined these routes and found Schlatter's central route would prove feasible for the new Pennsylvania Railroad. The route selected by Thomson went from Harrisburg west through Logan's Narrows nearly in a direct line to Sugar Gap Run and to Robinson's Summit (now Altoona). This route followed the Susquehanna and Juniata rivers to the summit which was 800 feet above the elevation of Harrisburg. The steepest ascent began near the summit of the Alleghenies and from there followed a gradual descent to Pittsburgh.[6] The Pennsylvania Railroad officials paid an estimated $11,140,000 for construction and equipment for the new railroad. The first section of the proposed route to Pittsburgh opened for passenger and freight service between Harrisburg and Lewiston in September, 1849.[7]

3. THE SELECTION OF THE TOWNSITE OF ALTOONA

While the railroad pushed steadily westward, railroad agents purchased local farmers' land for the route. Archibald Wright, presumably working for the Pennsylvania Railroad, paid $10,000 for the 224 acres of David Robeson's (sometimes spelled Robison and Robinson) farmland and woodland. The transfer of deed occurred on April 24, 1849. This tract became the townsite of Altoona and fifteen acres of it became the first railroad shops.[8] The townsite lay 235 miles west of Philadelphia and 116 miles east of Pittsburgh at an elevation of 1,164 feet above sea level. The name Altoona may be the Americanized version of the Cherokee word "Allatoona," meaning high land of great worth.

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6. Pennsylvania Railroad Company, *Third Annual Report of the Directors of the Pennsylvania Rail-Road Company to the Stockholders, October 31,1849* (Philadelphia: Crissy & Markley, 1850), p. 35; Altoona Charter Centennial Committee, *Altoona Charter Centennial* (n.p.: n.p., 1968), p. 15; Howard Ward Schotter, *The Growth and Development of the Pennsylvania Railroad Company: A Review of the Charter and Annual Reports of the Pennsylvania Railroad Company 1846 to 1926 Inclusive* (Philadelphia: Allen, Zane, and Scott, 1927), pp. 14-15; and William Bender Wilson, *History of the Pennsylvania Railroad Company with Plan of Organization, Portraits of officials and Biographical Sketches* (Philadelphia: Henry T. Coates & Company, 1889), p. 8.

7. Stevens, *Pennsylvania: Titan of Industry*, III: 562.

8. Richard E. Beeler, "Altoona, Pennsylvania: Keystone City of the Keystone State," *Altoona Centennial Booklet* (Altoona: Altoona Centennial Incorporated, 1949), pp. 7-8; and James H. Ewing and Harry Slep, *History of the City of Altoona and Blair County, Including Sketches of the Shops of the Pennsylvania Railroad Co.* (Altoona, Pa.: Harry Slep's Mirror Printing House, 1880), p. 62; and Charles B. Clark, *Clark's Altoona City Directory, April, 1886* (Altoona, Pa.: Barclay Brothers, Steam Power Press Printers, 1886, p. 81.

Wright began selling plots in the town in 1851. One of the earliest buildings constructed in Altoona became the office for the railroad's road engineer. Railway shops construction began in 1850 with Wright conveying the deed for the land to the railroad in 1851. The railroad officials selected this site to construct a town because trains coming from the east required additional motive power here to climb the Alleghenies while helper engines added to trains coming from Pittsburgh were no longer be required. The grade east of Altoona rose about twenty feet to a mile and near Altoona, the grade began increasing to ninety-five feet to the mile which necessitated engine power increase. Also, this site served as a location for changing the makeup of the trains and making repairs on engines and cars. The main topographical reason for founding Altoona beside the steeper grades which occurred after this point was that water became less accessible and abundant farther west. In addition, Pennsylvania Railroad officials found that the raw material needed for shop work such as coal, iron, and lumber could be acquired readily in this vicinity. Company officials further felt confident that the newly created town would remain economically dependent on the railroad for many years. During 1851, the Pennsylvania Railroad tracks extended from Harrisburg to Altoona which was a distance of one hundred and thirty-two miles. At a point one and a quarter miles west of Hollidaysburg, the Pennsylvania Railroad connected its track temporarily with those of the Allegheny Portage Railroad.[9]

4. THE FIRST PENNSYLVANIA RAILROAD SHOPS

In 1849, the Pennsylvania Railroad officials developed plans for constructing repair facilities at Altoona. These plans called for the construction of an enginehouse, erecting shop, and machine shop. The next year the railroad constructed an eight tracks and eight stalls roundhouse with parts of this structure serving as a paint shop and freight car repair facility. A long one-story building housed a machine shop, paint shop, woodwork shop, blacksmith shop, locomotive repair shop, and foundry. The railroad constructed these facilities east and tangent to Twelfth Street. These early facilities were later torn down to make way for the Altoona machine shops. The Altoona shop construction created a number of problems for the railroad management, including the need to

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9. Tarring S. Davis, ed., *A History of Blair County, Pennsylvania* (Harrisburg: National Historical Association, Inc., 1931) I: 255-256; and *Pennsylvania Railroad Company, Fifth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 2, 1852* (Philadelphia: Crissy & Markley, Printers, 1852), pp. 60-65.

provide adequate accommodations for company employees. Railroad official efforts to provide these facilities continued for the next several years.[10]

In 1850, the Pennsylvania Railroad opened a single track to Altoona and in December of that year the first train ran from that city to Pittsburgh using portions of the New Portage Railroad tracks. By 1853, one-half of the roadbed to Pittsburgh was completed. Pennsylvania Railroad officials planned to use iron bridges made in Altoona to provide passage for trains between the Portage Viaduct and the Summit Tunnel and over the Little Conemaugh. In 1854, the Pennsylvania Railroad completed the Horseshoe Curve construction. This engineering feat provided a gradual grade increase of no greater than 1.75 percent which permitted the successful crossing of the Allegenies by trains of that period. The directors of the Pennsylvania Railroad originally intended to construct a single-track road to Pittsburgh, but, during construction it became evident that a second track would be of value and so they ordered construction of a second track in certain sections.[11]

By 1852, the Altoona shops repaired railway cars and manufactured parts for locomotives, as well as constructing railway cars, cast iron bridge parts, boiler plate bridge parts, and wrought iron tracks. In addition, the Altoona foundry provided castings for Pennsylvania Railroad repair shops at Columbia, Harrisburg, Mifflin, Conemaugh, and Pittsburgh. The next year the Altoona machine shops came into full operation which only proved sufficient to keep up with the growing demand for their use.[12]

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10. Schotter, *The Growth and Development of the Pennsylvania Railroad Company*, p. 432; Davis, ed., *A History of Bar County, Pennsylvania*, p. 256; Harry E. Emerick, *Official Program Old Home Week, Altoona and Blair County, August, 13th to 19th 1922* (Altoona: n.p., 1922), p. 20; and Pennsylvania Railroad Company, *Fifth Annual Report of the Directors of the Pennsylvania Railroad Co., to the Stockholders, February 2, 1852*, p. 64.

11. Slason Thompson, *A Short History of American Railways Covering Ten Decades* (Chicago: Bureau of Railway News & Statistics, 1925), pp. 114-115; and Pennsylvania Railroad Company, *Sixth Annual Report of the Directors of the Pennsylvania Railroad Co., to the Stockholders, February 7, 1853* (Philadelphia: Crissy & Markley Printers, 1853), p. 64.

12. Pennsylvania Railroad Company, *Sixth Annual art of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 7, 1853*, pp. 53-55; Pennsylvania Railroad Company, *Seventh Annual art of the Directors of the Pennsylvania Rail road Company to the Stockholders, February 6, 1854* (Philadelphia: Crissy & Markley, Printers, 1854), p. 53; and Pennsylvania Railroad Company, *Ninth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 4, 1855* Philadelphia: Crissy & Markley Printers, 1856), p. 50.

In 1855, the directors of the Pennsylvania Railroad reported that:

> The shops at this place [Altoona] have been still further expanded, and new tools added since last report. A new Engine House, containing stalls for 26 engines, was brought into use early in the Autumn, giving a very desirable shelter to most of the engines lying over at this point. A new Smithy, containing 18 forges has been completed; the new Foundry and extension of the Machine Shop are finished; the latter is used at present as a shop for painting Passenger Cars.
>
> Early in the spring the erecting shop will be ready, relieving the present machine shop frog much of the heavy work which now crowds and encumbers it.[13]

In addition, the company authorized the construction of a brick house for the purpose of drying sand for use in the locomotives and the fabrication of iron bridges for placing over the Little Juniata River and Union Furnace. Company officials believed that a need existed for the erection of a passenger car shed at Altoona to facilitate the work there. The next year company officials requested approval from the board of directors to construct an addition to the machine shop for boiler repairs and erection of a new enginehouse as engines presently stood out in all weather while waiting for repairs.[14]

5. THE DEVELOPMENT OF THE ALTOONA RAILROAD SHOPS PRIOR TO THE CIVIL WAR

The railroad community's population rose from a few settlers in 1850 to a population of 2,000 in 1854 and 3,591 in 1860. These figures represent the rapid and steady growth of the Pennsylvania Railroad in Altoona. During the next decade, the population in Altoona tripled to 10,610.[15] By 1855, the railway shops employed more than one thousand people. The Altoona shop complex included a car shop, tin shop, roundhouse, carpenter shop, paint shops, engine repair shop, car repair shop, boiler shop, iron foundry, brass foundry, and a store house with reading room. These shops

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13. Pennsylvania Railroad Company, *Eighth Annual Report of the Directors of the Pennsylvania Rail Road Company to the Stockholders. February 5th, 1855* (Philadelphia: Crissy & Markley, Printers, 1855), p. 51.

14. Pennsylvania Railroad Company, *Ninth Annual art of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 4, 1856*, p. 50.

15. Clark, *Clark's Altoona City Directory, April, 1886*, p. 82.

stood by the railroad yard between Twelfth and Fourteenth Streets. In addition to the shop buildings, the Pennsylvania Railroad located various administrative offices for the shops and the railroad's Mountain Division in Altoona.[16]

Despite the new improvements at the shops, Epoch Lewis, Second Assistant Superintendent of Motive Power, in 1856 requested that the directors add a boiler repair facility to the existing machine shop and the enginehouse be expanded to accommodate all locomotives requiring repairs.[17] The directors took action on this request in 1857, but problems still hampered operations as Master of Machinery Alexander McCausland wrote:

> An early completion of the extension to the erecting and boiler shop already commenced, is urgently required to relieve the Round House; which building is not at all calculated for other than its legitimate business, owing to its constant exposure, deficient light, and annoyance from smoke and steam rendering it almost impossible for the person in charge to have a proper supervision of his men. Only repairs of a trifling nature ought, under any circumstances, to be made there, there being no facilities with regard to tools and power. The fact of a large proportion of the general repairs on Freight Engines being made in the Round House, has largely added to the expenses of repairs.
>
> Our present demands for Engine accommodation require thirty tracks, whereas in the present building there are only twenty-six. A portion of which are constantly occupied by extra Engines, and those undergoing general repairs, causing on the average six Engines to be nightly exposed to the severe weather on the Mountain Division. A temporary building, with accommodations to house six Engines, is strongly recommended.[18]

The Pennsylvania Railroad purchased the Main Line of the Public Works from the state in 1857 and closed the portage railroad that same year. The Altoona shops expansion continued into 1858 to accommodate the additional work load which resulted from this purchase. Construction undertaken at the Altoona shops included a new car

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16. *Guide for the Pennsylvania Railroad, with an Extensive Map; Including the Route, with All Its Windings, Objects of Interest, and Information Useful to the Traveller* (Philadelphia: T. K. and P.G. Collins, Printers, 1855), p. 23.

17. Pennsylvania Railroad Company, *Tenth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 2,1857* (Philadelphia: Crissy & Markley, 1857), p. 44.

18. Pennsylvania Railroad Company, *Eleventh Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 1, 1858* (Philadelphia: Crissy & Markley Printers, 1858), p. 50.

repair shop, new paint shop, and extensions to the erection and boiler shops. A number of general improvements in the shop yards included the building of a large transfer table to move cars from one parallel truck to another, the laying of more than one mile of track, and the constructing of a large underground sewer system designed to drain water quickly from around the tracks in the yard. That same year the Pennsylvania Railroad began dismantling the portage railroad and sending the usable stone blocks from that railroad to Altoona for use in masonry buildings there.[19]

In 1859, company officials installed gas lighting and water mains in all shops, the latter for improved illumination and the former for fire protection. In a move to further upgrade facilities, the railroad installed a cast iron turntable to replace one made of boiler plate and constructed an L-shaped brick building, measuring 237 feet in length by 23 feet in width, divided into sections to store materials for brass and iron foundries to be constructed there. Also, the railroad constructed a brick extension to the maintenance of way department building. The next year the railroad erected a structure to house lumber and replaced the wooden turntable at the smaller roundhouse with a cast iron one. In an effort to provide better fire protection, the railroad authorized the erection of a firehouse next to the machine shops in which to maintain a fire engine.[20]

6. THE IMPACT OF THE CIVIL WAR ON THE ALTOONA RAILROAD SHOPS

The opening of the American Civil War in April of 1861 resulted in the Altoona shops repairing engines and furnishing cars to transport soldiers and munitions for the Union forces. The Pennsylvania Railroad constructed entrenchments along certain sections of their track system and hired guards to protect bridges from Confederate

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19. Pennsylvania Railroad Company, *Tenth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 2, 1857*, p. 44; Wilson, *History of the Pennsylvania Railroad Company with Plan of Organization, Portraits of Officials and Biographical Sketches*, I: 152; George H. Burgess and Miles C. Kennedy, *Centennial History of the Pennsylvania Railroad, 1846-1946* (New York: Arno Press, 1976), p. 291; Pennsylvania Railroad Company, *Corporate, Financial and Construction History of Lines Owned, Operated and Controlled to December 31, 1945* (New York: Allen, Lane and Scott, ca. 1945), p. 71; and Pennsylvania Railroad Company, *Twelfth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 7, 1859* (Philadelphia: Crissy & Markley Printers, 1859), p. 54.

20. Pennsylvania Railroad Company, *Thirteenth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 6, 1860* (Philadelphia: Crissy & Markley Printers, 1860), pp. 28, 41; and Pennsylvania Railroad Company, *Fourteenth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 4, 1861* (Philadelphia: Crissy & Markley Printers, 1861), pp. 39, 47.

saboteurs. When General Robert E. Lee moved the Army of Northern Virginia into Maryland in September of 1862, Pennsylvania Railroad officials ordered that all locomotives at Altoona be fired up and prepared to leave if Confederate forces moved north toward that city. Some forty locomotives with rolling stock were fired up and prepared to roll out, but the Confederate forces retreated south after the Battle of Antietam.[21]

Further expansion occurred at Altoona in 1862 to accommodate the additional work resulting from Union war effort. The enginehouse was rebuilt and enlarged to accommodate an additional fifteen engines. Despite the increase size in the enginehouse, Master of Machinery, John P. Laird, requested that the directors consider constructing another new enginehouse to accommodate the growing volume of locomotives being repaired in Altoona. The company erected a brick building for the car inspectors, trainmen, and yard clerks. The management contracted for the erection of a new frame paint shop and the former paint shop was appropriated for engine repairs. One building which served as a passenger car shed became a freight car repair shop. Also, a number of small buildings were built including an ice house and sheds for drying sand and storing oil, while a number of other buildings were altered with some receiving new floors, sewer systems, and roofs. The increase in the amount of bridge fabrication work led management to have a new temporary blacksmith shop erected.[22]

In 1863, the management decided to rearrange the work activities at the Altoona shops in order to obtain more efficiency and economy. The eastern section of the main shop building was converted from a passenger shop into a machine shop. This configuration allowed for a new fitting shop next to the boiler shop with the former fitting shop turned over for bridge work. Management placed the passenger car works in the southern wing of the main shop opposite the freight car shop. All wood-working machines were removed from the main car shop to a detached building. Management

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21. Robert L. Emerson, *Allegheny Passage: An Illustrated History of Blair County* (Woodley, California: Winsor Publishing, 1984), p. 40; and Clark, *A History of Blair County, Pennsylvania*, p. 71.

22. Pennsylvania Railroad Company, *Fifteenth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 3, 1862* (Philadelphia: Crissy & Markley Printers, 1862), pp. 20, 31-32; and Pennsylvania Railroad Company, *Sixteenth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 2, 1863* (Philadelphia: Crissy & Markley,1863), pp. 23, 34, and 45.

hoped these changes would benefit supervision and security of the works and provide the shops with better fire protection. Also, they authorized construction of a new brass foundry, a dry house for seasoning wood, a frame blacksmith shop, and a major extension to the machine shop.[23]

In June of 1863, Confederate forces under the command of General Lee marched north into Pennsylvania. Rumors circulated around Altoona that a Confederate raid on the railway shops soon would be launched.[24] All work ceased at Altoona with the workers loading up most movable equipment and taking it to places of safety away from the advancing Confederate army. The railroad workers dismantled and packed heavy less easily moved equipment in preparation for evacuation in case Lee's advancing army threatened Altoona. Maintenance of Way crews began constructing fortifications around railroad property. General Superintendent of Motive Power Epoch Lewis selected a dozen men and stationed them along the southern border of Pennsylvania to observe Confederate troop movements and report these activities to the superintendent at Altoona. These scouts reported daily to two or three telegraph operators stationed by the telegraph line and they passed these messages on to railroad officials. The withdrawal of Lee's forces after the Battle of Gettysburg allowed the Altoona shops to resume normal activities.[25] The Pennsylvania Railroad in a demonstration of support for the Union cause promised to pay the families of men that enlisted in the army five dollars a week for three months.[26]

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23. Pennsylvania Railroad Company, *Seventeenth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 16,1864* (Philadelphia: Crissy & Markley, 1864), pp. 39 and 47.

24. Michael R. Gannett, ed., "Twelve Letters from Altoona, June-July 1863," *Pennsylvania History*, XLVI (January, 1980), p. 52.

25. Wilson, *History of the Pennsylvania Railroad Company with Plan of Organization, Portraits of Officials and Biographical Sketches*, I: 412-413; and Jesse C. Sell, *Twentieth Century History of Altoona and Blair County Pennsylvania and Representative Citizens* (Chicago: Richmond-Arnold Publishing Company, 1911), p. 127.

26. Gannett, ed. , "Twelve Letters from Altoona, June-July 1863," *Pennsylvania History*, XLVI (January, 1980), p. 52.

The business of repairing locomotive and railroad cars increased so much in 1864 that railroad officials began planning to contract out iron bridge work and concentrate solely on the former tasks. They converted those shops which fabricating parts for the iron bridges to manufacturing locomotive and car parts. Management believed that the present yard and enginehouses were inadequate to serve the growing demand for train repairs. A particularly dangerous situation arose each night when forty to sixty engines required moving on one track out of the shops into the yards. Railroad officials hoped that a new enginehouse would alleviate this problem.[27]

The next year a new freight car repair shop and blacksmith shop opened at Altoona and these operations increased the efficiency of the repair facilities there. Maser of Machinery John P. Laird still requested that a new enginehouse be authorized to alleviate the congestion in the locomotive repair section.[28]

7. THE ALTOONA RAILROAD SHOPS AFTER THE CIVIL WAR

The railroad's growth during the war and increased demand for locomotive and car repairs after the war resulted in the Pennsylvania Railroad adding machine facilities at the Altoona and Pittsburgh shops. In addition, management placed the shops at Mifflin in a subordinate role to those at Harrisburg and Altoona. Also, in 1867, the railroad constructed a new enginehouse of 44 stalls at Altoona along with a fireproof oil house for the storage and mixing of oil products, a brick sandhouse, and the enlargement of the brass foundry by the addition of two furnaces.[29]

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27. Pennsylvania Railroad Company, *Eighteenth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockhoders, February 21, 1865* (Philadelphia: Crissy & Markley,1865), pp. 32-33.

28. Pennsylvania Railroad Company, *Nineteenth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, February 20, 1866* (Philadelphia: Crissy & Markley, 1866), pp. 45-46.

29. Pennsylvania Railroad Company, *Twentieth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockhoders, February 19, 1867* (Philadelphia: E.C. Markley & Son Printers, 1867), pp. 56-57 and Pennsylvania Railroad Company, *Twenty-First Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, February 18, 1868* (Philadelphia: E.C. Markley & Son Printers, 1867), pp. 30, 49.

Two fires caused serious loss to the Altoona shops in 1869. On January 21, an arsonist set a fire which destroyed the frame freight repair shop. This department was relocated to the eastern roundhouse and work commenced twenty-four hours after the fire. A second fire occurred on November 16 when the planning mill burned along with its tools. Pennsylvania Railroad officials temporarily set up a planning mill in the Maintenance of Way shop.[30]

Eighteen sixty-nine marked a turning point for the Altoona railroad shops. By this time, the original grounds for the railway shops were filled with shops, tracks, and equipment. In the previous year, Superintendent of Motive Power, Alexander J. Cassatt, who directed the work at Altoona, complained that the existing facilities at Altoona were fully utilized and additional facilities were required to meet further demands. Preferably, he suggested these facilities be set up in a new location away from the congested original shop area. The situation resolved when the railroad purchased land along Chestnut Avenue below Seventh Street for the construction of a new complex of shops known as the Altoona car shops. This area became the primary site for the repair and construction of railroad cars. The original shops' area came to be known as the Altoona machine shops and became the center for repairing and constructing locomotives. In the next few years, the railroad officials authorized construction of a circular car-repair shop, passenger-car repair shop, blacksmith shop, foundry, cabinet/machine shop, firehouse, ice house, engine and boiler shop, and office and storehouse. The reason for this increase in facilities came from the fact that the Pennsylvania Railroad continued to do increasing business, particularly, on those lines east of Pittsburgh. Additional passenger

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30. Pennsylvania Railroad Company, *Twenty-Third Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockhoders, February 15, 1870* (Philadelphia: E.C. Markley & Son Printers, 1870), pp. 38-39.

cars were needed to accommodate this growth, but the bulk of the new cars were required to move freight such as coal, oil, and steel.[31]

One of the first buildings constructed for the Altoona car shop complex was the blacksmith shop. Here all the wrought-iron for passenger and freight cars would be produced. The building, originally 74 by 204-foot was extensively altered and extended over the years to its present dimension of 472 feet in length. The building served as a blacksmith shop until the 1960s when Altoona Enterprises purchased it from the Pennsylvania Railroad. Presently, the building serves as the administration offices and factory for Lumax industries which manufactures lighting fixtures.[32]

Another structure dating to 1869 is the cabinet/machine shop adjacent to the blacksmith shop. The cabinet shop produced the woodwork for interior and exterior car use. The machine shop contained lathes, drill, bolt-cutting machines, and other industrial equipment. The building originally measured 304 feet in length, but later was extended another 150 feet. In later years, the cabinet shop was replaced by a sheet metal shop and a tin shop which operated in the building. Currently, the building is part of the factory portion of Lumax Industries. The building is connected with the blacksmith shop by a concrete block wall.[33]

In 1871, a small office and warehouse was constructed for the Altoona Car Shops. Over the years, the building continued to be enlarged to serve various functions. Today,

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31. Pennsylvania Railroad Company, *Twenty-Second Annual art of the Board of Directors of the Pennsylvania Railroad Company to the Stockhoders, February 16, 1869* (Philadelphia: E.C. Markley & Son Printers, 1870), p. 40; Beeler, "Altoona, Pennsylvania: Keystone City of the Keystone State," *Altoona Centennial Booklet*, compiled by Altoona Centennial Inc., pp. 27-28; Donald J. Howard, "Cities and Towns of Blair County: A Brief History of Altoona," *Blair County's First Hundred Years, 1846-1946* (Hollidaysburg, Pennsylvania; The Blair County Historical Society, 1945), p. 28; Robert L. Emerson, *Allegheny Passage: An Illustrated History of Blair County*, p. 45; Pennsylvania Railroad Company, *Twenty-Fifth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, February 20, 1972* (Philadelphia: E.C. Markley & Son Printers, 1870), p. 62; and Patricia T. Davis, *End of the Line: Alexander J. Cassatt and the Pennsylvania Railroad* (New York: Neale Watson Academic Publications, Inc., 1978), p. 33.

32. Peter H. Stott, "HAER Survey of Southwestern Pennsylvania" (unpublished report for Historic American Engineering Record, National Park Service, Department of the Interior, Washington, D.C., 1987), p. 2.

33. Ibid., p. 6.

the building serves as offices for the Home Nursing Agency. The same agency's garage occupies a small brick building which may be an 1871 firehouse and stable constructed by the Pennsylvania Railroad to provide fire protection for the car shops.[34]

Another small building constructed in the early 1870s in the car shop area was for "Maintenance of Way Shops." The shops in this 40- by 130-foot brick building repaired and supplied equipment to the signal houses, watch-boxes, small stations and other functions. By 1888, this structure became known as the Bolt Shop and during the next twenty years was extended to 352 feet. The function of the shop later changed to storage and maintenance of batteries for passenger cars. When the first electric lights were installed in passenger cars, electrical power was supplied by batteries which required charging and changing on a regular basis. This structure became known as the battery shop. In the 1960s, the Pennsylvania Railroad sold the building to the Lithcote Company.[35]

By the early 1870s, Pennsylvania Railroad management set as a goal standardization of all cars, engines, and other machinery used on the railway. They sought to accomplish this goal by having the Altoona engineers draw up al I construction designs whether the locomotive or car be constructed at Altoona, other company shops, or on contract by a private firm. In this way, they hoped to achieve uniformity and interchangeability of parts and design. Another management decision was not to rebuild old locomotives, but rather to replace them with six new locomotives. This policy resulted in large scale locomotive production at Altoona.[36]

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34. Ibid., pp. 6, 8.

35. Ibid., p. 13.

36. William B. Sipes, *The Pennsylvania Railroad: Its Origin, Construction, Condition, and Connections. Embracing Historical, Descriptive, and Statistical Notices of Cities, Towns, Villages, Stations, Industries, and Objects of Interest on Its Various Lines in Pennsylvania and New Jersey* (Philadelphia: The Passenger Department, 1875), p. 27.

In 1874, the Pennsylvania Railroad management introduced a system of cranes for lifting and moving locomotives in the repair shops. Also that year saw the new wheel foundry in full operation with 21,837 wheels being manufactured.[37]

Alexander Graham Bell invented the telephone in 1875 and patented it the next year. That year two of Bell's assistants traveled to the Altoona railway shops to study the feasibility of placing a telephone line in the shops. Telephone lines were installed for various departments to communicate with one another in May of 1877.[38]

By 1879, the administrative office for the Altoona Works was located in Altoona a short distance from the shops, and Pennsylvania Railroad officials began making plans to move the administrative office closer to the shops. They authorized construction of a two-story office building and in 1882, it opened as the Master Mechanics offices. Later, the building was extended thirty feet to the east and two stories were added to the structure. The Pennsylvania Railroad housed various railroad offices in the building over the years until 1984. Currently the building, known as the Conrail Ninth Avenue & Twelfth Street Office building, is vacant.[39]

The Pennsylvania Railroad established the department of physical tests in 1874 and the next year established a chemical laboratory followed in 1889 by a bacteriological laboratory. The purpose of these units were to conduct scientific testing which would prove beneficial to the railroad.[40] A more detailed discussion of the Pennsylvania Railroad test program will be found in later sections of this report.

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37. Pennsylvania Railroad Company, *Twenty-Eighth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockhoders, March 9,1875* (Philadelphia: E. C. Markley and Son, 1875), p. 124.

38. Altoona Charter Centennial Committee, *Altoona Charter Centennial*, p. 25.

39. Stott, "HAER Survey of Southwestern Pennsylvania," pp. 21-22.

40. Edwin P. Alexander, *The Pennsylvania Railroad: A Pictorial History* (New York: Bonanza Books, 1947), p. 134.

In 1881, the state of Pennsylvania experienced drought which forced Pennsylvania Railroad officials to supplement the water supply for the Altoona Works by water carrying tank cars brought in from other locations. To prevent future emergencies, the Pennsylvania Railroad constructed a twenty-eight million-gallon reservoir at Pottsgrove to provide adequate water for the Altoona shops in times of scarcity. The reservoir work was completed in December of 1881 with water turned into the reservoir in January of 1882. This project cost the railroad more than sixty-five thousand dollars.[41]

Also work began in 1881 on a new erecting shop and other buildings needed for the locomotive repair and construction work. This work included an erecting shop known as No. 2 on the south side of the machine shop which measured 65- by 350-foot as well as a new 40- by 170-foot, two-story storehouse, and the dismantling of the old machine shop which was rebuilt to two stories and measured 70- by 355-foot.[42]

Pennsylvania Railroad management formally established the office of General Superintendent of Motive Power in 1882 in Altoona though the position informally existed prior to official recognition. The duties performed in the office included the supervision of all rolling stock and locomotives, setting design standards, and carried out the Pennsylvania Railroad testing programs. Since this person would be located in Altoona, these shops became the most important on the railroad.[43]

An explosion on May 14, 1884 destroyed the bolder house. This structure was rebuilt and extended sixteen feet to provide room for two additional boilers. Also the Pennsylvania Railroad officials discovered that the upper portions of the walls on

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41. "Pennsylvania," *Railroad Gazette*, XIII (September 16, 1881), p. 504; Pennsylvania Railroad Company, *Thirty-Fourth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting, held March 8, 1881* (Philadelphia: N.P., 1881), p. 115; and Pennsylvania Railroad Company, *Thirty-Fifth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting, held March 14, 1882* (Philadelphia: N.P., 1882), p. 125.

42. Pennsylvania Railroad Company, *Thirty-Sixth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting, held March 13, 1883* (Philadelphia: N.P., 1883), p. 98; and "Pennsylvania," *Railroad Gazette*, XIII (September 30, 1881), p. 544.

43. "Historical Development of the Organization of the Pennsylvania Rail," *Railroad Gazette*, XIV (December 22, 1882), p. 793.

roundhouse No. 2 were insecure and these were taken down and replaced with wooden walls. In addition, a new roof structure was constructed on roundhouse No. 2 in order to relieve pressure on the lower wall portions.[44]

In 1886, a fire destroyed the flue shop in the Altoona machine shops area. The next year, the directors of the Pennsylvania Railroad authorized the construction of a 44-by 129-foot brick building for a new flue shop along with a brick paint shop facility, and a small structure for electrical light equipment. At the car shops, the directors authorized construction of a building for assembling car trucks and the extension of the storehouse by 47 feet. The board of directors further approved the construction of a reservoir south of Altoona at Brush Mountain to supply water for use at the shops.[45]

8. THE CONSTRUCTION OF THE JUNIATA SHOPS

In 1886, Pennsylvania Railroad officials began developing plans for construction of additional shops for the purpose of locomotive repair and building. The reason for this new shop complex was that the work load had so increased that it was necessary to expand the shops area. The site selected for the new shops was Juniata. Pennsylvania Railroad officials determined that the Juniata shop complex would contain a paint shop, boiler shop, blacksmith shop, boiler house, erecting shop, two-story machine shop, electric and hydraulic house, two-story office and storeroom, paint storehouse and gas house, and hydraulic transfer table and pit. Construction work on these structures began on September 15, 1888, with most of the construction work completed in 1890 and the first locomotive built in 1891 In full operations, this plant was scheduled to erect 150 locomotives a year. Today the machine shop, blacksmith shop, erecting shop, power

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44. Pennsylvania Railroad Company, *Thirty-Eighth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting, held March 10, 1885* (Philadelphia: N.P., 1885), p. 97.

45. Pennsylvania Railroad Company, *Forty-First Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting, held March 13, 1888* (Philadelphia: N.P., 1888), p. 102.

plant and boiler, paint storage building, and flue shop remain of the original complex though all have been modified.[46]

After the Juniata shops were fully operational, the Altoona shops complexes consisted of the machine shops located between Ninth and Tenth Avenues and between Eleventh and Sixteenth Streets, the car shops located between the main line tracks and Chestnut Avenue and from Seventh Street to below First Street and the Juniata Locomotive shops located in Juniata. The machine shop complex contained the iron foundry which produced the iron castings used in car construction with the exception of the car wheels, and the brass foundry cast car wheel bearings and all brass castings. Also there were three blacksmith shops containing seventy-six fires and three bolt furnaces. The two wheel foundries were capable of handling 20,000 pounds of melted iron. These foundries processed more than 19,000 tons of melted metal annually not counting the metal used in the wheel foundries, which produced over 100,000 wheels a year. A boiler shop manufactured boilers and a flue shop made and repaired flues. The boiler shop produced an average of two locomotive boilers a week as well as constructing stationary boilers. Also there was a lathe shop for planing, smoothing, and boring cylinders. A vise shop did filing and grinding of parts for engines with great precision. An air brake shop manufactured air brake equipment, steam gauges, and safety-valves. Three erecting shops were used for constructing locomotives. The erecting shops were equipped with a traveling crane capable of lifting and moving twenty-five tons. A paint shop applied paints and varnishes to engines, tanks, and cabs. The tin and sheet iron shop manufacturing items for locomotives from sheet iron and copper while the telegraph machine shop repaired telegraphic and electrical equipment. A pattern shop made various patterns casting. Also this shop produced various miscellaneous items such as locomotive-pilots. In addition, a carpenter shop, administrative office, and two roundhouses were in this complex. A fire department in this complex contained a complement of 60 men with two men on duty at al l times.

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46. Wilson, *History of the Pennsylvania Railroad Company with Plan of Organization, Portraits of Officials and Biographical Sketches*, p. 209; Clark, *A History of Bar County, Pennsylvania*, p. 94; Pennsylvania Railroad Company, *Altoona Shops and Motive Power Statistics* (Altoona, Pennsylvania: Office General Superintendent Motive Power, 1890), n.p.; and Stott, "HAER Survey of the Southwestern Pennsylvania," pp. 29-36, 39-40.

Also the railroad kept a force of more than forty watchmen with sixteen watching over the buildings and merchandise by day and twenty-five patrolling the grounds at night.[47]

The car shop complex contained two planing mills for doing various woodwork projects including the preparing of wood for depots, telegraph towers, and other company buildings as well as freight and passenger cars. Attached to one mill was a carpenter shop. A blacksmith shop fashioned various iron parts for the passenger and freight cars. The equipment used here included 5,000-pound steam hammers, 60,000-bolt manufacturing machines, and iron shears capably of slicing through a 3-inch thick by 6-inch wide piece of cold iron in seconds. A truck shop manufactured car trucks. A machine shop contained hydraulic presses for placing on and removing wheels from axles. Also in the complex was a cabinet shop which could steam and bend wood into various desired shapes. A passenger shop here produced twenty-five passenger coaches a month plus repairs to these cars. Three paint shops in this complex painted, ornamented, and varnished passenger, parlor, mail, express, and baggage cars. One of the three paint shops worked strictly with freight cars while another served as headquarters for those people who painted depots, telegraph towers, and other company buildings. A freight car shop there had the capability of working on more than seventy-five freight cars at one time. An oil house in this complex was used for the storage of oils and cotton material needed in the lubricating of car axles. A lumberyard covered twenty-five acres and contained facilities for receiving, drying, and storing lumber. In addition, the complex included a bolt and nut shop, upholstering shop, air-brake shop, tin shop, buffing room, storehouse, firehouse, and administrative offices. Thirty watchmen were employed to patrol the grounds here.[48]

In 1888, the directors of the Pennsylvania Railroad authorized the erection of a paint shop for locomotives in the machine shop area which was completed the next year. The locomotives would be brought in on rails to the east side of the shop and went through a series of stations until a fully painted engine emerged from the west end of the shop. Railroad officials in the early part of the twentieth century redesignated the

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47. Clark, *A History of Blair County, Pennsylvania*, pp. 89-91.

48. Clark, *A History of Blair County, Pennsylvania*, pp. 92-93.

structure as a warehouse. It remained in this capacity until the 1960s when the railroad officials decided the structure was not needed and sold it to the Altoona Pipe and Steel Supply Company which continues to use the building as a warehouse.[49]

The paint shop for passenger cars in the car shop complex was constructed in 1889. Over the years, these painting facilities continued to be improved. The Pennsylvania Railroad sold the property in 1963 to the Lithcote Company. This company continues to use and update the facilities to clean and paint various freight cars including hoppers, tank cars, gondolas, and box cars.[50]

In 1893, the directors of the Pennsylvania Railroad approved a number of construction projects for Altoona. The projects included for the car shops complex, a new 254- by 58-foot air-brake shop along with an 135-foot extension for the blacksmith shop, and a 250- by 30-foot shed for storage. At the Juniata shops, the railroad authorized the construction of a 78- by 21-foot building for storage of sand, firebrick, and other materials and a 51- by 17-foot building to serve as storage for the heavy dies used in flanging boiler sheets.[51]

The Pennsylvania Railroad, to promote their accomplishments and products, created an exhibit for the World's Columbian Exposition at Chicago, Illinois in 1893. One part of this exhibit consisted of photographs, drawings, models, and full size products manufactured at the Altoona shops. The products displayed included a passenger coach and telegraph equipment from the Altoona shops. Another part of the exhibit was devoted to the items tested in the chemical and physical testing department at Altoona.

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49. Stott, "HAER Survey of Southwestern Pennsylvania," pp. 23-24; and Pennsylvania Railroad Company, *Forty-Third Annual Report for the Year 1889 of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders. Presented at the Meeting held March 11th, 1890* (Philadelphia: N.P., 1890), p. 117.

50. Stott, "HAER Survey of Southwestern Pennsylvania," p. 9.

51. Pennsylvania Railroad Company, *Forty-Sixth Annual Report for the Year 1889 of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders. Presented at the Meeting held March 14th, 1893* (Philadelphia: N.P., 1893), p. 138.

This included various oils used to lubricate locomotives and various steel fabrications used in locomotive and car construction.[52]

By 1895, the number of people employed in the various shop complexes included 4,051 in the machine shops, 2,364 in the car shops, and 789 in the Juniata shops.[53] The machine shop complex consisted of an iron foundry, a brass foundry, three blacksmith shops, two wheel foundries, a boiler shop, lathe shop, vise shop, air-brake shop, three erecting shops, paint shop, tin and sheet iron shop, telegraph machine shop, pattern shop, cab and tank shop, carpenter shop, two roundhouses, and a structure for the storage and the test department. The car shop complex contained two planing mills, blacksmith shop, bolt and nut shop, truck shop, machine shop, upholstering shop, cabinet shop, passenger shop, two paint shops, air-brake shop, freight car shop, tin shop, buffing room, storehouse, oil house, firehouse, and lumberyard. The Juniata shops consisted of a machine shop, boiler shop, blacksmith shop, erecting shop, boiler house, electricity and hydraulic building, paint shop, paint storehouse, gas house, and an office and storehouse.[54] That same year, the Pennsylvania Railroad Company began construction of a brick boiler house and accumulator room to replace the old boiler house. The building which served as the test department, storehouse, and machine shop was enlarged to the north end with a three-story addition of 36 by 40 feet. To supply water to the Juniata shops, a 16-inch pipeline was laid from the shops three miles east to Elizabeth Furnace and Bell's Run to provide water for this shop complex.[55]

9. THE EARLY 1900s AND THE RAILROAD SHOPS EXPANSION

Work increased sufficiently at the Juniata shops so that during 1902 and 1903 the erecting shop, blacksmith shop, machine shop, and boiler shop were increased in size

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52. Pennsylvania Railroad Company, *Catalogue of the Exhibit of the Pennsylvania Railroad Company at the World's Columbian Exposition* (Chicago: N.P., 1893), pp. 11, 26, 152-158.

53. Clark, *A History of Blair County, Pennsylvania*, p. 82.

54. Charles B. Clark, *Illustrated Altoona* (Altoona: N. P. , 1895), pp. 31-35.

55. Pennsylvania Railroad Company, *Forty-Ninth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting, held March 10th, 1896* (Philadelphia: N.P., 1896), p. 106.

with the machine shop more than doubled in length. In addition, a new storehouse and blacksmith shop were constructed. This blacksmith shop known as Blacksmith Shop No. 2 presently serves as a warehouse.[56]

Because of the increasing demand for iron castings for locomotives and cars, the Pennsylvania Railroad began planning for the construction of a foundry complex in South Altoona and new enginehouse in East Altoona. The railroad purchased 85 acres of land in South Altoona in 1903. The South Altoona foundry complex when constructed between 1903 and 1905 consisted of a pattern shop, spring shop, storehouse, oil mixing facility, and office. Later, a machine shop was constructed there. The wheel foundry was one of the largest in the country, capable of producing 900 wheels per day. The oil mixing facility came as a result of the demand by the railroad for better quality control for oil products. Here, the Pennsylvania Railroad experts could supervise the mixing of oils, gases, and lubricants as well as test the raw products being purchased from outside companies for conformance to railroad specifications. This plant supplied petroleum products to the entire railroad system.[57]

As steel wheels replaced steel cast iron wheels, the railroad converted the iron foundry to various other shops. In 1972, the foundry became a storehouse and in recent years, Conrail remodelled the building and used it for a systemwide storehouse for parts and materials. The Pennsylvania Railroad sold the gray-iron foundry by in the 1960s to Altoona Hydrocon. Presently, the Federated-Fry Metals Company owns the foundry and has updated the equipment to produce tin and lead alloys. This same company presently owns the original machine shop which serves as a storage building.[58]

In 1904, the railroad officials constructed a 52-stall enginehouse in East Altoona and closed the two remaining machine shop area roundhouses. Later, a cab and tender

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56. Frederick Blount Warren, "A Railroad University: Altoona and Its Methods," *Scientific American*, June 29, 1907, p. 26324; and Stott, "HAER Survey of Southwestern Pennsylvania," pp. 37-38.

57. Davis, ed., *A History of Blair County, Pennsylvania*, pp. 256-257; Altoona Charter Centennial Committee, *Altoona Charter Centennial*, p. 29; Emerson, *Allegheny Passage*, p. 55; and Emerick, *Official Program: Old Home Week, Altoona and Blair County, August, 13th to 19th 1922*, p. 20.

58. Stott, "HAER Survey of Southwestern Pennsylvania," pp. 53-56.

shop and power plant were built on the sites of the machine shop enginehouses.[59] The Pennsylvania Railroad in 1905 began construction on "Erecting Shop No. 3" and completed work on this structure in 1907. The building contained overhead cranes and jib cranes to assist in the construction of freight cars. Railroad management declared the building surplus and sold it to the Altoona Pipe and Steel Supply Company in the mid-1960s. This company, about 1978, began using the building to repair railcars and continues this operation to the present.[60]

In 1906, the Pennsylvania Railroad began constructing all-steel passenger cars. The company authorized the construction of a 92- by 553-foot steel car shop to facilitate the production process. Today, Conrail still uses the building, known as the steel shop.[61]

By 1909, railroad management authorized the construction of a second planing mill to serve the Altoona car shop area. This structure remained as a planing mill until the early 1960s. The Pennsylvania Railroad sold this property to the Lithcote Company in 1963 which currently uses the building to clean and line tank cars. Also in 1909, a two and one-half-story brick firehouse stood at 1128 Ninth Avenue in the Altoona machine shop complex. The Pennsylvania Railroad converted the firehouse to office space in the early 1950s and in the mid-1950s sold the structure to the Altoona Pipe and Steel Company. This company continues to use the building as office space.[62]

10. THE RAILROAD SHOPS DURING AND AFTER WORLD WAR I

The United States entry into World War I resulted in the loss of shop personnel through military recruitment and an increase in railroad traffic as troop and supply trains passed through Altoona. The congestion and confusion in the national railroad system

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59. Davis, ed. *A History of Blair County, Pennsylvania*, pp. 256-257; Emerson, *Allegheny Passage*, p. 55; and Emerick, *Official Program: Old Home Week, Altoona and Blair County. August 13th to 19th 1922*, p. 20.

60. Stott, "HAER Survey of Southwestern Pennsylvania," pp. 27-28.

61. Ibid, pp. 14-15.

62. Ibid, pp. 12, 25-26.

caused the federal government to assume control of the railroads on December 28, 1917. The government controlled the railroad industry until March of 1920.[63]

The Pennsylvania Railroad began the construction of a second machine shop at Juniata in 1917. This structure, completed in 1918, served as a tank shop to repair and construct locomotive tenders. This function lasted only until 1925 when the building was refitted for heavy machine work. Then in 1952, this structure became the diesel engine shop.[64]

By 1922, various railroad shops and departments occupied fifty acres and were housed in hundreds of buildings. The work force, during this time, varied from between 15,000 to 16,000 people.[65] The Pennsylvania Railroad expanded the Juniata Works in 1924 and 1925 by construction of a fifty-stall erecting and machine shop at the east end of the existing shops along with a three-story storehouse and a small flue shop. This all was part of an effort to move the locomotive works away from the area of the Altoona machine shops around Twelfth Street. Presently, the erecting and machine shop is the center for diesel repair, the storehouse serves as offices for Con rail operations, and the flue shop functions as a warehouse. In 1924, the circular freight car shop at First Street became the locomotive finishing shop.[66]

Every year minor changes occurred to upgrade facilities and to cut the cost of operations. For example in 1924, the following changes occurred. The blacksmith shop at the Altoona car shops manufactured a jib crane to use in adjusting the height of freight and passenger cars and a heavy duty forging machine to replace one that wore out. That same year the metal yard at the Altoona car shops purchased a 15-ton

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63. Emerson, *Allegheny Passage*, p. 59.

64. Stott, "HAER Survey of Southwestern Pennsylvania," pp. 45-56.

65. Emerick, *Official Program: Old Home Week, Altoona and Blair County, August, 13th to 19th 1922*, p. 20.

66. Emerson, *Allegheny Passage*, p. 60; Stott, "HAER Survey of Southwestern Pennsylvania," pp. 47-52; and Emerick, *Official Program: Old Home Week, Altoona and Blair County, August, 13th to 19th 1922*, p. 29.

locomotive crane with electromagnet to replace twelve laborers and a three-man derrick crew. The Altoona machine shops purchased three cranes and seven platform-type electric trucks to save labor costs of sixty people. The air-brake shop at the Altoona machine shops purchased a new turret lathe to increase the production of stem collar bolts and tank valve seats. The erecting and machine shop at Juniata purchased a crane and platform type electric trucks and a stock adjusting machine to save on labor costs and increase productivity. The South Altoona oil mixing plant made changes and additions to their grease mixing facilities which eliminated one laborer position and reduced the work of three other laborers.[67]

The Altoona Works in 1926 consisted of the Altoona machine shops, Altoona car shops, Juniata shops, and South Altoona foundries. During the year, roundhouse No. 3 in Altoona was closed. The Altoona machine shops in that year contained the hammer shop, brass foundry, miscellaneous department, blacksmith shop, spring shop, flue shop, frame shop, wheel shop, boiler shop, three erecting shops, bolt shop, cab and pilot shop, tank and automatic shop, and machine and air-brake shop. These shops, primarily manufactured locomotive, with 5,500 people working there. During a typical day, the shops completed heavy repairs on four locomotives. The Altoona car shops contained the passenger car paint shop, freight car paint shop, trimming shop, bolt shop, machine shop, blacksmith shop, two passenger shops, truck shop, steel car shop, sheet metal shop, and planing mill and cabinet shop. These shops primarily repaired passenger and freight cars. They specialized in the repair and manufacturing of steel cars with more than 3,000 people working here. During a typical day, the shops repaired ten open freight cars, gave heavy repairs to three passenger cars, and light repairs to five passenger cars. The Juniata shops contained two blacksmith shops, boiler shop, two machine shops, tank shop, two welfare buildings, and an erecting and machine shop. These shops constructed and repaired locomotives with more than 4,200 people working there. These shops could repair four locomotives a day and build twelve locomotives a month. The South Altoona foundries consisted of two foundries, power plant, oil mixing plant, machine shop, and pattern shop and storage with more than 700 people working

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67. Works Manager to Chief of Motive Power, February 17, 1925, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No.1810, Hagley Museum and Library, Wilmington, Delaware.

there. The foundries cast wheels and other metal parts and could produce 1,000 cast iron wheels a day.[68]

In 1927, the Pennsylvania Railroad management ordered the consolidation of the locomotive tender repair work done at the Altoona machine shops and Juniata shops in a building located near the steel shop at the Altoona car shops. This resulted in the closing of the older tank shops at the Altoona car shop and Altoona machine shops. Today, the building is designated as Conrail Freight Shop No. 2 and serves as a repair facility for locomotives.[69]

In 1928 the cast iron wheel foundry closed.[70] In 1929, the old spring shop closed and a new building opened in South Altoona for the purpose of repairing spring.[71] Also that year, Works Manager Frederick W. Grimshaw proposed to close the machine and blacksmith shops at the South Altoona foundry complex and consolidate this work with the Altoona machine shops. The next year, 1930, construction was completed on a brass foundry in South Altoona.[72]

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68. Schotter, *The Growth and Development of the Pennsylvania Railroad Company*, pp. 432-436.

69. "Closures in 1927," Box 121, Superintendent of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Frederick G. Grimshaw, "The History of the Pennsylvania Railroad Company in Blair County," *Blair County's First Hundred Years, 1846-1946* (Hollidaysburg, Pennsylvania: The Blair County Historical Society, 1945), pp. 376-377; Altoona Charter Centennial Committee, *Altoona Centennial Booklet*, p. 29; and Stott, "HAER Survey of Southwestern Pennsylvania," pp. 17-18.

70. "Closures in 1927," Box 121, Superintendent of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

71. Grimshaw, "The History of the Pennsylvania Railroad Company in Blair County," *Blair County's First Hundred Years, 1846-1946*, p. 377.

72. Grimshaw to Fred W. Hankins, Chief of Motive Power, May 18, 1929, Superintendent of Motive Power Files, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and Pennsylvania Railroad Company, *1930, The Pennsylvania Railroad Company, Eighty-Fourth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders for the Year 1930, presented and adopted at the Annual Meeting of the Stockholders, 14th April, 1931* (Philadelphia: N.P., 1931), p. 6.

11. THE IMPACT OF THE GREAT DEPRESSION ON THE RAILROAD SHOPS

A fire broke out at the Altoona machine shops on December 27, 1931, which resulted in one and one-half million dollars worth of damage to that complex. The fire started in machine shop No. 3 and destroyed buildings between Twelfth Street and Fourteenth Street. The flames destroyed the air-brakes repair facilities and various valve repair operations. The Altoona works management transferred the people from these shops to other shop areas.[73]

The various shop complexes functions could be divided in the following manner by the end of 1931. The Altoona machine shops repaired locomotives, and fabricated parts for locomotives and cars. The Altoona car shops repaired passenger and freight cars, built new passenger cars and freight cars, repaired and built locomotive tenders, and fabricated steel parts for passenger cars, freight cars, and engine tenders. The Juniata shops repaired and built steam and electric locomotives, built and repaired scales, and fabricated parts for locomotives and cars. The South Altoona foundries manufactured gray iron castings, brass products, grease and oils, and new springs. Also the foundries repaired springs for locomotives, tenders, and railroad cars.[74]

In 1932, the Pennsylvania Railroad transferred operations at the brass foundry on Twelfth Street to South Altoona where a new electric furnace had recently been installed. The company set up a new department at the South Altoona known as the brass finishing shop.[75] In addition, Works Manager Grimshaw proposed eleven possible changes in operations at Altoona. First, install a new automatic shop in the South Altoona foundry area. This shop would use machines to manufacture metal pins, valves, studs, and sleeves. Second, consolidate all tool rooms for the Altoona works in Juniata. Third, consolidate all machine work on ferrous parts in the Juniata machine shop.

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73. Grimshaw, "The History of the Pennsylvania Railroad Company in Blair County," *Blair County's First Hundred Years, 1846-1946*, p. 375; and Emerick, *Official Program: Old Home Week, Altoona and Blair County, August, 13th to 19th 1922*, p. 29.

74. "Statement Showing Departments of the Altoona Works and Nature of Operations As of December 31, 1931," Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

75. Grimshaw, "The History of the Pennsylvania Railroad Company in Blair County," *Blair County's First Hundred Years, 1846-1946*, p. 375.

Fourth, the electric shops be transferred from the Altoona machine shop to the Altoona car shop area. Fifth, the bolt making operation be transferred to the Juniata shops. Sixth, all bolt forging operations be concentrated in the Juniata shops. Seventh, expand the Altoona machine shops wheel making operations. Eighth, transfer the valve repair operations from the Juniata shops to the Altoona machine shops. Ninth, transfer the boiler and flange work from the Altoona machine shops to the Altoona car shops and the Juniata shops. Tenth, open a new air-brake shop in the Juniata shops. Eleventh, transfer the facilities for making boiler compounds, tempering salts, and other chemical activities to the area of the South Altoona foundries.[76] The next year the manager closed the cab repair shops at the Altoona machine shops and the Juniata shops and consolidated their functions at the Altoona car shops. Also the manager closed the boiler house at the Altoona machine shops.[77]

By 1933, the Pennsylvania Railroad had developed an extensive system of reservoirs to supply water to the various shop complexes and 54 miles of distributing lines. The Blair Gap Water Supply Company, a subsidiary of the Pennsylvania Railroad Company, supplied more than 100,000 gallons a day to the Altoona works. In addition, an eastern series of reservoirs at Tipton, Bellwood, Riggles Gap, and East Altoona with a total storage capacity of more than 4,500,000 gallons supplied between 4 and 500,000 gallons daily to the Juniata shops. A southern reservoir group included Brush Mountain, Rose Hill, and Pottsgrove with a total storage capacity of more than 200,000,000 gallons supplied the machine and car shop complex with more than 2,000,000 gallons of water per day. A western reservoir group composed of Blair Gap and Plane Nine reservoirs with a total storage capacity of more than 140,000,000 million gallons supplied the South Altoona foundries with more than 1,000,000 gallons of water per day. The total daily consumption of water for the shops was between 7 and 9,000,000 gallons of water with a total reservoir storage capacity of 803,895,000 gallons of water. On rare occasions

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76. Grimshaw to Hankins, November 23, 1932, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

77. "Economic Effects at Altoona Works During the Year 1933," Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

during dry summer days, the total reservoir storage was depleted by thirty percent in one day.[78]

The growth and consolidation of the Altoona works continued into 1935 with the main thrust of this effort being to eliminate work in the Altoona machine shops area. The railroad management transferred the spring shop and foundry activities to the South Altoona foundries and the cab shop, tank shop, and hammer shop duties to the Juniata shops. These changes resulted in two old erecting buildings, machine shop No. 3, and a four-story building in the machine shop complex being torn down.[79]

By 1936, the Altoona machine shops though diminished in size, still made locomotive and car repairs. This shop complex contained an erecting shop, boiler shop, blacksmith shop, machine shop, tin shop, electric shop, mixing laboratory, and boiler plant. Also, the shop area contained a large steel cleaning vat in which locomotives could be submerged to their running boards and have their running gear and wheels thoroughly cleaned. The Juniata shops contained erecting shops, machine shops, boiler shop, blacksmith shop, air-brake shop, and heat treating department. The erecting shop contained 250-ton electric cranes and 15-ton cranes for moving the locomotives. The Altoona car shops contained a steel shop, X-29 freight car shop, original car shop building, freight car construction and repair shop, finishing shop, and passenger and car paint shop. The South Altoona foundries contained a gray iron foundry, core room, pattern shop, spring storage, boiler house, central electric general plant, and brass foundry.[80]

In 1936, the Pennsylvania Railroad management authorized the construction of an air-brake shop and welding building and began a massive modernization program. This

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78. National Board of Fire Underwriters, *Report on the City of Altoona, Pa.* (Altoona, N.P., 1933), p. 9; and "The Pennsylvania Railroad Co., Altoona, Pa.," Unidentified Newspaper Clipping, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

79. Hankins to J.D., Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

80. "The Altoona Works of the Pennsylvania Railroad," Box 608, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

included building new locomotives and updating passenger cars.[81] The types of passenger cars updated included coaches, coach-baggage cars, dining cars, and cafe-coaches. These updated cars began coming out of the shops in early 1937.[82]

To promote the Altoona Works in 1937, the Pennsylvania Railroad in cooperation with Railroad Stories Magazine, the New York Chapter of the Railway and Locomotive Historical Society, and the National Railway Historical Society sponsored a tour of the Juniata shops. A special train left from Pennsylvania Station in New York City on Sunday, May 16, 1937, making stops at Newark, North Philadelphia, Paoli, and Harrisburg. At Harrisburg, the train met passengers which were brought by train from Washington, D.C. and Baltimore, Maryland. Upon arriving at Altoona, the crowd of more than 1,700 people toured the Juniata erecting shop, machine shop, blacksmith shop, car shops, locomotive test plant, and the South Altoona foundries. The tour generated a large amount of favorable publicity for the railroad.[83]

The Pennsylvania Railroad on September 1 , 1938, closed the erecting shop, steel shop, tin shop, flue shop, flue mill, blacksmith shop, machine shop, boiler shop, boiler erecting shop, flange shop, hammer shop, and truck and frame shop at Altoona machine shops. The last locomotive repair completed at this facility was on July 26, 1938 with all locomotive repair operations transferred to Juniata. The Altoona Works manager transferred more than 1,200 men to the Altoona car shops and more than 300 men to the Juniata shops. The reason for this action was that the new Pennsylvania Railroad electric locomotives and steam locomotives such as the MI, II, and LI required less

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81. Pennsylvania Railroad Company, *1936, The Pennsylvania Railroad Company, Ninetieth Annual art of the Board of Directors to the Stockholders. Presented and adopted at the Annual Meeting of the Stockholders, 13th April, 1937* (Philadelphia: N.P., 1937), p. 5; and Emerson, *Allegheny Passage*, p. 68.

82. Pennsylvania Railroad New Release, June 20, 1937, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

83. "A visit behind the scenes of the Standard Railroad of the World," Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; G.E. Payne to Downes, Box 608, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Walton Wentz to R.C. Morse, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and "2,000 Visit Local P.R.R. Yards, Shops," May 17, 1937, Unidentified newspaper clipping, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

maintenance and less time in the shops. The locomotive repairs at the Altoona machine shops had steadily declined from 1,100 in 1927 to less than 400 in 1937. Most of the other buildings at the Twelfth Street area were used for storage with the exception of the old brass foundry.[84]

The manufacturing shop, miscellaneous shop, electric shop, power plant, automatic shop, and manufacturing laboratory remained open at the Altoona machine shop area. Late in 1938, management began planning for the abandonment of the manufacturing laboratory. The next year management transferred the manufacturing laboratory to the old machine shop in South Altoona where the facility would be combined with the oil mixing plant.[85]

The Pennsylvania Railroad in 1938 continued the modernization program begun two years earlier and ordered one thousand gondola cars, twenty electric locomotives, and a few specialty cars from the Altoona Works at a cost of $8,315,000. This resulted in

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84. Grimshaw, "The History of the Pennsylvania Railroad Company in Blair County," *Blair County's First Hundred Years, 1846-1946*, pp. 375, 379; "Statement Showing Buildings at Altoona Works Actually Removed, Those in the Course of Demolition, and Those Abandoned for Shop Purposes But Not Yet Removed for Year, 1938," n.d., Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; "Letter that Mr. Grimshaw Proposes Sending to the Men," n.d., Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; "Notice of Discontinuation of Altoona Machine Shop Unit," August 31, 1938, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Grimshaw to Hankins, January 18, 1938, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; J.A. Lockard to Hankins, March 8, 1939, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Grimshaw, "Memorandum Covering Procedure to be Followed in Connection with the Handling of a New Car Order if Received at Altoona Works," January 20, 1938, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and Hankins to J.F.D., January 20, 1939, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

85. "Letter that Mr. Grimshaw Proposes Sending to the Men," n.d., Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Hankins to J.F.D., November 23, 1938, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

increased work schedules for the Altoona labor force and management brought back laid off workers.[86]

Early in 1941, management developed plans to move the automatic shop to the old wheel foundry in South Altoona and the machine tool manufacturing department from the automatic shop to the Juniata shops. Railroad officials decided to abolish the machine tool manufacturing department though all the department functions would be transferred to the Juniata shops. This project entailed the transfer of one hundred and fifty machines which included automatic machines, turret lathes, grinding machines, milling machines, bolt threaders, engine lathes, and drill presses as well as three hundred men. The final transfer of the automatic shop and the machine tool manufacturing department occurred in 1942.[87]

12. THE RAILROAD SHOPS DURING WORLD WAR II

The entry of the United States into World War II in December of 1941 resulted in massive government contracts for the manufacturing of war related items. The Pennsylvania Railroad believed that the shops at Altoona could produce some of these items and by August of 1942, forty men in the Altoona Works were engaged in work directly related to the American war effort.[88] The war work included straightening armor plate for tanks, fabricating low pressure cylinders for marine engines, trimming press

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86. Telephone memorandum from Grimshaw to Hankins, June 2, 1938, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; "P.R.R. to Provide Additional Work for Employes (sic) at Altoona Shops Building 1 ,000 Gondolas, 8 Special Freight Cars, 20 Engines," *Philadelphia Inquirer*, June 9, 1938, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and Sounding of Shop Whistle Sbrings (sic) Elation in City," *Mirror*, Altoona, Pennsylvania, August 1, 1938, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

87. H.W. Jones to J.F.D., February 18, 1941, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Grimshaw to Jones, March 27, 1942, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Jones to J.F.D., March 26, 1941, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Jones to J.F.D., March 29, 1941, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and Grimshaw, "The History of the Pennsylvania Railroad Company in Blair County," *Blair County's First Hundred Years, 1846-1946*, p. 376.

88. Jones to Buckner, August 24, 1942, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

frames, manufacturing carriages for 40 millimeter guns, manufacturing parts for hot metal cars, repairing army locomotives, fabricating parts for bomber landing gears, machining castings for guns, and manufacturing parts for air compressors. In 1943, the Altoona Works did drop forging for Army tank trucks, machined cylinders for power presses, manufactured water cylinders, and made machine castings for a device to straighten bomber parts. Additional war work in 1944 included forging connections for tank treads, machining and assembling cinder cars, and forging locomotive parts. In 1945, the war work encompassed making flanging and pressurized boilerheads.[89]

In June of 1945, Altoona Works Manager Grimshaw made an evaluation of the facilities there and made the following suggestions. First, the machines in the Juniata machine shops be replaced by new equipment. Second, a new boiler plant be constructed for the Juniata Shops. Third, the electrical shop be moved from the Twelfth Street area to Juniata. Fourth, the passenger car paint shop be enlarged. Fifth, the locomotive finishing shop be enlarged. Sixth, the passenger car shop be reconstructed to provide better efficiency. Seventh, the wheel shop be enlarged to meet demand. Eighth, the tank shop be extended. Ninth, the power plant and boiler houses be replaced by modern facilities. Tenth, a new planing mill be constructed in South Altoona. Eleventh, the equipment at the South Altoona iron foundry be modernized. Twelfth, the fire suppression system in the pattern storage building be reconstructed. The management of the Pennsylvania Railroad took these suggestions under advisement, but did not act on them at the time.[90]

Late in 1945, the Pennsylvania Railroad placed in service a new freight car repair facility. In this shop, freight cars traveled down a railway to various stations where repair tasks were performed. The cars reached the shop's end repaired and ready for painting. This facility could rehabilitate and strip locomotives for painting as well as freight cars.

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89. "Performance of War Work in P.R.R. Shops," September 1, 1942, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and "Expenditure for War Work until May 1945," n.d., Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

90. Grimshaw to Jones, June 13, 1945, Box 607, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

The Pennsylvania Railroad designated the structure as Passenger Car Shop No. 4. This designation has now been changed to Conrail Miscellaneous Shop No. 2.[91]

13. CHANGES AFTER WORLD WAR II

Between the late 1940s to 1957, the Pennsylvania Railroad converted from steam to diesel-electric locomotives. The new diesel-electric engines required less maintenance than the steam engines. This resulted in a number of furloughs, layoffs, and recalls of Altoona shops employees. Also this resulted in the need for less shop space and repair facilities.[92]

By 1947, the Altoona Works consisted of the Altoona car shops, Twelfth Street car shop, South Altoona foundries, and Juniata shops divided into more than fifty shops. These included locomotive shops, blacksmith shops, boiler shops, machine shop, spring shop, air-brake shop, gray iron foundry, nonferrous metal foundry, oil mixing plant, automatic machine shop, pressed steel shop, welding shop, manufacturing machine shop, and brass finishing shop along with other facilities. These shops built new equipment and made repairs on locomotives, freight, and passenger cars. Locomotive and railroad car parts were manufactured both for local needs and for shipment to other railroad repair shops. The South Altoona foundries and oil mixing plant produced all the lubricants and special oils needed on the railroad system. Before 1949, facilities for reclaiming diesel engine oil were added to the plant. The foundries produced ferrous and nonferrous castings for use on both new and repaired equipment. The total work force numbered 11,939 workers.[93] In 1949, the erecting and Machine Shop No. 2 in

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91. "New P.R.R. Shop Now in Service," November 26, 1945, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and Stott, "HAER Survey of Southwestern Pennsylvania," pp. 19-20.

92. Jeanne N. Lindaman, "The-Up-Down-Up of a Railroad-Founded-and-Dominated-City Altoona, Pennsylvania," (Unpublished Manuscript, Altoona Area Public Library, 1970), p. 25.

93. J.M.S. to R.H. Chapman, April 3, 1948, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and H.T. Cover to C.E.M., April 3, 1948, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and Altoona Charter Centennial Committee, *Altoona Charter Centennial*, p. 29.

Juniata was renovated to service diesel engines. Also, the old tank shop at the Twelfth Street facilities became the diesel generator and traction motor repair shop.[94]

In the 1950s, the Pennsylvania Railroad began moving shop facilities away from Altoona and reducing the work force there. The company in June of 1952 issued an order that all positions in Altoona which did not support the diesel locomotive program or the car construction and repair program would be abolished. The company announced in 1953 that as of the end of December the abolition of the steam locomotive program. In 1954, a reclamation plant to salvage parts from worn out or obsolete stock was opened in Hollidaysburg. The next year the Samuel Rea Shop began operations in Hollidaysburg. This shop rebuilt, rehabilitated, and constructed freight cars. The company spent thirty-five million dollars on the construction of these facilities. The completion of these facilities resulted in the transfer of work from the Twelfth Street area shops, Altoona car shops, and South Altoona foundry to Hollidaysburg and subsequent abandonment of portions of these complexes.[95]

Despite the order by the Pennsylvania Railroad Company, the locomotive shops in Altoona still constructed steam locomotives for the next several years in addition to electric, gas electric, and diesel locomotives. Fabrication of parts for freight cars continued in Altoona along with oil reclamation and production of springs and bearings. Transfer of most of the car construction functions from Altoona to Hollidaysburg occurred in 1956 when the Samuel Rea shops went into full operations.[96]

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94. Emerick, *Official Program: Old Home Week, Altoona and Blair County, August, 13th to 19th 1922*, p. 31.

95. Altoona Charter Centennial Committee, *Altoona Charter Centennial*, p. 31; and Pennsylvania Railroad Company, *The Pennsylvania Railroad Company One Hundred and Seventh Annual Report for the Year Ended December 31, 1953* (Philadelphia: N.P., 1954), p. 13.

96. "The Pennsylvania Railroad Company Altoona-Heavy Repair Shops, Business-Education Day Program, November 10, 1955," Unpublished manuscript, Altoona Pennsylvania Railroad Eastbound Shops File, Altoona Area Public Library, n.p.; and Pennsylvania Railroad Company, *The Pennsylvania Railroad Company One Hundred and Seventh Annual Report for the Year Ended December 31, 1956* (Philadelphia: N.P., 1957), p. 16.

14. THE ELIMINATION OF THE OLDER RAILROAD SHOP BUILDINGS IN THE 1960s AND AFTER

In 1964, a new repair shop opened in the Juniata complex. In addition the Juniata shop adopted a disassembly and assembly line technique known as the "process line." This technique meant that the locomotive or car moved from one work position to another on a time schedule until work was completed and the product ready for testing. This process was used for locomotives requiring light repair as well as routine maintenance.[97]

On February 1, 1968 at 12:01 a.m., the Pennsylvania Railroad and New York Central merged to form the Penn Central Transportation Company. Railroad officials of the two systems first approached each other concerning the merger in 1957 and a formal merger application was submitted to the Interstate Commerce Commission in March of 1962. Pennsylvania Railroad officials indicated when the merger became final that the Juniata shops would be the center for intermediate locomotive repairs and the Samuel Rea shops would be the center for car repair and construction. New York Central Railroad facilities at Indianapolis, Cleveland, and East Rochester would be closed and the workers transferred to Altoona. In the mid-1970s, the plan came into effect when management moved workers from the East Rochester facility to Altoona. In addition, three hundred and fifteen employees of the Beech Grove, Indiana shops, were transferred to Altoona in 1972.[98]

In 1969, the new Penn Central completed a $6,500,000 modernization program. At that time, the Altoona Works consisted of the Juniata shops, the South Altoona shops, the Samuel Rea shops, the Altoona car shops, and reclamation plant. The Juniata

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97. Pennsylvania Railroad buff G. Franklin Ackerman in a letter to the author commented that he believed that the Pennsylvania Railroad neither constructed new steam locomotives nor performed any heavy repairs (e.g., refluing) to its existing steam locomotives after 1953. He further asserted that neither the Pennsylvania Railroad nor any other railroad ever constructed a diesel-electric locomotive in its company shops. G. Franklin Ackerman to John Paige, July 11, 1988; and Altoona Charter Centennial Committee, *Altoona Charter Centennial*, p. 31.

98. Michael Gartner ed., *Riding the Pennsy to Ruin: A Wall Street Journal Chronicle of the Penn Central Debacle* (New Jersey: Dow Jones Books, 1971), pp. 3, 7; "P C to Transfer Jobs to City," *Altoona Mirror*, March 21 , 1972, p. 1 ; Michael Bezilla, "The Development of Electric Traction on the Pennsylvania Railroad, 1895-1968," *Pennsylvania History*, XLVI (July, 1979), p. 210; and "Merger Will Center Work in Local Area," July 20, 1962, Unidentified newspaper clipping, Pennsylvania Railroad Merger File, Altoona Area Public Library, Altoona, Pennsylvania, n.p.

shops mainly repaired diesel-electric locomotives with other facilities there worked on air brakes and wheels for passenger cars in addition to manufacturing parts for locomotives and cars. The South Altoona shops operated as a brass foundry producing nonferrous castings, springs, and bearings. The Samuel Rea shops rebuilt and constructed freight cars and performed some work on passenger cars. The Altoona car shops repaired those freight and passenger cars that did not lend themselves to the process line technique used in the Samuel Rea shops. The reclamation plant continued to serve as a salvage facility for freight cars. The workload at these facilities increased when portions of the shops operations were closed at the Columbus, Pitcairn, Enola, and Wilmington shops and those operations transferred to Altoona.[99]

During the first year of operation under the Penn Central, the Altoona Works experienced a dramatic increase in work. The number of light locomotives repaired at Juniata increased from 243 to 714. This resulted in the calling back to work of 1,400 employees and a local payroll of $30.3 million dollars.[100] On May 1, 1970, the Altoona Works, now the Penn-Central Altoona Shops received a new general manager when Joseph S. Fadale succeeded John C. White.[101]

Starting in 1969, a number of the older shop buildings in the Twelfth Street area and the Altoona car shop area were demolished or sold after their functions were transferred to Juniata or the Samuel Rea shops. In the spring of 1971, the Penn Central management announced that they planned to tear down or sell a number of structures in the Twelfth Street area including the old powerhouse, paint shop, test plant complex, and

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99. Penn Central Press Release, September 1969, Altoona-Penn Central File, Altoona Area Public Library, Altoona, Pennsylvania.

100. "Penn Central Raises Steam," *Tribune Democrat*, April 8, 1969, Altoona-Penn Central File, Altoona Area Public Library, Altoona, Pennsylvania.

101. "Fadale to Succeed White in PC Post," *Altoona Mirror*, April 28, 1970, Altoona-Penn Central File, Altoona Area Public Library, Altoona, Pennsylvania.

erecting and machine shop.[102] That same year the company announced that the South Altoona facilities would be rehabilitated and converted to a material distribution center. The cost of this amounted to $279,396.[103]

A series of events including inflation, poor management, and abnormally harsh weather conditions forced the new railroad to file a petition for bankruptcy on June 21, 1970. The bankruptcy resulted when the administration of Richard M. Nixon withdrew a government guarantee for a 200-million-dollar loan that the company needed to continue operations. The failure of this and other eastern and midwestern railroads resulted in congressional action. Congress passed the Regional Rail Reorganization Act of 1973 which requested the United States Railway Association to study the problem and submit a railroad reorganization plan to Congress. This group recommended that a private corporation to be known as the Consolidated Rail Corporation (Conrail) be created from major portions of the Penn Central, Erie Lackawanna, Central of New Jersey, Lehigh Valley, Lehigh and Hudson River, and Reading Railroads. The federal government would invest up to $2.1 billion dollars in Conrail securities which would be paid back from railroad revenues. Once these funds were paid back to the government, federal involvement in the corporation would end. Part of this study selected the Juniata shops as a major locomotive repair shops and the Samuel Rea shops as a car repair facilities for the new system. President Gerald R. Ford on February 5, 1975, signed the Railroad Revitalization and Regulatory Reform Act which implemented the study proposals. The new corporation took over operations from the existing railroads at 12:01 a.m. on April 1, 1976.[104]

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102. "P C Shops Face Ball," *Altoona Mirror*, April 12, 1971, p. 1; "P C Disposal of 12th Street Shops Expected Soon," *Altoona Mirror*, March 25, 1971, p. 1; "Railroad Asked to Clear Area," *Altoona Mirror*, March 31, 1971, p. 10; "Landmark Collapses," *Altoona Mirror*, July 13, 1971, p. 1; and "P C Offers Test Plant to Authority," *Altoona Mirror*, February 27, 1973, p. 1.

103. "Court Okays P C Facilities," *Altoona Mirror*, September 30, 1971, p. 1.

104. "Local Shops to be Included in Preliminary Rail Plan," *Altoona Mirror*, January 22, 1975, p. 2; "Urgent Need for Federal Funds," *Penn Central Post*, January, 1975, p. 2; "Congress Votes Railroad Aid," *Penn Central Post*, February-March, 1975, p. 2; "Plan for New Railroad Network," *Penn Central Post*, February-March, 1975, p. 2; "USRA Presents Its Final System Plan," *Penn Central Post*, July-August, 1975, p. 1; "A Look at the New Railroad," *ConRail*, April 1, 1976, p. 5; and "ConRail to Take Control on April 1," *Penn Central Post*, March 1976, p. 1.

The new corporation promised to spend 14.5 million dollars to update the Altoona shops. The primary responsibility of the Juniata shops remained the repairing of locomotives. In addition, the Juniata shops took on the role as the central manufacturing and warehouse responsible for rebuilding, trucks, power assemblies, and other components required by Conrail shops throughout the new system.[105] The present Juniata shops and South Altoona facilities remain an active and vital part of the Conrail system.

105. "20,000 ConRail People Go Full Throttle on M-of-E," *Conrail*, August/September 1976, pp. 4-5; and "Altoona Works Manager Named Superintendent of Con Rail Shops," *Altoona Mirror*, April 2, 1976, p. l.

CHAPTER 2: THE PRODUCTS OF THE ALTOONA RAILROAD SHOPS

1. RAILROAD CARS AND IRON PRODUCTS FROM 1850 UNTIL 1952

The Pennsylvania Railroad planned the shops at Altoona for the purpose of making repairs on locomotives, freight, and passenger cars as well as manufacturing parts for these items. The railroad company both constructed freight and passenger cars and also contracted out for the manufacture of these products. Thus, a variety of cars were either built, rebuilt, or repaired at Altoona. Pennsylvania Railroad management believed that railroad cars, as a general rule, could be constructed cheaper and better by the company than a contractor. The railroad management saw Altoona an ideal location for repair and construction projects as nearby could be obtained abundant supplies of coal, iron, and lumber. In addition, topographical features favored a repair facility at this point on the railroad.[1]

By 1852, the company ordered that the railroad car repair work at Harrisburg be transferred to the better equipped Altoona shops. Also by this time, the foundry at Altoona came into full operation and produced castings for all shops except the West Philadelphia repair shop. That year the Altoona shops constructed emigrant cars, box burden cars, open stock cars, and flat cars.[2]

During the winter of 1852, the Altoona machine shops began producing wrought iron, boiler plate, and cast iron bridge parts for railroad construction in the Pennsylvania Railroad system. Some of the first iron bridge superstructures fabricated for such bridges as the railroad crossings of the Portage Road and the Little Conemaugh came from the Altoona shops. The Pennsylvania Railroad became one of the first American railroads to adopt the use of iron bridges instead of wooden ones. Most of the bridges constructed on the Altoona to Pittsburgh segment of the railroad were iron when the road

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1. Pennsylvania Railroad Company, *Fifth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 2, 1852*, p. 65; and Pennsylvania Railroad Company, *Sixth Annual art of the Directors of the Pennsylvania Railroad Company to the Stockholders, January 7, 1853*, pp. 53-55.

2. Pennsylvania Railroad Company, *Sixth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 7, 1853*, pp. 53-55.

first opened in 1854, and over the next several years, the railroad replaced the few wooden bridges on the system with iron ones.[3]

In 1853, the Altoona shops rebuilt old railroad cars as well as constructed new baggage cars, four-wheeled coal cars, four-wheeled box cars, and eight-wheeled box cars with iron and wood trucks.[4] The Altoona shops in 1854 constructed passenger cars, eight-wheeled stock cars, eight-wheeled iron cars, eight-wheeled and four-wheeled coal cars, and eight- and four-wheeled box cars. The early passenger cars essentially were large boxes mounted on two swiveling trucks with no brakes. Each end of the cars had a platform for mounting into the interior. The interior consisted of long boxes on which 32 passengers could sit, and a row of eight twelve-paned windows on each side of the car provided light and an outside view. A vent pipe in the center of the car provided air and ventilation. In addition to passenger and freight car repair, the shops continued manufacturing iron parts for bridges that year.[5]

The Altoona shops continued this same type of work for the next several years with the four-wheeled cars gradually being discontinued in favor of eight-wheeled cars. Also, the Altoona shops spent time converting narrow passenger and freight cars to wide cars. The wide cars measured 37 feet 9 inches in length and had a width of 9 feet from the outside sls. Outside car body height was 7 feet 10-3/4 inches with an inside height of 6 feet 10 inches or less. After these cars became outdated, they were converted to serve as "emigrant trade" transport.[6]

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3. Ibid. , p. 53; Pennsylvania Railroad Company, *Seventh Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 6, 1855*, pp. 53-55; and Sipes, *The Pennsylvania Railroad: Its Origin, Construction, and Connections*, p. 26.

4. Pennsylvania Railroad Company, *Seventh Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 6, 1855*, pp. 53-55.

5. Pennsylvania Railroad Company, *Eighth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 5, 1855*, pp. 47, 50, and 51; and Burgess and Kennedy, *Centennial History of the Pennsylvania Railroad Company, 1846-1946*, p. 755.

6. Pennsylvania Railroad Company, *Ninth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 4, 1856*, pp. 47-49; Burgess and Kennedy, *Centennial History of the Pennsylvania Railroad Company, 1846-1946*, p. 756; and Pennsylvania Railroad Company, *Tenth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 2, 1857*, pp. 40-42.

The Pennsylvania Railroad developed thirty experimental refrigeration cars in 1857. These cars were constructed with double sides, roofs, and floors. The space created by the double wall construction were filled with sawdust to provide insulation. A hole was drilled in the floor between the doors to provide drainage for ice water with the ice placed in containers built into the door. Later, the ice was moved to huge boxes strapped to the end of the cars.[7]

In 1857, Thomas Woodruff devised a railway sleeping car and the next year obtained a patent for it. Woodruff concluded an agreement with the President of the Pennsylvania Railroad, Thomas Scott, in 1858 to supply his sleeping cars under contract to the railroad. He agreed to provide one car for every night train with an additional car provided on request. This agreement allowed for the construction of a sleeping car facility at Altoona for the repair and maintenance of these cars. Another contract stipulation required the railroad to attach a fifty cents fee in addition to the regular ticket fare for those passengers using the Woodruff sleeper. The Woodruff company received this fee. The Pennsylvania Railroad used this type of sleeping cars until the I880s.[8]

In 1858, the Pennsylvania Railroad company designated that all car shops use standard patterns. The reason for this was to cut down on the amount of patterns necessary for repair work on these cars.[9] The full implementation of the policy did not take place until the I870s when it was extended to cover locomotives as well as freight and passenger cars.

During 1862, a new type of passenger car designated as Class PA was constructed. This car seated 52 passengers and had an outside length of 53 feet with an interior length of 45 feet 10-1/2 inches. The interior was 8 feet 6 inches in width by

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7. Louis Dwight Harvell Weld, *Private Freight Cars and American Railways* (New York: Columbia University, 1908), p. 12.

8. Lucy Wolf, "Patent Fight Ended in Stalemate," *Altoona Mirror*, October 18, 1979, p. 51.

9. Pennsylvania Railroad Company, *Twelfth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 7, 1859*, p. 37.

8 feet 10-5/16 inches in height. Candles provided light for these cars while one stove supplied the car with heat in cold weather. These cars contained neither wash basins nor toilet facilities.[10]

The Altoona car shops produced some of this country's first mail cars in 1866 under the direction of John P. Levan, then general superintendent at Altoona. These mail cars were constructed under contract with the federal government and sent to Washington, D.C. when completed for final inspection. Each of the mail cars contained a small slot at the bottom of the door for people to place letters when the train stopped at a depot.[11]

In 1867, the Class PB car became the newest improvement for passenger travel. This car provided seating for 54 passengers and offered added height through the use of a clerestory roof known as a "monitor." Three double lamps which burned coal gas supplied light, but no sanitary facilities existed. In 1878, a toilet and basin facilities were added which resulted in the reduction of space by two seats.[12]

Another car constructed in the late l860s was a gondola car. By 1869, these Class GA cars had inside dimensions of 30 feet 9-1/2 inches by 7 feet 6-1/2 inches with a capacity of 28,000 pounds. A 40,000-pound capacity car known as Class GC came into use in 1880. This and all gondola cars were constructed of wood until 1898. This fact meant that about half of the car's capacity was taken up by its own weight.[13]

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10. The class designation for passenger and freight cars is that used by the Pennsylvania Railroad and may differ from car designations on other railroads. Pennsylvania Railroad Company, *Sixteenth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 2, 1863*, p. 23; and Burgess and Kennedy, Centennial History of the Pennsylvania Railroad Company, 1846-1946, p. 756.

11. James M. Shafer, "Postal Cars Railroaded Out of Existence Finally," *Altoona Mirror*, January 16, 1973, p. 16; and "Victim of Progress," Unidentified newspaper clipping, Altoona Railroad File, Altoona Area Public Library, Altoona, Pennsylvania.

12. Burgess and Kennedy, *Centennial History of the Pennsylvania Railroad Company, 1846-1946*, p. 756.

13. Ibid., p. 774.

In 1870, the Altoona shops began constructing baggage cars. These baggage cars usually consisted of two sections with a forward compartment for regular baggage and a back section closed off with a grill and barred window for transporting valuable parcels and money. Also cabin cars were constructed that year which served as mobile homes for construction crews.[14]

In 1873, the original erecting shop in Altoona installed an overhead crane to facilitate in the construction and repair of engines and cars. That same year Pennsylvania Railroad officials became interested in testing the new air brakes developed and patented by George Westinghouse in 1869. Testing began in 1875 and these brakes proved so successful in tests that the Pennsylvania Railroad became the first railroad to adopt them for all their cars in 1878.[15]

By 1875, passenger cars were both designed and constructed in Altoona. These passenger cars were of particularly sturdy construction and designed to protect the passenger in case of an accident. The wheels for these cars were of the double-plate pattern and fabricated using a casting process which combined steel with charcoal iron resulting in a very durable wheel resistant to cracking. The next year the Altoona shops began constructing excursion cars. The excursion cars were identical to the standard Pennsylvania passenger car except that they contained wooden slab seats and were fitted up in a less costly manner.[16]

The Altoona shops in 1876 produced a new type of coal car for use on the Pennsylvania Railroad. That same year the management of the Pennsylvania Railroad Company adopted a policy to equip all cars with automatic couplers. This coupler

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14. "Altoona Products," *Altoona Mirror*, January 16, 1973, p. 16; "Victim of Progress," Unidentified newspaper clipping, Altoona Railroad File, Altoona Area Public Library, Altoona, Pennsylvania; and Burgess and Kennedy, *Centennial History of the Pennsylvania Railroad Company, 1846-1946*, p. 778.

15. Frank H. Spearman, *The Strategy of Great Railroads* (New York: Cares Scribners Sons, 1904), pp. 26, 30; Paul T. Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924* (Philadelphia: Baldwin Locomotive Company, 1924), p. 33; and Steward H. Holbrock, *The Story of American Railroads* (New York: Crown Publishers, 1947), p. 290.

16. Sipes, *The Pennsylvania Railroad: Its Origin, Construction, and Connections*, pp. 29-30; and Pennsylvania Railroad Company, *Thirtieth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders As presented at the Meeting, held March 13, 1877*, p. 145.

replaced the link and pin coupling devise which proved so dangerous to railway workers.[17] In 1877, a committee of Pennsylvania Railroad officials met in Altoona and developed a set of criteria so that all box cars used on lines operated by that railroad would be standardized.[18]

The Pennsylvania Railroad in 1879 unveiled a newly designed observation car. This car differed from observation cars used on the Central and Union Pacific Railroads in that it had a top which protected passengers from the elements. The car appeared designed in a similar style to older passenger cars, but was open at the windows and ends where fluted columns supported the roof. The passengers sat on wooden seats. The railroad used these cars on the mountain route between Altoona and Pittsburgh as they considered this extremely scenic.[19]

Besides passenger cars, the Altoona shops in 1879 constructed box, stock, tool, coal, derrick, hopper, gondola, oil tank, and cabooses. The 1879 box cars had a length of 79 feet and a capacity of 24,000 pounds with an internal dimension of 1,321 cubic feet. Also that year freight cars began to be equipped with arch bars which had greater strength and flexibility than earlier types.[20]

The Pennsylvania Railroad in 1881 introduced a new standard passenger car designed in the "Eastlake" style. The Altoona designers designed this car to appear light and airy while being durable and easy to maintain. An iron frame supported a wooden body composed of white pine, yellow pine, black walnut, and poplar. Galvanized steel

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17. "Coal Car for the Pennsylvania Railroad, Constructed at the Altoona Shops," *Railroad Gazette,* VIII (April 7, 1876), p. 149; and Holbrook; *The Story of American Railroads*, p. 290.

18. "Pennsylvania," *Railroad Gazette,* IX (June 1, 1877), p. 248.

19. "The Pennsylvania Observation Cars," *Railroad Gazette*, XI (May 23, 1879), p. 290.

20. Pennsylvania Railroad Company, *Thirty-Third Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting, held March 9, 1880* (Philadelphia: E.C. Markley & Son, 1877), p. 120; and Burgess and Kennedy, *Centennial History of the Pennsylvania Railroad Company, 1846-1946*, pp. 756, 782.

overlay the white pine roof.[21] These passenger cars with a width of 8 feet 5 inches were narrower than the previous standard passenger cars which measured 8 feet 11 inches. The designer did this by reducing the size of the aisle. This reduced the car's weight by 5 percent and air resistance by 10 percent. However, the Pennsylvania Railroad did not adopt this as a policy for all cars as parlor cars constructed at Altoona were wider than standard passenger cars.[22]

In 1884, the Pennsylvania Railroad Company decided to construct a new parlor car in Altoona. These cars proved a novelty in that the sides contained a series of bay windows which provided a more panoramic view for the passenger. The seating was so arranged in the car that the passenger could take full advantage of outside scenic views. That year the West Jersey Railroad contracted with the Altoona shops for six of these parlor cars.[23]

The railroad continued to improve their trains through technological innovation. In 1882, experiments began for lighting passenger trains with electric lights. The "Pennsylvania Limited" in June of 1887 became the first regular scheduled Pennsylvania train to be illuminated with electrical lights. Prior to this in 1885, the company developed a system to use the locomotive steam to heat passenger cars. The company in 1886 began constructing an improved refrigeration car to better transport meats and other items requiring cool temperatures for preservation. The railroad introduced vestibules in 1887. The vestibules provided a safe passage between cars and linked the entire train together as a unit instead of being just individual cars.[24]

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21. "Pennsylvania Railroad Standard Passenger Car," *Railroad Gazette,* XIII (August 5, 1881), p. 431.

22. "Narrowing Passenger Cars," *Railroad Gazette,* XIV (August 25, 1882), p. 519.

23. "Pennsylvania," *Railroad Gazette,* XVI (January 18, 1884), p. 58; "Car Notes at Altoona," *Railroad Gazette,* XVI (May 16, 1884), p. 380; and "Bay Window Parlor Car, Pennsylvania Railroad," *Railroad Gazette,* XVI (August 29, 1894), p. 361.

24. Burgess and Kennedy, *Centennial History of the Pennsylvania Railroad Company, 1846-1946,* p. 756; Pennsylvania Railroad Company, *The Passing of the Wooden Passenger Car from This Railroad* (Clifton Heights, Pennsylvania: Harry P. Albrecht, 1928), p. 7; Pennsylvania Railroad Company, *Fortieth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting held March 8th, 1887,* p. 112; and August Mencken, *The Railroad Passenger Car* (Baltimore, Maryland: The John Hopkins Press, 1957), p. 34.

During this entire period, the Altoona car shops constructed private railroad cars. An example of this work is found in the private car used in a trip taken by United States President Benjamin Harrison in 1889 from Washington to New York City. The private car used by the president belonged to Pennsylvania Railroad First Vice-President Frank Thomson. One-third of the car contained a drawing room finished in white wood with a large gas-burning chandelier. A working fireplace stood in one corner of the room complete with mantel. Adjoining this was a bedroom with lavatory which occupied the middle third of the car except for an enclosed passageway that led from the drawing room to a sitting room. This sitting room served as a working and dining room during the day and additional sleeping quarters at night. This room contained a writing desk, lavatory, and toilet. Attached to the sitting room was a kitchen and pantry. The rear of the car contained an open observation room enclosed on the sides and top.[25]

By 1892, the standard passenger car used on the Pennsylvania Railroad measured 60 feet 7 inches in length on the exterior and 53 feet 5 inches in length on the interior, 9 feet 10 inches in width on the exterior and 8 feet 10 inches in width on the interior, and 14 feet in height on the exterior and 9 feet 5 inches in height on the interior. This coach could seat 52 people and was heated by two side heating Spear stoves and ventilated by a movable deck sash. Candles and gas lamps illuminated the interior and the restrooms contained a toilet and drinking water facility.[26]

In 1895, the Altoona shops constructed a wooden hopper car, class GG. This car was one of the first hopper cars built for quick unloading. The car's interior measured 27 feet and 7 inches with a capacity of 70,000 pounds. The floor was designed on a 30-degree angle to facilitate unloading. The first all-steel hopper car, class GL, built in Altoona was in 1898. This offered several advantages including a longer useful life and

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25. Pennsylvania Railroad Company, *From The New Capital to the Old, April 29th-May 1st, 1889* (Philadelphia: Allen, Lane & Scott, 1889), pp. 3, 12-14.)

26. William Voss, *Railway Construction: A Work Describing in Detail and Illustrating with Scale-Drawings the Different Varieties of American Cars as Now Built* (New York: R.M. Van Arsdale, 1892), p. 142; and Pennsylvania Railroad Company, *Catalogue of the Exhibit of the Pennsylvania Railroad Company at the Worlds Columbian Exposition* (Chicago: N.P., 1893), p. 11.

quicker dumping over the wooden hopper car. The interior length of the steel car measured 31 feet and 6-1/4 inches and a capacity of 100,000 pounds.[27]

The Bettendorf Company in 1903 introduced cast steel truck side frames in 1903. The next year the Altoona works built a steel passenger car for the New York City rapid transit system.[28] In June of 1906, the Altoona car shops built the first all steel passenger car, class P58. This was followed by the construction of the first all steel postal and baggage cars in November of 1906 and February of 1907.[29]

The 1906 steel passenger car incorporated improvements that the Pennsylvania Railroad developed since the 1892 wooden passenger car became the accepted standard for the system. These modifications included a wider vestibule which enclosed the entire platform and electric lights. Electric lights had become standard on class PL passenger cars developed in 1902. The 1902 car seated 72 passengers with the exterior dimensions being 67.5 feet in length. The first all steel car was very similar in design to the 1902 passenger cars. Shortly after the first all steel car was made, Altoona engineers began designing an improved passenger car to take full advantage of steel construction. They developed the P70 cars which had an exterior dimension of 79 feet 10-1/2 inches with interior dimensions of 69 feet and 7-3/8 inches in width and 9 feet and 1-1/8 inches in width. This design became the standard steel passenger car and was modified to serve for passenger-baggage, mail, baggage mail, dining, and other types of cars. This new car originally seated 88 passengers, but this was reduced to 80 with the installation of lavatories at each end of the car in 1926.[30]

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27. "Hopper Cars Refurbished," *Altoona Mirror*, October 31, 1968, Penn Central Railroad File, Altoona Area Public Library, Altoona, Pennsylvania; and Burgess and Kennedy, *Centennial History of the Pennsylvania Railroad Company, 1846-1946*, p. 775.

28. "Steel Passenger Cars," Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

29. Edwin P. Alexander, *The Pennsylvania Railroad: A Pictorial History* (New York: Bonanza Books, 1947), p. 133; and Grimshaw, "The History of the Pennsylvania Railroad Company in Blair County," *Blair County's First Hundred Years: 1846-1946*, p. 376.

30. Pennsylvania Railroad Company, *The Passing of the Wooden Passenger Car from This Railroad*, p. 5; and Burgess and Kennedy, *Centennial History of the Pennsylvania Railroad Company*, 1846-1946, pp. 760-761.

In 1924, the Altoona car shops built an all-steel dining car. In 1936, the Pennsylvania Railroad redesigned these dining cars with the new cars containing a 38-passenger dining area and a club section. Then in 1939 the designers developed the first twin unit dining car. These units used one entire car as a diner while the second unit served as the kitchen with lunch counter or dormitory for staff depending on the service needs.[31]

During the l920s and l930s, a wide variety of cars were built in Altoona. These included various classes of the X29, X3l, X32, and X33 box cars. These all-steel box cars ranged from 40 to more than 50 feet in length with a capacity of up to 100,000 pounds. During this time, the Altoona works constructed both G26 and G27 gondola cars which measured 68 feet and a little over 50 feet, respectively, in length and could carry loads up to 140,000 pounds. Also the H27 and H30 hopper cars were constructed at Altoona. These cars measured more than 30 feet in length and could carry 140,000 pounds. The H30 cars carried covered loads such as cement or other bulk commodities. The Altoona shops also constructed a special cement car known as GLE. Various flat cars of the F29, F30, and F3l types were built in the shops. These measured from 50 to 52 feet in length and carried from 140,000 to 210,000 pounds. The F29 was a well-type car and the F3l was a especially designed for carrying containers.[32]

Each of these freight cars required various manufacturing time requirements. For example, the G27 gondola car required 106-man hours for fabricating the structure, 138-

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31. Schotter, *The Growth and Development of the Pennsylvania Railroad Company*, p. 396; Pennsylvania Railroad Press Release, June 20, 1937, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and C.H. Stein to H.W. Jones, April 17, 1944, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

32. Pennsylvania Railroad Press Release, December 11, 1935, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Hankins to G.E. Payne, July 28, 1936, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and "The Altoona Works of the Pennsylvania Railroad," ca. 1936, Box 608, Office of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

man hours for assembling, 7-man hours for fabricating air brakes, 6-man hours for installing air brakes, and 8-man hours for painting for a total of 265-man hours per car.[33]

In 1936, the Pennsylvania Railroad began a modernization program which included the passenger car air-conditioning and making these cars more comfortable for the passenger. The purpose of this program was to make the railroad more competitive with automobiles, buses, and airlines.[34] As part of this program, some forty passenger cars were especially redesigned for the needs of overnight travelers. These cars contained large luggage compartments, and rotating and reclining individual seats with sponge rubber cushions. Each of these cars contained 68 seats and three washrooms. Another twenty passenger coaches were redesigned for daylight runs. This modification to these cars included sponge rubber cushions for seats and partially divided seats. These cars held seating for 84 passengers and contained two washrooms and an enlarged overhead baggage rack.[35]

Another phase of this modernization program involved the replacement of trucks on some 185,000 freight cars. The reason for this program was the development of one-piece cast-steel sideframes to replace the arch bar truck. This work continued through part of 1938.[36]

In 1938, the Altoona Works received an order for 1,000 gondola cars, 25 locomotive tenders, and 8 special freight cars. The special freight cars included six with

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33. Grimshaw to Hankins, January 18, 1938, Box 3, Office of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

34. Emerson, *Allegheny Passage*, p. 68.

35. "Pennsylvania Railroad Press Release," June 20, 1937, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

36. "Pennsylvania Railroad Press Release," February 7, 1937, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

"well hole" construction and two flat cars of the 200-ton capacity. The tenders were to be of 21,000-gallon capacity for M-1 locomotives.[37]

The Altoona Works also constructed experimental cars for the Pennsylvania Railroad. In the early 1940s, the shops produced a refrigeration car to test the effectiveness of dry ice versus water ice in refrigeration.[38] During the war years, the United States government ordered construction of new passenger cars to stop in order to conserve resources for the war effort.[39]

After the war, planning began for the construction and transfer of the freight and passenger car manufacturing facilities to the Samuel Rea shops in Hollidaysburg. These shops became fully operational in 1956. A few cars that did not lend themselves to the assembly line work process at the Samuel Rea shop continued to be built or rebuilt at the Altoona works. As late as 1969, the Altoona shops were constructing cabooses for the Penn Central Railroad.[40]

2. LOCOMOTIVES FROM THE 1860s UNTIL THE 1980s

When the Pennsylvania Railroad began planning the Altoona shops, the directors decided to assign the shops the duty of repairing locomotives as well as freight and passenger cars. The bulk of the first locomotives used on the Pennsylvania Railroad came from the M.W. Baldwin and Company in Philadelphia, with other locomotives

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37. "Pennsylvania Railroad Press Release," June 29, 1938, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; "P.R.R. to Build 25 New 21,000-Gallon Tenders at Altoona Works," October 24, 1938, Unidentified newspaper clipping, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and "P.R.R. To Provide Additional Work for Employes (sic) at Altoona Shops Building 1,000 Gondolas, 8 Special Freight Cars, 20 Engines," Unidentified newspaper clipping, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

38. "Research Report," n.d., Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

39. "Brotherhood Pageant Slide Show Narrative," ca. 1946, Box 1, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

40. "Meet the 1969 Version of the Little Red Caboose, the Big, Green, Brand, New Cabin Car," *Penn Central Post*, September 1, 1969, p. I.

coming from R. Norris & Son, Ross Winans, Seth Wilmarth, and Smith and Perkins. A few of these locomotives were coal burners, but most required wood for fuel and all required a great amount of maintenance.[41]

In 1861, the Pennsylvania Railroad became one of the first American boilers railroads to install steel fireboxes under the locomotive boilers.[42] By 1862, the locomotive repair and rebuilding operations at Altoona was well under way with fifteen or more engines at a time undergoing some type of repair there.[43]

The first locomotive built in Altoona was passenger engine No. 86 completed in May of 1862. This engine had four 66-inch drivers and weighed 69,400 pounds. The engine number was changed to 73 in 1869 and it was cut up for scrap in 1885. Another early engine, often mistakenly referred to as the first Altoona engine, was passenger engine No. 142 built in January of 1867. This engine was slightly smaller in that it weighed 66,000 pounds, but otherwise of similar design as No. 86.[44]

To understand the kinds of locomotives built at Altoona, a brief discussion is necessary concerning the locomotive classifications system. The first eight classes of locomotives from the 1860s until 1895 were designated by the first eight letters of the alphabet. This system was revised in 1895 when a letter was assigned to designate a wheel arrangement followed by a figure or letter and figure combination to indicate the difference classes having that wheel arrangement. In the following discussion, the old classification will be used with the revised classification, when known, given in parenthesis to better identify the locomotives. Since some of the alphabet designation will only have meaning to those familiar with Pennsylvania Railroad classification, the

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41. Burgess and Kennedy, *Centennial History of the Pennsylvania Railroad Company*, 1846-1946, p. 85.

42. Spearman, *The Strategy of the Great Railroads*, p. 26.

43. Pennsylvania Railroad Company, *Sixteenth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 2, 1863*, p. 23.

44. J.A. Lockard to H.T. Cover, January 31, 1949, Box 1, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

Whyte classification system will be used to help clarify locomotive types. This system is based upon the grouping of locomotive wheels by diameters and will appear in parenthesis.[45]

In 1866, the Pennsylvania Railroad management adopted a policy of not doing major repairs to locomotives, but instead replacing them with new locomotives. These new locomotives were built at Altoona as well as other Pennsylvania shops and by a number of private contractors. This resulted in lowering the cost of repairs per mile run and increasing the profitability of the railroad.[46] The Pennsylvania Railroad management in 1867 adopted a policy that all locomotives be constructed according to a standard design. This resulted in 40 percent of the locomotives used on the Pennsylvania system in 1873 being of standard design. The various classes of locomotive design allowed flexibility within the standard design limits. Often times parts such as boilers of one class of locomotives were interchangeable with boilers of other classes. One hundred percent standardization was achieved by 1900 on all lines of the Pennsylvania system.[47] Still the Altoona shops did not become a major locomotives manufacturer until after 1875.[48]

In the early l870s, the Altoona shops constructed class A (reclassified DI and D7), (4-4-0), class C (D3 and D4) (4-4-0), class E (G2) (4-6-0), class F (BI) (0-6-4), class G (D5) (4-4-0), and class H (B2) (0-6-0) locomotives along with various permutations of these basic types. By 1872, the Altoona shops constructed and placed in service 32

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45. Paul T. Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924* (Philadelphia: Baldwin Locomotive Company, 1924), p. 27; Roy V. Wright, com. and ed., *Locomotive Dictionary* (3rd Ed., New York: Simmons-Boardman Publishing Co., 1912), pp. 150-151; and Frederic Shaw, *Casey Jones' Locker: Railroad Historiana* (San Francisco: Hesperian House, 1959), pp. 175-177.

46. Sipes, *The Pennsylvania Railroad: Its Origin, Construction, and Connections*, p. 27.

47. John H. White, Jr., *American Locomotives: An Engineering History, 1830-1880* (Baltimore, Maryland, John Hopkins Press, 1968), pp. 26-27.

48. Ibid., p. 19.

new locomotives plus repairing a number of locomotives.[49] The next year Altoona shops placed in service 57 locomotives.[50]

In 1875, the Altoona shops began constructing class I (HI) (2-8-0) engines. These were the first engines of the consolidation type built by Altoona though the Pennsylvania Railroad System previously had purchased a few for service. The type of boiler used in this locomotive became known as the "Altoona" or "Belpaire" type and differed from those on earlier classes. The boiler was so designed as to minimize the loss of steam. The crown and roof sheeting of this boiler differed from other boilers. This locomotive became the Pennsylvania standard heavy freight engine. It hauled 80- to 90-car trains at 14 miles per hour.[51]

By 1880, the Altoona shops had produced 500 locomotives and in 1886 had completed 1,000 locomotives.[52] The Altoona works introduced the class K (D6) (4-4-0) engines in 1881 which represented the high efficiency locomotive of its day. Its capacity was a marked increased over any other locomotive previously built by the Pennsylvania railroad. That same year the Altoona works began building class BA (D2a) (4-4-0) engines which combined features of class B and class A locomotives.[53] The shops built 131 new engines in 1883 some of which were switching locomotives of the class M (B3 and B4a) variety as well as the class N (D8) (4-4-0) and class P (Dlla, Dl3c, Dl4, and Dl4a) (4-4-0). The next year the Altoona works constructed 81 locomotives in 1884.[54]

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49. Pennsylvania Railroad Company, *Twenty-Fifth Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, February 2, 1872*, p. 38.

50. Burgess and Kennedy, *Centennial History of the Pennsylvania Railroad Company*, 1846-1946, p. 291.

51. Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, pp. 30-31, 33, 39; and White, Jr., *American Locomotives: An Engineering History, 1830-1880*, p. 65.

52. Ibid., p. 19.

53. Alexander, *Pennsylvania Railroad: A Pictorial History*, pp. 173-174, 175; and Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, p. 36.

54. "Locomotive Building," *Railroad Gazette*, XVIII (March 6, 1885), p. 148; and Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, pp. 38-39.

In 1885, the Altoona shops turned out an experimental consolidation, freight locomotive designated as class R (H3). The term consolidation came from an engine type designed for the Lehigh Valley railroad by Alexander Mitchell in 1866. The purpose of this locomotive was to transport freight over mountain grades. The locomotive proved successful in testing and Altoona soon constructed fifteen additional locomotives. This locomotive offered several advantages over contemporary engines. It produced a higher boiler pressure which meant more power than Class I locomotives and its design meant the engine could operate more efficiently with less fuel.[55]

In addition, the Altoona works began building a new four-coupled switching engine known as class Q (A2 and A2a) (0-4-0). This switching locomotive was designed for certain sections of Philadelphia where the sharp curves prohibited the use of six-coupled engines. These small switchers were built in the Juniata complex until 1924.[56]

In 1884, the Altoona shops could construct a locomotive in less than twenty hours. The shops efficiency continued to increase and by 1888 in a timed test, a locomotive could be readied for a trial run in less than seventeen hours.[57]

Classes O (DlO and Dl0a) (4-4-0) built at Altoona in the early l890s represented an engine used for high speed passenger service. These engines saw much service in the Middle Division of the Pennsylvania Railroad which predominately had gentle grades. Class P built in Altoona in the early l890s also served as an engine for high speed passenger service. These engines saw service in the Philadelphia and Pittsburgh

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55. "Locomotive Building," *Railroad Gazette*, XVIII (December 25, 1885), p. 824; and "Consolidated Locomotive, Class R, Pennsylvania Railroad," *Railroad Gazette*, XVIII (September 17, 1886), pp. 638, 640.

56. Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, p. 40; and Alvin F. Staufer ed., *Pennsy Power: Steam and Electric Locomotives of the Pennsylvania Railroad 1900-1957* (N.P.: Alvin F. Staufer, 1962), p 15.

57. "Notes at Altoona," *Railroad Gazette*, XVII (July 25, 1884), p. 555; and Emerson, *Allegheny Passage*, p. 47.

Division which had steeper grades. Both of these engines answered the need for speedier schedules and heavier train loads.[58]

In 1895, the Altoona shop began constructing class L (DI6, DI6b, DI6c, and DI6d) (4-4-0) locomotives. This class represented an improvement of the basic American type of locomotive with increased steam pressure. These locomotives saw service in heavy grade areas while a modified version was used in gentler grade areas.[59]

That same year, the need for increasing hauling capacity and speed resulted in several experimental consolidated (2-8-0) locomotives being built in Altoona following European and American designs. These experiments resulted in the construction of "mogul type" (2-6-0) class FI and Fla locomotives at Altoona. In 1901, an improved version with an enlarged boiler and increased steam pressure known as class F3 was constructed in Altoona. Subsequent modifications to the firebox and boiler resulted in the class F3b and F3c engines.[60] Also, the Altoona shops built four coupled switching locomotives class U (A3) in 1895. In addition, a consolidated engine of the class R (H3) type was built at Atloona. These engines remained in production until 1890.[61]

In 1898, a new consolidated engine class H5 was constructed in Juniata. These trains could handle 568 tons unloaded and 643 tons loaded. This engine was so big that only the Altoona turntables could turn them. The next year class H6 (2-8-0) locomotives were built at Altoona. In 1899 ten-wheeled locomotives (4-6-0) designated class G4 was built at Altoona.[62] The boiler design for this train was such that it could

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58. Fred Westing, *Pennsy Steam and Semaphores* (Seattle, Washington: Superior Publishing Company, 1974), pp. 8-9.

59. Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, pp. 42-43, 45.

60. Ibid., pp. 42-43, 45, 59.

61. Ibid., p 50; and Gustav Redek, *The World of Steam Locomotives* (New York: G.P. Putnam's Sons, 1974), p. 142.

62. Alexander, *Pennsylvania Railroad: A Pictorial History*, p. 173; and Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, p. 47.

handle unusually high steam pressure and had exceptionally good traction force for the time. This was used in the heavy grades east of Pittsburgh.[63]

In 1901 , Altoona constructed many class H6 and H6a (2-8-0) engines designed by the Baldwin Locomotive Company between 1902 and 1905. These were followed in 1910 by class H8 locomotives and, in 1913, by the H9s and Hl0s. The H9s and H10s represented the highest development of the consolidation locomotive types. They were used principally for freight service.[64]

The first three Atlantic (4-4-2) class E1 built at Altoona in 1899 were for service between Camden and Atlantic City, New Jersey. They proved very satisfactory and hauled 300-ton trains at speeds up to 75 miles per hour. These were the only Pennsylvania engines with the cab located in the middle of the boiler known as Camel or Camel back type. Altoona constructed later modifications of this design including the E1a, E2, E2a, E3, E3a, and E6 (4-4-2) engines. W.W. Atterbury, General Superintendent of Motive Power for the Pennsylvania Railroad, was responsible for the design of E2a and E3a which were introduced between 1901 and 1903. These engines pulled heavy express trains. The E6 locomotive was the last of this class and was designed and tested in 1911. The E6 came into mass production in 1913 when the Altoona shops constructed 80 of these engines for the New York and New Jersey Divisions of the Pennsylvania Railroad.[65]

In 1902, the Altoona works constructed an 85-ton class B6 switch engine. The B6 switch engine was built for service on lines west of Pittsburgh along with the B4a. The B6 was constructed until 1913 and then modified to become the B6sb which was constructed until 1926. The latter became the standard heavy switch engine on the

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63. Alexander, *Pennsylvania Railroad: A Pictorial History*, p. 173; and Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, p. 47.

64. The suffix "s" identified a locomotive class as being superheated. The "s" was dropped as superflous in 1923. Alexander, *Pennsylvania Railroad: A Pictorial History*, pp. 172-173; and Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, p. 47.

65. Alexander, *Pennsylvania Railroad: A Pictorial History*, pp. 173-174; and Redeck, *The World of Steam Locomotives*, p. 245.

Pennsylvania system. In 1903, a lighter switch engine designated as B8 was constructed for service on eastern lines of the Pennsylvania.[66]

The class K2 (4-6-2) locomotives were designed in Fort Wayne in 1910 and built in Altoona. In 1911, the K2 became the first Pennsylvania Railroad engines to use superheating. Superheating used a collecting chamber which ran inside the boiler tubes and re-routed steam into tubes which dried and greatly heated it. This device increased locomotive efficiency by nearly 20 percent. To meet the need for heavier engines, the K4 was designed and constructed at Altoona in 1914. This became the standard passenger engine for the Pennsylvania Railroad for the next several years. The Juniata shops constructed 350 K4s (4-6-2) between 1914 and 1928 while the Baldwin Company constructed 75 in the same period.[67] Contemporary with the K4s was a Mikado type locomotive known as class L1s which worked in heavy freight service. Many parts of this locomotive were interchangeable with parts on the K4 including the entire boiler.[68]

The Pennsylvania Railroad in 1905 reached an agreement with the Westinghouse Company to construct two experimental direct current locomotives. The Westinghouse Company provided the electrical gear and the Juniata shops built the locomotive bodies. The company agreed to furnish all equipment free of charge and place its railway engineering staff at the disposal of the Pennsylvania Railroad free of charge. This experiment convinced railroad officials to continue working with the Westinghouse Company to construct electric engines for the New York City area. This collaboration resulted in the development of the class DDI. The first of this class locomotives was constructed in 1909 and tested prior to full production of twenty-three electric locomotives

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66. Alexander, *Pennsylvania Railroad: A Pictorial History*, p. 174; Staufer ed., *Pennsy Power*, p. 17; and Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, pp. 72-73.

67. Alexander, *Pennsylvania Railroad: A Pictorial History*, p. 175; Staufer ed., *Pennsy Power*, p. 173; and Brian Reed, "Pennsylvania Pacifics," *Locomotives in Profile* (Garden City, New York: Doubleday & Company, Inc., 1972), II: 35.

68. Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, p. 66.

in 1910.[69] The Altoona shops in 1917 constructed an experimental electrical locomotive designated as class FFI. The designers plan to use the locomotive to move heavy freight and provide pushing service. Again, Altoona fabricated the mechanical parts and the Westinghouse supplied electrical components.[70]

The Altoona shops constructed an experimental "Decapod" (2-10-0) known as class I1s in 1916. The term "Decapod" came from a type of locomotive deigned for the Dom Pedro Segundo Railway of Brazil. This particular locomotive had five pairs of driving wheels connected with a two-wheeled leading truck. The Pennsylvania Railroad tested this engine for use in heavy freight service. The purpose of these tests was to develop a locomotive with 25 percent greater capacity than the L1s and more efficient at lower speeds. The trials proved so successful that the Juniata shop constructed 123 of these engines and the Pennsylvania Railroad assigned them to the Pittsburgh division. Eventually 598 I1s locomotives were built.[71]

In 1916, a large light switching locomotive known as class A5 (0-4-0) was constructed for the purpose of doing work in areas of sharp curves and limited clearances. These switch engines were equipped with superheaters and larger cylinders and fireboxes than the small class A4 (0-4-0) . Also this switch engine represented a gain in traction force over the class B switch engine. The Juniata shops constructed these engines until 1924.[72]

In 1919, the Altoona shops designed and constructed an experimental mallet articulated locomotive known as HC1 (2-8-8-0). The ma let was a type of locomotive with two separate engines working with one boiler. The rear engine was rigid and the

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69. Michael Bezilla, *Electric Traction on the Pennsylvania Railroad, 1895-1968* (University Park, Pennsylvania: The Pennsylvania State University Press, 1980), p. 48.

70. Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, pp. 76-77.

71. Alexander, *Pennsylvania Railroad: A Pictorial History*, p. 174; and Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, p. 67.

72. Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, pp. 72-73; and Staufer ed., *Pennsy Power*, p. 15.

front engine articulated or jointed to take the curves. Once constructed this engine was sent to Atlantic City, New Jersey, to be an exhibit at the Master Mechanics' convention. Pennsylvania Railroad officials claimed this was the largest locomotive in the world. This trial locomotive only saw limited service as a pusher since the drawbar pull was too great to haul trains not equipped with the strongest couplers. Pennsylvania Railroad engineers designed this unit to give maximum economy in fuel and water consumption while providing maximum traction force.[73]

In 1923, the Altoona shops constructed two new classes of passenger locomotives. The "Mountain type" (4-8-2) designated as M1 and M1a could be used either for fast freight or heavy passenger service. The second new design was a ten-wheeled locomotive known as G5 (4-6-0) whose primary purpose was to serve the needs of suburban passenger runs. Altoona produced forty of these engines in 1923 and another fifty in 1924. They combined the virtues of high starting traction with rapid acceleration which proved desirable assets on suburban service routes.[74]

In 1924, the Altoona shops designed an eight-coupled switching locomotive designated as class C1 (0-8-0). This was one of the largest two-cylinder switching locomotives ever built. Unfortunately, the rigid frame and axle construction resulted in the engine achieving only low speeds and caused frequent derailments.[75] Also the shops constructed two types of electric locomotives designated as the L5 and L5a. These represented a collaboration with the Westinghouse Company where, again, Altoona fabricated the mechanical parts and Westinghouse supplied the electrical components. The alternating current L5 was scheduled to serve the Philadelphia Division while the direct current L5a to serve other locations. These represent an effort by the Pennsylvania Railroad to standardize direct and alternating current operations by using identical type of locomotive design for both. The eighty-inch driving wheels on these

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73. Alexander, Pennsylvania Railroad: *A Pictorial History*, p. 175; Robert Selph Henry, *This Fascinating Railroad Business* (New York: The Bobbs-Merrill Company, 1946), p. 196; Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, p. 70; and Staufer ed., *Pennsy Power*, p. 19.

74. Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, pp. 71-72.

75. Ibid., p. 73; and Staufer ed., *Pennsy Power*, pp. 17-18.

locomotives led to a number of problems which convinced railroad engineers to switch to slightly smaller wheels for electric locomotives.[76]

In order to perform yard work in electrified areas of the New York and Philadelphia terminals, the Altoona shops in 1926 began constructing electric switching engines. These engines were semi-permanently coupled in pairs and designated as classes BB1, BB2, and BB3 (0-6-0). The BB1 and BB2 were equipped to operate with alternative current while the BB3 used direct current. The BB3 was equipped especially for operations on the Long Island Railroad. Later all units were designed for use of alternating current and redesignated as B1. The Altoona works in 1934 and 1935 produced fourteen B1 units for service in electrified areas.[77]

Since the Pennsylvania Railroad planned to extend electrification to several sections of their system, management ordered that new prototype machines be constructed at Altoona. In 1930, the Altoona Works produced two electric locomotives designed as class 01 for light passenger service. Again purchasing the electrical equipment from Westinghouse. The Pennsylvania Railroad placed the electrical locomotives in experimental service on the Pennsylvania-Wilmington runs and the newly electrified Philadelphia-Trenton runs. The Altoona shops produced six additional engines of this type by the end of 1931 with the electrical components being supplied by Westinghouse, General Electric, and American Brown-Boveri. To distinguish these locomotives, they were designated as classes O1a, O1b, and O1c. This electric locomotive class could generate 2,500-horsepower and used 72-inch driving wheels.[78]

During the same period, Altoona began construction of a more powerful electrical locomotive designated as P5. These engines had an output of 3,750-horsepower and used 72-inch drive wheels. Two experimental electric locomotives of this class were

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76. "Pennsylvania Railroad's Exhibit," Unidentified newspaper clipping, June 17, 1924, Box I, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, pp. 76-77; and Bezilla, *Electric Traction on the Pennsylvania Railroad, 1895-1968*, p. 123.

77. Bezilla, *Electric Traction on the Pennsylvania Railroad, 1895-1968*, pp. 124-125.

78. Ibid., p. 123.

constructed in the Altoona shops in the spring of 1931. Company officials were so confident in the PS locomotives capability that they ordered ninety additional units from the Baldwin Locomotive Works, Westinghouse, and General Electric before the prototypes were constructed and road tested. Road tests revealed several mechanical defects including cracking along the driving axles and pronounced lateral motion at speeds more than seventy miles per hour. This resulted in withdrawing the P5 locomotives from service and temporarily replacing them with steam locomotives. The modified PS class were designation P5a. Meanwhile, Pennsylvania Railroad officials began searching for a replacement electrical engine. Their work led to the development of the GG1 in 1934. The Pennsylvania Railroad designed this locomotive in cooperation with engineers at General Electric which brought with them experience in working on electrical locomotives on the New York Central system.[79]

During the next years, the Altoona shops turned out an appreciable number of GG1 (4-8-4) electric locomotives for use on the eastern lines of the Pennsylvania Railroad. In early 1938 alone, the Altoona shops constructed eleven of this type of locomotive and began construction on twenty more as part of the overall modernization program that the Pennsylvania Railroad undertook at the time. These locomotives generated more than 4,500 sustained horsepower and hauled a passenger train at one hundred miles per hour speeds for extended periods of time.[80]

Pennsylvania Railroad officials in the early 1930s became interested in the development of an electric heavy freight engine to replace the L5. For this purpose, the Altoona shops constructed a new electrical freight locomotive designed as L6. Two were built in the fall of 1931 at Altoona for experimental purposes. Pennsylvania Railroad

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79. Michael Bezilla, "The Development of Electric Traction on the Pennsylvania Railroad, 1895-1968," *Pennsylvania History*, XLVI , No. 3 (July, 1979), pp. 202-205.

80. Pennsylvania Railroad Press Release, March 1, 1938, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and Pennsylvania Railroad Press Release, June 29, 1938, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

officials were confident enough in the design that before these engines were completed they placed an order for thirty more with the Lima Locomotive Works.[81]

In 1936, Raymond Loewy in collaboration with the Pennsylvania Railroad engineering department designed a streamlined version of the K4.[82] The Altoona shops in 1939 built another Loewy creation for exhibition at the world's fair in New York advertised as one of the world's largest and fastest coal-burning engines. Designated as class S1 (6-4-4-6) this duplex engine could achieve speeds of 100 miles per hour in level areas and haul a 1,200-ton passenger train. This project was a joint engineering effort with the Baldwin Locomotive Works, American Locomotive Company, and the Lima Locomotive Works. After the World's Fair, the Pennsylvania Railroad placed the train in service in the western section of their system. This locomotive was scrapped in 1949.[83]

In 1940, the Pennsylvania Railroad's Board of Directors authorized the design and construction of a high powered freight locomotive with greater capacities than the M1. This resulted in design of a superheated four cylinder engine designated the Q1 (4-6-4-4) and first constructed in Altoona in 1942. Starting in 1945 a larger locomotive known as Q2 (4-4-6-4) was constructed in the Juniata shops. Another duplex constructed at Altoona for heavy passenger-train service was the T1 (4-4-4-4). The prototype for the T1 was constructed by the Baldwin Locomotive Works in 1942 and actual production engines were built in Altoona and the Baldwin works in 1945 and 1946. The T1 had an undesirable characteristic of slipping at slow speeds and were extremely expensive to maintain. With these locomotives under development, the railroad management negotiated with the Lima Locomotive Works for the plans of a large freight engine designated as J1 (2-10-4). Both the J1 and a modified engine designated as the J1a were not innovative, but designed to meet the wartime need for additional freight engines. One hundred and twenty-five of these locomotives were constructed in Altoona

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81. Bezilla, *Electric Traction on the Pennsylvania Railroad, 1895-1968*, p. 124.

82. Alexander, *Pennsylvania Railroad: A Pictorial History*, pp. 173-174, 175.

83. Ibid., p. 175; "Resume of Locomotive and Equipment Developments on the Pennsylvania Railroad," n.d. , Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and Staufer, *Pennsy Power*, p. 226.

with the first one constructed in 1942 and placed in service on the Pennsylvania Railroad's Middle Division. By 1954, the T1 and Q2 engines were no longer in active service, but J1 locomotives continued in service until 1956.[84]

The Altoona shops continued in operation after the merger with the New York Central Railroad. In 1969, the Altoona shops overhauled diesel-electric switchers as well as electrified equipment for the new Penn Central system. This work boosted the switchers horsepower from 1,000 to 1,200 and increased their fuel capacity 50 percent. The rejuvenation of these locomotives culminated with repainting them with the colors of the new Penn Central.[85]

By 1976, the Juniata shops performed similar tasks for the new Conrail system. The Juniata shops rebuilt engines as well as repairing frames and rewiring locomotives. This refurbishing work finished with the engines receiving a coat of blue paint with white lettering marking them as Conrail equipment.[86]

3. SPECIALTY ITEMS

The Altoona shops occasionally built reproduction or replica historical locomotives. The shop in 1927 reproduced the "John Bull" locomotive and tender. The next year the shop reproduced the "John Stevens" locomotive along with 680 feet of track.[87] Recently, the Juniata shops restored a K4 locomotive, number 1361.

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84. "Resume of Locomotive and Equipment Developments on the Pennsylvania Railroad," n.d. , Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; "Resume of Locomotive and Equipment Developments on the Pennsylvania Railroad," n.d. , Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Staufer ed., *Pennsy Power*, p. 90; Redeck, *The World of Steam Locomotives*, p. 294; G. Freeman Allen, *Railways: Past, Present and Future* (New York: William Morrow and Company, Inc., 1982), p. 178; and Brian Reed, "Pennsylvania Duplex," *Locomotives in Profile*, II:275.

85. "P C Men give Diesels New Hustle Muscle," *Penn Central Post* (November, 1969), p. 20.

86. "20,000 Conrail People Go Full Throttle on M-of-E," *Conrail*, Vol. 1, No. 3 (August/September, 1976), p. 4.

87. "Listing of Historical items reproduced or held by Pennsylvania Railroad," n.d. , Box 1, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

4. HISTORY OF THE TEST DEPARTMENT AT THE ALTOONA RAILROAD SHOPS

A. The Test Department in the Nineteenth Century

The Pennsylvania Railroad in 1874 established the Department of Physical Testing under the direction of the Superintendent of Motive Power Theodore N. Ely. In August 1874, John W. Cloud was placed in charge of the newly created department. This was not the first such testing facility in the world as the British railway opened a chemical testing laboratory in Crewe, England, in 1865.[88]

The next year the Pennsylvania Railroad added a chemical laboratory under Dr. Charles B. Dudley. Dr. Dudley faced the challenge of organizing a chemical testing department and proving the value of the department to the railroad. The newly organized department adopted the following program: first, to determine what materials were best for any given job; second, to prepare detailed specifications for purchasing materials in free market competition; third, to devise methods for testing the acquired material to determine if it met specifications; and fourth, conduct independent research and keep in touch with the scientific community in order to reduce costs for the railroad.[89]

The chemical testing department made the first tests on tallow use for lubrication of engine cylinders to determine if it had been adulterated. The samples tested contained a large amount of organic impurities and so a search began for a better quality of tallow. The laboratory next tested various lubrication oils, steel plate, and boiler water to determine what quality of these items were needed to keep an engine running smoothly. The test department personnel soon began publishing their findings in scientific and professional journals of the day.[90]

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88. "The Place of Chemistry in Railroad Developments," October 15, 1947, Unpublished Manuscript, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

89. Pennsylvania Railroad Company, *Thirtieth Annual Report of the Board of Directors of Pennsylvania Railroad Company to the Stockholders As presented at the Meeting, held March 13, 1877* (Philadelphia: E.C. Markley & Son, 1877), pp. 145-146; and "The Place of Chemistry in Railroad Developments," October 15, 1947, unpublished manuscript, Chief of Motive Power File, Box 3, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

90. "The Place of Chemistry in Railroad Developments," October 15, 1947, Unpublished Manuscript, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

Soon the Pennsylvania Railroad required most of its suppliers to give samples to the test department to determine if they met railroad standards. The laboratory developed a number of machines for their testing program. In a short time, the test department developed a machine which tested steel plate tensile strength while another tested the lubrication oils quality. The department grew in staff and importance with John W. Cloud in 1879 becoming the first Engineer of Test in charge of the department.[91]

The testing department role went beyond the mere analyzing of materials. In 1878, representatives from that department traveled around Great Britain and Continental Europe to inspect their railroads. The representatives came back from this trip with ideas on how to improve the test department and general railroad operations. General Manager Frank Thomson, following the their report's recommendations, ordered that the English manner of freight handling be adopted by the Pennsylvania Railroad.[92]

At first, the Superintendent of Motive Power located the test department in a section of the Master Mechanic's building on Ninth Avenue at Twelfth Street. By 1896, the test department occupied two stories of that building. The first floor served as a storehouse and testing room with offices and the chemical laboratory on the second and third floors.[93] A major task facing the testing department in the late 1890s was the problem of making sure that the potable water supplied to coaches, shops, diners, and stations was of good quality. The Pennsylvania Railroad utilized water at 100 locations in 13 states for their trains and this water required testing. These factors resulted in the

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91. "The Place of Chemistry in Railroad Developments," October 15, 1947, Unpublished Manuscript, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and "Notes at Altoona," *Railroad Gazette*, July 25, 1884, p. 555.

92. Pennsylvania Railroad Company, *Thirty-second Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting, held March 11, 1879* (Philadelphia: N.P., 1879), pp. 123-124.

93. "The Place of Chemistry in Railroad Developments," October 15, 1947, Unpublished Manuscript, Box 3, Chief of Motive Power File, Pennsylvania Rail road Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Beeler, *Altoona's Centennial Booklet*, p. 27; Clark, *A History of Blair County, Pennsylvania*, p. 90; and Stott, "HAER Survey of Southwestern Pennsylvania," p. 22.

creation of a bacteriological laboratory in 1899 as part of the chemical department to test water quality.[94]

Also in the 1890s, the Pennsylvania Railroad used the test department for public relations purposes. A large portion of the railroad's exhibit at the World's Columbian Exposition at Chicago, Illinois, in 1893 consisted of demonstrations by the physical and chemical testing departments. The public could observe how railroad products were tested and developed.[95]

B. The Development of the Locomotive Test Plant

The first locomotive test plant was constructed in Russia in the 1880s under the direction of Alexander Borodin for the purpose of gaining information on steam locomotive operations. In the early twentieth century, professor William F. Gross of Purdue University, unaware of Borodin's work, designed and constructed a locomotive test plant at Lafayette, Indiana. Pennsylvania Railroad officials studied this testing system when they designed theirs for the Louisiana Purchase Exposition in St. Louis, Missouri.[96]

The first formal announcement on the development of the locomotive test plant came on June 25, 1903, at a joint convention of the American Society of Mechanical Engineers and the American Railway Master Mechanics' Association in Saratoga, New York. A Pennsylvania Railroad spokesperson announced that a locomotive laboratory would be constructed and set up in the transportation building as part of the Pennsylvania exhibit at the Louisiana Purchase Exposition. Pennsylvania Railroad

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94. "The Place of Chemistry in Railroad Developments," October 15, 1947, Unpublished Manuscript, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

95. Pennsylvania Railroad Company, *Catalogue of the Exhibit of the Pennsylvania Railroad Company at the World's Columbia Exposition*, pp. 152-158.

96. Frederick Westing, *Apex of the Atlantics* (Milwaukee, Wisconsin: Kalmback Publishing Co. , 1963), p. 60; and Pennsylvania Railroad Company, *The Pennsylvania Railroad System at the Louisiana Purchase Exposition, Locomotive Tests and Exhibits, Saint Louis, Missouri, 1904* (Philadelphia: The Pennsylvania Railroad Company, 1905), p. 1.

officials requested the two organizations to nominate people for an advisory committee to help in laying out the programs and tests to be run on locomotives.[97]

The test plant held an engine stationary, with driving wheels revolving and a full head of steam in the boiler. This was accomplished through the use of a wheel configuration on heavy metal bedplates which simulated the wheel arrangement on the locomotive. These support wheels matched up with all the locomotive driving wheels and could be varied as to resistance to simulate various speeds and grades. Hydraulic brakes absorbed the energy generated by the locomotive and retarded the revolution of the wheels. The mechanical system used water to dissipate the heat generated by this activity and to create frictional resistance. The locomotive's drawbar was attached to a dynamometer. This mechanism helped to hold the locomotive steady and measured the drawing power of the engine. Other instruments measured the steam's quality and indicated the heat of the flue gases, firebox, and steam. Still other devices analyzed the steam and gases and the steam's actions in the cylinders. A flexible stack was used to vent smoke out of the test area. The test plant was designed by Pennsylvania Railroad engineers and manufactured by the William Sellers and Company of Philadelphia.[98]

At the Louisiana Purchase Exposition, twelve locomotives were tested on the test plant between May 2 and November 30, 1904, with each locomotive tested from fourteen to twenty days. The first locomotive was a French engine of de Glehn type purchased by the Pennsylvania Railroad for experimental purposes. The exhibit received a special commemorative gold medal for scientific and engineering investigation. In 1905, the Pennsylvania Railroad dismantled the test plant and took it to Altoona and installed it in a building near Sixteenth Street especially constructed for it. The locomotive testing in St. Louis resulted in a few modifications being made to the test plant to increase its

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97. Pennsylvania Railroad Company, *Locomotive Testing Plant at the Louisiana Purchase Exposition, St. Louis, Missouri, U.S.A., 1904* (Philadelphia: The Pennsylvania Railroad Company, 1905), p. 4.

98. Westing, *Apex of the Atlantics*, pp. 59-60; and James H. Lambert, *The Story of Pennsylvania at the World's Fair, St. Louis, 1904* (2 vols.; Philadelphia: Pennsylvania Commission, 1905), II:290.

efficiency before the railroad rebuilt it in the Altoona works. The test plant as operated in Altoona required a staff of twenty-six people.[99]

C. The Test Department In the Twentieth Century

The expansion of the testing department work in the twentieth century resulted in the need for additional building space. This resulted in the Pennsylvania Railroad authorizing the construction of a new building in 1913. In September of 1914, the test department moved out of the Master Mechanic's office into a new fireproof laboratory building in the west end of the Altoona machine shop yard at Margaret Avenue and Sixteenth Street. By 1924, the test department occupied four buildings in the Altoona machine shop yard and had a whistle testing facility in South Altoona. The various divisions of the test department were the physical and chemical laboratory, the locomotive test plant, the manufacturing laboratory, and the brake shoe testing building. The test department cost the Pennsylvania Railroad more than a half a million dollars a year to staff and operate. The department performed thousands of tests and experiments to find ways and products that helped the railroad operate more efficiently and safeguarded the health of the employees and the public.[100]

Two incidents occurred in 1929 of interest. First, the Pennsylvania Railroad closed the whistle testing plant. Second, sparks from the locomotive testing plant set fire to the roof of Enginehouse No. 3. This incident led Pennsylvania Railroad officials to have the abandoned enginehouse demolished.[101] Until 1930, the railroad directed that all research conducted in the test department focused on solving specific problems faced by the

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99. "Locomotive Testing Plant of the Pennsylvania Railroad at Altoona," *The Railway Age*, May 10, 1907, p. 734; Pennsylvania Railroad Company, *Locomotive Testing Plant at the Louisiana Purchase Exposition, St. Louis, Missouri, U.S.A., 1904*, pp. 8-9; Lambert, *The Story of Pennsylvania at the World's Fair, St. Louis, 1904*, II:291-292; and Warner, *Motive Power Development of the Pennsylvania Railroad System, 1831-1924*, pp. 56-57.

100. Stott, "HAER Survey of Southwestern Pennsylvania," p. 22; Schotter, *The Growth and Development of the Pennsylvania Railroad Company*, p. 435; and Pennsylvania Railroad Company, *Sixty-Eighth Annual Report of the Board of Directors to the Stockholders, for the Year 1914, Presented and adopted at the Annual Meeting of the Stockholders, 9th March, 1915* (Philadelphia: N.P., 1915), p. 10.

101. Chief of Motive Power to Regional Vice-President, April 13, 1929, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

railroad. That year fifteen full-time engineers were given permission to conduct pure research which may or may not directly benefit the railroad.[102]

By 1936, the main test department was housed in a five-story building. Nearby stood the locomotive test plant, the brake shoe test machine, and the drop test machine. Also in the old tank shop on Twelfth Street was the magnetic test laboratory. Organizationally, the engineer of tests supervised the test department while the chief chemist supervised the chemical laboratory. These people reported directly to the chief of motive power in Philadelphia. The functions of the test department included administration of the physical laboratory, metals laboratory, rubber laboratory, electrical laboratory, cement laboratory, photographic studio, road test department, locomotive test plant, brake shoe test machine, drop test machine, and inspection department. The chemical laboratory supervised the general chemistry laboratory, bacteriology laboratory, and water laboratory. The test department and chemical laboratory staff totalled 201 people.[103]

In 1937, the test department developed a squeeze test machine for testing the structural strength of a passenger car. The machine attached to the coupler system of the car and simulate the pressure of an 800,000-pound load. Examiners then inspected the car body for any defects. Other railroad companies adopted the use of this machine in testing new passenger car designs and the first car of new orders.[104]

By 1940, the staff for the test department totaled 269 people and this increased to 275 people in 1944. In the latter year, the department cost the railroad $1,500,000 to

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102. "Questionnaire on Industrial Research," July 11, 1947, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

103. "The Pennsylvania Railroad Company Test Department and Chemical Laboratory," August 17, 1936, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; L.B. Jones to Cover, February 16, 1948, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and F. W. Hankins to M.W. Clement, n.d., Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

104. C.K. Steins to H.W. Jones, April 17, 1944, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

operate on a yearly basis.[105] In 1948, the railroad undertook a series of actions designed to improve their testing programs. These actions included the opening of a x-ray laboratory to help in the examination of steel and locomotive parts and the moving of the magnetic test laboratory closer to the test department complex in order to provide easier access and better testing conditions there.[106]

The merger of the Pennsylvania Railroad and the New York Central Railroad in 1968 resulted in the closing of the testing facilities on Sixteenth Street on September 1, 1968, and the people transferred to the Cleveland Technical Center in Cleveland, Ohio. Also the Penn Central management demolished the test plant building. Earlier, in 1955, the Pennsylvania Railroad dismantled the test plant. The Penn Central Railroad in the late 1960s and early 1970s demolished most of the remaining test department buildings and facilities. Today, a small testing facility remains in the Juniata shops complex.[107]

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105. "Research the Key to Railroads Progress," *Train Talks*, June, 1944, n.p., Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

106. Cover to C.I. Clugh, October 27, 1948, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

107. "Famed Railroad Test Site Soon to be Memory," August 30, 1973, Unidentified newspaper clipping, Pennsylvania Railroad File, Altoona Area Public Library, p. 10; and "Test Plant of Former PRR To Cease Here," *Atloona Mirror*, August 6, 1968, p. 2.

CHAPTER 3: LABOR AND MANAGEMENT RELATIONS AT THE ALTOONA RAILROAD SHOPS

1. WORKING CONDITIONS IN THE NINETEENTH AND TWENTIETH CENTURIES

The Pennsylvania Railroad created the town of Altoona and remained the most important industry in the town for years. The railroad management took a paternalistic interest in the affairs of the community. As early as 1854, the railroad directors noted in their annual report of the scarcity of employee housing in Altoona and the high cost of rents in all of the non-company built houses. They believed this to be against the company's interests and sought to increase the availability of reasonably priced housing for railroad workers.[1] By 1855, the railroad labor force in Altoona amounted to nearly one thousand people.[2]

Railroad work represented the leading technology of the nineteenth century and attracted the best mechanics, engineers, artisans, and craftsmen of the day. The Altoona shops benefited from this popularity and drew ambitious people from the surrounding vicinity to the shops. These workers represented a highly skilled and motivated segment of nineteenth century society.[3]

These workers proved reluctant to form unions, but they eventually began to unionize to improve their working conditions and wages. The first union formed on the Pennsylvania Railroad was the Brotherhood of Locomotive Enginemen in 1863. Following this in 1868 came the union of Railway Conductors and Brakemen and in 1873 the Brotherhood of Locomotive Firemen and Enginemen first formed. The Switchmen's

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1. The Pennsylvania Railroad, *Eighth Annual Report of the Directors of the Pennsylvania Rail Road Company to the Stockholders, February 5th, 1855*, p. 51.

2. Beeler, *Atloona's Centennial Booklet*, p. 21.

3. Emerson, *Allegheny Passage*, p. 47.

Union of North America organized in 1876 and the Brotherhood of Railway Trainmen received a charter in 1883.[4]

By the early 1870s, Pennsylvania Railroad employees received wages at least equivalent to any other eastern railroad if not higher. The management provided a working environment as safe as those on any other railroad, but had little sympathy for the desire of workers to organize into unions. In 1872, the railroad management begrudgingly recognized the Brotherhood of Locomotive Engineers on its western lines and promised to consult with representatives from the brotherhood prior to any wage changes. This agreement soon came under pressure when the Panic of 1873 reduced railroad income. In December of 1873, Pennsylvania Railroad Director John Thomson unilaterally reduced wages by 10 percent. The locomotive engineers went out on strike. Company officials requested and received assistance from the state militias in breaking the strike.[5]

The most significant labor dispute at Altoona occurred in 1877. Because of the country's depressed economy, the Pennsylvania Railroad board of directors in June decided to enact a ten percent cut in the salary of those workers making more than one dollar per day. The directors further decided not to formally notify the workers of this decision until July. The Pennsylvania Railroad officials announced the reduction of wages on July 6 noting that the salary cuts would be retroactive to June 1, 1877. This announcement precipitated no strike on the Pennsylvania Railroad except for some workers on the New York piers. An additional grievance on the Pittsburgh Division of the Pennsylvania railroad came when the superintendent for that division reduced train crew

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4. "Altoona Shops, Organization Dates, Pennsylvania Railroad Unions," Pennsylvania Railroad-Unions File, Altoona Area Public Library, Atloona, Pennsylvania.

5. Ward, *J. Edgar Thomson: Master of the Pennsylvania*, pp. 221-222; and Stewart H. Holbrook, *The Story of American Railroads* (New York: Crown Publishers, 1947), pp. 244-245.

size by one brakeman. This resulted in the train crew earning less money and doing more work.[6]

Other railroads took similar measures throughout the country. On July 11, the management of the Baltimore and Ohio Railroad announced a ten percent cut in wages effective on July 16. Railroad workers began a strike on that day. The strike soon spread to other railroads which had enacted pay cuts, including the Pennsylvania Railroad. On July 19, freight crews at Pittsburgh went on strike. This rail center became a focal point for strike activity. On July 21, trains carrying soldiers to break the Pittsburgh strike passed through Altoona. The first troop train passed through unmolested by strikers except for some shouted insults and futile attempts to uncouple the cars. The strikers knocked one soldier to the ground in a scuffle with the strikers. The strikers next set about halting all freight train traffic through Altoona, but they allowed passenger trains to pass. In the afternoon, the strikers attempted to swarm over an incoming troop train, but the soldiers beat them back. The officer in charge placed a guard around the train to protect it. One striker was bayoneted in the arm while trying to uncouple the train and one soldier was beaten up by the strikers when the guard attempted to reboard the train. The strikers threw stones and exchanged shots with the soldiers; however, the train managed to pull out of the Altoona station without serious injury to either soldiers or strikers.[7]

The next morning another ten carloads of militia arrived in Altoona under the command of Brigadier General James A. Beaver. The train stopped for the soldiers to eat breakfast and obtain a heavier engine for the remainder of the trip to Pittsburgh. The strikers shut the roundhouse gates and captured a detachment of soldiers sent to

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6. Samuel Yellen, *American Labor Struggles* (New York: Harcourt, Brace, and Company, 1936), pp. 9, 15; "Pennsylvania," *The Railroad Gazette*, June 1 , 1877, p. 248; Pennsylvania Railroad Company, *Thirty-First Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders as Presented at the Meeting, held March 12, 1878; Also Proceedings of the Adjourned Annual Meeting of the Stockholders of March 25, 1878* (Philadelphia: E.C. Markley & Son, 1878), pp. 70-74; "Pennsylvania," *The Railroad Gazette*, June 8, 1877; and Sell, *Twentieth Century History of Altoona and Blair County Pennsylvania and Representative Citizens*, p. 336.

7. Davis, ed., *A History of Blair County, Pennsylvania*, p. 257; "The Railroad Strikes," *The Railroad Gazette*, July 27, 1877, p. 342; Robert V. Bruce, *1877: Year of Violence* (Indianapolis: The Bobbs-Merrill Company, Inc., 1959), pp. 185-186; and Sell, *Twentieth Century History of Altoona and Blair County Pennsylvania and Representative Citizens*, p. 337.

open the gates. The strikers next set about disabling the engines in the roundhouse. The soldiers, finding it impossible to obtain an engine, returned to Harrisburg.[8]

The following Monday, the strikers met and pledged themselves to protect public and private property. They further requested that the Altoona shops be closed. George W. Stratton, master mechanic of the shops, agreed to this request. The strikers and shop people met that afternoon and requested management to reestablish the pre-June wage scale and not take action against any of the strikers. This request was sent to General Superintendent G. Clinton Garner, who replied that he would have to consult with the board of directors before making any such promises. State militia arrived in Altoona on July 25. On July 27, the soldiers confronted the strikers and removed them from the railroad station arresting a few of the strike leaders. This broke the strike and all men returned to work on Monday July 30, 1877.[9]

By mid-August, the strike was broken throughout the country. The most serious rioting on the Pennsylvania Railroad system occurred in Pittsburgh where a fire started by the mob did more than one-half million dollars damage to railroad property. Eventually, more than 1,200 carloads of scrap metal from the Pittsburgh fire was sent to Altoona for melting down. On March 29, 1880, the Pennsylvania Railroad's board of directors decided to restore wages to the compensation allowed before June 1, 1877.[10]

The Pennsylvania Railroad regulated railroad workers' lives in Altoona. A bell manufactured by the Meneely company of West Troy, New York, had been installed in the first erecting house in 1851 to signal workers when to begin and end work. This bell, purportedly, was a half-size replica of the Liberty Bell. The company used this bell to signal work and rest periods until 1895. In the morning at 6:00 a.m., the bell and

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8. Yellen, *American Labor Struggles*, p. 18; "Pennsylvania," *The Railroad Gazette*, March 3, 1878, p. 132; Bruce, *1877: Year of Violence* p. 180; and Sell, *Twentieth Century History of Altoona and Bar County Pennsylvania and Representative Citizens*, p. 337.

9. Davis, ed., *A History of Blair County, Pennsylvania, p. 258; and Sell, Twentieth Century History of Altoona and Blair County Pennsylvania and Representative Citizens*, pp. 337-339.

10. Yellen, *American Labor Struggles*, p. 18; "Pennsylvania," *The Railroad Gazette*, March 3, 1878, p. 132; Bruce, *1877: Year of Violence* p. 180; and "Pennsylvania," *The Railroad Gazette*, April 2, 1880, p. 187.

later a whistle or horn blew to wake up the community. At ten to 7:00 a.m. another whistle blew which gave the workers time to walk to their work stations by 7:00 a.m. at which time a whistle blew and work began. The bell and later whistle blew at noon, ten to one, and one o'clock to signal the start and end of lunch time. The closing signals were at five and again at six for those working later schedules.[11]

By 1877, most of the shop did tasks on a "piece work" system. This meant that old locomotives were dismantled, new ones assembled, new passenger cars and freight cars built and painted at so much a piece. The work method operated in the following manner when building a passenger car. A twelve-man gang would be responsible for the erection and completion of the car's outside. Two men worked on each end of the car and four men worked on each side. The work crew selected one man to act as foreman and be responsible for the work. Part of the foreman's responsibility included making sure that each of the crew members did their share of the work. He reported any slacker to superiors for disciplinary action. These crews usually completed the outside work of a freight car in six days with some crews completing work in five days. Passenger cars took slightly longer to finish.[12]

Work in the shops was long, arduous, and difficult. One worker, Samuel Vauclain, began working at the Altoona shops at sixteen years of age. On his first day on the job, he turned bolts, repaired locomotive water pumps, cut keyway slots in pistons, and smoothed iron shafts with hand tools. This final job eventually resulted in the wearing down of the palms of his hands to the tendons. By the age of twenty, Vauclain was in charge of a work crew.[13]

Pennsylvania Railroad management developed an apprenticeship program in 1871 for those selected to be future supervisors. The only qualifications for this program were

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11. "Old Pennsy Shop Bell in Service," *Altoona Mirror*, January 21, 1931, p. 3; and Emerson, *Allegheny Passage*, p. 56.

12. Vauclain went on to a distinguished career at the Baldwin Locomotive Works. "Notes at Altoona," *The Railroad Gazette*, July 25, 1884, p. 555.

13. Emerson, *Allegheny Passage*, p. 47.

that the person selected needed a degree from a college or technical school and be recommended by one of the company's general officers. The management apprentice spent four and one-half years working in various departments including the erecting shop, vise shop, blacksmith shop, boiler shop, machine shop, air brake shop, car shop, roundhouse, shop clerk's office, test department, iron foundry, motive power offices, drafting department, and firing on a locomotive. Throughout this apprenticeship, the individual received grades and frequent evaluations. Once they served the apprenticeship work, the person became eligible for the position of inspector. From here the person could rise through the various grades of inspectors to the positions of assistant master mechanic, assistant engineer of motive power, assistant road foreman of engines, master mechanic, or superintendent of motive power.[14]

In 1889, the Pennsylvania Railroad issued orders to general foremen and master mechanics on how to manage shop affairs. These people kept a daily log of the hours worked by each man and rate of pay. Normally, company management did not permit work at night nor on Sunday.[15]

The Pennsylvania Railroad in order to prevent the development of strong unions made an effort to provide for the employees' needs. By 1904, the railroad relief department offered the employees insurance which had benefits in case of sickness, accident, or death. Also, the railroad management offered each employee the benefits of the Pennsylvania Railroad Pension Fund. Upon employment with the Pennsylvania Railroad, the company began setting aside a certain amount of money each pay period to cover the employee's pension. This was done without a tax or contribution by the employee. In addition, they offered the employee a chance to invest in the Pennsylvania Employees' Savings Fund. Here, an employee could voluntarily place up to $100 a

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14. Frederic Blount, "A Railroad University: Altoona and Its Methods," *Scientific American Supplement No. 1643*, June 29, 1907, p. 26324.

15. Pennsylvania Railroad Company, *Rules of the Pennsylvania Railroad Company for the Government of for the Transportation Department* (Philadelphia: Stephen Greene, 1889), pp. 57-58.

month in a savings account earning three and one-half percent interest. The employee could keep up to $5,000 in the account.[16]

In 1908, in an effort to deal with Pennsylvania Railroad's upper management, the Brotherhood of Locomotive Firemen and Engineers requested to negotiate directly with general manager of the Pennsylvania Railroad matters which affected union employees. Railroad officials insisted that such negotiations be taken up on a lower level. The brotherhood refused and the question was taken up by the Interstate Commerce Commission without resolution.[17]

Another controversy with labor occurred in 1910 when two unions, the Brotherhood of Railroad Trainmen and the Order of Railway Conductors, demanded new wage rates and work rules. Negotiations broke off on July 13 and the union instructed members to be prepared to strike within forty-eight hours. Both sides compromised before the strike occurred, but strained feelings remained on both sides. In 1912, railroad management prevented the union from striking when they acquired a court injunction against the union. The next year another union members of several railroads including the Pennsylvania voted to strike. President Woodrow Wilson stepped in and invited all sides to the White House where railroad management and the union agreed to submit their grievances to binding arbitration.[18]

During this period of labor unrest, a conductor by the name of George Brown in 1914 with the approval of railroad management began meetings culminating in the formation of the Mutual Beneficial Association of Pennsylvania Railroad Employees, Incorporated. Pennsylvania Railroad officials saw this as a way to cultivate a closer more harmonious relationship between management and labor. The tangible programs of the association included the establishment of cheap insurance for employees to provide for them and their families in case of accident, a supplement to their pension, and

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16. Spearman, *The Strategy of Great Railroads*, pp. 28-29.

17. Louise Lee Outlaw, *History of the Mutual Beneficial Association of Penn Central Employees, Inc. 1913-1970* (n.p.: n.p., 1970), p. 3.

18. Ibid., p. 3.

providing employment for those men suspended from the railroad. Later, the organization established recreation opportunities for the workers and in the 1920s opened restaurants to provide hot meals at reasonable prices to workers. Three such restaurants operated in the Altoona Works. This organization continues to provide assistance to railroad workers to the present.[19]

In 1916, the United States Congress passed the Adamson Act which stipulated the work day as eight hours for interstate railroad employees. This was a labor reform rushed through Congress by the Wilson administration when four railway brotherhoods threatened a nationwide strike to get the eight-hour day and railroad companies refused to consider this demand. Pennsylvania Railroad officials believed the eight-hour day unconstitutional and would result in an unjustifiable increase in wages paid workers. That same year, the American Federation of Labor granted the Blair County Central Labor Union a charter.[20]

The termination of government price controls at the end of World War I resulted in labor unrest and strikes around the country as unions sought to increase wages for their members to keep up with rising prices. Pennsylvania Railroad officials in 1921 countered these strikes by creating company sponsored unions which company officials recognized as the only legitimate bargaining agent for the employees. A major test for non-company unions occurred in 1922 when a strike was called by the Blair County General Labor Union. Altoona Works employees failed to strike and remained loyal to the company union while company officials locked out independent union leaders. Membership in the non-company sponsored Blair County General Labor Union plummeted. The company sponsored union remained despite the passage of the Railroad Labor Act of 1926 which forbid such activity until 1934 when congressional amendments to the Railroad Labor Act outlawed company sponsored unions. In Altoona, this resulted in the formation of the

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19. Ibid., pp. 4-6, 40-41.

20. Oscar Theodore Barck, Jr., and Nelson Manfred Blake, *Since 1900: A History of the United States in Our Times* (New York: The Macmillan company, 1969), pp. 165, 205; Lindaman, "The-Up-Down-Up of a Railroad-Founded-and-Dominated City Altoona, Pennsylvania," (Unpublished manuscript, Altoona Area Public Library, 1970), pp. 3-4; Daniel Aaron, Richard Hofstader, and William Miller, *The United States: The History of a Republic* (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1967), p. 664; and Pennsylvania Railroad Company, *The Pennsylvania Railroad Company, Seventieth Annual Report of the Board of Directors to the Stockholders, For the Year 1916, Presented and Adopted at the Annual Meeting of the Stockholders, 13th March, 1917* (Philadelphia: N.P., 1917), p. 7.

Brotherhood of Railroad Shop Crafts of America. This union chose to remain independent from the national union and thus continued in a weak bargaining position vis-à-vis the railroad management. Workers preference for an unaffiliated national union was confirmed in 1938 when they voted overwhelmingly in favor of keeping the Brotherhood of Railroad Shop Crafts of America as their union over seven crafts represented by the American Federation of Labor's railway employee department in an election conducted by the National Mediation Board.[21]

The nationwide depression which began in late 1929 had a profound impact on Altoona workers. In 1928, the Altoona shops payroll stood at nearly $21 million. This dropped to $18 million in 1930 and $8.3 million in 1932 and 1933. The shop payrolls even had great fluctuations on a monthly basis during this period. For example, in 1935, the first pay period of September (employees were paid on a biweekly basis) dropped 40 percent below that of the first payroll of August. The Pennsylvania Railroad modernization program in the mid-1930s led to a $16.7 million payroll in 1937, but this dropped to $6.4 million in 1938. Prior to the Depression, the railroad had been fairly successful in not furloughing employees for extended periods of time. Unfortunately, this policy could not be sustained during the Depression years.[22]

The reduction of the employee force in Altoona coincided with company reorganization. The Altoona Works management handled reorganizations in the following manner. When employees were reassigned from the Altoona machine shops to the Altoona car shops and the Juniata shops in 1938, management provided each employee with a list of potential jobs at these two locations. The employee indicated on the list the number of positions for which he would be applying in order of preference. Management then assigned workers to these positions based on worker preference and

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21. Lindaman, "The-Up-Down-Up of a Railroad-Founded-and-Dominated City Altoona, Pennsylvania," pp. 4-5; and "P.R.R. Shopmen Select Brotherhood of Shop Crafts to Represent Them," *Philadelphia Record*, October 15, 1938, n.p., newspaper clippings, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

22. "Altoona: One-Company Town in Search of Industry," *Business Week*, May 10, 1952, pp. 78, 80.

seniority. This resulted in some employees being forced to take lower pay in less desirable jobs.[23]

During World War II, the Altoona shops suffered labor shortages as men were furloughed for military duty. A number of female employees were hired to act as replacements. These new employees worked in various jobs until the end of the war when they left the labor force.[24]

The period after World War II posed many challenges to workers and management. The transition from steam to diesel resulted in a number of employee furloughs, layoffs, and recalls. Many employees could not built up their unemployment insurance from one lay-off to the next and became disillusioned with the railroad management. The shift in employment away from the railroad is best illustrated by the fact that in 1915 more than 11,000 workers in Blair County were employed by the Pennsylvania Railroad while slightly more than 6,000 workers were in all other manufacturing jobs combined. By the 1950s, the railroad employed more than 10,000 workers while all other manufacturers employed nearly an equal number of employees. Though the railroad remained a potent force in Altoona, the growth in this industry remained stagnant compared to other parts of the Blair County economy.[25]

The Pennsylvania Railroad in the 1950s continued to support a number of activities which provided benefits for the workers. These included the Pennsylvania Railroad Voluntary Relief Department whose operating expenses were paid for by the railroad, a Pennsylvania railroad women's aid society which raised money through voluntary donations, a Mutual Beneficial Association privately supported by employees, and the Employees' Mutual Provident and Loan Association, another employee supported

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23. Frederick W. Grimshaw to All Crafts Employees at the Altoona Machine Shop, July 20, 1938, Box 3, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

24. Works Manager to H.W. Jones, March 27, 1942, Box 121, Chief of Motive Power File, Pennsylvania Railroad Collection, Hagley Museum and Library, Wilmington, Delaware; and S. Kip Farrington, Jr., *Railroads at War* (New York: Samuel Curl, Inc., 1949), p. 129.

25. "Altoona: One-Company Town in Search of Industry," *Business Week*, May 10, 1952, p. 76.

organization. The relief department which began operations in 1886 distributed death and disability benefits to employees. The women's aid raised money for the purpose of providing assistance to railroad families in time of need. The mutual benefit association provided insurance for employees. The Mutual Provident and Loan Association provided members with loans at low costs.[26]

In the 1950s, the Pennsylvania Railroad shop craft workers became members of the United Railroad Workers of America, which was part of the Congress of Industrial Organizations. Then in 1954 Altoona employees voted in favor of establishment of local 2017 of the Transportation Workers Union of the AFL-CIO. The new union pledged to fight the Pennsylvania Railroad's effort to abolish workers' jobs. This resulted in a period of confrontation between the railroad management, existing unions, and the new union. The new union sent letters to the local newspaper complaining of the worker treatment by the railroad. Occasionally, the union called a strike to make a point with management.[27]

The merger of the New York Central with the Pennsylvania Railroad in 1968 led to many changes for the workers. A year after the merge, the payroll for the Altoona Works totaled $30.3 million, an increase of 38 percent over the pre-merge payroll. The railroad and shops reorganization after the merger left a number of employees feeling betrayed and resulted in a net decline in worker productivity.[28]

In 1969, the Order of Railway Conductors and Brakemen, Brotherhood of Locomotive Firemen and Enginemen, Switchmen's Union of North America, and Brotherhood of Railway Trainmen merged into the United Transportation Workers Union. The majority of unions in the Altoona Works preferred to remain independent from

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26. Pennsylvania Railroad Company, *The Pennsylvania Railroad Company One Hundred and Seventh Annual Report for the Year ended December 31, 1953* (Philadelphia: N.P. , 1954), p. 20.

27. Lindaman, "The-Up-Down-Up of a Railroad-Founded-and-Dominated City Altoona, Pennsylvania," pp. 19, 25-26.

28. "Penn Central Raises Steam," *Tribune Democrat*, April 8, 1969, n.p., Newspaper clipping, Altoona-Penn Central file, Altoona Area Public Library, Altoona, Pennsylvania; and Richard Saunders, *The Railroad Mergers and the Coming of Conrail* (Westport, Conn.: Greenwood Press, 1978), pp. 276-277.

national affiliation and by 1970, only five of the thirteen unions in the Altoona Works were affiliated with the national AFL-CIO.[29]

When in 1972, the Penn Central laid off more than 200 workers, the Transportation Workers Union complained that this violated an earlier agreement reached at the time of the merger. The people laid off were recalled, but efforts by the company to lay off employees continued. As the Penn Central system descended into bankruptcy, various unions at Altoona conducted talks with management in order to preserve members' jobs.[30]

2. ASPECTS OF THE SOCIAL, RECREATIONAL, AND CULTURAL LIFE AT ALTOONA

The railroad's influence was pervasive in all aspects of life in Altoona. In 1853, the Pennsylvania Railroad encouraged the newly founded city to establish a city band which played on a regular basis on stands set up beside the railroad-owned Logan House Hotel. Also, this band played at parades and other festive occasions.[31]

The Pennsylvania Railroad on November 13, 1858, opened the Altoona Mechanics Library and Reading Room in a railroad building on Eleventh Avenue and Thirteenth Street. The library was open to anyone willing to pay a small fee. In 1860, the railroad moved the library to the second story of a railroad ticket office and in 1885 to the Logan House. The Pennsylvania Railroad in 1926 donated the entire library to the Altoona School District along with $20,000 to cover the initial expense of establishing a free public library. The free public library opened in 1927 and eventually became the present Altoona Area Public Library.[32]

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29. Lindaman, "The-Up-Down-Up of a Railroad-Founded-and-Dominated City Altoona, Pennsylvania," p. 6.

30. "PC Violated Agreement in Layoff," *Altoona Mirror*, March 10, 1972, p. 1; and "Plan for New Railroad Network," *Penn Central Post*, February-March 1975, p. 2.

31. Emerson, *Allegheny Passage*, p. 48.

32. K. Virginia Krick, "Culture in Blair County," *Blair County's First Hundred Years, 1846-1946*, ed. by George A. Wolf (Hollidaysburg, Pennsylvania: The Blair County Society, 1945), pp. 279-280.

In the 1850s the railroad constructed housing for employees and in the 1860s, the railroad began selling off this company housing to employees. By 1875, the Pennsylvania Railroad provided the town with a number of amenities. They provided a school for employees' children which was kept open all the time for the convenience of the workers and their families. The railroad purchased a steam fire engine for use by the town and shops in fighting fires. Also, the railroad developed a reservoir system to supply the shops and town with water.[33]

In 1878, the railroad assisted in the establishment of the Altoona Cricket Club and providing a sports field known as the Cricket Field. In later years, this area became the site for railroad sponsored athletic events including baseball games, football games, equestrian competitions, tennis matches, and track and field events. This athletic field served the varied recreational needs of Altoona until 1959 when the railroad sold a portion of the land to the American Stores Company. This company razed the existing structures and constructed a shopping center.[34]

Railroad management joined with prominent people of Altoona in 1883 to establish a hospital. The railroad donated the land for the hospital and after it opened, the railroad continued to provide financial support to the facility on a yearly basis. Railroad representatives over the years served on the board of trustees as part of their commitment to community service.[35]

In the early years of the twentieth century, the Pennsylvania Railroad helped with financial support of a golf course for the use of employees and contributed to the establishment of a Young Men's Christian Association which provided recreational

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33. Pennsylvania Railroad Company, *Thirteenth Annual Report of the Board of Directors of the Pennsylvania Rail Road Company to the Stockholders, February 6, 1860*, p. 45; and Sipes, *The Pennsylvania Railroad*, p. 139.

34. Altoona Charter Centennial Committee, *Altoona Charter Centennial*, p. 23; and Richard E. Beeler, *Atloona's Centennial Booklet: Noteworthy Personages and Events, Altoona History, 1849-1949* (n. p. : Altoona Centennial Incorporated, 1949), p. 23.

35. Emerson, *Allegheny Passage*, p. 23.

opportunities for workers and their families. Railroad management in turn deducted a dollar a year from the employees paychecks to help defray the cost of supporting the YMCA. This organization provided facilities for basketball, volleyball, badminton, boxing, individual exercise, swimming, ping-pong, bowling, billiards, socials, and banquets. In addition, the YMCA offered classes in crafts, music, gym, and religion. Railroad organizations such as the Altoona Works Chorus, Apprentice Club, Welders Society, Retired Workers Association, Shop Bowing League, Middle Division Band, Pennsylvania Railroad Supervising Agents, Pennsylvania Railroad Veterans Association, Pennsylvania Railroad Floral Association, and Railroad Police Officers Classes held meetings in the YMCA.[36]

The Pennsylvania Railroad participated in community festivities by setting up displays for special occasions such as hosting a touring exhibition of the "Train of Tomorrow" for the 1949 Altoona centennial celebration and a slide show for the 1946 community celebration of "Brotherhood Week." These programs displayed to the community various products of the Altoona Works and these activities continued to emphasize the paternal role of the Pennsylvania Railroad in the city.[37]

Despite the efforts of the Pennsylvania Railroad to provide workers with various amenities, various writers that visited Altoona described in the terms such as "At best the city is not a garden spot . . ."[38] and filled with ". . . dirty-gray frame houses badly in need of paint. . . ." where "Soft-coal soot fogs the city. . . ."[39] Life in Altoona was not

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36. "Memorandum of Community Activities Partially Funded by the Pennsylvania Railroad," March 19, 1931, Box 1, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; Lindaman, "The-Up-Down-Up of a Railroad-Founded-and-Dominated City Altoona, Pennsylvania," p. 6; and Works Manager to Assistant Chief of Motive Power, March 5, 1946, Box 1, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

37. Works Manager to Cover, August 17, 1949, Box 1, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware; and Jones to J.F. Deasy, January 28, 1946, Box 1, Chief of Motive Power File, Pennsylvania Railroad Collection, Acc. No. 1810, Hagley Museum and Library, Wilmington, Delaware.

38. Blount, "A Railroad University: Atloona and Its Methods," *Scientific American Supplement No. 1643*, June 29, 1907, p. 26325.

39. "Altoona: One-Company Town in Search of Industry," *Business Week*, May 10, 1952, p. 76.

without the drudgery and bleakness of nineteenth century industrialism, but a number of amenities existed to provide for social and recreational needs of the railroad workers.

CHAPTER 4: SIGNIFICANCE AND RECOMMENDATIONS FOR FUTURE RESEARCH

1. SIGNIFICANCE OF ALTOONA WORKS

The Altoona Works are one of the most important railroad shop complexes in America. From modest beginnings in 1850 as one of several railroad shops along the main route of the Pennsylvania Railroad, this grew to become one of the world's largest railroad repair and construction operations of locomotives and cars by 1945. Today, this complex continues to repair locomotives having successfully made the transition from steam to diesel and electric operations. This marks it as one of the oldest railway shop complexes in continuous operation, having conducted car and locomotive construction and repairs for more than 130 years under the management of three companies. The most impressive development here, besides the sheer magnitude of repair and construction operations, was the Pennsylvania Railroad development of a test department beginning in 1875. The Pennsylvania Railroad led the nation in the development of research and testing programs of practical value for the industry. The original test department remained active until 1968. Shortly after this date, most of the structures associated with the test department were demolished. A notable exception to this is the Conrail Ninth Avenue and Twelfth Street Office Building which housed the test department from 1874 until 1914. Pennsylvania Railroad management rarely was innovative, but took proven ideas and developed them fully. This can be illustrated in the use of the locomotive test plant set up for the 1904 Louisiana Purchase Exposition and moved to Altoona the next year. This facility was demolished in 1968.

The Altoona shops constructed a wide variety of locomotives and cars used by American railroads. The most significant contributions can be found in the construction of the first all-steel passenger, mail, and baggage cars in 1906 and 1907. In the engineering of locomotives, the engine that best represents the Altoona design school is the K4 which was first designed in 1914.

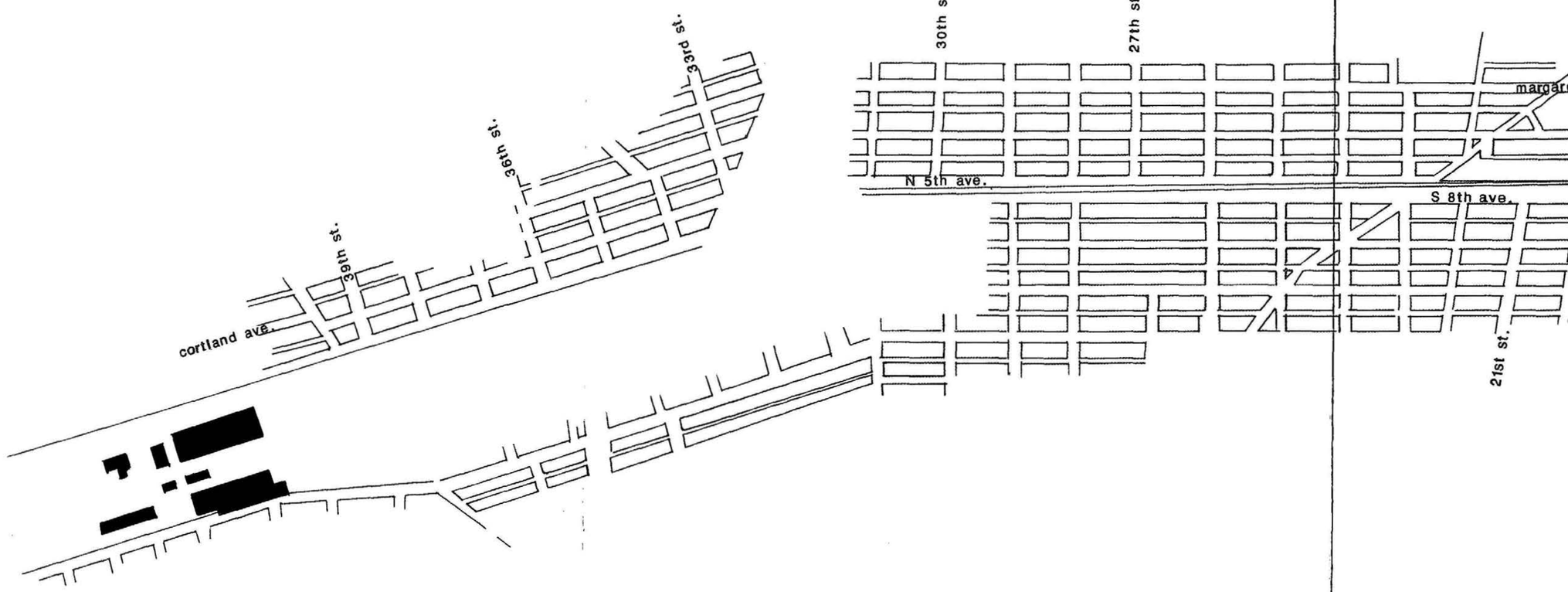
Major National Park Service history themes represented at the Altoona Works include: XII. Business, B. Manufacturing Organizations, 2. Transportation Equipment is not represented by any site in the National Park Service; XII. Business, B.

Manufacturing Organizations, 4. Fabricated Metal and Glass Products is represented by one site not related to the railroad industry; the theme XIV. Transportation, E. Railroads is represented by three sites, all relating to the American railroad industry; and the theme XVIII. Technology (Engineering and Invention), B. Transportation is represented by three sites with one relating to the American railroad industry; and XXX. American Ways of Life, J. Occupational and Economic Classes is represented by two sites, none relating to the American railroad industry. Minor themes at Altoona Works include: XXXI Social and Humanitarian Movements, H. Labor Organizations, which is not currently represented by any site in the National Park Service.

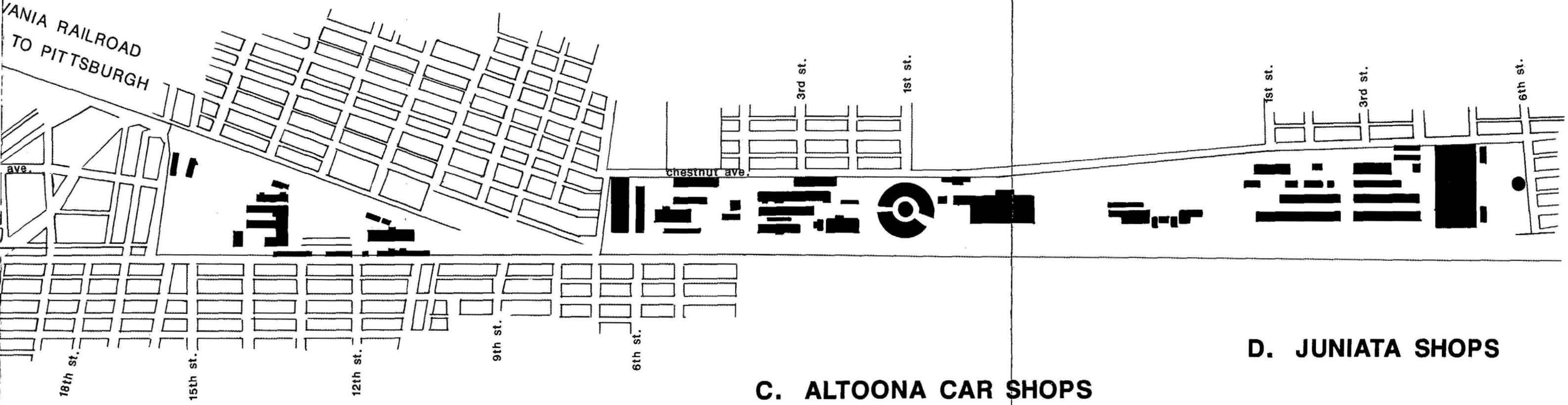
2. RECOMMENDATIONS FOR FUTURE RESEARCH

A number of studies are appropriate for this site. A special history study should be undertaken to go into greater detail concerning the ethnic groups which served as workers in Altoona and evaluation of the integrity of their neighborhoods. Another special history study should be completed on the role of the Altoona shops in the history of American railroading and railroad technology. Historic structure reports should be written for the most significant structures remaining in the Altoona Works.

National Register of Historic Places forms should be written when the role of the National Park Service in Altoona is further defined. The records of the Pennsylvania Railroad at the Hagley Museum and Library in Wilmington, Delaware, would be searched more thoroughly for material when they become fully inventoried and available to researchers. The same statement holds true for material at the state archives in Harrisburg, Pennsylvania, concerning the Pennsylvania Railroad.



A. SOUTH ALTOONA FOUNDRIES



D. JUNIATA SHOPS

C. ALTOONA CAR SHOPS

B. 12TH STREET CAR SHOPS

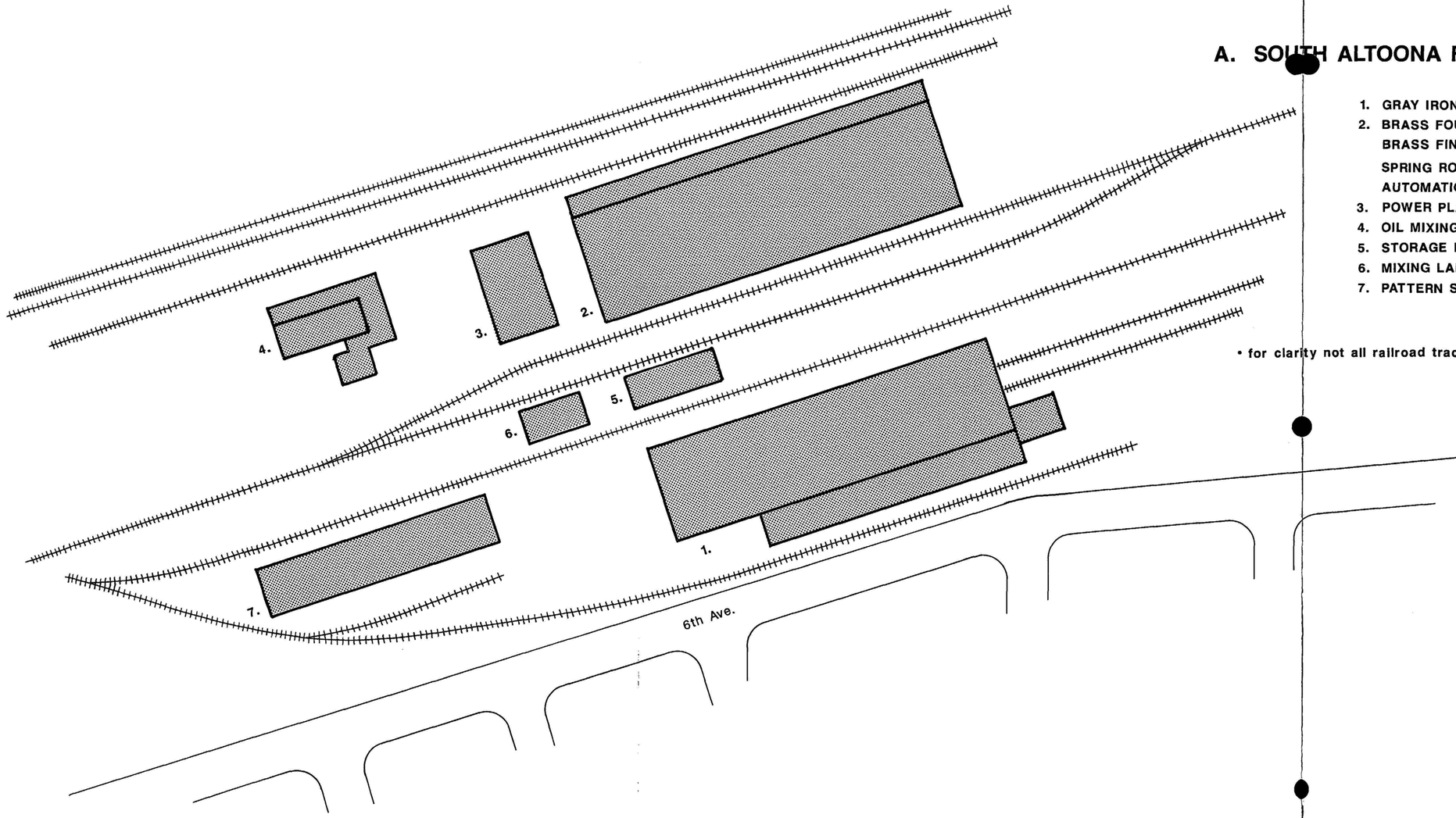
• for clarity not all railroad tracks are depicted on this map

PENNSYLVANIA RAILROAD ALTOONA WORKS AREA MAP

United States Department of the Interior
National Park Service

DSC·FEB 1989·957/25000

ON MICROFILM



A. SOUTH ALTOONA FOUNDRIES (CA 1931)

1. GRAY IRON FOUNDRY
2. BRASS FOUNDRY,
   BRASS FINISHING,
   SPRING ROOM,
   AUTOMATIC & TOOL ROOM
3. POWER PLANT
4. OIL MIXING PLANT
5. STORAGE BUILDING
6. MIXING LAB
7. PATTERN SHOP & STORAGE

• for clarity not all railroad tracks are depicted on this map

PENNSYLVANIA RAILROAD ALTOONA WORKS SOUTH ALTOONA FOUNDRIES

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

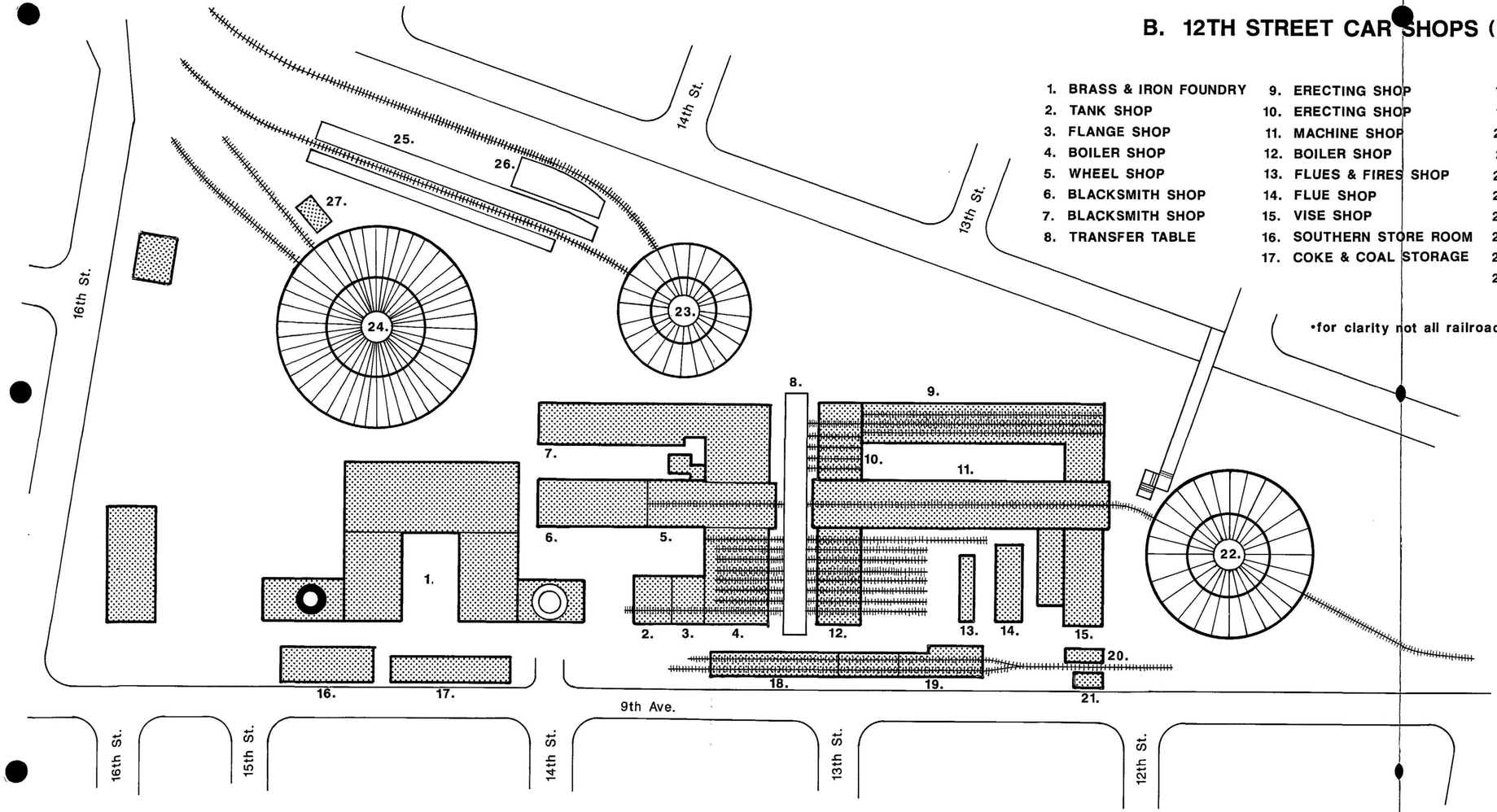
DSC • FEB 1989 • 957/25004

ON MICROFILM

B. 12TH STREET CAR SHOPS (CA 1881)

1. BRASS & IRON FOUNDRY
2. TANK SHOP
3. FLANGE SHOP
4. BOILER SHOP
5. WHEEL SHOP
6. BLACKSMITH SHOP
7. BLACKSMITH SHOP
8. TRANSFER TABLE
9. ERECTING SHOP
10. ERECTING SHOP
11. MACHINE SHOP
12. BOILER SHOP
13. FLUES & FIRES SHOP
14. FLUE SHOP
15. VISE SHOP
16. SOUTHERN STORE ROOM
17. COKE & COAL STORAGE
18. CARPENTER SHOP
19. PAINT SHOP
20. TEST ROOM
21. FIRE ENGINE STORAGE
22. ENGINE HOUSE
23. ENGINE HOUSE
24. ENGINE HOUSE
25. COAL PLATFORM
26. COAL SHED
27. SAND HOUSE

•for clarity not all railroad tracks are depicted on this map

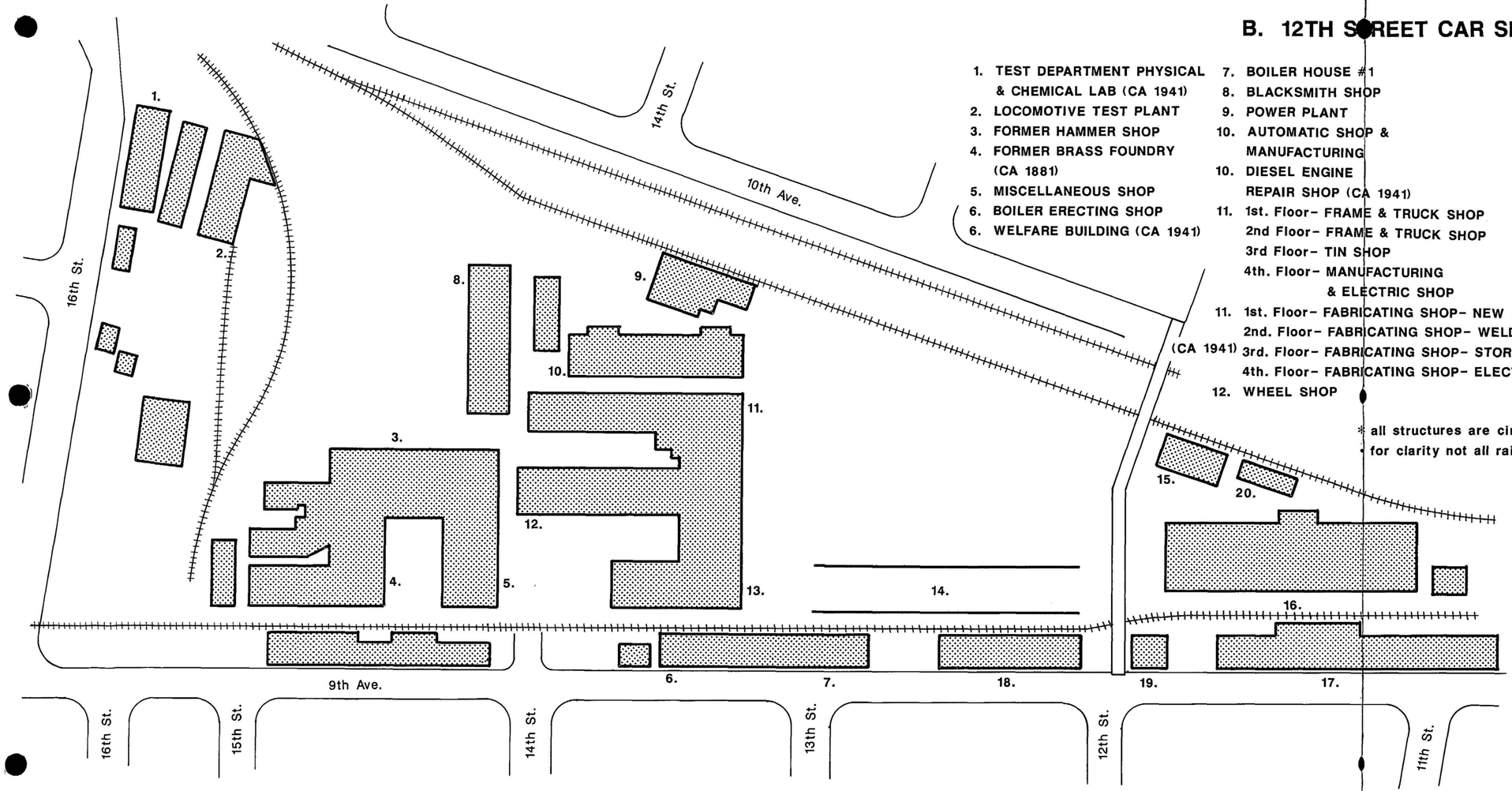


PENNSYLVANIA RAILROAD
ALTOONA WORKS
12TH. STREET CAR SHOPS

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DSC • FEB 1989 • 957/25002

ON MICROFILM



B. 12TH STREET CAR SHOPS *

1. TEST DEPARTMENT PHYSICAL & CHEMICAL LAB (CA 1941)
2. LOCOMOTIVE TEST PLANT
3. FORMER HAMMER SHOP
4. FORMER BRASS FOUNDRY (CA 1881)
5. MISCELLANEOUS SHOP
6. BOILER ERECTING SHOP
6. WELFARE BUILDING (CA 1941)
7. BOILER HOUSE #1
8. BLACKSMITH SHOP
9. POWER PLANT
10. AUTOMATIC SHOP & MANUFACTURING
10. DIESEL ENGINE REPAIR SHOP (CA 1941)
11. 1st. Floor- FRAME & TRUCK SHOP
    2nd Floor- FRAME & TRUCK SHOP
    3rd Floor- TIN SHOP
    4th. Floor- MANUFACTURING & ELECTRIC SHOP
11. 1st. Floor- FABRICATING SHOP- NEW CARS
    2nd. Floor- FABRICATING SHOP- WELDING
    3rd. Floor- FABRICATING SHOP- STOREHOUSE
    4th. Floor- FABRICATING SHOP- ELECTRIC SHOP
12. WHEEL SHOP
12. UNDER FRAME FABRICATING SHOP (CA 1941)
13. BOILER SHOP
13. TRUCK SHOP- NEW CARS (CA 1941)
14. CRANE RUNWAY
15. AIR-BRAKE SHOP & SD #3
15. CAFETERIA & SD #3 (CA 1941)
16. ERECTING SHOP #3
16. BODY SHOP (CA 1941)
17. STORES DEPARTMENT
18. MASTER MECHANIC OFFICE
19. FIRE STATION #7
20. RESTROOM & LOCKER BUILDING

(CA 1941)

* all structures are circa 1931 unless otherwise indicated
• for clarity not all railroad tracks are depicted on this map

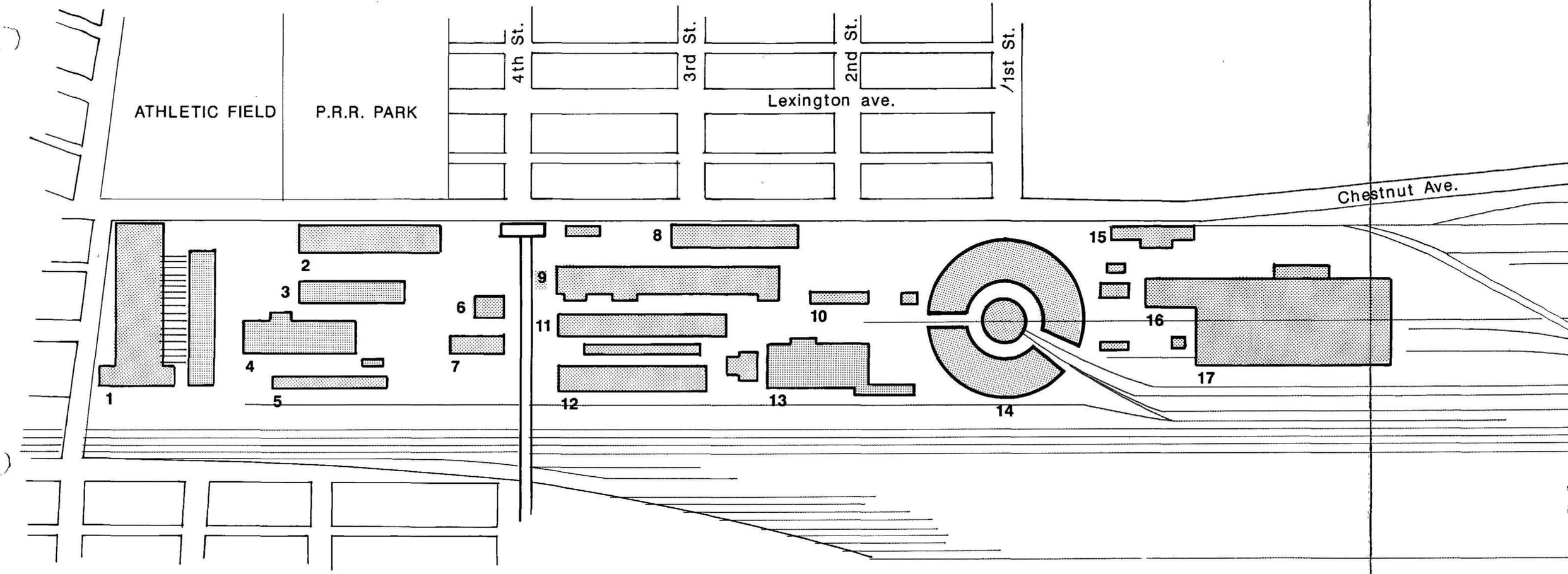
PENNSYLVANIA RAILROAD ALTOONA WORKS

12TH. STREET CAR SHOPS

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

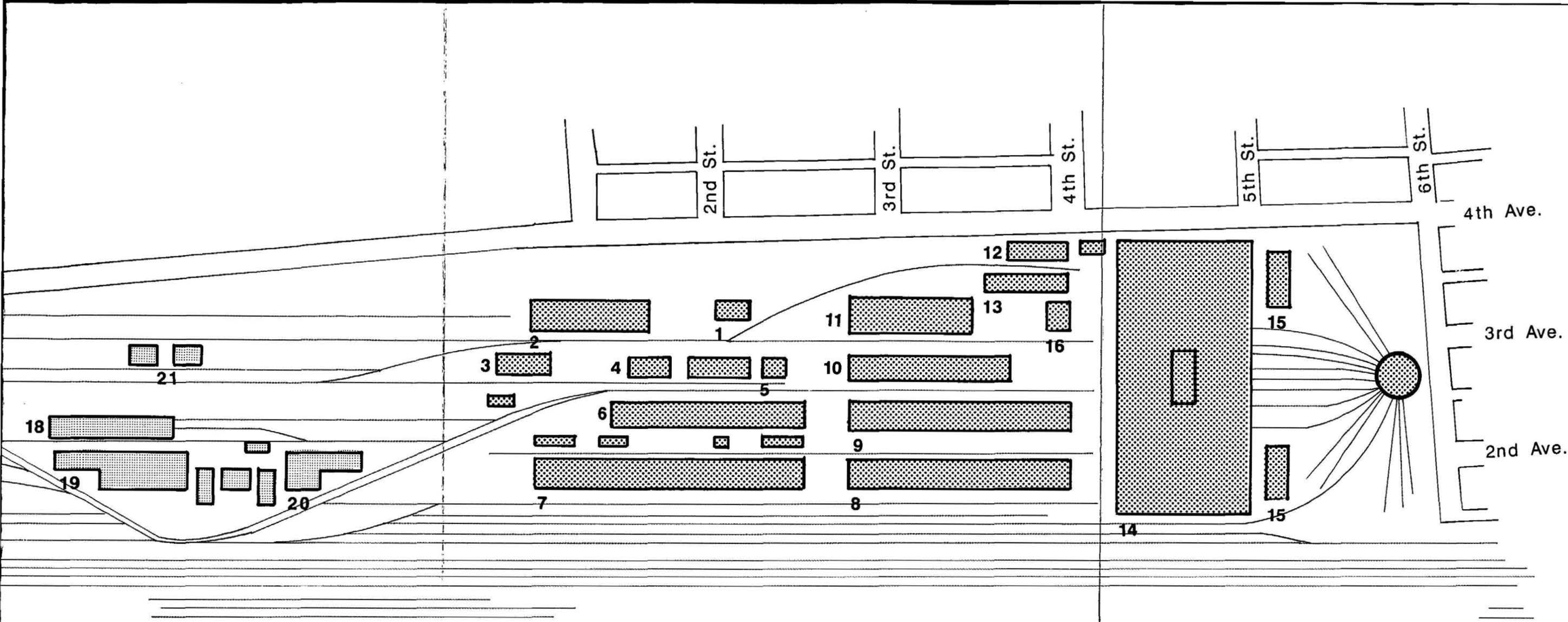
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ON MICROFILM



ALTOONA CAR SHOPS (CA 1931)

1. PASSENGER CAR SHOP
2. CAB SHOP
3. STORAGE BUILDING
4. PLANING MILL
5. FORMER BOLT SHOP
6. POWER PLANT
7. BOILER HOUSES 1 & 2
8. 1st. FLOOR- TRIMMING & BUFFING & UPHOLSTERING SHOP
   2nd. FLOOR— PLUMBING SHOP
9. 1st. FLOOR- MACHINE & SHEET METAL SHOP 2nd. FLOOR- TIN SHOP
10. GENERAL FOREMAN OFFICE & STOREHOUSE
11. BLACKSMITH SHOP
12. PASSENGER CAR ERECTING SHOP #2
13. PASSENGER CAR ERECTING SHOP #1
14. LOCOMOTIVE FINISHING SHOP
15. TRUCK SHOP
16. TANK SHOP
17. STEEL SHOP
18. SANDBLAST BUILDING
19. FREIGHT CAR DOOR REPAIR SHOP
20. DRIED LUMBER SHED
21. OXYGEN & ACETYLENE STORAGE



JUNIATA SHOPS (CA 1931)

OFFICE OF GENERAL SHOP INSPECTOR
BLACKSMITH SHOP #2
SCALE SHOP
POWER PLANT
BOILER HOUSES 1 & 2
BLACKSMITH SHOP #1
BOILER SHOP
X-29 SHOP
MACHINE SHOP #1
10. STOREHOUSE & OFFICE BUILDING
11. MACHINE SHOP #2
12. FLUE SHOP
13. AIR BRAKE SHOP
14. ERECTING & MACHINE SHOP
15. WELFARE BUILDINGS
16. WELDING BUILDING

• for clarity not all railroad tracks are depicted on this map

PENNSYLVANIA RAILROAD
ALTOONA WORKS
ALTOONA CAR SHOPS AND JUNIATA SHOPS

United States Department of the Interior
National Park Service

DSC·FEB 1989·957/25001

ON MICROFILM

ILLUSTRATIONS



Illustration 1.
Juniata Shops, Sign at Entrance.
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.



Illustration 2.
Juniata Shops, Turntable, ca. 1910.
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.

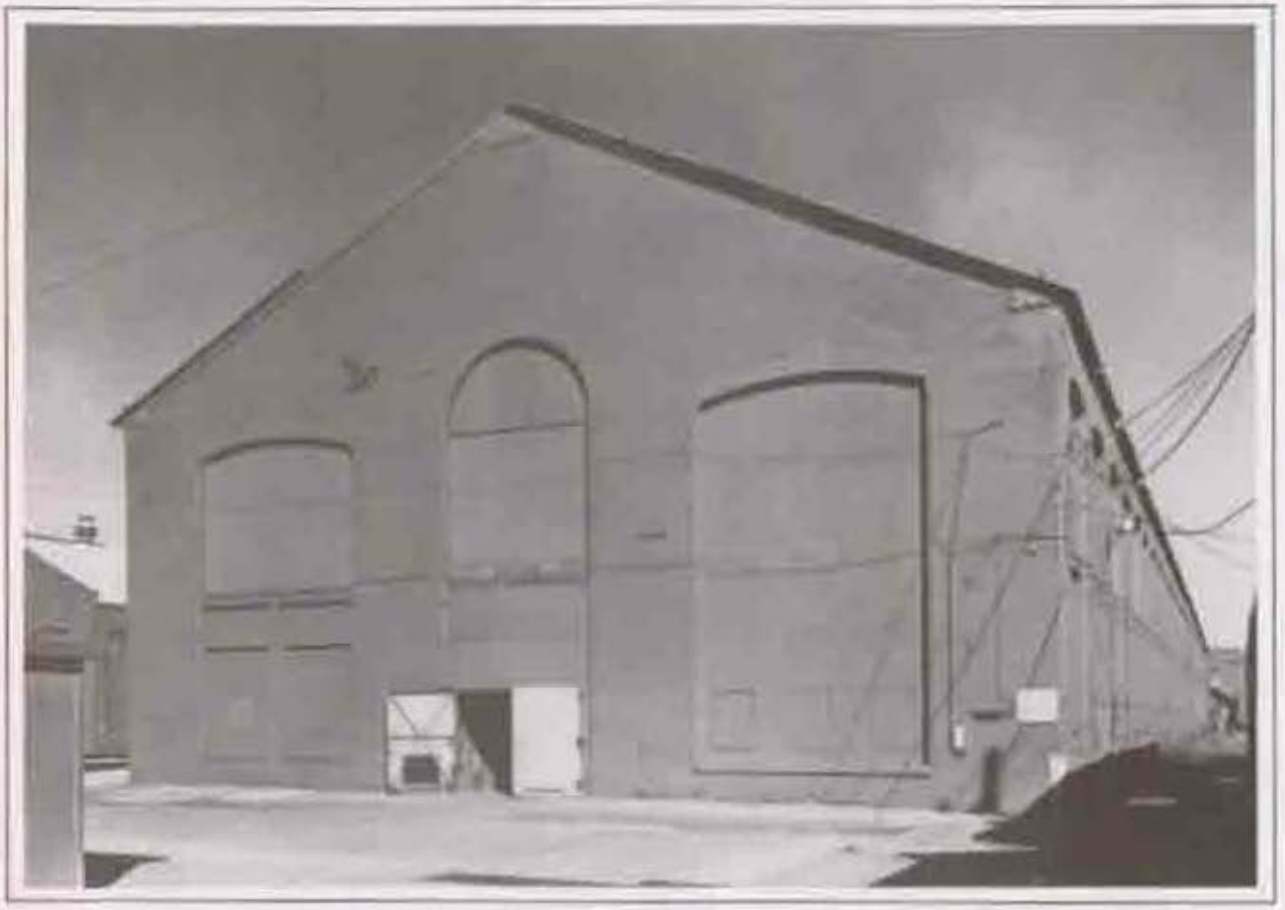


Illustration 3.
Juniata Shops, Blacksmith Shop No. 1, 1888-90.
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.



Illustration 4.
Juniata Shops, Blacksmith Shop No. 2, 1903-04, 1918.
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.



Illustration 5.
Juniata Shops, Blacksmith Shop No. 2, 1903-04, 1918.
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.

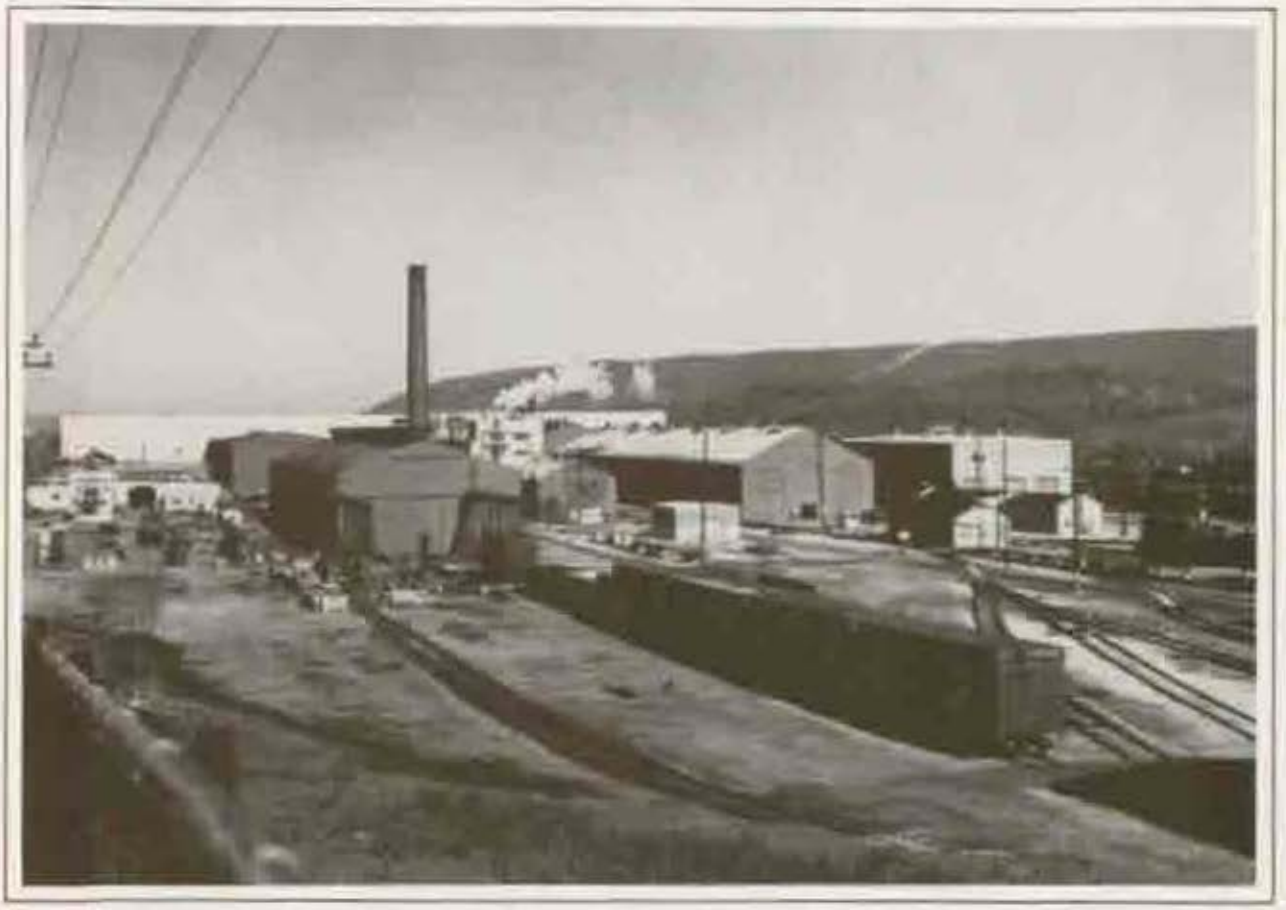


Illustration 6.
Juniata Shops (Looking Northeast).
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.



Illustration 7.
Juniata Shops, Erecting Shops, 1889.
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.



Illustration 8.
Juniata Shops, Machine Shop, No. 2, 1889.
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.

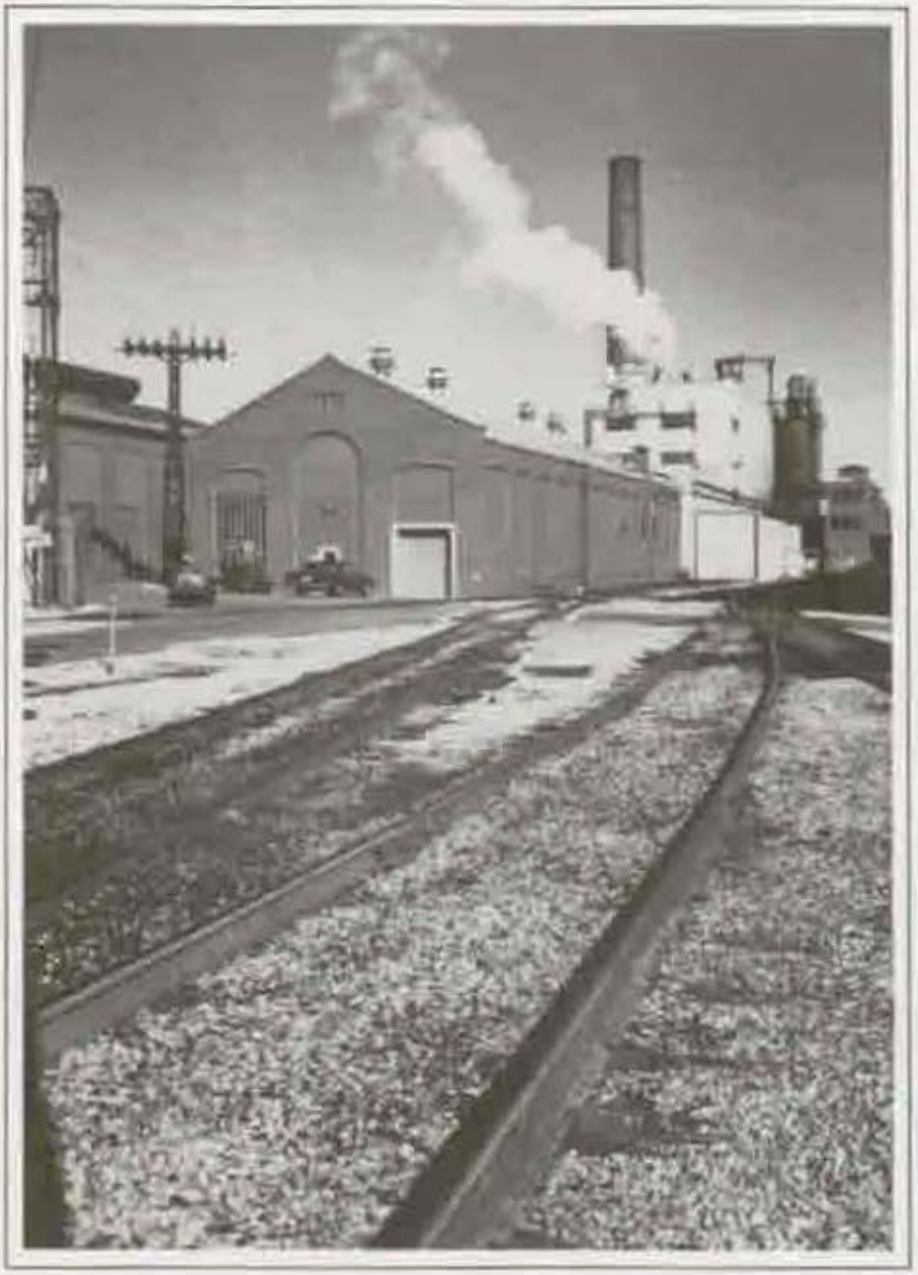


Illustration 9.
Juniata Shops, Power Plant (Boiler House in Foreground), 1888-90, 1905, 1955.
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.



Illustration 10.
Juniata Shops, Axle Finishing Shop (in Machine Shop No. 1), Journal Lathe.
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.



Illustration 11.
Altoona Shops, Master Mechanic's Office and Testing Department, 1886, 1896, 1906.
Photograph by Jet Lowe, 1987.
Courtesy of Historic American Engineering Record, Washington D. C.



Illustration 12.
Altoona Shops, Erecting Shop, No. 3, 1905-07.
Photograph by Jet Lowe, 1987.
Courtesy of Historic American Engineering Record, Washington D. C.



Illustration 13.
East Altoona Shops, Classification Yard (Abandoned).
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.



Illustration 14.
East Altoona Shops, Turntable (Ca. 1903), Served the Great East Altoona Roundhouse (Roundhouse Demolished Ca. 1956).
Photograph by Jack E. Boucher, 1988.
Courtesy of Historic American Engineering Record, Washington D. C.



Illustration 15.
Erecting Shop at Juniata, 1906.
Courtesy of Altoona Area Public Library Collection, Altoona, Pennsylvania through Theodore Holland, Altoona Railroaders Memorial Museum, and Gregory Fitzsimons, HAER.



Illustration 15.
Altoona Shops, 1916.
Courtesy of Altoona Area Public Library Collection, Altoona, Pennsylvania through Theodore Holland, Altoona Railroaders Memorial Museum, and Gregory Fitzsimons, HAER.



Illustration 17.
Altoona Shops, Casting Stores and Test Plant, N.D.
Courtesy of Altoona Area Public Library Collection, Altoona, Pennsylvania through Theodore Holland, Altoona Railroaders Memorial Museum, and Gregory Fitzsimons, HAER.



Illustration 18.
Altoona Car Shops, Interior with Workmen, 1934.
Courtesy of Altoona Area Public Library Collection, Altoona, Pennsylvania through Theodore Holland, Altoona Railroaders Memorial Museum, and Gregory Fitzsimons, HAER.



Illustration 19.
Altoona Car Shops, Interior with Workmen, 1934.
Courtesy of Altoona Area Public Library Collection, Altoona, Pennsylvania through Theodore Holland, Altoona Railroaders Memorial Museum, and Gregory Fitzsimons, HAER.

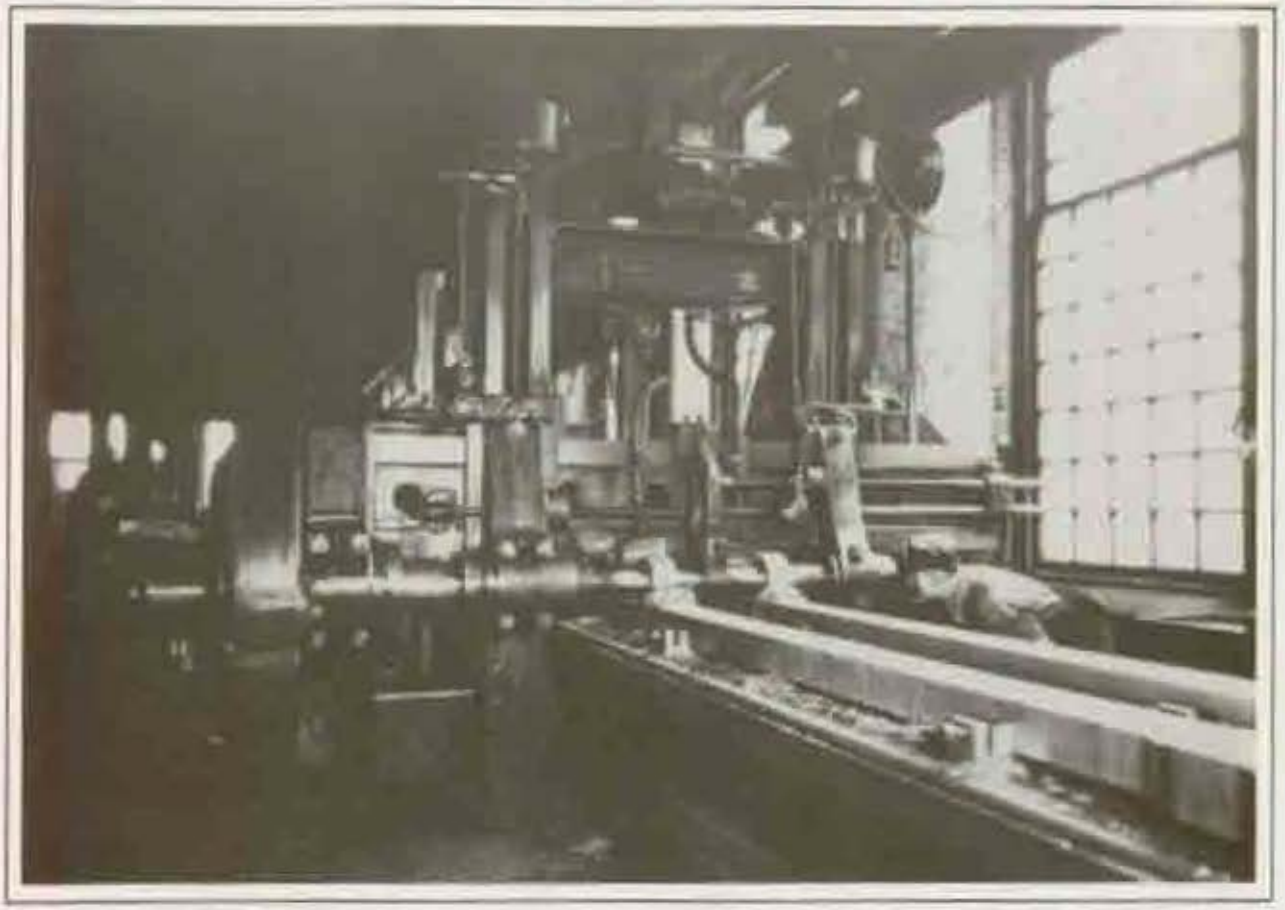


Illustration 20.
Unidentified Altoona Shop Interior with Workmen, 1934.
Courtesy of Altoona Area Public Library Collection, Altoona, Pennsylvania through Theodore Holland, Altoona Railroaders Memorial Museum, and Gregory Fitzsimons, HAER.

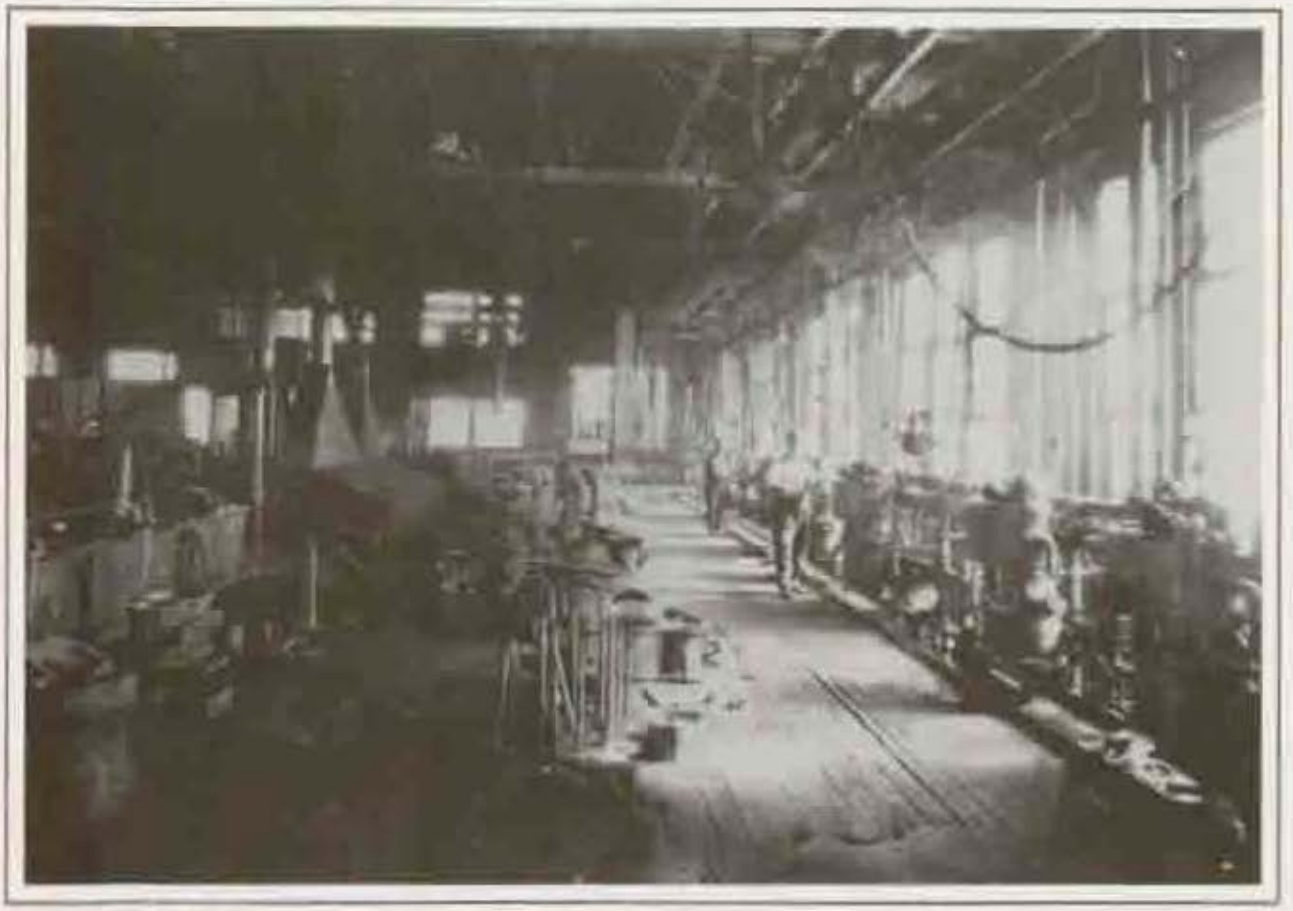


Illustration 21.
Unidentified Altoona Shop Interior with Workmen, N.D.
Courtesy of Altoona Area Public Library Collection, Altoona, Pennsylvania through Theodore Holland, Altoona Railroaders Memorial Museum, and Gregory Fitzsimons, HAER.



Illustration 22.
Juniata Shop Interior with Workmen, N.D.
Courtesy of Altoona Area Public Library Collection, Altoona, Pennsylvania through Theodore Holland, Altoona Railroaders Memorial Museum, and Gregory Fitzsimons, HAER.

APPENDIXES

Appendix A:	A Selected Listing of Officers and Board of Directors for the Pennsyvlania Railroad
Appendix B:	Selected Descriptions of the Altoona Shops
Appendix C:	Selected Listings of Products Manufactured at Altoona Shops

A: SELECTED LISTING OF OFFICERS AND BOARD OF DIRECTORS FOR THE PENNSYLVANIA RAILROAD

Listing of Presidents of the Pennsylvania Railroad Company from 1847 Until 1935

PRESIDENTS

The Pennsylvania Railroad Company

Name	From	To
Samuel Vaughan Merrick	March 31, 1847	September 1, 1849
W.C. Patterson	September 1, 1849	February 2, 1852
J. Edgar Thomson	Febrary 3, 1852	May 27, 1874
Thomas A. Scott	June 3, 1874	June 1, 1880
George B. Roberts	June I, 1880	January 30, 1897
Frank Thomson	February 3, 1897	June 5, 1899
A.J. Cassatt	June 9, 1899	December 28, 1906
James McCrea	January 2, 1907	January 1, 1913
Samuel Rea	January 1, 1913	October 1, 1925
W.W. Atterbury	October 1, 1925	April 24, 1935
M.W. Clement	April 24, 1935	---

George H. Burgess and Miles C. Kennedy, *Centennial History of the Pennsylvania Railroad Company 1846-1946* (Philadelphia: The Pennsylvania Railroad Company, 1949), p. 793.

Anspach, William, 1867-1879
Ayres, William, 1852-1854
Bacon, Josiah, 1856-1881
*Barnes, William H., 1890-1898
*Biddle, Alexander, 1874-1898
Bodine, Samuel T., 1860-1874
Black, George, 1869-1873
Brenner, John G., 1857-1859
Bringhurst, John H., 1856-1857
Brown, David S., 1847-1852
Buther, Washington, 1849-1862 and 1866-1873
Carpenter, George W., 1847-1858
Cass, George W., 1859-1866
*Cassatt, A.J, 1874-1882 and 1883-1898
Coates, G. Morrison, 1867-1878
Colwell, Stephen, 1847-1851
*Comegys, B.B., 1887-1898
Cope, Thomas P., 1847-1848
Corbett, Henry, 1847 (March 30th to May 17th)
Craig, Hugh, 1863-1865
Cummins, D.B., 1878-1887
Curtis, Benjamin T., 1859 (Died December 4, 1859)
Davis, Edward M., 1849-1852,
Derbyshire, Alexander J., 1851-1855 and 1873-1878
Derbyshire, John, 1865-1866
**Du Barry, J.N., 1882-1892 (Died Dec. 17, 1892)
Elkin, Lewis, 1866-1869 and 1870-1871
*Elkins, William L., 1879-1898
Farnum, John, 1853-1858
Felton, Samuel M., 1873-1884
*kFoster, William B., Jr., 1853-1860 (Died March 4, 1860)
*Fox, Alexander M., 1871-1898
Godely, Jesse, 1847-1848
* **Green, John P., 1882-1898
*Griscom, C.A., 1884-1898
Hallowell, Morris L., 1848-1849
Haupt, Herman, 1856-1857
Houston, H.H., 1881-1895 (Died June 21, 1895)
Howell, George, 1848-1857
Hume, John, 1858-1867
Jeanes, Samuel, 1852-1855
Kennedy, John M., 1860-1863 and 1864-1880
Knight, Edward C., 1861-1863 and 1864-1874
Lea, Thomas T., 1847-1852
*Little, Amos R., 1888-1898
**Lombaert, Herman J., 1864-1872
Lyon, William M., 1856-1858
Magee, James, 1847-1848
Martin, William, 1862-1863

Megargee, Samuel, 1857-1860
Magargee, Sylvester J., 1863-1865
Mellon, Thomas, 1856-1864
***Merrick, Sam'l Vaughan, 1847-1852
Myers, Joseph B., 1863-1873
Miller, J. Craig, 1862-1863
*Morris, Effingham B., 1897-1898
Morris, Wistar, 1858-1890
Mott, Edward T., 1852-1855
McManes, James, 1880-1881
McMichael, Morton, 1869-1870
Neal, William, 1854-1856
Nimick, Alexander, 1865-1869
*Patterson, C. Stuart, 1895-1898
***Patterson, William C., 1847-1852
Phillips, Henry M., 1874-1885
* **Prevost, S.M., 1897-1898
* **Pugh, Charles E., 1893-1898,
Rice, John, 1865-1873
*** **Roberts, George Brooke, 1870-1897 (Died 1897)
Robinson, William, Jr., 1852-1856
Robbins, John, Jr., 1857-1859
Rosengarten, G.D., 1858-1865
Salomon, David, 1863-1864
Scott, John (Pittsburgh), 1873-1877
Scott, Thomas, 1855-1858
*** **Scott, Thomas A., 1860-1880 (Resigned June, 1880)
Shoenberger, John H., 1848-1851
*Shortridge, N. Parker, 1874-1898
**Smith, Edmund, 1870-1872 and 1874-1888 (Resigned June 30, 1888)
Smith, William H., 1860-1865
Spangler, Christian E., 1847-1858
Stockton, Robert F., 1848-1849
Thaw, William, 1881-1889 (Died Aug. 17, 1889)
Thomas, Joseph M., 1859-1860
* *** **Thomson, Frank, 1882-1898
***Thomson, John Edgar, 1852-1874 (Died May 27, 1874)
Thompson, William, R., 1852-1862
Toland, Robert, 1847-1848
Weigand, John, 1848-1849
Welsh, Henry D., 1878-1896
Wetherill, John Price, 1878-1888
Wilkins, William, 1848-1853
Wood, Horatio C., 1859-1860
*Wood, George, 1891-1898
Wood, Richard D., 1847-1848
Wright, John A., 1847-1848
Yarrow, John, 1849-1856

Those marked thus * still serving in 1895. Those marked thus *** Presidents. Those marked thus ** Vice Presidents.

The present Directors are:

Frank Thomson, elected October 1, 1882.
Alexander M. Fox, elected March 8, 1871.
Alexander Biddle, elected March 24, 1874.
N. Parker Shortridge, elected March 24, 1874.
William L. Elkins, elected March 25, 1879.
Alexander J. Cassatt, elected June 29, 1874.
Clement A. Griscom, elected September 24, 1884.
Benjamin B. Comegys, elected November 9, 1887.
Amos R. Little, elected November 18, 1888.
William H. Barnes, elected November 11, 1889.
George Wood, elected March 24, 1891.
Christopher Stuart Patterson, elected July 2, 1895.
Effingham B. Morris, elected December 31, 1896.
John P. Green, elected October 1, 1882.
Charles E. Pugh, elected March 1, 1893.
Sutherland M. Prevost, elected February 10, 1897.
Mr. A.J. Cassatt served as Vice President 1874-1882, when he resigned.

William Bender Wilson, *History of the Pennsylvania Railroad Company with Plan of Organization, Portraits of Officials and Biographical Sketches* (2 vols.: Philadelphia: Henry T. Coates and Company, 1895), I:9-11.

Test Department – Pennsylvania Railroad

1874 – Established – Organization under direction Theo. N. Ely, S.M.P.
8- -74 – Department Physical Tests placed in charge John W. Cloud.
11- -75 – Chemical Laboratory added under Dr. Charles B. Dudley.
5- -79 to 8- 1-86 – John W. Cloud, Engineer of Tests. (Succeeded to office Mechanical Engineer 8-1-86, retaining control of Test Department).
8- 1-86 to 7- 1-93 – Under Mechanical Engineer (#) in charge of W.O. Dunbar.
7- 1-93 to 9- 1-02 – Under Mechanical Engineer in charge of A.W. Gibbs, Assistant Mechanical Engineer.
9- 1-02 to 8- 1-03 – Under Mechanical Engineer in charge of W.F. Kiesel, Jr., Assistant Mechanical Engineer.
8- 1-03 to 9-16-11 – E.D. Nelson, Engineer of Tests.
10- I-II to 5- 9-17 – C.D. Young, Engineer of Tests.
6- 1-17 to 4-16-37 – F.M. Waring, Engineer of Tests.
4-16-37 to date** – L.B. Jones, Engineer of Tests.

Chemical Laboratory

11- -75 to 12-21-09 – Charles B. Dudley, Chemist. (Died 12-21-09).
1- 1-10 to 1- 1-21 – F. N. Pease, Chemist (Title Chief Chemist after 8-I-12).
1 - 1-21 to date** – M.E. McDonnell, Chief Chemist.

11- 1-81 to 1- 1-1O – F.N. Pease, Asst. Chemist.
1- 1-16 to 1- 1-21 – M.E. McDonnell, Asst. Chief Chemist.

Mechanical Engineers

7- -66 to 3-20-86 – John B. Coin
8- 1-86 to 2-14-87 – John W. Cloud
3- 1-87 to 2- 1-19 – A.S. Vogt
2- 1-19 to 10- 1-36 – W.F. Kiesel, Jr.
10- 1-36 to date** – W.R. Elsey

1849 - 1850 Under the organization established in 1849 - 1850 the Departments of "Motive Power" and "Maintenance of Cars" were placed under the general superintendence of Herman Haupt, Superintendent of Transportation.

Annual Report for 1850 states that "the Motive Power Department was principally in charge of the Foreman of the Harrisburg Shop."

1852 Organization adopted December 1, 1852, placed the Motive Power Department, including Maintenance of Cars, in charge of Enoch Lewis, Second Assistant Superintendent (to Superintendent of Transportation).

From	To		
10- 1-57		Enoch Lewis left service.	
1857		Alexander McCausland	Master of Machinery (M.P. and Car Departments)
1858	12-31-61	George W. Greer	Master of Machinery (M.P. Dept.)
1858	1862	Ambrose Ward	General Foreman, Car Department
6-15-62		(John P. Laird	(Master of Machinery (M.P. and
		(	(Car Departments)
63	7-15-66	(	(Supt. Motive Power and Machinery
		(	((M.P. and Car Departments)
7-15-66	10-15-67	R.E. Ricker	Supt. Motive Power and Machinery
11 -16-67	4- 1-70	A.J. Cassatt	Supt. Motive Power and Machinery
4- 1-70	3- 1-72	Isaac Dripps	Supt. Motive Power and Machinery
3- 1-72	3- 1-73	Geo. Clinton Gardner	Supt. Motive Power and Machinery
3- 1-73	7- 1-74	Frank Thomson	Supt. Motive Power and Machinery
7- 1-74	)	Theo. N. Ely	(Supt. Motive Power (P. R. R. and
	)		(U.R.R. of N.J.)
82	3- 1-93)		(Gen. Supt. Motive Power, Lines East
3- 1-93	7- 1-11)		(Chief of Motive Power, Lines East
			(and West
3- 1 -93	10- 1-01	F.D. Casanave	Gen. Supt. Motive Power, Lines East
10- 1 -01	1- 1-03	W.W. Atterbury	Genl. Supt. Motive Power, Lines East
1- 1-03	7- 1-11)	Alfred W. Gibbs	(Gen. Supt. Motive Power, Lines East
7- 1-11	5-19-22)		(Chief Mechanical Engineer
7- 1-11	12- 9-11	R.N. Durborow	Gen. Supt. Motive Power, Lines East
I- 1-11	3- 1-20)	J.T. Wallis	(Gen. Supt. Motive Power, Lines East
3- 1-20	3- 1-27)		(Chief of Motive Power, System
3- 1-27	**	F.W. Hankins	Chief of Motive Power (*)

Mechanical Enginners

7- -66	3-20-86	John B. Coin
8- 1-86	2-14-87	John W. Cloud
3- 1-87	2- 1-19	Axe S. Vogt
2- 1-19	10- 1-36	William F. Kiesel, Jr.
10- 1-36	**	W.R. Elsey

(*) Asst. Vice-President – Chief of Motive Power 6-1-36
(**) 1939

"Test Department and Motive Power Department Organization from 1849 until June 13, 1939," June 13, 1939, Box 3, Acc. No. 1810, Pennsylvania Railroad Collection, Hagley Museum and Library, Wilmington, Delaware.

B: SELECTED DESCRIPTIONS OF THE ALTOONA SHOPS

Configuration of the Altoona Shops in 1890

ALTOONA CAR SHOPS

1.	Passenger Car Paint Shop	420 ft. x 132 ft.
2.	Electric Transfer Table and Pit	397" x 60"
3.	Group of Maintenance of Way Buildings	19,142 sq. ft.
4.	Freight Car Paint Shop	392 ft. x 108 ft.
5.	Freight Car Truck Shop	82" x 70"
6.	Planning Mill	356" x 74"
7.	Blacksmith Shop	357" x 73"
8.	Machine and Cabinet Shop	303" x 73"
9.	Upholstery and Trimming Shop, (two stories).	363" x 73"
10.	Passenger Car Erecting Shop	213" x 133"
11.	Office and Store Room, (two stories)	79" x 39"
12.	Freight Car Shop	433 ft. diam.
13.	Steam Turn Table	100 ft. diam.
14.	Lumber Drying Kilns	3,343 sq. ft.
15.	Fire Apparatus	53 ft. x 33 ft.

Total Floor Area, 368,680 sq. ft.

ALTOONA

JUNIATA LOCOMOTIVE SHOPS

(Under Construction)

1.	Paint Shop	146 ft.x 67 ft.
2.	Electric and Hydraulic House	60" x 45"
3.	Boiler Shop	386" x 80"
4.	Blacksmith Shop	306" x 80"
5.	Boiler House	70" x 43"
6.	Office and Store Room, (two stories)	71" x 51"
7.	Hydraulic Transfer Table and Pit	261" x 60"
8.	Erecting Shop	354" x 70"
9.	Machine Shop, (two stories)	258" x 75"

Total Floor Area, 118,986 sq. ft.

SUMMARY.

AREA OF SHOPS AT ALTOONA

Locomotive Shops	367,314 sq. ft.
Car Shops	368,680 sq. ft.
Locomotive Shop	118,986 sq. ft.
Total	854,980 sq. ft.

Or 19 7-10 acres.

Pennsylvania Railroad Company, *Pennsylvania Railroad Company, Altoona Shops and Motive Power Statistics* (Altoona: Office General Superintendent Motive Power, 1890), n.p.

C: SELECTED LISTINGS OF PRODUCTS MANUFACTURED AT ALTOONA SHOPS

Listing of Nineteenth Century Locomotives Repaired or Constructed in the Altoona Shops

The Altoona shops embrace five general departments, as follows: Altoona Machine shops, Altoona car shops, Juniata shops, East Altoona engine house and South Altoona foundries. They cover a yard area of 242.39 acres and embrace a floor area of 2,089,463 square feet, or 48.03 acres.

Altoona Machine Shops. – The Altoona machine shops comprise all that body of buildings extending from below Twelfth street to Sixteenth street. Here are located buildings having an aggregate frontage of more than three miles, all constructed of stone or brick, and occupied by the best machinery for locomotive building and repairing that modern ingenuity can devise. The machine shops include thirty-six departments, the total floor area being 689,961 square feet, or 15.83 acres, while the area of the shop yard is 23.8 acres. The number of men employed in all the departments is 4,153.

Master Mechanic I. B. Thomas, subject to direction from the superintendent of motive power, is in charge of the machine shops. This position was held for many years prior to 1904 by George W. Strattan, now retired. W.B. Norris is the general foreman and Fred A. Bell the chief shop clerk. The buildings in which are located the thirty-six departments, with their dimensions and area are as follows:

	Feet	Sq. Feet
Bunk house	20 x 83	1,660
Locomotive testing plant	48 x 155	7,440
Oil house	30 x 75 & 15 x 50	3,000
Gas producer building	25 x 95	2,375
Sand shed	24 x 95	2,280
Lead Lining room	37 x 138	5,106
Brass foundry	59 x 149	11,202
Hammer shop	99 x 250	39,770
Bolt shop	75 x 140	10,500
Miscellaneous shop	75 x 140	10,500
Storage building (2 stories)	50 x 100	9,107
Engine house, diameter 296 ft	–	–
Locos, handled daily 155		69,434
Coal wharf	78 x 133	10,480
Blacksmith shop	68 x 225	14,739
Frame shop (4 stories)	60 x 342	82,080
Spring shop	50 x 107	4,964
Boiler house No. 2	68 x 70	4,387
Power plant	70 x 103	6,761
Tank shop (3 stories)	64 x 266	40,491
Wheel shop	70 x 277	20,251
Flange shop	66 x 128	7,953
Boiler shop	84 x 263	22,092
Flue shop	44 x 171	7,524
Boiler house No. 1	44 x 119	5,236

Machine shop (2 stories)	60 x 320	38,400
Machine shop (2 stories)	70 x 260	36,400
Machine shop (4 stories)	70 x 202	56,560
Erecting shop No. 1	66 x 350	23,100
Erecting shop No. 2	66 x 399	26,334
Erecting shop No. 3	94 x 404	37,976
Storehouse and office (4 stories)	40 x 135	19,536
Laboratory and test room (4 stories)	40 x 70	10,906
Fire engine house (2 stories)	41 x 62	4,522
Paint shop	37 x 435	16,095
Cab and pilot shop (2 stories)	70 x 131	18,340
Locker and wash room	30 x 82	2,460

Altoona Car Shops. – On the west side of the railroad tracks, in the southern section of the city, is located the yard enclosing the immense round house and the construction and repair car shops. They cover an area of 65.64 acres, while the floor area of the buildings is 738,495 square feet, or 16.9 acres. There are thirty departments giving employment to 3,974 men. Here are manufactured and repaired passenger, mail, parlor and sleeping cars. Like the Altoona machine shops, it is a giant plant, one of the largest of the kind in the world, but their magnitude cannot be comprehended by this statement. It is necessary to see them running at their full capacity to realize their extent and capabilities. During the past decade great changes have taken place in this department. Wooden cars, both freight and passenger, are rapidly becoming a thing of the past, and this has greatly changed the character of the work in the car shops. Instead of carpenters and wood carvers, there are now steel workers, machinists and blacksmiths employed here.

W.F. Eberle has been general foreman of the shops since November, 1904.

Among those who have served as foremen in the various departments of these shops are Andrew Kipple, freight car shop; Levi Geesey, passenger car shop; John L. Burley, cabinet shop; James Sharp, machine shop; C.C. Mason, trimming shop; Harry A. Folk, smith shop; Walter K. Beatty and George L. Freet, planing mill; Fred S. Ball and Simon H. Walker, paint shop; Daniel Houseman and William E. McKee, outside laborers; Colonel John Piper, Alexander Smith, Andrew Vauclain, George Hawkesworth and Thomas Myers. Colonel Piper was the first general foreman, and was succeeded by Mr. Levan, the position being thus filled by but three men.

The buildings in which are located the thirty departments, with their dimensions and area are as follows:

	Feet	Sq. Feet
Paint stock room	50 x 74	3,337
Passenger car paint shop	134 x 465	62,284
Elec. transfer table and pit	77 x 380	29,260
Buffing-room	40 x 90	3,219
Planing-mill No. 1	91 x 314	28,574
Bolt shop	40 x 300	12,187
Storage building	54 x 388	20,952
Freight car paint shop	109 x 512	55,808
Power plant	74 x 120	8,880
Boiler house	63 x 76	4,410
Boiler house	63 x 76	4,788

Planing-mill No. 2	74 x 365	25,310
Shed for finished lumber	50 x 75	3,750
Blacksmith shop	74 x 492	35,505
Machine shop	74 x 138	10,212
Cabinet shop	74 x 455	33,670
Upholstering and trimming shop	74 x 363	51,017
Office and storeroom (2 stories)	40 x 170	12,291
Passenger car shop	134 x 278	37,252
Fire engine house	33 x 73	2,409
Freight car shop, diameter 433 ft	–	145,626
Truck shop	58 x 254	14,732
Oil house	34 x 40	1,978
Shed for finished lumber	50 x 351	17,550
Steel car shop	90 x 550	47,598
Crossarm building	57 x 115	6,555
Undried lumber shed	50 x 100 & 100 x 260	31,000
Dry kilns (2 stories)	70 x 90	12,600
Dried lumber shed	50 x 75 & 100 x 120	15,750
Lumber yard	–	–

The Juniata Shops. – The Juniata locomotive shops are located a short distance from the eastern boundary of the city of Altoona and were erected in 1889 and 1890. Their total floor area is 281,273 acres, or 6.45 acres, and the number of men employed about 1,600. These men are employed solely on the production of engines, steam and electric, for the Pennsylvania Railroad. Originally built with an estimated capacity of 150 new engines per year, more than double that number can now be turned out. The first engine turned out of these shops was a class R, the date being July 27, 1891.

Beginning at the western end of the shops, the paint shop and the paint store house are the first buildings. The paint shop is 68 x 150 feet, with three tracks for the accommodation of tenders and engines. It has a floor space of 10,895 square feet. David A. Little is the foreman of this shop. The department paints all the work turned out in the shops.

The electric and hydraulic building is probably one of the most interesting buildings on the list of the shops. It is a one-story building, well lighted, and contains electric light and power machinery, hydraulic pumping machinery for furnishing power to the boiler shop, air compressors and fire service pumps. H.H. Riggin is in charge of the engines, boilers, etc., throughout the plant. The building is 45 x 105 feet in dimensions.

The boiler house, containing stationary boilers for furnishing steam throughout the plant, is a separate building, 45 x 151 feet. In the winter all the shops are heated by steam, on the Studevant system. All the boilers are fitted with self-feeding and self-cleaning machinery, thus doing away with the drudgery attending a fireman's work.

There are two blacksmith shops, known as No. 1 and No. 2. The floor space of No. 1 is 42,520 square feet, the dimensions of the building being 80 x 514 feet. No. 2 shop covers an area of 15,977 square feet and is 80 x 210 feet in dimensions. In this department William Cook is foreman, his assistant being Harry E. Gamble. The number of men employed in this department is about 500, these men being divided into six classes: smiths, helpers, foremen, heaters, hammermen and hammerboys.

A number of giant hammers are used in this department. There are two 6,000 pound hammers, one 3,000, two 1,600, four 1,100, one 600, and other smaller ones. In the forging department gas furnaces are used, but in the bolt department oil furnaces are used. There are five furnaces in the forging department and two in the bolt department.

An enormous pair of shears, worked by hydraulic power, is a special feature of this shop.

The Juniata blacksmith shop is brilliantly lighted by large windows and the ventilation is about as perfect as possible, there being a total absence of all the unpleasant smoke usually noticed in such shops. The system of lighting by means of arc lights is such that on the darkest night the shop is as bright if not brighter than in daylight.

The machine shop is a two-story building, the outer walls of which are apparently all windows. The effect of these windows is noticed very readily on entering the shop every portion of the building being well lighted. The building is 75 x 578 feet in dimensions. The car shops operations give employment to 954 men. Edward McClain is the foreman of the department. Following are the buildings comprising the department, with their respective areas and dimensions:

	Feet	Sq. Feet
Pattern storehouse (3 stories)	193 x 91	50,193
Pattern shop	192 x 91	17,714
Boiler room	43 x 161	6,360
Engine room	47 x 161	6,926
Scale houses (3)	20 x 18	824
Wheel foundry	602 x 188	87,386
Annealing pits (2)	145 x 45	11,928
Wheel breakers (3)	16 x 9	322
Material building and storehouse	146 x 60	8,760
Iron foundry	564 x 163	91,925
Core rooms	180 x 60	16,748
Cupola rooms (3)	45 x 40	10,575
Office building (2 stories)	50 x 40	6,727
Coke trestle	216 x 23	4,968
Machine and smith shop	99 x 60	5,940

Paul T. Warner, *Motive Power Development on the Pennsylvania Railroad System, 1831-1924* (Philadelphia: N.P., 1924), pp. 27-29.

C: SELECTED LISTINGS OF PRODUCTS MANUFACTURED AT ALTOONA SHOPS

The Introduction of Standard Locomotive Designs, and Subsequent Motive Power Development Up to the Year 1899

These locomotives were all designed to use bituminous coal as fuel, and the different classes were designated by the first eight letters of the alphabet. This system of class designation remained in effect until 1895, when it was revised by assigning one letter to each wheel arrangement, and following this with a figure, or a figure and letter combined, to indicate the different classes having that wheel arrangement. The old locomotives were re-classified on this basis. In the following discussion the old classification will be used, but the revised classification will be given in parenthesis in order that the locomotives may be more easily identified.

The characteristic features of the first eight classes of standard locomotives were as follows:

Class A (D1) – A locomotive of the American (4-4-0) type, for express passenger service. Cylinders, 17" x 24". Driving wheels, diameter, 68".

Class B (D2) – A locomotive of the American type for mountain passenger helper service. Cylinders, 18" x 24". Driving wheels, diameter, 62". Boiler of similar design to that used on Class A, but with a firebox of somewhat larger dimensions.

Class C (D3) – A locomotive of the American type for general passenger or fast freight service. cylinders, 17" x 24". Driving wheels, diameter, 62". Boiler of the same dimensions as that used on Class B.

Class D (G1) – A locomotive of the ten-wheeled (4-6-0) type for general freight service. Cylinders, 18" x 22". Driving wheels, diameter, 56".

Class E (G2) – A locomotive of the ten-wheeled type for freight service on mountain grades. Cylinders, 18" x 22". Driving wheels, diameter, 50". Boiler of similar design to that used on Class D, but with a firebox of somewhat larger dimensions.

Class F (B1) – A six-coupled tank locomotive for switching service. Cylinders, 15" x 18". Driving wheels, diameter, 44".

Class G (D5) – A locomotive of the American type for light passenger service. Cylinders, 15" x 22". Driving wheels, diameter, 56".

Class H (B2) – A six-coupled locomotive, with separate tender, for switching service. Cylinders, 15" x 22". Driving wheels, diameter, 44".

The records indicate that Classes C (D3), D (G1), and E (G2) were built far more extensively than any of the others. Classes A (D1) and B (D2), especially, were built in limited numbers only.

To these first classes there were added in 1873, an American type passenger locomotive for burning anthracite, generally similar to Class C and designated as C anthracite (D4); and in 1875 a locomotive of the Consolidation (2-8-0) type, for heavy freight service, and designated as Class I (HI). The C anthracite locomotives were specially designed for service on the lines in New Jersey, and in 1875 a number were built with driving wheels 68 inches in diameter, and designated as Class CA anthracite (D4a) These locomotives were placed in fast passenger service on the New York

Division, and handled the traffic most successfully until 1881, when they were replaced with heavier power.

Paul T. Warner, *Motive Power Development on the Pennsylvania Railroad System, 1831-1924* (Philadelphia: N.P., 1924), pp. 27-29.

Examples of Products Constructed at the Altoona Shops
in the Nineteenth Century

Railroad Cars Built and Rebuilt at the Altoona Shops in 1853

During the year 1853, new cars, as follows, were built at Altoona shop, viz.:

1 four-wheeled box car.
45 eight-wheeled do
2 do iron trucks.
10 four-wheeled coal cars. total four-wheeled cars, 105.

During the same period, cars were rebuilt, as follows, at Altoona shop:

5 four-wheeled box cars.
25 eight-wheeled do
2 do stock cars.
9 do wood trucks.
9 do iron trucks. Total four-wheeled cars, 95.

Pennsylvania Railroad Company, *Seventh Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders*, (Philadelphia: Crissy and Markely, 1854), p. 56.

Railroad Locomotives and Cars Constructed at the Altoona Shops in 1880

LOCOMOTIVES

For the Pennsylvania Railroad Company, to fill vacant numbers	65
For the Philadelphia and Erie Railroad Company, to fill vacant numbers	4
For the Northern Central Railway Company	8
For the Richmond and Danville Railroad Company	6
For the West Jersey Railroad Company	2
Total	85

PASSENGER EQUIPMENT CARS

For Pennsylvania Railroad Company, to increase equipment	50 passenger cars
For Pennsylvania Railroad Company, to replace United Railroads of New Jersey cars	13 passenger cars
For Pennsylvania Railroad Company, to fill vacant numbers	7 passenger cars
For Pennsylvania Railroad Company, to fill vacant numbers	8 postal cars
For Pennsylvania Railroad Company, to fill vacant numbers	6 combined cars
For Pennsylvania Railroad Company, to fill vacant numbers	4 passenger cars
Total	106 cars

FREIGHT EQUIPMENT CARS

For Pennsylvania Railroad Company, to fill vacant numbers:

Hopper Gondolas	396
Long Gondolas	11
Acid car frames, and trucks	4
Total number Gondolas	411
Box cars	225
Stock cars	43
Cabin cars	30
Tank cars	13
Total	722

For the Railway Car Trust of Pennsylvania. Series B, C, and D:

Box cars	1,500
Hopper Gondolas	1,000
Long Gondolas	500
Total	3,000

For Empire Line, to fill vacant numbers	24 box cars
For Northern Central Railway Company	2 cabin cars
For Troy and Greenfield Railroad	1 cabin car
For G. R. and I. R. R. Co	1 box car
For P. C. and St. L. Railway Co	5 box cars
For Cambria Iron Co	19 hopper gondolas

MAINTENANCE OF WAY EQUIPMENT

For Pennsylvania Railroad Company, to fill vacant numbers	2 derrick cars
For Pennsylvania Railroad Company, to fill vacant numbers	4 tool cars
For Pennsylvania Railroad Company, to fill vacant numbers	1 experimental cars
Total	7 cars

Pennsylvania Railroad Company, *Thirty-fourth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting, held March 8, 1881* (Philadelphia: N.P., 1881), pp. 129-130.

Railroad Locomotives and Cars Constructed at the Altoona Shops in 1885

LOCOMOTIVES

For the Pennsylvania Railroad Company, to fill vacant numbers	29
For the Philadelphia, Wilmington and Baltimore Railroad Company	8
For the Northern Central Railway Company	1
For the Pennsylvania Company	3
For the Pittsburgh, Cincinnati and St. Louis Railway Company	2
For the Chicago, St. Louis and Pittsburgh Railroad Company	2
Total	45

PASSENGER EQUIPMENT CARS

For the Pennsylvania Railroad Company, to increase equipment	2 passenger cars
For the Pennsylvania Railroad Company, to fill vacant numbers	21 passenger cars
For the Pennsylvania Railroad Company, to fill vacant numbers	4 baggage cars
For the Philadelphia, Wilmington and Baltimore Railroad Company	6 passenger cars
For the Baltimore and Potomac Railroad Company	3 passenger cars
For the Pittsburgh, Cincinnati and St. Louis Railway Company	6 passenger cars
For the Pennsylvania Company	5 postal cars
Total	47

FREIGHT EQUIPMENT CARS

For the Pennsylvania Railroad Company, to increase equipment	51 refrigerator cars
For the Pennsylvania Railroad Company, to increase equipment	10 cabincars
For the Pennsylvania Railroad Company, to fill vacant numbers	106 box cars
For the Pennsylvania Railroad Company, to fill vacant numbers	1 refrigerator cars
For the Pennsylvania Railroad Company, to fill vacant numbers	118 stock cars
For the Pennsylvania Railroad Company, to fill vacant numbers	734 gondola cars
For the Pennsylvania Railroad Company, to fill vacant numbers	24 cabin cars
For the West Jersey Railroad Company	2 cabin cars
For the West Jersey Railroad Company	1 box car
For the West Jersey Railroad Company	8 gondola cars
For the Camden and Atlantic Railroad Company	1 gondola car
For the Pennsylvania Car Trust (New York, Philadelphia and Norfolk Railroad)	152 box cars
For the New York, Philadelphia and Norfolk Railroad Company	2 box cars
For the Pennsylvania Company	300 box cars
For the Pittsburgh, Cincinnati and St. Louis Railway Company	70 box cars
For the Pittsburgh, Cincinnati and St. Louis Railway Company	120 stock cars
For the Pittsburgh, Cincinnati and St. Louis Railway Company	25 gondola cars
For the Pittsburgh, Cincinnati and St. Louis Railway Company	42 flat cars
For the Chicago, St. Louis and Pittsburgh Railroad Company	35 box cars
For the Chicago, St. Louis and Pittsburgh Railroad Company	30 stock cars
For the Chicago, St. Louis and Pittsburgh Railroad Company	15 gondola cars

For the Little Miami Railroad Company	35 box cars
For the Little Miami Railroad Company	7 flat cars
For the Jeffersonville, Madison and Indianapolis Railroad Company	10 box cars
For the Jeffersonville, Madison and Indianapolis Railroad Company	7 flat cars
Total	1,920

MAINTENANCE OF WAY EQUIPMENT

For the Pennsylvania Railroad Company, to fill vacant numbers . . .	2 tool cars
For the Pennsylvania Railroad Company, to increase equipment . .	2 tool cars
For the Pennsylvania Railroad Company, to fill vacant numbers . . .	3 derrick cars
For the Pennsylvania Railroad Company, to fill vacant numbers . . .	7 flat cars
For the Pennsylvania Railroad Company, to fill vacant numbers . . .	12 hand cars
For the Pennsylvania Railroad Company, to fill vacant numbers . . .	12 hand cars
For the Pennsylvania Railroad Company, to fill vacant numbers . . .	4 hand trucks
For the Pennsylvania Railroad Company, to increase equipment . .	14 hand trucks
For the Tuckerton Railroad Company	1 hand car
Total	57

Pennsylvania Railroad Company, *Thirty-ninth Annual Report of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting held March 8th, 1886* (Philadelphia: N.P., 1886), pp. 113-114.

FREIGHT EQUIPMENT CARS
Built at Altoona Car Shops

For the Pennsylvania Railroad Company, to increase equipment . .	25 cabin cars
For the Pennsylvania Railroad Company, to increase equipment . .	9 long gondola cars
For the Pennsylvania Railroad Company, to fill vacant numbers . . .	519 box cars
For the Pennsylvania Railroad Company, to fill vacant numbers . .	29 stock cars
For the Pennsylvania Railroad Company, to fill vacant numbers . .	205 long gondola cars
For the Pennsylvania Railroad Company, to fill vacant numbers . .	53 coke gondola cars
For the Pennsylvania Railroad Company, to fill vacant numbers . .	552 hopper gondola cars
For the Pennsylvania Railroad Company, to fill vacant numbers . .	55 cabin cars
For the Pennsylvania Railroad Company, to fill vacant numbers . .	9 refrigerator cars
For the Equipment Trust Bond, Series "A"	127 refrigerator cars
For the Northern Central Railway Company	1 cabin car
For the Northern Central Railway Company	44 box cars
For the Northern Central Railway Company	52 hopper gondola cars
For the Philadelphia, Wilmington and Baltimore Railroad Company .	169 box cars
For the Philadelphia, Wilmington and Baltimore Railroad Company .	8 long gondola cars
For the Philadelphia, Wilmington and Baltimore Railroad Company .	6 flat cars
For the Philadelphia, Wilmington and Baltimore Railroad Company .	1 hopper gondola cars
For the West Jersey Railroad Company	16 long goldola cars
For the Camden and Atlantic Railroad Company	3 box cars
For the Pennsylvania Company	650 hopper gondola cars
For the New York, Philadelphia and Norfolk Railroad Company . . .	14 box cars
For the Atlantic Refining Company	2 long gondola cars
Total	2,576 cars

MAINTENANCE OF WAY EQUIPMENT CARS
Built at Juniata Shops, Altoona

For the Pennsylvania Railroad Company, to fill vacant numbers . . .	71 flat cars
For the Pennsylvania Railroad Company, to fill vacant numbers . .	9 hand trucks
For the Camden and Atlantic Railroad Company	1 hand truck

Built at Juniata Shops, Altoona

For the Pennsylvania Railroad Company, to fill vacant numbers . .	5 hand cars
For the Pennsylvania Railroad Company, to fill vacant numbers . .	2 derrick cars
For the Pennsylvania Railroad Company, to fill vacant numbers . .	16 hand cars
For the West Jersey Railroad Company	5 hand cars
For the Camden and Atlantic Company	1 hand car

Pennsylvania Railroad Company, *Forty-ninth Annual Report for the Year 1895 of the Board of Directors of the Pennsylvania Railroad Company to the Stockholders, Presented at the Meeting held March 10th, 1896* (Philadelphia: N.P., 1896), pp. 121-123.

Railroad Locomotives and Cars Constructed at the Altoona Shops in 1895

LOCOMOTIVES
Built at the Altoona Machine Shops

For the Pennsylvania Railroad Company, to fill vacant numbers	25
For the Philadelphia, Wilmington and Baltimore Railroad Company	2
For the Pittsburgh, Cincinnati, Chicago and St. Louis Railway Company	4
For the Allegheny Valley Railroad Company	2
For the Cleveland and Marietta Railroad Company	3
Total	42

Built at Juniata Shop, Altoona

For the Pennsylvania Railroad Company, to fill vacant numbers	34
For the Pittsburgh, Cincinnati, Chicago and St. Louis Railway Company	9
For the Erie and Pittsburgh Railroad Company	2
Total	45
	87

PASSENGER EQUIPMENT CARS
Built at Altoona Car Shops

For the Pennsylvania Railroad Company, to fill vacant numbers	7 passenger cars
For the Pennsylvania Railroad Company, to fill vacant numbers	8 combined cars
For the Pennsylvania Railroad Company, to fill vacant numbers	1 passenger (suburban) car
For the Pennsylvania Railroad Company, to fill vacant numbers	1 baggage and mail car
For the Pennsylvania Railroad Company, to fill vacant numbers	1 baggage car
For the Pennsylvania Railroad Company, to fill vacant numbers	2 baggage express cars
For the Northern Central Railway Company	1 baggage car
For the Philadelphia, Wilmington and Baltimore Railroad Company	1 combined car
For the Philadelphia, Wilmington and Baltimore Railroad Company	1 baggage express car
For the West Jersey Railroad Company	3 passenger cars
For the West Jersey Railroad Company	1 combined car
For the West Jersey Railroad Company	1 baggage car
For the Camden and Atlantic Railroad Company	2 passenger cars
For the Camden and Atlantic Railroad Company	1 combined car
For the Camden and Atlantic Railroad Company	4 baggage express cars
For the Pittsburgh, Cincinnati, Chicago and St. Louis Railway Company	1 postal (letter) car
For the Pittsburgh, Cincinnati, Chicago and St. Louis Railway Company	1 postal (paper) car
Total	39 cars

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