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Cleveland : An Inventory of Historic Engineering and Industrial Sites

Daniel M. Bluestone

CLEVELAND

An Inventory of Historic Engineering and Industrial Sites

Historic American Engineering Record

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An Inventory of Historic Engineering and Industrial Sites

Edited by: Daniel M. Bluestone

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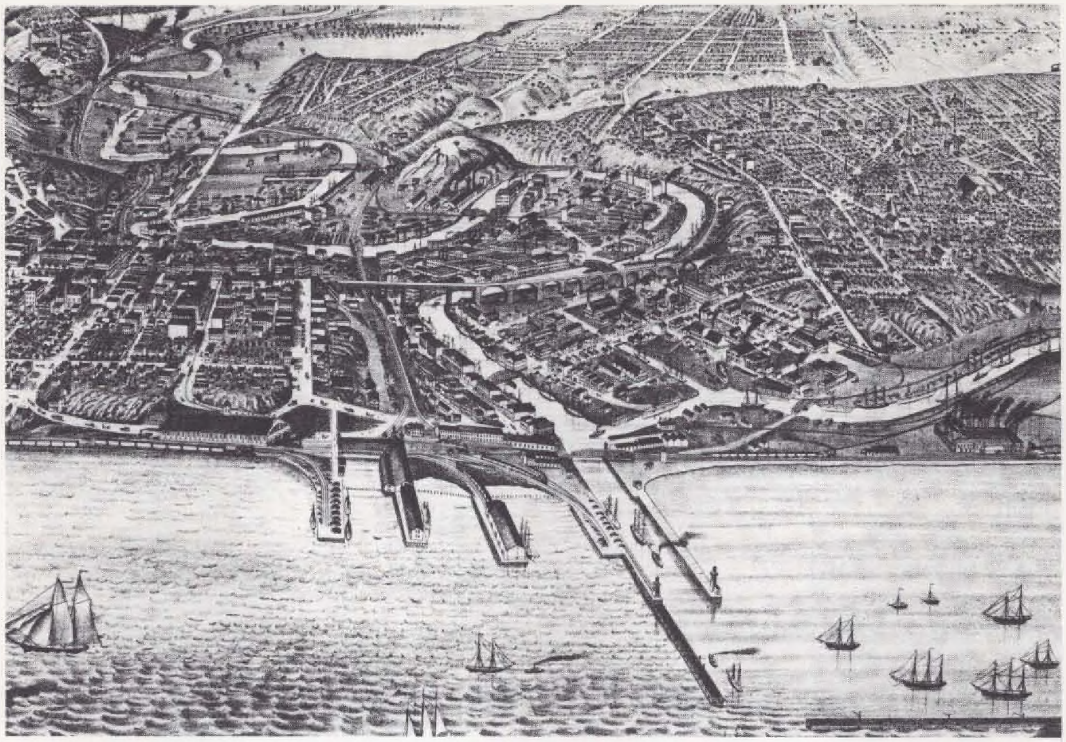
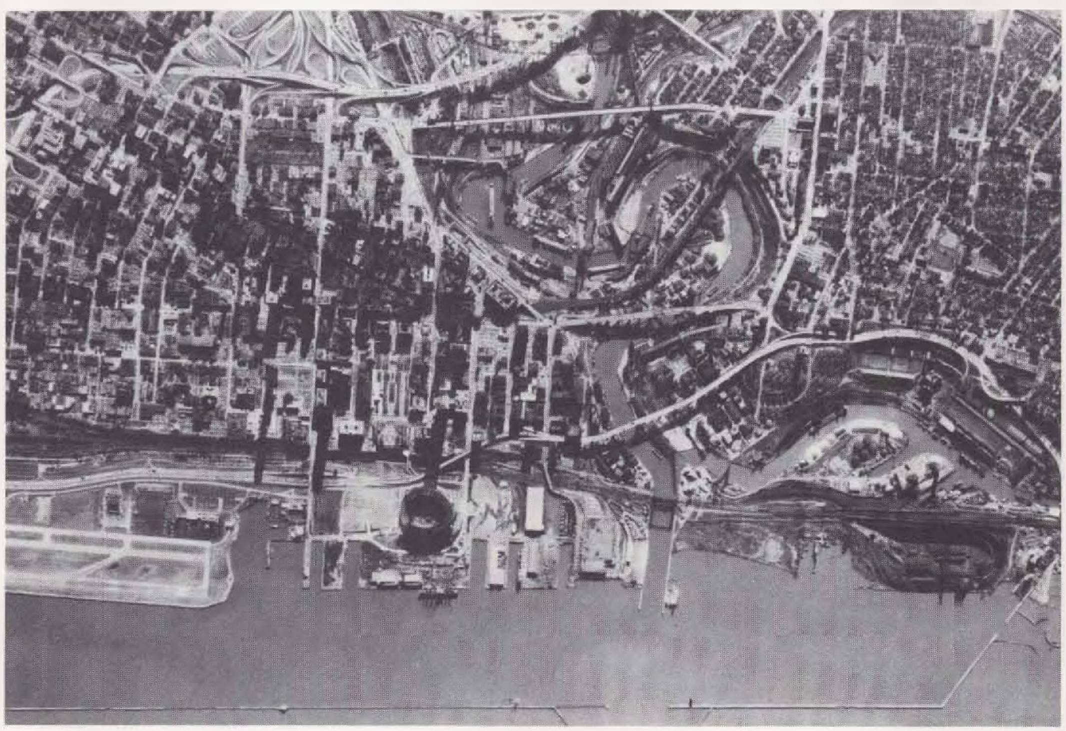


Cleveland, Ohio in 1877



Aerial View of Cuyahoga River and Flats Area, (c. 1970)

Introduction: The Cleveland Inventory

As a part of the Office of Archeology and Historic Preservation, Department of the Interior, the Historic American Engineering Record (HAER) documents historic engineering and industrial sites throughout the Nation. This inventory is the first step in the documentation process. It provides a context within which to judge the relative significance of sites and the need for more complete recording by HAER.

In 1975 the Cleveland Foundation made a grant to the Cleveland Landmarks Commission (John D. Cimperman, Director) to undertake a study of engineering and industrial works located primarily along Cleveland's Cuyahoga River Valley. Professor Clarence H. C. James, Chairman of the Department of Civil Engineering and Engineering Mechanics at Cleveland State University, and Thomas Palko and John Sullivan, engineering students, undertook the study between April and September 1975. The team received technical support from HAER and adopted the national HAER inventory format. The team recorded 34 sites on HAER inventory cards including the name, date, type, industrial classification, location, owner, condition, physical and historical description, photographs, a site sketch map, and a bibliography for each structure. Among the sites were 25 bridges, five industrial sites, a steam engine, a coal tipple, a powerhouse, and canal structures.

A second HAER inventory was conducted in Cleveland in cooperation with the Cleveland Landmarks Commission from June to August 1976. Working under the direction of T. Allan Comp, HAER Senior Historian and inventory coordinator, Daniel M. Bluestone served as the Cleveland project historian and compiler, inventorying a wide range of engineering and industrial sites throughout Cleveland. Tom Fisher and Eric Johannesen of the Ohio Historic Preservation Regional Office at the Western Reserve Historical Society, provided assistance during the summer. During the fall, Mr. Bluestone completed and edited the inventory in the HAER Washington office. Dr. Comp and Donald C. Jackson, HAER engineer, provided technical assistance and support in completing the manuscript. Professor Sara Ruth Watson and John Wolfs offered their manuscript, "Bridges of Cuyahoga County, Past, Present, and Future," which was most helpful in the revision of the entries relating to Cleveland bridges. Mr. John D. Cimperman and the staff of the Cleveland Landmarks Commission provided important support to the inventory project. Margaret A. Orelup and Donna M. Ware assisted Isabel T. Hill in preparing the manuscript for publication.

An 1893 Visitor's Directory to the Engineering Works and Industries of Cleveland, Ohio, published by the Cleveland Civil Engineers Club, expresses the unavoidable omissions of such a large-scale work: "It would be impossible in a work of this size to describe all the hundreds of mechanical industries in this busy city; only a careful selection of representative concerns has been attempted, though it is with regret that many deserving works are necessarily omitted." The HAER inventory completed thus far highlights some of the salient features of Cleveland engineering industry; however, like the 1893 directory, it is not a comprehensive work. The author hopes the presentation of this inventory will interest others in continuing the investigation. In general, major late nineteenth and early twentieth century Cleveland industries, as indicated in the Federal census, and industries and engineering works particularly important to Cleveland or to the country received priority.

Excellent resources are available for conducting inventory work in Cleveland. Several city and county histories provide important information. William Ganson Rose's Cleveland: The Making of A City is an encyclopedic chronicle of city history which reads like a telephone book, but is at least as useful. William Henry Alburn and Miriam Russell Alburn's This Cleveland of Ours provides the most comprehensive overview of major Cleveland industrial operations. Rose, Alburn, and other local historians are frequently inaccurate in their statements regarding Cleveland industry. Rose, for example, presents figures on Cleveland's industrial operations in 1870 by quoting federal census figures for all of Cuyahoga County. Cleveland's population at the time was 92,829 and Cuyahoga County's population was 132,829. The figures make it appear that the number of industrial establishments in Cleveland decreased from 1,149 to 1,055 during the 1870s, one of the periods of Cleveland's greatest industrial expansion. Rose compensates for this error by stating that the 1880 firms manufactured $84,860,405 worth of products when in fact the figure is $48,604,050. The Alburns drew on Cleveland Chamber of Commerce booster literature and presented Cleveland paint production as leading all other American cities. Several pioneer firms in the American mixed paint and varnish industry started in Cleveland; the city's plants, however, never surpassed the production of New York or Chicago plants.

The Cleveland business directories dating from the 1850s provide the precise location of Cleveland firms as well as a general indication of their dates of operation. Cleveland and Cuyahoga County maps and plat books, particularly the Sanborn and Hopkins series, were issued nearly every decade after 1860. With the maps it is possible to determine the location, size, and expansion projects of Cleveland's industrial plants. Cleveland building permits, first issued in the 1880s, are an invaluable source for inventory purposes. They record the size, construction specifications, engineers/architects, and date of nearly all Cleveland buildings and additions. The records are kept in the Cleveland Division of Buildings and are accompanied with a convenient index. The Cleveland Survey Department maintains extensive files and engineering drawings on Cleveland bridges. The Engineering

Index and *Industrial Arts Index* provide references to articles in the periodical literature on Cleveland industry and engineering.

The works and the structures are the greatest resources. Cleveland city officials, citizens, and the personnel working at each site have provided access and information which made the inventory possible.

CLEVELAND'S ECONOMIC AND INDUSTRIAL DEVELOPMENT:

Cleveland's economic development during the early nineteenth century largely depended upon its position as a center of trade and commerce. Its prominence derived from its position as the Lake Erie terminus of the Ohio and Erie Canal completed in 1832. The mouth of the Cuyahoga River provided a protected harbor for Lake Erie ships moving freight between the Cleveland terminus of the Ohio and Erie Canal and the Buffalo terminus of New York's Erie Canal. The Ohio and Erie Canal, the 1839 canal connection between Cleveland and Pittsburgh, and other Ohio canals served as Ohio's primary means of commercial and inland transportation before the expansion of railroad operations in the 1850s. Cleveland's merchants sited favorably for waterborne commerce, exported agricultural goods and raw materials from Ohio's interior to eastern markets and operated as the regional distributors for manufactured goods. Many of the city's earliest industries derived from the manufacture of unprocessed agricultural materials and raw materials arriving in the city over the canals and the Great Lakes. During the 1850s increased railroad construction and trade eclipsed canal commerce and threatened Cleveland's position as a commercial trade center. Substantial investment of commercial capital went into Cleveland's subsequent industrial development.

Major industrial possibilities arose with the 1855 opening of the Sault Ste. Marie Canal. The canal provided the Lower Great Lakes with water access to Lake Superior ore deposits, which developed into the United States' major ore-producing region. Cleveland also maintained easy railroad access to the Pennsylvania and West Virginia coal and coke production regions. The emerging pattern of the United States' iron and steel industry during the late nineteenth and early twentieth centuries allowed industrialists to develop Cleveland's position on an important trade route in raw materials into a cornerstone of local industrial development.

In 1879, with 7,120,000 tons of ore produced in the United States, Pennsylvania was the principal iron-mining state, producing 1,951,000 tons; Michigan occupied second place, producing 1,641,000 tons. With the 1880s and 1890s' production of ore in Minnesota and Michigan, the Lake Superior region assumed a dominant role in United States ore production. In 1899 the United States produced 24,683,000 tons of iron ore - 17,887,000 came from the Lake Superior region; 81.1 percent came from this area in 1909 and 86.1 percent came in 1919. During the entire period Pennsylvania production steadily declined to 627,000 tons or about 1.0 percent of production in the United States. Still sited favorably in regard to coal deposits and coke production, the iron and steel producers in the Mahoning Valley, Pittsburgh, and Western Pennsylvania enlarged their production by drawing on Lake Superior ore, arriving at Lake Erie ports. Drawing on adjacent ore fields, Duluth industrialists initiated iron and steel production but they needed to import coal and coke. With Cleveland and other Lake Erie ports commanding a central position, a major raw materials trade route for the iron and steel industry developed. Railroad cars carrying coal and coke from Western Pennsylvania and West Virginia arrived at Cleveland and traded cargoes with the ore boats returning to the Lake Superior region.

FIG. 1.—Cleveland's strategic location with respect to iron ore, coal (close stipples show the Appalachian Field; heavy black stripes coking coal; open stipples non-available coal), and fluxing limestone. In addition to the Lake Huron side of the Lower *Peninsula of Michigan*, which is outstanding in *limestone* production, *Kelley's Island* and Marblehead in Ohio are important sources of metallurgical stone. Cities invariably grow up where bulk is broken. It is true that Cleveland's "basic commodity is transportation." Scale of map approximately 1:18,500,000. (Map by C. Langdon White and George Primmer. Courtesy of *The Geographical Review*.)

Located in a viable iron and steel marketing place, Cleveland tapped the trade in iron ore and coal and developed extensive iron and steel plants of its own. Cleveland eventually came to use about a third of the ore and coal arriving in the city. Cleveland's port expanded to accommodate the increased trade and established itself as one of the major Lake Erie ports. In 1889 a total of 2,737,708 tons of cargo arrived in Cleveland; of which 1,951,564 tons were ore. Cleveland shipped a total of 883,662 tons of cargo, 825,030 tons which were coal. In 1906 there arrived 8, 235,366 tons, of which 7,461,465 tons were ore; 3,434,962 tons were shipped, of which 2,905,506 were coal. In 1916 a total of 13,456,962 tons arrived, 12,289,920 tons were ore. The volume of coal exported did not keep pace with ore receipts and actually declined from 1906 to 2,626,458 tons in 1916.

The 1870 Federal census for Cuyahoga County shows the emergence of the iron industry in Cleveland and the surrounding towns. Of the county's 10,063 workers, 1,219 worked in plants producing iron or various iron products. This production accounted for $4,574,264 of the county's total manufactured product value of $27,049,012. In 1880, in Cleveland alone, 6,176 or 28.4 percent of the city's 21,724 workers, worked in the various iron and steel working plants and the foundries and machine shops. These plants accounted for $10,948,597, or 22.5 percent of the city's total manufactured product value of $48,604,050. The important role of the iron and steel industry in Cleveland's economy continued throughout the late nineteenth and early twentieth centuries.

The iron and steel manufacture, the cornerstone of Cleveland's industrial development, did not preclude the emergence of an extremely diversified industrial base. Around 1880 Cleveland stood in sharp contrast with Pittsburgh; 53 percent of Cleveland's workers and 57 percent of the total manufactured product value were involved in iron and steel working plants and foundry and machine shops. Other leading Cleveland industries included slaughtering and meat packing, petroleum refining, clothing, liquors, and developing later, automobiles and parts, and electrical machinery. Throughout the late nineteenth and early twentieth century, Cleveland industrial firms represented from 70 to 85 percent of the United States Census industrial classifications.

Industrial and population growth reinforced each other and between 1850 and 1910, Cleveland moved from the thirty-seventh to the sixth largest city in the United States. Including the various annexations of surrounding suburbs and towns, Cleveland's population grew from 17,034 in 1850, to 92,829 in 1870, to 261,353 in 1890, to 560,663 in 1910, to 900,429 in 1930. The number of establishments of productive industry in Cleveland similarly expanded from 1,055 in 1880, to 2,307 in 1890, to 2,927 in 1900.

Cleveland's rich engineering and industrial resources reflect its once varied industrial output and at the same time indicate the city's decline in prosperity. Suburbanization and relocation of industry in other parts of the nation have debilitated Cleveland's population and industrial base since the 1950s. During the 1960s Cleveland lost 14.3 percent of its population and 17.2 percent of its jobs. The former plants of the Cleveland Worsted Mills Company and the Industrial Rayon Corporation, now used by a number of small manufacturers and warehouse operators, point to the general decline of the city's once thriving textile industry. The Old River Bed plant of the American Shipbuilding Company, now deteriorated and inactive is a reminder of the day when Cleveland was the major shipbuilding center of the Great Lakes. The American Shipbuilding Company has relocated its plant in Lorain, Ohio. Alexander Brown designed materials-handling equipment which totally altered the methods for unloading ore from ships; the merger of the Brown company with another led to the abandonment of its extensive Cleveland plant, now used as a warehouse. The expanding industries of Cleveland did not replace their structures, but rather left many nineteenth and early twentieth century plants intact. Little production equipment remains because of the urban location of these abandoned industries. The steel industry's market for scrap metal has also contributed to the disappearance of old manufacturing equipment and structures. The steel industry and other remaining Cleveland manufacturers have carried out extensive plant modernization displacing examples of past technology.

Despite abandonment and modernization some extraordinary examples of civil, mechanical, and industrial engineering, and older industrial plants remain throughout Cleveland. Through Cleveland's extant engineering and industrial sites, it is possible to perceive a part of the technical development of specific plants as well as the general evolution of Cleveland as an industrial city.

Ore Docks and Engineering Firms

Cleveland's lakeside location, water access to the Lake Superior ore region, and connecting rail lines to the Mahoning Valley and other inland steel-producing regions helped establish the city as a major ore-unloading port. Owning vast mining and shipping operations, Cleveland-based ore agents spurred the development of the local iron and steel industry. The expanding iron and steel industry and the use of larger ore boats necessitated the development of ore-handling technology to expedite the flow of ore from mine to blast furnace. Modern production was not compatible with wheelbarrow unloading of ore boats. Alexander E. Brown and George M. Hullett, two Cleveland engineers, designed and built machinery which helped alter the entire process of ore unloading. Radically improving the speed and efficiency and reducing the cost of unloading ore, the Brown and Hulett designs played a key part in the development of the iron and steel industry. [Miriam Russell Alburn and William Henry Alburn, <u>This Cleveland</u>, 1: 478; Walter G. Stephan, "Ore Handling at Lower Lake Ports," in <u>The ABC of Iron and Steel</u>, 4th ed., edited by A. O. Backert, (Cleveland, 1927), pp. 49-60.]

NEW YORK, PENNSYLVANIA, AND OHIO ORE DOCK — Cleveland South
(Erie-Lackawana Ore Dock) — 17.440590.4593900
River Road on Old River Bed

The New York, Pennsylvania, and Ohio Ore Dock frequently incorporated the developing technologies for unloading ore boats. In 1880-1881, Alexander E. Brown designed and installed the first mechanical ore unloading system ever to distribute ore from the hold of the boat to the railroad cars or storage piles without rehandling. The Brown Cable Tramway Hoisting and Conveying Apparatus replaced the steam hoist system which simply lifted hand shovelled ore out of the hold and onto the dockside. In 1906-1907, a 100-foot by 80-foot powerhouse was constructed with separate boiler and engine rooms. The Stirling boilers supplied steam for operating four Hoover-Mason unloaders and power for the electrical unloaders which replaced Brown's machines. During the 1920s, the dock received outside electrical energy and the boilers, generators, engines and smokestack were removed. An office and machine shop now occupy the powerhouse. In 1916 and 1922, two Hulett unloaders with 17-ton bucket capacities replaced the four Hoover-Mason unloaders. The Dock has no storage space and the three Hulett unloaders are the only remaining handling equipment. [Hugh E. Scott, "Ore-Unloading at the New York, Pennsylvania, and Ohio Dock at Cleveland, Ohio," <u>Journal of the Worcester Polytechnic Institute</u> 12 (January 1912): 79-94; J. H. Stratton, "The Development of Ore Unloading on the Great Lakes," <u>Journal of the Cleveland Engineering Society</u> 6 (July 1913): 3-26.]

The Brown Hoisting Machinery Co.

CLEVELAND, OHIO, U. S. A.

Manufacturers of Special Machinery for Hoisting, Conveying, Storing and Handling Material of all kinds, under the well-known "Brownhoist" Patents.

ORE HANDLING MACHINERY for handling ore from vessels, docks and cars. 90% of the iron ore output on the Great Lakes is handled by machinery of our design and construction.

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FURNACE HOIST AND STOCK DISTRIBUTOR for the automatic charging of blast furnaces, doing away with top fillers.

MACHINERY FOR HANDLING STRUCTURAL WORK, MARINE PLATES, etc., in shipbuilding yards.

FLOATING CRANES for ship and navy yards.

CRANES OF ALL KINDS, Electric, Steam and Hand Power.

THREE MOTOR ELECTRIC TRAVELLERS.

ELECTRIC TRANSFER TABLES.

OVERHEAD TRAMRAIL AND TROLLEY EQUIPMENTS, ETC.

CANTILEVER CRANES (Chicago Drainage Canal Design). These Cranes hold the World's Record for such work as to quantity handled and cost of same.

MACHINERY of our design and construction is in use in all the principal lake ports and on the Atlantic and Pacific Coasts, by the leading Railroad and Dock Companies, also in all the principal Ship and Navy Yards, and in the chief Iron and Steel Works in the United States.

Plants of our design are now in operation and being erected in Russia, Austria, Germany and England.

Main Office and Works: Cleveland, Ohio, U. S. A.

EASTERN OFFICE:	PITTSBURG OFFICE:	EUROPEAN OFFICE:
26 Cortland St.,	Carnegie Building,	39 Victoria St.,
NEW YORK CITY.	PITTSBURG, PA.	LONDON, S. W.

Cable Address: "Brownhoist," Cleveland, New York and London

Telegraphic Address of London Office: "Shovelling," London

Codes used: Liebers, A B C, Engineering Telegraph, A1 and Directory

BROWN HOISTING MACHINERY COMPANY
(Reserve Terminals Company)
4301-4311 Hamilton Avenue at East 45th Street

Cleveland North
17.444730.4596370

After successfully designing and installing the first mechanical ore-unloading system ever to distribute ore from the hold of the boat to the railroad cars or storage piles without rehandling, Alexander E. Brown organized a company to manufacture his designs. Brown's Cable Tramway Hoisting and Conveying Apparatus greatly reduced the price and time for handling ore and in 1893 it was estimated that seventy-five percent of the Great Lakes ore was handled by Brown hoisting machinery. Meeting the material-handling needs of an industrializing Cleveland, the Brown Company quickly expanded the scope of its products to include major equipment for the "rapid and economical handling of materials" for boat docks, coal companies, steel plants, railroads, and shipyards. In 1901-1902, replacing buildings destroyed by a fire, Milton J. Dyer, the architect of the Cleveland City Hall, Cleveland United States Coast Guard Station, and the King Bridge Company designed and built the present brick and steel building, 497 feet by 308 beet and 40 feet to 60 feet high. In 1927 the Company merged with the Industrial Works of Bay City and changed its name to the Industrial Brownhoist Corporation. In 1934, Industrial Brownhoist abandoned the Cleveland Works and the building was vacant until 1940 when it was used by the National Bronze and Aluminum Company. In 1949 the Reserve Terminals Company purchased the building which it continues to use as a warehouse. No original equipment remains.
[The Brown Hoisting Machinery Company, Catalogue: 1919, (Cleveland, 1919); William Ganson Rose, Cleveland: The Making of a City, pp. 437-438.]

PENNSYLVANIA RAILWAY ORE DOCK
Whiskey Island

Cleveland South
17.43900.4593800

A rapid succession of refinements in ore-handling machinery followed Alexander E. Brown's 1880 installation of the first ore-handling and conveying machinery on the Cleveland docks of the New York, Pennsylvania, and Ohio Railroad. George M. Hulett's 1898 design of an automatic unloader radically altered ore-handling and established a technological plateau which lasted nearly seventy years. By 1913 the Hulett unloaders reduced the cost of unloading ore from nineteen cents to six cents per ton. Up until 1912 the Pennsylvania Railway received ore shipments on the Old River Bed of Whiskey Island and unloaded ore with several Hoover-Mason unloaders and Brown ore bridges. The difficulty of boats approaching the narrow channel docks and the problem of river congestion led the Railway to design a new dock. The Pennsylvania Railway and Wellman-Seaver-Morgan Company, Cleveland engineers, designed and constructed "the latest and most modern ore dock on the Lakes," on forty acres of reclaimed land on the Lake Erie side of Whiskey

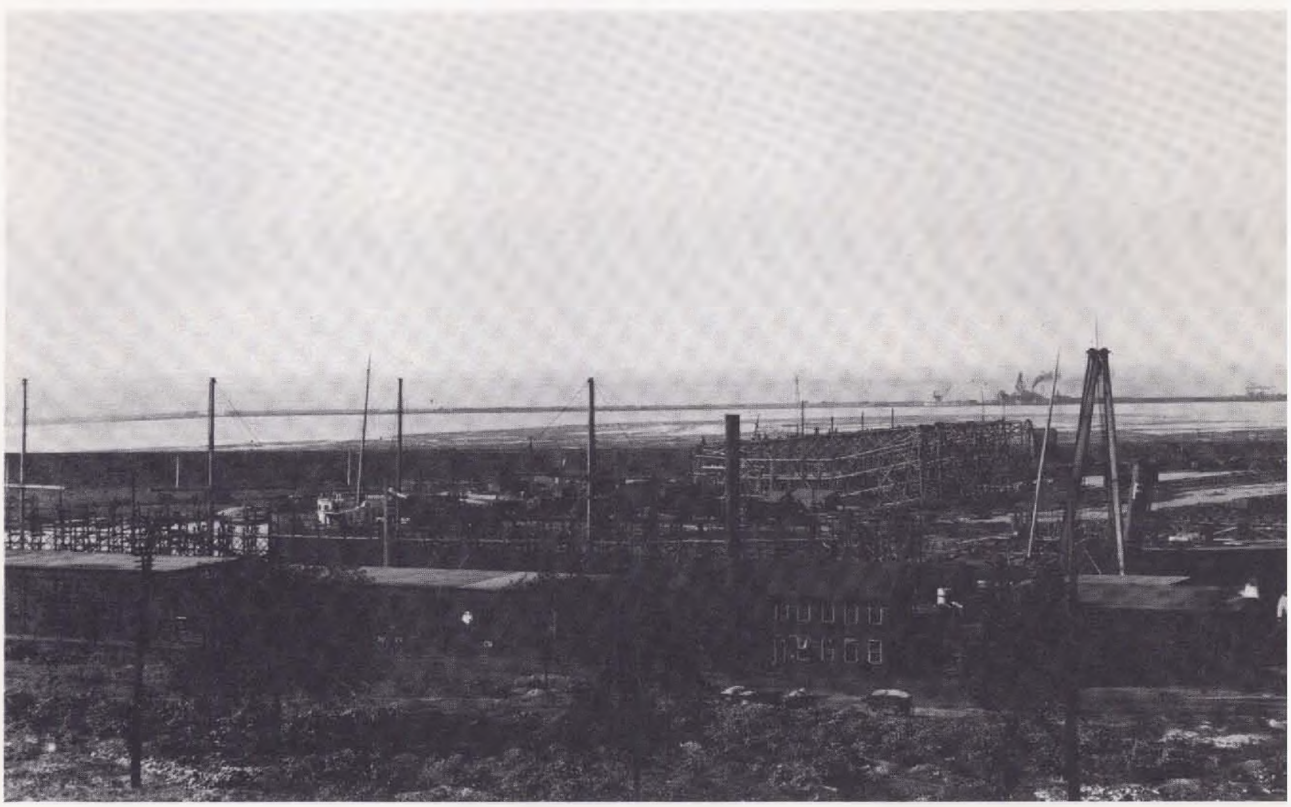
Island. Slag and refuse served as a fill and the dock was built of a double row of 40-foot reinforced concrete piles supporting a concrete superstructure heavily reinforced with 85-pound rails. The face of the dock is 1,000 feet long. The four Hulett unloaders with 17-ton buckets allowed for the nearly continuous digging of ore from the boat. Instead of loading ore into cars or piles, the Hulett bucket drops ore into a hopper in its framework. The bucket returns for another load while a larry car and operator in the machine's framework weighs and transfers ore from the hopper into railcars or a temporary storage pit. A 15-ton ore-handling bridge with a 260-foot main span and a 173-foot cantilever at each end moves ore around the 1,000,000-ton capacity storage yard. The Huletts and the ore bridge are powered by the original Westinghouse electrical machinery. Using all original equipment, the yard operates today much as it did in 1912. The original office, machine shop, with its 25-ton Shaw traveling crane, and powerhouse remain. The use of outside electricity led to the replacement of the original boilers and power equipment in the 1930s. The Hulett unloaders, which are no longer manufactured, will, perhaps, be replaced someday with ore docks equipped to handle self-unloader ore boats.
["A Modern Ore Dock and Unloading Plant," Iron Trade Review 50 (April 18, 1912): 845-850; George E. Edwards, "Unloading Iron Ores in the Lower Lakes," Mining and Engineering World 40 (June 20, 1914): 1156-1159; J. H. Stratton, "The Development of Ore Unloading on the Great Lakes," Journal of the Cleveland Engineering Society 6 (July 1913): 3-26.]

WELLMAN-SEAVER-MORGAN ENGINEERING COMPANY — Cleveland South
(McDowell-Wellman) — 17.447575.4593720
7000 Central Avenue

In 1896, Samuel T. Wellman established an engineering firm which designed heavy industrial materials-handling equipment. Oriented toward the special needs of Cleveland's growing steel industry, the Wellman firm designed machines which were utilized throughout the industrial areas of the United States. The firm featured the Hulett ore unloaders which revolutionized the handling of ore in the early twentieth century. Wellman invented the automatic open-hearth steel process. Wellman also manufactured coalcar dumpers, hoisting machinery, coke-oven machinery and gas producers.

In 1901-1902, to manufacture its equipment designs, the firm designed and built a foundry, machine shop, and office complex on Central Avenue and East 71st Street. Much of the original shop, 50 feet by 150 feet by 33 feet, the boiler-engine house, 53 feet by 157 feet by 29 feet, both the foundry buildings, 110 feet by 300 feet by 45 feet, 64 feet by 80 feet by 36 feet, and the machine shop, 125 feet by 303 feet by 69 feet, all of brick and steel, remain today. Some buildings have additions and the old office building has been demolished.

Named Wellman-Seaver-Morgan Engineering Company in 1902, the present McDowell-Wellman Engineering Company builds its machines by metal-fabricating processes and thus none of the original foundry equipment remains. The only early boiler- or engine-room equipment are two 1917 Ingersol-Rand air compressors. Two Pond Manufacturing and Tool Company lathes, 60 inches and 40 inches, continue operating as does a 1912 Wellman-Seaver-Morgan 18-foot 9-inch vertical boring mill. Twenty-one electric Morgan overhead traveling cranes, with capacities from 5 to 80 tons, built between 1902 and 1910, operate, spanning the machine shop, foundry, and outdoor yard space. [Wellman-Seaver-Morgan Engineering Co., Catalogue: 1922, (Cleveland, 1922).]



Ore Dock of American Steel and Wire Company: Central Furnace Plant; Brown, McMyler and Julett Ore Unloaders; In distance, 1904 and 1906 Scherzer Rolling Lift Bridges; Right, Coal Car Dumper, (c. 1910)

Lower left, American Shipbuilding Company Plant; Right, Ore Dock with Brown Hoisting and Conveying Apparatus in Place; In distance, the Breakwater, (1901)

Corrigan, McKinney and Company Ore Dock, (1910-1916)

Otis Steel Company Ore Dock, (1913-1914); 1919 Ore Handling Bridge Operates Over Self-Unloading Dock

Pennsylvania Railway Ore Dock, (1912)

Iron and Steel Manufacture

After 1860 the iron and steel industry served as the mainstay and primary determining factor in Cleveland's transition from a mercantile to an industrial center. The development of the iron and steel industry relied heavily upon reinvested capital from the prosperous mercantile and small manufacturing concerns surrounding Cleveland's Ohio canal and Lake Erie trade. Sixty-eight percent of all the officers and directors of Cleveland iron and steel companies between 1875 and 1900 came from business and small manufacturing families. Between 1860 and 1880 Ohio maintained second place behind Pennsylvania in pig iron production and assumed second place in output of rolled iron. During this period and through the late nineteenth century, the entire pattern of Ohio iron and steel industry altered. Pennsylvania coal and coke replaced local charcoal for fuel. Ohio ore production declined from 488,750 gross tons in 1880 to 61,016 gross tons in 1900. In 1855 the first ore from the Lake Superior region was mined and available. The successive openings of the Marquette, Menominee, and Mesabi ranges made this area the most important ore-producing region in the United States.

Ninety percent of the Lake Superior ore was transported by boat. Cleveland became one of the major Great Lakes ore ports for the receipt of Lake Superior ore. Increasingly dependent on Lake Superior ore, the Ohio iron and steel industry moved north from its base in the Hanging Rock Region and Hocking Valley to more accessible areas in Cleveland and Youngstown. Railroads between Cleveland and Western Pennsylvania brought coal and coke to Cleveland and carried ore from the ore docks to inland steel producers. Cleveland's easy access to both ore and coal helped to make the city one of the major iron and steel centers of the United States. [William T. Hogan, Economic History of the Iron and Steel Industry in the United States, 5 vols. (Lexington, 1972). pp. 17-23,53,62-63, 195-196; John N. Ingham, "Rags to Riches Revisited: The Effect of City Size and and Related Factors on the Recruitment of Business Leaders," Journal of American History 63 (December 1976): 617-637; Charles Langdon White, "Location Factors in the Iron and Steel Industry of Cleveland, Ohio," Denison University Bulletin: Journal of the Scientific Laboratories 29 (April 1929): 81-96.]

AMERICAN STEEL AND WIRE COMPANY: CENTRAL FURNACE PLANT
2650 Broadway Avenue — Cleveland South
17.443480.4592720

Purchasing the land for the Central Furnace in 1881, the Cleveland Rolling Mill Company constructed a blast furnace plant to supply its Newburgh steelworks with iron. In an 1899 consolidation of the American Steel and Wire Company of Illinois and several independent companies, the plant came under the control of the American Steel and Wire Company of New Jersey, which in turn served as the

Cleveland cornerstone in the 1901 formation of the United States Steel Corporation. None of the site's three blast furnaces built prior to 1901 remain today. Blown in July 1911, Furnace D was reported by Iron Age magazine as "one of the most modern and at the same time most completely equipped with safety appliances," of its day. Intact but idle today, Furnace D represents one of the early experiments in thin-lined furnace construction. The furnace, 95 feet high and 23 feet in diameter, was built with a one-inch rolled steel shell. The Furnace D designers solved the problem of leakage through the rivet holes by connecting the water-cooling troughs to the shell by drilling and tapping holes so that the troughs could be fastened by means of cap screws instead of drilling through the shell. The designers also paid close attention to safety features by providing three paths against material falling from the skip hoists, and constructing bridges over the plant's railway tracks. The furnace hearth has been enlarged from 16 inches to 22.5 inches, and the original blowing engines have been replaced.

In 1908 Wellman-Seaver-Morgan Company designed and installed a modern ore dock consisting of two remaining Hulett automatic ore unloaders, with 10-ton capacity buckets and a 10- ton capacity ore-handling bridge. Unloading ore for storage or direct shipment to the Newburgh blast furnace at the rate of 250 tons per hour, the Huletts made the Brownhoist and McMyler ore unloaders' capacities seem "scarcely worthwhile" and these older machines were eventually dismantled. The use of tractor scrapers to distribute ore in the yard replaced the 10-ton ore-handling bridge which no longer remains. Early remaining structures with no original equipment are the blowing-engine house, 1901; scale house, 1908; main office, 1921; boilerhouse, 1927; pumphouse, 1927. In 1936 the Newburgh steelworks closed and left Central Furnaces with no local U.S. Steel operation to utilize its blast furnace products. Today the iron is either cast into pigs or is shipped hot to a local ingot-making foundry. ["The Latest Thin-Lined Blast Furnace," Iron Age 89 (1 February 1912): 287-292; William R. Prendry, History of the Cleveland District of the American Steel & Wire Co., (Cleveland, 1936), pp. 50-55; Walter G. Stephan, "A 1908 Iron Ore Handling Plant: The New Hulett Machines at Central Furnaces, Cleveland, Ohio," Iron Age 82 (8 October 1908): 985-987.]

AMERICAN STEEL AND WIRE COMPANY: CUYAHOGA WORKS
4300 East 49th Street Cuyahoga Heights — Cleveland South
Cuyahoga Heights — 17.444700.4587975

In 1907, needing land to expand its Cleveland wire mill operations, the American Steel and Wire Company, a division of the U.S. Steel Corporation, purchased a 70-acre site south of Harvard Avenue in Cuyahoga Heights. The wire mill, put into operation in 1908, consisted of ninety-six 22-inch blocks. The plant also operated a bale tie department and strip mill. By the 1920s the Cuyahoga works was one

of the largest wire mills in the United States. Started in 1909, the cold rolling department was the largest in the world by the 1920s. Several of the original plant buildings remain. The 1,450-foot brick and steel frame hot-strip mill building contains the oldest remaining machinery, a 1927 fifteen-stand Morgan hot strip mill. The plant's operation today consists of rod and wire manufacture as well as cold rolling and tie manufacture.
[Alburn, This Cleveland, 1: 557-558; Prendy, American Steel and Wire, pp. 68-72.]

CORRIGAN, MCKINNEY AND COMPANY
(Republic Steel Corporation)
3100 East 45th Street

Cleveland South
17.444400.4591325

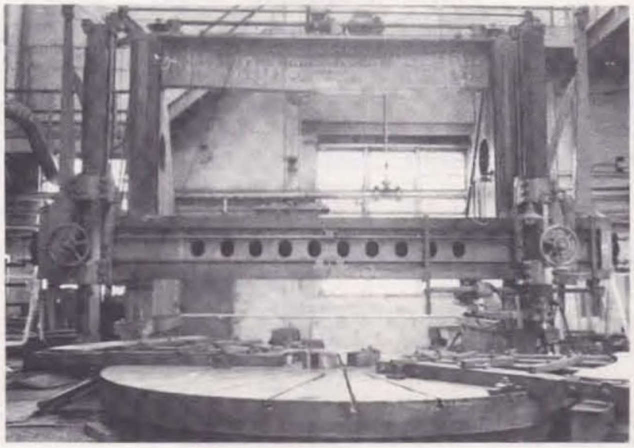
In 1910-1912 the Corrigan, McKinney and Company, iron and ore merchants, built a blast furnace plant with two stacks along the Cuyahoga River to produce merchant pig iron under the name of the River Furnace Company. From this start the Corrigan, McKinney and Company and its 1935 successor, the Republic Steel Corporation, expanded its operations to include an integrated steel-making plant. It is today among the largest basic steel-making plants in Ohio, covering 798 acres of the Cuyahoga River Valley. From 1913 to 1916, Corrigan, McKinney and Company built a seventeen-building steel plant as well as two additional blast furnaces and a coke plant. H. T. Harrison, of Corrigan, McKinney and Company, and the Engineering Department designed the entire facility.

The original plant contained a 40-inch reversing blooming mill, a 21-inch four-stand, and an 18-inch six-stand, continuous sheet bar and billet mill, all of which have been replaced. The brick, steel, and concrete blooming-mill building, 95 feet by 700 feet, remains. The Mesta twin-tandem compound single-lever-control-reversing-engine, with two cylinders of 47-inch bore and two cylinders of 76-inch bore, a 60-inch stroke, a rated capacity of 35,000 horsepower, drove the original 40-inch reversing blooming mill. The Mesta was a duplicate of an earlier engine installed at the Youngstown Sheet and Tube Company and is the only one of three ever built that is still in operation.

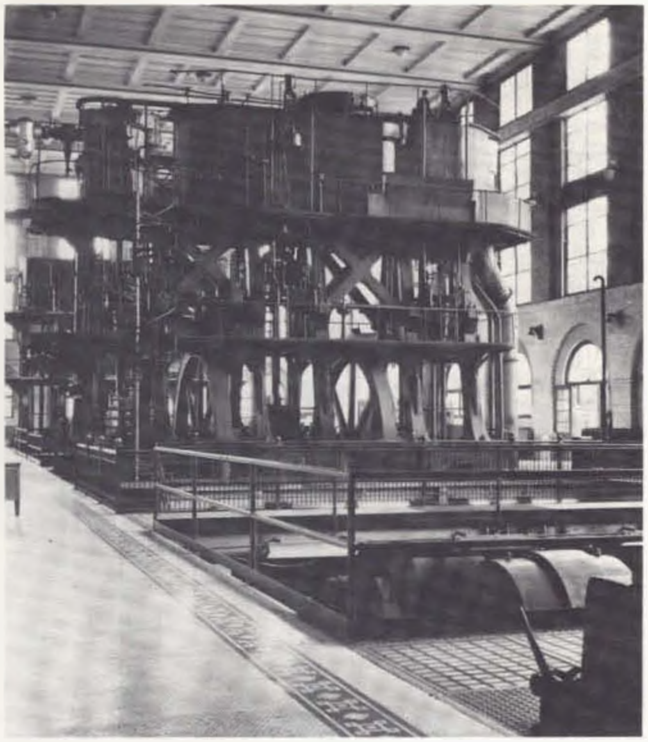
The 1916 coke plant included 204 Kopper ovens with 12.5-ton capacities. The coke plant's four oven batteries have been entirely replaced and the only remaining equipment is a Brownhoist coal handling bridge with a 200-foot span. All twelve original open-hearth furnaces have been replaced; the plant presently operates primarily basic oxygen furnaces. When completed in 1916 the blast furnace plant included four blast furnaces, all of which have been entirely replaced. The blast furnace ore dock still operates three original Hulett automatic unloaders (1910-1911) with 10-ton bucket capacities and one of the two 1916 Brownhoist Ore Bridges with a 375-foot span and a 10-ton capacity bucket. The brick, steel frame, and reinforced

Belt-Driven Machine Tools, (c. 1920) at Ferry Cap and Set Screw Company

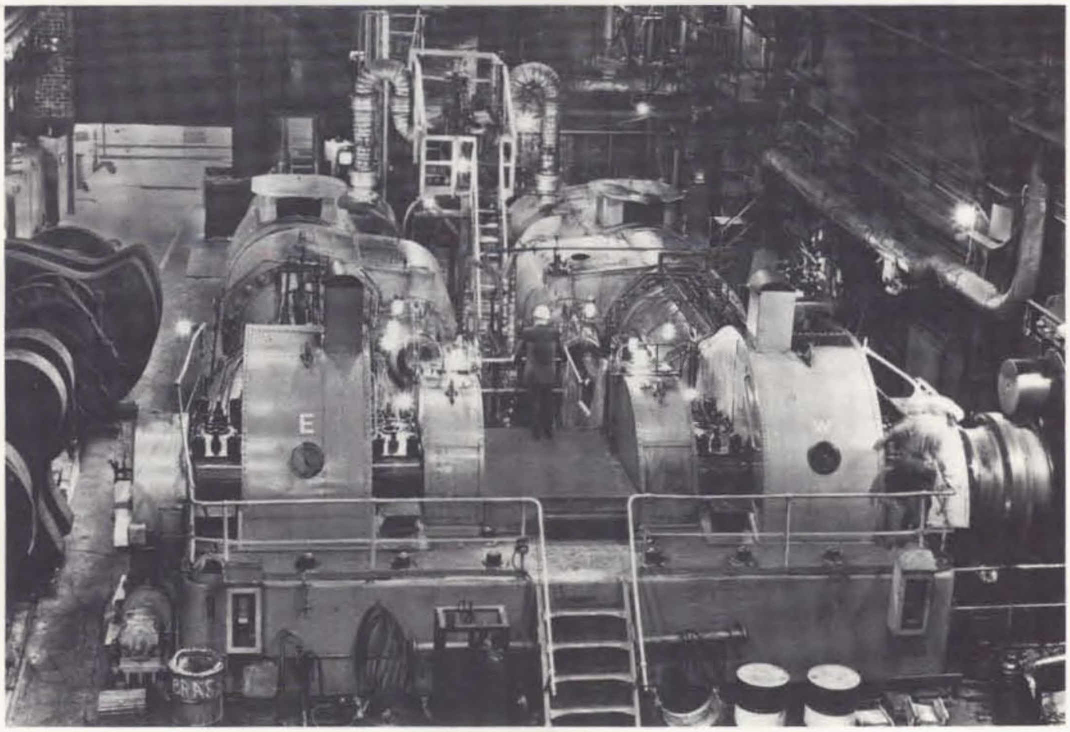
Wellman-Seaver-Morgan Engineering Company 18-foot nine-inch Vertical Boring Mill, (1912)



Division Avenue Pumping Station, (1918), Two Vertical Triple Expansion Steam Engines Prior to Demolition



Mesta Twin-Tandum Reversing Engine, (1913-1916) at Corrigan, McKinney and Company



concrete powerhouse, 76 feet by 408 feet by 127 feet, supplied power for practically the entire original plant. The original 832-hp Stirling Boilers with Green automatic condensing chain grate stokers and three 3,000-hp Mesta horizontal cross compound noncondensing engines. Many of the plant's original buildings, as well as the mill buildings added in 1926-1928 remain intact. With the exception of a 1927 Morgan 10-inch Billet mill, no old mill equipment remains. There are several overhead traveling cranes installed from 1916 to 1927 in buildings with capacities from 15 to 30 tons. The four-story brick and reinforced concrete office building, 261 feet by 60 feet, was designed in 1924 by architects Walker and Weeks. The plant's machine shop contains several lathes, grinders, presses, shears, bolt cutters, and hammers dating between 1916 and 1927. After 1937 the plant expanded and moved into adjacent land to the southwest along the river and included additional coke ovens, blast furnaces, ore-handling and mill plants.
["The Corrigan, McKinney New Steel Plant," Iron Age 100 (15 November 1917): 1180-1186; Republic Steel Corp., Cleveland District Plants, (Cleveland, 1937).]

OTIS STEEL COMPANY
(Jones and Laughlin)
3341 Jennings Road

Cleveland South
17.442180.4590060

In 1873 Charles Otis obtained a license to use the Siemens open-hearth process in the United States. While several steel plants had experimented with the open-hearth process, Otis's plant was the first to produce steel exclusively through this method. In 1912, lacking the necessary space for expansion of its Lakeside Plant, the Otis Steel Company purchased a 330-acre site along the Cuyahoga River adjoining the blast furnace and coke plant operations of the Cleveland Furnace Company. In 1913-1914 the American Bridge Company designed and built the original brick and steel furnace-mill-annealing-shear-building, 765 feet by 420 feet, as well as eight other buildings, including a stock house, machine shop, smith shop, millwright office, turbine house, pumphouse, and powerhouse. In 1923, meeting the demands of a growing automotive industry, Otis built eight mills for rolling auto body and full finished sheets. The new mills occupied a 1320-foot by 200-foot row of connecting steel and brick buildings. The purchase of the Cleveland Furnace Company made the Otis Riverside plant a completely integrated steelworks.

In 1942 Jones and Laughlin Steel Corporation purchased the Otis Steel Company and initiated a vast expansion and modernization program. Most of the site's early structures remain but are now used primarily for storage and maintenance shops. Furnaces and mills date from the 1950s and 1960s; none of the early steel production equipment or engines remain. A 1917 5-ton Alliance Traveling Crane remains in use in the original mill building. The only blast furnace or ore-handling equipment which remains after the ore dock started receiving shipments from self-loader boats is the 1919 Hoover and Mason ore-handling bridge with a 305-foot 4-inch span. In 1960 the coke plant was dismantled and the plant now receives coke from the Jones and Laughlin Pennsylvania coke facilities. [Alburn, This Cleveland, 1: 548-552; Otis Steel Company, The Otis Steel Company: Cleveland, Ohio, (Cleveland, 1939).]

EBERHARD MANUFACTURING COMPANY
(Midwest Wire Company)
2800 Tennyson Avenue

Cleveland South
17.447640.4592440

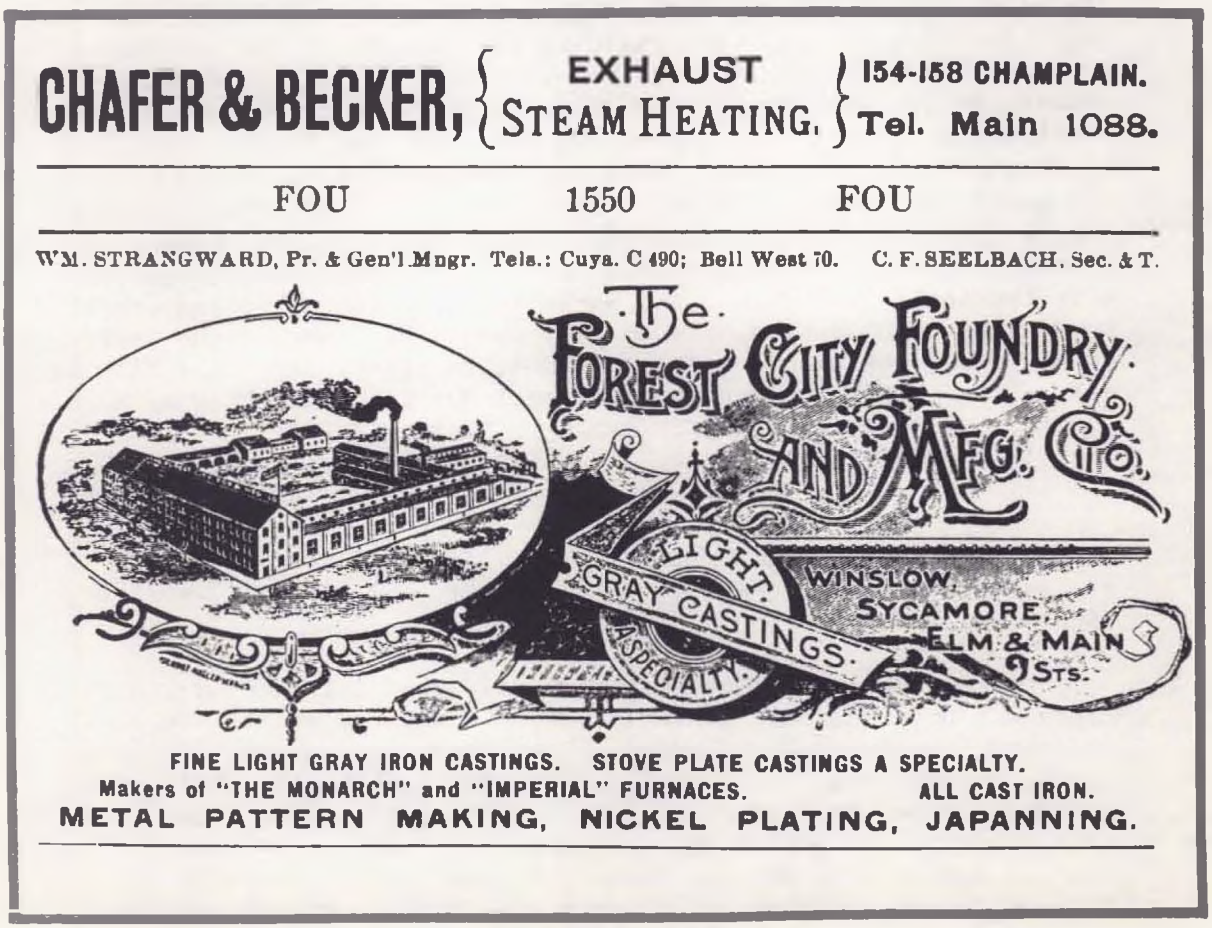
In 1881 on a thirteen-acre Tennyson Avenue site, the Eberhard Manufacturing Company started manufacturing a wide variety of carriage, wagon, and saddlery hardware. By 1890 the plant was the largest malleable-casting vehicle hardware plant in the United States. With the growth of the motor vehicle industry, Eberhard began manufacturing bus and truck hardware and, for a time, malleable-casting spoke wheels for trucks, buses, and passenger cars. In 1959, having ceased its foundry and molding operation, Eberhard leased part of its plant to the Midwest Wire Company. Midwest occupies the entire plant in 1974. The oldest remaining building is the boiler-engine house (1885) which has no original equipment. The two connecting molding buildings, 620 feet by 70 feet, 380 feet by 70 feet, were constructed in the early 1890s. In 1897 Knox and Eliot, architects of Cleveland's Rockefeller Building, designed the three-story brick and steel warehouse, 60 feet by 170 feet and in 1898 they designed the two-story office building, 55 feet by 90 feet. The one-story foundry building, 70 feet by 200 feet on East 90th Street was constructed in 1901. Most of the annealing, rolling mill, and stock complex was constructed between 1895 and 1910. None of the early foundry, milling or annealing equipment remains today. The Midwest Wire Company operates one Morgan-Conner Multiple Wire Drawing Machine constructed in 1927.
[The Industries of Cleveland, (Cleveland, 1888), p. 85.]

WALWORTH RUN FOUNDRY COMPANY
(Forest City Foundry Company)
2500 West 27th Street

Cleveland South
17.441450.4591810

During the late nineteenth and early twentieth century, heavily dependent upon and only slightly behind Cleveland's iron and steel industry, the foundry and machine shop industry represented Cleveland's second largest industry. In 1888 the Walworth Run Foundry Company started operations on West 27th Street, making light gray iron castings for registers, furnaces, and stoves. In 1928 the company merged with another Cleveland foundry, the Forest City Foundry Company. Today the foundry continues to operate on the same site, one of the oldest Cleveland foundries, and one of the

few remaining jobbing iron foundries. A remaining brick and steel portion of the foundry was built in 1897. In 1907-1908 the Kaufman Arch Company designed the four-story brick and reinforced concrete machine shop, 170 feet by 56 feet, along West 27th Street. The Foundry's two cupola furnaces date from the 1940s and no early machine tool or boiler equipment remains.
[Cleveland: Some Features of the Commerce of the City, (Cleveland, 1917), p. 46,55.]



VAN DORN IRON WORKS COMPANY
2685-2751 East 79th Street

Cleveland South
17.447180.4592620

During the late nineteenth and early twentieth centuries, the manufacture of iron and steel products was Cleveland's second largest industry in terms of dollar value and manpower employed. In 1878, seeking a closer supply of raw materials and a more favorable market, James H. Van Dorn moved his six-year old ornamental wrought iron fence business from Akron to Cleveland. In 1878 Van Dorn started manufacturing jail cells, known as "fences built indoors," and soon the company became the largest jail manufacturer in the world. The Van Dorn Iron Works Company manufactured a diverse line of iron products which over the next fifty years included structural ironwork, iron lawn benches, weathervanes, electric streetcar parts and vestibules, bicycle parts, metal office furniture, Warner and Swasey telescope domes, truck frames and bodies, fenders and cabs, railroad equipment, mailboxes, and automotive parts. In the 1940s Van Dorn dropped most of its previous iron manufacture and began its present manufacturing of a diverse line of containers and plastic-injection molding machines. While none of the early ironworks machinery remains, manufacture continues in the old ironworks buildings. The one-story brick and iron machine shop with monitor windows, 210 feet by 80 feet, constructed in the early 1890s, and the three-story brick and iron office building, 32 feet by 66 feet, designed by Van Dorn in 1894, the steel structural shop, 290 feet by 120 feet, constructed in 1899 remain intact. In 1918 William Dunbar designed and built the brick and steel frame assembling shop, 120 feet by 85 feet, and a building, 120 feet by 120 feet, along Grand Avenue. In 1919-1920 Van Dorn again built along Grand Avenue, this time a three-story brick and reinforced concrete building designed by Ernest McGeorge and measuring 265 feet by 44 feet by 121 feet.
[Alburn, This Cleveland, 2: 786; Van Dorn Company, One Hundred Years at Van Dorn, (Cleveland, 1972).]

The Van Dorn Iron Works Co.
CLEVELAND, OHIO

General Iron Workers

SPECIALTIES:

PRISON CONSTRUCTION

CELL WORK   LOCKING DEVICES   TOOL PROOF STEEL
WINDOW GUARDS, ETC.

METAL FURNITURE

FILE CASES   DESK AND OFFICE FURNITURE   LOCKERS
SHOP SHELVING AND SHOP EQUIPMENT

Ornamental Iron and Bronze
Structural Steel

THE GENERAL GARTAGE AND STORAGE CO. PARCEL and BAGGAGE DELIVERY. 141-147 SENECA ST. Both Phones.

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CLEVELAND TWIST DRILL CO.

MANUFACTURERS OF

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Reamers, Stay Bolt Taps, Cutters and Machinists' Tools.

COR. LAKE AND KIRTLAND STS. Tels.: Cuya. Branch Exch. M 1005; Bell Main 638.

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CLEVELAND TWIST DRILL CO. (J. D. Cox, Jr., and Francis F. Prentiss.) Lake, sw. cor. Kirtland

CLEVELAND TYPE FOUNDRY., M. M. Daniels Mngr. 255 to 259 St. Clair. Tels. Cuya. C 1172; Bell Main 814

— Typesetting Co., William D. Gray, mngr. 239 St. Clair

CLEVELAND WILLIAM H., Master Plumber, Gas Fitter, Steam and Hot Water Heating. 545 and 547 Central av.; Tels. Cuya. R 1267; Bell North 389 F, r. 153 Arlington; Tel. East 1220 L

— William R. artist *Cleveland Leader*, r. 153 Arlington

CLEVELAND TWIST DRILL COMPANY
1242 East 49th Street

Cleveland North
17.444830.4596640

By designing and building the machines necessary to manufacture twist drills in the 1870s, Jacob D. Cox, C. C. Newton, and F. F. Prentis pioneered the Cleveland manufacture of machine tools. Organized in 1876, the Cleveland Twist Drill Company is today the world's largest manufacturer of twist drills. The Company moved to its present location in 1888 and occupied buildings No. 1 and No. 2, which were replaced in 1937 with a five-story brick and reinforced concrete building designed by George S. Rider Company. Of the Company's twenty buildings, the oldest remaining are No. 4 (1899) and Nos. 5, 6, and 7 (1906). These were built of masonry, steel, and brick, and had wooden floors. Buildings No. 9 (1918), No. 10 (1918), and No. 16 (1907) are of brick and reinforced concrete.

Innovation in the manufacture of twist drills has come largely in the composition of the metals and in the annealing or hardening process. Cleveland Twist Drill Company still operates many milling

and grinding machines from the early 1900s. Designed by both outside companies and Cleveland Twist Drill engineers (CTD), these machines remain intact except for the conversion from belt-drive to individual electrical engines for each unit. The early equipment includes: J. D. Cox Jr. Flat Bed Milling Machine, c. 1900; No. 3 Brown and Sharpe Internal Grinder, 1905; CTD Speed Lathe Point Machine, 1905; Whitney Hand Milling Machine, 1905; New Milling Machine, 1905; CTD No. 2 Duplex Milling Machine, 1905; CTD No. 1 Milling Machine, 1905; Whitney Hand Milling Machine, 1905; Cox and Prentis Company Milling Machine, 1905; CTD Hand Straightening Press, 1906; CTD .5 Milling Machine (flutes and wheel clear at the same time, a major innovation), 1909; No. 0 Brown and Sharpe Milling Machine, 1910; CTD Bench Grinder, 1913; Chicago Speed Lathe Reamer, 1916; CTD Straightening Machine, 1917; CTD Duplex Milling Machine, 1918; No. 2 Brown and Sharpe Milling Machine, 1919; Leland Gifford Multiple Drill Press, 1919; Leland Gifford Five-Spindle Drill Press, 1920; No. 1 Brown and Sharpe Milling Machine, 1920; Kearney and Trecker Milling Machine, 1920. The Company's rod-drawing, cutting and stock-finishing work is relocated in the Cleveland Twist Drill Company's Kentucky works.
[Alburn, This Cleveland, 2: 782; Jacob D. Cox, Sr., Building an American Industry: The Story of the Cleveland Twist Drill Company, (Cleveland, 1951); Rose, Cleveland, pp. 408-409, 935.]

FERRY CAP AND SET SCREW COMPANY — Cleveland South
2151 Scranton Avenue — 17.442040.4592600

Taking advantage of the raw material supplied by Cleveland's iron and steel industry and serving local manufacturers and western markets, Cleveland's bolt and nut industry established the city as a major bolt and nut center during the nineteenth century. A large number of bolt and nut manufacturers operated in factories in the Cuyahoga River Flats and especially in the area bounded by Carter and Scranton Avenues. The Ferry Cap and Set Screw Company is the only bolt and nut manufacturer remaining in this area. In 1907 Thomas Ferry built a two-story brick building, 40 feet by 150 feet, on Scranton Avenue. In 1909 a third story was added. Ferry, who manufactured specialty screws and fasteners, had built across the street from one of Cleveland's largest bolt and nut factories, Lamson and Sessions. I. P. Lamson served as the first president of Ferry Cap and Set Screw Company. The original two-story building now serves as the center of a greatly expanded plant. In 1914-1915 a three-story building, 176 feet by 40 feet, of brick mill construction was added. In 1919 two three-story brick, wood beam, and steel additions, designed by Ernest McGeorge, were added.

Still manufacturing a specialty line of fasteners, Ferry today uses several machines which predate 1930. Some of the equipment lines are belt-driven from a central power source. Equipment installed between 1907 and 1930 and still in use includes eight Detroit Machine

and Tool Company five-spindle drill presses, seven Chas. G. Allen Company multiple-spindle drill presses, six Chas. G. Allen single-spindle drill presses, five Cook Company shaver and slotter machines, five economy shavers, three 3/8-inch Spider feed machines, two 1/2-inch drum hopper machines, two American Gas Company rotary carburizer furnaces, two A. P. Schraner Company spotters, two Garvin tappers, a No. 1 Bristol miller, a 3/4-inch chain drive trimmer, a single-spindle tapper, and a 1923 Waterburry-Farrel Company horizontal screw-thread rolling machine.
[Cleveland: Some Features of the Commerce of the City, (Cleveland, 1917), p. 46.]

UPSON NUT COMPANY (Federal Steel and Wire Company) — Cleveland South 17.441850.4593160

Upson Nut Company was a major bolt and nut manufacturing center during the late nineteenth century. In 1893 Cleveland's production of bolts and nuts surpassed all other American cities. In 1905 the Upson Nut Company was America's leading manufacturer of bolts and nuts. Upson originated as the Cleveland Nut Company, a partnership established in 1872 between the Union Nut Company of Unionville, Connecticut, the Aetna Nut Company of Southington, Connecticut, and the Lamson and Sessions Company of Cleveland. In 1883 the company name changed to the Upson Nut Company. Manufacturing a wide variety of cold and hot pressed and forged nuts, bolts, and washers for carriages, machines, plows, tires, stoves, cutlery, and carriage hardware, the company continued operating on its Scranton Avenue site and in an adjoining plant purchased from the Lamson and Sessions Company. In 1910, absorbing the operations of some Scranton Avenue-Carter Avenue neighbors, Upson operated a completely integrated steel-works. The Cleveland Iron Company operated a pig iron and blast furnace operation on Carter Road which started in 1870. The facility became the River Furnace plant of Pickands-Mather and Company, and in 1910 was owned and used as the ore-handling and blast furnace section of the Upson Nut Company.

In 1909 Upson purchased the site of the Maher and Brayton Company, a car wheel foundry which had operated on Carter Road since 1880. In 1910 Upson constructed the 1,200-foot by 135-foot connecting line of steel frame and brick buildings housing five open-hearth furnaces, a bar mill, and a blooming mill. This building's steel production was supplied with iron from the recently acquired riverside ore-handling and blast furnace facility. The steel was in turn used in the manufacture of Upson nuts and bolts. In 1912-1913 Anton Burchard designed the six-story brick and reinforced concrete office building, 105 feet two-inches by 106 feet ten-inches and the one-story brick and steel forge shop, 630 feet by 174 feet. In 1920 the Bourne-Fuller Co. purchased the Upson Nut Company and the Union Rolling Mills Company. Between 1924 and 1929 Bourne-Fuller Company added seven four- and five-story buildings designed by H. K. Ferguson Company on line with

the 1913 forge shop. In 1930 the Republic Steel Company purchased the Bourne-Fuller Company. After 1935, when Republic's Cleveland properties included the McKinney Steel Company, the Upson plant served as the Republic Bolt and Nut Division. The blast furnace, ore docks, and open-hearth plant were dismantled. In 1973 Federal Steel and Wire Company purchased the Bolt and Nut Division and sold all of the bolt and nut manufacturing equipment. Most of the buildings are vacant. A 1910 Morgan 11-inch bar mill and several Morgan Company and Alliance Company overhead traveling cranes dating from 1910 to 1913 with 5-15 ton capacities remain.
[Civil Engineers' Club of Cleveland, Visitors' Directory to the Engineering Works and Industries of Cleveland, Ohio (Cleveland, 1893), pp. 39, 65-66; W.R. Wilbur, History of the Bolt and Nut Industry of America, (Cleveland, 1905), pp. 172-177.

Peerless Motor Car Company,
(1906)

Fisher Body Company, (1920)

American Steel and Wire Company:
Central Furnace Plant, (1911)

National Carbon Company, (1893)

Corrigan, McKinney and Company,
(1910-1916)

Cranking is Obnoxious

You know it. So does every other car owner. And it ought to be eliminated. Yet every car on the market *must* be cranked, *except just one.*

That *one* is the

Self-Cranking,
Sweet-Running,
Six-Cylinder

In the Winton Six air pressure cranks the motor. And it is a wonderful convenience.

The Winton Six is an ideal car in other respects also. Let us show you. The $3000 1911 Winton Six is now at our salesroom. Call and see it, or telephone North 969 for a demonstration.

Catalog on request

THE WINTON MOTOR CAR. CO.
HURON ROAD AND EUCLID AVE.
Cleveland, Ohio

Automobile Manufacture

A variety of technological, industrial and financial circumstances contributed to Cleveland's rapid development as one of America's early automobile manufacturing centers. Until 1908 Cleveland led all other cities in automobile production. Eventually bested by Detroit, Cleveland continued as the second American automobile manufacturing city, a position maintained until the Depression ended all automobile production in 1932. Cleveland has always been a major supplier of automobile parts. Automobile assembly manufacture shared techniques for standardized, interchangeable parts with major Cleveland manufacturers of sewing machines, bicycles, and wagons. Cleveland's iron and steel industry provided the technical skill, capacity, and materials necessary for the development of automobile manufacture. Avoiding heavy capital investments, numerous Cleveland automobile manufacturers simply designed and assembled their vehicles. They relied heavily on the already established machine shops, foundries, carriage makers, and rubber manufacturers to produce all of the assembly components.

The 1880s and 1890s' development of American bicycle manufacture, of which Cleveland was an important center, contributed much to the automobile industry: steel-tube framing, the chain drive, ball and roller bearings, differential gearing, and pneumatic tires. The entry into the Cleveland automobile industry of the Whites, who manufactured sewing machines and bicycles, and of Peerless, Winton, and Lozier, who manufactured bicycles, suggests that Cleveland drew strongly on its nineteenth-century tradition of machine techniques, ironworking, and parts manufacture to help establish its automobile industry. The growing demand for automobiles and efforts to effect economies of scale led to the concentration of automobile production; by 1923, ten producers were responsible for ninety percent of the automobile production. The concentration of production and expansion of single plants required much larger investments than were required for early entry into the industry. Conservative Cleveland bankers helped further Detroit's domination of the industry. [John B. Rae, The American Automobile: A Brief History, (Chicago, 1965), pp. 6,30; Lawrence H. Seltzer, A Financial History of the American Automobile Industry (Boston, 1928), pp. 19-29, 56; Richard Wagner, Golden Wheels: The Story of the Automobiles Made in Cleveland and Northeastern Ohio, (Cleveland, 1975).]

WINTON MOTOR CARRIAGE COMPANY — Lakewood
10406-10910 Berea Road — 17.436460.4591880

In designing and marketing a single-cylinder, internal-combustion vehicle in 1898 on a production basis, Cleveland's Alexander Winton was among the first American automobile manufacturers of productive importance. Through its advertising and production work (including Winton's drive from Cleveland to New York in July 1897), Winton's company guided and stimulated the early growth of the automobile industry. In 1903 Winton left his old bicycle manufacturing plant on East 45th Street and moved into a new plant on Berea Road and Madison Avenue. Ten of the site's original twelve buildings remain intact. Richardson and Thomas designed the one-story 1903 buildings of brick and wood beam construction, 100 feet by 230 feet, 110 feet by 237 feet, 100 feet by 800 feet and 166 feet by 200 feet. In 1910 the plant expanded: J. W. Chrisford designed a one-story brick foundry building, 80 feet by 150 feet; Richardson and Watts designed a one-story brick building, 700 feet by 25 feet; and S. W. Watterson designed the three-story brick, wood beam and steel assembly building, 70 feet by 308 feet. All were built on Madison Avenue.

Winton manufactured successively one-, two-, four-, and six-cylinder cars. In 1920 Winton output reached 2,500 cars annually. Winton's failure to leave the saturated expensive-model car market and to enter the growing medium-priced market led to the Company's financial failure in 1924. Winton continued his other business, the Winton Engine Company. The Company manufactured diesel engines for marine, railway, and airplane use. Winton had pioneered American diesel production in 1913. In 1924 the Berea Road plant was sold. It has since been used for storage and manufacture. Neither the Winton production equipment nor the boilers remain.
[Alburn, This Cleveland, 2:686, 730; J.C. Hildreth, "Automotive," in Cleveland Engineering Society, The Golden Anniversary Book of the Cleveland Engineering Society, (Cleveland, 1933), pp. 9-14; Wagner, Golden Wheels, pp. 3-11.]

WHITE MOTOR COMPANY — Cleveland North
842 West 79th Street — 17.447100.4597975

In 1901 Rollin H. White, of Cleveland's White Sewing Machine Company, designed and marketed the Stanhope, a steam-powered car. Instead of using the conventional tubular boiler, White invented a flash generator, a helical coil of seamless tubing. The water entered the top of the coil and was converted into steam before it reached the bottom. In 1906 White's annual production of 1,500 cars represented a volume twice that of any other large touring-car manufacturer in the world. In 1906 White Motor Company moved out of the one-story brick and steel building, 88 feet by 216 feet, designed by George H. Smith. The 1906-1909 buildings serve as the nucleus of a greatly expanded plant which now covers 214,157 square meters. White discontinued steam car production in 1908 and manufactured a gasoline car in 1909 and a gasoline truck in 1910. Shifting its production from cars and taxicabs, White assumed a pioneer position in the manufacture of trucks and buses. For many years during the first quarter of the twentieth century White Motor Company was

Cleveland's largest industrial manufacturer. Today the Company builds custom truck fleets. Although most of the original equipment has been replaced, many older machine tools used in the production of truck axles, frames and gear equipment have been retained. [Alburn, This Cleveland, 2: 697; 730; J.C. Hildreth, "Automotive," p. 11.]

White Motor Trucks

Are owned by the leading manufacturing and mercantile firms throughout the United States.

There are more White trucks operated by motor truck owners in Cleveland than all other makes combined.

This is rather conclusive evidence of the merit of White trucks.

White trucks are selected on account of strength and simplicity of construction, ease and economy of operation, and reliability and long life in service.

White owners are more than satisfied they are enthusiastic.

The White Company

St. Clair Ave. and East 79th St.

Manufacturers of gasoline motor cars, trucks and taxicabs

PEERLESS MOTOR CAR COMPANY
(C. Schmidt and Sons, Incorporated)
Quincy Avenue and East 93rd Street

Shaker Heights
17.448150.4593410

During the early twentieth century the Peerless Motor Car Company manufactured one of the most expensive cars produced in America; the prices ranged from $2,800 to $11,000. The Peerless Company started in Cincinnati as a washing-machine wringer manufacturer and later as a bicycle manufacturer. Peerless' entry into the automobile industry came with the manufacture of transmissions and other parts for the De Dion-Burton, a French automobile produced in Brooklyn, New York. In 1900 Peerless adopted the De Dion patent to build its own automobiles and in 1902 the Company started producing expensive cars of its own design. In 1906 the Company moved to East 93rd Street and Quincy Avenue and started to build its No. 1 and No. 2 plants. By 1917 the plants covered approximately twenty acres, including numerous one-, two-, and three-story shops and an outdoor test track which encircled plant No. 2. As reflected by the plant size, Peerless manufactured, on this site, all of its own automobile parts except wheels and rubber tires. The Art Deco administration building was designed in 1906 by J. Milton Dyer, architect of the Cleveland City Hall. John McGeorge, a Cleveland engineer, designed the plant layout and several of the industrial buildings. McGeorge's son, Ernest, was the designer of several other Cleveland automobile plants in the 1910s and 1920s. Since 1931 when Peerless ended automobile production, the plant has been used as a brewery by the Brewing Corporation of America, Carling Brewing Company, and presently by C. Schmidt and Sons. [Historic American Buildings Survey and Western Reserve Historical Society, <u>The Architecture of Cleveland: Twelve Buildings, 1836-1912</u>, (Cleveland, 1973), pp. 80-87.]

CHANDLER MOTOR CAR COMPANY
(Weatherhead Company)
300 East 131st Street

East Cleveland
17.450520.4599680

From 1913 to 1928 the Chandler Motor Car Company occupied a central position in Cleveland automobile manufacture. In 1913, F. C. Chandler and several other former executives of the Detroit-based Lozier Motor Company established the Chandler company to manufacture a moderately priced, six-cylinder automobile. A prototype of the Chandler received high acclaim at the 1913 Chicago show, establishing $1,785 as a "new low" in the price of a six-cylinder car. Production began July 1, 1913 in the 450-foot by 120-foot, brick and reinforced concrete, one-story building built by Chandler on East 131st Street. The Chandler car met with great success and in 1915 the plant expanded. Ernest McGeorge designed the two-story, brick office building, 120 feet by 40 feet, the boiler house, 42 feet by 46 feet, the one-story brick, steel, and concrete machine shop, 120 feet by 403 feet and a one-story steel and concrete storage house, 121 feet by 243 feet. Producing 15,000 cars in 1916, Chandler

represented Cleveland's largest automobile manufacturer. In 1916-1917 McGeorge designed the four-story brick and reinforced concrete assembly building 502 feet 8 inches by 62 feet 6 inches. In 1919-1920, with plans to expand production by eighty percent, Chandler constructed the five-story brick office building, 42 feet by 94 feet, a four-story assembly building extension, 442 feet by 62 feet 6 inches, and the four-story brick and reinforced concrete building, 402 feet by 82 feet, across from the main plant; Ernest McGeorge designed all of the additions. During the 1920s with competition from Chevrolet and other medium-priced car manufacturers, Chandler production declined and in 1928 the Hupp Motor Car Corporation of Detroit purchased the Chandler plant. Hupp manufactured its Hupmobile in the Chandler plant. Hupp manufactured its Hupmobile in the Chandler plant until 1931 when its operations contracted and the Chandler facility was closed. In 1936 the Weatherhead Company, a manufacturer of automobile parts and accessories, occupied the plant. With the exception of three 1916 D. Connelly Boiler Company boilers, a 1920 McNault Boiler Company boiler, and several Worthington and Ingersoll-Rand air compressors weighing from 90 pounds to 350 pounds; none of the original Chandler equipment remains.
["Construction Has Started on an 80% Increase to the Chandler Factory Capacity," Chandler Bulletin 6 (October-November, 1919): Wagner, Golden Wheels, pp. 138-142.]

FORD MOTOR COMPANY — East Cleveland
11610 Euclid Avenue — 17449720.4595390

Cleveland's status as the second American automobile manufacturing city was based primarily on the production of luxury cars. In 1914, introducing the manufacture of low-price cars to Cleveland, Ford Motor Company opened one of its thirty assembly plants on Euclid Avenue. Albert Kahn, a Detroit architect, who designed numerous plants for Detroit automobile manufacturers, including Ford's River Rouge plant and the Fisher Body Company's Cleveland plant, designed the four-story brick and reinforced concrete building, 144 feet by 280 feet. Operating under Ford's recently developed moving assembly line system, the plant manufactured Model T cars and trucks. In 1925 the plant reached a production peak of 225 cars and trucks per day and employed 1,600 workers. After first contracting its operations, Ford closed its plant in 1932, converting the building into a general office and distribution center. The closing marked the end of all Cleveland automobile production. Still drawing on the local iron and steel industry, the abundance of machine tool manufacturers and skilled machinists, Cleveland's thriving automobile industry gave way to an extensive parts industry. The Ford building is occupied today by several small manufacturers and none of the automotive production equipment remains except indentations in the floor of the second-floor shipping and receiving area, where trains had entered the building.
[Wagner, Golden Wheels, pp. 138-142.]

CLEVELAND AUTOMOBILE COMPANY
(Parker-Hannifin Corporation)
1735 Euclid Avenue

East Cleveland
17.453300.4599925

In 1919 Cleveland's Chandler Motor Car Company established the Cleveland Automobile Company in an attempt to enter the low-priced car market. Ernest McGeorge, who had designed several buildings for Chandler's East 131st Street plant, designed the original buildings for the Cleveland Automobile Company. The two plants share design principles in the construction of four-story, long, narrow assembly buildings. Built in stages between 1919 and 1920, the plant's main four-story assembly building of brick and reinforced concrete was 82 feet 10 inches by 801 feet 8 inches. In 1926 a four-story extension 100 feet by 82 feet 10 inches was added. The one-story brick and steel machine shop, 263 feet by 185 feet, was built in 1920. The one-story buildings along London Street were built during the mid-twenties. In 1920 the plant produced 16,000 automobiles. In 1926, experiencing financial problems and especially competition from Chevrolet and other manufacturers of medium- and low-priced automobiles, the Chandler Motor Car Company absorbed its subsidiary and the Cleveland Automobile Company line was discontinued. In 1928 the company was sold to Hupp Motor Car Corporation of Detroit. Hupp manufactured Hupmobiles in both the Chandler and Cleveland plants until 1931 when its Cleveland assembly operation ended. Hupp continued to make automobile bodies in the former Cleveland Automobile Company plant through 1934. In 1936 the Parker Company, a Cleveland manufacturer of fittings for hydraulic transmission, occupied the plant. The first and third floor of the main assembly building is now used for production, much of the second floor is remodeled as office space. Several single-story buildings have been added to the plant.
[Wagner, Golden Wheels, pp. 131-137.]

FISHER BODY COMPANY
Coit Road and East 140th Street

East Cleveland
17.450850.4600080

In 1920 planning to supply bodies for the manufacture of the Chandler and Cleveland automobiles, the Fisher Body Company of Detroit initiated construction of what was the world's largest closed-body manufacturing plant. Albert Kahn, an industrial architect who designed factories for many Detroit automobile manufacturers including the Ford River Rouge Plant, designed the seven original Fisher Body buildings occupying fifteen acres of the forth-acre Coit Road site. The plant was built just a few blocks from Cleveland's largest automobile manufacturer, the Chandler Motor Car Company. The central building, in what was the largest building permit ever issued in the State of Ohio from the standpoint of floor space, was the six-story brick and reinforced concrete body assembly building, 1150 feet by

70 feet. The plan also included a one-story brick, steel, and reinforced concrete mill building, 300 feet by 615 feet, a one-story steel-frame press shop, 120 feet by 460 feet by 50 feet, a one-story stock building 72 feet by 520 feet which later had five stories added, a kiln building, train shed, and powerhouse. In 1926 a two-story brick office building, 183 feet by 57 feet designed by Fisher Body Company engineers was added. In 1923 the Cleveland Fisher Body plant pioneered the use of lacquer painting of car bodies and initiated a knockdown shipping system which increased boxcar capacity from sixteen to one-hundred auto bodies. In 1924 the plant produced six-hundred finished bodies a day for such cars as the Chandler, Cleveland, Chrysler, Oakland, and Chevrolet. With the 1926 purchase of Fisher Body by General Motors Corporation, Fisher Body produced bodies exclusively for Chevrolet. In 1936 body assembly ceased at the plant and production shifted to metal fabrication. Today the plant is a metal-and-trim-fabricating facility, producing such parts as seat frames, quarter panels, wheelhouses and luggage compartments. The plant also houses a tool and die operation. The greatly expanded plant still includes the original buildings. None of the manufacturing equipment remains.
["Fisher Body Cleveland," The Fisher Body Craftsman 1 (July, 1968): 1-4; "New Plant of the Fisher Body Ohio Company," Power Plant Engineer 26 (February 15, 1922): 201-209; "Oversize Construction Plant Demonstrates Value in Building Fisher Body Company," Engineering News-Record 86 (January 13, 1921): 82-85; V. E. Windell, "Auto Body Plant Built of Reinforced Concrete," Concrete 18 (April 1921): 161-164.

Shipbuilding Industry

During the midnineteenth century, as the volume of Great Lakes shipping increased, Cleveland became a major center of Great Lakes wooden shipbuilding. The industry depended upon the availability of Michigan and Wisconsin lumber and the presence of skilled workmen, machinists, and machine builders in Cleveland. The 1890s' transition from wood to iron and steel as the chief materials in American shipbuilding boosted Cleveland from a regional shipbuilding center to one of national prominence. Cleveland's former wooden shipbuilding industry, the city's waterside location, the abundance of machinists and of machine tool industries, and its extensive iron and steel industry provided a substantial basis for the growth of the iron and steel shipbuilding industry. After 1882, when the Globe Ironworks Company completed the first iron ship built in Cleveland, Cleveland maintained a position within the top three United States shipbuilding centers; the gross annual tonnage of Cleveland-built ships generally vied for first place with Philadelphia shipyards. World War I Navy contracts fostered the development of competing shipyards and at this time Cleveland lost its dominance of the industry. All Cleveland shipbuilding operations ended in the late 1940s.
[Henry Hall, Report on the Ship-Building Industry of the United States, (New York, 1882), p. 219.]

GLOBE IRONWORKS COMPANY
(Reserve Terminals Company)
Center and Spruce Streets

Cleveland South
17.440820.4593860

In 1853 the Globe Ironworks Company established a marine machine and boiler manufacturing operation to supply the local wooden shipbuilding yards. In 1880 business was expanded to include Cleveland's first iron shipbuilding. The plant included a dry dock on the east side of Elm Street which has since been covered. Some of the remaining buildings of the Globe operation date from the 1860s and are bounded by Center, Elm, Spruce and Hemlock Streets. Here the machinery department and offices were located. The brick, iron and wood-beam machine works, originally three stories, was expanded to four stories between 1888 and 1893. Among the machinery equipment were steam cranes, overhead railways, lathes, planers, and boring machines.

The boiler shop, 75 feet by 227 feet, was located north of the machine shop and extended from Elm to Center Street. The foundry was located in the block bounded by Center, Elm, Spruce and Main Streets; in 1893 the foundry operated two 10-ton capacity cupola furnaces. The iron shipyard was located on 1,400 feet of the Old River Bed where four iron ships could be built at once. Vessel

keels were laid parallel with the stream and when completed were launched broadside. A network of tramways serviced the entire yard; 100-ton capacity derricks lifted boilers and other machinery into the holds. In the 1899 consolidation of Cleveland shipbuilding, Globe became part of the American Shipbuilding Company. The buildings were used until the early 1900s when the entire American Shipbuilding Company operation relocated in new buildings along the Old River Bed. The Cleveland Window Glass and Door Company occupied the Globe plant for a time and it is now used as a Reserve Terminals Company warehouse. None of the original machinery or boilers remain.
[The Industries of Cleveland, (Cleveland, 1888), pp. 55-56.]

SHIP OWNERS' DRY DOCK COMPANY — Cleveland South
(American Shipbuilding Company) — 17.439620.4593340
Foot of West 54th Street on Old River Bed

In 1888, stimulated in part by the shipping needs of Cleveland's growing iron and steel industry, the Ship Owners' Dry Dock Company constructed a dry dock and shipbuilding facility along the Old River Bed. George E. Hartnell, a Cleveland civil engineer, designed and built a second dry dock in 1890. In 1893, the facility was the largest dockyard on the Great Lakes. In 1895 one dry dock was enlarged to 430 feet by 54 feet with 17 feet over the sill. In 1899 the American Shipbuilding Company consolidated the Ship Owners' Dry Dock Company with other Cleveland shipbuilders and continued to build ships on the site until the late 1940s. The lack of room for expansion and the narrow river bed site caused American Shipbuilding Company to end its Cleveland operation. The administrative and engineering offices remained on the site until 1963 when they were moved to Lorain, Ohio. The office building, the pattern shop, and the machine shop were designed in 1915 by Cromwell, Lundhoff, Little Company of concrete and brick and are used today as offices and warehouses by various small manufacturing concerns. The foundry built in 1915 was recently demolished. The 1,000 feet line of steel frame buildings used for blacksmithing, ironworking, woodworking, mold-laying, and storage, built around 1900, are used today primarily as warehouses. One of the dry docks, abandoned prior to 1930, has been filled in and only the shell of the pumphouse remains with no equipment. An 80-ton-capacity sheer leg crane is the only remaining shipbuilding equipment.
[Alburn, This Cleveland, 1: 499-505; Civil Engineers Club of Cleveland, Visitors' Directory to the Engineering Works and Industries of Cleveland, Ohio, (Cleveland, 1893), pp. 45-53; Richard J. Wright, Freshwater Whales: A History of the American Ship Building Company And Its Predecessors, (Kent, 1969), pp. 26-28.]

UPSON-WALTON AND COMPANY — Cleveland South
1310 River Street — 17.441340.4594045

Cleveland's position as a port for the Great Lakes, Ohio Canal,

and Cuyahoga River crucially determined its commercial and industrial development. Ship chandlers and jobbers represented an important support industry for Cleveland shipping and shipbuilding. In 1871, J. E. Upson and J. W. Walton opened a ship chandler and grocer's business in a building constructed in 1868 on River Street. Cleveland's other five ship chandlers all maintained shops along the few short blocks of River Street which fronts on the river bank at the mouth of the Cuyahoga River. Upson-Walton's business expanded into general jobbing in northern Ohio and the distributing and selling of manila rope, tackle blocks, fitting and general marine accessories. The firm invented and patented several models of wire rope used most extensively in the form of galvanized steel Hawsers for towing vessels on the Great Lakes. Cargo or rope could be unloaded directly into the building's basement storage area. The general offices and stock rooms occupied the first floor. The third floor lofts were used for the storage of cotton duck, the rigging of tackle blocks and wire ropes, and the manufacture of tents, awnings, and sails. In 1961, after ninety years of business on the same site, the Samsel Company took over the Upson-Walton and Company business. No original equipment remains. The building is presently being divided for use by several retail stores.
[Rose, Cleveland, p. 377; Upson-Walton and Company, Rope, (Cleveland, 1902).]

Machine Tool Manufacture

Cleveland's development as one of the major machine tool manufacturing centers in the United States in many ways parallels the earlier growth of the industry in New England. Similar to the pattern of earlier growth of the industry in New England, industrial expansion stimulated the development of the local machine tool industry; machine tools were first developed by the user industries rather than independent machine tool manufacturers. The textile and small firearms industry stimulated New England's machine tool industry; in Cleveland the growth and expansion of the various metalworking industries provided a substantial basis for machine tool development. In the 1870s the Cleveland Twist Drill Company pioneered Cleveland machine tool manufacture by designing and building the machines necessary to produce twist drills. Sharing techniques of manufacturing interchangeable parts and the need for large volumes of identical parts, the manufacture of sewing machines, hardware, ships, bicycles, and automobiles determined the growth of the machine tool industry, particularly in Cleveland, Ohio and other East-North-Central states. These states, with Ohio in the lead, came to predominate the machine tool industry in 1900, producing nearly forty percent of all American machine tools. The White Sewing Machine Company which produced sewing machines, bicycles, and, for a short time, automobiles, developed one of the earliest American multi-spindle automatic-screw machines. Delineating the general transfer of machine tool production from the user industries to independent machine tool producers, White helped form the Cleveland Automatic Screw Machine Company. The Standard Tool Company developed from Cleveland's Bingham and Company. Several independent machine tool producers began operations in Cleveland around 1900 which continue today.
[Joseph Winchkam Roe, English and American Machine Tool Builders (New Haven, 1916), pp. 261-266; Nathan Rosenberg, Technology and American Economic Growth (New York, 1972), pp. 98-105; Harless D. Wagner, "The United States Machine Tool Industry from 1900-1950," Ph.D. dissertation, American University, pp. 550-551.]

WARNER AND SWASEY COMPANY — Cleveland North
5701 Carnegie Avenue — 17.445750.4494460

In 1881, after an unsuccessful attempt to attract enough skilled machinists for the manufacture of machine tools in Chicago, Warner and Swasey moved to Cleveland and built a factory on the site of the company's present Carnegie Avenue plant. Located near Cleveland's iron and steel industry and near the city's extensive foundry, machine shop, and metalworking industries, Warner and Swasey first manufactured milling and boring machines as well as a number of telescopes. The Warner and Swasey Company 36-inch

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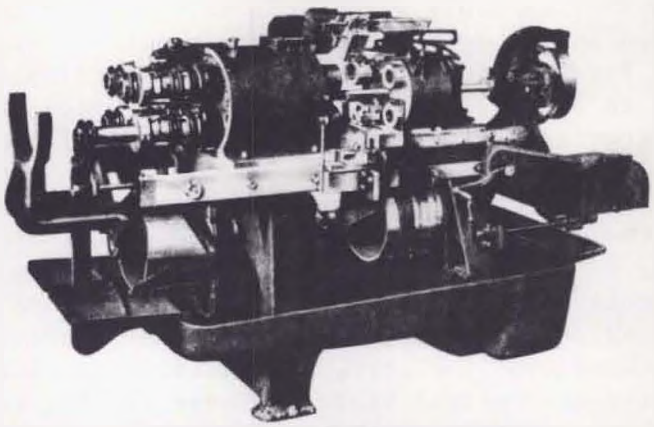

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4. **Economy:** Rehandling of parts is avoided. One man runs 4 to 6 machines. Production is increased from 60 to 200 per cent per amount of space per man per day.

"The Production of Duplicate Parts" explains and illustrates the Acme way. Ask for it.

THE NATIONAL-ACME MANUFACTURING CO.

CLEVELAND, OHIO

NEW YORK, DETROIT — CHICAGO, ATLANTA — BOSTON, MONTREAL

[illegible]

refracting telescope, built for the Lick Observatory in 1866, was the largest refracting telescope built up to that time. The start of the automotive industry spurred Warner and Swasey Company's production of turret lathes which became the company's principal product and specialty. The plant's oldest remaining building is the five-story brick and reinforced concrete building, 395 feet by 62 feet, constructed between 1905 and 1908. The building was used for a machine shop until recently when it was remodeled for office space. The other five-story brick and reinforced concrete machine shop, designed by the Osborne Engineering Company, 112 feet by 112 feet, was constructed in 1916. The one-story assembly bays date from the 1940s. All boiler and machine tool equipment used in production is modern.
[Warner Seely, "Mechanical," in Cleveland Engineering Society, The Golden Anniversary Book of the Cleveland Engineering Society (Cleveland, 1903), pp. 34-41; Warner and Swasey Company, The Warner and Swasey Company: 1880-1920 (New York, 1920).]

NATIONAL ACME COMPANY — East Cleveland
Coit Road and East 131st Street — 17.450480.4600050

In 1901 Edward C. Henn and Reinhold Hakewessel, two Connecticut machinists, moved to Cleveland to manufacture their machine tool invention, the first multiple-spindle automatic lathe, or screw machine. They had conceived of a multiple-spindle automatic lathe, the first to have four spindles, bars fed through the spindles and revolved while cams advanced in position the cutting tools. The machine had great advantages over the single-spindle lathe because it carried out several operations simultaneously and greatly reduced the machining time. Since the machine worked automatically, one operator could work several machines at once. Established in a plant on Stanton Avenue, National Acme continued to develop their line of multiple-spindle machines. In 1916-1917 National Acme constructed a second Cleveland Plant at Coit Road and East 131st Street. The one-story brick, steel, and concrete machine shop, 534 feet by 603 feet, designed by George S. Rider and Company, was equipped with several hundred multiple-spindle machines and became the National Acme screw machine products plant. In 1926 National Acme transferred its machine tool manufacture to its plant in Windsor, Vermont, to remain until the early 1930s when the machine tool manufacture returned to Cleveland and occupied the buildings at Coit and East 131st Street. National Acme then ended its screw machine products manufacture and has continued to manufacture various machine tools. The Stanton Avenue plant no longer stands. In 1917 George S. Rider and Company designed the brick power house, 49 feet by 94 feet, and in 1918 it designed the two-story brick and reinforced concrete office building, 112 feet by 50 feet.
[Frederic H. Chapin, "National Acme: An Informal History," in Newcomen Society American Branch Publications: 1949 (Princeton, 1949), pp. 1-28.]

Textile Manufacture

During the late nineteenth century Cleveland's highly concentrated garment district developed in the area bounded by West 6th Street, West 9th Street, St. Clair Avenue, and Lakeside Avenue. Garment district jobbers produced clothing parts for assembly by other manufacturers and helped create the district's highly concentrated pattern of manufacture. In American clothing production, Cleveland always remained far behind New York where over fifty percent of all clothing was produced. Producing three to five percent of America's clothing, Cleveland ranked among America's secondary garment centers, Boston, Philadelphia, Chicago, and Los Angeles. Despite the city's relatively small percentage of the national production, clothing was one of the city's largest industries. From 1880 to 1930 between six and ten percent of Cleveland's workers were engaged in the clothing industry; this represented the largest industrial segment of Cleveland workers outside of the iron and steel, and foundry and machine products industries. In terms of the value of its products, Cleveland's clothing industry maintained a position as one of the city's top five industries.
[Mabel A. Magee, Trends in Location of the Women's Clothing Industry (Chicago, 1930), pp. 37-40.]

THE CLEVELAND WORSTED MILLS COMPANY — Cleveland South
6114 Broadway Avenue — 17.445830.4590300

In 1878 Joseph Turner and Sons opened a small worsted mill. The Turner mill was the forerunner and nucleus of the 1902 Cleveland Worsted Mills Company, one of the early twentieth century's largest manufacturers of woolen and worsted goods in America. In 1920 the Cleveland Worsted Mills Company controlled eleven different plants spread through the northeast United States. The plants carried on different operations, shipping materials to other facilities for further processing. The Cleveland plant was the largest, most complete plant in the network. It handled every operation from the scouring and sorting of wool to the burling of cloth. The dyeing and finishing processes were conducted in a plant at Ravenna, Ohio. The oldest building on the site dates from 1895. The powerhouse, with no original equipment remaining, was built about 1900. The other ten buildings on the site, designed largely by George S. Rider Company, range from four to ten stories and date from 1908, 1910, 1913, 1918-19, and the 1920s. The plant ceased operation in 1957 and is used today for warehouse space and a number of small manufacturing concerns. None of the textile machinery remains.
[Cleveland Worsted Mills Company, The Clothing of the People (Cleveland, 1922); Arthur Harrison Cole, The American Wool Manufacture, 2 vols. (Cambridge, 1926), 2: 227-229; Rose, Cleveland, p. 418.]

H. BLACK AND COMPANY
(Tower Press Building)
1912 Superior Avenue

Cleveland North
17.443330.4595030

In 1907 H. Black and Company, a manufacturer of Wooltex women's clothing, moved from Cleveland's old garment district to a new factory on Superior Avenue. The 283-foot by 90- to 144-foot three-story building is of reinforced concrete with a brick exterior. The factory is notable for the efforts of Robert Kohn, the architect, and H. Black and Company to focus their design attention on creating a comfortable working environment. Kohn felt "strongly that the advantages of proper healthful working conditions, intelligent thought given to the life of the employee while in the establishment and even to the beautification of his surroundings during that period may be demonstrated to be of as great economic importance as the handling of the raw material." Blue and green tiles were applied to the interior and exterior walls and artists were hired to stencil a simple geometric pattern on the interior white walls to help relieve monotony. The ordinary sprinkler tank was placed inside a brick and stucco tower. Expressing optimism in the possibility of improving working conditions through architectural study, Kohn hoped that "this building might show it possible to build a commonsense, economical factory, practical in every particular and reasonable in cost, of simple low-priced materials and yet a building fairly good looking inside and out." In 1928 various branches of the Evangelical Press occupied the building and now several small commercial and manufacturing concerns occupy it. The building's exterior adornment remains intact but much of the interior stencil and tile work has been painted over. None of the original factory equipment remains.
["Wooltex Plant of Nessrs. H. Black & Co.," American Architect and Building News 99 (June 14, 1911): 222; Robert D. Kohn, "Architecture and Factories," Architectural Record 25 (February 1909): 130-136.]

CLEVELAND-AKRON BAG COMPANY
(Halle Brothers Warehouse)
1858-1899 East 40th Street

Cleveland North
17.445010.4595010

In 1915, merging with the Wagner Manufacturing Company, the Cleveland-Akron Bag Company moved into its new 130-foot by 300-foot, six-story, brick, concrete and steel-frame building, designed by the Osborn Engineering Company. The company manufactured paper, cotton, and burlap bags , as well as tents, awnings, hammocks, and canopies. In moving from West 3rd Street to East 40th and Perkins, the Company joined many other manufacturing concerns which moved from the older industrial sections of Cleveland into outlying previously residential sections. In 1925 the Chase Bag Company succeeded the Cleveland-Akron Bag Company and began sharing the building with a number of other manufacturers. In 1939 the Halle Brothers Company occupied the entire building as a warehouse for its department stores. Additions have been made to the north and west sides of the building. None of the original equipment or machinery remains except two Kewanee Type C

Boilers. One boiler has been converted to gas, but the other, with its coal stoker in place, is no longer used.
[Cleveland: Some Features of the Industry and Commerce of the City (Cleveland, 1917), p. 71.]

RICHMAN BROTHERS COMPANY — Cleveland North
1600 East 55th Street — 17.445560.4596000

In 1916 the Richman Brothers Company, a leading American manufacturer of men's clothing established in 1879, moved from Cleveland's old garment district to a new factory on East 55th Street. Christian, Schwarzenberg, and Gaede Company, with Dana Clark as architect, designed the four-story brick and reinforced concrete building, 321 feet by 195 feet. The building won the Cleveland Chamber of Commerce's City Plan Committee Award for Cleveland's best-designed factory of 1916. Richman's success in operating direct-sell retail outlets stimulated enormous growth of the Richman operation. Between 1924 and 1930 Christian, Schwarzenberg, and Gaede Company designed five connecting buildings for the complex, increasing the floor space to over seventeen acres. Richman Brothers has modernized extensively, replacing all of the factory's original machinery and boiler equipment with such devices as automatic sponging and computerized laser beam cloth-cutting.
[Alburn, This Cleveland, 2: 796-797; "Medal for Merit Awarded American Factory Building," American Architect 14 (October 30, 1918): 525-532.]

NATIONAL ARTIFICIAL SILK COMPANY — Lakewood
(Industrial Rayon Corporation) — 17.437100.4589350
901 Walford Avenue

The Viscose Company initiated artificial silk manufacture in the United States in 1911. Six years later the second mill opened, the National Artificial Silk Company. The company operated under the supervision and patents of Beno Borzykowski, who owned and operated a plant in Germany. The Forest City Engineering Company designed the plant's original three buildings of brick and steel: one three-story building, 52 feet by 165 feet; a one-story building 165 feet by 370 feet; and the power house, 57 feet, 10 inches by 84 feet, 9 inches. Settling on a large site with good rail access, the designers planned the original complex anticipating future expansion. The layout allowed additional building without destroying the materials-handling plan. Still intact today, the original buildings form the western edge of a greatly-expanded plant. A merger in 1920 of the Industrial Fibre Corporation with an Italian manufacturer, Snia Viscosa, permitted the Fibre Corporation to manufacture rayon under the Italian viscose patents using wood pulp as a base for the spool method of spinning.

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PERFECT. POWERFUL. POPULAR.

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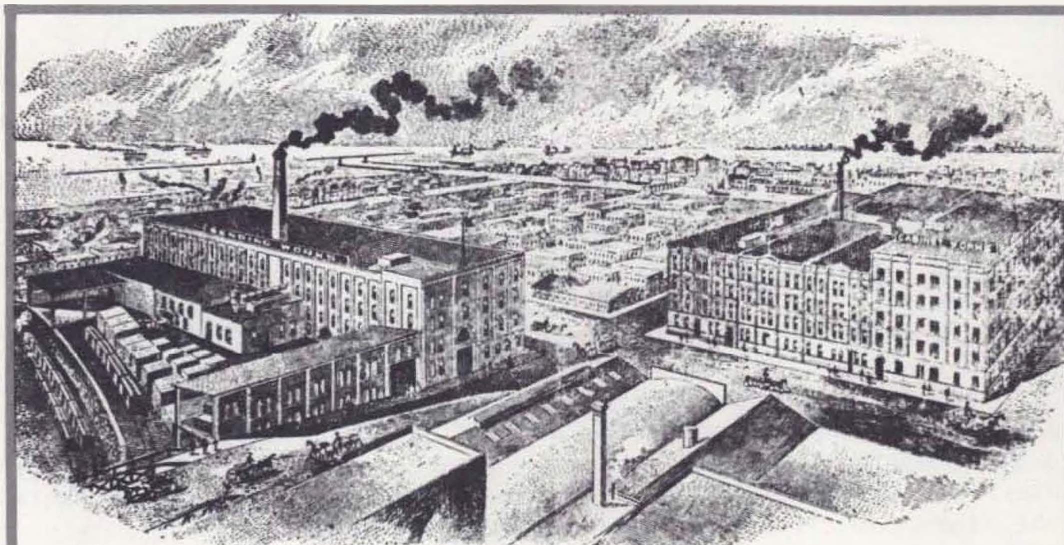


THEODOR KUNDTZ,

MANUFACTURER OF

SEWING MACHINE CABINET WORK.

WEST CENTER, WASHINGTON AND WINSLOW STS. TEL. WEST 117. CLEVELAND, OHIO.

With a seven-fold increase in production between 1916 and 1927, the United States became the world's leading manufacturer of rayon. In 1925 the Industrial Fibre Corporation reorganized as the Industrial Rayon Corporation and became a leading rayon manufacturer, providing most of its output in later years to the Cleveland-Akron tire industry. In 1938 Industrial Rayon Corporation successfully developed "continuous method" for rayon manufacture, combining into one process the steps of coagulation, desulphuring, bleaching, lubricating, and drying. The new nethod revolutionized rayon production. The Cleveland plant ceased operation in 1961 and today the facility is used by a number of manufacturers and as warehouse space. None of the rayon manufacturing remains.
["Important Changes in Industrial Fibre Corporation," Textile World 68 (September 26, 1925): 1766-1767; "New Artificial Silk Plant at Cleveland," Textile World 52 (January 13, 1917): 913; Mois H. Avran, The Rayon Industry (New York, 1927), pp. 117-121; Theodore R. Oliver, "Viscose Rayon Spun Continuously," Chemical and Metallurgical Engineer 55 (December 1938): 668-672.]

THEODORE KUNDTZ COMPANY — Cleveland South
(White Sewing Machine Company) — 17.441080.4593900
2120 Elm Street

The Theodore Kundtz Company plant was started in 1875 by the Cleveland Sewing Machine Company. In 1880 the plant was purchased by Kundtz who used it to manufacture cabinets for Cleveland's growing sewing machine industry. In 1893 the White Sewing Machine Company manufactured 100,000 sewing machines, the Standard Sewing Machine Company 50,000; this annual production was greater than that of any other American city, and made Kundtz's plant one of the largest, most complete wood-working plants in Ohio. After World War I, the White Sewing Machine Company acquired substantial financial interest in Theodore Kundtz Company; in 1924 White moved its Canal Street factory operations into the Kundtz plant. Today the complex is occupied by Apex Fiberglass Products, a division of White Consolidated Industries. None of the original cabinet-making machinery remains.
[The Industries of Cleveland (Cleveland, 1888), p. 57; Rose, Cleveland, pp. 336,620,693.]

Cleveland Storage Company, (1884)

Walker Manufacturing Company, (1890)

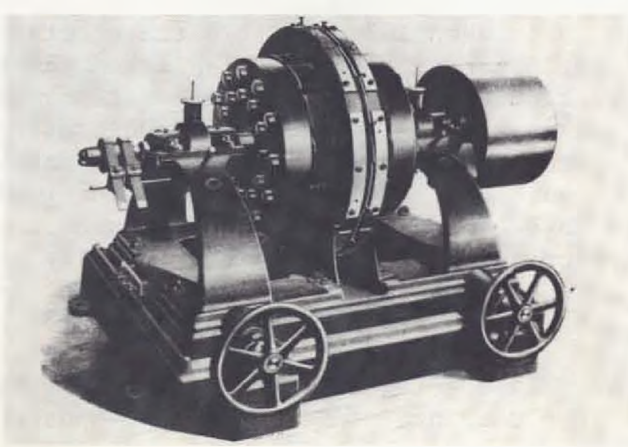
Upson Walton and Company, (1868)

H. Black and Company, (1907)

Electrical Manufacture

Charles Francis Brush, the pioneer innovator in arc lighting, was largely responsible for establishing Cleveland as a center of the early electrical industry. The electrical industry continues to be one of the city's most important industries in terms of value of its products. Brush's commercially successful applications of earlier scientific knowledge of electricity attracted entrepreneurs to Cleveland. Some manufacturers worked with Brush to establish their own operations. In 1883, for example, Edward M. Bentley and Walter H. Knight began experiments in electrical railroad traction in Cleveland. The Knight-Bentley work, conducted in the shops of the Brush Electric Company and on an experimental track in the yards, led to the electrification of a one-mile stretch of the East Cleveland Street Railway. The line was the first electric railroad open to the public in America and operated with difficulties until it was discontinued in the summer of 1886.

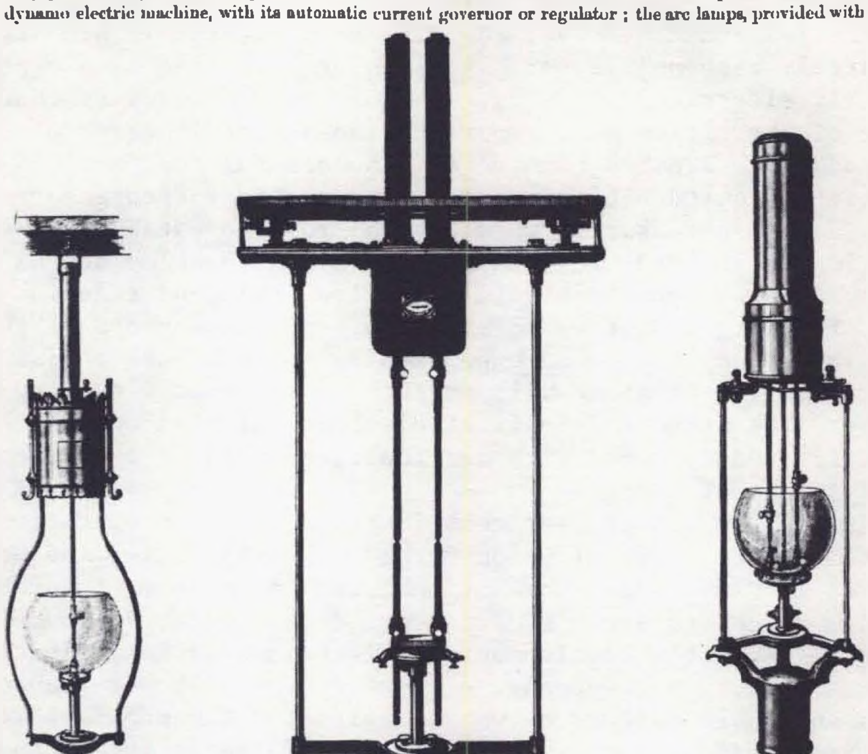
Aside from his pioneer contributions, Brush's operation indirectly affected the location of Union-Carbide, Westinghouse, and General Electric in Cleveland. The National Carbon Company, later Union Carbide, purchased Brush's carbon arc department. Following the lead of Bentley-Knight's development of electric traction, Cleveland's Walker Manufacturing Company, a manufacturer of power-transmission plants and cable railway networks, initiated the manufacture of electrical railway lines and equipment. Walker's manufacture infringed on the patents controlled by Westinghouse and General Electric, who owned the Bentley-Knight Company. Legal battles over the patents led to Westinghouse's control of Walker's business. Company mergers led to the eventual ownership and operation of the Brush Electric Company by General Electric. Brush's pioneer efforts in electrical manufacture thus contributed significantly to the development of an entire industrial and technical network in Cleveland.
[Arthur A. Bright, Jr., The Electric-Lamp Industry: Technological Change and Economic Development from 1800-1947, (1949: New York, 1972), pp. 83, 145.]



Brush Alternating Current
Dynamo Electric Machine.
Stationary Armature.

The Brush Electric Arc Light.

The Brush System of Electric Lighting differs from all others in that it is COMPLETE IN ITSELF and is fully protected by foundation patents granted to Mr. Brush. These inventions and patents cover the dynamo electric machine, with its automatic current governor or regulator ; the arc lamps, provided with



Single Swell-Rod Ornamental. Double Lamp. With Post Socket, Double.

automatic cut out, the carbons, and the apparatus for storing electricity, consisting of the accumulator or secondary battery, the automatic charging and discharging apparatus or current manipulator, and the meter for measuring the amount of current delivered. All the above are fully covered by patents issued

BRUSH ELECTRIC LIGHT COMPANY
(General Electric Corporation)
1814 East 45th Street

Cleveland North
17.445300.4595160

Between 1876 and 1878 the electrical inventions of Cleveland's Charles Francis Brush established the foundation of the electric lighting industry and of central station electrical distribution. While many earlier experimental demonstrations of electric lighting had already taken place, Brush's work made possible for the first time, cheap, commercially saleable electric light. First Brush invented a more efficient dynamo and then an arc lamp with an automatic regulator which kept the carbons equally separate. In 1877 Brush devised a regulating shunt coil designed to permit two or more lamps to operate in a series and making central distribution possible.

Brush originally manufactured his electrical equipment with the Cleveland Telegraph Company; in 1880 he formed the Brush Electric Light Company. In 1889 Thomson-Houston Company purchased the Brush

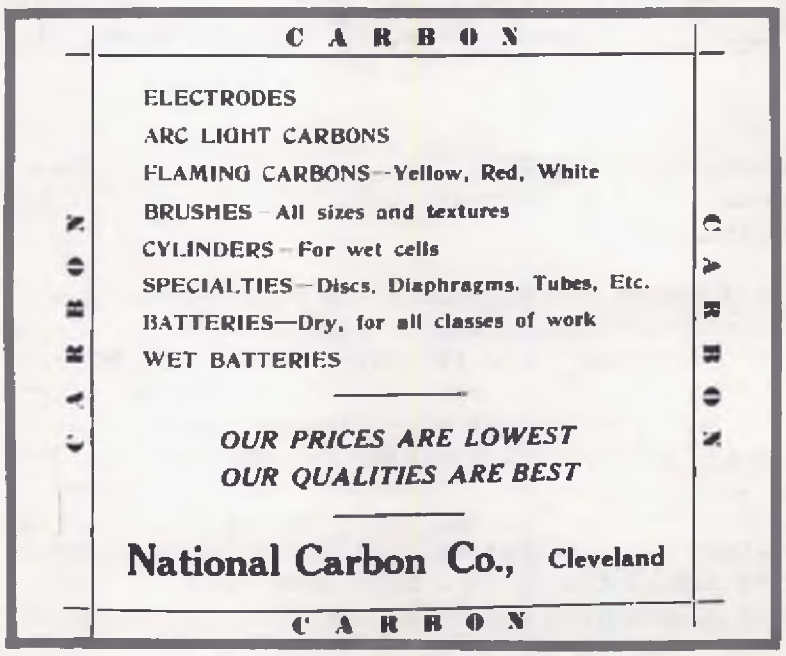
Company, merging three years later with the Edison General Electric Company to form the General Electric Company. The General Electric Company continues to operate a lamp manufacturing plant on the old Brush Electric Light Company site. Following an 1880 fire, the Brush company reconstructed a large plant on its East 45th Street property to manufacture electric machinery, carbon arc lighting and a short time later the Swan incandescent electric lamps. Two buildings of the 1880 plant remain, a brick and wood-beam building with monitor roof, 200 feet by 100 feet, and the old powerhouse, 120 feet by 110 feet. Between 1909 and 1912 several brick and reinforced concrete buildings, designed by Samuel Austin and Son Company replaced many of the original one-story buildings. Added was the three-story building along East 43rd Street, 62 feet by 180 feet, and the line of connected three-story buildings on the north end of the site, 72 feet 6 inches by 115 feet 6 inches, and 115 feet by 166 feet. Little early manufacturing equipment remains today. There is a 1913 exhaust and sealing machine and three large 1915 Blake and Knowles vacuum pumps which provide vacuum for lifting and handling lamps during manufacture.
[The Industries of Cleveland (Cleveland, 1888), p. 199; Civil Engineers Club of Cleveland, Visitors' Directory to the Engineering Works and Industries of Cleveland, Ohio (Cleveland, 1893), pp. 58-61; Passer, Electrical Manufacturers, pp. 333-334; Rose, Cleveland, p. 590.]

WALKER MANUFACTURING COMPANY — Cleveland South
(Westinghouse Electric Corporation) — 17.439310.4593200
1216 West 58th Street

In 1883 the Walker Manufacturing Company opened a foundry on West 58th Street. Walker manufactured a full line of power-transmitting machinery and cable railway networks in addition to specialties of shafting, pulleys, machine-molded gearing, and travelling cranes. Walker's production of electrical railway lines and equipment infringed on electric traction patents controlled by Westinghouse and General Electric. Concerned over the volume of Walker's business, General Electric and Westinghouse filed infringement suits against Walker and his customers in 1894. Court-ordered restrictions on Walker's manufacturing line made continuing in business difficult, and in 1898 Walker sold out to Westinghouse for about $1,000,000. Westinghouse operated the plant as a casting division. In the 1930s the plant became a major light-manufacturing division producing lights for airports, highways, industry and commerce.

The line of brick and steel buildings with monitor roofs which front on East 58th Street date from 1890. In 1890 F. Felkel, a civil engineer, designed the three buildings, 166 feet by 209 feet by 31 feet, 52 feet by 120 feet by 31 feet, and 52 feet by 289 feet by 41 feet. The eight-story brick and reinforced concrete building, 70 feet by 200 feet designed by Prack and Perrine, replaced the No. 1

works of the Hill Clutch Company in 1915. The bays of the 1890s building have been extended and several more recent buildings occupy the western portion of the site. In 1968 Westinghouse ended its sand-casting work in the plant. Lights are now manufactured on die-cast molding machinery. No early cupolas, furnaces, foundry, boiler or other equipment remains.
[The Industries of Cleveland (Cleveland, 1888), p. 199; Civil Engineers Club of Cleveland, Visitors' Directory to the Engineering Works and Industries of Cleveland, Ohio (Cleveland, 1893), pp. 58-61; Passer, Electrical Manufacturers, pp. 333-334; Rose, Cleveland, p. 590.]



NATIONAL CARBON COMPANY
(Union-Carbide)
11907 West Madison Avenue
Lakewood

Lakewood
17.435700.4591710

The 1870s electrical inventions of Cleveland's Charles Francis Brush made inexpensive carbon-arc lighting from central distribution stations possible. This development stimulated the rapid growth of the local carbon industry which provided carbon arc used largely in street and industrial lighting until 1900. Cleveland's local oil refining industry provided the National Carbon Company with the refuse coke from its oil stills, used extensively in manufacturing carbon arcs. In 1893, after purchasing the carbon-arc manufacturing department of the Brush Electric Light Company, the National Carbon Company moved out of its old plant on East 55th Street into a new plant on West 117th Street and Madison Avenue. The company developed and manufactured a diverse line of carbon products including electrodes, brushes, high illumination carbons, Eveready batteries, dry cells, and electrical and mechanical equipment using batteries. In 1917 the National Carbon Company, the oldest and one of the largest carbon manufacturers merged into the Union Carbide and Carbon Corporation. In 1925, most of the battery production operations were moved into the old Standard Parts Company buildings on West 79th Street and Edgewater. The Madison Avenue plant now produces modern carbon and graphite specialties. While no old manufacturing or boiler equipment remains, several of the twelve 1893 buildings on the thirty-acre site are still intact. The buildings are of mill construction, brick, and wood beam, with large monitor windows. The oldest line of buildings are in the northeast corner of the site, each 242 feet by 70 feet, adjacent to the office building. The original office now forms the central part of the expanded office building.
[Civil Engineers Club of Cleveland, Visitors' Directory to the Engineering Works and Industries of Cleveland (Cleveland, 1893), p. 78; Union Carbide and Carbon Corporation, Union Carbide and Carbon Corporation: Activities and Products of the Important Subsidiaries (New York, 1929), pp. 39-49.]

WOODLAND AND WEST SIDE RAILROAD COMPANY POWER STATION
1180 Cathan Avenue

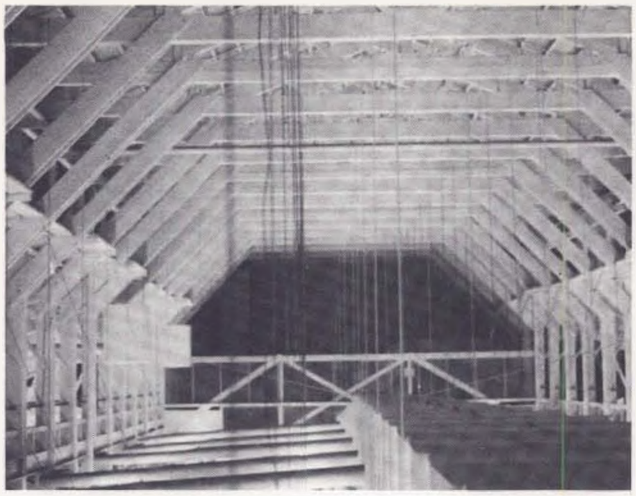
Cleveland South
17.441200.4593880

The Woodland and West Side Railroad Company Powerhouse, 160 feet by 140 feet with a 175-foot stack, was built of brick and steel in 1893 to supply electric power to part of its 32-mile line; horses were used on a portion of the line. The nearby shops of the Globe Ironworks Company constructed the plant's three 500-hp Scotch Marine-type boilers, three triple-expansion marine engines with two-foot stroke, and four Globe and West 500-kw generators. The measurement instruments were constructed by Westinghouse. The plant was extended with the 1901 addition of a new engine house and 240-foot stack, and the 1905 boiler and enginehouse. The additions housed new General Electric and Westinghouse generators, Allis Company engines, and Stirling boilers. The Woodland and West Side Railroad Company was absorbed by the Cleveland Electric Railway Company which used the powerhouse until 1920. The powerhouse which had been valued at $1,172,233 in 1907 was later used as a warehouse by the Globe Steel Barrel Company. Only the shell of the building remains; there are plans to convert the structure into a multiuse commercial building. [Civil Engineers Club of Cleveland, Visitors' Directory to the Engineering Works and Industries of Cleveland, Ohio (Cleveland, 1893), pp. 32, 35-38; The Cleveland Electric Railway Company, Physical Value Schedules, the Cleveland Electric Railway Company as of January 1, 1908 (Cleveland, 1908); W.F. Miller, "Old Powerhouse in Flats to Be Theater Center," The Cleveland Plain Dealer 20 (May, 1975): 2A.]

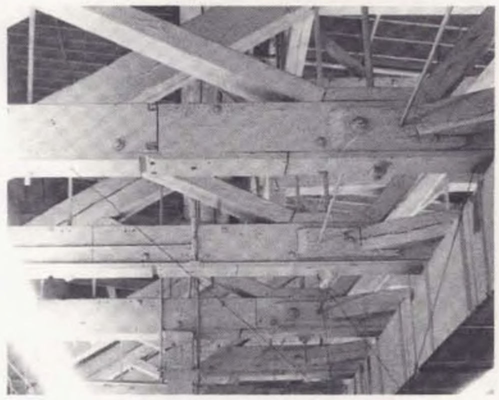
NELA PARK — East Cleveland
(General Electric Lamp Division) — 17.453200.4598800
1901 Noble Road
East Cleveland

By the late 1890s General Electric and Westinghouse dominated the American incandescent lamp industry. The smaller lamp firms were generally too weak to compete with the extensive research, development, and marketing operations of General Electric and Westinghouse. The small firms' volume of lamp production, however, equalled General Electric's and in 1901 Franklin S. Terry and Burton Tremaine worked toward a consolidation of the smaller firms. In the formation of the National Electric Lamp Company, Terry and Tremaine controlled the operation, but General Electric provided financing, shared research, and operated as a silent partner. Soon General Electric, National, and Westinghouse controlled more than 90 percent of the domestic market for incandescent lamps.

As part of the agreement, National purchased General Electric's old East 45th Street Brush Electric Company plant to use as a headquarters and manufacturing plant. Despite extensive additions and the lease of several neighborhood buildings, Terry felt the need for additional facilities. In 1911 Terry met this need with an unusual move, developing a suburban office, laboratory, and research and development complex removed from the major manufacturing plant. Nela Park, which included 20 buildings, smaller utility structures, and an employee's camp, was located on a 90-acre site in East Cleveland. Frank E. Wallis, a New York architect, designed the Georgian Revival buildings distributed in a setting similar to a university campus. The advantages of lower land cost, lower taxes, superior working conditions, location near employee homes, and the chance to enhance the company's image with a model working environment contributed to Terry's insistence on a suburban location for the complex. Nela Park was one of the early industries to relocate part of its operation in suburban Cleveland; this area was more extensively developed in the 1920s and 1930s as the concentration of industry grew less important and more room was needed for plant expansion and operation. [Paul W. Keating, Lamps for a Brighter America (New York, 1954), pp. 56, 89, 91; Mattuck Price, "The Development of an Industrial Group, New Buildings at Nela Park in Cleveland," Architectural Record 53 (May 1923): 382-395; Hollis Townsend, A History of Nela Park: 1911-1957 (Cleveland, 1957), pp. 1-165.]

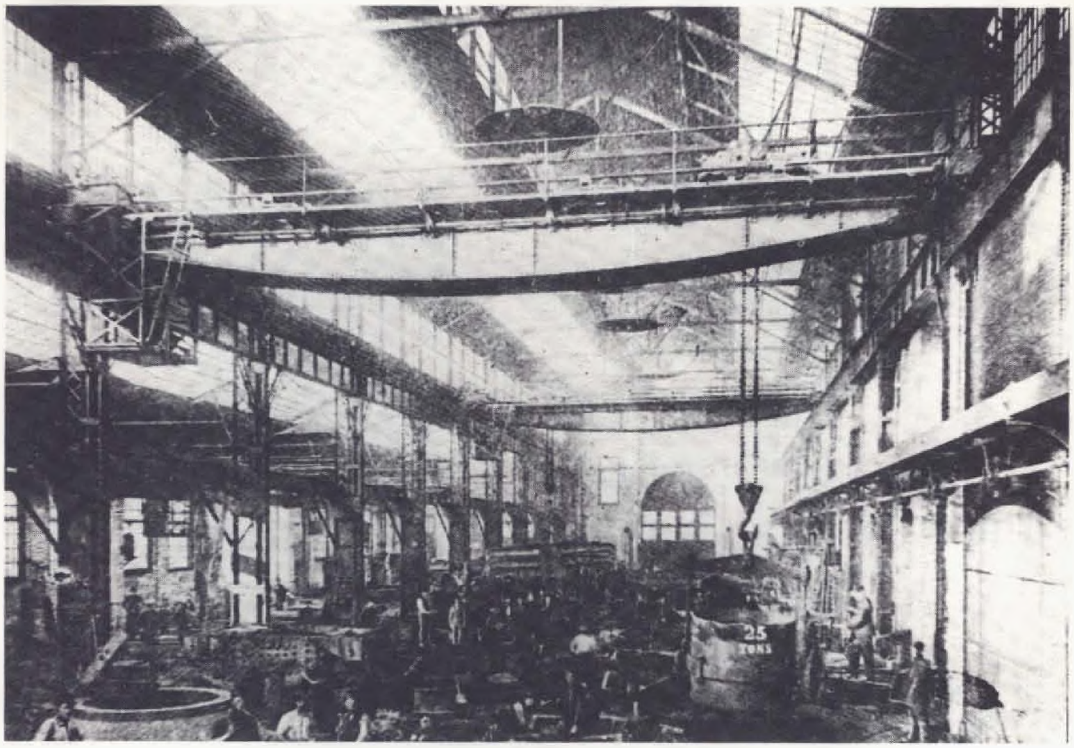


Wood Truss Roof
Brush Electric Light Company
(1880)



Detail: Wood Truss Roof
Brush Electric Light Company
(1880)

Upson Nut Company, (1910)



Interior, Walker Manufacturing Company, (1890)

Cleveland Automobile Company, (1919)

Oil, Chemical, Paint and Varnish Manufacture

Cleveland's importance in the oil, chemical, paint and varnish industries is based primarily on the fact that several pioneer companies which came to occupy central positions in their industries originated in Cleveland. John D. Rockefeller's aggressive consolidation of Cleveland oil refineries established the city as the cornerstone of the Standard Oil Company and as the world's largest oil-refining center--a position maintained throughout the last third of the nineteenth century. The industrial operation of Cleveland's oil and steel industries drew heavily on the chemical industry and attracted the Grasselli Chemical Company and other major chemical manufacturers to Cleveland. In the 1870s Henry A. Sherwin was one of the first American manufacturers to produce ready-mixed paints; the Sherwin-Williams Company which continued to develop in Cleveland while expanding to other locations is now the world's largest manufacturer of paint and varnish. The presence of Sherwin-Williams and numerous other paint and varnish manufacturers in Cleveland, including the Glidden Company, which originated in Cleveland, established the city as the third ranking U.S. paint and varnish center since 1890; New York and Chicago have always exceeded Cleveland's production.

STANDARD OIL COMPANY: CLEVELAND NO. 1 WORKS — Cleveland South
2635 Broadway Avenue — 17.444150.4592680

In 1859 in Titusville, Pennsylvania, Edwin L. Drake opened the first commercially successful oil well. Within a decade of Drake's pioneer operation, Cleveland became the world's largest oil-refining center, a position it maintained throughout the last third of the nineteenth century. Although located nearly two hundred miles from the Pennsylvania oil fields, Cleveland's excellent transportation system made it an attractive oil-refining center. Prior to the construction of oil pipelines, two trunk line railroads connected New York and Cleveland and transported both crude and refined oil. Cleveland also held the advantage of water transportation, accessible to the Erie and Ohio canals, and the Great Lakes. The rail and water transportation allowed Cleveland oil refiners to ship to both eastern and western markets. In 1870 fifty separate oil refineries operated along Cleveland's Walworth and Kingsbury Runs.

The Standard Oil Company stabilized Cleveland's leadership in oil refining. In 1862 John D. Rockefeller invested in Samuel Andrews' sulfuric acid method of oil refining. Three years later he and Andrews formed a partnership which became the Standard Oil Company in 1870. Starting in 1865 Rockefeller consolidated many of the independent Kingsbury Run refineries and established the Cleveland No. 1 Works bordered by Broadway, Pittsburgh, and East 34th Streets. In 1911 the U.S. Supreme Court ordered the dissolution of Standard Oil into thirty-four separate companies; the Cleveland No. 1 Works continued operation as a Standard Oil of Ohio refinery. In 1916 with the installation of cracking stills, the No. 1 works became a large gasoline refinery. In 1966, consolidating its refinery operation at Toledo, Standard Oil closed and dismantled the No. 1 works, at that time the world's oldest continuously operated refinery. A small asphalt plant and a few buildings are all that remain of Cleveland No. 1 Works. A one-story ironclad and steel building used in the asphalt plant, 210 feet by 100 feet, dates from about 1910. Two two-story brick and reinforced concrete buildings designed by Crowell and Sherman Company, 72 feet by 302 feet, and used as the Standard Oil can manufacturing plant remain. The two-story brick refinery office built in 1922 by J. A. Watterson remains. The two-story brick, steel, and concrete boiler house designed in 1925 by James Stewart and Company supplies steam for the asphalt plant. The boilerhouse had eight 750-horsepower Vogt Machine Company water tube boilers fired by chain grate automatic stokers, 12 feet by 15 feet. One boiler remains in its original condition; two boilers have Foster and Wheeler coal pulverizers from the 1930s; and the other boilers have been converted to gas and oil. The asphalt plant contains 30-foot high oxidizers with 30-foot diameters which date from the 1920s. Several 1920s Union Steam Reciprocating Pumps move the asphalt through the plant. ["70th Anniversary Number: 1870-1940," The Sohian 12 (January 1940): 4-18; Alburn, This Cleveland, 2: 593-644; Paul Truesdell, "Standard of Ohio Embodies Latest Ideas in Two New Boiler Plants," National Petroleum News 17 (June 10, 1925): 76-83.]

GRASSELLI CHEMICAL COMPANY — Cleveland South
(E. I. Du Pont and De Nemours and Company) — 17.444100.4591940
2891 Independence Road

In 1866 Eugene Grasselli moved his chemical manufacturing operation from Cincinnati to a site in the Flats of Cleveland's Cuyahoga industrial valley. Meeting the demands of the more than thirty oil refiners in the Kingsbury Run section, Grasselli entered large-scale manufacture of the sulfuric acid necessary for refining oil. Situated next to Standard Oil's refinery, Grasselli shared and aided the tremendous growth of the Standard Oil Company. W. R. Veazey described the relationship:

> No better illustration could be found of the dependence of general industry on chemical manufacture than this interrelation of the Standard Oil Company and the Grasselli Chemical Company . . . without the sulfuric acid of Grasselli the refined oils of Rockefeller would not have been possible.

As other chemical-dependent industries, and particularly the iron and steel industry, grew in Cleveland, Grasselli manufactured more diverse heavy chemicals. In 1928 Grasselli became a division of E. I. Du Pont and De Nemours and Company.

To date, more than 130 inorganic chemicals have been manufactured on the Grasselli site. Modern chemical process has replaced all old manufacturing equipment and boilers. Among the forty brick and frame buildings standing on the site are several brick and woodbeam buildings which were constructed in the 1880s and 1890s. The northernmost buildings, No. 1 and No. 2, are the remains of the older line of buildings, 1885-1895, used originally in sulfuric acid production. The plant still produces sulfuric acid, as well as zinc chloride, galvanizing fluxes, sodium bisulfate, silicates, "Quilon," and "Torvex." [William Haynes, Chemical Pioneers: The Founders of the American Chemical Industry (New York, 1939), pp. 88-106; W.R. Veazey, "Chemical," in Cleveland Engineering Society, The Golden Anniversary Book of the Cleveland Engineering Society (Cleveland, 1930), pp. 19-24.]

SHERWIN-WILLIAMS COMPANY — Cleveland South
601 Canal Street — 17.441920.4593830

In 1866 Henry A. Sherwin started a business as a wholesale and retail dealer of paints, oils, and varnishes. In 1870 he organized Sherwin-Williams Company which started manufacturing paints in 1873 in a cooperage building beside the Cuyahoga River, purchased from the Standard Oil Company. Sherwin devoted a great deal of attention in the early years of operation to developing a ready-mixed liquid paint of high quality. He developed both a paint formula and a patented paint mill which ground pigments fine enough to insure their suspension in the oil base. The ready-mixed paint met with great success when first marketed in 1880. In 1888, continuing its service to railroad equipment manufacturers, Sherwin-Williams opened a second plant in Chicago next to the Pullman Palace Car Company. Sherwin Williams expanded to other locations as well as concentrating its development on ownership and production of its own raw materials, smelters, oil, chemical, can, color-making, and manufacturing plants. Sherwin-Williams development contributed to its success as the world's largest paint and varnish manufacturer.

Since 1873 the Sherwin-Williams Cleveland plant has been continuously expanded and altered; additional land along Canal Street and the Cuyahoga River was purchased in 1885, 1888, and 1896 for plant extensions. In 1881 the office and warehouse on Canal Street was built, and in 1903 the structure was extended to the east. An 1881 Howe Truss covered bridge 120 feet in length connected the office and warehouse complex across the railroad tracks to the manufacturing plant; this was replaced in the 1930s.

As Sherwin-Williams developed specialized facilities at other locations, the Cleveland plant operation changed. Through the nineteenth century the Cleveland plant manufactured tin cans for its use. In the early 1900s the can-making operation ended when a separate can-making facility was constructed. Sherwin-Williams 1902 construction of a Cleveland linseed oil mill plant led to the closing of the kettle-room and oil-refining operations at the Canal Street plant. In 1930 all the office facilities were moved to Cleveland's Midland Building. Attempts to open more space in the crowded downtown site

for paint mixing and manufacturing led to removal of warehouse operations to another site. Modernization of the manufacturing equipment has replaced all early ball and pebble mills. No early manufacturing or boiler equipment remains.
[Luther H. Schroeder, The Story of Sherwin-Williams (Chicago, 1955); Sherwin-Williams Company, A Visit: Being a Coloquial Description of the Sherwin-Williams Company's Paint and Color Manufactory Located at Cleveland, Ohio (Buffalo, 1895); Sherwin-Williams Company, What Fifty Years Have Wrought (Cleveland, 1916).]

GLIDDEN VARNISH COMPANY — Lakewood
Madison Avenue and Berea Road — 17.436060.4591740

While Henry A. Sherwin and the Sherwin-Williams Company dominated Cleveland's paint industry, Francis H. Glidden dominated the varnish, veneer, and lacquer industry. Glidden started the Glidden and Joy Varnish Company in 1875 in a factory at Woodland Avenue and East 79th Street. In 1888 he built a second factory at the corner of Madison and Berea. In 1906-1909 the Osborn Engineering Company designed and built a new plant on the Berea and Madison Avenue property and Glidden abandoned the original (East 79th Street) factory. By 1917, when the company incorporated as the Glidden Company, it was manufacturing a diverse line of paint, veneer, black automotive finish and food products. Glidden manufactured paints and varnishes at the Madison and Berea plant until June 1976.

Much of the original twenty-three-building plant remains intact today. Two of the three open-fire kettle houses remain while the interiors and the open-fire hearths have been replaced. All of the equipment in the powerhouse and boilerhouse has been replaced. The two-story storage house (1907) contains four compartments, each with thirty-one original 2,000-gallon, galvanized iron storage tanks with wooden bottoms; the original piping system is intact. The original outdoor tank farm has been dismantled. Glidden transferred all of its modern equipment to other paint plants. In the manufacturing buildings there are still several Patterson Machine Company and Paul O. Abbe Company pebble mills. The earliest ones were built in the late 1920s. The now obsolete pebble mills revolutionized paint and varnish manufacture by ending hand mixing and combining the mixing and grinding operations in one machine which ran twenty-four hours a day. Glidden maintains a paint laboratory and office on the property. Small manufacturers will occupy the remaining buildings.
[Cleveland: Some Features of the Industry and Commerce (Cleveland, 1917), p. 30; Alburn, This Cleveland, 2: 786-788; Cleveland Engineering Society, The Golden Anniversary Book of the Cleveland Engineering Society (Cleveland, 1930), pp. 41-46.]

Gristmills

ALEXANDER'S MILL
(Wilson Feed Mill)
7604 Canal Road
Valley View

Northfield
17.450110.4578260

In 1833 Andrew Alexander moved from Columbiana County to Independence where he purchased farmland along the Ohio Canal. In 1855 Alexander constructed a gristmill; he utilized water diverted from the canal to power the gristmill's waterwheel and machinery. The mill was the first to operate in Independence, now part of Valley View, and actually served several surrounding local communities. In the early 1900s, the gristmill was purchsed by the Wilson family which still owns it. The metal turbines, installed in the early 1900s, are the only water-driven equipment which survive and they are no longer used. The waterwheel has been removed. The structure which is located adjacent to a 14-mile lock on the Ohio canal is presently used as a garden center and feed mill which operates electric machinery. [Jim Kuth, Cuyahoga Valley Tour (Tour Guide Pamphlet), September, 1973; William R. Coates, History of Cuyahoga County and the City of Cleveland (Chicago, 1929), I: 92-93, II: 139; Memorial Record of the County of Cuyahoga and City of Cleveland, Ohio (Chicago, 1894), p. 634.]

CLEVELAND MILLING COMPANY
(Fairchild; Cereal Food Processors)
1635 Merwin Street

Cleveland South
17.441290.4593500

The 1830 opening of the Ohio Canal helped make Cleveland a major milling and transshipment center for Ohio wheat and flour being shipped to eastern markets. In 1871, when milling first started on the Merwin Street site of the Cleveland Milling Company thirteen flour mills operated in Cleveland. Today only the mill on Merwin Street remains. The present complex dates from the late 1880s or early 1890s. The corn mill building no longer exists. The 100-foot high wood frame elevator "B" is not used and only half of the bins in the 110-foot wood frame elevator "A" are used. The milling operation still takes place in the six-story brick mill building; the two-story warehouse and the two-story boilerroom are still in use. The boiler is a 1911 Erie City Iron Company make. A 600-horsepower General Electric synchronous engine powers the various milling operations. Most of the milling machinery has been replaced and modernized during the last twenty years. The original elevator boot system for unloading the wheat from boats is still used (the wheat is now shipped primarily from Duluth-Superior). The old round reels, reduction fans, purifiers, wheat cleaners, flour packers, and dust collectors have been replaced. The oldest machines still in place are the S. Howe Company dusters, the Allis Roller mill stands, and the Simon Roller mill stands. The roller mills are nine-inches by thirty-inches, nine-inches by thirty-six-inches, ten-inches by thirty-inches, and ten-inches by forty-inches. In 1936-37 a reinforced concrete grain elevator 125 feet high, designed by Edmund Wilkes Jr. of Kansas City, was added to the complex. [W. G. Rose, Cleveland: The Making of a City, pp. 122, 166; Herman Steen, Flour Milling in America, (Minneapolis: T. S. Denisont and Company, 1963), p. 324.]

Waterworks

DIVISION AVENUE PUMPING STATION — Cleveland South
Division Avenue, foot of West 45th Street — 17.440180.4593200

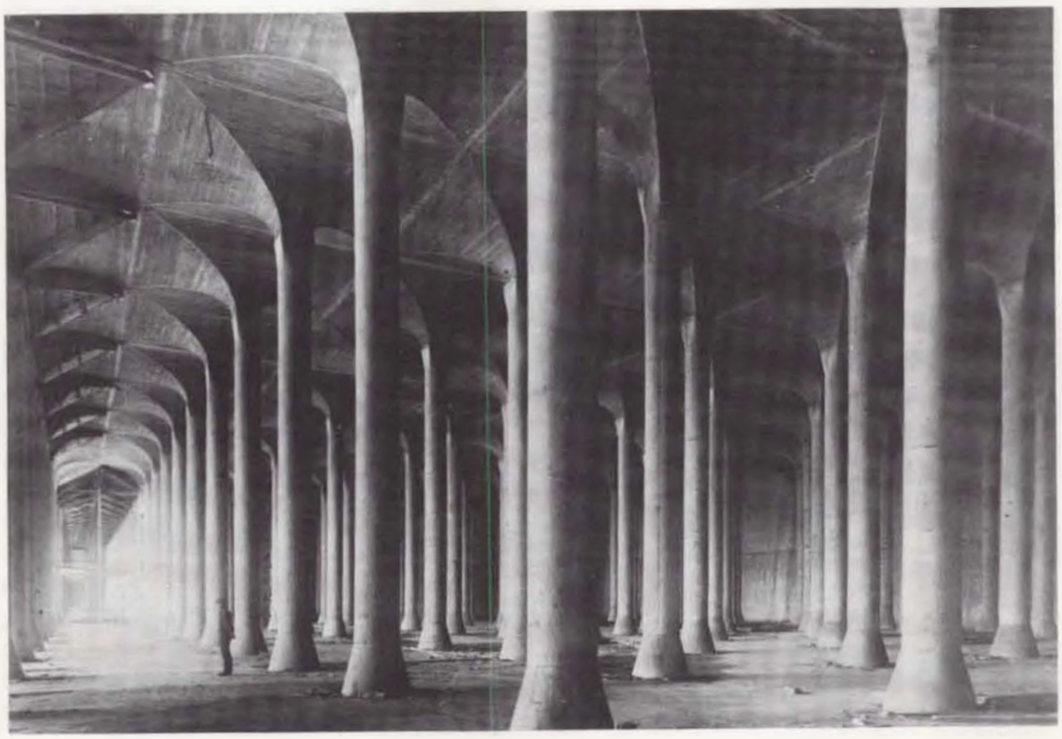
When completed in 1918 and served by modern and efficient steam engines, the Division Avenue filtration complex was Cleveland's most extensive waterworks unit, pumping seventy percent of the city's water. Lake Erie water enters the system's crib 26,000 feet from the shore. Low-lift pumps move water through the original screen well, the four mixing chambers (subsurface), five coagulating basins (subsurface), and thirty-six filter units to the clear water reservoir (subsurface). Electric low-lift pumps operate in place of the original three De Laval steam turbine-driven centrifugal pumps installed in 1915 with 100-million gallon per day capacities. The De Laval pumps remain intact and operable. In 1918 six vertical triple-expansion pumps distributed the clear water; a turbine-driven centrifugal pump was added in 1920.

Only two machines remain intact: the Allis-Chalmers vertical triple-expansion pump, installed in 1915 with a 20-million gallon per day capacity, and the De Laval turbine-driven centrifugal pump, installed in 1920 with a 20-million gallon per day capacity. The Allis-Chalmers engine is over four stories high and has flywheels, 20 feet in diameter which weigh 60 tons. Few of its kind remain. The six original 500-hp Babcock and Wilcox Stirling boilers, installed in 1917, fed coal by a Sanford-Riley underfed retort stoker, provide steam for the Allis-Chalmers and De Laval engines. The four-story Chemical House has traces of the chute, crusher, and worm conveyor which moved chemicals from railroad cars to ten storage bins. Eight of the bins held 1,500 tons, two held 400 tons. All are intact under the top floor. Raw water entering the Chemical House is measured by the original Builders' Iron Foundry Company 72-inch by 42-inch Venturi Meter. The wash water for filter cleaning is provided from the original 400,000-gallon concrete water reservoir (subsurface) on the hillside above the plant. [Cleveland Water Department, Cleveland Water System: 1924, (Cleveland, 1924); John T. Martin, "The Water Works System of the Convention City," <u>Fire and Water Engineering</u> 69 (1 June 1921): 1-5.]

BALDWIN RESERVOIR AND FILTRATION PLANT — Shaker Heights
Fairhill Road — 17.449300.4593450

Constructed between 1914 and 1925, Cleveland's Baldwin Reservoir was the United States's largest covered reservoir with a storage capacity of 135,800,000 gallons. Designed by the Fraizeer-Sheal Company, a Cleveland engineering company, the concrete reservoir measured 1,008 feet by 521 feet with a depth of 36 feet from the

West Harbor Reconstruction, (c. 1900)



Interior, Baldwin Reservoir, (1914-1922) lowest point to overflow. A dividing wall parallel to the short dimension divided the reservoir into two basins about 500 feet square. The cathedral-like groined arch roof is supported by 1,196 columns, 30 inches in diameter, 34 feet 3 inches high, spaced 20 feet 3-1/2 inches on centers. After inspecting the reservoir before it was filled with water, Elbert Peets proclaimed it "an architectural masterpiece. It is the work of law, of a formula ruling over space and mass. . . . the product of man's desire for order, freed from the old conventions of architecture by the new conventions of engineering." Modern electric pumps at the Kirtland and Fairmount pumping stations pump water from Lake Erie to the Fairmount raw water reservoir, and in turn to the Baldwin filtration plant where gravity moves it through treatment and storage. The water returns to the Fairmount station for distribution. The original four bins, four chemical solution tanks, and six chemical dissolving tanks are intact in the plant's chemical house. Water mixes with the chemicals as it passes over the three inclined mixing flumes. The incline drops three feet in 20 feet, accelerating the water to ten feet per second which creates a hydraulic jump when the water falls into a pool below. Treated water enters one of four 110 feet by 660 feet concrete settling basins under a groined arch roof. Each basin has a 8,250,000-gallon capacity. Before entering the reservoir the water passes through one of the administration-filter building's forty filters which have combined daily capacity of 166,000,000 gallons. The Baldwin Reservoir and Filtration Plant continues to be Cleveland's largest water treatment-storage plant. ["Building the Baldwin Reservoir, Cleveland Water-Works," Engineering-News 89 (November 30, 1922): 916-920; G. W. Hanlin, "The Baldwin Filtration Plant," American Water Works Association Journal 17 (April 1927): 420-428; Elbert Peets, "The Cleveland Reservoir," American Water Works Association Journal 17 (April 1927): 417-419.]

Bridges and Viaducts: Cuyahoga River Valley

The navigable section of the Cuyahoga River Valley, from Lake Erie to about seven miles downstream, contains Cleveland's highest concentration of bridges. Twenty-two bridges and viaducts carry railroads, rapid transit cars, motor vehicles, bicycles, and pedestrians from the east side and downtown to the west side. Waterborne commerce along the Great Lakes, the Cuyahoga River, and the early American canals, particularly the Erie Canal and the Ohio and Erie Canal, was largely responsible for the city's commercial importance and industrial growth. The mouth of the Cuyahoga River and the adjacent Old River Bed formed Cleveland's only protected harbor until 1876 when the U.S. Army Corps of Engineers started construction of a breakwater in Lake Erie. By this time, however, ship-related industries had already developed along the Cuyahoga River.

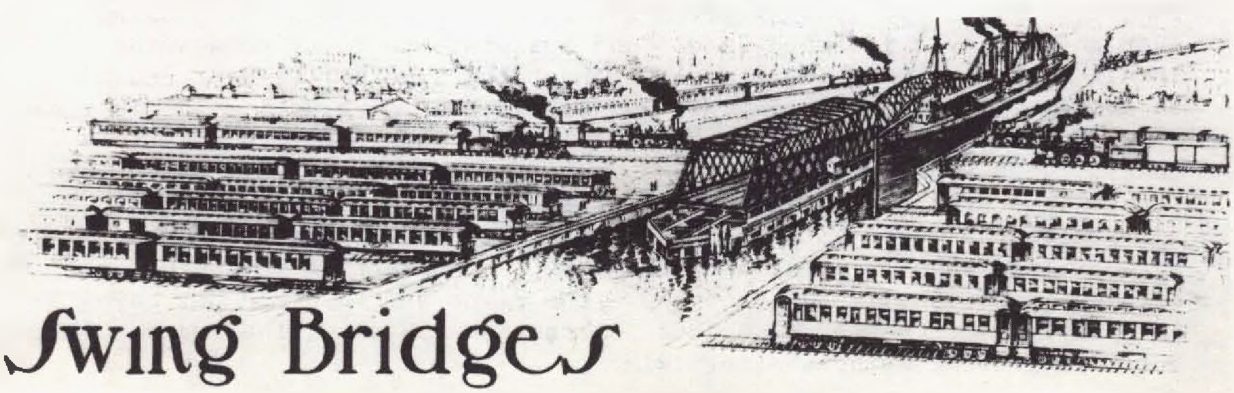
Cleveland's industrial growth on both sides of the Cuyahoga Valley resulted in the development of an intricate transportation network. The network consisted of several conflicting modes of transportation, all of which placed a high priority on speed and efficiency. Ships required a clear navigation channel; railroads serving valley industries needed to cross the river on low-level bridges as did workers and motor vehicles with business in the valley. Pedestrians, and later streetcars and motor vehicles, sought an expedient route between east and west Cleveland without the delays created by passing railroads, open bridges, and the long route up and down the sides of the valley. The difficulty of traveling across the valleys and over the river from the major business and industrial sections of Cleveland's east side retarded residential development on the west side throughout the nineteenth and early twentieth centuries. Gradually as railroads eclipsed canals, the railroads began to dominate the riverside, lakefront, commercial and industrial areas of the valley, which had previously served as the early harbor and canal termini. Growing population in Cleveland and the development of transportation technologies explain the frequent bridge replacements and the adoption of new bridge designs along the Cuyahoga River.

Wishing to end transportation delays, Cleveland planned the Superior Avenue Viaduct. The viaduct, which opened in 1878, provided the first high-level passage from the east to the west side, passing over the valley's railroad tracks and spanning the river on a swing span. A boat passing by the open span of the Superior Viaduct caused an average five minute delay, which, with the growing use of automobiles and streetcars, congested street traffic. As an attempt to ease this delay, the Detroit Superior Bridge was constructed in 1918. It was the first high-level, fixed-span highway bridge built over the navigable section of the Cuyahoga River and it had a separate deck for streetcars. Fixed span bridges, although more expensive than low swing-span bridges, were usually 100 feet above the river and thus did not have to open for ship passage. Because of this convenience, they were built in growing numbers after 1918.

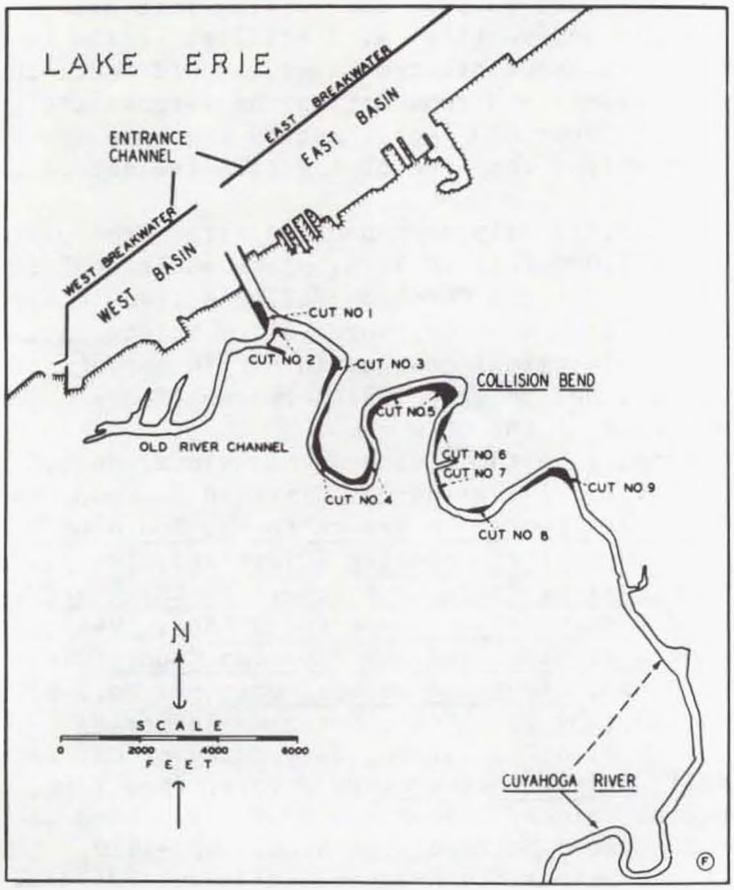
Cleveland's dependence on Great Lakes shipping and the changing size and demands of the ships operating on the Lakes initiated major changes in the types of movable bridges over the Cuyahoga. In 1893, there were twenty movable bridges in Cleveland, ten highway and ten railroad, and all had a swing span over the river. Prior to 1900 the tortuous course of Cleveland's "inner harbor," the winding Cuyahoga River, had not adversely affected Cleveland shipping or industry--in fact the series of river bends permitted a higher concentration of water-dependent industries because it offered more dock frontage in a limited area.

By the early 1900s the Cuyahoga's twisting course was no longer an advantage. The increased size of iron and steel ships constructed on the Great Lakes in the early 1900s offered tremendous transportation savings, but threatened Cleveland shipping and some major industires. The narrow river could not accommodate the larger ships, many of which were constructed in Cleveland shipyards. In 1913 only 55 percent of the ships operating on the Lakes could travel up the river, and by 1924 the percentage had declined to 32 percent.

Recognizing a threat to the economical operation of the iron and steel, oil, and chemical industries, several businessmen and the Cleveland Chamber of Commerce initiated a successful campaign to improve the Cuyahoga River. The first step was replacing swing bridges with bascule and rolling lift bridges. Several of Cleveland's nine Scherzer rolling lift bridges built in the early 1900s replaced older swing bridges. The center pier and the protective guard on the swing bridges took up much of the navigable channel on the river and forced ships to steer out of the channel. Also, since they swung parallel to the riverbank, swing bridges blocked valuable dock space. At times they prevented river dredging because the settling of the center pier misaligned an entire bridge. The engineering of the bascule and rolling lift bridges eliminated two of the complaints made against the "obstructive" swing bridges: (1) the pier rested on the shore, replacing the river pier of the swing bridge, enlarging the navigation channel without any excavation; (2) no more land than that of the right-of-way was required, preserving dock space. Replacing many swing bridges with bascule and rolling lift bridges helped ease the navigation problem.



ALL TRAFFIC BLOCKADED BY A VESSEL JAMMED IN THE NARROW PASSAGE


LAKE ERIE
EAST BREAKWATER
EAST BASIN
ENTRANCE CHANNEL
WEST BREAKWATER
WEST BASIN
CUT NO 1
CUT NO 2
CUT NO 3
COLLISION BEND
CUT NO 5
OLD RIVER CHANNEL
CUT NO 6
CUT NO 7
CUT NO 9
CUT NO 4
CUT NO 8
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SCALE
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2000
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6000
FEET
CUYAHOGA RIVER

The size of Great Lakes ships continued to increase, generally determined by the maximum possible size for passage of the Sault Ste. Marie Locks, and in the 1930s the U.S. Army Corps of Engineers deepened and widened the Cuyahoga River. An $11,000,000 plan adopted in 1939 called for substantial excavation of nine riverbend embankments and widening the river channel. The shipping benefits of cutting a wider channel were minimal unless the areas adjacent to the older bridges, built for a narrower channel, were also widened. The widening of the river since the 1930s has directly led to the replacement of a number of the older bascule and rolling lift bridges, usually with modern bascule and vertical lift bridges. Prior to 1930 the largest ship able to negotiate the river was 525 feet; the river improvements succeeded in accommodating the largest freighters on the lakes, at the time about 600 feet. But by the time the river accommodated 600-foot ships, the size of the lake freighters far exceeded this length.

For a city historically dependent on water transportation, larger lake ships, up to 1,000 feet in 1976, place additional technical and industrial pressures on the Cuyahoga Valley's transit network. Shipping's significant impact on Cuyahoga Valley bridge engineering demonstrates that historical changes in single aspects of a transportation, industrial, and geographical network affects major developments in other parts of the network.

["Recent Improvements to the Harbor at Cleveland, Ohio," Engineering Record 59 (January 19, 1909): 66-67; Clifford F. Hood, Easing the Cuyahoga, A 100-Year Program: A Report to the Board of Directors of of the Cleveland Chamber of Commerce (Cleveland, 1947); Clifford F. Hood, The Cuyahoga River Project: A Report to the Board of Directors of the Cleveland Chamber of Commerce (Cleveland, 1949); Stanley L. McMichael, Bridges of Cleveland and Cuyahoga County(Cleveland, 1918); U.S. Congress, House, Cleveland Harbor, Ohio, H. Doc. 629, 79th Congress, 2nd session,(May 29, 1946); Helen Mable Strong, "The Geography of Cleveland," (Ph.D. dissertation, University of Chicago, 1921); J. A. L. Waddell, Bridge Engineering, 2 vols. (New York, 1916), 1: 684-716; Robert R. Weiner, "The History of Civic Land Use Decision Making in the Cleveland Metropolitan Area, 1880-1930," (Ph.D. dissertation, Kent State University Graduate College, 1974); C. Langdon White, "After 100 Years of Vacillation Cleveland Solves Its River Problem," Annals of the Association of American Geographers 30 (September 1940): 195-209.]

OLD DETROIT AVENUE LOW LEVEL BRIDGE — Cleveland South
Detroit Avenue over Erie Railroad Tracks — 17.441140.4593520

Railroad lines completed to Cleveland during the 1850s sought and acquired the necessary rights-of-way to reach the established commercial and industrial areas along the Cuyahoga River. The railroad entrance into already settled areas divided city districts and interrupted established roadways. In order to promote safety and to mini-

mize the inconvenience to nonrailroad traffic, some early grade separations were made between the railroad lines and city streets. In 1853 a grade separation project carried the old Detroit Avenue over the double track of the Cleveland and Mahoning Valley Railway. The bridge is 55 feet long and 93 feet wide and is the oldest bridge still used in Cleveland. The bridge's two skewed-stone arches are about 15 feet wide and 17 feet high.
[Erie-Lackawanna Railroad, Files relating to various Erie-Lackawanna Railroad-owned and operated bridges, Erie-Lackawanna Railroad Office, Midland Building, Cleveland, Ohio.]

SUPERIOR AVENUE VIADUCT — Cleveland South
Superior Avenue on West bank of Cuyahoga River — 17.441200.4593680

Prior to the construction of the 1878 Superior Avenue Viaduct, Cleveland's first high level bridge connecting the east and west side, people crossed the river on one of the several low level, movable bridges. Travel between downtown and the west side required traversing the Cuyahoga River Valley via the Detroit Avenue hill, the West 9th Street hill and the Superior Avenue hill. Trains running on the two tracks of the Big Four railroad leading to the lakefront docks and piers frequently delayed people crossing the valley. Prior to initiating plans for the Superior Avenue Viaduct, a plan for sinking the railroad tracks was considered. Similar to the grade separation on the 1853 old Detroit Avenue Low Level Bridge, sinking the railroad lines below grade and carrying the streets across them on bridges would allow uninterrupted travel. Bridging the tracks would not, however, provide the desired level passage between the east and west sides; the trip through the valley would still be necessary.

After plans for sinking the railroad lines were rejected, the Superior Avenue to Detroit Avenue route for a high level bridge was chosen over a plan for connecting Superior Avenue to Franklin Avenue. Charles H. Strong, City Civil Engineer, and his principal assistant, S. H. Miller, planned a 3,211-foot masonry viaduct with a 322-foot long, 46-foot wide river span above the river. A 50-hp engine opened the swing span in one minute and the passage of a ship generally interrupted traffic for five minutes. The western approach to the swing span was constructed of Berea sandstone by contractor E. W. Ensign and consisted of ten arches, eight of which were 83-foot spans and two of which were 97.5-foot. Unanticipated problems of driving piles to support the western approach caused B. F. Morse, who succeeded Mr. Strong as City Civil Engineer in May 1875, to reconsider plans for a masonry approach on the east side of the river. A masonry approach would have required that a great deal more land for a right-of-way be purchased for piles driven into the river bed and part of the way up the hill as well as under all the bridge piers. Morse decided to construct several iron spans, totalling 598 feet and supported on masonry piers rather than masonry arches. Sherman and Flager constructed the masonry piers; Claflin and Sheldon constructed the iron spans and swing spans; and Lauderbach and Company built the iron railing.

Substituting the iron section saved the city approximately $2,500,000 of which $650,000 was paid for the bridge right-of-way. The river, automobile, streetcar, and pedestrian congestion caused by the Viaduct's swing span contributed to the decision to build the fixed-span, high level, Detroit-Superior Bridge. In 1920, shortly after the completion of the Detroit-Superior Bridge, the Superior Avenue Viaduct was condemned and in 1922 most of the structure was removed with the exception of the seven Berea sandstone arches which occupy a prominent position on the west bank of the Cuyahoga River. [Civil Engineers Club of Cleveland, Visitors' Directory to the Engineering Works and Industries of Cleveland, Ohio (Cleveland, 1893), pp. 12-14; B. F. Morse, "The Cleveland Viaduct," Engineering News 6 (January 11, 1879): 10-11; B. F. Morse, "The Superior Avenue Viaduct, Cleveland," Journal of the Cleveland Engineering Society 5 (March 1913): 339-345.]

CENTRAL VIADUCT: ABBEY AVENUE BRANCH — Cleveland South
Abbey Avenue from West 15th to West 19th Streets — 17.442000.4592550

After the 1878 completion of the Superior Avenue Viaduct proved the advantages of high level bridges carrying pedestrian, wagon and streetcar traffic over railroad tracks and river valleys, plans were made to cross the valley with another high-level viaduct connecting downtown Cleveland with the southern sections of the west side. The City Bridge Engineer, W. M. Hughes, and the City Civil Engineer, W. P. Rice, designed the Central Viaduct in two sections. The first section connected Ohio and Hill Streets with Jennings Avenue and was 2,828 feet long and 56 feet wide. This section ran 101 feet above the river. A swing span, which pivoted to parallel the riverbank, allowed ships to move up the river. As part of the Central Viaduct project, a second section, intersecting the river section, was built to span a west side railroad line and Walworth Run along Abbey Avenue. The Walworth Run section was 1092 feet long and 56 feet wide and passed 76.5 feet above Scranton Avenue. Its iron and steel spans were supported by iron towers resting on masonry foundations. The Abbey Avenue branch has a roadway 70 feet wide and two sidewalks 8 feet wide. Both branches were constructed by the King Iron Bridge and Manufacturing Company. In 1930 the original wooden block paving was replaced. In 1941 the Cuyahoga River branch was condemned and subsequently dismantled. The Abbey Avenue branch remains intact as one of Cleveland's oldest iron and steel bridges.
[Civil Engineers Club of Cleveland, Visitors' Directory to the Engineering Works and Industries of Cleveland, Ohio (Cleveland, 1893), pp. 14-16; E. W. Doty, The Central Viaduct (Cleveland, 1889).]

CENTER STREET BRIDGE — Cleveland South
Center Street over the Cuyahoga River — 17.441310.4593640

In 1893 twenty swing bridges, ten highway and ten railroad, spanned the Cuyahoga River. Only the 1901 Center Street Bridge remains. It is the oldest moveable bridge over the navigable portion of the Cuyahoga River. It is a rim-bearing swing span 249 feet long with a 23-foot eight-inch roadway and two 6-foot sidewalks. Cleveland's King Bridge Company designed and erected the superstructure. Z. King started manufacturing Cleveland bridges in 1853,and in 1864 he received one of the earliest known patents for a swing bridge. By the 1890s, drawing heavily on the Cleveland iron and steel industry, the King Company was one of the largest bridge and structural work fabricating plants in the country; in 1893 the plant covered under one roof 155,000 square feet and was located at East 69th and St. Clair Streets. Originally powered by a steam engine, the bridge is now swung by two 35-hp electric motors. The necessary counterweight is provided by a concrete deck on the bridge's shorter span, opposite the open steel mesh deck used on the larger span.
[City of Cleveland, Files and drawing relating to various Cleveland-owned and -operated bridges, Survey Department, City Hall, Cleveland, Ohio; Civil Engineers Club of Cleveland, Visitors' Directory to the Engineering Works and Industries of Cleveland, Ohio (Cleveland, 1893), pp. 55-57]

NEWBURGH AND SOUTH SHORE RAILROAD BRIDGE — Cleveland South
Near Houston Avenue over Cuyahoga River — 17.443660.4592000

H. L. Schuler designed the Scherzer Rolling Lift Bridge which carried the Newburgh and South Shore Railroad across the Cuyahoga River near Houston Avenue. When completed in 1904, the 160-foot double-track bridge was the longest single-leaf Scherzer bridge ever constructed. The bridge, which gives a navigation channel of 120 feet, also has two deck plate girder 50-foot approach spans resting on concrete abutments. With the construction of the 1894 Metropolitan Elevated Railroad bridge in Chicago, Scherzer helped pioneer the modern rolling lift bridge. The bridge is one of the oldest remaining rolling lift bridges in the United States. The original 50-hp General Electric motors remain intact. The bridge has not been used since 1967.
["A New Scherzer Rolling Lift Bridge," Engineering News 52 (December 15, 1904): 548; "A New Scherzer Rolling Lift Bridge at Cleveland," Railroad Gazette 34 (January 17, 1902): 209.]

BALTIMORE AND OHIO RAILROAD BRIDGE #460 — Cleveland South
Near Houston Avenue over Cuyahoga River — 17.443680.4591960

In 1906 the Baltimore and Ohio Railroad built a Scherzer Rolling Lift Bridge across the Cuyahoga into the American Steel and Wire Company: Central Furnace Plant. The railroad delivered coal and coke to the plant's blast furnaces. Baltimore and Ohio engineers D. D. Carothers and J. E. Greiner supervised work on the 205-foot, double-track bridge designed from plans of the Scherzer Rolling Lift Bridge Company. The main lift span which houses the operating engines is 160 feet long. Constructed at the Toledo Plant of the American Bridge Company, the bridge weighs 775 tons, exclusive of the 800-ton cast iron counterweight. All of the bridge's connections are riveted. In 1950 the two original General Electric 50-hp railway-type motors powering the lift span were replaced with two new electric motors. The bridge now operates as part of the Chessie System.
[Chessie System, Files relating to various Chessie System owned and operated bridges, Chessie System Office, Metropolitan Building, Akron (December 17, 1904): 720.]

BALTIMORE AND OHIO RAILROAD BRIDGE #464 — Cleveland South
Near Riverbed Avenue over Old River Bed — 17.440860.4594100

In the early 1900s the larger modern Great Lakes ships found it increasingly difficult to swing out of the Cuyahoga River into the shipyards, dry docks and ore docks located along the Old River Bed. For example, the Baltimore and Ohio Railroad's center-pier swing bridge at the head of the Old River Bed obstructed larger vessels. In 1907 Baltimore and Ohio replaced it with a 230-foot, single-leaf, single-track, lift bridge, designed by the Scherzer Rolling Lift Bridge Company. The King Bridge Company manufactured the bridge's superstructure, which at the time of its completion was the longest single-leaf bascule bridge ever built. Baltimore and Ohio's engineer, J. E. Greiner supervised the construction. Without the obstruction of the old swing bridge's center pier, the rolling lift bridge permitted a 210-foot channel for navigation. Including fixed plate girder approaches, the bridge is 334 feet long. It is supported on concrete piers supported on piles, and its moving span carries the operating pinions. Two 75-hp alternating current electric motors provide power for lifting the bridge. The Pittsburgh Construction Company erected the bridge and the Chessie System presently owns and operates it.
[Chessie System, Files relating to various Chessie System owned and operated bridges, Chessie System Office, Metropolitan Building, Akron, Ohio.]

NEW YORK, CHICAGO, AND ST. LOUIS RAILROAD VIADUCT
(Norfolk and Western Viaduct) Cleveland South
Near University Road over Cuyahoga River 17.442240.4592800

In the 1800s the New York, Chicago, and St. Louis Railroad extended its line through Cleveland. An 1882 wrought iron viaduct with alternate tower spans and intermediate spans of Fink truss design, supported on sandstone masonry piers, carried the double-track line across the Cuyahoga Valley. J. A. Latcha, Chief Engineer, W. M. Hughes, Bridge Engineer, and W. A. Boch, Substructure Engineer, designed the viaduct 68 feet over the ground and spanned the river with a pin-connected deck swing span. In 1882 when the viaduct was completed, locomotives weighed 66 tons; in 1907 when locomotives weighed about 145 tons and the structure showed signs of wear, the viaduct was replaced with a 3,010.5-foot plate girder viaduct 50 feet to 60 feet above the ground. Chief Engineer E. E. Hart, and A. J. Himes, Bridge Engineer of the New York, Chicago, and St. Louis Railroad, designed the viaduct which generally alternated 30-foot tower spans and 60-foot intermediate spans. The swing span of the old viaduct was replaced with a 167-foot bascule bridge designed by the Scherzer Rolling Lift Bridge Company and permitted a 124.7-foot clear channel. Although it was considered for replacement in the 1930s as part of the Cuyahoga River widening and deepening project, it was not until 1957 that the river span of the viaduct was replaced with a 267-foot vertical lift bridge giving a 200-foot clear channel for navigation. Hardesty and Hanover, and railroad company engineers, R. T. Bewitt, H. F. Whitmore, and E. F. Manley designed the vertical lift section which was constructed by Hunkin-Conkey Company, Koch Steel Erecting Company, and Mount Vernon Bridge Company.
["Bridge Over a Bridge Under a Bridge," Engineering News-Record 159 (July 25, 1957): 50:52; "Cuyahoga Valley Viaduct," Engineering Record 59 (June 5, 1909): 722-725; "Cuyhoga Viaduct of the New York, Chicago and St. Louis Railroad," Engineering Record (January 9, 1909): 44-46; George H. Tinker, "The Cuyahoga Valley Viaduct of the Nickel Plate Railroad," Cleveland Engineering Society Transactions 2 (October 12, 1908).]

RIVER TERMINAL RAILWAY BRIDGE Cleveland South
North of Clark Avenue over Cuyahoga River 17.442140.4591010

Between 1913 and 1916, Corrigan, McKinney and Company expanded its blast furnace and pig iron plant located on the west side of the Cuyhoga River into a fully integrated basic steelmaking plant. The company built rolling mills and the open-hearth furnaces on the east side of the river. The River Terminal Railway Company, a Corrigan subsidiary, moved hot metal from the west side blast furnaces to the east side steelworks across a private 1913 Scherzer Rolling Lift Bridge. Yard locomotives pulled 50-ton Pollock ladle cars across

1. Detroit-Superior High Level Bridge Under Construction, (1916); Left foreground, Center Street Bridge, (1901); Right foreground, Cleveland Milling Company (Fairchild), wheat being unloaded into elevator.

2. Superior Avenue Viaduct, (1878); Foreground, Baltimore and Ohio Swing Bridge.

3. Superior Street Viaduct, (1878); Foreground, Scherzer Electric Rolling Lift Bridge, (1907) which replaced the earlier swing bridge in #2.

3.


FAIRCHILDS
FLOUR
MILLS
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B
DETROIT-SUPERIOR HIGH LEVEL BRIDGE

1.

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the 129.8-foot river span of the single-track bridge which also included a footway. The bridge, a vital link in the steelmaking operation, could be raised to allow navigation further upstream. In 1951, Republic Steel Corporation, a successor of Corrigan, McKinney, and the River Terminal Railway Company strengthened the bridge to accomodate 300-ton ladle cars. The stringers in the bascule span, the top and bottom flanges, and the floor beams were strengthened. Rivets were replaced and trusses were reinforced by welding on bars and plates. The electrical equipment and machinery were completely renewed and modernized. Hazelet and Erdal worked as engineering consultants on the project. Leonard Larson of Republic and E. J. Lisy of River Terminal Railway supervised the project.
["The Corrigan, McKinney New Steel Plant," Iron Age 100 (November 15, 1917): 1180-1186; A. L. R. Sanders and M. Asce, "Railway Bascule Strengthening to Carry Extra Heavy Loads," Civil Engineering 28 (April 1958): 73-74.]

DETROIT-SUPERIOR HIGH LEVEL BRIDGE — Cleveland South
Detroit and Superior Avenues over Cuyahoga River — 17.441250.4593560

The 1918 completion of the Detroit-Superior High Level Bridge temporarily solved many traffic problems on the adjacent Superior Avenue Viaduct. The double deck construction separated streetcars from automobile and pedestrian traffic. The 93-foot height of the fixed span over the Cuyahoga River permitted traffic to cross the bridge and boats to move along the river at the same time -- thus avoiding the five to ten minute delays caused by the opening of the Superior Viaduct swing span. Cuyahoga County engineers, Frank R. Lander and A. M. Felgate and county bridge engineers W. A. Stinchomb and A. W. Zesiger designed the 3,112-foot long, 75-foot wide, bridge with twelve concrete arches ranging in width from 58 feet to 181 feet and a 591-foot steel-arch span over the Cuyahoga River. When the bridge was completed it was the longest double deck bridge ever built. The lower deck provided room for six streetcar tracks, four of which were installed. The Hunkin-Conkey Construction Company used steel falsework to support the wooden molds for the concrete arches during construction; after the concrete hardened, the falsework was removed and used in erecting the next arch. Cleveland's King Bridge Company constructed the three-hinged central steel arch; the trusses were constructed of nickel steel; other parts were carbon steel. O'Rourke Engineering Company of New York built the two main river piers. The Trinidad Paving Company laid the original wood block paving. Rapid transit cars no longer use the bridge's lower deck, traveling instead over the 1929 Cleveland Union Terminal High Level Bridge. The bridge was widened to six lanes in 1967-68 by cantilevering the extra lanes outside the center span.
["A Half-Mile Double-Deck Concrete Bridge," Scientific American 114 (April 15, 1916): 403; "Electric Railway Construction on Detroit-Superior Bridge," Electric Railway Journal 52 (July 27, 1918): 145-146;

"Main Span of Detroit-Superior Bridge over Cuyahoga River at Cleveland," Engineering Record 70 (November 28, 1914): 591-593; Rose, Cleveland, pp. 615, 758.]

CLEVELAND CHAMBER OF COMMERCE AND ST. LOUIS RAILROAD BRIDGE #6 — Cleveland South 17.442110.4593030
South of Lorain-Carnegie over Cuyahoga River

In 1920 the J. B. Strauss Bridge Company designed a single-leaf Strauss Heeltrunnion bascule bridge for the Cleveland Chamber of Commerce and St. Louis Railroad crossing of the Cuyahoga River. The American Bridge Company built the single-track, riveted truss span 175 feet long and 18 feet wide. The bridge tender tower stands on a 45-foot fixed span and rests on three concrete piers. The bridge opens to a full angle of 82 degrees, forming a clear channel width of 140 feet.
[Penn Central Railroad, Files relating to various Penn Central Railroad-owned and-operated bridges, B & B Office, Terminal Tower, Cleveland, Ohio.]

CLEVELAND UNION TERMINAL HIGH LEVEL BRIDGE — Cleveland South
Near Columbus Road over Cuyahoga River — 17.441450.4593000

The Cleveland Union Terminal High Level Bridge was built in 1929 as part of the rapid transit and railroad operations centered in the new Terminal Tower-Union Terminal development. The bridge carries two Penn Central tracks and two Cleveland Transit System tracks across the Cuyahoga River Valley for approximately 3,350 feet on deck-plate girders resting upon reinforced concrete piers. The 30 spans range in size from 49 feet 7 inches to the 270-foot deck truss span over the Cuyahoga River. At the point where the bridge crosses the river there is a clear channel for navigation of 192 feet.
[Penn Central Railroad, Files relating to various Penn Central Railroad-owned and-operated bridges, B & B Office, Terminal Tower, Cleveland, Ohio.]

EAGLE AVENUE VIADUCT — Cleveland South
Eagle Avenue over Cuyahoga River — 17.445550.4593530

Cleveland's first vertical lift bridge with a span of 225 feet and a width of 52 feet, was built in 1931 as part of the Eagle Avenue Viaduct. F. L. Gorman and W. H. Suloff designed the 1,998.2-foot viaduct to carry traffic from the Flats area over railroad tracks leading to the recently completed Union Terminal and out of the Cuyahoga Valley. The Eagle Avenue Viaduct accommodated the increasing automobile and truck traffic connected with the Flats' industries.
[City of Cleveland, Files and drawings relating to various Cleveland-owned and-operated bridges, Survey Department, City Hall, Cleveland, Ohio; C. D. Laidlaw, "New Lift Bridge Has Special Safety Features," The American City 41 (September 1929): 156-157.]

LORAIN-CARNEGIE HIGH LEVEL BRIDGE — Cleveland South
Lorain-Carnegie Avenue over Cuyahoga River — 17.442090.4593090

When completed in 1932, the Lorain-Carnegie High Level Bridge provided a third high level connection between Cleveland's downtown and the west side. The bridge shared high traffic across the valley with the 1888 Central Viaduct and the 1918 Detroit-Superior Bridge, and provided an easy link between the west side and the recently completed Terminal Tower office development. Carnegie Avenue also carried traffic from the growing east side suburbs of Cleveland Heights, University Heights, and Shaker Heights through to the west side. The total length of the bridge and its approaches is 4,490 feet, of which 2,886 feet is over the valley. The valley section consists of fourteen steel and concrete cantilever truss spans ranging in length from 132 feet at the ends to 299 feet over the Cuyahoga River. The river clearance under the bridge is 93 feet high and 180 feet wide. Wilbur J. Watson and Associates designed the bridge with two decks. The upper deck has a 60-foot roadway and two 7-foot walks. The lower deck was designed for two rapid transit tracks and two 18-foot truck roadways. The lower deck of the bridge has never been used. Cleveland architect Frank Walker, of Walker and Weeks, consulted with the engineers on the sandstone architectural embellishment of the bridge, designed the bridge's four figural pylons, and contributed to the decision to decoratively curve the bottom chord. Symbolizing development in road transportation, the eight pylon figures sculpted by Henry Hering hold in their hands a hay wagon, a covered wagon, a stage coach, a passenger automobile, a dump truck, a concrete-mixer truck, and two other trucks. Lowensohn Construction Company built the substructure and the Mt. Vernon Bridge Company built the superstructure. The American Institute of Steel Construction praised the Lorain-Carnegie Bridge as one of the most beautiful bridges of 1932. ["Cleveland Again Bridges Cuyahoga Valley," _Engineering News-Record_ 109 (December 22, 1932): 747-749; Wilbur J. Watson, "Lorain-Carnegie Bridge in Cleveland," _Civil Engineering_ 2 (November 1932): 680-684.]

MAIN AVENUE BRIDGE — Cleveland South
State Route #2 over Cuyahoga River — 17.441140.4594120

In the early 1930s under the auspices of the WPA, Cleveland adopted a regional traffic plan including the construction of a six-mile lakefront highway connecting Gordon Park on the east side with West Boulevard at Edgewater Park on the west side. The six-mile route was intended to relieve city streets of crosstown and through traffic. The Main Avenue Bridge, funded by the WPA, was a ten-span, continuous cantilever truss, fixed high-level bridge 2,520 feet in length. The span length ranged from 200 to 400 feet. The longest, the river span, carried traffic over industries, railroads, streets, and river in the Cuyahoga Valley and Flats area. The four-span east approach ramp to the bridge, crossing the New York Central and the

Penn Central Railroad tracks, is constructed with three parallel, continuous steel girders (one span, 270.8 feet long, was then the longest span girder built in America). The bridge's total length, including approach spans and ramps is 8,000 feet. County engineers John O. McWilliams, W. E. Bleser, F. L. Plummer, R. W. Deitrick, and C. M. Haake, as well as consulting engineer Wilbur J. Watson worked on the design and planning for the bridge which was completed in 1939.
["Lakefront Freeway Speeds Cleveland Traffic," Engineering News-Record 124 (April 11, 1940): 64-67; Fred L. Plummer, "Girder Span Record Boosted To 271 Feet," Engineering News-Record 126 (March 27, 1941): 466-468; Fred L. Plummer, "Model Study of an Arch Bridge for Statically Indeterminate Stresses," Engineering News-Record 109 (September 8, 1932): 282-283.]

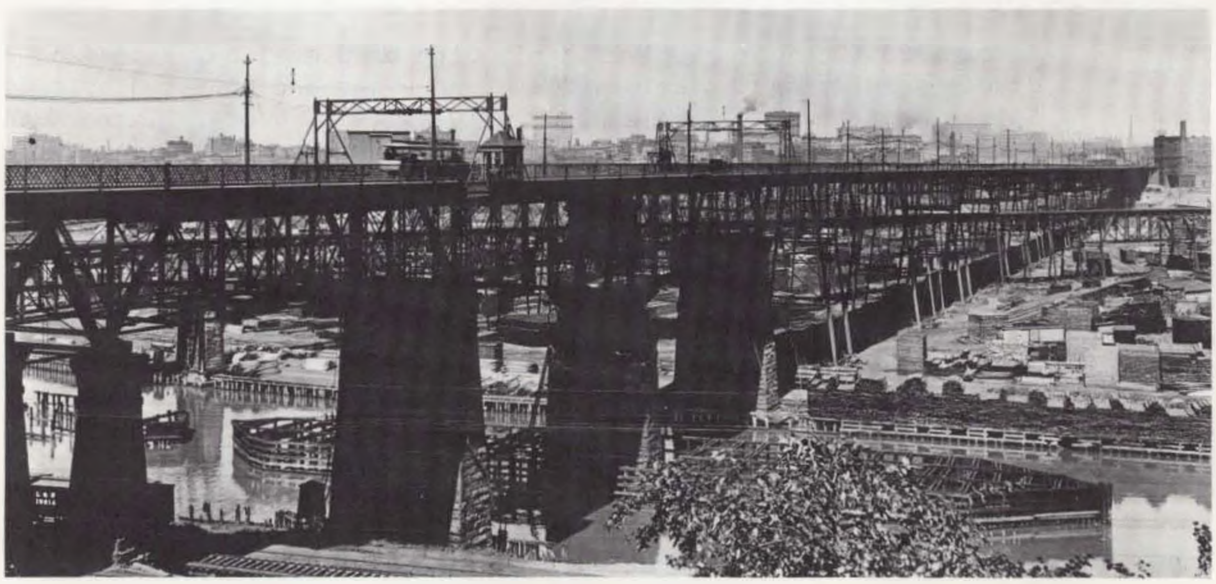
CARTER ROAD BRIDGE — Cleveland South
Carter Road over Cuyahoga River — 17.441740.4593640

In 1940, the Cuyahoga River was widened at Carter Road to provide a 201-foot channel. The old swing bridge was then replaced with a 284-foot vertical lift bridge. The vertical lift span is 220 feet with a 46.5-foot roadway, two 5-foot sidewalks, and an overall width of 58.5 feet. The bridge has a normal lift of 74.6 feet and a clearance for ships of 97 feet 3-5/8 inches. The emergency lift raises the bridge an additional 5 feet 4.5 inches. Wilbur J. Watson and Associates designed the bridge; Mt. Vernon Bridge Company fabricated the bridge; and Bass Construction Company erected the structure. The Western Foundation Company built the foundation. Each pier includes six 30-inch steel cylinders, each about 140 feet in length with steel batter piles and a steel sheet pile enclosure.
["Driven Cylinder Foundations Built Rapidly," Engineering News-Record 123 (October 26, 1939): 55; City of Cleveland, Files and drawings relating to various Cleveland-owned and-operated bridges, Survey Department, Cleveland, Ohio; George B. Sowers, "Three Methods for Erecting Lift Bridges," Engineering News-Record 125 (August 1, 1940): 63.]

CLEVELAND CHAMBER OF COMMERCE AND — Cleveland South
ST. LOUIS RAILROAD BRIDGE #4 — 17.441600.4593410
East of Columbus Road over Cuyahoga River

In 1937 the United States Army Corp of Engineers and the River and Harbor Committee of the Cleveland Chamber of Commerce drew up plans for an $11,000,000 project to deepen and widen the Cuyahoga River. The plans for dredging the channel and cutting down the riverbank in the river bends anticipated the increased size of river vessel accommodation from 525 feet to 600 feet. The river widening also involved extensive bridge removal and replacement of the bridges built when the channel was much narrower. Located in a substantially widened section of Collision Bend, a 1901 Cleveland Chamber of Commerce

Newburgh and South Shore Railroad Bridge, (1904)



Central Viaduct, River Section, (1878), New York, Chicago and St. Louis Railroad Viaduct runs underneath

Lorain-Carnegie Bridge, (1932); Front, Cleveland Chamber of Commerce and St. Louis Railroad Bridge #6, (1920).

Lake Erie and Wheeling Bridge, (1906) across Old River Bed

and St. Louis Railroad Scherzer Rolling Lift Bridge was designated for replacement. The channel in this area could not be dredged without disturbing the Scherzer Bridge foundations. Howard, Needles, Tammen and Bergendoff designed the 260-foot span vertical lift bridge with a normal lift of 89 feet to replace the Scherzer Bridge. Completed in 1953, the bridge received the American Institute of Steel Construction Annual Award for the most beautiful steel bridge, class IV. There are no uphaul or downhaul cables; the lift section is raised and lowered by balance chains powered by two 135-horsepower electric motors. The Mt. Vernon Bridge Company fabricated the bridge. The Federal government paid ninety percent of the construction cost, and the railroad paid the remaining ten percent. The bridge replacement and dredging increased the clear channel from 110 feet to 200 feet.
[Clifford F. Hood, The Cuyahoga River Project: A Report to the Board of Directors of the Cleveland Chamber of Commerce, (Cleveland, 1949); C. Langdon White, "After 100 Years of Vacillation Cleveland Solves Its River Problem," Annals of the Association of American Geographers 30 (September 1940): 195-209.]

BALTIMORE AND OHIO RAILROAD BRIDGE #463 Cleveland South
Near Sycamore Street over Cuyahoga River 17.441390.4593810

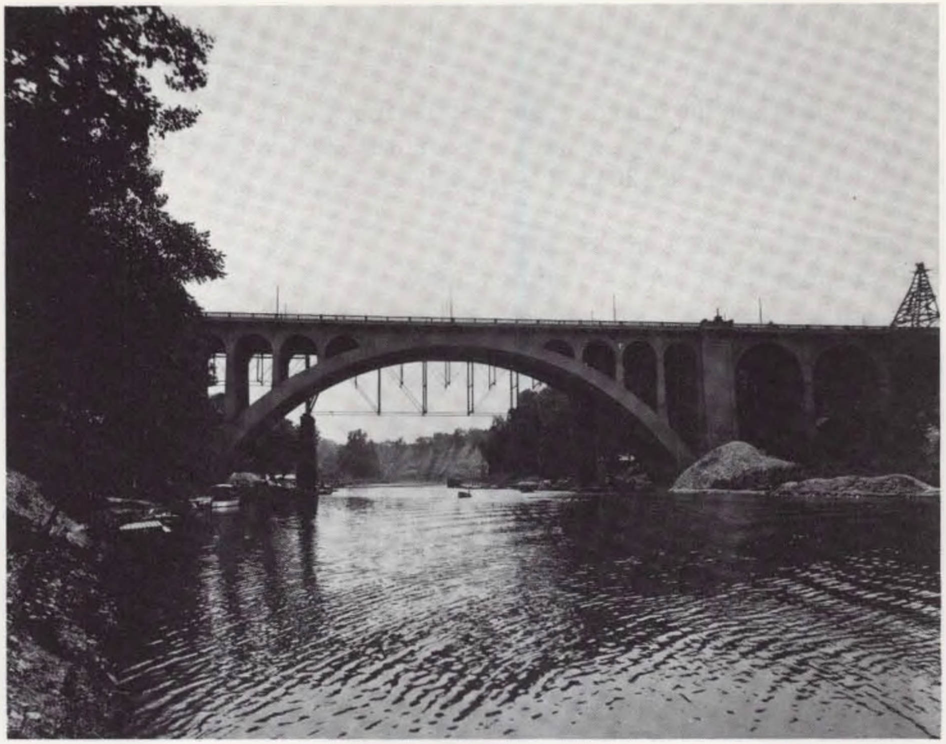
As early as 1937, the United States Army Corps of Engineers and the River and Harbor Committee of the Cleveland Chamber of Commerce drew up plans to enlarge the Cuyahoga channel and recommended the replacement of the 1911 Scherzer Electric Rolling Lift Bridge carrying the Baltimore and Ohio Railroad track over the Cuyahoga River. But in 1946, the Board of the Corps of Engineers rejected the recommendation because "the narrow and tortuous channel of the Cuyahoga" had many places with channel clearances of less than 120 feet. The Baltimore and Ohio Bridge, with a clearance of 161 feet, in the Board's opinion, was "not unreasonably obstructive to navigation." Ten years later, however, the channel at this point was enlarged from 161 feet to 231.5 feet; a single track jackknife bascule bridge replaced the 1911 bridge. The river span is approached from the west by a 55-foot tower span and from the east by a 63-foot deck plate girder span. Its main trunnion span is 255 feet (five feet short of the largest known bascule bridge built in 1919 over the Chicago River). The bridge is a 10-panel riveted Warren truss, 375 feet in its entirety. Merritt-Chapman and Scott Corporation constructed the substructure, two concrete piers with 30-inch steel caissons and 10-inch steel pipe piles. K. J. Wagoner, chief engineer of the Baltimore and Ohio Railroad, designed and planned the bridge; Hardesty and Hardesty served as the consulting engineers. The bridge is used and maintained by the Chessie system, a successor of the Baltimore and Ohio Railroad.
["Bascule Bridge Comes Close to Record," Engineering News-Record 158 (February 28, 1957): 23; Chessie System, Files relating to various Chessie System-owned and-operated bridges, Chessie System Office,

Metropolitan Building, Akron, Ohio; W. T. Christine, "Bascule Bridge, Longest of Its Type, Built Over the Chicago River," Engineering World 16 (January 1, 1920): 11-14.]

INNER BELT FREEWAY BRIDGE — Cleveland South
Interstate 71 over Cuyahoga River — 17.442370.4592750

The Inner Belt Freeway Bridge, opened in 1959, forms a portion of Cleveland's Inner Belt Highway System. It had been a tentative plan for Cleveland's highway system since the early 1940s. The 1941 condemnation and demolition of the 1888 Central Viaduct provided part of a right-of-way across the Cuyahoga River Valley. The Central Viaduct was built primarily for pedestrians, horsecarts, and streetcars although it eventually carried automobiles. Occupying a portion of the Central Viaduct right-of-way, the Inner Belt Freeway Bridge was built to accommodate 95,000 vehicles per day and served an entirely different transportation system and technology. This explains the nearly twenty-year delay in replacing the bridge. The old right-of-way helped determine the route of the Inner Belt between the lakeside highway, constructed in the 1930s and the Cuyahoga Valley crossing.

The bridge, as finally designed in the 1950s by Howard, Needles, Tammen and Bergendoff, is 4,223 feet long and 116.25 feet wide, with eight lanes and two three-foot emergency walkways. The 116.25-foot width made the bridge the widest ever constructed in Ohio. The bridge consists of 1,502 feet of plate girder approach spans and 2,721 feet of cantilever deck truss spans, ranging from 226 feet to 400 feet in length. The bridge spans the river, two highways, several roadways, the railroad tracks of four separate companies, a railroad freight station and terminal yard, a riverside sand and gravel processing plant, and several other industrial plants. The 68-foot trusses of the spans are supported on hollow reinforced concrete piers with 2.5-foot walls, resting on reinforced concrete footings and concrete piles. The bridge's single set of bearings permit expansion in two directions and rotation in all directions. Fort Pitt Bridge Works fabricated the steel members. The John Beasley Construction Company erected the superstructure.
["Cantilever Deck Truss Bridge Has Novel Bearings and Connections," Engineering News-Record 164 (February 11, 1960): 34-36, 38.]



Rocky River Bridge,(1910); In background, Old Steel Span Bridge.

Wade Park Bridge, (1899)

TINKER'S CREEK BRIDGE
Over Tinker's Creek
Bedford

Shaker Heights
17.455330.4581380

In 1864 the Cleveland and Pittsburgh Railroad replaced its wooden trestle across Tinker's Creek with a 200-foot long, 20-foot wide masonry arch bridge. The bridge carried the railroad's single track approximately 100 feet above the creekbed. The four masonry arches were each approximately 50 feet wide. In 1901 the railroad altered its line in the Tinker's Creek area, abandoning the viaduct. The new line crossed the area on a large landfill embankment which covered one arch and the lower portions of the bridge's piers. The Cleveland and Pittsburgh is one of the Cleveland area railroads consolidated into the Pennsylvania Railroad system.
[Ned Hubbell, Life in Bedford, 1813-1970, (Bedford, 1971), p. 86.]

ROCKEFELLER PARK BRIDGES
Wade Park Avenue, Superior Avenue,
St. Clair Avenue, Penn Central Railroad Bridge

Cleveland North
East Cleveland
17.448370.4596000

In 1896 John D. Rockefeller gave 273 acres of land to Cleveland to develop as a park. Rockefeller also gave $100,000 for bridging the park roads and Doan Brook; an additional $20,000 was raised for the bridges from other sources. Charles F. Schweinfurth, a prominent Cleveland architect, designed Rockefeller Park's four brick, stone, and concrete bridges which were constructed between 1897 and 1907. The style of Schweinfurth's bridges is similar to ones designed by H. H. Richardson for the Boston Park System in the 1870s and 1880s. The Wade Park Avenue Bridge is 220 feet long, 100 feet wide with an arched opening, 88 feet wide and 19.2 feet high. The bridge foundation and pylons are concrete and rest on driven piles. The arch is constructed of yellow brick and concrete; the bridge is faced with rough-hewn stone. The three other bridges are of similar engineering and design. The Superior Avenue Bridge is 145 feet long and 100 feet wide with a main arch height of 15 feet. One span passes over the road and a second span carries the road over Doan Brook. The St. Clair Avenue Bridge is 120 feet long and 100 feet wide with a main arch height of 20 feet. Two arches over the sidewalks are adjacent to the roadway arch. The Penn Central Railroad crosses through the park over the fourth Schweinfurth Bridge, a 150-foot long and 40-foot wide double-track bridge.
[Historic American Building Survey and Western Reserve Historical Society, The Architecture of Cleveland: Twelve Buildings, 1836-1912, (Cleveland, 1973), pp. 47-51; State Historic Preservation Office of Ohio, "Rockefeller Park Bridges," in Files of the National Register Of Historic Places, National Park Service, Washington, D. C.]

WARNER ROAD STONE ARCH BRIDGE
Warner Road over Mill Creek

Shaker Heights
17.447800.4588080

Completed in 1899 at a cost of about $36,000, the Warner Road Stone Arch Bridge carries Warner Road traffic over the Mill Creek. The bridge is located adjacent to the industrial and residential sections which developed in Newburgh. The bridge's overall length is 72 feet 10 inches, exclusive of wing walls; the arched span over Mill Creek is 40 feet in length with a clearance of 14.5 feet. In 1906 the sidewalks over the arch were raised to 14 feet when the roadway grade was raised. The bridge contractors were Spillacy-Mayer and Carlisle.
[City of Cleveland, Files and drawings relating to various Cleveland-owned and-operated bridges, Survey Department, City Hall, Cleveland, Ohio.]

DETROIT AVENUE BRIDGE
(Rocky River Bridge)
Detroit Avenue over Rocky River

Lakewood
17.430590.4592450

At the time of its construction, the Detroit Avenue Bridge over Rocky River was the world's longest concrete arch bridge. Developments of the concrete arch, after the 1910 completion of the bridge, led to several longer concrete arches. The Detroit Avenue Bridge, however, remains the longest American non-reinforced concrete bridge, surpassing the Walnut Lane Bridge at Philadelphia by 47 feet. The bridge is 708 feet with a concrete arch span conprising 280 feet of this length. It is a concrete, multiple, open spandrel arch structure, comprised of five 44-foot clear span approach arches,a central twin ribbed main arch plus end abutments and retaining walls. The bridge deck is approximately 95 feet above the river and carries a roadway 40 feet wide and two sidewalks eight feet wide. The bridge initially carried a double-track interurban railway and two lanes of highway traffic. Beneath the floor, centered above each main arch rib are two chambers, three feet by eleven feet, for utility pipes and cables. The central arch is similar to the Walnut Lane Bridge (1906-08), an important forerunner of long-span fixed arches in the United States, County Engineer A. M. Felgate designed the bridge; Schillinger Brothers Company erected the bridge. Wilbur J. Watson designed the steel falsework used to support the concrete molds during construction. The bridge replaced an earlier steel span bridge supported on masonry piers.
["The Construction of the Rocky River Bridge," Engineering Record 61 (January 1, 1910): 4-8; "The Stress Sheets and Some Construction Details of a 280-foot Span Rubble Arch Bridge at Cleveland, Ohio," Engineering-Contracting 31 (March 10, 1909): 184-187; A. M. Felgate, "A Triumph in Concrete," The Ohio Architect, Engineer and Builder 16 (October 1910): 47-54; Henry Grattan Tyrrell, History of Bridge Engineering, (Evanston, 1911), pp. 401-402; Wilbur J. Watson, "Steel Centering Used in the Construction of the Rocky River Bridge, Cleve-

land, Ohio," Transactions of the American Society of Civil Engineers 74 (December 1911): 1-14.]

BROOKSIDE PARK BIG CREEK BRIDGE — Cleveland South
Cleveland Zoo Grounds — 17.440080.4588630

The 1909 design of the Brookside Park Big Creek Bridge followed closely the design of the first three-hinged concrete arch bridge built in the United States. A. W. Zesiger, Cleveland's Assistant Park Commissioner, designed the first bridge of this type as a park footbridge. The bridge was removed when a culvert was installed along the creek. The Big Creek Bridge's flat, semi-elliptical arch rises four feet 1.25-inches above the pins at the abutments. The pins are located 21 feet from the inside face of the arch opening, with a pin at the center. The hinges are built up of plates, angles, steel shafting, and cast iron bearing plates embedded in concrete. The concrete railing is faced with rubblestone. W. A. Stinchcomb, Chief Engineer of the Park Commission, took part in the bridge design which is generally attributed to A. W. Zesiger.
[City of Cleveland, Files and drawings relating to various Cleveland-owned and-operated bridges, Survey Department, City Hall, Cleveland, Ohio; H. F. Hackedorn, "Three-Hinged Concrete Arch Bridge, Brookside Park, Cleveland, Ohio," Engineering News 55 (May 10, 1906): 507-508.]

SIDAWAY AVENUE FOOTBRIDGE — Cleveland South
Near Kinsman Avenue and East 70th Street — 17.446330.4592010

In 1931 Fred L. Plummer, Chief Designer for Wilbur J. Watson and Associates, designed the Sidaway Avenue Footbridge. The 680-foot bridge, built to span Kingsbury Run and the shops of the Shaker Rapid Transit between two residential neighborhoods, is Cleveland's only suspension bridge. The bridge was condemned after a 1966 fire destroyed part of the steel cable bridge's wooden deck. A terraced playing field along Kingbury Run is now used for passage between the neighborhoods.
[American Institute of Architects: Cleveland Chapter, Cleveland Architecture: 1796-1958, (New York, 1958), p. 56.]

LORAIN ROAD VIADUCT — Lakewood
Lorain Road over Rocky River — 17.431109.4589000

The 1935 Lorain Road Viaduct is a 1,260.9-foot long open-spandrel steel arch viaduct. Two of the bridge's four parabolic, two-hinged steel arches are 256 feet in width; the two unsymmetrical end spans are about 237 feet in length. The viaduct carries a 40-foot roadway and two five-foot sidewalks 130 feet above the Rocky River. The uniform plate girder arch ribs carry vertical posts without diagonal bracing. Twenty-six 34-foot long butt-welded joints connect the bridge. Cleveland's Lincoln Electric Company manufactured the shielded arc

equipment used in constructing the bridge. The butt welds largely replaced rivets in the construction; the rivets employed were countersunk. Ohio State Highway Department bridge engineers, J. R. Burkey, Chief Engineer, and W. H. Rabe, Chief Designer, designed the bridge. The bridge which has the appearance of a concrete structure won the 1935 first prize awarded by the American Institute of Steel Construction in the under $1,000,000 class.
["New Cleveland Bridge Will Be Steel But Its Appearance Suggests Concrete," Steel 97 (July 29, 1935): 15; Wilbur J. Watson, A Decade of Bridges: 1926-1936, (Greenville, 1937), pp. 16-17.]

EAST 222ND STREET UNDERPASS — East Cleveland
Norfolk and Western Railway over East 222nd Street — 17.456090.4602940
Euclid

The 1959 elimination of the East 222nd Street at grade crossing of the Norfolk and Western Railway in Euclid, Ohio resulted in the construction of the first welded rigid frame bridge built in the United States. The bridge consists of three parallel single spans; the center span carries the main Norfolk and Western east-west traffic on two tracks; the adjacent spans carry single track industrial spur lines and a four-foot four-inch sidewalk with a steel railing. The structural steel elements are made up of a series of parallel welded steel ribs spanning 91 feet 4.25-inches. The composite reinforced concrete deck covers the frames. Alloy steel reduced the weight of the sections and the amount of welding work. Cuyahoga County and the City of Euclid each paid 42.5 percent of the $1,600,000 cost; the railroad paid the remaining 15 percent. Osborn Engineering Company, in consultation with county and railroad engineers, designed the bridge. The National Engineering and Contracting Company constructed the bridge.
[R. T. Blewitt and H. T. Borton, "Conception, Design and Fabrication of a Welded Rigid-Frame Railroad Bridge," Welding Journal 39 (June 1960): 577-583.]

CLEVELAND STORAGE COMPANY
1944 Scranton Avenue

Cleveland South
17.441980.4593260

In 1884, to serve the storage and transshipment needs of the rapidly industrializing Flats area, the Cleveland Storage Company constructed a four-story, brick and wood beam warehouse, 180 feet by 120 feet, designed by J. S. Watterson. The warehouse's Scranton Avenue site had easy access to the Cuyahoga River, as well as three railroad lines, Cleveland Chamber of Commerce and St. Louis, Lake Shore and Michigan Southern, and the Erie Railroad. An 1884 advertisement stated, "We call your attention to the advantages offered by our warehouse... especially to that large class of merchants to whom it is an advantage to have a stock of goods in this city from which to supply all small orders in broken lots, or for quick delivery to any desired point. We are prepared to receive pig iron, iron ore, copper, lumber, dry goods, canned goods, household goods, ..." The warehouse also had a large cold storage capacity for storing fruit, butter, eggs, and other perishable goods. In 1890 the warehouse expanded. J. S. Watterson designed a two-story brick and wood-beam building, 47 feet by 200 feet, which had three additional stories added in 1895. In 1895 a two-story building, 94 feet by 43 feet, was added. The buildings are used for storage today. The cold storage area no longer exists.
[Cleveland City Directory: 1884-1885 14 (Cleveland, 1884): 129.]

FOREST CITY BREWING COMPANY
(Distributors Furniture Warehouse)
6920 Union Avenue

Cleveland South
17.446530.4590140

A large brick and concrete building of castellated design, the Forest City Brewery is the best-preserved of Cleveland's few extant brewery structures. Cleveland's large population of German and other middle and eastern European immigrants supported two dozen breweries by the turn of the century. The Forest City Brewing Company was formed by Czech-Americans in 1904. The brewery produced light Bohemian Pilsener beer until Prohibition when the operation shifted to bottling soft drinks and manufacturing ice. The building consists of a series of units: a five-story tier on the street front, diminishing to four stories at the rear; a two-story block to the east with a cylindrical brick chimney; and a three-story utility unit behind it. The structure reflects the necessities of brewing beer. The height was needed for processes based on gravity flow, assisted by pumping and hoisting. The horizontal extensions contained power, heating, and refrigerating equipment, and bottling and loading facilities. The bottling plant closed in 1930 and the building is now used as a furniture warehouse. None of the brewing equipment or machinery remains.

HESSLER COURT WOODEN PAVEMENT
Hessler Court

East Cleveland
17.449460.4595440

In 1870 Cleveland had 10.5 miles of stone pavement and 8.75 miles of wooden block pavement. During the 1880s wooden pavements were replaced with Medina sandstone. Hessler Court was platted in 1906 and the wooden block pavement presumably dates from this time. The pavement covers an area 275 feet long and 19.5 feet wide. The end grain of the blocks, about 4.5-inches by nine inches, forms the surface of the pavement -- an estimated 19,000 blocks. The Hessler Court pavement is the only known wooden block pavement to survive on a Cleveland street; wooden block floors remain in a number of Cleveland industrial plants, including parts of the Fisher Body Company plant. Portions of the Hessler Court pavement have been repaired with concrete and asphalt, but 95 percent of the original paving is intact.
[Rose, Cleveland, pp. 371,432,489,953.]

WEST SIDE MARKET HOUSE
Lorain Avenue and 25th Street

Cleveland South
17.441300.4592570

Opened in 1912, the present West Side Market House is Cleveland's only remaining municipal market. The Cleveland architectural firm of Hubbell and Benes originally designed the market house and a 5,000-seat public auditorium for the site. When objections arose over the inappropriateness of a market area for an auditorium and the congestion it would cause, the designers dropped the auditorium plan. The brick and stone market house is 241 feet by 124 feet and is 44 feet high. Adjacent to the market house is a long protective shed for the open-air fruit and vegetable stands. The market's vaulted double ceiling, reinforced by five great arches, lighted by two rows of monitor windows, is one of the greatest column-free interiors in Ohio. The 137-foot high clock tower originally served as a water tower. The steel water-tank was scrapped during the 1940s. A million-dollar modernization program between 1952 and 1954 replaced much of the old mechanical equipment. The original coal-fired boiler was replaced with three Bryan Copper tube boilers. The hydraulic elevators were replaced. The engines and compressors which cooled the basement's 144,000 cubic foot refrigeration plant were replaced with separate electrical compressors for each storage locker.
["Cleveland West Side Market House," Brickbuilder 25 (January 1916), plates 6-7; Richard Campen, Ohio: An Architectural Portrait, (Chagrin Falls, 1973), p. 284; Cleveland Chamber of Commerce, "Report of the Municipal Committee on the West Side Market House, Auditorium, Etc.," in Reports and Addresses: 1906, (Cleveland, 1906).]

CLEVELAND MUNICIPAL AIRPORT
Berea Airport Freeway
Brook Park

Lakewood
17.429840.4584550

With the initiation of the United States Air Mail service in 1918,

Cleveland became a strategic point in the coast-to-coast air and rail transfer route. In 1924 the first all air coast-to-coast mail service began, but Cleveland's inadequate airport facilities threatened to deprive the city of its air mail station. In 1925, the Cleveland City Council voted a $1,250,000 bond issue for the construction of the first municipal airport in the United States. Major John Berry designed and laid out a 1,000-acre site on the city's edge. The construction consisted of grading the field for drainage. There were no runways in the early airport -- the entire field was used as a landing surface. The airport opened July 1, 1925. In the next few years, $750,000 was spent by Cleveland and private companies for further improvement and for the original airport buildings. An extensive reconstruction project, 1952-1956, included the demolition of the original administration building and the twelve original hangars. Among the demolished hangar buildings was one designed by the Austin Company, 125 feet by 200 feet with a 20-foot clearance; completed in 1929, the hangar was the second-largest cantilever truss hangar in the United States. The airport's 1929 observation tower was the first airport observation tower in the world and the Cleveland Municipal Airport was the first American airport to have radio communications with pilots to advise them of wind, air traffic, and field conditions. Radio equipment and the 1/2 billion candle power arc type flood light are part of the Smithsonian Institution collection. The oldest remaining equipment is the green and white airport beacon installed in the late 1930s.
["Cleveland Improves Airport During Past Year," Airway Age 10 (August 1929): 1198-1201; "Development and Operation of Cleveland's Airport," Airway Age 9 (August 1928): 14-17; Jay Marton, "Cleveland's Municipal Airport," National Municipal Review 15 (September 1926): 510-514.]

OHIO AND ERIE CANAL: VALLEY VIEW SECTION — Shaker Heights
Adjacent to Canal Road — Northfield
17.447510.4582420

In the early nineteenth century, canal connections to Cleveland combined with advantageous geographical features -- such as its level lakefront site -- to shape the city's commercial and industrial growth. Completed in 1825, New York's Erie Canal gave Cleveland water access across Lake Erie to New York City and other eastern markets. The Pennsylvania and Ohio Canal, connecting Pittsburgh with Cleveland, was completed in 1839. The Ohio and Erie Canal was proposed and discussed as early as 1816. Actual construction of the canal began in 1825. In 1827 a construction crew of from 1,500 to 2,000 men completed the first section between Cleveland and Akron; in 1832 the entire 308-mile route opened between Cleveland on Lake Erie and Portsmouth on the Ohio River. As Cleveland's primary inland transportation, canals stimulated the growth of population, the establishment of towns, the expansion of trade and commerce, and the rise of land values.

As well as serving local needs, Cleveland merchants at the terminus of the Ohio and Erie Canal, exported agricultural goods and raw materials from the interior to eastern markets and operated as the regional distributors for manufactured goods. Many early Cleveland industries depended upon unprocessed agricultural and raw materials arriving in the city via canals and the Great Lakes. Cleveland's Alfred Kelley, an Ohio Canal Commissioner, helped obtain the state legislature's approval and funding for the Ohio and Erie Canal. New York Governor DeWitt Clinton, convinced of the financial soundness of the Erie Canal, was instrumental in obtaining financing for the Ohio Canal. Several canal engineers who had worked on the Erie Canal, including James Teddes and William H. Price, worked on the design and construction of the Ohio and Erie Canal.

The 308-mile course of the canal included 148 locks and 14 aqueducts. The first 37-mile section between Cleveland and Akron included 41 locks and three aqueducts. Use of the Ohio Canal peaked in 1851, then declined as railroads expanded. The canal functioned with a declining significance to the local economy into the twentieth century. Today about one-third of the Cleveland-Akron section contains water; much of the remainder is dry, but the course is still apparent. The section of the canal within Cleveland has nearly been buried beneath expanding railroad and industrial operations. The section of the canal water starts south of the American Steel and Wire Company; Cuyahoga Works which draws water from the canal for use in its steel plant. The best preserved section of canal runs adjacent to Canal Road from Rockside Road to within Valley View Village. The section includes three locks in disrepair and the aqueduct and sluice over Tinkers Creek. In 1905 the original wooden supports for the wooden sluice were replaced with steel supports. The original sandstone block columns remain. The locks in this section were repaired before 1905 with cement which obscured the original sandstone block construction. The Wilson Feed Mill is located adjacent to Lock #37 and a house which served the canal as a store and inn is adjacent to Lock #38.

[Edmund H. Chapman, Cleveland: Village to Metropolis, (Cleveland, 1964), pp. 36-37; G. W. Dial, "The Construction of the Ohio Canals," Ohio Archeological and Historical Society Publications 13 (1904): 460-482; United States Department of the Interior: National Park Service, "Ohio and Erie Canal, Ohio," Files of The National Survey of Historic Sites and Buildings, Washington, D. C.; Frank Wilcox, The Ohio Canals, ed. William A. McGill (Kent, 1969), pp. 34-60.]

CLEVELAND OUTER HARBOR BREAKWATER	Cleveland South
In Lake Erie on Cleveland lakefront	Cleveland North
	17.440260.4595000

During Cleveland's first eighty years the city's major commercial and industrial operations concentrated in the Cuyahoga River Valley. Along the riverbank the loading and unloading of ships was protected from the winds and waves of Cleveland's lakefront. The

United States Congress River and Harbor Act of March 3, 1875 authorized the United States Army Corps of Engineers to design and build a breakwater along the lakefront. The construction of a breakwater was intended to substantially expand Cleveland's protected harbor and port facilities. Accommodating docks and waterborne commerce along the protected lakefront promised to free some Cleveland shipping from the crowded river channel, congested by other ships and many bridges. The 3,130-foot shore arm and the 4,030-foot lake arm of the west breakwater was completed in 1884. The breakwater consisted of stone-filled timber cribs, 50 feet long and 32 feet wide, resting on a riprap stone foundation in 16 feet of water. The crib timbers were all 12-inches square and connected with iron drift bolts 1.25-inches in diameter and 30-inches long. The west breakwater below the water level remains intact.

The original stone-filled timber superstructure, eight feet above the mean lake level, and the 3,530-foot timber parapet on the lakeward arm, four feet high and 16 feet wide, were replaced with a concrete superstructure between 1898 and 1907. The new concrete superstructure consisted of blocks ten feet long, four feet high, and 3.5 feet to four feet high. The space between the blocks was leveled off and planked over at mean lake level and covered to a height of five feet with blocks 30 feet wide, alternating 20 feet to 30 feet in length. A concrete parapet five feet high and ten feet wide on top and 13 feet wide at the base, tops the breakwater. In 1895 a 200-foot gap in the west breakwater was made to allow for river industrial waste and sewerage to circulate into the lake.

In 1910 the Pennsylvania Railway's landfill and ore dock construction project on the north side of Whiskey Island made the railroad one of the main beneficiaries of the west breakwater construction. The protected harbor gave the railroad and Cleveland one of the most accessible and efficient ore docks on the Great Lakes. The construction of the east breakwater commenced in 1885 but progressed much more slowly than the west breakwater construction. By 1900 the east, stone-filled, timber crib breakwater extended 3,300 feet east from the harbor entrance. Between 1917 and 1926 the stone superstructure replaced the stone-filled crib superstructure along the first 3,300 feet of the east breakwater. The June 13, 1902 River and Harbor Act authorized the extension of the east breakwater to the city limit. Between 1903 and 1915 a 17,970-foot rubble mound breakwater extension was completed along the lakefront. The new main entrance to the harbor was constructed from 1904-1908; two 1,250-foot long rubble mound breakwater arms branched from the main breakwater, 700 feet on each side of the opening, and converged at pierheads 700 feet apart and 1,000 feet lakeward from the main breakwater. The harbor line of the east breakwater is 2,000 feet wide for the first two-miles, increasing to 2,432 feet wide at the easterly end. Limestone from Kellys Island 60 miles west of Cleveland and sandstone from Amherst, Ohio, 32 miles from Cleveland, were used in the construction of the rubble mound portions of the breakwater.

[James H. Cassidy, "Cleveland's Greater Harbor: The Cuyahoga Valley," Journal of the Cleveland Engineering Society 2 (September 1909): 20-24; Civil Engineers Club of Cleveland, Visitors' Directory to the Engineering Works and Industries of Cleveland,Ohio, (Cleveland, 1893), p. 10; United States Army Corps of Engineers, "Cleveland Harbor Improvements," Files in the Buffalo District Office, Buffalo, New York; War Department, Corps of Engineers, United States Army and United States Shipping Board, Lake Series No. 5: The Port of Cleveland, Ohio, (Washington, 1932).]

COLLINWOOD RAILROAD YARD COAL TIPPLE — East Cleveland
Between East 146th Street and East 152nd Street — 17.451720.4601160

In 1903 the New York Central Railroad established a repair shop and railroad yard in Collinwood, Ohio, later annexed by Cleveland. The yard's reinforced concrete coal tipple, built around 1920, hoisted coal out of railroad cars and into storage bins supported by columns over railroad tracks. The steam locomotive's tender was driven on the track beneath the storage bin and received coal through gravity chutes. The small tower at the top of the coal tipple housed the hoisting equipment used to raise the coal to the top of the storage bins. The transition from steam to diesel and electric power ended the use of the Collinwood Yard's coal tipple. The yard's roundhouse, machine shop, and coal bunker are no longer extant.

HAER INVENTORY

BULK:KILN: Coke (11.6)
BULK:METAL: Steel Works-Rolling Mill (14.2)
BULK:STORAGE/MATH:Cargo: Ore Handling Equipment (84.4)
PS & PM:STEAM: Mesta Twin Tandem (40.1)

1. NAME OF STRUCTURE (Republic Steel Co.) CORRIGAN, MCKINNEY & CO.

2. DATE 1909-1916

3. NATURE OF STRUCTURE Integrated Steel Works

5. LOCATION: STREET & NUMBER 3100 East 45th Street — CITY OR TOWN Cleveland — COUNTY Cuyahoga — STATE OHIO

6. USGS QUAD MAP & UTM GRID REF 17:444400:4591325

7. OWNER OF PROPERTY — ADDRESS Republic Steel Corp., Republic Building, Cleveland, Ohio

8. CONDITION: EXCELLENT x GOOD FAIR DETERIORATED RUINS UNEXPOSED x ALTERED ACCESSIBLE TO PUBLIC

9. DESCRIPTION & BACKGROUND HISTORY: NUMBER OF STRUCTURES, DIMENSIONS, FABRIC, STRUCTURE & FORM, SURVIVING MACHINERY, FITTINGS AND EQUIPMENT, APPROX. AREA OF SITE, ALTERATIONS, PRESENT USE, ENGINEER, ARCHITECT, DESIGNER, IMPORTANT EVENTS & INDIVIDUALS

In 1910-1912 the Corrigan, McKinney & Co. iron and ore merchants built a blast furnace plant with two stacks along the Cuyahoga River to produce merchant pig iron under the name of the River Furnace Co.. From this start the Corrigan, McKinney & Co. and its 1935 successor, the Republic Steel Corp., expanded its operations to include an integrated steel making plant and is today among the largest basic steelmaking plants in Ohio, covering 798 acres of the Cuyahoga River Valley. From 1913-1916 Corrigan, McKinney & Co. built a seventeen building steel plant as well as two additional blast furnaces and a coke plant. H.T. Harrison, of the Corrigan, McKinney & Co., and the engineering department designed the entire facility. The original plant contained a 40" reversing blooming mill, a 21" four-stand and an 18" six-stand continuous sheet bar and billet mill all of which have been replaced. The brick, steel, and concrete blooming mill building, 85' x 700' remains. The 46" x 76" x 60" Mesta twin-tandem compound single lever control reversing engine with a rated capacity of 35,000 hp drove the original 40" reversing blooming mill and today drives the plant's modern 44" blooming mill. The Mesta was a duplicate of an earlier engine installed at the Youngstown Sheet & Tube Co. and is the only one of three

10. PHOTOGRAPHS & SKETCH MAP ON REVERSE SIDE

11. RELATED SOURCES OF INFORMATION: HISTORICAL REFERENCES (PUBLISHED ARTICLES, MANUSCRIPTS, REPORTS, DRAWINGS, PHOTOGRAPHIC RECORDS) CONTACTS (NAMES & ADDRESSES OF ANYONE WITH EYE-WITNESS ACCOUNTS OR RELEVANT INFORMATION), TAPE RECORDINGS

"The Corrigan, McKinney New Steel Plant," Iron Age, v. 100, (November 15, 1917), 1180-1186.

Republic Steel Corp., Cleveland District Plants, Cleveland, n.p., 1937.

12. DANGER OF DEMOLITION OR DAMAGE: YES x NO — NATURE OF THREAT:

13. PRIORITY 2

14. EXISTING SURVEYS AND DATES: NHL NR HAER HABS STATE COUNTY LOCAL OTHER

15. INVENTORIED BY: YOUR NAME Daniel M. Bluestone — ADDRESS — AFFILIATION HAER — DATE July, 1976

ever built still in operation. The 1916 coke plant included 204 Kopper ovens with 12-1/2-ton capacities. The coke plants four oven batteries have been entirely replaced and the only remaining equipment is a Brownhoist Coal Handling Bridge with a 200' span. All twelve original open-hearth furnaces have been replaced, the plant presently operates primarily basic oxygen furnaces. When completed in 1916 the blast furnace plant included four blast furnaces all of which have been entirely replaced. The blast furnace ore dock still operated two of the three original Hulett automatic unloaders (1910-1911), with 10-ton bucket capacity and one of the two 1916 Brownhoist Ore Bridges with a 375' span and a 10-ton capacity bucket. The brick, steel frame, and reinforced concrete power house, 76' x 408' x 127' supplied power for practically the entire original plant. Idle but in place are the original 832 hp Stirling Boilers with Green automatic chain grate stokers and three 3,000 hp Mesta horizontal cross compound non-condensing engines. Many of the plants original buildings, as well as, the mill buildings added in 1926-1928 remain intact. With the exception of a 1927 Morgan 10" Billet Mill no old mill equipment remains. There are several overhead travelling cranes installed from 1916 to 1927 in the plant's buildings with capacities from 15 to 30 tons. The four story brick and reinforced concrete office building, 261' x 60' was designed in 1924 by architects Walker & Weeks. The plants machine shop contains several lathes, grinders, presses, shears, bolt cutters, and hammers dating between 1916 and 1927. After 1937 as the plant expanded it moved into adjacent land to the southwest along the river and includes additional coke ovens, blast furnaces, ore handling and mill plants.

ILLUSTRATION CREDITS

Page

vi (Top) Detail of Shober and Carqueville "Birds Eye View of Cleveland, Ohio in 1877," Library of Congress.
(Bottom) City of Cleveland.

4 Library of Congress.

5 Library of Congress.

10 Library of Congress.

14 (Top) Ore Dock of American Steel and Wire Company, c. 1910, Library of Congress.
(Bottom) Ore Dock and Harbor, 1901, Library of Congress.

16 (Top) Corrigan Ore Dock, HAER Inventory Photo, Daniel M. Bluestone, 1976.
(Bottom) Otis Ore Dock, HAER Inventory Photo, Daniel M. Bluestone, 1976.

17 Pennsylvania Ore Dock, City of Cleveland, M. Thomas, 1977.

22 (Top) Ferry Cap, City of Cleveland, M. Thomas, 1977.
(Bottom) Wellman-Seaver-Morgan, HAER Inventory Photo, Daniel M. Bluestone, 1976.

23 (Top) Division Avenue, HAER Collection, Eric Delony, 1974.
(Bottom) Mesta, Republic Steel Corporation, 1975.

26 Library of Congress.

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32 (Top) Peerless, HABS Collection, Library of Congress.
(Bottom) Fisher, HAER Inventory Photo, Daniel M. Bluestone.

33 (Top) Central Furnace, HAER Inventory Photo, Daniel M. Bluestone.
(Center) National, HAER Inventory Photo, Daniel M. Bluestone.
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56 (Top) Cleveland, HAER Inventory Photo, Daniel M. Bluestone, 1976.
(Bottom) Walker, City of Cleveland, M. Thomas, 1977.

57 (Top) Upson, HAER Inventory Photo, Daniel M. Bluestone, 1976.
(Bottom) Black, HAER Inventory Photo, Daniel M. Bluestone, 1976.

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66 (Top) Brush, HAER Inventory Photo, Daniel M. Bluestone, 1976.
(Center) Brush, HAER Inventory Photo, Daniel M. Bluestone, 1976.
(Bottom) Upson, HAER Inventory Photo, Daniel M. Bluestone, 1976.

67 (Top) Civil Engineers Club of Cleveland, Visitors' Directory to the Engineering Works and Industries of Cleveland, Ohio (Cleveland, 1893).
(Bottom) Cleveland, HAER Inventory Photo, Daniel M. Bluestone, 1976.

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76 (Top) West Breakwater, c. 1900, Library of Congress.
(Bottom) Interior, Baldwin Reservoir, 1922, City of Cleveland.

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88 (Top) Detroit-Superior Bridge, 1916, Library of Congress.
(Bottom) Superior Avenue Viaduct, 1908, Library of Congress.

89 (Bottom) Superior Avenue Viaduct, Library of Congress.

94 (Top) Scherzer Rolling Lift Bridge Company, Catalogue: 1908, Chicago, 1908.
(Bottom) Central Viaduct, c. 1910, Library of Congress.

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95 (Top) Lorain-Carnegie Bridge, Ohio State Historic Preservation Office, E. Johannesen, 1975.
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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U. S. administration.

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