THE 19th CENTURY GLASS INDUSTRY IN NORTHEASTERN OHIO

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The chronicle of the glass industry in 19th century northeastern Ohio is the story of the development of manufacturing technology and factory organization. This will be shown by the glass industry's role in the social, economic, and industrial development of the local area. The industry can be conveniently divided into three periods: one, frontier efforts of the 1820's; two, incorporated factories from 1849 through 1880; and three, from 1880 to 1900, sustained industrialization. Events of the transition from the first period to the second period will be the major concern of this paper.

Initially, the factories were supportive and subordinate to agricultural activity. The investigation will show the transformation from craft workshop technology to a developed factory system. These events can be demonstrated by an examination of natural resources, capital, technology, labor, market, and product.

On the national level, the glass industry followed trends of the American economy. Eighteenth century glass efforts were frustrated by lack of capital, limited skilled labor, and foreign imports, yet some factories achieved moderate success. The War of 1812 stimulated American manufacturing, including the glass industry. By the early 19th century, glassmaking centers were located in New York, New Jersey, New England, and Pittsburgh. At least 44 glass factories were started in the United States between 1808 and 1814. By 1819, at least half of the glass factories had failed, largely because of events brought on by the panic of 1818-1819. After the war British goods flowed into the country. Bounties paid to exporting manufacturers by the British government effectively nullified American tariffs. For the glass industry, "The loss of foreign trade, a completely disordered currency, and over-expansion of business credit ..." was more than most factories could handle.

During this period, northern Ohio was a frontier manifesting the economic and social norms associated with frontier areas: i.e., economic isolation, poor transportation, low income farming, and small scale merchants. Production activities included distilleries, sawmills, gristmills, blacksmiths, tanneries, and cheese factories. Often these activities were operated by individuals who also pursued farming activities.

Transportation was the major impediment to economic development. Unprocessed farm goods were difficult to transport without spoilage and the high cost of transportation effectively reduced trade with other regions, thus processed and less perishable agricultural goods such as cheese and whiskey were produced. Referring to an early account book, The History of Portage County comments: "To judge from the daily consumption of whiskey, it was pre-eminently the 'staff of life,' there being scarcely an account against a white or Indian, male or female, of which it does not form a large proportion."

It was not until the opening of the Ohio canal in 1827 between Cleveland and Akron, and its final completion in 1832, that the area opened to extensive economic and commercial development.

In the pre-canal period, a number of glass factories located in northeast-
ern Ohio. The area would seem to have offered little incentive for the manufacture of glass, yet by an examination of individual factories, an overall pattern is established which suggests the intimate ties between the isolated farming community and the manufacture of glass.

The glass industry in Ohio is necessarily a footnote to the innovative and extensive Pittsburgh area factories. Pittsburgh's flint glassware was hailed as the finest in America and rivaled European products. Pittsburgh's location on trade routes allowed its goods to be used from Maine to Mexico. Zenas Kent, a Portage County merchant, bought and sold Pittsburgh window glass and tableware in 1818. Indeed, Pittsburgh men started Ohio's first recorded glassworks in 1814 in Cincinnati. Other establishments followed, the most notable and extensive of which was located in Zanesville in 1815.

In northeastern Ohio there are five factories on which information is available: Palmer and Clark, New Portage (near present-day Barberton), 1821?; The Mantua Glass Works, 1821-1829; Woodward, Hopkins and Ladd, Kent, 1823-1832; the Franklin Glass Works, Kent, 1824-1832. Samuel Pollack is reported to have started a factory in Painesville in 1825.

Available information on the first known factory at New Portage is found in History of Summit County, which provides important material on factory operation:

A glass-house was started by Palmer . . . in a large barn like structure, with a stack or furnace in the center.

His pots and molds were brought from Zanesville, Ohio.

Sand was produced by pounding sand stone in a huge trough, the pounding or crushing being done by spring pole and pestle.

Black salt was made at many places thro the new country where ashes were plenty from log heaps that were burned by thousands in all directions. Wood was used for fuel for smelting the sand . . . At first six blowers were employed, but, afterwards the shop was enlarged and eight were employed. Sand of good quality was found in the marshes of Coventry about the time of this enlargement and it was used from this time on. But the business proved a failure . . . "

This quotation provides the most complete description uncovered on the operation of an early local glass factory.
The other factories of the period operated in a manner similar to the factory at New Portage. The scale of these first factories is indicated in the United States census report of manufacturing in 1820. A small window and green glass factory in Cincinnati reported capital assets at $25,000, employed ten blowers and a total of twenty-one men and ten boys and girls, and produced $19,000 worth of ware. The establishment suffered due to foreign imports. These figures are probably typical of the factories in northern Ohio.

A manuscript history of Mantua by Orrin Harmon gives details of the Manuta Glass factory and provides information on David Ladd, an important figure in Portage County glass manufacture. David Ladd was a store clerk from Connecticut. He arrived in Mantua in 1816 with various family members and apparently sold dry goods for a time. In 1818, Ladd purchased milk cows, produced cheese and boated down the Cuyahoga, Tuscarawas, and Muskingum rivers, passing through New Portage, to find a suitable market for his goods. In 1821, Ladd made bricks and converted his brother's tannery into a bottle glass factory. Ladd stayed at the factory for two years, then went to Franklin (present-day Kent), and built another factory. The Mantua Glass Works continued under various management until 1829.

Ladd's factory in Kent was in association with Joshua Woodward and Benjamin Hopkins. Besides the glass factory they built a tannery, two woolen mills, a sawmill, an anvil mill, (Porbably a trip-hammer blacksmith shop), an ashery, and opened a store. Ladd's enterprising activities (he was referred to as a "yankee") are manifested in the variety of holdings. It should be noted that all these businesses dealt with farm products or supplied farm and home services.

Located a few miles north of the Woodward, Hopkins and Ladd glass works was the Franklin Glass Works of James H. Edmunds. This factory was of similar scale and nature to other area factories. The site was excavated by a team of Case Western Reserve University archaeologists in 1968 and 1969 under the direction of David S. Brose. George L. Miller, the field archaeologist, has completed a study of the history of the factory, published in the Glass Club Bulletin, which provides important details about the factory's conception and operation which will be useful in the following examination of the economic and technological reasons the Franklin Glassworks located in northeastern Ohio and of their relationship with agricultural interests of the community.

Factors influencing the location of the factories in northeastern Ohio included the economic and labor situation. Idled workers from the eastern factories which had closed following the War of 1812 could locate in Ohio, which was isolated from cheap imports due to the poor transportation system. Also, Ohio encouraged the glass industry by exempting factories from taxes.

Portage County area's natural resources included most of the necessary material to produce glass. The New Portage factory used both crushed sandstone and beach sand. "Near Kent certain layers of the conglomerate [sandstone] [had] been found which [were] white enough to serve for the manufacture of glass." Lime, an ingredient used in the composition of glass, was found in many areas of Portage County. Other locally available material included refractory clay, common brick clay, and firestone, a type of heat-resisting sandstone, all of which were necessary for the construction of ovens and furnaces used in glass manufacture.
Portage County was abundantly supplied with wood, which, as previously noted, supplied fuel for ovens and furnaces and also was the source of wood ash and wood ash products used in glass batch. The complementary relationship between agricultural interests and glassmaking becomes evident with an examination of wood supply, land investment and capital.

During the second decade of the nineteenth century, "investment in western lands had been stimulated by high prices brought by agricultural staples during the War of 1812 and the sustained demand during the post-war period." The panic of 1818–1819 forced agricultural prices down, and farmers and land speculators were hard pressed to make payments. The situation in northeastern Ohio was complicated by vast areas covered with forest which depressed the value of the land. A possible solution to clearing land profitably was suggested in A Statement of the Arts and Manufactures of the United States for the Year 1818:

Wood fuel and consequently alkaline salts are to be procured with a profit, because the land from which a glass manufacturer or potter should take them would be greatly increased in value, by the removal of the wood.

George L. Miller's intensive study of the relationship between the operators of the Franklin Glass Works and the owners of the glass works property indicates the owners were easterners who invested in vast areas of land in Franklin Township. Large lots were purchased, and small amounts of land were sold to settlers. The information Miller uncovered indicates that the owners of the property had a recongized relationship or agreement with the Franklin Glass Works. The evidence supports the claim that local owners of glass works, or glass works property, were speculating on the increased value of cleared land.

This beneficial relationship between land speculators and glass factories also held value for farmers of similar wooded lots. They could provide fuel and potash to glass works in exchange for goods or payment, and clear their land in the process. Miller suggests the possibility that Christian Cackler, an early settler and farmer, performed just such an arrangement with the Franklin Glass Works. The manufacture of potash was another activity that produced a marketable product to glass factories. An ashery was located in Mantua Center, about four miles from the Mantua Glass Works, from 1818 to about 1828. The closing date is very close to the closing of the glass factory, although no association between them can be documented. It has been noted that David Ladd's enterprises in Kent included an ashery; unfortunately no notices were found in local newspapers of glass factories soliciting wood and ashes. Perhaps this suggests a ready supply in the local area where chopping cord wood and burning were common farming activities.

The seasonal operation of these factories, usually producing in spring and fall, gave workers a chance to gather supplies, repair equipment, market...
ware, and allowed some farming activity. Farm equipment and goods were sold from the Franklin Glass Works by order of the Commissioner of Insolvents. It is impossible to determine the extent of farming activities that might have been carried on by the glassworkers, but again, an association with agriculture is documented.

The products of these factories, primarily bottles and flasks, were useful to the agrarian community. Whiskey, as previously noted, was important to early settlers. It was not only a means of preserving farm produce, but was also a medium of exchange, and was one of the few diversions to the hardships of pioneer life. Large globular shaped bottles found use as storage or shipping containers, while the smaller pocket flask was convenient for carrying a personal supply of the 'staff of life'. Table glass, including salts, sugar bowls, pitchers, bowls and decanters, offered a touch of refinement to the early home.

The organization of production and the technology employed in producing the bottles and other ware was quite basic. Employing a minimum number of workers, these factories probably used an equal amount of skilled and unskilled labor. Division of labor had to be quite limited due to the small scale of operation. Standardization of the product line to a uniform size and shape depended on the skill of the blower. Full sized molds were used for one known style of flask, embellished with Masonic symbols and a portrait of Andrew Jackson, and for two known styles of decanters. Examination of artifacts recovered from the archaeological digs at Mantua and Franklin proves that both wooden molds and pattern molds were used. These types of molds would not produce a final sized piece. The skill of the blower determined the final form and size. Obviously these small factories were not modern establishments, even for the early 19th century. Actually they were more closely related to the German 'Forest Glass' factories of 15th and 16th century Germany than to nearby and contemporary Pittsburgh factories. Indeed, these Ohio and other midwestern factories, serving an isolated region with products, were probably the last instance of this type and scale of operation in the United States.

Changing social, cultural, technological, and economic conditions spelled the end to this first generation of factories. With the opening of the canal, more fashionable ware, produced by advanced technology, flowed into the area. Land was rapidly being cleared, and wood, the catalyst between agriculture and glass manufacturing, was less available. Capital investment was wooed to more profitable ventures. These and other factors led to the closing of the last early factory about 1833.

From about 1833 to 1849 glassmaking in the Western Reserve appears to have ceased. In general, national industries were emerging into a major era in which technology and machines would have prime importance. Simple partnership craft workshops were being replaced by capitalistic factories as the major producers of goods.

American technology rapidly developed heavy industries such as foundries, railroads, and steam engines. Industry relied on coal, not wood, as the major fuel. Heavy industries aided light industries such as textiles, arms, and glass by providing efficient transportation systems, power, and machines. The factory systems and the railroad gave rise to cities and towns, center of commerce and industry. This was true not only for large regional cities such as Chicago
and Pittsburgh, but also for local centers of business and commerce such as Kent and Ravenna.

Railroads were built through Kent in the mid-19th century. Prior to the railroad, Kent benefited by its location on the Cuyahoga River and Ohio Canal, which provided water power for early industries such as those previously cited of Woodward, Hopkins and Ladd. In 1832, Ladd and Zenas Kent purchased extensive properties, including water power rights of the Cuyahoga. Ladd was bought out by Kent in the following year. In 1836, The Franklin Land Company purchased Kent's property with the intent of manufacturing silk. Zenas Kent was among the twenty incorporators of the company. The History of Portage County provides the following record of the Franklin Silk Company:

The company contracted with the canal company
to build a dam, but as the canal people, besides
controlling the water at this point, were interested
in the then rival town of Akron, they diverted nearly
the entire volume of the Cuyahoga to their canal,
ostensibly for navigation purposes, but really to
furnish water power to Akron. 22

The company became insolvent and through legal process and purchase was acquired again by Zenas Kent. In 1848, Kent's sons Marvin and Henry purchased the land from their father.

They erected a large cotton-mill, but through the
failure of eastern parties . . . the factory was
not stocked. Glass works were erected, and the
other enterprises inaugurated, but the village
languished until the completion of . . . the rail-
road. 23

Marvin Kent was the town's most prominent promoter; indeed the name of the town honors this man. He was involved in other ventures, including the building of railroads, Ohio politics and banking. It would be difficult to find a more vivid account of capital, industry, and incorporation than that supplied by Zenas and Marvin Kent. Obviously the glass company they established was a small part of a large and complex investment of capital.

The attitude towards the Kent family and capitalization was not universally
as positive as reported in History of Portage County. The Portage Sentinel, a Ravenna Democratic newspaper, warns the public in November of 1849 to beware of "... the power of capital, of combined, incorporated wealth, which is insidiously fastening its fangs upon the government and asserting its superiority over man ..." 24

By contrast, the Portage County Democrat, a Republican Ravenna paper started in 1854, firmly supported the Kents' involvement in business and manufacturing; it proves to be a valuable source of information about the glass factory.

The Ohio Star reports in July of 1849 that materials were being collected on the Kent River property for the construction of the glass works. 25 The incorporation papers of the factory, dated June 13, 1851, list capital at $20,000 divided between five shareholders. It was called the Franklin Glass Company and it was to manufacture window glass or holloware. 26, 27

In 1864, the factory was taken over by Day, Williams and Company and renamed the Franklin Rock Glass Works. 28 Little is known about the operation of the factory under Kent family ownership. It is known that window glass made by cylinder method was produced. 29 Apparently the factory suspended operation for a period before ownership by Day, Williams and Company. Before production could begin the works had to be put in order and new accommodations for workmen constructed. 30 Under Day, Williams and Company the factory continued operation past 1880.

The Day, Williams and Company factory experienced labor and financial problems during the period 1867 through the 1870's. Cheap foreign imports lowered market price for window glass, and in November of 1867 the owners proposed that employees work at a diminished rate of pay. During 1867, the company gave a 10% discount off list price, in 1867, they expected to discount from 40% to 60%. 31, 32 This request by the owners resulted in a 'lock-out' of workers; the dispute was not settled until March of 1868. 33

In March of 1870 the Portage County Democrat reported:

The glass works in Kent have been suspended, because
the reduction in the price of glass will not permit
the company to pay the former price for labor, and
the laborers are unwilling to work for lower wages. 34

The matter was resolved by May of 1870 and the works were again put in operation. 35

The lot of the glass workers, in any glass factory in the 19th century was hot and hard, but pay was generally good. Figures on pay scale are available from a report on glass manufacturers compiled in 1880. At that time
blowers of window glass made from $2.18 to $12.00 per day, averaging $5.30. Window glass blowers were usually paid by piecework, and their average pay was more than any other category of workers in all of the glass industry, including managers, bottle blowers, and mold makers. 

These figures from 1880 are indicative of conditions at the Day, Williams and Company during the late 1860's and early 1870's.

The Day, Williams and Company factory, though they were still experiencing labor problems, extended their factory in 1872. The managers were unable to open the factory and the new extension until another labor dispute was settled. The Portage County Democrat, with typical bias towards management, reported: "The glass blowers and cutters are unable to make satisfactory arrangements with the company for wages for the ensuing year. The company will probably yield to the dictates of 'skilled labor' before long -- how capital does oppress labor in the country." It is interesting to note that wages, not working conditions, were the discontent of the workers.

Henry Haynes was employed at the Day, Williams and Company factory in 1868 as a glassblower. His diary, which is in the Western Reserve Historical Society Library collection, documents his work week to be six days, about ten hours per day, one shift daily. The blowers' work week usually started midnight Sunday, but the schedule depended on when the glass was ready to blow. The diary indicates he was called into the factory at all hours to handle emergencies and that he went home early if the quality of melted glass was not good.

The Day, Williams, and Company factory continued production through the 1870's. The Portage County Atlas of 1874 provides the following description of the factory as operated in 1873:

... Day Williams, and Company is unsurpassed by any in America. Their manufactory is the most extensive in the west, having two large ten-pot furnaces, with a capacity of 80,000 boxes annually, necessitating the employment of about 125 men.

By 1880 employment had dropped to 100 men who produced 70,000 boxes of window glass annually, 10,000 less than reported in 1873. The firm closed - before the end of the century.

Such is the history of Portage County's first window glass factory. It was a business started as one segment of an investment program of Portage County's leading capitalists. The factory's operation was the epitome of mid-19th century manufacturing: Incorporated capital, specialization of labor, reliance on railroads, organized labor and labor disputes.

In addition to the window glass factory in Kent, there was a bottle glass factory in the town of Ravenna which operated during the second half of the
19th century. Ravenna was the county seat and a center of commerce and politics, yet its manufacturing ventures lagged behind those of Kent. A series of articles prompting new businesses in Ravenna was run in the Portage County Democrat in 1856 and in 1857; among the suggestions was the erection of a glassworks. The idea was acted upon by local businessmen in February of 1857 when the Ravenna Glass Works was incorporated by Seth Day, a local merchant; E. Spalding, a Ravenna attorney; and S. Terry. The works were to produce hollowware such as bottles, druggist ware, and jars.

The glass factory was put into operation early in October of 1857, a short 7½ months after initial organization. The main building, located near the Cleveland Pittsburgh railroad, was a 60 foot by 80 foot sandstone structure with a self-supporting roof which was 60 feet square over the main section. The factory contained one melting furnace which could accommodate 21 blowers; and 12 other ovens of various types for firing pots, preparing raw materials, and cooling finished ware. A second, two story building, 25 feet by 60 feet, served three functions: one, a room for construction, drying and storing of pots, which were made with clay imported from Germany; two, a room for material storage, grinding, and processing; three, a packing and shipping area, where products were packed in straw and shipped in boxes. At the opening date the factory employed 40 workmen. In the judgement of admirers, the glass was equal to the finest French glass. This was a highly unlikely attribute for a common bottle glass factory, but indicates the enthusiasm generated by the opening of the factory.

The Ravenna Glass Works advertised heavily. Two weeks after the opening of the works, glassware, including fruit jars, milk pans, and wine bottles, were advertised in the Portage County Democrat. The announcement headlined: "Great panic in Wall Street!," and "Exciting times in Tinnicum!," and "New goods at the store of the Ravenna Glass Company!"42 The first line alluded to the crisis of 1857, a depression which was highlighted by a panic on the New York stock exchange. The national economy was shaken, capital and specie evaporated from the economy, banks and railroads failed, land prices fell, and business and manufacturing suffered. Yet in Tinnicum, better known as Ravenna, an exciting event made news. The glass works was in production, and for the first time offered its new goods for sale.

The tight money situation during 1857 is witnessed by company's acceptance of farm goods, most suspended bank notes, and specie payment. The context in which specie is used makes it apparent that it was rarely available.

The cited advertisement and examples in the Western Reserve Historical Society collection provide details of the factory production. The Ravenna fruit jar, now highly prized by collectors, is one of a few marked products of the factory. The fruit jar was advertised as "What everybody now wants." Indeed, home "putting by" of foodstuffs in glass jars was a popular and new development. With new technology developed in the 1850's, glass jars were cheaper to produce and offered important advantages over canning containers made of other materials. Although improved fruit jar sealing systems were being developed in the 1850's, the Ravenna jar used an old-fashioned wax sealed tin lid.
The travelers companion flask, made in pint and quart sizes and embossed with "Ravenna Glass Company," paid tribute to westward movement. Other flasks made by the factory were embellished with an eagle. These motifs added sales appeal and were used by other glass factories of the period. Additional flask motifs attributed to the Ravenna factory include a union design, agricultural symbols and portraits of Presidents Washington and Taylor, but specific Ravenna flask forms with these motifs are unknown. Another known Ravenna product is the Jenny Lind calabash bottle, misspelled "Jeny" on the example attributed to Ravenna. The bottle honors "The Swedish Nightingale," a popular entertainer who was flawlessly promoted by P. T. Barnum in the 1850's.

Other ware produced at the factory included unidentified bottles for ink, snuff, champagne, hock, wine and whiskey. Full-sized molds were commonly used for the manufacture of these types of bottles. In fact, standardized full-sized molds were exclusively used to make all ware identifiable to the Ravenna factory. Variations in finishing techniques prove the Ravenna Glass Company used the newest innovations in bottle production. Still, the production of bottles was accomplished by skilled men who worked in specialized teams similar to window glass production.

The Ravenna Glass Company marketed ware both in wholesale and retail markets. Under new management in the coming years, retail advertising would cease and the company store would close, indicating a strictly wholesale operation.

By 1858, the Ravenna Glass Company's directing personnel included E. H. Terry and T. J. Terry, brothers of Samuel Terry, superintendent of the works and one of the original organizers of the company. Often in 1857 and 1858 the works were shut down completely; the depression following the panic of 1857 reduced business activity. The long-running fruit jar advertisement last appeared in March of 1859. By April of 1859 the Ravenna Glass Company was no longer listed in the Portage County Democrat's business directory.

The business failed and the factory shut down some time early in 1859. On March 16, 1861, the value of the factory was appraised at $4,175 and subject to sherriff's sale. Whether the depression, labor problems, lack of market, mismanagement, or withdrawal of capital brought on the closing is beyond information recovered. The works were apparently inactive into 1863, when Terry Brothers, including Samuel and T. J., reopened the factory as a partnership under the name The Ravenna Rock Glass Works. The Portage County Democrat rejoiced on January 21, 1863:

Mr. T. J. Terry of the village, is now making arrangements to put the glass works, in this village, in blast. The furnaces have been rebuilt, and the fires will be started next week. Materials are being collected, and it is designed to commence blowing about the 10th of next month. Eleven blowers will be employed. As before, when these works were
in operation, all kinds of druggist ware, wine bottles and
bottles of every kind will be manufactured. We understand
that Mr. Terry has already large orders to fill.46

The works continued through 1866 under management by the "enterprising"
Terry Brothers. The Portage County Democrat pointed to the factory as the town's
most outstanding industry, and provides the following information about the
factory in 1866:

The capacity of the furnace is sufficient to manufacture
$10,000 worth of ware per month. To manufacture this
amount of ware required 450 tons of sand, 189 tons
of soda ash, 12 tons of lime and 27 tons of salt per year.
It also requires 1,200 tons of coal per annum and 120,000
feet of lumber per year to box the ware. When running full
force required the works in every department consist of 60
men and boys.

During 1865 the factory has not been worked fully, but the manager announced
their purpose to work the establishment to its full capacity during 1866.47

Coal is now established as the fuel for firing the furnaces. Soda ash,
a manufactured form of sodium carbonate, was the primary flux in the glass batch,
which superceded the use of potash and wood ash. New developments in the manu-
facture of soda ash were being made during the period. No longer do the local
factories rely on a supply of wood, an important change from early nineteenth
century factories.

The year 1866 did not bring the full production that the Terry Brothers
had expected. The works were suspended. Estimated earnings of the last month
were $1,400 to $1,500. These figures are probably inflated because of the Portage
County Democrat's interest in having new investors reopen the factory.48

No doubt the business was overextended during the Civil War years, and
the slight slump following the Civil War led to the closing. The firm had been
experiencing financial problems for some time. William Nichols, a blower at
the factory, filed suit against Terry Brothers in July of 1865 for unpaid wages.
During this period, assuming he worked six days per week, Nichols averaged four
dollars and fifty cents per day during the three full months he worked. Nichols
was paid by piecework; for example, $0.18 for one dozen quart size fruit jars.49

On October 28, 1867, the factory was reorganized as the Diamond Glass Com-
pany. The Portage County Democrat sheds light on the new venture: "Diamond
Glass Company will, when organized, operate at the glass house, lately known as the Ravenna Rock Glass Works [Terry Brothers] but will manufacture window glass instead of hollow ware.

In 1874, Diamond Glass Company's annual product was valued at nearly $250,000. By 1880, 60 men were employed and the annual product was valued at only $1,000.

New technology was developed in the third quarter of the 19th century in which glass furnaces were fired with natural gas, a fuel superior to coal. Also developed were new and improved machinery for making window glass. By 1900, these manufacturing innovations forced the Diamond Glass Company to close.

Other factories were established in Ravenna and Kent in the latter part of the 19th century. They produced glass pails, lamp chimneys, blown and pressed ware. They are characterized by the continued power of capital in the organization of glass manufacture. They too closed before 1900.

The post-1850 glass factories were quite different from those of the pioneer period. Glassmaking now blossomed into a full-fledged factory system promoted by leading local capitalists. Raw materials, now imported from as far away as Germany and New York, were no longer a function of purely local supplies. The use of soda ash and coal for fuel ended an important phase of interaction with agricultural interests. Technological innovation marked the organization of labor and the production of ware. Labor and management tangled over wage disputes. Wholesale marketing of ware, conveniently shipped on the extensive railway system, reduced dependence on local markets. Although skilled workers were still required in the latter factories, mechanization and standardization had been introduced. Between the first quarter of the 19th century and the third quarter, the character of Western Reserve glassmaking changed from small workshops organized to take advantage of frontier conditions to mature factory organizations which operated in a national market.
FOOTNOTES

3. McKearin, Two Hundred Years, pp. 71-72.
5. History of Portage County, pp. 192-193
7. Harry Hall White, "The Story of the Mantua Glass Works"
11. Glass batch is the term describing the mixed material glass is melted from. A typical early 19th century batch for green glass: six bushels sand, six bushels wood ash, two bushels pot ash, one bushel and three pecks salt. From Parker's Arcana of Arts and Sciences of Farmer's and Mechanics Manual.
15 Ibid., p. 6.
16 History of Portage County, p. 481.
17 Ibid., p. 476.
18 Miller, Franklin Glass Works, p. 7.
19 McKearin, Glassmaking in Ohio, pp. 52-53.
20 Wilson, Pressed Glass, p. 167.
21 John Schoup, Kent antique dealer and student of Portage County glass, recalls a reference to a glass factory in a document of the mid-1830's.
22 History of Portage County, p. 440.
23 Ibid.
24 Portage Sentinel (Ravenna), 12 November 1849.
25 Ohio Star (Ravenna), 4 July 1849.
27 The original of the document was located by George Miller at the Kent State Archives in 1971. In 1977 librarians were unable to locate the document. My reference is from Miller verbatim copy.
28 Ibid.
29 In this process a workman called the gatherer removed an amount of molten glass from a pot inside the furnace using a blow pipe and formed a large bubble of glass about ten inches in diameter and four feet long. The bubble became a cylinder when the ends were removed. This cylinder was cut and opened into a flat sheet and eventually cut into panes.
Portage County Democrat (Ravenna), 18 March 1868.

Democrat, 20 November 1867, p. 3.

The Portage County Democrat on February 10, 1864, reported the commercial price of a box of window glass, 100 feet, changed from $3.75 to $4.00. No figures were reported for 1867.

Democrat, 18 March 1868, p. 3.

Ibid., 30 March 1870, p. 3.

Ibid., 11 May 1870, p. 3.


Democrat, 8 October 1873, p. 3.


History of Portage County, p. 449.

Democrat, 11 February 1857, p. 3.

Ibid., 14 October 1857, p. 3.

Ibid., 28 October 1857, p. 3.

Tinnicum is the American Indian word for sweet root or briar, and the name the Indians called the area of Ravenna. The name was quaintly used in the 19th century as a sobriquet. Information received from an interview with Cy Plough, Portage County Historical Society Director, 14 November 1977.

Individual workmen often made freeblown whimsical pieces such as canes, bells, and paperweights.
No apparent connection with the Kent Rock Glass Works of Day, Williams and Company.

Democrat, 21 January 1863, p. 3.

Ibid., 17 January 1866, p. 2.

Ibid., 12 December 1866, p. 3.


Democrat, 28 October 1867, p. 3.


History of Portage County, p. 541.