

ROCHESTER HISTORY

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The Triphammer Forge

by Spurgeon King

Robert Dalzell Master Millwright of the Genesee

by Spurgeon King





Eric Bartles stands next to part of the Triphammer Mill water wheel after it was excavated. From Rochester Bureau of Communications.

Cover: The Triphammer Forge Building in the early 1970s. Photographer unknown. Rochester Bureau of Communications.

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THE TRIPHAMMER FORGE: FROM NINETEENTH CENTURY INDUSTRIAL WORKPLACE TO MODERN ARTIFACT

In 1977, a spectacular fire claimed yet another victim along Brown's Race in Rochester, New York. An old abandoned industrial building at 40 Brown's Race, known locally as the Triphammer Forge, caught fire during the night of August 14.¹ The building's old timber beams and trusses provided ready fuel for a crackling blaze that raged unabated for several hours and substantially destroyed the old stone factory. The blackened ruins lay undisturbed for six years until the City of Rochester began to clear the site.

In 1983, a backhoe smashed through a ground level floor to unveil a cavernous space below.² Upon further examination, workers discovered a large in situ water wheel with substantially intact cast iron elements. Local authorities hailed the find as an important historical discovery, and archaeologists surveyed the site prior to its rehabilitation as a public park. Today, the stabilized ruins and reconstructed water wheel dramatically symbolize Rochester's early nineteenth century industrial stirrings along the lower Genesee River when two enterprising brothers from Rome, New York, decided to invest almost four thousand dollars to construct a large millrace there.³

The west side of the rocky gorge adjacent to Rochester's high falls must have fairly hummed with activity during 1816 as Matthew and Francis Brown rushed to complete the south section of their new millrace. Since the previous year, the two brothers had been blasting and digging the solid bedrock on the west bank of the Genesee River gorge within the Village of Frankfort (which merged with the adjacent Village of Rochester in 1817). The excavation process was laborious—workers drove iron bars into the bedrock and packed the holes with a combination of gunpowder and metal to blast and fracture the rock.⁴

Workmen removed stones suitable for building to a storage lot some distance from the race, and used left-over rock fragments as fill for a street on the bank.⁵ Sometime during construction of the race or shortly thereafter, the brothers also blasted out a wheel pit and tail race on the east shoulder of their water channel and built a 3-story stone factory building over the newly excavated pit and trench. By 1819, they had leased the building to their associate William Cobb, who began to advertise in the local paper the

availability of edge tools manufactured in his new furnace and triphammer establishment.⁶ In 1820, Cobb formed a partnership with Lawson Thayer to continue the manufacture of edge tools, and the partnership promptly built a blacksmith shop, according to a newspaper advertisement of the time, "at the west end of the Bridge."⁷

It is likely that the bridge referred to in the ad was the old toll bridge just south of the high falls built by Thomas Mumford and the Browns in 1819, since the Brown's Island location was within a few hundred feet of the Triphammer Forge. This assertion is also substantiated by Matthew Brown's 1828 sale advertisement in which he described as part of the offering "a hand shop with four fires situated on the Island above the falls."⁸ The ultimate success, however, of Cobb's edge tool business hinged on the dual benefits of the powerful fall of water from the Genesee River and the extensive transportation system afforded by the Erie Canal.

Surging water powered Rochester's early industry. Ebenezer Allan built the area's first grist mill on a site 1500 feet south of the high falls of the Genesee, and by 1817, sawmills and grist mills dotted both sides of the river. Allan's 100-acre tract subsequently became the nucleus of Rochester. Matthew and Francis Brown, et.al., bought a 200-acre mill plot adjacent to Rochester on the west side of the falls in 1810, and founded the Village of Frankfort on their new site. In 1815, the brothers took something of a calculated business risk by forming the Genesee Manufacturing Company to construct their large millrace, since Rochester's economic future was anything but secure. The gamble ultimately paid big dividends when the village was chosen as the site of an aqueduct to carry the Erie Canal across the Genesee River.

Completion of the canal through Rochester in 1821 opened domestic markets both east and west, providing cheap access for Rochester goods to the Hudson River Valley, New York City, and foreign ports of call. During the decade of the 1820s, Rochester's population increased tenfold as settlers poured into the area and, as population multiplied and trade increased, entrepreneurs such as the Browns successfully harnessed water power to grind grain, fashion tools, saw wood, and run many varieties of manufacturing machinery.

In 1816, William Cobb migrated to Rochester and brought his edge tool business with him. He already knew the Browns, since all three hailed from the same central New York town of Rome, and William's brother, Gideon, already resided in Rochester. The close association of William Cobb with Matthew and Francis Brown and the

Valuable Mills, Mill Scites, and Village Lots, FOR SALE.

THE SUBSCRIBER, offers for sale, for the purpose of closing the concerns of the late firm of FRANCIS BROWN, & Co. the real estate of the said firm, situated at and near the High Falls of the Genesee River, in the village of Rochester, and state of New-York, consisting of the following described property, viz:—

The **PHENIX FLOURING MILLS**, with four runs of *French Burr Stones*, with machinery upon the most approved modern construction; complete for a Merchant Flouring Mill, in good order for business. The Flour made from this Mill bearing the brand of "Phoenix," is inferior to none made in this State.

A woollen establishment of one double, and two single **CARDING MACHINES**, with a *Picker*, and an excellent **PULLING MILL**, **DYING ESTABLISHMENT**, and **PRESS**, complete for clothiers' business.

The undivided half part of the **FRANKFORT MILLS**, commonly known by the name of *Whitney & Brown's Mills*, situated at the end of one of the most important streets, being in rear of the New Market—the machinery now, with one of the best water privileges in the western country.

The **SAW MILL**, south of the Phoenix Mills.

The **TRIPHAMMER ESTABLISHMENT** at the Falls, with a **FURNACE**, and very extensive *water blast*, together with the *Island*, known by the name of **BROWN'S ISLAND**, in all, making one of the most advantageous situations in the Union, for manufacturing establishments on a scale to almost any extent.

Another **Furnace** with a *Water Blast* and *Mill Lot*, situated adjoining the *Frankfort Mills* of nearly equal size.—These furnaces are well calculated for making mill and other machinery, and at present employed in that business.

Several unoccupied *Mill Scites* of large extent, are also offered to gentlemen either in companies or individually, who are disposed to avail themselves of an opportunity to establish themselves as manufacturers on one of the most permanent and advantageous mill streams in the world.

The property heretofore enumerated, is situated on a Canal, cut through the rock from above the high falls of the Genesee, along the western bank for eighty four rods in length, with a fall of eighty to ninety feet. The canal, is thirty feet wide and from 2 1/2 to 4 feet water. This canal or mill race, is nearly parallel to, and about sixty rods distant from the *Grand Erie Canal*; so that every facility for importing the raw material, and exporting the manufactured article is any of the before mentioned establishments is offered to the purchaser.

The *Flouring Mills* and *Triphammer* establishments are built of stone, and remarkably well timbered.

The Subscriber also offers for sale, a large number of *pleasant dwelling houses*, and unoccupied *village lots*, extremely well situated. The property is offered in such parcels as may suit purchasers.

MATTHEW BROWN, Junr.

Rochester, July, 1828.

A handbill describing the Triphammer complex when it was put up for sale by Matthew Brown in 1828. From the Rochester Public Library, Local History Division.

subsequent relocation of his edge tool manufacturing business to Rochester suggests that a deal was probably struck between them prior to the construction of Brown's Race to also simultaneously build the forge. It certainly made practical sense to blast out a wheel pit and tail race while also blasting the water channel, and the Browns could take satisfaction in attracting a major new business to their fledgling mill race.

Although many accounts circumstantially place the date of construction for the Triphammer Forge at 1818, the original building may have been completed and occupied in 1816 when the lower part of the race was finished, or anytime between then and 1819 when the first recorded newspaper advertisement for Cobb's edge tools appeared.⁹ In any event, William Cobb was producing edge tools and advertising them for sale by 1819, and his time-honored methods for refining and shaping iron had changed very little for almost two thousand years.

The Chinese inventor, Tu Shih, first used water power in iron casting when he built a water-powered reciprocator in A.D. 31 to operate a bellows. Although waterwheels in China were generally

horizontal, the Chinese also utilized vertical wheel technology to operate conventional triphammers used in forges, and metal casters were commonly using triphammers by the third and fourth centuries, A.D.¹⁰ The spoon tilt hammer was another crushing device invented by the Chinese that consisted of a hammer on one end of a shaft and a water bucket on the other—as the bucket filled, the hammer was raised; the raising of the hammer automatically emptied the bucket, and the hammer fell.¹¹ Chinese blast furnace technology did not migrate to Europe until the fourteenth century.

A furnace believed to have been in operation before 1350 has been excavated in Sweden. The Europeans subsequently designed a more elaborate furnace that heated iron ore into an alloy that had a much lower melting point than pure iron, thus making possible the casting of molten iron.¹² Cooled in reservoirs whose shape reminded metal casters of suckling pigs (thus, the name “pig” iron), the cooled pig was then reheated to create purified, or cast, iron. This process traveled to North America with European settlers, and changed very little until the harnessing of steam.

Documentary evidence suggests that the Triphammer Forge establishment included a complete iron smelting and tool manufacturing complex consisting of a cupola blast furnace for remelting pig iron or scrap metal, two triphammers for refining and forming the remelted pig into malleable iron, grindstones for sharpening edge tools, and machine and blacksmith shops for finished work.¹³ The cupola furnace and blacksmith shop were located within walking distance on Brown’s Island. Iron ore or pig iron for the furnace were readily available twenty miles away in Wayne County where a bed of Upper Silurian red fossil ore fed the nearby Wolcott Hot-Blast Charcoal Furnace built in 1821 and also, after 1825, the Ontario Water and Steam Hot-Blast Charcoal Furnace.¹⁴

Nineteenth century ironmongers continued to use triphammers to remove impurities from remelted pig iron or shape certain heavy iron implements such as scythe blades, shafts, axles, or anvils. Pig iron heated to a molten state in a hot forge was pounded and repounded to produce highly refined, malleable iron. The refined iron was then reheated at a second forge and hammered into bars of varying shapes (known as “merchant bars”) suitable for working by a blacksmith, or into other finished shapes. Steam-powered rolling mills took over the iron shaping process during the 1840s, with the nearest rolling mill located 60 miles to the west of Rochester in Buffalo, New York.¹⁵ A large vertical water wheel almost 25' in diameter powered the Triphammer Forge’s two hammers through

a series of rotating gears that raised the hammer and then “tripped” it into falling once a certain gear cam had rotated through the cycle. This process allowed a constant movement of the triphammer, which stopped when the gears were disconnected. Two lesser water wheels powered grindstones and machine shop lathes.

The Triphammer Forge’s water-powered hammers, bellows, grindstones, and associated finishing machinery must have created a cacophony of sound and motion, all within an extremely hot environment where molten metal could reach temperatures of over 1000°F. The cupola blast furnace on Brown’s Island also contributed to the din. In London during medieval times citizens swore out complaints against the ironmongers for making too much noise and threatening neighborhoods with destruction by fire (no records of similar complaints have been unearthed in Rochester).¹⁶ In addition to all the clanging and thumping, the creaks and rumbles of the waterwheel and the sound of rushing water must have created an interesting challenge to the senses. A forge also employed a diverse group of workmen: master refiners, hammermen, blacksmiths, woodworkers, and draysmen, plus colliers and stokers to produce charcoal and operate the furnaces. A millwright was also needed to tend the waterwheel with its associated mechanical systems.

Typical workflow at the Triphammer Forge probably began as laborers moved heavy remelted pig iron to the finery forge, where the master refiner heated the pig into a glowing mass, bringing it out at the proper moment for shaping under the rhythmic blows of the giant triphammer. The resulting product, commonly called a “slag” or “anchony,” was then again reheated in the chaffery forge, and shaped into usable forms by skilled hammermen working with a second triphammer. Blacksmiths and woodworkers in the finishing shops fashioned and attached wooden and metal accessories; scythe blades and other edge tools were sharpened in the grindstone room. Working in the forge of Cobb & Thayer meant hard labor under dangerous, noisy conditions. And when blast furnaces were worked up, they generally operated for several months without let-up. The busy Triphammer Forge was a significant early component of manufacturing along Brown’s Race, remaining a working fixture of Rochester’s industrial scene through several ownership changes until the late 1960s.

On December 8, 1821, the Cobb and Thayer partnership dissolved, and William Cobb continued his edge tool business alone.¹⁷ Sometime between 1821 and 1825, he formed another partnership with Almon White which dissolved on Oct 4, 1825.¹⁸ William Cobb passed away in Kentucky in 1826, the same year that Lewis Selye

constructed a large four-story stone factory on the corner of Mill and Furnace Streets across from the Triphammer Forge. Matthew Brown, stunned by the premature death of his younger brother and business partner, Francis, began selling his Brown's Race properties in 1828. Lewis Selye bought the Triphammer Forge in 1830 and reestablished the edge tool business. Both buildings later burned in 1836, but the proprietor quickly rebuilt and continued business as usual.

Between 1830 and 1848, Selye manufactured fire engines, scythes, mill irons, axes, and other implements in his two buildings on Brown's Race. He reconstructed the Triphammer water wheel during the early 1830s and expanded its capacity by transferring power across Brown's Race to his other building through a series of gears and cast-iron shafts. The single pitchback water wheel subsequently powered belt-driven machinery in both Selye buildings. The well-constructed Selye fire engines earned praise from the City of Schenectady, which formally resolved in 1836 that the engines were "best adapted to the wants of the city, on account of the facility with which they throw water and the perfect ease with which they are kept in repair; so that in every emergency, they can be relied upon with entire confidence."¹⁹

In 1867, Junius Judson, a business associate of Lewis Selye, purchased Selye's building across Brown's Race to the west and, the following year, he purchased the Triphammer Forge. Judson manufactured governors to control pressurized steam engines (for which he held a patent originally issued in 1848; a patent for an improved version was issued in 1861), and he also developed an integrated process to economically produce pins.²⁰ The Judson Steam Governor Company and Judson Pin Works made Junius Judson one of the wealthiest citizens of Monroe County. In 1882, he expanded the Triphammer Forge by adding two stories plus a new addition extending from the east wall facing the river gorge and, in 1888, installed a water-powered turbine in a deep pit located in the new section.

Two years later, Judson loaned \$75,000 to his son, John Lee Judson, to construct the Edison Electric Illuminating Company below the Triphammer Forge in the flats along the river.²¹ This company was the precursor of the Judson Power Company, incorporated in 1896. That same year, John Lee Judson conveyed title of the Triphammer Forge to the Judson Power Company. Junius, who also died in 1896, sold the Judson Pin Works to a Boston firm shortly before his death. John Lee continued to manage both the steam governor and power companies until his death in 1903, when his son, Junius II, assumed

control. The trend toward consolidation of power companies had led to the formation of Rochester Gas And Electric Company (RG&E) in 1892, and John Lee Judson had served as the company's first president; after 1903, Junius II held a seat on the Board of Directors.²²

The Judson Power Company surrendered most of its water rights to RG&E in 1918, retaining only enough to feed its underground turbine. Junius II, a lawyer, left the day-to-day operations of the Judson Steam Governor Company to Mr. Frank Cullinan, who supervised the business until its demise in 1941, the victim of U.S. Navy cut-backs in requests for Judson steam governors during the mid-1930s.²³ The Judsons sold the steam governor manufacturing equipment and, on October 31, 1944, they conveyed the property to the City of Rochester. In 1951, the City sold it to Mr. Hymen H. Mink of Rochester; Mr. Mink utilized the building as part of his plastic bag manufacturing business until the late-1960s, when he moved his firm to Henrietta, New York. In 1976, the 40 Brown's Race Realty Corporation purchased the Triphammer Forge building which tragically burned the following year, ending hopes of commercial development. After 1977, the Triphammer Forge story fortuitously paralleled the development of New York State's Urban Cultural Park system, an effort that focused attention on future revitalization of Brown's Race.

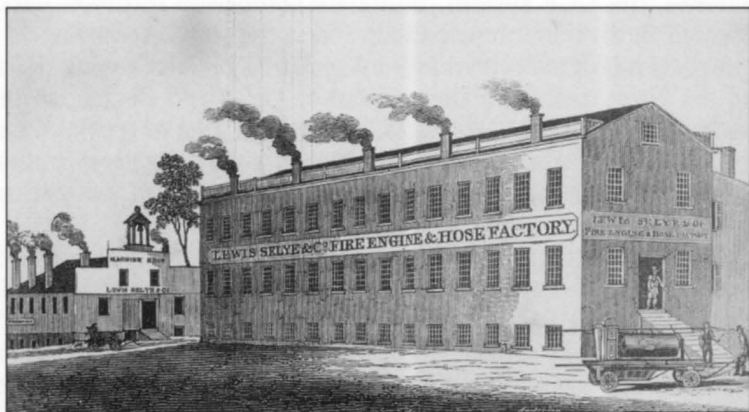
As the Triphammer Forge complex lay in ruins following the fire, the New York State Legislature passed a law in 1977 creating a statewide "Urban Cultural Park (UCP)" system. Originally envisioned as a means to increase redevelopment and tourist interest by capitalizing on an area's significant cultural and historical themes, the UCP system ultimately comprised fourteen parks located in diverse municipalities across the state. According to a progress report submitted to the legislature by the Commissioner of the New York State Department of Parks and Recreation, an individual park was defined as "a historical area of special social or cultural significance combined with a revitalization process designed to satisfy four basic goals: preservation, education, recreation, and economic development."²⁴

The Brown's Race district and the Genesee River corridor subsequently became the focus of the City of Rochester's UCP development. Addressing the Rochester UCP, the Commissioner's report specifically stated: "The aim of the Urban Cultural Park is to increase our basic understanding about the significance of the [Genesee] river to the life and history of the city; to provide public access to the natural beauty of the gorge and its open spaces; and to redevelop the long neglected industrial area [Brown's Race] adjacent

to the gorge.”²⁵ The state initiative focused attention on Brown’s Race and its future development potential, spurring the City of Rochester to undertake several major studies to implement the intent of the Commissioner’s progress report. In 1986, the New York State Legislature passed the Environmental Quality Bond Act (EQBA), which, among other initiatives, provided funding for worthwhile UCP-related projects. In 1991, the City of Rochester received a \$350,000 EQBA grant to excavate, stabilize, and preserve the Triphammer Forge remains.

City archaeologists and engineers completed site excavation and documentation by January, 1992, and the Triphammer Forge site was dedicated and opened to the public in 1994. The detailed site excavation and documentation undertaken by the City of Rochester’s DES Engineering Bureau successfully challenged several apparently erroneous assumptions concerning the building’s age and the type of waterwheel found in the pit.²⁶

Various written accounts about the Triphammer Forge traditionally fixed the construction date of the building as 1818. Many writers simply drew the date from previous articles and reports without providing a sound documentary basis for such a conclusion. The Engineering Bureau’s official report raised the possibility that actual construction may have pre-dated 1818 by at least two years.²⁷ The close association of the Brown brothers with William Cobb, and the convenience of blasting the wheel pit and tailrace simultaneously with the main raceway do suggest the conjectural likelihood of a pre-1818 construction date. In addition,



The Lewis Selye Fire Engine & Hose Factory. From Henry O'Reilly's Sketches of Rochester. The larger structure is the extant Parazin Building, and the smaller building to the left is the Triphammer Forge.

Orsamus Turner's *History of the Pioneer Settlement of Phelps and Gorham's Purchase and Morris' Reserve* states that William Cobb moved his axe and scythe manufactory to Rochester in 1816, but does not identify the new location, which was probably Brown's Race.²⁸ Examination of the waterwheel and pit, however, led to several readjustments of common assumptions based more firmly on the documentary and archaeological record. After the backhoe operator found the water wheel in 1983, most accounts hailed the event as a "discovery" of an important industrial artifact that had lain undetected for decades. In fact, according to the city's report, the existence of the wheel was previously known by architects and others involved in a failed development initiative during the early 1970s, but apparently the proper persons who could have acted earlier to minimize further structural deterioration and incidental damage before or after the 1977 fire were never notified of the wheel's existence. The description and size of the wheel were also wrongly described by various sources as an overshot type between 25 to 30 feet in diameter. Closer examination revealed the wheel as a pitchback model just a shade under 25 feet in diameter.²⁹ Unfortunately, questions concerning the location, operation, and evolution of various equipment and power systems may never be fully answered because of extensive building and site reconstruction over the years, fire damage, and structural deterioration due to neglect and the elements.

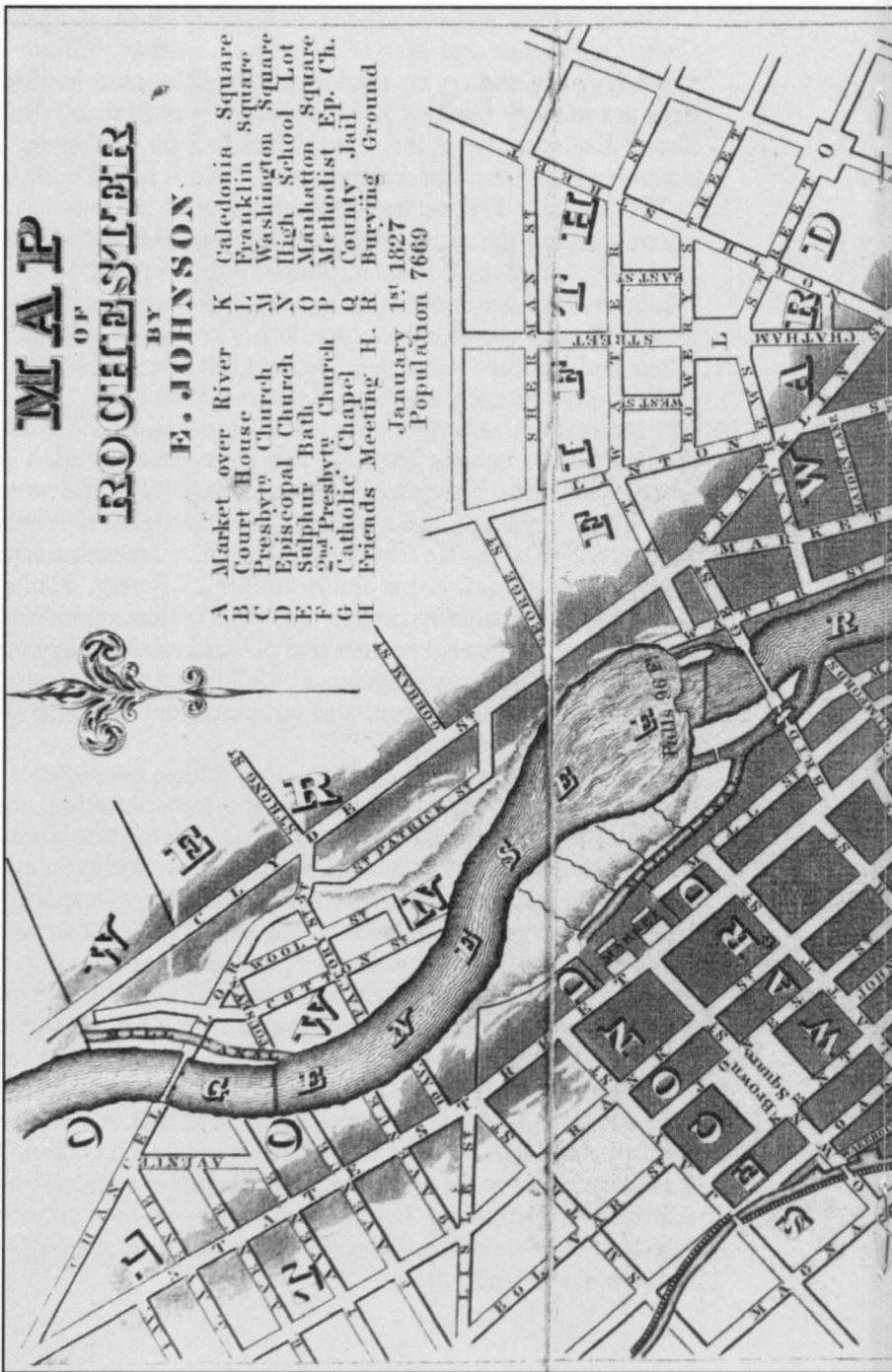
The Triphammer Forge site today exemplifies Rochester's early reliance on water for manufacturing and transportation, and the evolution of industry from supplying basic tools to more specialized items such as fire engines and steam governors. Rochester evolved into a regional industrial center and commercial entrepôt by first utilizing water power, and then new steam technology that powered railroad engines and boilers, gradually rendering canal transportation and water-powered mills obsolete by 1875. The development of fixed power sources also meant that industry could locate away from water channels such as Brown's Race, which experienced an inexorable decline as many businesses moved from sites along the Genesee River during the first half of the twentieth century. Although modern times have witnessed a changing role for Brown's Race in the revitalization of Rochester's central business district, the completed Triphammer Forge site will continue to illustrate the dynamic influence of water power in the city's early industrial development.

MAP OF ROCHESTER

BY
E. JOHNSON

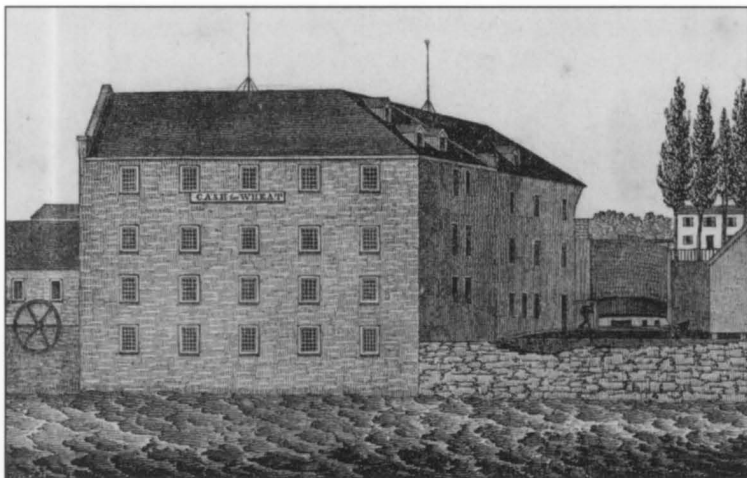
A Market over River K Caledonia Square
B Court House L Franklin Square
C Presby'ty Church M Washington Square
D Episcopal Church N High School Lot
E Sulphur Bath O Manhattan Square
F 2nd Presby'ty Church P Methodist Ep. Ch.
G Catholic Chapel Q County Jail
H Friends Meeting H. R Burying Ground

January 1st 1827
Population 7669





1827 map of Rochester including the Browns Race at the 96 foot High Falls. Map by Elisha Johnson, 1827, as published in the first City Directory, Local History Division, Rochester Public Library.



Hervey Ely's Mill on the east bank of the Genesee River, completed by Robert Dalzell in 1828. From Henry O'Reilly's Sketches of Rochester.

ROBERT M. DALZELL MASTER MILLWRIGHT OF THE GENESEE

In 1826, Robert M. Dalzell, a Scotch-Irish millwright residing in central New York, accepted an offer that forever changed his life. A business partnership headquartered in Rochester, a booming western New York commercial center, had asked him to build a large water-powered grist mill alongside an Erie Canal turnaround basin within the village.¹ Robert, then living near Vernon, a small Oneida County hamlet located 125 miles east of Rochester, must have realized that the healthy agricultural economy of western New York assured a robust demand for mills and those who could build them. As a practicing millwright, he also knew that temperamental mill machinery required continuous upkeep and repair. In short, a successful mill project in a boom town like Rochester could lead to years of full-time employment. And so it did. His towering six-story mill displayed a latent skill for building on a grand scale, impressing those who counted most—the conservative Rochester business community. During the next decade, Rochester investors commissioned the young builder to construct at least nine more mills, and he quickly earned a solid reputation as the Genesee region's most innovative and prolific millwright.

Robert was born near Belfast, Ireland, in 1793.² John Dalzell, his country squire father, was a putative ringleader of Ireland's ongoing nationalist struggle against England. After armed rebellion broke

out in 1798, rampaging English forces hotly pursued John to the seacoast, where he narrowly escaped capture by putting to sea in a small dinghy and serendipitously hailing a New York City bound schooner. Following this escapade, the English exacted revenge by burning John's mansion and confiscating his assets, but evidently did not detain or physically harm the squire's wife and children, since the Dalzell family reunited less than a year later in Vernon, Oneida County, New York. Young Robert subsequently grew up on a modest farm where the hard economic conditions differed considerably from the family's former prosperity in Ireland. Robert attended the nearby country school and, following completion of his studies there, apprenticed with a local millwright. Completing his apprenticeship, the youthful journeyman earned a steady income building and maintaining numerous small country mills in and around Oneida County. His first wife, Sally, and their two children, James and Elizabeth, lived a simple rural life until Robert's successful mill commission in western New York considerably enhanced the family's social and financial prospects. In 1827, Robert's family finally joined him in Rochester, a boom town owing its early agricultural prosperity to the extensive Genesee River watershed, part of a fertile topography scoured by glaciers nearly twenty thousand years ago.

During the last ice age, gradually receding Pleistocene ice sheets left behind rolling hills and deep, narrow valleys in the western New York landscape. Oriented north-to-south, many valleys filled with water to form deep lakes, while others with natural outlets provided ideal channels for flowing water. Sometime after the final ice receded, a tiny runlet gushed forth in the Allegheny mountains of northern Pennsylvania about ten miles below the present New York State border. This inauspicious occurrence marked the birth of the mighty Genesee River. The unleashed and ever-widening water stream cascaded down through the foothills of the mountains across the border to begin a gradual descent northward through rugged, picturesque gorges and lesser valleys. The river widened as it approached the flat lands around the site of modern-day Rochester, where the now roaring torrent plummeted 96 feet over a spectacular precipice into a large natural basin, beginning a final journey between steep, rocky embankments to Lake Ontario.³ Fifteen hundred feet above the high falls, a small channel forked inland before rejoining the surging cascade further downstream, forming an island on the west side of the river. In 1789, an itinerant frontiersman named Ebenezer "Indian" Allan built the area's first grist mill on the west bank of the water channel across from the island.

A peripatetic adventurer who reputedly led a Loyalist band of Indian marauders during the Revolutionary War, Ebenezer Allan seemed perpetually one step ahead of the law or a disgruntled husband.⁴ For reasons never quite made clear, Oliver Phelps and Nathaniel Gorham, owners of a large land tract that included the Genesee country, hired Allan to construct a frame overshot mill and sawmill designed to service settlements further south in the Genesee valley. In return for building the mills, Phelps and Gorham deeded 100 acres of land to Allan which later formed the nucleus of Rochester. Nearly inaccessible except by boat, the hastily constructed grist mill had only one run (or pair) of grinding stones and was located on a water course susceptible to summer droughts. The restless Allan rather predictably soon departed, and by 1803, the neglected mill was no longer in service. In 1807, Charles Harford erected a second frame mill further north on the west bank of the Genesee River adjacent to the high falls. Harford sold his 200-acre mill tract in 1810 to Matthew and Francis Brown, two brothers from Rome, New York, who founded the Village of Frankfort on their new site. The Brown brothers continued to operate the mill, monopolizing service to nearby settlements until 1815, when another mill appeared on the same side of the river. The Village of Frankfort merged with Rochester in 1817, a year that also witnessed mill construction on the east bank of the Genesee River prompted by the rising availability of excess Canadian wheat and a simultaneous increase in domestic grain production.

During Rochester's early boom years between 1820 and 1830, the village's population swelled from 1,500 to almost 11,000 persons.⁵ Many newcomers relied on farming for ready cash to pay mortgages and living expenses. Expanded agricultural output generated by the influx of new settlers accelerated demand within the village for water-powered industry, creating a potential for exportable surplus grain products. By 1816, prospective mill owners were diverting Genesee River water into man-made channels known as "races," which provided generally consistent waterflow with lessened reliance on extended flumes and sluiceways. To combat freezing water during harsh northern winters, local millwrights learned to place waterwheels in pits below the water channels. Even in good weather, the rugged terrain and primitive transport consistently hampered economic activity in the Genesee country until the Erie Canal reached Rochester in 1821. The canal allowed cheap access to the Great Lakes and Hudson River transportation systems, thus supplying the missing catalyst for both import and export market growth. A network of local gentry families controlled the Rochester

economy, and the new waterway enhanced investment opportunities for their various business combinations.⁶ Increased production of grain products, accessible transportation, and ready capital stimulated a latent regional market whose emergence attracted droves of opportunistic frontier boosters like Robert Dalzell to the Rochester area.

Almost immediately following his arrival in Rochester in 1826, Robert began to grapple with the complex design problems associated with large mill construction. The sheer size of the proposed building created two major challenges: (1) how to adequately support and incorporate nine grinding systems under one roof, and (2) how to transport grain from canal boats up to the top bin floor without first manually moving it inside the mill. Utilizing stone from nearby quarries, Robert constructed strong exterior walls tied to heavy timber post-and-beam interior structural members to support the mill's interconnected processing machinery. Resembling the inner workings of a spring-wound clock, the intricate mechanical systems consisted of a horizontally or vertically rotating water wheel connected to a network of gears that manipulated belts and pulleys attached to various mechanisms designed to transport, sift, and separate grain prior to grinding. These mechanical techniques were extensively outlined in Oliver Evans' widely used book, *The Young Millwright and Miller's Guide*, first published in 1792. Robert added various gears to operate or disconnect each of the nine systems as determined by the amount of available grain for processing. Although Evans' book featured a fully automated system with an internal elevator for moving grain to the upper mill floors, most early frontier mills were not so sophisticated, requiring manual intervention to move the grain products. Robert Dalzell ingeniously adapted the "Evans Elevator" to local conditions by placing it outside the building.

The Aqueduct Mill location at the rear of Child's Basin on the Erie Canal allowed Robert to ponder the problem of transporting grain from boats moored in the basin up to the mill's roof without manually carting the raw product to a side chute. Since interior grain elevators with successive buckets arranged on a belt already existed, the millwright designed a similar covered exterior elevator system powered by the water wheel of the Aqueduct Mill. Canal boats laden with grain thereafter discharged their cargo directly onto the elevator, which then transported the grain to the mill's top-level bin floor where it automatically began a controlled descent through interior processing mechanisms. Following its successful debut in Rochester, Robert Dalzell's exterior elevator became a

familiar feature on mills in grain centers throughout the United States. Although the elevator proved popular and could have brought substantial financial reward, its inventor never patented the device, probably because of design similarities with the Evans Elevator. Robert's characteristic modesty may have stayed his hand in claiming original credit for a device previously designed by someone else. He pragmatically adapted the elevator concept to facilitate off-loading from canal boats and consistently refused financial benefit, although Oliver Evans clearly intended that other millwrights should utilize his published building concepts and methods.

The success of the Aqueduct Mill brought Robert immediate commissions to build at least nine more mills in Rochester, including Hervey Ely's large stone mill on the east bank of the Genesee River, which was also equipped with an outside grain elevator. Following completion of the Ely mill in 1828, he concentrated much of his building activity along Rochester's three major millraces: Brown's, Johnson's, and Rochester, Fitzhugh & Carroll's (a smaller fourth race known as "Cleveland's Course" existed on the east side of the high falls). Industrial development along Brown's Race far outpaced the others after 1831, when each of the three larger races boasted four grist mills apiece.⁷ Constructed in 1815-16 by the Genesee Manufacturing Company of Matthew and Francis Brown, the 30' wide water channel named for the brothers extended almost one-quarter mile along the west bank of the Genesee River beside the high falls. Elisha Johnson dug his raceway on the east side of the river in 1817, three years after the Rochester, Fitzhugh, & Carroll Race, an enlargement of the streambed where Ebenezer Allan constructed the area's first mill, was completed. With the Aqueduct and Ely Mills to his credit, Robert Dalzell had little trouble finding employment along Rochester's man-made raceways, particularly Brown's Race, where Elisha Beach and his brother had established a presence by forming a partnership with H. B. Williams. By 1851, Robert had supervised the building of at least 10 of Rochester's 22 operating flour mills, and he also had an interest in a mill in the adjacent town of Penfield. Although his obituary credits him with constructing all the Rochester mills, this seems unlikely, given that some mills predated his arrival in the city. Other accounts put the number of Robert's mills at ten or thirteen.⁸ However, five of the original six frame mills in Rochester later burned, and Robert may have had a hand in rebuilding or repairing some or all of those, thus creating the impression that he had worked on every mill at one time or another. This may be closer to the truth, since mill systems required constant upkeep and repair.

Although kept extremely busy at his demanding trade, Robert remained devoted to his family and religion. Settling into their new home at 208 State Street near Brown's Race, the Dalzells joined the nearby First Presbyterian Church of Rochester on November 4, 1827.⁹ Listed in church records as coming from "a sister church," the young family had previously practiced their faith in Vernon, Oneida County, where the two children, James and Elizabeth, were born. As devout Protestants and upright citizens, the Dalzells undoubtedly embraced the temperance and evangelical movements of the period. Robert's wife, Sally, was an active member of the Rochester Female Charitable Society, an interdenominational church organization dedicated to helping the poor.¹⁰ In later testimonials, Robert is described as a man of integrity and wisdom who freely contributed time and money to charitable causes, especially for the indigent. He was said to accept no more than 7% interest or discount on loaned monies. These appealing character traits undoubtedly facilitated Robert's acceptance into the ranks of Rochester's leading families, as evidenced by his long tenure as a director of the now defunct Rochester City Bank. The remarkably cohesive Rochester society of the period nonetheless treated some chosen outsiders as equals who could share economic benefits controlled by elites.¹¹

Robert's vocational career in Rochester, which began in 1826 and ended with his retirement in 1851, paralleled the heyday of water-powered industry along the Genesee River. During this period, Rochester achieved distinction as a major world flour center with an early peak production of almost 700,000 barrels in 1847.¹² The mammoth, rumbling mills symbolized Rochester's prosperity to local citizens and foreign visitors alike, but never directly employed more than three to four hundred persons yearly. When the mills reached their greatest number in 1855, the aggregate value of the twenty-two mills was estimated at \$630,000.¹³ The makers of barrels, wagons, and canal boats all benefited from business with the millers, who also paid ready cash to farmers for raw grain products. But other industries such as machine shops, foundries, and dyeing establishments gradually began to employ more people and produce more manufactured goods. Henry O'Reilly, a prominent Rochester newspaper owner, presciently remarked in 1835 that although Rochester was most famous for its flour, other manufactures were more important to the economic welfare of the city.¹⁴ This assertion was borne out by 1846, when eleven iron foundries turned out products weighing 2,890 tons, and machine shops, with 759 workers, produced goods valued at \$748,000.¹⁵ When Robert Dalzell retired in 1851, steam power was just beginning to fuel a more diverse local economy. The technological maturation of steam-driven

machinery and the availability of cheap coal transported by railroads allowed industry to shift away from the Genesee River as entrepreneurs invested venture capital in new manufacturing endeavors no longer reliant on water power. The Rochester mills gradually converted to steam-powered turbines and new grinding technology, but the aggregate number of mills inexorably declined following the Civil War.¹⁶ If Robert Dalzell arrived during a pivotal period in Rochester's industrial development when water power alone fueled production, then he exited the local industrial stage at an equally opportune moment when steam-powered systems began to supersede water-powered machinery. Retiring in 1851 shortly after his first wife's untimely death the year before, he dedicated the remaining years of his life to church and family.

First Presbyterian Church records indicate that Sally Dalzell died on October 22, 1850.¹⁷ The cause of death is unknown, but the event must have badly shaken the devoted husband. He waited six years before marrying a second time to Lucy S. Peet, who remained with him until his own death seventeen years later.¹⁸ His and Sally's now married children, James and Elizabeth, provided at least four grandchildren to compete for the affections of the old millwright during his retirement. As an elected Presbyterian elder, Robert also maintained an active interest in religious concerns. Following his death, church members published a glowing memorial praising his steady character and unswerving devotion to the church.¹⁹ Newspaper accounts of the period briefly mention him as a director of the Rochester City Bank, relate that he injured his leg in a sleighing accident in 1857, and cite a minor chimney fire at his home on State Street in 1863.²⁰ Seemingly well esteemed by all who knew him, Robert Dalzell passed away at his Rochester home in 1873 at age eighty, leaving behind an impressive legacy as a first citizen of Rochester, inventor of the outside grain elevator and, at retirement, builder of almost half the city's water-powered grist mills. Posterity may never know the true number of mills actually built or serviced by Robert Dalzell, but enough credible evidence exists to firmly establish his reputation as the premier millwright of the Genesee country.

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TRIPHAMMER FORGE END NOTES

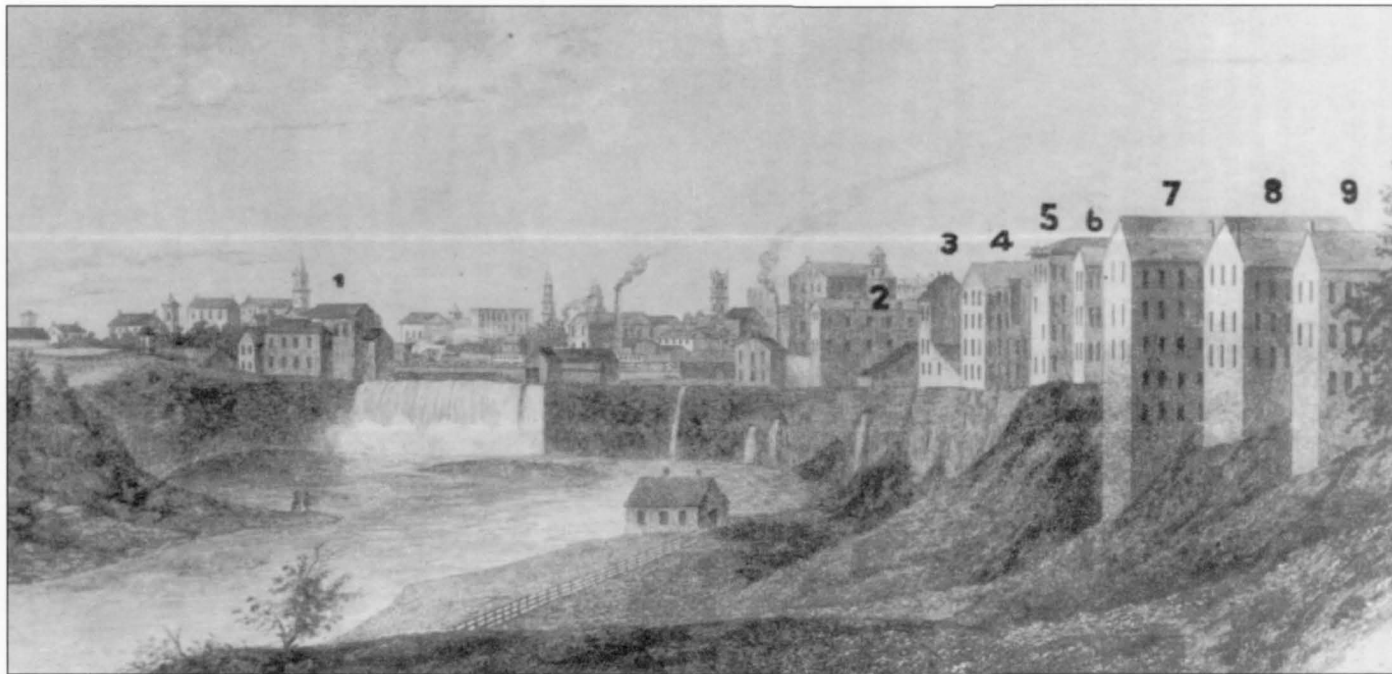
1. William M. Price, "Triphammer Forge Archaeological Documentation and Historic Resource Survey," City of Rochester, New York, Department of Environmental Services Engineering Bureau (May, 1993), p. 15.
2. Spurgeon King, "Brown's Race Historic District," National Register of Historic Places Registration Form (United States Department of the Interior, National Park Service, 1988-89; on file with the Keeper of the National Register of Historic Places, Washington, DC), section number 8, p. 20.
3. Matthew and Francis Brown to Myron Holley, 1 January 1817, Local History Division, Rochester Public Library, Rochester, NY; typescript copy in possession of author. The Brown to Holley letter itemizes expenses for the construction of Brown's Race; total construction cost for the lower race was \$3868.18.
4. Price, p. 36.
5. Brown to Holley; adjacent Mill Street probably received the rock fill.
6. Rochester (New York) *Telegraph*, 27 July 1819; Price, p. 8.
7. Rochester (New York) *Telegraph*, 18 January 1821; Price, p. 8.
8. Handbill dated July, 1828. Original in possession of the Rochester Historical Society, Rochester, New York; Price, p. 10.
9. Price, p. 16; O. Turner, *History of the Pioneer Settlement of Phelps and Gorham's Purchase and Morris' Reserve*, (Rochester: William Alling, 1851), pp. 610-611. The *History of the Pioneer Settlement* states that "William Cobb...had been connected with Dr. Matthew Brown in the axe and scythe manufactory, near Rome. In 1816, the business was transferred to Rochester..." This raises the possibility that Matthew Brown was a silent but active partner in Cobb's business, and that the Triphammer was constructed in 1816.
10. Francis and Joseph Gies, *Cathedral, Forge, and Waterwheel: Technology and Invention in the Middle Ages*, (New York: Harper Collins, 1994), pp. 88-89.
11. *Ibid.*, p. 89.
12. *Ibid.*, pp. 200-202.
13. Rochester (New York) *Telegraph*, 26 November 1828; Price, p. 10; C.W. Ammen, *Casting Iron* (Blue Ridge Summit, Pa.: TAB Books, Inc., 1984), pp. 19-21, provides an excellent discussion of cupola furnaces.
14. J.P. Lesley, *The Iron Manufacturer's Guide to the Furnaces, Forges and Rolling Mills of the United States...* (New York: John Wiley, 1859), p. 145. Lesley lists no furnaces, forges, or rolling mills in Rochester or Monroe County as of 1859.
15. *Ibid.*, p. 261.
16. Gies, p. 203.
17. Price, p. 7.
18. *Ibid.*, p. 9.
19. Henry O'Reilly, *Sketches of Rochester*, (Rochester: William Alling, 1838), reprinted. (Geneseo: James Brunner, 1984), p. 374.

20. Price, pp. 9-10.
21. Ibid., p. 79.
22. Ibid.
23. Ibid., pp. 79-80.
24. "New York Urban Cultural Park System Progress Report to the Legislature," (Albany: New York State Office of Parks and Recreation, 1980), p. 2. The state parks office is now known as the "New York State Office of Parks, Recreation, and Historic Preservation."
25. Ibid., p. 20.
26. Price, pp. 16-18.
27. Ibid., p. 16. Price cites the existence of an 1817 advertisement "in the local paper" for the William Cobb Axe and Scythe Factory. I could not find this ad, but concluded for different reasons cited in the text that the Triphammer Forge could have been constructed anytime between 1816 and 1819 (also see endnote #9 supra).
28. Turner, p. 610-611.
29. Ibid., p. 18; Charles Howell and Allan Keller, *The Mill: At Philipsburg Manor Upper Mills and A Brief History of Milling* (Tarrytown, New York: Sleepy Hollow Restorations, Inc., 1977), pp. 32-43, offer a good discussion of the four types of vertical waterwheels: overshot, pitchback, breastshot, and undershot. Water strikes a pitchback wheel at or just below its highest point nearest the sluice, causing the wheel to turn backwards towards the sluice.

ROBERT DALZELL END NOTES

1. Rochester was originally called "Rochesterville" until the city's incorporation in 1834, after which the name was shortened to "Rochester." For consistency, "Rochester" is used throughout the text.
2. Rochester (New York) *Union & Advertiser*, 20 January 1873, contains a useful thumbnail sketch of Robert's life.
3. Three falls actually existed in the Rochester area during the early settlement period: a series of rapids adjacent to the Allan watercourse (no longer extant today), the high falls, and another substantial falls closer to Lake Ontario. The falls historically have been referred to as the upper, middle, and lower falls, respectively. The largest of the three falls, the middle falls, is referred to as "high" falls throughout the text to consistently identify it as the largest falls around which Rochester subsequently developed.
4. Henry O'Reilly, *Sketches of Rochester*, (Rochester: William Alling, 1838), reprinted. (Geneseo: Brunner, 1984), pp. 359-60.
5. Ibid., census figures quoted in, p. 34.
6. Paul E. Johnson, *A Shopkeeper's Millenium: Society and Revivals in Rochester, New York, 1815-1837*, (New York: Hill and Wang, 1978), pp. 21-28.
7. Blake McKelvey, "Flour Milling at Rochester," *Rochester History*, v. 23 (July, 1971), p. 6.

8. Rochester (New York) *Union & Advertiser*, 20 January 1873 is the source crediting Robert with building all the mills in Rochester; O'Reilly, *Sketches of Rochester*, p. 361, cites the number as ten in 1838; Blake McKelvey, *Rochester: The Water Power City*, (Cambridge: Harvard University Press, 1945), p. 37, and "Flour Milling at Rochester," p. 9, uses two different figures: ten in "Flour Milling at Rochester," and thirteen (the Aqueduct Mill and "a dozen more") in *Rochester: The Water Power City*. The aggregate number of mills remained almost constant between 1835 and 1855, when few additional mills appeared, so most new construction (except in cases of severe damage) was completed by the time O'Reilly observed in 1838 that Robert had built ten mills.
9. *First Presbyterian Church Records*, "Admissions," p. 9.
10. O'Reilly, *Sketches of Rochester*, p. 308.
11. Johnson, *A Shopkeeper's Millenium*, p. 22.
12. McKelvey, "Flour Milling at Rochester," p. 9. The figure of almost 700,000 barrels of flour produced in 1847 represents the highest total production from predominantly water-powered mills. According to McKelvey (p. 17), thirteen steam-powered mills actually more than doubled the 1847 production figure in 1901 because of technological advances such as a new roller grinding process. Although the aggregate number of mills declined, production actually increased.
13. Lewis H. Morgan, "The Water Power and Flour Mills at Rochester," *Rochester Historical Society- Publication Fund Series*, v. 23, p. 125.
14. O'Reilly quoted in McKelvey, *Rochester: The Water Power City*, p. 209-10.
15. *Ibid.*, p. 232.
16. McKelvey, "Flour Milling at Rochester," pp. 14-18, offers a good discussion of milling in Rochester after 1865.
17. *First Presbyterian Church Records*, "Deaths," p. 2.
18. Rochester (New York) *Daily Union*, 21 February 1856.
19. Rochester (New York) *Union & Advertiser*, 20 January 1873.
20. Rochester (New York) *Daily Advertiser* of 11 June 1851 and 9 June 1852, Rochester (New York) *Daily Union* of 12 June 1855, Rochester (New York) *Union & Advertiser* of 9 June 1863, for directorship of Rochester City Bank; *Union & Advertiser* of 1 January 1857 for sleighing accident; and *Union & Advertiser* of 16 February 1863 for chimney fire.



In 1860 J. H. French's Gazetteer of the State of New York showed the mills along the Genesee River at the High Falls. They are: 1, Genesee Falls Mills; 2, Cotton Factory; 3, Achilles Custom Mills; 4, Revere Mills; 5, Granite Mills; 6, Phoenix Mills; 7, New York Mills and 9, Silas O. Smith's Mills. (Local History Division, Rochester Public Library)