FORD AND KIMBALL SHOP BUILDINGS

43-45 SOUTH MAIN STREET
CONCORD, NEW HAMPSHIRE

RECORDATION REPORT
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DECEMBER 2012

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ARCHITECTURAL HISTORY HISTORIC PRESERVATION

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Summary: The following report constitutes a recordation of the buildings at 43 and 45 South Main Street in Concord, New Hampshire. These buildings were demolished for redevelopment of their lot in July and August, 2012.

Western elevation of the complex at 43-45 South Main Street, Concord, New Hampshire, as seen in 2012 before demolition; an added wing of 1881, behind the ivy-covered structure to the left, is invisible from the camera's location. The red-painted building at the center is the altered Dunklee & Allen machine shop (c. 1866). To the right of the utility pole is a slightly earlier woodworking shop, remodeled in 1932. Between the utility pole and the red-painted building is the former engine house of the complex, originally one story in height but greatly altered and raised to two stories in 1932. The buff brick extension at the right, front, was added in 1951 for expanded automotive services.

Together, the two buildings represent significant surviving examples of structures that supported the types of manufacturing that characterized Concord in the nineteenth century: non-water-

powered shops and factories that depended on steam power and hand craftsmanship to fabricate their manifold products, and on the railroad to disseminate these products. The woodworking context of the White occupancy relates to dominant themes in the history of Concord manufacturing, especially coach and carriage building. Likewise, the electric motor theme of the later Cushman Electric Company occupancy relates to the early availability of three-phase electric current in Concord, generated by the Sewall's Falls hydroelectric plant, the first station in the East, and the second in the nation, to generate tri-phase alternating current. The availability of three-phase current stimulated production of three-phase electric motors in the city, widely-employed on Linotype typesetting machines among other uses.

The purpose of this recordation is to compile a descriptive and photographic record of the buildings, which were demolished for commercial development on the site before completion of the report. *To improve clarity, descriptions of the buildings are rendered in the present tense as if the structures were still standing*. This narrative report is accompanied by some 500 photographs taken before and during demolition of the complex in July and August 2012.

This recordation is intended to be analytical, describing and picturing the materials, construction systems, and (where discernible) alterations to the structures. The report is not a full historic structure report as defined by the National Park Service, nor a report on the level of Historic American Engineering Record (HAER) documentation. The report is intended to provide basic documentation of a single set of buildings that will augment Concord's understanding of its nineteenth-century manufacturing and commercial history and of the types of structures that supported that history.

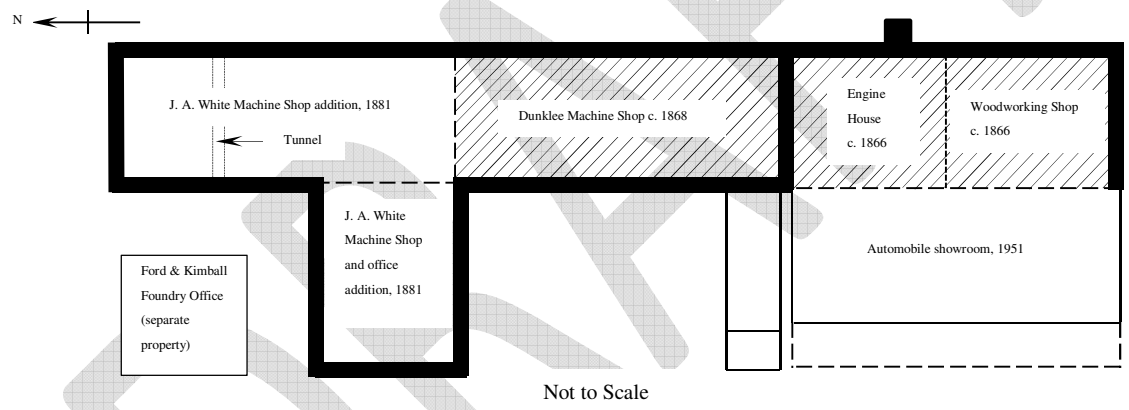
This report focuses on the physical structures rather than on a detailed history of the properties. An outline history of the properties has been prepared under the aegis of the City of Concord, in the form of a New Hampshire Division of Historical Resources (NHDHR) inventory form: CON0290, "Ford & Kimball (John A. White) Bldg.," written by preservation consultant Lisa Mausolf for the Concord Heritage Commission in February 2012. This form provides a basic history of uses on the northern portion of the property, with an abbreviated history of its uses in the twentieth century. The Mausolf inventory form does not deal except peripherally with the southern portion of the property beyond a party wall that presently defines the south boundary line of the New Hampshire Bindery holdings.

The present report attempts to discuss the evolution of the southern building and the engine house that stood between the northern and southern buildings, even though both the southern building and the engine house were largely transformed by an extensive remodeling to accommodate automotive services in 1932. This remodeling entailed changes in floor levels of the southern building, with the removal of the second floor except in a mezzanine area at the rear (east) of the southern building and the raising of the roof of the engine house to bring the roofs of the three separate structures (northern building, engine house, southern building) to even planes, as seen in the photograph of 2012, above.

A brief chronology of the construction, enlargement, alteration of use, and removal of the buildings is appended to this report as an accessible summary of the narrative history given in the inventory form prepared by Lisa Mausolf in February 2012. The evolution of the buildings, and

their changing uses over time, are further documented by a series of available Sanborn fire insurance maps beginning in 1874 and concluding in 1949. The evidence presented by these maps is discussed later in this report, following a description of the construction methods, materials, and techniques that were employed in the buildings.

Description, original buildings: The Ford and Kimball Shop Buildings are a series of structurally independent brick buildings that initially housed several discrete businesses. By 1881, the northern building was occupied as a manufactory of woodworking machinery under the management of John A. White, continuing a manufacturing use that had begun under prior occupants of the structure. White long operated under the name of the Concord Machine Works and occupied the northernmost of the two original buildings, a machine shop, by 1877. In 1881, White constructed an L-shaped addition at the northern end of the original complex of two buildings, while the southernmost of the original buildings, previously occupied by the Prescott Organ Company, was an independently owned woodworking shop. White's expansion brought the structures into their final plan as a sprawling assemblage of structural units that remained in use by several independent businesses until the 1920s, when the complex began to serve various automobile storage and service functions and to undergo substantial remodeling under different owners.



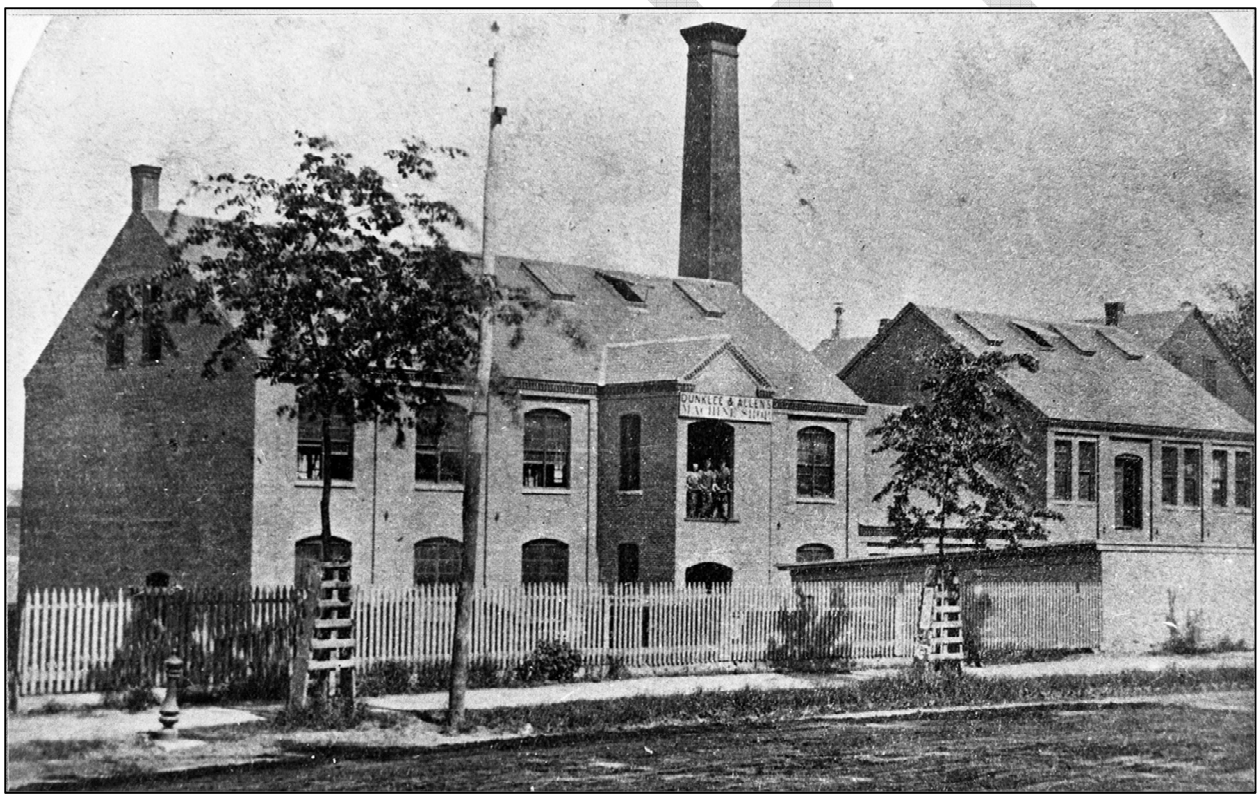
As built in the 1860s, the complex was composed of three separate units, indicated with cross-hatching in the sketch floor plan above. The earliest component, now heavily remodeled below the eaves but retaining an intact roof frame, was apparently standing in 1866. This is the southernmost building, measuring about 41 feet in width and about 38 feet in length, south to north.

The next unit was a one-story brick boiler and engine house, also measuring about 41 feet in width and having an aggregate length of about 34 feet. This building was divided on the interior into a boiler room on the south and an engine room on the north, separated by a brick partition that rose to the level of the eaves.[1] This unit was constructed around 1866, probably to supply power to a machine shop that then stood to its north. The Concord *Monitor* of July 13, 1866, reported that the machine shop, then owned by Ford & Kimball and Benjamin F. Dunklee, had been damaged by fire. The article reported that the "new brick engine house was several times on fire, but was saved by the utmost exertion."

[1] Sanborn Fire Insurance Map, 1928.

The third unit, the building north of the engine house, was built after the fire of 1866 to continue a machine shop business that had formerly operated on the site. This building measures about 41 feet in width, being uniform in width with the two units to its south. It extends northward from the north wall of the engine house about 72 feet. The Concord *Monitor* of April 17, 1868, noted that a new, two-story machine shop, measuring 41 feet by 72 feet, was to be erected "north from the present shop occupied by Dunklee and Tilton." This notice indicates that Benjamin F. Dunklee had temporarily moved his machine shop from the fire-damaged structure north of the engine house to the small building that stood south of the engine house pending the construction of a new northerly shop to replace the burned structure.

One known photograph records the appearance of these three structures before later additions and alterations transformed their appearance. This is a stereograph of the machine shop, then bearing the sign of "Dunklee & Allen" and of the engine house and woodworking shop to the south.[2] This valuable photograph is assigned a date of 1872 (source unknown). It records a Concord manufacturing complex, powered by steam (northern section) and utilizing hand manufacturing (southern section), as it stood in the years shortly after the Civil War.



Stereograph (dated 1872) of Dunklee & Allen Machine Shop (left) and Buildings to its South, courtesy of the New Hampshire Historical Society.

[2] For a chronology of the businesses that occupied these structures at various times, see Lisa Mausolf, New Hampshire Division of Historical Resources Individual Inventory Form #CON0290 and CON0291, prepared for the Concord Heritage Commission in February 2012, and the brief chronology of the construction, enlargement, alteration of use, and removal of the buildings that is appended to the present report.

This informative photograph reveals several things about the machine shop (left), the engine house (middle), and the woodworking shop to the south (right). First, the stereograph shows features that later disappeared, although not until the twentieth century. The first is the tall, square smokestack, which is described on Sanborn fire insurance maps of the 1870s as fifty feet tall (raised to eighty feet after 1900). An 1874 Sanborn fire insurance map identifies the low shed that stood adjacent to the sidewalk at the right of the photograph as a lumber shed; later Sanborn maps would indicate a coal shed aligned with the lumber shed farther south, probably serving as a coal pocket for the boiler.

Second, the stereograph illustrates aspects of the fenestration of the original buildings. Both the shop buildings are seen to have included scuttles or skylights in their roofs, a few of which, at the time the stereoscopic photograph was made in a summer season, were opened to ventilate the buildings. This ventilation was especially important in the northernmost building, which served as a machine shop and is shown on Sanborn insurance maps of the 1870s and 1880s to have included blacksmithing facilities on the first floor. The heat and smoke from the forges would have been exhausted from the building by means presently unknown—probably either by long-removed metal funnels penetrating the eastern slope of the roof, or by a single conduit connecting each forge either with the fifty-foot main smokestack or with the single-flue brick chimney that rises inside the northern gable end of the building (presently removed at roof level, but recorded in the stereograph). The presence of these forges is indicated by the contrast between the soot-darkened roof frame of the northern building and the relatively clean roof structure of the southern building, seen below under "**Roof System**." Partly because of the prevailing presence of insulation blankets beneath the roof of the northern building, possibly former openings for forge funnels cannot be detected. Where the roof surfaces of the north and south buildings can be seen, there is no evidence of scuttles on the eastern slopes of the roofs.

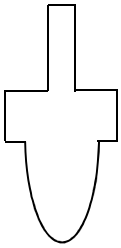
The stereograph indicates a difference in window design between the southern building and the slightly later northern building. In both structures, the windows are placed within wall bays that are flanked by thicker brick pilasters or buttresses. In the southern building, each bay contained two windows, separated by narrow brick piers. This composition remains visible on the eastern elevation of the building, although the upper sections of the window openings have been bricked up on both stories, as seen in the photograph below.

The stereograph indicates that the yard of these buildings was separated from the adjacent sidewalk by a fence of wooden pickets. This barrier would have been necessary both to keep pedestrians away from sites of industrial activity, and also because the first stories of the manufacturing buildings stand at elevations well below that of the sidewalk, presenting a hazardous declivity at the edge of the sidewalk.

The young elm shade trees planted between the sidewalk and Main Street were shielded by board enclosures to prevent cribbing by horses, a common precaution in urban settings.

Eastern elevation of southern building, showing evidence of original window openings, lintels, brick piers between windows, and wall buttresses defining bays for pairs of windows.

Few recognizably original sashes remain anywhere in the complex, but available evidence suggests that the original sashes, at least of the northern building, exhibited this muntin profile:

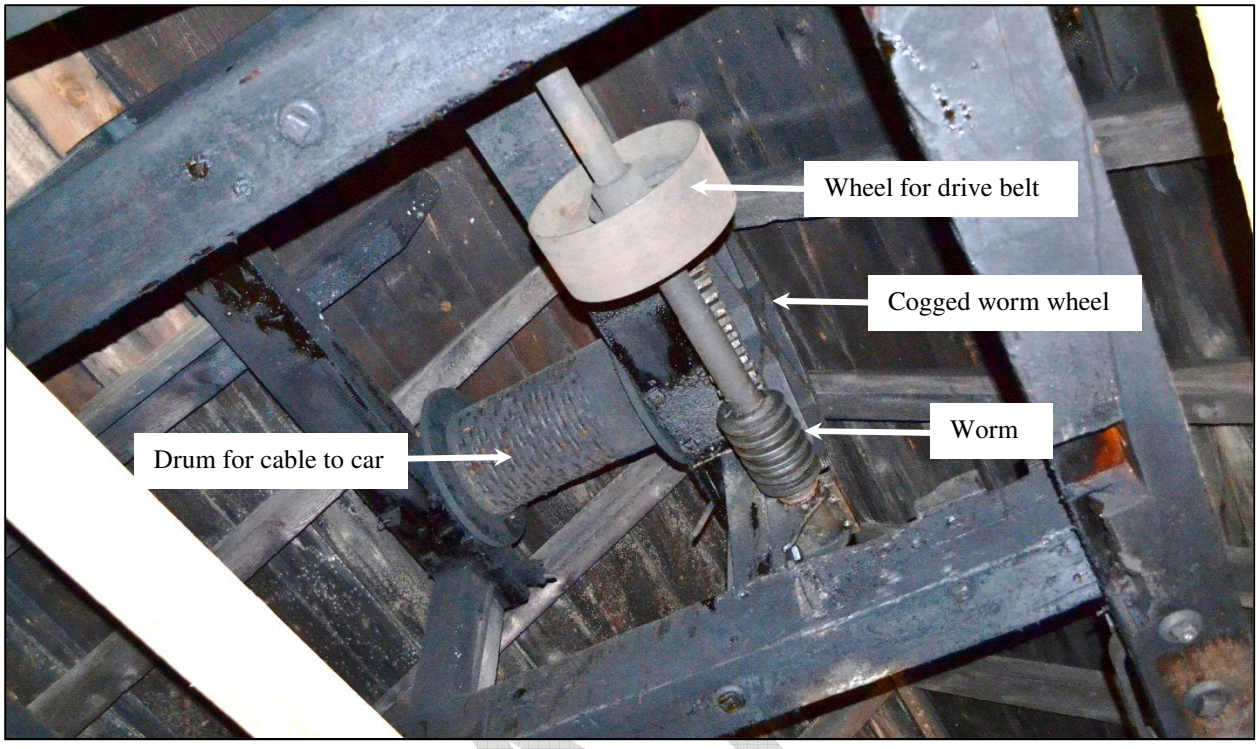


By contrast with the southern building with its paired rectangular windows, the northern building originally had a single, wide window opening between each wall buttress. Instead of being spanned by granite lintels, as in the southern building, the openings in the northern structure were topped by segmental brick arches. Beneath these arches were pairs of sashes, separated by wooden mullions. The original window design is well illustrated on the eastern elevation of the northern building, as seen below:

Eastern elevation of northern building. The area to the left of the double windows is the original engine house, increased in height from a single story circa 1932. The base of the smokestack, originally 50 feet high and later raised to 80 feet, is seen at the left, in the process of removal.

Third, the stereograph provides the only image seen thus far of the projecting stairwell of the northern building. Located off-center on the western elevation of the building, this feature provided loading doors and, presumably, an interior staircase connecting the two floors. As indicated by Sanborn insurance maps, the projection remained until after 1914, but had been removed by 1928, when the complex had been adapted for automobile service.

Sanborn insurance maps show that an "open elevator" connected the floors of the building inside this projecting bay at least as early as 1879. Part of the elevator mechanism survives in the roof structure above the former elevator shaft, now floored over but traceable in the attic floor. The lifting mechanism for the elevator is composed of an iron worm that was turned by a belt connected to the shafting that formerly ran through the building from the engine house. The worm drove an iron worm wheel on an axle that bore a wooden drum. Indentations on the drum show that a cable from the drum lifted or lowered the elevator car or platform, as shown in the photograph below. Parts of the driving mechanism were removed when shafting and belting were removed from the building, so the means of controlling the direction of the elevator, or of stopping it, cannot now be described.



Lifting mechanism for the elevator in the northern building

Description, added wings:

An article in the *Independent Statesman* (Concord) of September 1, 1881 describes the addition to the north of the original Dunklee & Allen building of 1868, then occupied by John A. White:

> **New Buildings**
>
> Work is to be begun immediately upon and extension of the building at the South end owned by Ford & Kimball, and occupied by the Concord Machine Works, John A. White proprietor. Dow & Wheeler, architects, of this city, have prepared the plans for the additions, and the contract for putting in the foundation has been awarded today. The new buildings will consist of one, 75 feet in length and 40 in width, one story in height, running parallel to the street. A second, extending at right angles to the first which will also be one story high, its other dimensions being 63x34 feet. At the end of this second building will be an office, fronting the street, which will stand one story above the street front and will be 34x20 feet. These increased accommodations are to be added to meet the constantly increasing business which is being done at the Concord Machine Works, and the improvements denote another advance in the business interests of the city. With the improvements that are being made in manufactures already established, and the prospect for the location of new industries in our midst, the business outlook for the future is certainly very encouraging.

The work of the architectural firm of Dow and Wheeler is described in greater detail below. This section of the report describes the addition.

The business of John A. White (1838-1899) was extensive, and his reputation as a manufacturer of woodworking machinery was widespread. The history of White's Concord Machine Works was given in capsule form in *The Leading Business Men of Concord and Vicinity* (1890):

> John A. White, manufacturer of Wood working Machinery, No. 31 South Main Street, Concord, N. H.—The business of which Mr. John A. White is proprietor was founded just about a quarter of a century ago [c. 1865], operations having been begun by Messrs. Kimball, Ford, Dunklee & Co., in 1865. The following year Mr. D. F. Dunklee assumed full control, but before the year was out became a member of the firm of Dunklee & Tilton. This concern gave place to Messrs. Dunklee & Allen in 1869, and in 1876 Mr. F. N. Stevens became sole owner; he being succeeded by the present proprietor in 1877. Mr. White is a native of this city, and served in the army during the Rebellion. He is almost universally known in manufacturing and general business circles, and his enterprising methods have had the natural effect of materially developing the business since it passed under his control. He manufactures a great variety of wood working machinery and holds numerous valuable patents, many of his productions not being obtainable elsewhere. The premises utilized are located at No. 31 South Main street, and contain a very complete plant of approved machinery, enabling operations to be carried on to the best possible advantage. The main shop measures 40X150 feet and there is a wing [office, machine shop, and pattern shop] of the dimensions of 32X62 feet. Employment is given to from thirty to fifty assistants, and no trouble is spared to retain the high reputation so long held for promptness and accuracy in the filling of orders. The high favor in which Mr. White's productions are held by practical wood-workers is due in great measure to their excellence of design, but the excellence of material and perfection of workmanship should by no means be left out of the reckoning, for they secure durability under the most trying of conditions and reduce the liability to get out of order to a minimum.[3]

The principal working section of John A. White's 1881 addition was a one-story addition (seen below) to the north of the original northern building.

[3] George F. Bacon, *The Leading Business Men of Concord and Vicinity, Embracing Penacook, East and West Concord* (Boston: Mercantile Publishing Company, 1890), p. 69.

North (end) and western elevations of the 1881 wing, built as a machine shop extension, showing wall buttresses defining window bays.

Sanborn insurance maps of 1884 and later show that this wing was integrated with the older building as an extension of the first-story machine and blacksmith shop. Evidence of brick arches preserved at the edges of the present concrete floor in this wing show that the original floor was wooden, and was elevated above the elevation of the current concrete slab. The arched window openings at the former grade level indicate a crawl space or possibly a shallow basement beneath both legs of the 1881 addition, ventilated through these regularly spaced openings.

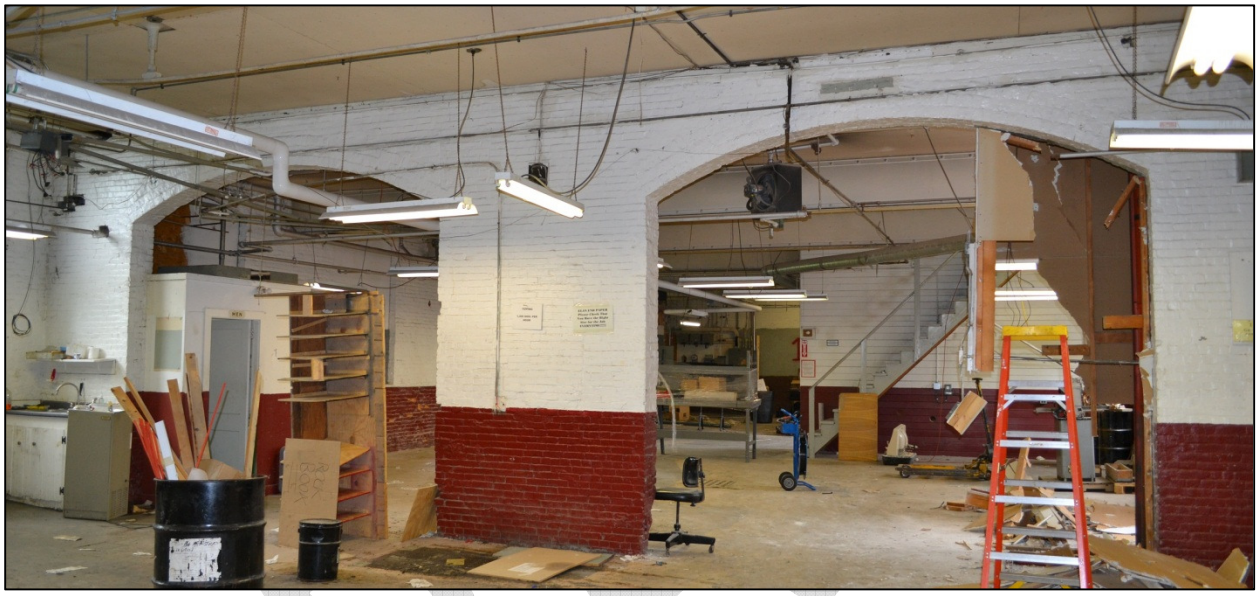
Because the Ford and Kimball office occupied a wooden structure on Main Street (see sketch plan on page 3), the office needed direct access to the Ford and Kimball foundry on the eastern side of the new wing. A tunnel or subway was therefore provided beneath the original floor of the 1881 wing, accessible through an arched opening (seen below) that remains partly above grade on the western side, and through a break in the stone foundation/retaining wall on the eastern side of the new building. The tunnel is first indicated on the 1893 Sanborn fire insurance map, but the finished masonry of the wall and the arch, composed of multiple concentric tiers of rowlock voussoirs, shows that the tunnel was provided when the wing was built in 1881.

Top of arched tunnel (filled) leading under the 1881 wing to the Ford & Kimball Foundry

The 1881 addition was consciously designed for functions that are no longer clear. As seen in the photograph of its western elevation, above, this side of the building has five broad and high windows, each enframed within a panel embraced by brick buttresses. The north end of the building has four small and high windows. The eastern elevation, seen below, has nine windows (or eight and a door, as at present), each with a segmentally arched head, but with no thickened wall buttresses to define wall panels.

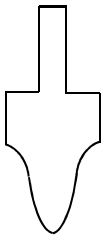
Eastern elevation of the 1881 wing, without wall buttresses defining window bays.

The northern leg of the 1881 additions, shown above, contained a single large room connected with the first story of the original northern building through broad arched openings that were created in the brick wall of the latter. This room was apparently connected with the first story of the two story leg of the additions, extending westerly toward Main Street, as it is today. The 1884 Sanborn insurance map shows that the entire first story of the 1881additions, together with the first floor of the original northern building, functioned together as a large machine shop, with blacksmithing facilities remaining on the first story of the older building as well.



Arched openings connecting the one-story leg of the 1881 addition to the older building, looking south from the 1881 addition.

The flat roof of the northern leg of the 1881 additions is supported from below by inverted metal queenpost trusses, described in greater detail in a later section of this report. These trusses permitted the northern leg of the addition to remain unobstructed by columns that would otherwise have been needed to support the weight of the roof materials and snow loads. The forty-foot-wide room was amply lighted by double-hung windows on both its east and west elevations, and by the four smaller windows in its northern elevation. Where they survive (mostly on the western elevation of the one-story leg and the northern elevation of the two-story leg), the original sashes in this addition display this muntin profile:



Interior, one-story leg of 1881 additions, looking north, showing metal queenpost trusses supporting the roof system.

Beneath the northern end of the one-story leg of the 1881 additions was a boiler room (now used for storage) that provided steam to heat portions of the building. The chimney for this boiler rises along the interior face of the northern (end) wall of the addition, visible in the photograph above.

This room has a supplementary system of wood-framed roof trusses, running north-and-south at right angles to the metal trusses. These rest mostly on the bottom chords of the metal trusses except at the southern end, where a metal truss was removed and the bottom chord of the wooden trusses is supported by a wooden column, as seen in the photographs above and below. The wooden truss system was apparently added to provide support for intermediate roof beams, probably because the roof joists between the metal trusses were sagging or failing.

Timber kingpost truss system added to the metal roof trusses of the one-story leg of the 1881 addition and resting on the bottom chords of the metal trusses except at far right.

The western leg of the 1881 additions is a two-story brick building measuring about 35 feet in width and about 63 feet in length, having a flat roof supported by a system of timber beams. This leg was apparently intended only to be one story in height, and to have a street-level office at its western end. The newspaper description of September 1881, quoted previously, describes the proposed structure as "a second [leg], extending at right angles to the first[,] which will also be one story high, its other dimensions being 63x34 feet. At the end of this second building will be an office, fronting the street, which will stand one story above the street front and will be 34x20 feet."

Instead, the western leg of the 1881 addition was built a full two stories high throughout, although the western end was treated on the interior as a lofty one-story office. As shown on the 1884 Sanborn insurance map, the wing accommodated an extension of the first-story machine shop, with a pattern room on the second floor except at the front (western end), where the office of the Concord Machine Works was located.

Western (left) and northern elevations of western leg of 1881 additions, occupied as the office of John A. White's Concord Machine Works. The broad, filled openings at sidewalk level reflect the later use of this area for Carlson's automobile showroom in the 1950s.

Above the center of the western façade of the office wing is a granite tablet bearing White's name:

The original interior configuration of the western leg of the 1881 addition is difficult to discern because of subsequent changes. The office at the western end of the addition, described in the newspaper article of September 1881 as 34 feet wide and 20 feet deep, appears to have been a single room. Above a modern suspended ceiling for the current offices in this area is a closed space that retains an elaborate coffered ceiling of pressed metal, as shown below. This architectural treatment may represent the original appearance of the Concord Machine Works office.

The area east of this office, divided into two stories, has been remodeled many times, and has served as additional second-floor offices, workrooms, and storage areas. As indicated by Sanborn insurance maps, it functioned as a pattern shop in the latter part of the nineteenth century.

Throughout the late nineteenth century and into the 1920s, the southern building, south of the engine house, remained separate from the Concord Machine Works and its successors. This two-story building was consistently listed as a carpenter's and builder's shop during this period.

Brick Walls: The walls of each of the separate building units on the site are laid in common or American bond, using bricks that may be presumed to have been manufactured nearby in one of the many brickyards of Concord or nearby Pembroke or Hooksett. American bond utilizes an

outer and an inner tier or withe of brick. A number of courses of these bricks in both the outer withe and the inner withe are laid in stretcher fashion, with the bricks oriented lengthwise along the plane of the wall. After a predetermined number of stretcher courses are laid, a course of headers is inserted to bond the outer and inner withes of the wall firmly together. The bricks in header courses are laid at right angles to the plane of the wall, penetrating part or all of the thickness of the wall to lock the entire fabric together into a cohesive structural unit.

The face bricks of the buildings are well-vitrified bricks that were selected for hardness, resistance to weathering, and general uniformity of color. The original appearance of these bricks is best seen in the attic that was created when the roof of the former boiler/engine room was raised to the level of the adjoining roofs in 1932; the exterior walls of much of the rest of the complex have been painted. In the attic, the south-facing gable of the northern machine shop is exposed to view, having been protected from the elements and from alteration for eighty years. As seen in the photograph below (left), the header courses are placed at every tenth course. Also seen in this photograph is the general uniformity of color and texture of these face bricks, denoting their grade as common face bricks of good industrial quality. During much of the nineteenth century, such bricks sold in nearby brickyards for about $4.00 per thousand, gradually increasing to $6.00 per thousand as railroad transportation increased the volume of production.[4]

Because the total width of two tiers or withes or bricks laid as stretchers slightly exceeds the length of the bricks that are laid as header courses in a two-withe or eight-inch wall, the headers are laid flush with the exterior plane of the wall but do not project through the full thickness of the wall. On the interior, the recess or groove created at each header course is commonly parged or filled roughly with mortar to give the wall an even thickness. This technique is visible on the interior of the gable walls of both the north and the south gabled buildings, as seen in the photograph below (right). This treatment of the interior of header courses in the American bond is seen in the Concord area as early as circa 1830.

Left: *Exterior gable wall of the northern machine shop, showing face bricks laid in common bond. The gable outline below is the original roof peak of the boiler/engine house.*

Right: *Interior gable wall of the northern machine shop, showing softer backing bricks laid in common bond. The lines of mortar mark the backs of each header course.*

[4] James L. Garvin, "Small-Scale Brickmaking in New Hampshire," *IA, The Journal of the Society for Industrial Archeology* 20:1-2 (1994), pp. 28-9.

As seen in the photograph at the left, showing the inside face of the breached northern gable wall of the southern building, the brick walls of the complex are laid in lime-sand mortar, which retains a very white appearance if not exposed to pollutants. It can be seen that the courses of the outer withe (left) do not align precisely with those of the inner withe (right). Where the header courses are placed, the bricklayers sometimes shimmed the headers with mortar and brick chips to level the headers as they extended through the wall.

The production of bricks even in the clay-rich regions of New Hampshire was limited in scale well into the nineteenth century because of the difficulty of transporting large quantities of heavy bricks from the point of manufacture to distant markets or places of consumption. Of all brick making regions in New Hampshire and adjacent Maine, the seacoast region was clearly the most favored in terms of transportation. In that area, the best clay beds lie alongside or near tidewater, permitting the easy loading and moving of great quantities of brick by water. Inland areas like Merrimack County might see bricks transported some distance up or down the Merrimack River, but it is safe to assume that the bricks used in the Ford and Kimball buildings and other local brick structures of the latter nineteenth century were made close to, or in, Concord.

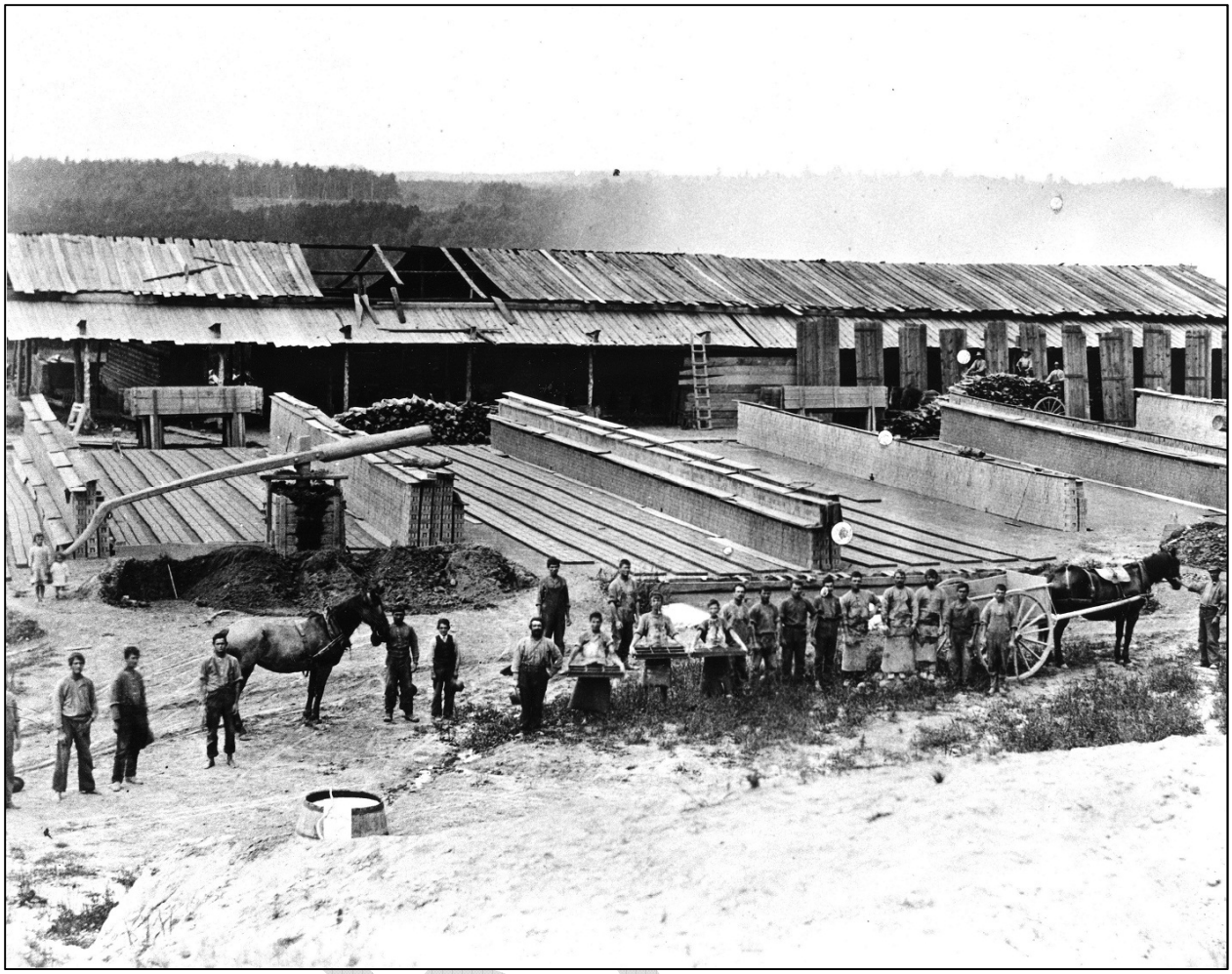
In the eighteenth and early nineteenth centuries, bricks were made by simple processes that depended largely on the muscular power of men, boys, and animals. Clay as taken from the ground is not suitable for molding. Such clay is stiff and sticky, and must be tempered or rendered more plastic. This was traditionally accomplished by digging the clay from the clay bank in the fall and allowing it to freeze and thaw, with repeated turnings, over the winter. This tempering process was followed by re-wetting and mechanical kneading, with the addition of sand to make the clay more workable. This was carried out in early brickyards by driving cattle or horses over the lumps of clay; the pug mill, an animal-powered device for mixing sand with the clay, was probably adopted later in the nineteenth century. Tempering was a slow process, inviting hasty or inconsistent work. Writing in 1792, New Hampshire historian Jeremy Belknap complained that much of the clay used in making bricks in coastal yards was “not sufficiently mellowed by the frost of winter, or by the labour of the artificer.”

After the clay had been tempered to the consistency of a stiff mortar, it could be molded. This was accomplished by taking a lump of clay and throwing it into a wooden mold with rectangular cells slightly larger than the dimensions of the fired brick, then striking off the surplus clay with a straightedge. The molding operation required considerable strength and a degree of skill that developed over the course of molding thousands of bricks. To enable the prism of sticky clay to drop out of the mold as a "green" brick, the mold was wetted with water or dusted with dry sand. Physical evidence provided by the smooth surface of bricks in most Concord-area buildings suggests that local brick makers usually used water without sand to lubricate their molds. Most local face (exterior) bricks from the early nineteenth century exhibit some surface irregularities as a result of their having been dropped out of the mold and handled during air-drying. When seen in a raking light, most also display flat, shallow indentations on their faces. These impressions result from the weight of superincumbent bricks when the still compressible green bricks were stacked in the kiln for firing.

After being dropped from the mold, the "green" bricks were laid flat on the ground to begin to dry and stiffen. After a few days, they were tipped up on their edges to dry further. After this initial drying, the bricks were carefully stacked in rows, often under the makeshift shelter of boards placed over the rows to protect the unburned bricks from rain, the brick maker's enemy.

Once molded and air-dried, green bricks were ready for firing or "burning." The green bricks were carefully stacked in a "clamp"—a rectangular structure with corbelled tunnels running at intervals through its base and with innumerable gaps or interstices throughout the entire construction to allow heat from the fires in the arches to pass upward through the entire pile. The outer faces of the clamp were "scoved" or covered with an un-mortared veneer of hardened refuse bricks from earlier firings, and were carefully parged or plastered with mortar made of clay and sand to contain the heat of the fires.

The bricks in a clamp were vitrified by the heat of wood fires made in each of the arches at the base of the pile. By feeding and adjusting these fires and regulating the draft, the temperature at the bottom of the clamp was gradually raised to a point between 1,500 and 2,000 degrees Fahrenheit, transforming the prisms of blue clay into ceramics, made red by the oxidization of the iron contained in the clay. Firing and cooling a clamp of bricks could take well over a week. After the firing was complete and the kiln was slowly cooled over a period of several days, the entire pile was taken apart and the bricks sorted for various uses. Despite the best skill of the brick maker, the bricks near the fires would inevitably be more vitrified than those at the top of the kiln. Usually, the bricks from the mid-region of the clamp would be the characteristic bricks of the burning, displaying a color, size, and hardness that reflected the properties of their clay and their method of firing.



Brickyard, Pembroke, New Hampshire, late 1800s. A yard of this type would have supplied the bricks for the Ford and Kimball shop buildings. In the foreground, left, is seen a pug mill, which was turned by a horse to mix clay with sand. Some of the workers posing at the center hold wooden brick molds. In the middle ground are bricks tipped from the molds onto beds of sand to dry in the sun; drier bricks have been stacked under board covers for further drying. In the background are the crude sheds that cover the scove kilns. The kiln at the right is being fired; wood smoke and steam from the vitrifying bricks rise above the structure. Courtesy of the Pembroke Historical Society.

The bricks that were hardest burned yet were not distorted by over-firing were selected as face bricks like those seen above. The bricks that had achieved a lesser degree of vitrification were less able to withstand the effects of moisture and the freeze-thaw cycles of northern climates. These bricks were selected for use as backing bricks. The variation in color of backing bricks may be seen in the photographs above. Less visible is the difference in size between face bricks and backing bricks. Although made in the same molds, the bricks in the cooler areas of the clamp experienced less shrinkage during firing than bricks in the hotter areas, leaving them with slightly larger final dimensions. This is why every ninth course of backing bricks, below each header course, is reduced to a course of split bricks or fragments in the walls illustrated above.

The local production of bricks was stimulated greatly by the advent of the railroad in the 1840s. In 1832, before the arrival of this new means of transportation, the Secretary of the Treasury carried out a survey of the manufactures of the United States. At that time, the Merrimack

Valley, including Pembroke, Allenstown, and Hooksett, together produced 1,271,000 bricks per year, selling virtually all of them in the immediate area.[5]

Once the railroad arrived in an area where extensive clay beds had formerly encouraged local production, the scale of brickmaking operations often changed dramatically, making the figures of 1832 seem insignificant. This was especially true in places like Hooksett and the adjacent river towns, where the nearby and rapidly growing manufacturing cities of Manchester and Concord created an almost infinite demand for bricks.

In Hooksett, early demands placed on the extensive underlying beds of clay were small, reflecting in no degree the scale of operations that would appear there later in the nineteenth century. An 1885 history of Merrimack County notes:

> About the year 1810 the late Captain Rice Dudley, of Pembroke, who had worked at brickmaking in Massachusetts some, prospected, in company with Samuel Head, the clay-banks now worked by Jesse Gault and W. F. Head [in Hooksett]. Mr. Dudley prophesied that the banks would be developed some time, but Mr. Head scouted [ridiculed] the idea, for the reason that it would be difficult to transport them to market. Since that time the clay-banks have been utilized; a railroad, with its side-tracks, has been extended up near the kilns, and it is no uncommon thing to see twenty-five cars of brick loaded in one day.[6]

This notable demand had already given rise to brickmaking on an impressive scale when state geologist Charles Henry Hitchcock described the upper Merrimack Valley in his *The Geology of New Hampshire* (1878). Hitchcock noted that the clay beds first discovered by Captain Rice Dudley about 1810 had proven to be "a nearly continuous stratum, which has a thickness of from 20 to 30 feet," extending four miles north from Hooksett Village on the east side of the river.[7]

By 1878, shortly after the Ford and Kimball buildings were in operation on Concord's main street, Hitchcock reported that Natt and William Head of Hooksett were making about 5,000,000 bricks annually, with a market value of $6.00 to $10.00 per thousand bricks. The Heads employed about sixty men in their brickyard operation and sold their product not only in nearby cities like Manchester and Concord but, thanks to railroad connections, also in Nashua and Lowell, Lawrence, and Worcester, Massachusetts. Jesse Gault, whose Hooksett brickyard utilized the same stratum of clay first detected about 1810, was then employing forty men to manufacture between 3,000,000 and 4,000,000 bricks each year. Another six manufacturers in Hooksett, Suncook Village, and Pembroke employed an additional sixty men in their yards. Their production, according to Hitchcock, averaged "about 80,000 brick yearly to each man employed."[8]

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[5] *Documents Relative to the Manufactures in the United States Collected and Transmitted to the House of Representatives in Compliance with a Resolution of Jan. 19, 1832, by the Secretary of the Treasury*, Vol. 2 (New York: Burt Franklin, 1969).

[6] D. Hamilton Hurd, ed., *History of Belknap and Merrimack Counties, New Hampshire* (Philadelphia: J. W. Lewis & Co., 1885, pp. 380-1.

[7] C. H. Hitchcock, *The Geology of New Hampshire* (Concord: Edward A. Jenks, 1878), part 3, Surface Geology, pp. 94-5.

[8] Ibid., part 5, pp. 85-6.

Roof System of the Three Original Buildings: The roof system of both the north and south buildings and of the boiler and engine house section between the two shops (originally a one-story building, raised to two stories in 1932), is composed of a series of wooden roof trusses supporting heavy, sawn purlins. The purlins, in turn, support a roof membrane of sawn common rafters, which are covered by roof sheathing boards applied horizontally across the rafters. The roof was originally slated, but was re-shingled with asphalt during the twentieth century.

The roof trusses that compose the main structural system of the building's roof are wood-and-iron queenpost trusses. Trusses of this general type were widely used during the mid-nineteenth century to span wide spaces. At that period, such truss systems represented a relatively new phenomenon in American construction, though their principles had been understood and promulgated in England for more than half a century. Once accepted in the United States, the concept of using wood for compression members and iron rods for tension members in trusses was adopted not only for roof trusses of building, but was also translated into a popular and successful bridge truss, the Howe truss, patented by William Howe of Massachusetts in 1840.

The combined use of wood and iron became a widespread structural solution to covering large buildings in the mid-1800s. Where gable roofs permitted the inclusion of kingpost or queenpost trusses under a roof, such trusses, fabricated from wood and iron, may be expected in non-domestic buildings of this period. Their function was usually to support the roof planes of the building while simultaneously providing an attic floor that required no support from below. Such truss systems were therefore widely used not only in churches, public halls, and factory buildings, but also in stables and livery buildings where unencumbered movement was desirable.

A leading proponent of wood and iron roof trusses was Boston architect and author Thomas W. Silloway (1828-1910), one of the most prolific New England designers of the mid-to-late 1800s. Silloway was credited with the design of more than three hundred church buildings. In 1857, at the age of twenty-nine, Silloway was selected to rebuild the Vermont state house at Montpelier after the original building of 1836 was heavily damaged by fire. Silloway was a strong advocate of timber and iron roof trusses, and was so impressed with the advantages of this type of composite system that he pronounced such trusses "an invention, which has, in the process of time, brought about as great a revolution in the art of carpentry as the introduction of the arch did in that of masonry."[9]

Silloway's church commissions frequently required the design of large roof trusses to provide expansive ceilings that were unsupported from below. Silloway thus became adept at designing such trusses of timber and iron, but also became interested in the history of the introduction of such combination structures into American architecture and engineering. In his *Text-Book of Modern Carpentry* (Boston, 1858), Silloway recapitulated the history of the wood-and-iron truss and illustrated a number of his own designs for such trusses, including a complex version that he was employing in the Vermont capitol, then under construction.

[9] Thomas W. Silloway, *Text-Book of Modern Carpentry* (Boston: Crosby, Nichols and Co., 1858), p. 103.

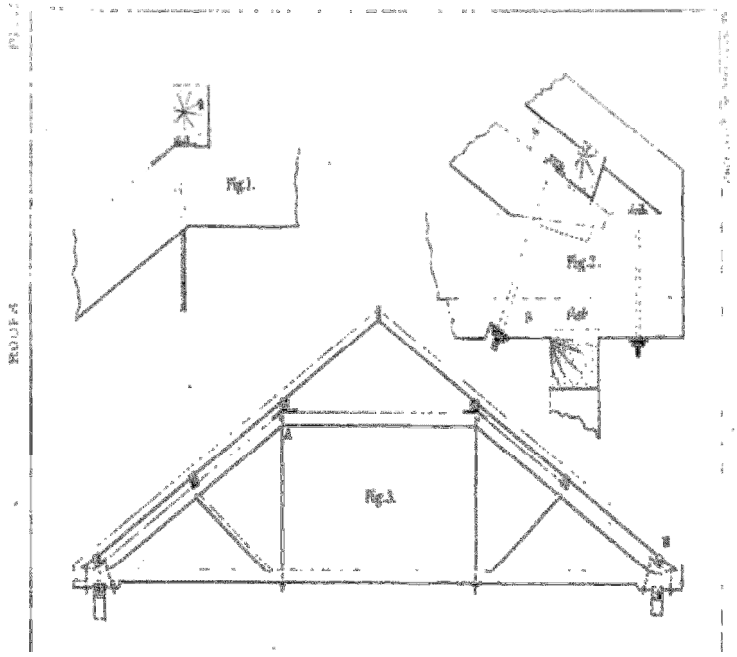

Plate VI, Thomas W. Silloway, Text-Book of Modern Carpentry *(1858), showing "a design for a roof of from forty to sixty feet span."*

Silloway found that the idea of substituting iron tension members for timber members in roof trusses had first been suggested by the prolific and influential Scottish author Peter Nicholson in his *The Carpenter and Joiner's Assistant* (1797). Nicholson illustrated many timber roof trusses in this book, but also included two that combined wood and iron. The first, an existing system that had been employed at the chapel of the Royal Hospital at Greenwich by architect Samuel Wyatt as early as 1785, was a flat-topped variant on a kingpost truss, with the central vertical composed of an iron rod; this truss has a clear span of 51 feet. Second, Nicolson illustrated a multiple kingpost, or kingpost-queenpost, truss, apparently of his own invention, having three vertical iron tension members.[10]

Silloway noted that the idea of composite timber and iron roof trusses had received only limited acceptance in England even as late as the mid-1840s.

By that time, the principle had been incorporated in the bridge patent of Howe in Massachusetts. The use of iron tension members in roof trusses had also been practiced by the Boston architects Alexander Parris and Charles G. Hall. Such trusses were first illustrated in the United States by the Boston architect and author Asher Benjamin, supposedly under the influence of Hall, an English architect and engineer who had immigrated to the United States in 1823.[11]

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[10] Peter Nicholson, *The Carpenter and Joiner's Assistant* (London: printed for I. and J. Taylor, 1797, Plates 71 and 79.

[11] Silloway, *Text-Book of Modern Carpentry,* p. 105.

Asher Benjamin, whose seven architectural guidebooks were published in Massachusetts over a period extending from 1797 to 1843, had a powerful influence over American builders in matters of both style and technology. His *Practice of Architecture* (1833) included one timber and iron queenpost truss roof frame similar to the later Silloway design shown above, together with the observation that a wrought iron rod having a cross-section of one square inch had a tensile strength of 76,400 pounds, more than ten times the tensile strength of any species of wood. Of the use of iron, Benjamin noted that metal "avoids the difficulty of shrinkage and indentation of the heads of the queen post."

In his next book, *The Builder's Guide* (1839), Benjamin illustrated another timber and iron queenpost truss, this one with diagonal struts like those in the Silloway diagram above. He also illustrated a timber scissors truss reinforced by iron rods whose tension was adjustable by turnbuckles. Benjamin's last volume, *Elements of Architecture* (1843), was more like a textbook than a builder's guide. It had extensive text, including fairly extensive coverage of the strength of building materials, but few plates. This volume illustrated several timber and iron combination trusses. It also illustrated an all-iron truss floor system designed to support the weight and thrust of a series of brick vaults that lie on top of the trusses, thus anticipating various attempts at noncombustible construction.[12]

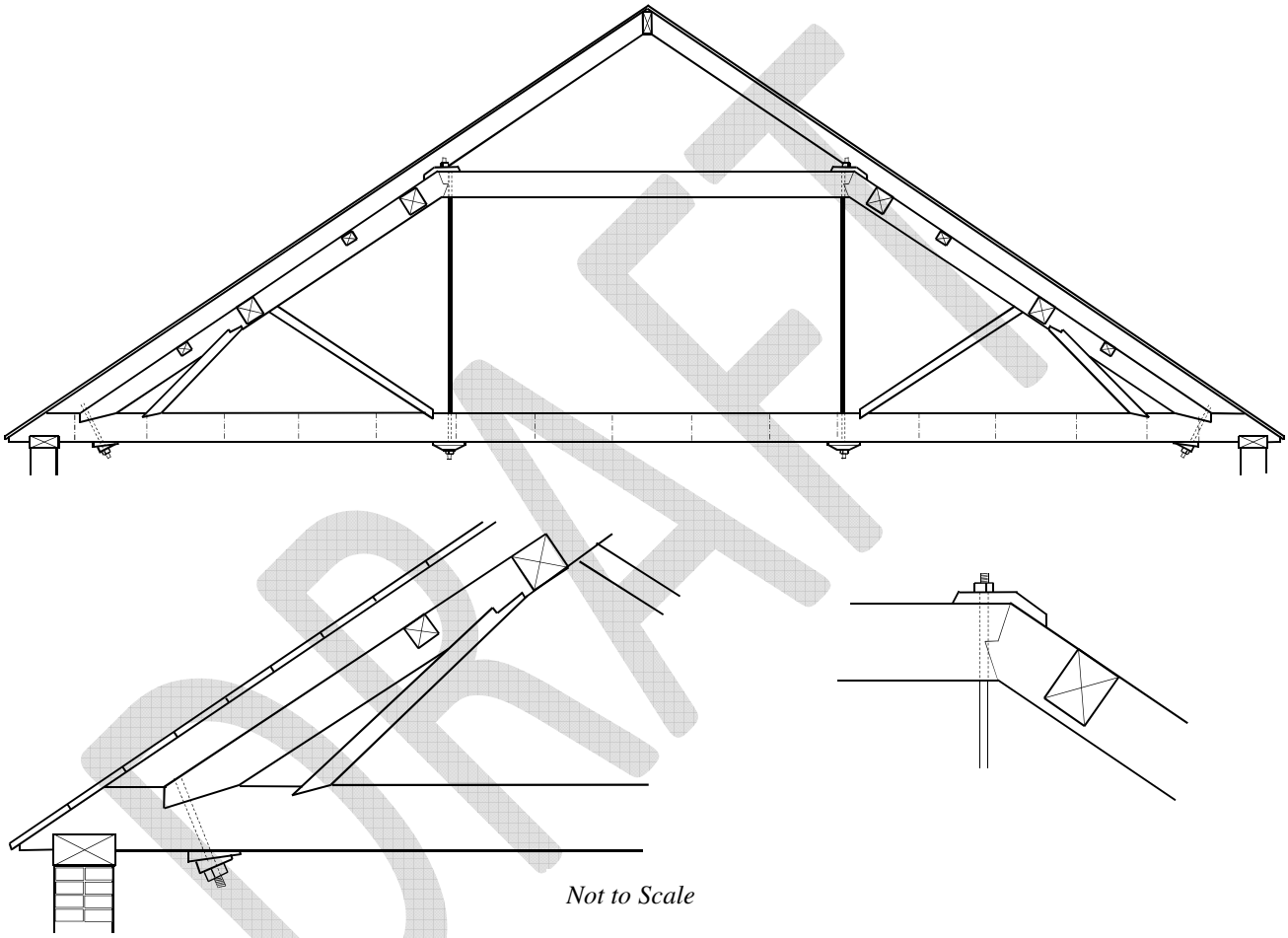
Of these designs, published between 1833 and 1843, Silloway said, "the work of Mr. Benjamin was no sooner published than a reform commenced, which has steadily advanced, until its great value and economy are universally acknowledged."

The Ford and Kimball buildings offer excellent examples of timber and iron trusses as a solution to spanning the large spaces above the original two-and-a-half story buildings or the one-and-a-half story boiler/engine room between them. These trusses are composed of timber sawn on circular saws, notched and fitted at their ends according to standard carpentry practices illustrated by Benjamin and, later, by Silloway. Iron rods show some irregularity of surface texture, but may be presumed to have been produced in rolling mills by circa 1870 rather than forged and swaged into a round cross-section by hand blacksmithing. Nuts are square rather than hexagonal, and are employed in combination with large iron washers or plates (probably cast iron) of differing profiles in the north and the south sections of the building.

The roof system is composed of horizontal tie beams, which extend across the full forty-foot width of the building without joints. Resting upon and tenoned into each tie beam is a queenpost truss having timber end posts or chords, and queenposts of iron, as shown below. Extending longitudinally along the plane of the roof are two heavy timber purlins, the upper one placed near

[12] Benjamin, *Elements of Architecture* (1843), Plate XXVI. In some of his truss designs, Benjamin illustrated iron tension members with branched tops or heads created by forge welding to fasten both to the top chords and the slanted end posts of the trusses, and thus involving increased reliance on blacksmithing. In older all-timber trusses, smith's work had generally been restricted to the forging of iron ties or stirrups, commonly used to lock the feet of heavy timber king- or queenposts to the tie beams into which the feet of the posts were traditionally tenoned. By the time that composite timber and iron (or later timber and steel) trusses had become universally accepted, threaded rods were generally used as they came from rolling mills, with little later manipulation by the blacksmith except for upsetting (thickening) the ends to accept the cutting of threads without loss of net cross section in the threaded area, followed by the threading of the ends.

the horizontal top chord of the queenpost truss (called the “straining beam” in the nineteenth century), and the lower one placed at about the midpoint of the slanted end post of the truss. Lying atop the purlins are the common rafters of the roof, which support the roof sheathing boards and the roof covering of slate (originally) or asphalt shingles.



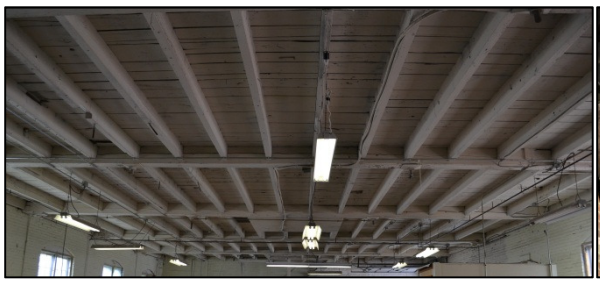
Not to Scale

The members of the trusses are joined together with visible joints like those shown above. As illustrated by exploded drawings in books, including those of Benjamin and Silloway, there may be hidden details connected with the joints, not visible unless the trusses are disassembled. As is common with composite timber and iron trusses, the juncture of the lower chord or tie beam and the slanted end post of each truss is strengthened and reinforced by the insertion of a diagonal threaded rod whose nut bears upon a slanted washer, apparently of cast iron, and a wooden wedge or shim.

The queenpost trusses support the rafters, which bear upon the two heavy purlins placed near the tops and the mid-height of the trusses. This arrangement of framing elements is particularly evident in the attic of the southern building, where the original floor, at the level of the tie beams of the trusses, was removed and lowered several feet in the twentieth century. This alteration provided a full view of the trusses the purlins, the diagonal braces that connect the slanted end posts of the trusses with the purlins, and the rafters that extend from eaves to ridge, as seen in the photograph at the left, facing the eastern slope of the roof.

The bottom chords or tie beams of the trusses also support the attic floors of those portions of the building that had such floors (the boiler and engine room apparently did not, since the brick walls and roof structure of this portion of the building were whitewashed, indicating that the roof was visible from below). In the southern gable-roofed building, shown at the left, the floor joists were notched and rested on ledgers nailed to the bottoms of the tie beams or lower chords of the trusses. In the northern building, by contrast, the notched joists were held in notches cut into the top edges of the tie beams or lower chords of the trusses (below, left). Where they survive in the attic floor of the northern building, the floor joists measure 3" by 8." The lower truss chords, into which the joists are notched, measure 8" by 8."

As seen in the early photograph of the shops of the Dunklee and Allen machine shop, said to date from 1872, both the northern and southern shop buildings had a series of scuttles on the western slopes of their roofs, near the ridge. The larger north building apparently had six or seven; the southern building had four. Areas of newer roof sheathing are evident on the western slopes of the roofs of both buildings today, verifying the location of the scuttles (below, right). The presence of such openings, for ventilation and light, may be another characteristic feature of nineteenth manufacturing buildings in Concord.

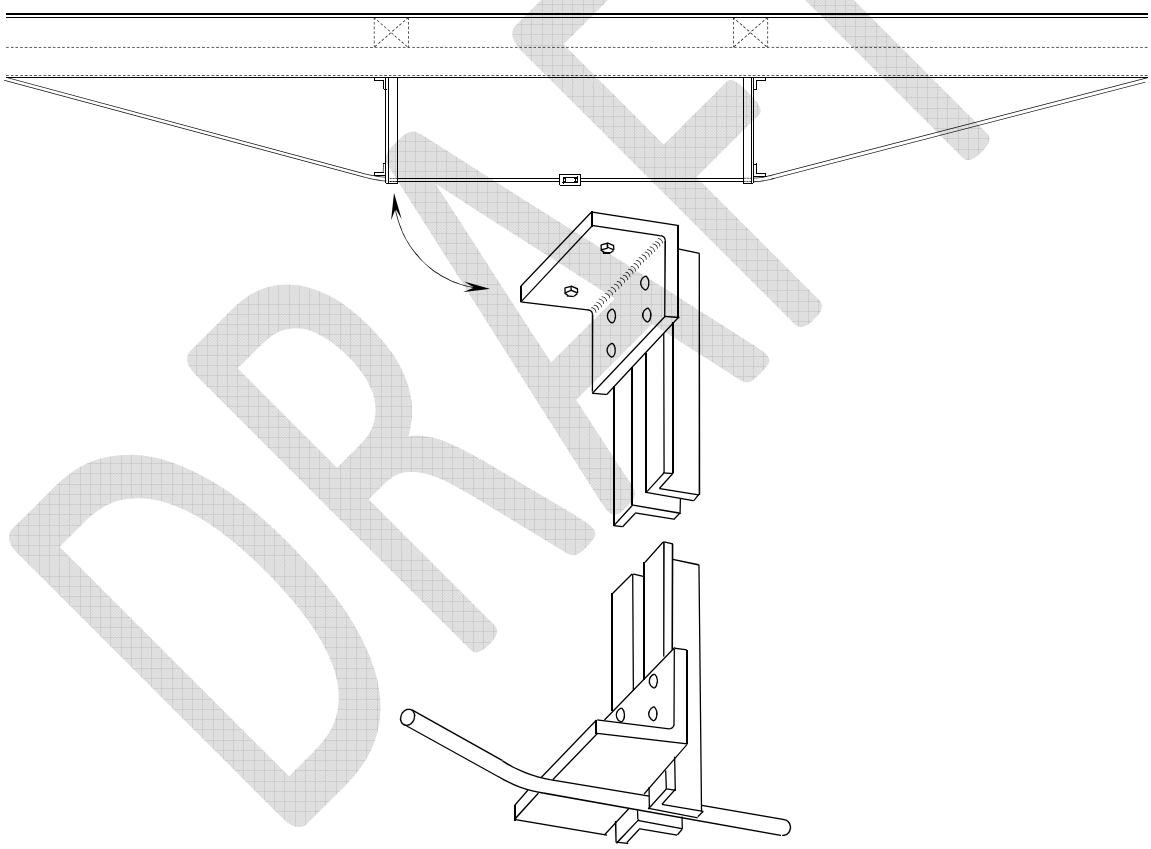


Left: *Attic floor frame of the northern building, seen from below to show the joists notched into the bottom chords of the roof trusses (tie beams).*

Right: *Western roof of the southern building, seen from below. Former scuttles in the roof are indicated by irregular rafter placement and lighter-colored sheathing.*

Roof System of the 1881 Machine Shop Addition:

The machine shop extension that was added in 1881 to the northern wall of the older northern building was planned with a flat roof system rather than the pitched gable roofs seen on the older structures. While the details of the roof system are not visible above modern ceiling materials, the key members of the system lie below the ceiling. These are a series of five inverted metal queenpost trusses that provide support for lateral roof beams above the ceiling. Because these trusses are inverted and have their loading imposed from the roof above them, the trusses act in the opposite way from the timber and iron trusses beneath the pitched roof of the older buildings, which support the attic floors at the bottoms of the trusses. The metal trusses have posts in compression rather than tension, and their lower chords, being in tension, are composed of round bars of wrought iron, threaded at their ends and connected at the center by adjustable turnbuckles, as shown below.



Although these trusses vary somewhat in details, they are all fabricated simply from rolled wrought iron angles, riveted together as shown above to provide bearing beneath the roof beams and to offer a secure notch to hold the wrought iron bars or rods at their bottoms. Their presence in a roof system of 1881 points to a slow transition from timber and iron trusses to all-metal trusses. The same evolution is seen at this period in highway and railroad bridge construction, where wrought iron Pratt trusses and iron "lattice" trusses began to supplant timber bridges. This transition may be attributed to the increasing availability of rolled wrought iron shapes of many

sizes and configurations, and to ever-increasing familiarity with structural design in metal on the part of architects and engineers.

New Buildings.

Work is to be begun immediately upon an extension of the building at the South end owned by Ford & Kimball, and occupied by the Concord Machine Works, John A. White, proprietor. Dow & Wheeler, architects, of this city, have prepared the plans for the additions, and the contract for putting in the foundation has been awarded today. The new buildings will consist of one, 75 feet in length and 40 in width, one story in height, running parallel to the street. A second extending at right angles to the first which will also be one story high, its other dimensions being 63x34 feet. At the end of this second building will be an office, fronting the street, which will stand one story above the street front and will be 34x20 feet. These increased accommodations are to be added to meet the constantly increasing business which is being done at the Concord Machine Works, and the improvements denote another advance in the business interests of the city. With the improvements that are being made in manufactures already established, and the prospect for the location of new industries in our midst, the business outlook for the future is certainly very encouraging.

Dow and Wheeler, Architects: As indicated by a notice in the Concord *Independent Statesman* of September 1, 1881 (*left*), the architectural partnership of Dow and Wheeler designed the 1881 additions to the original northern building of the Ford and Kimball complex. This documentation is significant, because relatively little has been known about the firm's designs for manufacturing buildings as distinct from residences and public buildings. Dow designed a dwelling for Walter Aiken, a leading inventor and manufacturer of Franklin, so it is possible that Dow also designed some or all of the extensive Aiken shops in that city. It is also possible that Dow designed the original Ford and Kimball shop buildings circa 1867-8.

Other utilitarian buildings that Dow designed include new buildings at the Merrimack County Farm in Boscawen (1878) and a freight house and office (1882) for the Concord Railroad.[13] Other buildings by Dow also had a technical or functional purpose, but were apparently embellished with much more stylistic refinement than might be found in structures of deliberate plainness and economy. Such buildings included a passenger depot at Tilton for the Boston, Concord and Montreal Railroad, described as a handsome structure "of Gothic architecture, surmounted with a tower" (1881) and a new ward room and [fire] engine house in Fisherville [now Penacook], of brick with granite trimmings and a tall hose tower (1881).[14]

Edward Dow lived from1820 until 1894, and Giles Wheeler from 1834 until 1915. Both had distinguished careers, Dow primarily as an architect and Wheeler primarily as a superintendent of major construction projects.

Like many architects who practiced in the mid-1800s, Edward Dow began his career as a builder. His father and grandfather were skilled craftsmen, and several members of Dow's family, living at Newport and Croydon, N. H., were employed in the building trades. Although the source of Dow's architectural training is unknown, his surviving drawings show that he was a meticulous draftsman. One wash drawing by Dow, a rendering of the Walter Aiken House in Franklin (c. 1868), is owned by Historic New England. The rendering includes carefully studied shadow effects and varied tonalities, reminiscent of the shaded elevation drawings that were common in the earlier decades of the century. Several building plans of a more traditional nature, executed in India ink, are owned by the New Hampshire Historical Society.

[13] Concord *Independent Statesman*, September 26, 1878, July 3, 1879, and June 1, 1882.
[14] Concord *Independent Statesman* August 18, 1881.

Edward Dow (1820-1894), elevation of façade, Walter Aiken House, Franklin, New Hampshire, c. 1868, ink rendering with wash, courtesy of Historic New England.

Edward Dow was born in Lemington, Vermont, but his family moved to Croydon, New Hampshire in his early boyhood, and to Newport when he was sixteen. He learned carpentry from his father and attended Kimball Union Academy in Plainfield, N. H. Dow first worked as a contractor and builder in Fall River, Massachusetts, reportedly studying architecture in Boston. He moved to Concord, N. H. around 1845, continuing in business as a carpenter, but by 1854 had established himself as an architect.

After service as a sharpshooter in the Civil War, Dow affiliated with partners who shared his knowledge of building construction. His first major partner was Giles Wheeler (1834-1915), an experienced carpenter and builder who joined Dow's architectural practice in 1873 and left in 1885. Dow's last partner, with whom he affiliated in 1890, was James E. Randlett (1846-1909), who had worked as a carpenter and cabinetmaker.

In practice alone or with his partners, Dow designed many private residences and a number of important public buildings. Among the New Hampshire commissions of the Dow office were St. Paul's Episcopal Church (1859) in Concord; Penacook Academy building (1866) in Boscawen; Kent Wing (1867) at the New Hampshire Asylum, in Concord; the Walter Aiken House in Franklin (1868); Culver Hall (1871) at Dartmouth College, the first home of the New Hampshire College of Agriculture and the Mechanic Arts; town halls in Charlestown (1872) and Newport (1873); a new state prison (1878) in Concord; the Merrimack County Almshouse (1878) at Boscawen, the National State Capital Bank in Concord (1880), and the Memorial Arch (1883) in Tilton. From 1864 to 1866, Dow also served as supervising architect for the enlargement of the New Hampshire State House under Gridley J. F. Bryant of Boston. At the end of his career, Dow and partner James Randlett designed Thompson Hall (1892) the main building of the College of Agriculture and the Mechanic Arts (later the University of New Hampshire) after that institution moved from Hanover to Durham, N. H.

Giles Wheeler, Dow's first major partner, shared with Dow the design of the 1881 addition to the Ford and Kimball buildings in Concord, then occupied by J. A. White for the manufacture of woodworking machinery. Like Dow and many other architects of the mid-nineteenth century, Wheeler came to the practice of architecture from a practical training in carpentry. Wheeler was

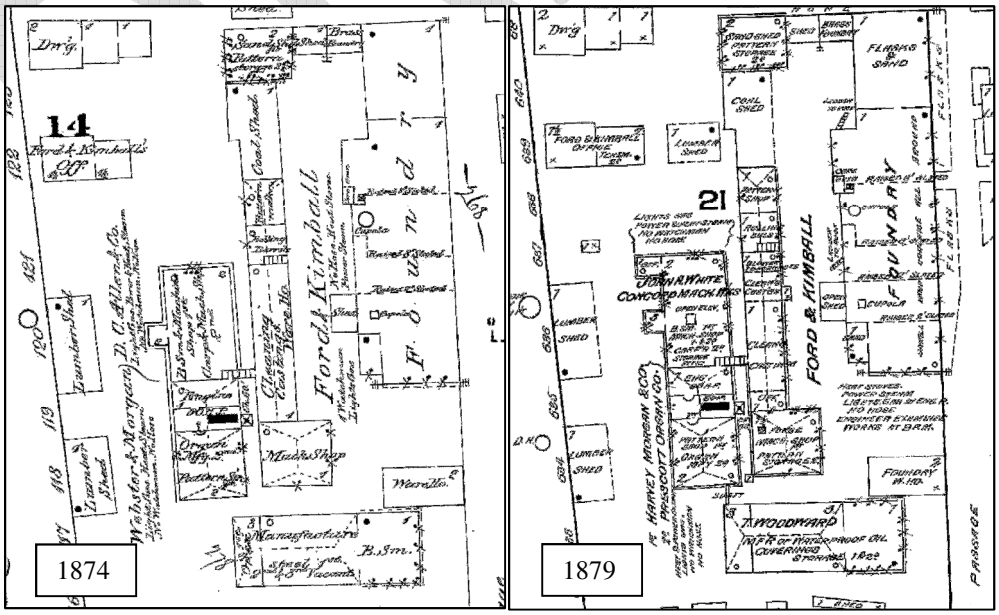
a native of Concord, growing up on the family farm near the Iron Works district, an area in which he always lived and retained an antiquarian interest. Wheeler was educated in both public and private schools in Concord and early in life was trained as a carpenter, a trade he followed for sixteen years. The partnership of Dow and Wheeler was a prolific one, resulting in designs for such major Concord-area buildings as the State Prison, the Merrimack County Courthouse, and the almshouse at the Merrimack County farm in Boscawen.

After leaving his partnership with Dow to oversee the construction of the Concord Post Office and United States Court House (1885, now the Legislative Office Building), Wheeler continued to superintend the construction of major buildings. Among these the State Library (1893-4), the Concord High School, Kimball School and Franklin School in Concord, the Statesman Building, Pillsbury Hospital in Concord, and the Soldier's Arch in front of the State House.

Wheeler was actively devoted to Concord history, writing accounts of the Iron Works and Garvin's Falls districts, serving on the standing (executive) and building committees of the New Hampshire Historical Society, and publishing an article on the religious buildings of Bow in the *Granite Monthly* magazine in 1911.

Evolution of the Buildings: Few photographs of these buildings have been located to record architectural changes that occurred over the years. The most informative sources of information for the varying uses and alterations of the complex are the Sanborn fire insurance maps of various dates. These maps indicate evolving uses, but suggest that there was relatively little change to the structures from the time of the additions of 1881, described above, until the mid-1920s, when the complex began its conversion from various manufacturing uses into service for automotive maintenance, storage, and sales.

Vignettes from available Sanborn fire insurance maps are shown below. These vignettes were selected to show the adjacent Ford and Kimball Foundry buildings to the east for context.



The 1874 map, on the left on the preceding page, shows that the northern building in the complex was then occupied by D. C. Allen and Company, successors to Dunklee and Allen, who had occupied the building at the time of the stereograph shown on page 8. D. C. Allen maintained a blacksmith shop and a machine shop on the first story, with a carpenter shop and machine shop in the second.

The manufacturing returns in the 1870 United States Census shed additional light on the Dunklee and Allen machine shop. Most important, the 1870 Census shows that Dunklee and Allen, and the successor firms of D. C. Allen and Company and John A. White's Concord Machine Works, were all manufacturers of woodworking machinery, undoubtedly acquiring the heavy castings needed for such machinery from the adjacent Ford and Kimball Foundry. The 1870 Census shows that the Dunklee and Allen establishment, recorded in the stereograph reproduced on page 8, included twelve lathes, three planers, two upright drills [drill presses] and three drill lathes, rolling and shaping machinery, and a bolt-cutting machine. Dunklee and Allen primarily manufactured molding machines or shapers, producing seventy such machines in 1870, valued at $16,500. They also produced 25 jigsaws valued at $2,500 in that year. The company employed sixteen men in 1870. The 1870 and 1880 Manufacturing Census Returns for 43-45 South Main Street, and for the adjacent Ford and Kimball Foundry, are transcribed at the end of this report.

By 1870, the adjacent Ford and Kimball Foundry, which owned the land on which the machine shop stood, was a significant producer of castings. The firm produced 300 railroad car wheels valued at $60,000, and railroad car castings worth an additional $65,800. Significantly, the foundry produced miscellaneous castings worth $20,000, some of which were undoubtedly the cast components of the Dunklee and Allen woodworking machines, and later of the machinery of Daniel C. Allen and John A. White.

Patent information from the 1870s shows that Daniel C. Allen was manufacturing circular saws, band saws, and related machinery. Several of these devices were the inventions of local machinery designer Edward F. Gordon (born in 1842 in New Hampton, New Hampshire), who worked successively for Daniel C. Allen and John A. White, and moved to Dover when White relocated his woodworking business there by 1893.[15]

The 1879 map, on the right on the preceding page, shows that John A. White's Concord Machine Works had taken occupancy of the northern structure. Like Daniel C. Allen before him, White maintained a blacksmith shop and a machine shop on the first story, with a carpenter shop and machine shop in the second. White had added a one-story office at the northwest corner of the original northern building, a modest precursor to the expansive office and machine shop wing he

[15] United States Patents issued to Edward F. Gordon: 151,217, Improvement in Band Sawing Machines; 221,804, Improvement in Gages for Circular Sawing Machines; 249,337, Feeding Device for Wood Planing Machines. In a different realm, Gordon patented a steam radiator (Patent 227,517) and co-founded Hobbs, Gordon & Company, manufacturers of sheet iron radiators, rapid circulating tube boilers, and woodworking machinery (*Bay State Monthly*, 1884, quoted in www.vintagemachinery.org.). Gordon also patented hand tools, including a self-lubricating bench plane in1879 (*Instruments of Change: New Hampshire Hand Tools sand Their Makers, 1800-1900* [Concord, N. H.: New Hampshire Historical Society, 1985]).

would add two years later in the same general location. Both maps show that the building was lighted by gas; the Concord Gas Company had been incorporated in 1850.[16]

The boiler in the engine house supplied steam both for the engine and for heating the complex. Both maps also indicate that the smokestack had a height of 50 feet; this would increase to 80 feet by 1906. Both the 1874 and 1879 maps indicate that the boiler had a capacity of fifty horsepower; boiler horsepower is a measure of the thermal output of a steam boiler. The 1879 map indicates that the steam engine then in the building was rated at sixty horsepower. This map also shows that a power shaft passed out of the southern wall of the southern building and into a detached shop building that stood nearby to the south. The steam engine in the main complex thus provided power for a separate operation that according to the map manufactured "waterproof oil coverings," presumably oilcloth.

The 1874 map shows the southern building to be occupied by Webster and Morgan. The building had a pattern shop on the first floor and an organ manufactory, otherwise unidentified, on the second. The 1879 map shows the same types of occupancy, but identifies the organ manufacturer as Prescott Organ Company.

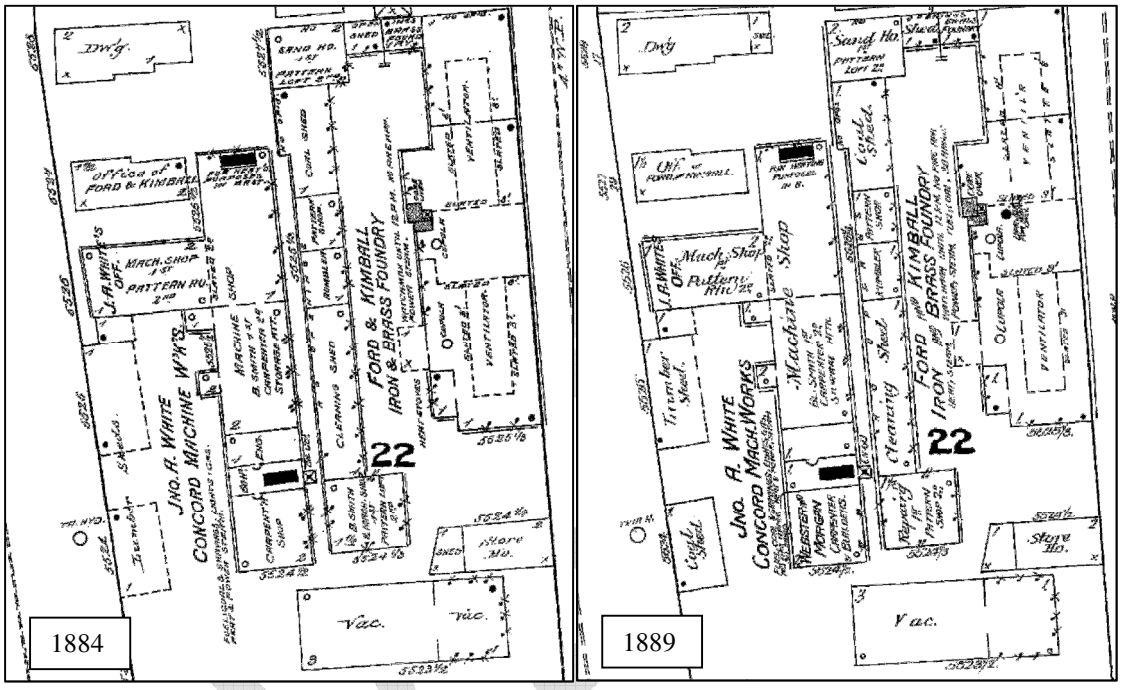
Prescott Organ Company was a major factor in Concord's ascendancy as an important center of musical instrument manufacturing in the latter nineteenth century. The genealogy of the company as it passed from its founder to later generations of the Prescott family is somewhat confusing, but the company began with the enterprise of Abraham Prescott (1789-1858) of Deerfield, New Hampshire. As a youth, Prescott taught himself to make "church basses," violoncello-like stringed instruments that were favored as instrumental accompaniment for choirs in New England churches. Moving his business to Concord between 1831 and 1833, Prescott soon diversified his stringed instrument business by beginning to manufacture improved elbow or lap melodeons, eventually progressing to elegant floor instruments: melodeons, seraphines, and aeolians. In 1845, Prescott took his son Abraham J. into the instrument business, changing the name of the company to Abraham Prescott and Son. When Abraham, Sr., retired in 1850, Abraham J. Prescott brought his brothers Josiah B. and Joseph W. Prescott into the family business, changing its name to Prescott and Brothers in 1850 and Prescott Brothers in 1858. The composition of the firm changed during the ensuing years, but in 1871 the company was composed of Abraham J. Prescott and his youngest brother George D. B. Prescott, and the company had about fifty employees working under the name of Prescott Organ Company. This firm was apparently the occupant of the second floor of the southern South Main Street building during the 1870s. The company began to manufacture upright pianos at other locations in 1886.[17]

The manufacturing returns in the1880 Census, transcribed at the end of this report, provide some additional information on the Prescott Organ Company at this date, before their removal to a new

[16] Concord Gas Light Company, Gasholder House, South Main Street, Concord, Merrimack [County], N. H., data pages; HAER No. NH-7 [NH,7-CON,9C-].

[17] Prescott Organ Company, *Illustrated Catalogue of the Prescott Organs* (Concord, N. H.: by the company, c. 1882); Henry B. Colby, "Our Only Piano Factory," *Granite Monthly* 26 (1899): 115-24; Prescott Piano Company, *Over 100 Years of Musical Progress, 1809-1910* (Concord, N. H.: by the company, 1910); "Prescott Piano and Organ Co.," *Leading Business Men of Concord* , 1894, p. 64; Howard Alan Jewell, "The Prescotts of New Hampshire, 108 Years of Business Integrity," *ROS* [Reed Organ Society] *Bulletin* 11 (Summer 1992): 3-13.

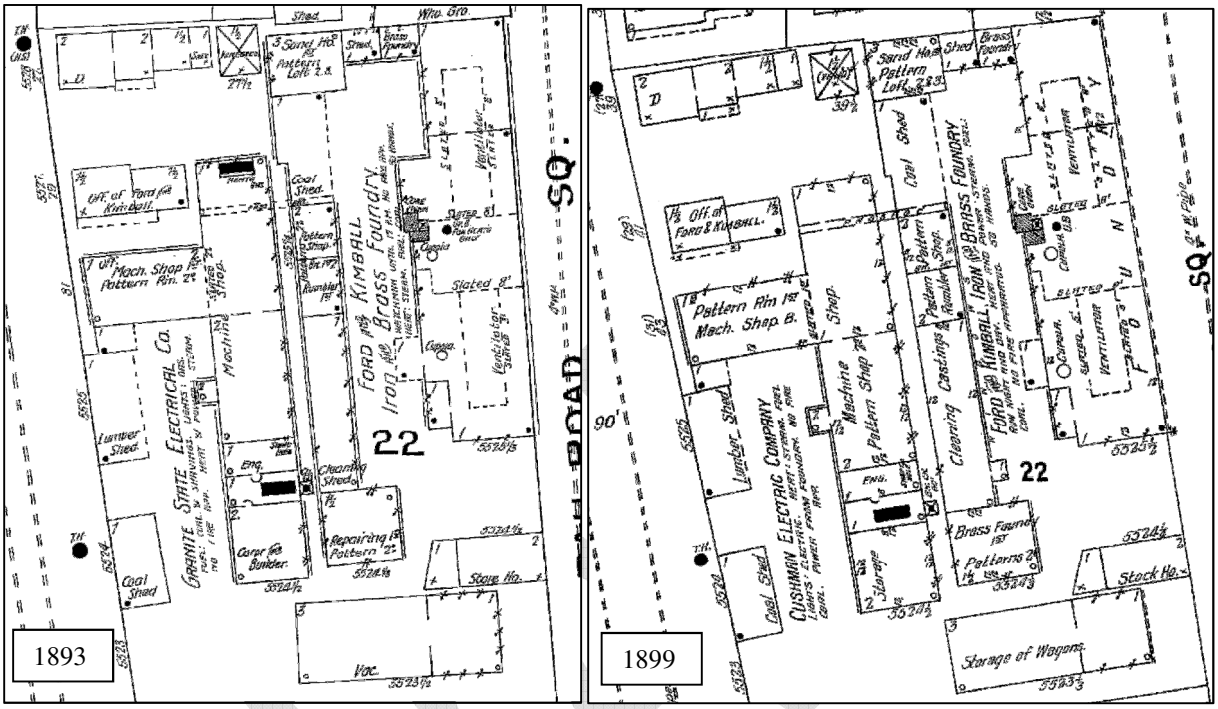
building of their own. In 1880, the company had twenty-seven employees, of whom twenty-five were adult males. The company made products worth $23,913 from raw materials valued at $9,441. The Census returns seem to document the fact that the Prescott Organ Company shared some of the output of the steam engine in the engine house, indicating, somewhat cryptically, that the company utilized steam power rate at five horsepower.



The Sanborn maps of 1884 and 1889 (above, left and right) portray the northern building as it had been enlarged in 1881 by John A. White, manufacturer of woodworking machinery, mowers, and other machinery. White's 1881 additions are described above on pages 12 to 19. The 1881 enlargement included White's office at the western end of the western leg of the additions, and the maps indicate that the northern leg and the first story of the western leg were all extensions of the machine shop that had formerly occupied the first story of the old northern building. The second floor of the two-story western leg of the additions was used as a pattern shop. These maps indicate that a second boiler was provided in the partial basement under the northern addition to heat the expanded volume of the new buildings.

The manufacturing returns for the 1880 United States Census are not as helpful for the Concord Machine Works as the 1870 Census had been for their predecessor, Dunklee and Allen. In 1880, White's Concord Machine Works had twenty-eight employees, of whom twenty-five were males over the age of sixteen. The company consumed $10,000 worth of raw materials, including fuel, to produce products worth $30,000. Not all of these products were finished machines; some of the company's income was derived from jobbing and repairing. The Census indicates that the company used twenty horsepower derived from the steam engine; this contrasts with the nearly contemporaneous 1879 Sanborn Fire Insurance map, which indicates that the engine was rated at sixty horsepower.

By 1884, the Prescott Organ Company had vacated the second story of the southern building; the company had built a large organ factory elsewhere on South Main Street, south of today's Turner Avenue, in 1881. The maps suggest that both stories of the southern building were occupied by Webster and Morgan, carpenters and builders.



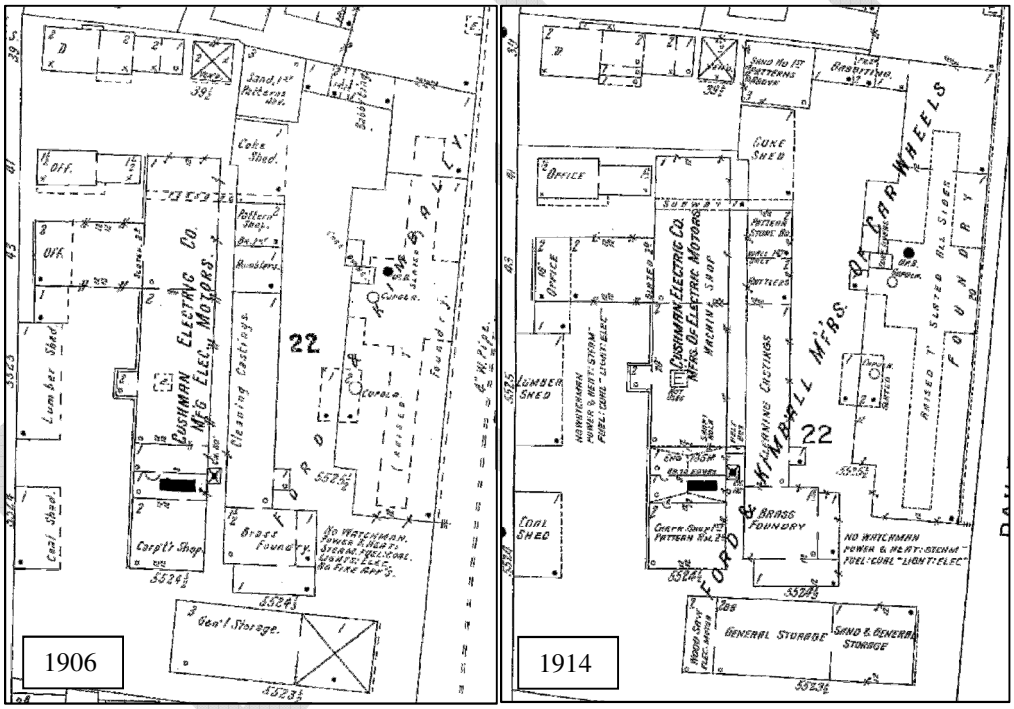
The 1893 and 1899 Sanborn maps (above left and right) indicate a significant change in the occupancy of the northern buildings. John A. White's Concord Machine Works had vacated the premises and relocated to Dover by 1893. The 1893 map shows that the northern buildings were then occupied by the Granite State Electrical Company; by 1899, this company was named the Cushman Electric Company. By 1899, lighting in the complex had changed from gas to electricity; the 1899 map also indicates that while the boiler remained in the engine house, the northern boiler under the 1881 addition had apparently been removed. Power for machinery in the buildings was supplied from the adjacent foundry through belting or shafting, and probably also from individual electric motors manufactured on the premises (see below). The remaining boiler in the engine house may have been used only to heat the buildings at this time, although the steam engine would later be replaced by a new engine for mechanical power. The 1893 and 1899 maps suggest that the Cushman Electric Company utilized the entire first story of the complex as a machine shop, and the entire second story, except for their office, as a pattern shop. Blacksmithing in the building had apparently ceased, at least on a significant scale.

The southern building remained a carpenter's and builder's shop in 1893, but was used only for storage in 1899.

The Cushman Electric Company was a partnership. Abe L. Cushman was its chief figure and vice president, but Benjamin Ames Kimball, owner of the land and buildings and of the adjacent Ford and Kimball Foundry, was a founder of the company and served as its president.

Abe Lincoln Cushman (1861-1943) was a figure of interest in Concord's manufacturing history, yet has been recognized only to a slight degree. Cushman was a native of Tunbridge, Vermont, who served an apprenticeship as a cabinetmaker in Randolph, Vermont. Cushman's trade brought him to Concord, where he worked first as a journeyman cabinetmaker and then as a designer and patternmaker for John A. White's Concord Machine Works.

Cushman remained in Concord when White moved his woodworking machinery business to Dover around 1893. Making a remarkable and as yet unexplained transition from his woodworking trade to that of electrician, Cushman joined with Kimball and others to fill the vacated woodworking machinery shops with an entirely new category of manufacturing, founding the Cushman Electric Company in 1893.



The 1906 and 1914 maps (above, left and right) provide little information about the internal disposition of the Cushman Electric Company spaces. The 1914 map, however, indicates that an apparently new 135 horsepower steam engine had been installed in the engine house, supplanting the sixty horsepower engine shown on the 1879 map. The smokestack was now labeled as eighty feet in height. The new engine may have been used principally or entirely to power operations in the adjacent Ford and Kimball Foundry; a belting box is shown connecting the engine house to the nearby western range of foundry buildings. Yet an advertisement for the Cushman Electric Company includes photographs of the machine shop with ample shafting and belting in evidence,

suggesting that the company relied on central steam power rather than on individual electric motors for heavier manufacturing operations.[18]

The Cushman Electric Company was an important element in a largely unstudied chapter in Concord's industrial history: the manufacturing of electric motors, especially three-phase alternating current motors that were well adapted to use with typesetting machines and electrically powered machine tools. The local electric motor industry derived directly from another industrial enterprise that sprang from the waterpower of the Merrimack River. The Concord Land and Water Power Company was incorporated on July 22, 1892. The company built the world's largest timber crib dam at Sewall's Falls on the Merrimack River, together with a power canal and generating station on the west bank of the stream, first transmitting three-phase alternating current to Concord on September 29, 1893. This was the second power station in the world to transmit three phase power, and the first in the eastern United States.[19]

The availability of three-phase alternating current in Concord clearly induced Abe L. Cushman to found his company simultaneously with the establishment of Concord Electric Company, successor to the Concord Land and Water Power Company. According to his own advertising, Cushman began to manufacture electric motors in 1893, the year when his business is shown on the Sanborn insurance map, on page 37, above. Three-phase motors were especially adapted to powering the Linotype machines by which most typesetting was then done, and Abe L. Cushman was a pioneer in this category of manufactures. The Cushman Electric Company specialized in manufacturing electric dynamos and motors, but also produced special motor drives for machine tools. A biographical sketch of Cushman stated that he

> . . . was the inventor of what is known as the tri-phase motor, which first came into practical use in 1893, and which gained for him a wide reputation as an electrician. The superior simplicity of these motors and their greater general adaptability to all the varied purposes of heating, lighting, and power production, as called for in the home, office, public hall, or factory, have caused them to become widely popular, and have thereby added largely to the prosperity of the makers, besides giving employment to a large force of skilled workmen.[20]

According to the Concord City Directories, Cushman Electric Company remained in business until 1960, moving to 69 South Main Street in 1926, as the Ford and Kimball property on Main

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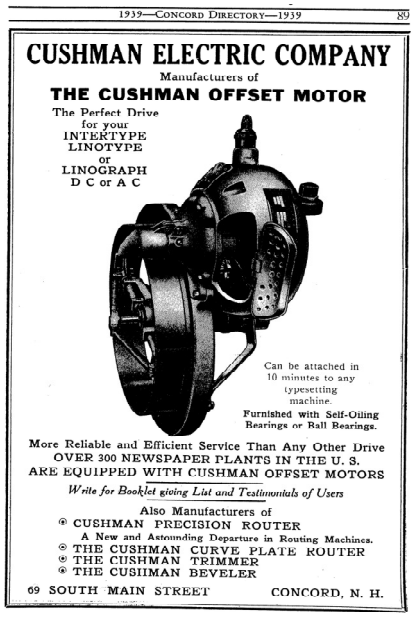
[18] Cushman Electric Company advertisement, reproduced in Lisa Mausolf, South Main Street [Concord] Manufacturing District Historic District Area Form, New Hampshire Division of Historical Resources.

[19] The Sewall's Falls power plant continued in operation until 1966. The wood crib dam failed during flooding on April 7-8, 1994, but remnants are preserved as an outdoor exhibit. See David R. Starbuck, "The World's Longest Timber Crib Dam; The Sewall's Falls Dam in Concord, New Hampshire," *New Hampshire Archeologist* 26 (1985): 87-102; Starbuck, "The Timber Crib Dam at Sewall's Falls," *IA: The Journal of the Society for Industrial Archeology* 16 (1990): 40-61; Dennis Howe, "The Maintenance of New Hampshire's First Polyphase Hydroelectric Station," *IA: The Journal of the Society for Industrial Archeology* 20 (1994): 119-38.

[20] *American Series of Popular Biographies, New Hampshire Edition: Representative Citizens of the State of New Hampshire* (Boston: New England Historical Publishing Company, 1902), pp. 415-16.

Street was sold to Jasper Hazen Bartlett and converted to automotive uses (described below). The company again moved to 42A Perley Street in 1946.[21]



1939—CONCORD DIRECTORY—1939 80

CUSHMAN ELECTRIC COMPANY

Manufacturers of

THE CUSHMAN OFFSET MOTOR

The Perfect Drive for your INTERTYPE LINOTYPE or LINOGRAPH D C or A C

Can be attached in 10 minutes to any typesetting machine.

Furnished with Self-Oiling Bearings or Ball Bearings.

More Reliable and Efficient Service Than Any Other Drive
OVER 300 NEWSPAPER PLANTS IN THE U. S.
ARE EQUIPPED WITH CUSHMAN OFFSET MOTORS

Write for Booklet giving List and Testimonials of Users

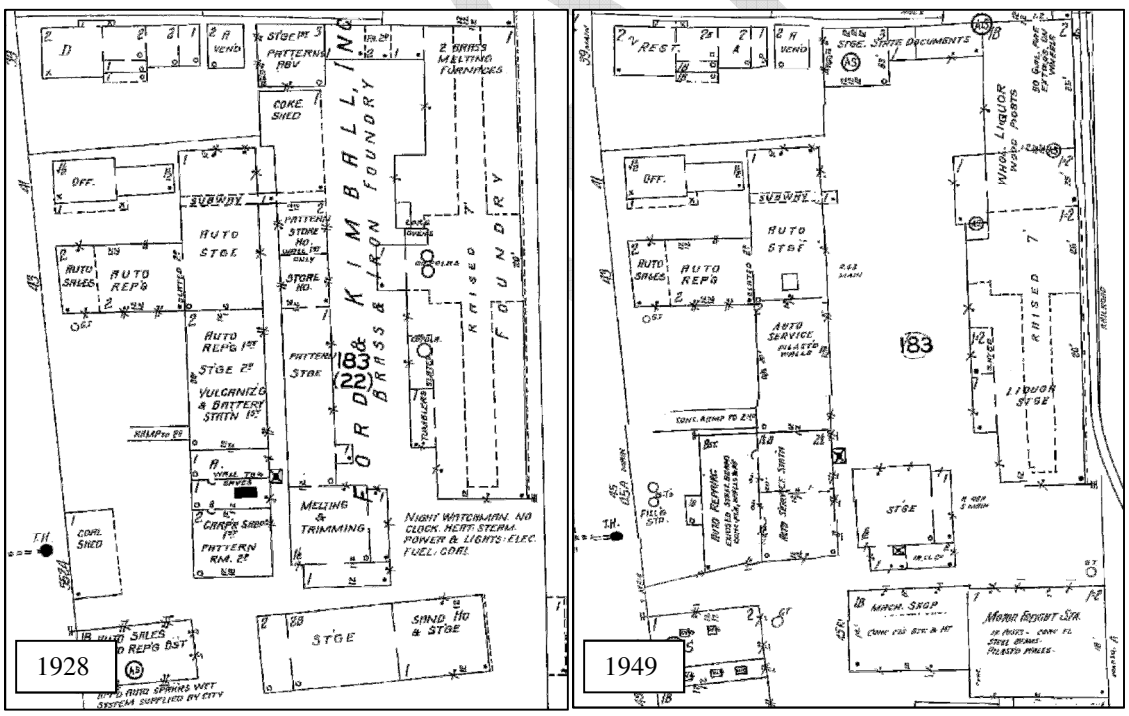
Also Manufacturers of

- CUSHMAN PRECISION ROUTER
  A New and Astounding Departure in Routing Machines.
- THE CUSHMAN CURVE PLATE ROUTER
- THE CUSHMAN TRIMMER
- THE CUSHMAN BEVELER

69 SOUTH MAIN STREET CONCORD, N. H.

Left: Advertisement for the Cushman Offset Motor, Concord Directory, 1939.

This advertisement states that the Cushman motor was employed in over three hundred newspaper plants in the United States, and lists some of the other machines that Cushman also manufactured.



[21] *Concord Directories*, 1893 to 1960-61. Luther W. Durgin, manager for Ford and Kimball, served as the treasurer of Cushman Electric Company from 1908 to about 1920. Thereafter, E. F. Spencer was treasurer. After Cushman's death in 1943, the company was run by Hector W. MacLean.

Meanwhile, at least one other manufacturer of three-phase electric motors appeared in Concord. During the 1920s, John J. Crawford manufactured such motors, adapted to Linotype and other typesetting machines, in or in the vicinity of the Durgin Silver Company shops on Washington Street.[22]

Beginning in the 1920s, as seen in the Sanborn insurance maps on page 40, a series of physical changes to 43 and 45 South Main Street would adapt those buildings ever more fully for automotive uses, eventually transforming the buildings into the highly remodeled complex seen on the cover page and title page of this report.

After the death of Benjamin Kimball in 1920, the Ford and Kimball firm continued in existence and retained ownership of the machine shop and foundry properties for several years.[23] In 1926, however, the company sold the property at 43 South Main Street to Jasper Hazen Bartlett. Bartlett began to use the complex as an automobile sales, repair, and storage facility, as shown on the Sanborn insurance map for 1928 (left on page 40). Bartlett's Garage initially specialized in sales of Pierce Arrow and Studebaker cars, but from 1937 through 1941 was listed in the *Concord Directory* as dealers in Dodge and Plymouth automobiles. Bartlett's Garage occupied the site until about 1941, although Mausolf lists Alice P. French as owner of the property.

The sale of 43 South Main Street initiated the division of the former Ford & Kimball Main Street complex into two separate properties, a status that apparently continued, although the *Concord Directories* from 1937 through 1941 list both 43 and 45 South Main Street as "Bartlett's Garage."

The Sanborn insurance map of 1928 shows that automotive services then occupied only the northern building at 43 South Main Street. The boiler and engine room section south of this property was still one story in height, with a boiler still indicated here and the wall between the boiler and engine rooms indicated as extending upward "to eaves." Bartlett's Garage removed the tower from 43 South Main Street and inserted a large vehicle door on the first floor level of the former tower bay. The first story of 43 South Main Street was used for automobile repair and storage, with vulcanizing and battery facilities. A ramp ascended to the second story, which was used for auto storage.

The 1928 Sanborn map indicates that the south end of the complex, listed as 45 South Main Street, was then occupied by a carpenter's shop on the first floor and a pattern room on the second.

It is clear from physical evidence that conversion to automotive service and storage required structural reinforcement of the second story of 43 South Main Street. In order to bear the live and dead loads of automobiles in a structure that was designed as a machine shop in the 1860s, the wooden structural system of the second story was reinforced by the placement of heavy steel I-beams beneath each of the principal lateral wooden girders of the floor, as seen in the

[22]New Hampshire Historical Society accession records, Crawford induction motor, acc. No. 1982.43.
[23]"Plan of Land belonging to Ford & Kimball Co., Concord, N. H.," 1920, Merrimack County Registry of Deeds, reproduced in Lisa Mausolf, Individual Inventory Form, "Ford & Kimball (John A. White) Building" (Inventory No. CON0290), New Hampshire Division of Historical Resources.

photograph below. This structural change would have permitted the removal of any columns that supported the second floor from beneath.

Steel reinforcing beam beneath original lateral wooden beam (above ceiling; not visible), supporting the second story of 43 South Main Street. To obtain the needed structural properties, this beam was fabricated from angles and plates, riveted together.

Changes began in the southern portion of the property, listed as 45 South Main Street, in the late 1920s. The *Concord Directory* of 1929 lists Clough's Battery and Ignition Service at 45 South Main Street, portending a dramatic conversion of the southern portion of the complex to automotive uses that echoed the changes to the north. In 1931, according to Lisa Mausolf, the Ford and Kimball interests sold the southern portion of the buildings, listed as 45 South Main Street, to Capitol City Motors, owned by John Aranosian.

That sale was swiftly followed in 1932 by a transformation of the former engine house and the southern building. The boiler and engine room area was raised to two stories and a new façade of brick, laid in Flemish bond and with a date plaque and window lintels of concrete or cast stone, was built to unify 45 South Main Street and transform its appearance to that of a modern automotive garage, as suggested by the photograph below.

As noted and illustrated on page 29, above, the remodeling of the southern building entailed not only the raising of the roof of the former engine and boiler house, but also the removal of the former attic floor framing from the bottom chords of the roof trusses in the southernmost building. A new floor was framed about four feet below the original attic floor in this building, supported by steel tension rods hung from the bottom chords of the original roof trusses. This change created a more usable attic above the remodeled auto service center, lighted by five low windows that were provided in the new façade and used for storage of automobile parts. (As seen in the photograph on the following page, these window openings were later reduced in size, or removed and filled, when later extensions were added to the front of the building, covering most of the façade of 1932.)

45 South Main Street during demolition, 2012, following the removal of a later addition at the front and revealing the façade created in 1932. The roof of the former engine house was raised in 1932 to the elevation of the roof of the original shop building of circa 1866, and a new façade of brick laid in Flemish bond was applied across the altered buildings (note central date tablet). The arrow indicates the juncture of the original roof (right) and the raised roof (left).

The *Concord Directory* of 1935 continued to list Clough's Battery and Ignition Service at 45 South Main Street, but now also listed Concord Hudson-Essex and Auto Body and Welding Company at the same address. In 1942, the *Concord Directory* listed Capitol City Motors, Ernest Aranosian proprietor, in the southern property at 45 South Main Street, shown in the photograph above; Lisa Mausolf indicates that Ford and Kimball had sold the southern portion of the buildings, listed as 45 South Main Street, to Capitol City Motors, owned by John Aranosian, in 1931.

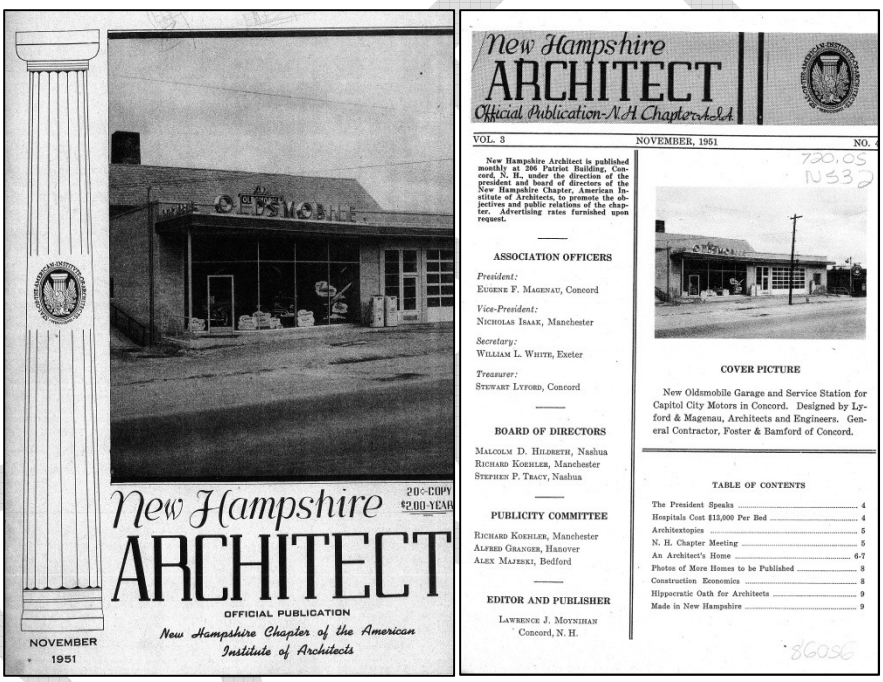
In 1942, according to Lisa Mausolf, the northern property at 43 South Main Street, formerly Bartlett's Garage, was sold to Edward Sanel, who as early as 1936 had occupied the property at 45A South Main Street as Sanel Auto Parts.

By 1943, Carlson's Motor Sales, dealers in Plymouth and DeSoto cars, occupied the northern property at 43 South Main Street, formerly Bartlett's Garage. Carlson's Motor Sales remained at this address until 1958. *Concord Directories* from 1946 to 1955 or 1957 show the former John A. White office wing as Carlson's showroom, with gasoline pumps in front, near the curb. *Concord Directories* in 1955 and 1957 show a slightly remodeled Carlson's showroom in this building, with gasoline pumps removed. Carlson's Motor Sales vacated the northern building at 43 South Main Street in 1958.

The 1949 Sanborn insurance map, reproduced on page 40, above, shows the entire complex in automotive uses. The original J. A. White office wing at 43 South Main Street was used as an

auto showroom (front) and auto repairs (back or eastern section). The north leg of the L-shaped addition of c. 1884 was used for auto storage. The original machine shop of c. 1866 was used for auto service, apparently on both floors. The remodeled southern building at 45 South Main Street was an automobile service station in the c. 1866 portion, with a new extension toward Main Street, used for auto repairing by Capitol City Motors, owned by the Aranosian family, and with gasoline pumps placed near the street.

In 1951, the *New Hampshire Architect* magazine, the official publication of the New Hampshire Chapter of the American Institute of Architects, illustrated a "new Oldsmobile garage and service station for Capitol City Motors in Concord" on the cover, with a wider, un-cropped view on the table of contents page. The magazine stated that the addition, which supplanted an earlier and smaller extension indicated on the 1949 Sanborn insurance map, was designed by Concord architects Lyford and Magenau and built by Foster and Bamford, general contractors of Concord.



The 1957 *Concord Directory* indicates that Capitol City Motors, former occupants of the southern property at 45 South Main Street, had become Hodgkins Oldsmobile.

The 1959 *Concord Directory* lists the northern property at 43 South Main Street as vacant. The New Hampshire Bindery, located on Durgin Lane off Warren Street since 1934, moved into the property at 43 North Main Street sometime in that year. New Hampshire Bindery was listed at 43 South Main Street from 1960 until 2012, when the properties at 43 and 45 South Main Street were sold and demolished. The New Hampshire Bindery then moved to a new location on Dow Road in Bow, New Hampshire. The bindery operation, the last function of 43 South Main Street, is documented in many of the record photographs that accompany this report.

CHRONOLOGY
43-45 SOUTH MAIN STREET, CONCORD, NEW HAMPSHIRE

1866, July 13. The Concord *Monitor* reported a destructive fire in the machine shop owned by Ford & Kimball and Benjamin F. Dunklee. It appears (below) that Dunklee thereupon relocated to the southern shop on the property, which may have been built circa 1867 as a replacement for the building that had burned in 1866.

1868, April 17. The Concord *Monitor* reported that a new, two-story machine shop measuring 41 feet by 72 feet (the dimensions of the present 43 South Main Street core building) was to be erected "north from the present shop occupied by Dunklee & Tilton."

1869 Dunklee & Tilton became Dunklee & Allen (Benjamin F. Dunklee and Daniel C. Allen). At some point (see below), the firm moved into the new brick machine shop erected on the northern part of the lot.

1872 (date given). Photograph (from a stereograph) of the Dunklee & Allen shop and the southern building in the Perry Scrapbooks, New Hampshire Historical Society (NHHS). This image shows wide arched window openings on both floors, with central mullions and double-hung sashes on each side. The sash configuration is hard to discern; try to find the original stereograph. The openings on the second story today have 9-over-9 sashes divided by the mullions; check the muntin profile today. The north gable end was a blank brick wall except for two attic windows, which appear to remain today with different sashes, and apparently a small door on the first story.

1874 Sanborn Fire Insurance map shows the northern building to be occupied by D. C. Allen & Company. The first story was a blacksmith's and machinist's shop; the second story was a carpentry and machine shop. The building was lighted by gas. Power and heat were provided by steam. No watchman; no hose.

The southern building was occupied by Webster & Morgan. The first story was an organ manufactory; the second was a pattern shop. The building was lighted by gas. Heat was provided by steam (no power?). No watchman; no hose.

1876 Daniel C. Allen became superintendent of schools and the company was taken over briefly by Frank M. Stevens who was later employed as master mechanic by the Concord Railroad.

1877 John A. White purchased the machine shop (see *Leading Business Men of Concord*, 1890).

1879 Sanborn Fire Insurance map shows the northern building to be occupied by John A. White, Concord Machine Works. The first floor was occupied by a blacksmith and machine shop. The second story was occupied by a machine shop and carpenter shop. The attic was used for storage. There was an open elevator in the middle, behind the front tower. A small one-story office had been added at the northwest corner. Power and heat were provided by steam. No watchman; no hose.

The southern building was occupied by Harvey Morgan & Company as a pattern shop on the first floor and by the Prescott Organ Company on the second floor. The building was lighted by gas. Heat and power were provided by steam. No watchman; no hose.

1881 The Prescott Organ Company built a new four-story factory on the east side of South Main Street (burned in 1896).

1881 An article in the *Independent Statesman* (Concord) of September 1, 1881 describes the addition to the north of the original Dunklee & Allen building of 1868, then occupied by John A. White:

> **New Buildings**
>
> Work is to be begun immediately upon and extension of the building at the South end owned by Ford & Kimball, and occupied by the Concord Machine Works, John A. White proprietor. Dow & Wheeler, architects, of this city, have prepared the plans for the additions, and the contract for putting in the foundation has been awarded today. The new buildings will consist of one, 75 feet in length and 40 in width, one story in height, running parallel to the street. A second, extending at right angles to the first which will also be one story high, its other dimensions being 63x34 feet. At the end of this second building will be an office, fronting the street, which will stand one story above the street front and will be 34x20 feet. These increased accommodations are to be added to meet the constantly increasing business which is being done at the Concord Machine Works, and the improvements denote another advance in the business interests of the city. With the improvements that are being made in manufactures already established, and the prospect for the location of new industries in our midst, the business outlook for the future is certainly very encouraging.

The 1884 Sanborn Fire Insurance map shows that the entire complex was occupied by the John A. White Company. An L-shaped addition had been built north of the old north wall, consisting, first, of a wing extending to Main Street, measuring 32 by 62 feet (Bacon, 1890). This had one story in the front, serving as John A. White's office, and two stories to the east, where it extended to the line of the original building. This portion of the wing was occupied by a machine shop on the first floor and a pattern shop on the second. The northern leg of the addition extended behind the office of the Ford & Kimball foundry. This leg of the L was a one-story structure, merged with the old shop, increasing the length of the latter from the original 72 feet to 150 feet (Bacon, 1890). The old building and the new L contained a blacksmith and machine shop on the first story, extending south to the wall of the engine room. In the basement under the northern leg of the L was a boiler, used strictly for heating. The second story was occupied by a carpenter shop. The attic was used for storage. The engine and boiler room remained as before. The building south of the power plant was used entirely as a carpenter shop. The building was lighted by gas. Heat and power were provided by steam; the southern boiler was fueled with coal and shavings.

1889 Sanborn Fire Insurance map shows the same uses of space, except that the southern building was occupied by Webster & Morgan, carpenters and builders.

1893 By this year, J. A. White Machine Works had moved to Dover. The building was then occupied by The Granite State Electric Light Company (shown as Granite State Electrical Company on the 1893 Sanborn insurance map). The building was then listed as 31 South Main Street. The extreme south end of the building, south of the boiler room, was occupied by a carpenter and builder. The Sanborn insurance map shows that the building

continued largely in its former use as a machine shop, and that a passage extended under the north end of the building, connecting the office of Ford and Kimball with the foundry to the east.

1899 The Sanborn insurance map indicates that the property was occupied by the Cushman Electric Company. An advertisement for the company illustrates the "Cushman offset motor for typesetting machines" and states that proprietor Abe L. Cushman had been a "manufacturer of motors since 1893." Cushman Electric Company continued to occupy the building (re-numbered 43 South Main Street by 1899) until about 1925, when the *Concord Directory* shows that Cushman moved to 69 South Main Street.

1914 The Sanborn insurance map shows the complex much as it was in 1899, still occupied by Cushman Electric Company, "mf'rs of electric motors." The building retained its front tower, facing toward Main Street, and its power plant was still one story in height. The building still had an elevator (not used) near the center of the machine shop floor in line with this tower. The map lists power and heat supplied by steam, with a coal-fired boiler and an 80-foot smokestack, and indicates a 135 horsepower steam engine with a shaft hole through the wall from the engine room into the machine shop. Lighting was now shown as electric. The south end of the building was occupied by a carpenter's shop on the first floor and a pattern room on the second.

1926 According to consultant Lisa Mausolf, Ford & Kimball retained ownership of the building (see plan of Ford & Kimball property, 1920, in Merrimack County Registry of Deeds), and in 1926 sold the property at 43 South Main Street to Jasper Hazen Bartlett, who used the complex as an automobile sales, repair, and storage facility. Bartlett's Garage initially specialized in sales of Pierce Arrow and Studebaker cars, but from 1937 through 1941 was listed in the *Concord Directory* as dealers in Dodge and Plymouth automobiles. Bartlett's Garage occupied the site until about 1941, although Mausolf lists Alice P. French as owner of the property. This sale initiated the division of the former Ford & Kimball Main Street complex into two separate properties, a status that apparently continued, although the *Concord Directories* from 1937 through 1941 list both 43 and 45 South Main Street as "Bartlett's Garage." Both properties were acquired by a single owner and subsequently demolished in the summer of 2012.

1928 The Sanborn insurance map shows that automotive services occupied only the northern building, listed as 43 South Main Street. The boiler and engine room section south of this property was still one story in height, with a boiler still indicated here and the wall between the boiler and engine rooms indicated as extending upward "to eaves." Bartlett's Garage removed the tower from 43 South Main Street and inserted a large vehicle door on the first floor level of the former tower bay. The first story of 43 South Main Street was used for automobile repair and storage, with vulcanizing and battery facilities. A ramp ascended to the second story, which was used for auto storage. The Sanborn map indicates that the south end of the building was occupied by a carpenter's shop on the first floor and a pattern room on the second.

1929 The *Concord Directory* lists Clough's Battery and Ignition Service at 45 South Main Street.

1931 According to Mausolf, Ford and Kimball sold the southern portion of the buildings, listed as 45 South Main Street, to Capitol City Motors, owned by John Aranosian.

1932 The boiler and engine room area was raised to two stories and a new façade of brick, laid in Flemish bond and with a date plaque and window lintels of concrete or cast stone, was built to unify this part of the building (45 South Main Street).

1935 The *Concord Directory* continues to list Clough's Battery and Ignition Service as 45 South Main Street, but now also lists Concord Hudson-Essex and Auto Body and Welding Company at the same address.

1937 The *Concord Directory* lists Bartlett's Garage, Dodge and Plymouth dealers, at both 43 and 45 South Main Street through 1941, although this may result from an address change for the northern part of the complex, formerly listed simply as 43 South Main Street.

1942 According to Mausolf, the northern property at 43 South Main Street was sold to Edward Sanel, who as early as 1936 occupied the property at 45A South Main Street as Sanel Auto Parts, later moving to the former Holt Brothers building at 219 South Main Street.

1942 The *Concord Directory* lists Capitol City Motors, Ernest Aranosian proprietor, in the southern property at 45 South Main Street. Mausolf states that Ford and Kimball had sold the southern portion of the buildings, listed as 45 South Main Street, to Capitol City Motors, owned by John Aranosian, in 1931. As noted below, in 1982 the Aranosian family sold the property at 45 South Main Street to Reynold Addario.

1943 Carlson's Motor Sales, dealers in Plymouth and DeSoto cars, occupied the northern property at 43 South Main Street, formerly Bartlett's Garage. Carlson's Motor Sales remained at this address until 1958. *Concord Directories* from 1946 to 1955 or 1957 show the former John A. White office wing as Carlson's showroom, with gasoline pumps in front, near the curb. *Concord Directories* in 1955 and 1957 show a slightly remodeled Carlson's showroom in this building, with gasoline pumps removed. Carlson's Motor Sales vacated the northern building at 43 South Main Street in 1958.

1949 An update of the 1928 Sanborn insurance map shows the entire complex in automotive uses. The original J. A. White office wing was used as an auto showroom (front) and auto repairs (back or eastern section). The north leg of the L-shaped addition of c. 1884 was used for auto storage. The original machine shop of c. 1866 was used for auto service, apparently on both floors.

The remodeled southern building at 45 South Main Street was an automobile service station in the c. 1866 portion, with a new extension toward Main Street, used for auto repairing by Capitol City Motors, owned by the Aranosian family, and with gasoline pumps placed near the street.

1951 The *New Hampshire Architect* magazine, the official publication of the New Hampshire Chapter of the American Institute of Architects, illustrates a "new Oldsmobile garage and service station for Capitol City Motors in Concord" on the cover, with a wider, un-cropped view on the table of contents page. The magazine states that the addition, which supplanted an earlier and smaller extension indicated on the 1949 Sanborn insurance map, was designed by Concord architects Lyford and Magenau and built by Foster and Bamford, general contractors of Concord.

1955-7 *Concord Directory* advertisement for Carlson's Auto Sales includes a photograph that shows the c. 1884 White office wing adapted as an automobile showroom.

1957 The *Concord Directory* indicates that Capitol City Motors, former occupants of the southern property at 45 South Main Street, had become Hodgkins Oldsmobile. Page 36 of this directory carries an advertisement illustration the 1951 addition designed by Lyford and Magenau.

1959 The *Concord Directory* lists the northern property at 43 South Main Street as vacant

1959 The New Hampshire Bindery, formerly located on Durgin Lane off Warren Street since 1934, moved into the property at 43 North Main Street sometime in 1959. New Hampshire Bindery is listed at 43 South Main Street from 1960 until 2012.

1979 The Sanborn fire insurance map of this date shows the 1951 addition designed by Lyford and Magenau extending to the sidewalk. Mausolf notes that in 1965 the enlarged building was occupied by Capitol City Motors and by the Aetna Life Insurance Company and the Floyd Lewis Insurance Company, although the *Concord Directories* from 1957 list the former Capitol City Motors as Hodgkins Oldsmobile.

1982 The Aranosian family sold the property at 45 South Main Street to Reynold Addario.

2012 The properties at 43 and 45 South Main Street were sold and demolished. The New Hampshire Bindery moved to a new location on Dow Road in Bow, New Hampshire.

MANUFACTURING CENSUS RECORDS
FORD & KIMBALL SHOP BUILDINGS
43-45 SOUTH MAIN STREET
CONCORD, NEW HAMPSHIRE

1870 CENSUS
Concord, Ward 5

Ford and Kimball Iron Foundry
Capital (real and personal) invested in this business: $50,000
If steam power is used: 60 h.p., one engine
Total wages paid during the year: $20,000
Months in full operation: 12
Materials consumed and value:
- Pig metal: 500 tons, worth $17,500
- Charcoal metal: 500 tons, worth $35,000
- Scrap iron: 600 tons, worth $19,200
- Anthracite coal: 500 tons, worth $5,500
- Sand: 225 tons, worth $1,350

Products manufactured and value:
- Car wheels: 3,000, worth $60,000
- Iron railing: 2,100 feet, worth $4,200
- Car casting, worth $65,800
- Miscellaneous, worth $20,000

Dunklee and Allen Iron Machinist
Capital (real and personal) invested in this business: $10,000
If steam power is used: 8 h.p., one engine
Machines:
- Lathes: 12
- Planers: 3
- Upright drills: 2
- Drill lathes: 3
- Rolling: 1
- Shaping: 1
- Bolt cutter: 1

Males over the age of 16 employed: 16
Total wages paid during the year: $9,984
Months in full operation: 12
Materials consumed and value:
- Iron and steel; coal: $8,000
- All other: $500

Products manufactured and value:
- Variety Moulding Machine: 70, worth $16,500
- Jig saws: 25, worth $2,500

Jobbing and repairing: worth $8,000

1880 CENSUS [Bracketed items in red ink]

Ford and Kimball Iron and Brass Castings [Brass Casting and Finishing]
Capital (real and personal) invested in this business: $100,000 [$95,000]
Greatest number of hands employed: 32 [31]
Males over 16: 28
Number of hours in the work day, May to November: 10
Number of hours in the work day, November to May: 10
Wages of a skilled mechanic: $2
Wages of an ordinary laborer: $1.25
Total wages paid during the year: $13,074 [$12,474]
Months in full operation: 12
Value of materials consumed: $50,000 [45,000]
Value of products manufactured: $69,787 [$65,390]
If steam power is used:
1 boiler
1 engine
50 h.p.

White, John A., Machinery
Capital (real and personal) invested in this business: $15,000
Greatest number of hands employed at any one time during the year: 28
Males over 16: 25
Number of hours in an ordinary labor day, May to November: 10
Number of hours in an ordinary labor day, November to May: 10
Average day's wages for a skilled mechanic: $2
Average day's wages for an ordinary laborer: $1.60
Total wages paid during the year: $12,000
Months in full operation: 12
Value of materials consumed, including mill supplies and fuel: $10,000
Value of products manufactured, including jobbing and repairing: $30,000
If steam power is used:
1 boiler
1 engine
20 h.p.

Prescott Organ Company, Cabinet Reed Organs [Musical instruments, organs, and Materials]
Capital (real and personal) invested in this business: $14,000
Greatest number of hands employed at any one time during the year: 27
Males over 16: 25
Number of hours in an ordinary labor day, May to November: 10
Number of hours in an ordinary labor day, November to May: 10
Average day's wages for a skilled mechanic: $2
Average day's wages for an ordinary laborer: $1.00

Total wages paid during the year: $11,148
Months in full operation: 12
Value of materials consumed, including mill supplies and fuel: $9,441
Value of products manufactured, including jobbing and repairing: $23,913
If steam power is used [blue marks over these entries]:

[1] boiler
[1] engine
5 h.p.