

NATIONAL HISTORIC LANDMARK NOMINATION

NPS Form 10-900

USDI/NPS NRHP Registration Form (Rev. 8-86)

OMB No. 1024-0018

FORD PIQUETTE AVENUE PLANT

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United States Department of the Interior, National Park Service

National Register of Historic Places Registration Form

1. NAME OF PROPERTY

Historic Name: Ford Piquette Avenue Plant

Other Name/Site Number: Studebaker Detroit Service Building

2. LOCATION

Street & Number: 411 Piquette Avenue

Not for publication:

City/Town: Detroit

Vicinity:

State: Michigan County: Wayne

Code: 163

Zip Code: 48202

3. CLASSIFICATION

Ownership of Property

Private: X

Public-Local: ___

Public-State: ___

Public-Federal: ___

Category of Property

Building(s): 1

District: ___

Site: ___

Structure: ___

Object: ___

Number of Resources within Property

Contributing

1

1

Noncontributing

___ buildings

___ sites

___ structures

___ objects

___ Total

Number of Contributing Resources Previously Listed in the National Register: 1

Name of Related Multiple Property Listing:

Designated a NATIONAL HISTORIC LANDMARK on

FEB 17 2006

by the Secretary of the Interior

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4. STATE/FEDERAL AGENCY CERTIFICATION

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this nomination request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property meets does not meet the National Register Criteria.

Signature of Certifying Official

Date

State or Federal Agency and Bureau

In my opinion, the property meets does not meet the National Register criteria.

Signature of Commenting or Other Official

Date

State or Federal Agency and Bureau

5. NATIONAL PARK SERVICE CERTIFICATION

I hereby certify that this property is:

- Entered in the National Register
Determined eligible for the National Register
Determined not eligible for the National Register
Removed from the National Register
Other (explain):

Signature of Keeper

Date of Action

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6. FUNCTION OR USE

Historic:	INDUSTRY	Sub:	manufacturing facility
Current:	COMMERCE WORK IN PROGRESS	Sub:	warehouse

7. DESCRIPTION

Architectural Classification: LATE 19TH & EARLY 20TH CENTURY AMERICAN MOVEMENTS/
Factory

MATERIALS: brick, concrete, asphalt, wood, glass
 Foundation: brick, concrete
 Walls: brick
 Roof: asphalt
 Other: wood, glass

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Describe Present and Historic Physical Appearance.

The Ford Piquette Avenue Plant is located approximately three miles north of the Detroit River in a section of the City of Detroit just east of Woodward Avenue between the Edsel Ford Expressway (Interstate 94) on the south and East Grand Boulevard on the north, known as *Milwaukee Junction*. The district takes its name from the fact that three railroads interconnect in this area—the Detroit & Milwaukee, the Grand Trunk Western, and the Michigan Central. Streetcar lines extended into this area from downtown on nearby Woodward Avenue, touching off some early residential growth in the 1890s. The construction of the Ford Piquette Avenue Plant in 1904 marked the beginning of a wave of construction of automobile factories in this district. Many industrial buildings situated along these rail lines, both east and west of Woodward Avenue, still remain today, and are included in the New Amsterdam Historic District (listed on the National Register of Historic Places in 2001) and the Piquette Avenue Industrial Historic District (listed on the National Register in 2004).

The Ford Piquette Avenue Plant is situated at the northwest corner of Piquette and Beaubien. (See Photographs 1 & 2, and Figure 1) The original three-story building measures 388' by 56', with a 20' ceiling on the first story and 16' ceilings on the second and third stories. Its exterior envelope consists of load bearing brick masonry walls constructed of common brick, punctuated with a regular pattern of window openings on all sides. The south (Piquette Avenue) elevation is the front, and exhibits Italianate influences with a tripartite arrangement of forms with a pediment over the center. The slightly sloping roof is hidden by the coping and parapet wall in the front; thus, it is not visible from the street. Structurally, the Ford Piquette Avenue Plant is in excellent condition, with its defining features, such as the brick walls, window arrangements, wood columns, wood floors, and rear elevator, all intact.

A large four-story industrial building was built on the adjacent lot in 1920 by the Studebaker automobile company. For the purposes of this nomination, it is being treated as an addition that does not contribute to the Ford plant's national significance because it was built a decade after the Ford company relocated elsewhere. The inclusion of the 1920 building conforms with National Register and National Historic Landmark documentation requirements because when built it was connected to the 1904 plant and it introduced internal openings (now sealed) between the two.

The Ford Piquette Avenue Plant was designed with some modest architectural pretensions, although it was built for utility. Its narrow front facade facing Piquette Avenue contains three bays, the center one projecting forward slightly. Detailing is in the brick and is concentrated around the parapet level in the form of a stepped corbel table. A stepped brick belt course separates the first and second stories; a shallow pediment, also outlined in stepped brick, projects from the center of the front facade. The same pattern of stepped brickwork is carried beneath the eaves along the east and north side elevations of the building. A projecting brick water table also continues around the sides at ground level. The west side of the building, facing the yard, is simplified, with the parapet rustication and corbeled band omitted. On the east side, Beaubien slopes down to the north, thus exposing the foundation wall, which is parged. (See Photographs 3, 4, & 5) Walls are capped with a vitreous clay tile coping, except at the south pediment, which is capped with an ogee-molded limestone coping. The brick is unpainted, except at the front facade, which is painted white. A series of Ford Motor Company outbuildings located west of the three-story brick factory, including a brick powerhouse (1904) and additional buildings erected in 1907-1908, are no longer extant.

On the front (south) facade, a recessed garage door type entrance now occupies the central bay of the first story. Originally, the entrance was composed of a single entrance door with a transom above, flanked by sidelights resting on the water table. (See Figure 1) Above this is still the original fan light opening, now filled in, with its exaggerated keystone centered in its arch. A

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grouping of three elongated windows occupies the central bay of the second floor; a large arched opening with a tripartite window occupies the central bay on the third story. This fenestration pattern is repeated on all three stories of the long side elevations of the building.

Window design and arrangement present a unified, horizontally banded visual organization to the building. There are approximately 355 wood double hung windows on the building, typically with divided lights and muntins in the upper and lower sashes. Masonry window openings are stacked in three story high groupings in bays that repeat along the length of the building, with minor variations at the end bays. Masonry opening heads on the first floor are segmentally arched on the exterior and flat (supported with a steel lintel) on the interior. Each opening contains one window. Windows are paired - two in each bay - each with a separate limestone sill. Second and third floor windows are set into an arched, recessed two-story bay, set four inches from the building face. Second floor window openings have flat heads with steel lintels, with each opening containing one window, and are paired in each bay with a masonry pier between them. Both windows in the pair share a limestone sill. The third floor windows are tripartite within a single arched masonry opening spanning the entire bay. These windows share a limestone sill. Corner bays differ from the typical bays in that they are not recessed on the first and second floors. The third floor windows are two separate arched windows instead of the typical tripartite arrangement, and the second and third floor windows do not share a sill. Windows are primarily six-over-six double hung sash; the first floor windows have three-light transoms above.

The second and third stories of the Ford Piquette Plant (along the southernmost three bays of the west elevation) are connected with the adjacent Studebaker Detroit Service Building (built in 1920) by the "Studebaker bridge." (See Photographs 1, 2, 7 & 8, and Figure 5) This building is four stories tall and its "bridge" provides a drive-through at ground level between the two buildings, providing access to the large court within between and behind the two buildings. Although the bridge once provided access between the two buildings at the second and third floors, these opening (between now separately-owned buildings) were sealed many years ago.

Several original door openings within the Ford building have been modified to accommodate changing use patterns, mainly for wider, contemporary overhead doors. (See Photograph 9) Typically, the arched openings above the doors have been filled in with brick. The location of almost all of the original windows and door openings are unchanged. A few windows have been bricked up.

At the end of the production process, most Ford automobiles were shipped by rail to Ford's dealers and distributors. A railroad spur extended from the main line to the rear of the plant, where cars would be loaded from a covered loading dock onto railroad freight cars. When Ford occupied the plant, the railroad lines were situated at street grade, so the loading dock was situated on the first floor at the rear of the building. In 1911, the railroad spur line extending from the main railroad line to the Piquette Plant was elevated above street grade, so the loading dock was moved to the second floor level. None of the 1904 loading dock is extant.¹ A square brick penthouse located on the roof at the northwest corner of the building houses the mechanical equipment for the elevator located there and originally served as the structural base for a 25,000 gallon wooden water tank designed to provide water to the sprinkler system. The wooden water tank was removed some time ago.

To the immediate north of the 1904 building (and not included within the nominated NHL boundary) is a large elevated platform supported by steel I-beams. When added in 1911, this was probably an open steel framework supporting a single railroad spur (ties and rails) and a wooden loading "shed" adjoining the 1904 factory, but is now enclosed on all sides, with railroad ties,

¹ Nameplate on the railroad overpass reads, "King Bridge Company, Cleveland, Ohio, 1911."

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rails, and loading shed entirely removed, and is covered with an asphalt roof. On the north and west sides, the space beneath the elevated platform surface is enclosed with cinder block walls. (See Photograph 10) At the northwest corner of the 1904 factory, part of the space under the railroad spur line has been converted into a pair of garages. The date(s) of these alterations are not known. Along the Beaubien Street (east) side of this elevated platform there is a large wall, 56' long, consisting of three distinct segments. (See Photograph 6) The first (lowest) segment is a reinforced concrete foundation, rising 6' above the sidewalk at its southern end, next to the brick factory building, but then gradually reached 7'-6" in height at its northern end. The second (middle) segment, consisting of common bond brick, is 6' in height, and the third (upper) segment, consisting of cinder block construction, is 10' in height, making the loading dock deck at least 22' above the level of the sidewalk on Beaubien. None of these walls are load-bearing. The elevated platform is 56' wide at Beaubien, but then tapers to approximately 35' in width at the northwest corner of the brick factory building and then tapers even more to a width of approximately 20' farther west. This platform abuts the 1904 brick factory, but is not structurally connected to it with bolts, braces, or brackets.

The elevating of the original loading shed in 1911 to the second floor level also changed some of the fenestration on the north facade of the 1904 building. The third floor fenestration is unchanged and is identical to that of the third floor on the south facade. On the second floor, however, several changes were made to accommodate the relocation of the loading dock. A pair of windows at the east end of the facade are original, as is a single window located in the western third of the facade. Two new door openings have replaced original windows. In the middle of the second floor facade, there is a timber-framed solid wooden door consisting of two equal segments that swing inward. On the west end of the second floor, there is a single wooden door, solid on the bottom, but with twelve window panes (6 over 6) on the top, which swings outward and provides access to the elevator located at the northwest corner of the building.

The interior of the Ford factory building is utilitarian on all three floors, providing little more than weatherproof space, light, power, adequate floor loading capacity, basic sanitation amenities and access required to facilitate the early twentieth century manufacturing process. The interior is devoid of any ornamentation or decoration except for painted finishes. It is not, however devoid of character. The heavy timber construction is fully exposed in almost all portions of the building, clearly articulating the relationship between all of its components. The predominance and consistency of the simple yet powerfully elegant structural system throughout the building makes it the primary character-defining feature of the interior. (See Photographs 11, 12 & 13, and Figures 2 & 3)

The utilitarian character is further reflected by the wall treatments which, with a few minor exceptions, is simple painted brick throughout the building. Floors are wood at the second and third floors, and concrete at the first floor. Water leakage and lack of heat over the years have resulted in the buckling of floor boards and the peeling of paint. Each floor of the building is divided into four compartments (rooms) for the purposes of fire safety by three brick masonry walls that extend from the first floor through the roof. Large arched openings in the center of these walls occur at each floor, and are protected by a pair of large tin-covered parallel horizontally-rolling doors which are important character defining elements. The southern one-fourth of the first floor, which is used for office space and for the sorting and packaging of uniforms, has been altered from its original appearance with drop ceilings, wall paneling, and floors covered in linoleum, tile, or carpeting. For the remainder of the first floor, the original heavy timber post and beam construction is visible. Each timber post, which supports timber beams running the length of the building, has a pair of timber braces tied to the beam at a 46-degree angle. Aside from this modernization, the decades of use, reuse and modifications to adapt to the needs of various occupants have been gentle, fairly sympathetic, and have done little to diminish the fundamental character of the interior.

The 1904 building originally had two stairwell/elevator combinations, one on the southwest side

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of the building and a second at the northwest corner. An original stairwell and elevator shaft still exist at the northwest corner of the building. The stairs, of timber construction, extend from the first floor to the third floors with guards, which are simply but attractively fashioned of beaded paneling and simple moldings. The extant elevator was built by the Houghton Elevator & Machine Company of Toledo, Ohio, with a nameplate indicating it was installed in 1926. The original equipment, including electrical switches, flywheel governor, and braking system, is in place and in excellent condition. The stairwell and elevator shaft on the southwest side of the building were relocated slightly north of their original location in 1926 to allow for clear access to the second and third stories of the adjacent reinforced concrete building through the "Studebaker bridge." A square brick penthouse on the roof of the three-story factory building houses the elevator machinery and equipment which was installed in 1926 and is identical to that found at the northwest corner of the 1904 building. The controls in the elevator car were replaced sometime in the 1950s. The second and third stories of the 1904 plant and the 1920 Studebaker building are connected through the "Studebaker bridge," which extends through the two southernmost bays of the Ford building. At the southernmost bay of the 1904 plant, approximately 2' north of the southwest corner of the building, there is a 12' wide steel industrial-type rolling door on both the second and third stories. On the second story, the middle section of the second bay has a solid steel wall 12' in width, which is recessed in 1' from the surrounding brick walls. This steel wall is fitted with a single standard steel door with a small vertical window. On the third story, the middle section of the second bay has a steel horizontally-rolling door 12' in width. The rolling door appears to date from 1920, when the Studebaker building was constructed. Finally, the northern portion of the second bay on both the second and third stories is taken up by the elevator that served the second and third stories of both buildings.

The 1904 Ford plant and the 1920 Studebaker building have separate electrical lines and water lines serving them. The Studebaker building has its own heating system, which may have served both buildings after the power house which originally supplied the 1904 factory with heat was demolished around 1937. Currently, the uniform supply company occupying the first story of the 1904 Ford Motor Company building uses gas space heaters to provide heat. The rest of the building has no source of heat at this time.

Other original features of the Ford building include the electrical panels, the fire suppression system on all three floors, including the sprinkler system, fire walls and fire doors, and some original signage on the third floor, including the "No Smoking" and "Exit" signs. The paint on the third floor, although peeling in places, appears to be the original paint applied in 1904. Photographs of the third floor taken in 1906 exactly match the appearance of the third floor today. The partitions enclosing the "Experimental Room" Henry Ford built in 1907 for designing the Model T Ford are no longer extant. One segment of a radiator from the original heating system has survived on the south end of the third floor. A walk-in vault, which held the Ford Motor Company's business records, remains in place in the southwest portion of the first floor. A second large vault, originally located directly above the first, on the second floor, was used to house engineering drawings. This vault was removed when the 1920 Studebaker building was erected. Two original iron fire escapes, located on the building's east facade, remain in place.² The Piquette Avenue Plant embodies standard New England mill design using load-bearing exterior walls of brick, with square timber posts and beams supporting wooden floors. The Ford factory did not utilize "slow-burning construction" of the type commonly used in New England textile mills of the era.

The adjacent Studebaker building was called the "Detroit Service Building." Designed by Albert Kahn (Job Number 938), this is an L-shaped building 251' in length on Piquette Avenue and 195' on Brush Street. The Piquette Avenue wing is 75' wide and the Brush Street wing is 100'

² "Ten Times Size of Present Plant: New Ford Motor Company Factory Will Be Well Equipped," *Detroit Free Press*, 29 May 1904, Part I, p. 3, includes a large rendition of the east facade showing the original fire escapes.

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wide.³ It has ten bays on Piquette Avenue and eight bays on Brush Street. This four-story service and manufacturing building is of reinforced concrete and brick design. The concrete frame was exposed on the exterior with brick curtain walls supporting large expanses of industrial steel window sash frame. The interior has "mushroom" columns supporting the floors above. A two-story brick tower rises above the fourth story and supports a large water tank. None of the original fenestration has survived. The fourth story now has two pair of double-hung steel sash windows in each bay, the second and third stories have glass block windows, and the first story window space is filled with concrete block. These modifications, as well as a revised paint scheme, have altered the Studebaker building's overall external appearance. Alterations have also been made to the north and east facades of this addition that face the interior of the block. The courtyard facades have been largely clad with vertical metal sheathing, leaving narrow openings for ribbon windows across each wing. Three windows fill each of the courtyard facade bays, including a center fixed light and flanking horizontal slider windows. Remaining windows are either fixed lights or filled with glass block.⁴

³ City of Detroit Building Permit No. 558, issued 21 May 1920 to Albert Kahn, architect, found in the offices of the City of Detroit Historic District Advisory Board, Coleman A. Young Municipal Building, Detroit; Job Book, Albert Kahn Associates, Architects and Engineers, 39; and Albert Russell Erskine, *History of the Studebaker Corporation* (South Bend, IN; the Studebaker Corporation, 1924), 88.

⁴ Much of the information for the Studebaker Building comes from the Piquette Avenue Industrial Historic District National Register of Historic Places nomination form that was prepared in September, 2003 by Elaine H. Robinson, Commonwealth Cultural Resources Group, Inc.

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8. STATEMENT OF SIGNIFICANCE

Certifying official has considered the significance of this property in relation to other properties:
Nationally: X Statewide: _ Locally: _

Applicable National Register Criteria: A X B X C _ D _

Criteria Considerations (Exceptions): A _ B _ C _ D _ E _ F _ G _

NHL Criteria: 1, 2

NHL Theme(s): V. Developing the American Economy
1. Extraction and production
VI. Expanding Science and Technology
1. Experimentation and Invention
2. Technological Applications

Areas of Significance: Industry
Invention
Transportation

Period(s) of Significance: 1904-1910

Significant Dates: 1904, 1908

Significant Person(s): Ford, Henry

Cultural Affiliation: N/A

Architect/Builder: Field, Hinchman & Smith, Architects

Historic Contexts: XII. Business
B. Manufacturing Organizations
2. Transportation Equipment
XIV. Transportation
G. Automobiles
XVIII. Technology (Engineering and Invention)
B. Transportation
G. Industrial Production Processes

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State Significance of Property, and Justify Criteria, Criteria Considerations, and Areas and Periods of Significance Noted Above.

Summary Statement of Significance

Henry Ford was a visionary who had a profound and revolutionary impact on the American automobile industry in the early years of the twentieth century. His plans for the Model T Ford, which he designed and first built at the Ford Piquette Avenue Plant, laid out his vision:

I will build a car for the great multitudes. It will be large enough for the family, but small enough for the individual to run and care for. It will be constructed of the best materials, by the best men to be hired, after the simplest designs that modern engineering can devise. But it will be so low in price that no man making a good salary will be unable to own one-and enjoy with his family the blessing of hours of pleasure in God's great open spaces.⁵

The Ford Piquette Avenue Plant is nationally significant on several grounds. First, it was the factory where the Ford Motor Company initially achieved quantity production of technically-advanced, yet inexpensive, automobiles, enabling the firm to become the largest automobile producer in the United States beginning in 1906. The Ford Motor Company became the leading firm in the American automobile industry two years after moving into this plant. Second, it was the place where the Ford Motor Company made substantial advances in manufacturing methods, making possible the moving assembly line introduced later at the Ford Highland Park Plant. Third, it was the birthplace of the Model T Ford, the most significant car in the history of the automobile industry. The Model T Ford was conceived, designed, and first produced there. The Ford Piquette Avenue Plant qualifies for listing as a National Historic Landmark under Criterion 1 because of its association with the Model T Ford and the beginnings of mass production of automobiles, and under Criterion 2 because of its strong association with this critical period in the career of Henry Ford.

The Ford Piquette Avenue Plant was the second of four Detroit-area factories used by Henry Ford and the Ford Motor Company to manufacture automobiles between the founding of the company in 1903 and Henry Ford's death in 1947. It is the oldest still extant. Each one of the four factories represented a stage or phase in the emergence of Henry Ford and his company as the leading American automobile manufacturer. Ford assembled his first automobiles at the Mack Avenue Plant, which his firm occupied from April 1903 until October 1904. There, the Ford Motor Company earned substantial profits from its first offering, the Model A Ford, but production remained small and the work was limited to assembling components manufactured by others. The Ford Motor Company's principal production operations were located at the Piquette Avenue Plant in 1904-1909, at the Highland Park Plant from 1910 until the early 1920s, and at the Rouge Plant from the early 1920s until the 1950s.

Background

Henry Ford (July 30, 1863 - April 7, 1947) is the most important automobile manufacturer of the twentieth century and perhaps the most important industrialist as well. He revolutionized the automobile industry by achieving mass production of the Model T Ford with the moving assembly line. The Model T Ford initiated the mass use of the automobile in the United States in the 1910s and 1920s and ultimately, throughout much of the rest of the world. In many respects, Henry Ford created the automobile-driven twentieth century. Henry Ford's mass production

⁵ Douglas Brinkley, *Wheels For the World: Henry Ford, His Company, and A Century of Progress, 1903-2003* (New York: Viking, 2003), 113, 783 n. 1. The precise source of this statement is not known, but it likely dates from 1907 or early 1908.

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methods were widely-adopted in manufacturing outside of the automobile industry. Ford further rationalized production through the use of vertical integration at his River Rouge Plant.⁶ Working closely with architect Albert Kahn, Ford also helped radically alter factory architecture in the twentieth century, with the use of reinforced concrete to create the "daylight factory" and then by using steel-framed buildings encased in glass at his River Rouge Plant.

In December 1879, Henry Ford left the farm where he grew up in Springwells Township, Michigan, west of Detroit, to begin working at a variety of industrial jobs in Detroit. Ford worked as an apprentice at a machine shop for nine months before taking a job as a machinist at the Detroit Dry Dock Engine Works, makers of marine steam engines. He stayed there from fall 1880 through summer 1882. Henry Ford held a variety of mechanical jobs and even tried farming in the 1880s, but then returned to the world of machinery. He worked for the Edison Illuminating Company in Detroit as an engineer starting in September 1891 and became chief engineer in 1895. This was the last position Ford held before entering Detroit's infant automobile industry.⁷

Henry Ford built his first automobile, powered by a two-cylinder engine, in 1896. He launched the Detroit Automobile Company in August 1899 to build a car of his own design, but disagreements with his partners led to the company's failure sixteen months later. He then founded the Henry Ford Company in November 1901, but resigned from the firm in March 1902 following disagreements with the principal stockholders. He then partnered with Alexander Malcomson, a Detroit coal merchant, and in late 1902 established Ford and Malcomson, Ltd. Malcomson convinced a group of investors to join him in incorporating the Ford Motor Company on 16 June 1903. By then, preparations to begin assembling the new Model A Ford, including contracts with suppliers, had already been completed.⁸

Ford's first factory, the Mack Avenue Plant, was an old wagon manufacturing shop owned by Albert Strelow, who agreed to remodel the building, a one-story frame structure 50' wide and 250' long, and rent it to the Ford Motor Company for \$75 a month. Ford began moving into the Mack Avenue Plant in April 1903, but did not begin assembling cars there until June, after the incorporation of the Ford Motor Company. The firm was officially launched with stock officially valued at \$28,000, but the original investors put in only \$19,500 at the start. Ford began with a labor force of only a dozen workers, who merely assembled components purchased from outside suppliers. Dodge Brothers (John and Horace Dodge) built the "running gear," which consisted of the chassis, engine, transmission, drive shaft, and both axles. Ford bought tires, wheels, and bodies from three other firms. Ford was an assembler of cars, but not a manufacturer at this point. While other contemporary automobile manufacturers also bought many components from outside suppliers, pioneers such as Henry Leland at the Cadillac Motor Car Company manufactured their own engines and transmissions.⁹

⁶ Vertical integration refers to the control over the production of the raw materials and components ultimately used in the manufacture of the final product. By the mid-1920s, Henry Ford operated his own iron mines, coal mines, lime quarries, bulk ore ships, and railroad, while at the River Rouge Plant proper, he made his own pig iron and steel, castings, and sheet steel for car body panels. He owned rubber plantations and forests and produced his own tires, wooden components, and sheet glass.

⁷ Sidney Olson, *Young Henry Ford: A Picture History of the First Forty Years* (Detroit: Wayne State University Press, 1963, 1997), 26-32, 53-59.

⁸ Roger Burlingame, *Henry Ford* (New York: Alfred A. Knopf, Inc., 1955), 31-39.

⁹ Mrs. Wilfred C. Leland and Minnie Dubbs Millbrook, *Master of Precision: Henry M. Leland* (Detroit: Wayne State University Press, 1966), 65-71; Allan Nevins and Frank Ernest Hill, *Ford: The Times, the Man, the Company* (New York: Charles Scribner's Sons, 1954), 230, 236, 238, 240. Nevins and Hill produced a three-volume history of Henry Ford and the Ford Motor Company through 1962 which still stands as the most thorough and complete history.

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The Mack Avenue Plant produced fifteen cars a day in the initial months of operations. A second story was added sometime in late 1903 to provide a paint shop and additional space for storage. By Spring 1904 the workforce had grown to about forty. The Mack Avenue Plant produced about 1,700 cars, all Model A Fords, during the first fifteen months of operations through September 1904. The Model A Runabout, seating two, sold for \$850 and the Tonneau model, which could seat four, sold for \$950. These were popular cars and Ford Motor Company earned profits starting in July 1902. During its first fifteen months of operations, the company enjoyed robust earnings of \$36,957.64, approximately \$200 on each car sold.¹⁰

In its first year, the Ford Motor Company became a fast-growing infant which quickly outgrew its crib and needed a lot more room. On 26 January 1904, the firm's board of directors authorized Alexander Malcomson, the company Treasurer, to take an option (at a cost of \$1,000) on a nearby parcel of 3.11 acres, an entire city block bounded by Beaubien Street on the east, Brush Street on the west, Piquette Avenue on the south, and the Michigan Central Railroad line on the north. A special Stockholders Meeting of 1 April 1904 authorized the purchase of the property for \$24,500. The land was situated in a largely-undeveloped section of Detroit about three miles north of the Detroit River, known as the Milwaukee Junction. The name derived from the junction of three railroads in this area—the Detroit & Milwaukee, the Grand Trunk Western, and the Michigan Central. The Ford Motor Company stockholders limited construction costs for a new factory to \$76,500. The company directors authorized Henry Ford and John Dodge to approve all the plans and specifications for the Piquette Avenue Plant. They employed the Detroit architectural firm of Field, Hinchman & Smith. Construction began on 10 May 1904, but the City of Detroit did not issue a building permit for the project until 21 May.¹¹

Field, Hinchman & Smith traced its roots to Sandusky, Ohio, where Sheldon Smith established an architectural practice in 1853. Sheldon Smith moved to Detroit in 1855, where his son Mortimer L. Smith and grandson Fred L. Smith later continued the family's architectural practice. In 1903, Fred Smith joined two engineers, Henry G. Field and Theodore H. Hinchman, Jr., both University of Michigan graduates, to form Field, Hinchman & Smith. It was one of only a handful of Detroit architectural firms that took on factory commissions. In addition to the Ford Piquette Avenue Plant, the firm designed factories for the Daisy Manufacturing Company (1903); multiple buildings for the Olds Motor Works and the Olds Gasoline Engine Works (1903-1905) in Lansing, Michigan; facilities for Walker & Sons (1904-1905) in Walkerville, Ontario, Canada; and factories for Dodge Brothers (1904-1905) in Detroit. Charles Bennett, one of the original Ford Motor Company stockholders, was also the president of Daisy Manufacturing Company (makers of air rifles) and would have been familiar with Field, Hinchman & Smith. When H.J. Maxwell Grylls joined the firm in 1906 and Field departed, the practice was renamed Smith, Hinchman & Grylls, the name it retained until the late 1990s. This is the oldest continually-operating architectural practice in the United States and one of the most prolific architectural practices based in Detroit.¹²

The Ford Piquette Avenue Plant initially consisted of a three-story brick factory building, 56' wide and 388' long and a brick powerhouse measuring 36' wide and 57' long, located near the northwest corner of the factory building. The powerhouse was equipped with three Pratt fire tube

¹⁰Allan Nevins and Frank Ernest Hill, *Ford: The Times, the Man, the Company* (New York: Charles Scribner's Sons, 1954), 245, 644-647.

¹¹Trent E. Boggess, "Birthplace of the Model T: The Piquette Avenue Plant," *Vintage Ford* 33 (November-December 1998): 16; City of Detroit Building Permit No. 558 (21 May 1904), microfilm copy located in the offices of the Historic Designation Advisory Board, City of Detroit.

¹²Thomas J. Holleman and James P. Gallagher, *Smith, Hinchman & Grylls: 125 Years of Architecture and Engineering, 1853-1978* (Detroit: Wayne State University Press, 1978), 19-22, 26-34, 61-63, 65, 71, 207-208.

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boilers, Skinner direct connection steam engines, and Triumph dynamos to generate electricity for the plant. At its meeting of 9 May 1904, the company directors authorized the major construction contracts with the Malow Brothers receiving the contract for carpentry work (\$23,500), and the contract for masonry work (\$21,195) was awarded to the firm of Nut & Clark. Additional contracts were let on 1 June and in August. Construction proved more costly than originally estimated, forcing the Ford Motor Company directors to authorize additional funds on 10 October 1904 to complete the work. The Piquette Avenue Plant was sufficiently finished by October 1904 to enable Ford to begin moving its operations into the facility, having spent its first eighteen months in the Mack Avenue Plant.¹³

Old-time Ford employees recalled the roominess of the new factory. Fred Rockelman asked Henry Ford if the company would ever need this much space and Ford challenged Rockelman to a foot race to one end of the building and back, and Rockelman accepted. Another employee, Frank Hadas, recalled eleven-year-old Edsel Ford riding his bicycle inside the plant, weaving between the columns in the half-empty building. When first occupied, the southern one-fourth of the first floor, near Piquette Avenue, included the office of business manager James Couzens, a vault, and offices for bookkeepers, clerks, stenographers, and sales staff. Henry Ford and his production and design staff had their offices on the second floor, also at the southern end of the building, but there is little surviving evidence of these offices. The first floor included an area for testing cars, a machine shop, and a shipping department at the north end of the building. The second floor included space for magneto assembly, an additional machine shop, and a storage area. The third floor, which included drafting rooms at the south end, contained the body trimming, painting and varnishing operations, with most of the space devoted to final assembly and storage. Over time, the usage of the space shifted considerably, but the location of offices on the first and second floors did not.¹⁴

The Ford Motor Company expanded the Piquette Avenue Plant by adding new buildings west of the three-story brick factory. In late 1906, the Board of Directors decided to build an engine-testing building equipped with ventilators and blowers and a paint shop, at a total cost of \$14,000. At the end of 1907, the Ford Motor Company erected a heat treatment plant to treat parts made from vanadium steel manufactured elsewhere. A detailed site plan produced by the Detroit Fire Department around 1908 shows the entire property between the three-story factory building on Beaubien Street and Brush Street at the western edge. (See Figure 6) The plan shows an iron or steel-framed building approximately 75' wide and 175' long located on the edge of Piquette Avenue and labeled "Chassis Room." In the middle of the property was a one-story metal building, measuring 50' wide and 120' long, with the eastern part labeled "Grinding Room" and the western section identified as the "Furnace Room." This was almost certainly the heat-treating plant built in 1907. A brick warehouse, roughly 100' by 150', stood at the northwest corner of the property, with "unloading sheds" extending to the railroad spur lines at the rear of the property. The brick powerhouse dating from 1904 is shown at the north edge of the property, with an adjoining brick "Test House" approximately 35' by 65' overall. A brick building 30' wide and 90' long, located just west of the main factory building, is identified as the "Snagging Room," where rough edges were likely removed from castings or forgings by filing or grinding. The remaining outbuildings, all small, included a "Soldering Room, Oil House, Laboratory, and Wash Room," all placed in the midst of the other outbuilding. The Detroit Fire

¹³ Boggess, "Birthplace of the Model T," 16. According to an e-mail communication, Trent E. Boggess to this author, 11 September 2004, the collections of The Henry Ford (formerly the Henry Ford Museum) include one of the original Skinner steam engine/Triumph dynamo sets.

¹⁴ *Ibid.*, 16, 18; Nevins and Hill, *Ford: The Times, the Man, the Company*, 266-267.

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Department plan reveals a manufacturing complex jam-packed with buildings.¹⁵

The Ford Motor Company moved most of its manufacturing operations from the Piquette Avenue Plant to the more spacious quarters in its new Highland Park Plant by January 1910, but kept some component production and most of its offices at Piquette Avenue through October 1910.

Innovations and Achievements in Automobile Manufacturing and Assembly Methods

During the six years that the Ford Motor Company occupied the Piquette Avenue Plant, the automaker transformed itself from a mid-sized company assembling several car models made with components manufactured by others, to the largest automobile company in the United States. While at the Piquette Avenue Plant, Ford began manufacturing a significant portion of the components used in its automobiles at Piquette Avenue and at the nearby Bellevue Avenue Plant. Ford manufactured engines at the Bellevue Avenue Plant in 1906 and 1907, but by late 1908, the automaker was manufacturing virtually all of its engines, transmissions, axles, and flywheel magnetos at the Piquette Avenue Plant. Because the design and reliability of their engines could determine the fate of early automakers including Ford, becoming self-sufficient in engines was an early goal of Ford and the others. To be sure, Ford continued to purchase bodies, tires, batteries, and other parts from outside suppliers, but these components were cheaper and less critical to the success of Ford's automobiles than engines and transmissions. The company achieved quantity production of automobiles by revolutionizing the way in which they were manufactured and assembled. During the years spent at the Piquette Avenue Plant, the Ford Motor Company laid the essential groundwork for the later development of the moving assembly line at its Highland Park Plant.

Ford Motor Company simultaneously assembled two or three different models at Piquette Avenue from Fall 1905 through September 1908. (See Figure 7) Producing a variety of models complicated the assembly process and created logistical problems in terms of coordinating the flow of components into the plant and the flow of finished automobiles out of the plant. During the year ending 30 September 1905, Ford Motor Company offered a large (1,700 pounds) four-cylinder touring car, the Model B, selling for \$2,000; a two-cylinder light runabout (1,250 pounds), the Model C, which replaced the Model A, selling for \$800; and a two-cylinder mid-priced touring car, the Model F (1,400 pounds), selling for \$1,000. Models B and C went into production at the Piquette Avenue Plant in Fall 1904, while Model F was introduced in February 1905. All were assembled on the third floor at Piquette. They all sold well, with combined sales of 1,745 cars in 1904-1905. According to James Couzens, the Ford Motor Company employed 300 men in April 1905 and was assembling 25 cars a day. Model C production ended in December 1905 and Models B and F were produced until April 1906. During the next year (1905/1906), sales fell slightly to 1,599 cars.¹⁶

The introduction of the successful new Model N in the middle of 1906 necessitated an enormous expansion in manufacturing and assembly capacity at the Piquette Avenue Plant and elsewhere. Sales increased more than five-fold from the previous year, to a staggering total of 8,423 cars in 1906/1907, a remarkable achievement given the Panic of 1907 sweeping the country. For calendar year 1905, Ford Motor Company was the fourth largest producer among American automakers, after Cadillac, Rambler, and Oldsmobile. Ford leaped to the top position in 1906 following the introduction of the Model N in July 1906 and remained the leading American nameplate every year through 1926. Three new models introduced in 1906-1907 were all low-

¹⁵ Boggess, "Birthplace of the Model T," 19, 20; Detroit Fire Department, "Fire Department Inspection Report on Hazardous Conditions, Piquette Ave. Ford Motor Company," ca. 1908, found in the National Automotive History Collection, Detroit Public Library.

¹⁶ Nevins and Hill, *Ford: The Times, the Man, the Company*, 260, 261, 270, 272, 644, 646.

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priced and set the stage for the introduction of the Model T Ford.¹⁷

The Model N Ford (July 1906) and its slightly more refined variants, the Model R (April 1907), Model S Runabout (July 1907), and the Model S Roadster (April 1908), incorporated Henry Ford's long-term goal of producing an inexpensive high-quality car in large quantities. The introduction of the Model N shifted the Ford Motor Company's sales philosophy to favor inexpensive cars, gave Henry Ford unchallenged control of the company, and brought fundamental changes in Ford Motor Company's manufacturing and assembly methods. It brought a power struggle between Alexander Malcomson, who insisted that the company make expensive cars, and Henry Ford, who was philosophically opposed to high-priced automobiles. On 10 May 1904, a Detroit newspaper carried a brief announcement, without attribution, that Ford Motor Company would introduce a car the following year that would sell for \$400 and begin with an initial production of 10,000 cars a year. A Ford Motor Company advertisement in *Cycle and Automobile Trade Journal* on 1 January 1906 announced Henry Ford's plans to build a four-cylinder runabout that would sell for \$450 and therefore be affordable for the average American.¹⁸

On 22 November 1905, Henry Ford and several Ford Motor Company stockholders, except for Malcomson, John Gray, Charles Woodall, and Vernon Fry, incorporated the Ford Manufacturing Company as a "dummy" corporation. It was established to make engines and other components for the inexpensive car that was planned, the Model N, and to earn profits on the sales of the components to the Ford Motor Company. This was a tactical move clearly intended to drive Alexander Malcomson out of the enterprise that he had bankrolled in 1902 and 1903. Ford Manufacturing Company leased a factory at 773-775 Bellevue Avenue (no longer extant) from the Wilson & Hayes Manufacturing Company. The Detroit city directories show Ford at the Bellevue Avenue location in 1906, 1907, and 1908. There, Ford manufactured engines and transmissions for the Model N, leaving Ford's long-time supplier, Dodge Brothers, providing engines for the expensive Model B and later, the Model K Ford. With these moves, the Piquette Avenue Plant briefly became an assembly plant for all Ford models and much of the component manufacturing shifted to Bellevue Avenue. The effort to get rid of Malcomson worked. On 12 July 1906, he sold his shares of Ford Motor Company stock (255 shares out of 1,000) to Henry Ford for \$175,000, giving Ford effective control of the company. Stockholders Charles Woodall and Vernon Fry quickly followed suit.¹⁹

Ford Motor Company began installing machinery at the Bellevue Avenue Plant in Spring 1906 to turn out Model N engines. Ford initially planned to assemble 100 cars a day starting in mid-July 1906, implying a yearly production of 30,000 cars, and planned to sell them for \$500 or less. The Model N received rave reviews in the automotive press and Ford could not begin to satisfy the orders that came pouring in. The \$500 price tag was also not attainable. The Model N sold for \$600, Model R for \$750, and Model S for \$700, all of them sold as runabout models. The Model S Roadster sold for \$750. Henry Ford intended to dramatically increase production of these cheap cars. An internal company memorandum of mid-October 1906 called for the production of 11,500 of the inexpensive models, along with 600 of the expensive Model K over the next 300 working days, or 41 cars per day. The Model K, which was Malcomson's favored model, sold for \$2,800 in either a roadster or touring car version. Malcomson was not alone in his support of a more-expensive model—the Dodge brothers also thought that this might be the

¹⁷ Ibid., 344, 644, 646; "The American Car Since 1775," *The Automobile Quarterly* (1971): 138-141.

¹⁸ "Ford Motor Company to Put Out \$400 Autos," *Detroit Free Press*, 10 May 1905, 11; Nevins and Hill, *Ford*, 282, 334; and e-mail communication, Trent E. Boggess to the author, 11 September 2004.

¹⁹ Nevins and Hill, *Ford*, 278-282, 330; *Detroit City Directories for 1905-1909* (Detroit: R. L. Polk & Company, 1905-1909).

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future trend in automobile sales.²⁰

During the two-year period when Ford Motor Company made the Model N (July 1906-June 1908), Henry Ford and his manufacturing staff made key advances in production methods that enabled the company to increase output significantly. Ford established even larger production at Piquette Avenue with the Model T, but the experience of Model N production laid the foundation for later improvements. Henry Ford began preparations for production at the Ford Manufacturing Company's Bellevue Avenue Plant by installing machinery purchased through Walter E. Flanders, an experienced Yankee machinist who sold machine tools for the Landis Tool Company. Henry Ford respected Flanders, who was very knowledgeable about machine tools and machining methods. Flanders urged Ford to hire Max F. Wollering as superintendent for the Bellevue Avenue Plant and Ford did so in April 1906. Ford later hired Flanders to take the position of works manager in mid-August 1906 and gave him complete control over manufacturing operations at both plants. Flanders brought with him Thomas S. Walborn, a talented associate of his in Cleveland. Flanders, Wollering, and Walborn were responsible for the dramatic changes in Ford manufacturing methods put into place for the Model N production.²¹

Flanders and his associates developed an improved manufacturing system at the Bellevue Avenue Plant in the second half of 1906, with the intent of installing the improved methods at the Piquette Avenue Plant as well. Wollering installed fixtures and jigs on machine tools that turned them into what he called "farmer's tools," i.e. tools that enabled an unskilled farmer to perform high-quality machining equivalent to that of an experienced machinist. More important, he and Flanders initiated "progressive machining" operations for the Model N engines. Other manufacturers typically arranged machine tools by type, i.e., all the drill presses would be in a single room or on a single floor, and the work would be brought to the machines. Flanders and Wollering arranged the machinery sequentially, according to the work that needed to be done. They also purchased specialized, single-purpose machine tools such as a drilling machine that drilled eight holes in one operation. By the end of 1906, the Bellevue Avenue Plant allegedly was producing one hundred engines a day.²² Production was more likely somewhere in the range of 50-75 engines a day. If the plant produced one hundred engines a day and operated only 250 days a year, it would produce 25,000 engines a year. Ford's combined production of all models in 1907 was slightly less than 15,000 cars.

The Ford Motor Company also made huge strides in achieving interchangeability in parts and components for the Model N, R, and S. Manufacturing and assembling cars in large numbers demanded sufficient precision in manufacturing to produce parts that were interchangeable. Flanders preached this gospel, which Ford wholeheartedly supported. Walter Flanders learned the machinist's trade in New England, the birthplace of interchangeable parts in the small arms, sewing machine, typewriter, and bicycle industries.²³ Ford advertising suggested that the company had achieved interchangeability by January 1906, at least six months before the fact: "We are making 40,000 cylinders, 10,000 engines, 40,000 wheels, 20,000 axles, . . . *all exactly alike.*"²⁴ Henry Leland had also achieved effective interchangeability of parts while managing

²⁰ Nevins and Hill, *Ford*, 275, 324, 336-338, 646.

²¹ *Ibid.*, 281, 324; Anthony J. Yanik, *The E-M-F Company: The Story of Automotive Pioneers Barney Everitt, William Metzger, and Walter Flanders* (Warrendale, PA: Society of Automotive Engineers, 2001), 38-39.

²² Nevins and Hill, *Ford*, 325-327.

²³ The best source for the history of interchangeable parts in American industry is David A. Hounshell, *From the American System to Mass Production, 1800-1932: The Development of Manufacturing Technology in the United States* (Baltimore: The Johns Hopkins University Press, 1984).

²⁴ Nevins and Hill, *Ford*, 282, 325.

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the Cadillac Motor Car Company at about the same time. In early 1908, Cadillac was the only manufacturer to enter a standardization test offered by the Royal Automobile Club of England. Leland entered three operating one-cylinder Cadillacs, which were disassembled and then parts selected randomly to reassemble the cars using only wrenches and screwdrivers. The test proved that Leland had achieved genuine interchangeability with the Cadillac. Only Henry Leland and Henry Ford had achieved this result.²⁵

The Model N Ford marked the beginning of Ford Motor Company's move into manufacturing key components of its cars, starting with engines. Manufacturing much of the automobile "in-house" became more attractive and more necessary as Ford dramatically increased production. Henry Ford could control the quantity, quality, and cost of key components by manufacturing them himself. In the early months of 1907, Ford Motor Company began to consolidate many of its manufacturing and assembly operations at the Piquette Avenue Plant, particularly those related to the high-volume production of the Model N. This involved rearranging almost all of the machinery in the three-story building. The heavy machines used to manufacture the engines and engine components were installed on the ground floor, but the second floor, where components were assembled, and the third floor, where final assembly took place, had no machinery whatsoever. Assembly work took place on benches along the outer walls and at "work stations," often no more than a pair of sawhorses supporting the component. This work was labor-intensive hand-work, involving nothing more than a few hand tools such as wrenches, screwdrivers, hammers, and files. A surviving floor plan of the plant from 1907 showed Model K assembly on the second floor, with Models N, R, and S assembled on the third floor. Ford also began making transmission at Piquette Avenue as well as engines. There is photographic evidence that Model K assembly as well as component production were moved to the Bellevue Avenue Plant by 1908 and perhaps earlier. This would have made sense because Models N, R, and S shared the same chassis and used components made at the Piquette Avenue Plant. The Model K was a much more expensive model (\$2,800) which sold at a much lower volume than the other offerings. The Dodge brothers manufactured Model K engines and other key components, while Ford Motor Company made almost none of the Model K parts.²⁶

The first significant addition to the Piquette Avenue factory complex was a heat treatment building constructed late in 1907 to treat vanadium steel parts. J. Kent-Smith, an English metallurgical engineer, demonstrated to Henry Ford the value of vanadium steel, an alloy made by adding vanadium to steel. This alloy was stronger and lighter than ordinary steel and thus an ideal metal to use for automobile parts subject to heavy stresses. Ordinary steel might provide up to 70,000 pounds per square inch in tensile strength, but vanadium steel provided up to 170,000 pounds per square inch. Its manufacture required furnace temperatures of 3,000 degrees Fahrenheit, not attainable at most American furnaces. Early in 1907, Ford found a small steelmaker in Canton, Ohio and paid for experimental production of vanadium steel there, which was successful. In March 1907, the Ohio firm produced a 40-ton heat of vanadium steel for Ford, the largest batch at any U.S. steel mill. The Ford Motor Company briefly employed Kent-Smith to help the automaker and its suppliers master vanadium steel production. Ford used vanadium steel in Models N, R, and S on a limited basis in 1907, but more extensively in the Model T. It was the first American automaker to do so, giving the Model T Ford an enormous advantage over competitive cars.²⁷

²⁵ Leland and Millbrook, *Master of Precision: Henry M. Leland*, 15-16.

²⁶ Nevins and Hill, *Ford*, 364-366; Lindy Biggs, *The Rational Factory: Architecture, Technology, and Work in America's Age of Mass Production* (Baltimore: The Johns Hopkins University Press, 1996), 93; and e-mail communication, Trent E. Boggess to the author, 1 September 2004.

²⁷ Nevins and Hill, *Ford: The Man, the Times, the Company*, 348-349; Boggess, "Birthplace of the Model T," 20-21; and Henry Ford, *My Life and Work* (Garden City, NY: Doubleday, Page & Company, 1922), 66.

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Flanders, Wollering, and Walborn quit the Ford Motor Company together on 15 April 1908 to work for the new E-M-F Company on the other side of Brush Street. Their departure mattered little to the Ford Motor Company because the production system they had developed remained in place and had the enthusiastic support of Henry Ford and the other stockholders. As the Piquette Avenue Plant was fulfilling the last orders for the Model N, the factory established a new industry-wide record for building cars in a single day—101 complete cars on 4 June 1908. Production of eighty cars per day was common earlier in the year. Ford reached these unprecedented output levels by achieving interchangeability of parts and carefully coordinating the delivery of parts and components to the Piquette Avenue factory and then the flow of work within the factory.²⁸

There would be no moving assembly used by the Ford Motor Company for another five years, well after the company had settled into the Highland Park Plant. Nevertheless, there was an interesting experiment with the concept of the assembly line carried out at the Piquette Avenue Plant in July 1908 using Model N parts and components. According to Charles Sorensen, who had replaced Flanders as the production manager, he and a handful of helpers, working on Sundays, experimented with a moving assembly line on the third floor of the Piquette Avenue Plant. Rather than using the standard “station assembly” method, where the chassis remained in one place and the workers brought the various components to the chassis and built up the car, Sorensen decided that “assembly would be easier, simpler and faster if we moved the chassis along, beginning at one end of the plant with a frame and adding axles and wheels; then moving it past the stockroom, instead of moving the stockroom to the chassis.” Sorensen and a handful of helpers spent several Sundays in July laying out components in several configurations to see what would work best. Finally, they assembled their first car using a primitive moving assembly line: “We did this simply by putting the frame on skids, hitching a towrope to the front end and pulling the frame along until axles and wheels were put on. Then we rolled the chassis along in notches to prove what could be done.” Henry Ford encouraged this effort and witnessed the first demonstration, but did not incorporate the concept until after Ford Motor Company had moved to its Highland Park Plant, a more appropriate factory setting for the assembly line. By the summer of 1908, all of Henry Ford’s attention was on getting the new Model T Ford into production for the fall selling season.²⁹

Birthplace of the Model T Ford

In many respects, the Model T Ford was the result of Henry Ford’s desire to improve on the Model N Ford and to take full advantage of vanadium steel, which offered the potential of a lighter and stronger car. In January 1907, Henry Ford had a separate “experimental room,” measuring 12’ by 15’, enclosed at the northern end of the third floor of the Piquette Avenue factory. The partitions are no longer extant and there is little physical evidence of this room. There, draftsman Joseph Galamb set up blackboards and a drafting table to convert the design ideas of Henry Ford and his chief engineer Childe Harold Wills into blueprints. According to the recollections of old-time Ford employees, Henry Ford supervised the drafting operations from a rocking chair. Also known as “Joe Galamb’s secret room,” it was kept locked and was off-limits to all but a few Ford employees. The first design completed for the Model T was a new transmission, developed over several months. Once blackboard drawings or blueprints were completed, Ford moved a drill press, lathe, and milling machine into the “experimental room,” where machinist C. J. Smith turned drawings into parts. Components such as the transmission, flywheel magneto, and springs were tested on a Model N chassis.³⁰

²⁸ Nevins and Hill, *Ford*, 365, 371.

²⁹ *Ibid.*, 369; Charles E. Sorensen, *My Forty Years With Ford* (New York: W.W. Norton & Company, 1956), 116-119. Sorensen quotations are on 117.

³⁰ Nevins and Hill, *Ford*: 389-392; Boggess, “Birthplace of the Model T,” 20.

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Ford Motor Company distributed the first circulars describing the future Model T Ford to its dealers on 19 March 1908. Even though the Model T Touring Car would retail for \$850 and would not be available until October, the circular touched off a frenzy of orders from dealers. When introduced, the Model T was superior to cars selling for twice the price. The new model featured the extensive use of vanadium steel in gears, crankshafts, springs, and other parts subject to stress, an innovative flywheel magneto, a durable planetary transmission, and other features not found in competitive cars. (See Figure 8) The lightweight four cylinder engine, which developed 20 horsepower, featured a removable head, allowing easier access to the valves and cylinders. The Model T Ford was one of the first American automobiles to have the steering wheel and controls located on the left. This became the standard design within a few years. Ford Motor Company produced more than 15 million Model T Fords between 1908 and 1927, often accounting for more than half of American automobile production. (See Figure 9) Because of its critical role in popularizing automobile ownership in the 1910s and 1920s, the Model T Ford is the most significant automobile of the twentieth century.

In mid-September 1908, Wills announced plans to produce 25,000 Model T Fords the first year, but these plans were entirely unrealistic. On 1 May 1909, the Ford Motor Company stopped accepting orders for the Model T for two months because the firm was overwhelmed, despite working two shifts in all departments. The Ford Motor Company did not come close to building the 25,000 cars promised in September 1908, but managed to assemble 10,607 for the year ending 30 September 1909. The firm reported an average workforce of 2,190 for that time period, but this included employees at sales branches, which distributed cars and parts to the dealers. Ford claimed to employ an average of 1,655 for calendar year 1909 at its “home plant,” presumably the Piquette Avenue Plant. Production for the entire calendar year of 1909, the last year the Ford Motor Company was based at the Piquette Avenue Plant, was a remarkable 17,771 cars.³¹

Henry Ford replaced the Piquette Avenue Plant with a spacious manufacturing complex in Highland Park, Michigan, which he began to occupy in the fall of 1909. Final assembly of the Model T moved from the Piquette Avenue Plant to the Highland Park Plant in January 1910. At the Ford Highland Park Plant, a National Historic Landmark, Henry Ford introduced and perfected the moving assembly line for the manufacture and assembly of the Model T Ford. Model T production jumped dramatically from 20,277 units in 1910 to 585,388 in 1916, while the retail price of the Model T touring car fell from \$780 to \$360 over the same time span.³² The Highland Park plant was the principal assembly plant for the Model T Ford from 1910 until the passing of the Model T in 1927. The Highland Park Plant is also a notable early example of reinforced concrete building design resulting in the “daylight factory,” executed on a large scale by architect Albert Kahn. Unfortunately, more than one-third of the Highland Park Plant is no longer extant, demolished in the early 1960s. The original administration building, signature power house with its distinctive five smokestacks, a four-story reinforced concrete factory building featuring an enormous “Ford Motor Company” sign, two machine shops, two crane ways, and two loading docks are no longer standing.³³

Ford’s fourth manufacturing plant was the Ford River Rouge complex, begun in 1917, but primarily built in the 1920s and 1930s. At the Ford River Rouge plant, also a National Historic Landmark, Henry Ford achieved vertical integration in production. There, Ford manufactured almost all of the components for a complete automobile, including engines, transmissions, frames, bodies, tires, and glass. Henry Ford and Albert Kahn together introduced innovative factory architecture at the River Rouge Plant—sprawling single-story steel-framed buildings

³¹ Nevins and Hill, *Ford*, 387-388, 396-397, 402, 644, 648; “The American Car Since 1775,” 139.

³² Hounshell, *From the American System to Mass Production*, 224.

³³ Biggs, *The Rational Factory*, 99-104.

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encased in glass. The all-new 1928 Model A Ford was manufactured and assembled at the River Rouge plant starting in November 1927 and the plant served as Ford's principal manufacturing facility into the 1950s. It remains an important part of Ford Motor Company's operations to this day. Approximately half of the original Albert Kahn-designed signature buildings at the Ford Rouge Plant, including the Dearborn Assembly Building, glass plant, tire plant, powerhouse, and foundries, are no longer extant.³⁴

Production and Labor

Model T Ford production during the eighteen months it was manufactured at the Piquette Avenue Plant proceeded from the first floor up to the third. In addition to containing the Ford Motor Company business offices, the first floor housed the heavy metal-working machinery, including drill presses, planing machines, and lathes. Here, engine and other castings produced at independent foundries were finished in preparation for assembly. This work was then moved by elevator to the second floor, which contained assembly departments for engines, rear axles, and flywheel magnetos. All of the assembly work was completed at a fixed "station," usually a bench. The second floor also contained the drafting department and pattern shop. The components assembled on the second floor were then delivered by elevator to the third floor, where final chassis assembly took place. The final assembly operation also involved stationary assembly, where a team of workers would add engines, transmissions, axles, and wheels to Model T frames. Once completed, the chassis would then be delivered by elevator to the ground floor and pushed out into the yard to the west of the brick factory building, where the engine would be started for the first time. Finally, the chassis would receive a body supplied by one of several body companies serving Ford, probably in the building housing the "Chassis Room."³⁵

During the time that the Ford Motor Company was at the Piquette Avenue factory, from October 1904 through the end of 1909, the company evolved into a very large enterprise, in terms of machinery and workers. Ford employed an average of about 125 workers at the Mack Avenue plant in late 1903, but this force increased to about 300 by fall 1904, when Ford moved to Piquette Avenue. Estimates of employment then range widely from an average of 700 in 1906 to an average of 450 in 1908. There is a more precise figure for 1909, when Ford employed an average of 1,655 workers in Detroit. This was an exclusively-male work force, with one exception. Women assembled flywheel magnetos in the Winding and Insulating Department on the second floor, in an area entirely separated from the working men.³⁶

Employment fluctuated wildly based on demand, model changeover, and the seasons. Although "average" employment for 1908 was 450 workers, a detailed payroll list showed 609 working for Ford Motor Company in October 1908. Of these, 519 worked in manufacturing and 90 were salaried workers, including managers, engineers, salespeople, accountants, clerks, and other office staff. Only twelve foremen supervised the manufacturing work force, suggesting that most of the workers were skilled craftsmen who worked with a good deal of independence. Although Ford had achieved quantity production, he still depended on highly-skilled mechanics

³⁴ The only other automotive production facility designated as an NHL is Detroit's Lincoln Motor Company Plant. Following its recent demolition, however, it was formally recommended to the Secretary of the Interior for dedesignation in the Fall of 2004. At the same meeting of the National Park System Advisory Board, Indiana's Auburn Cord Duesenberg Automobile Facility was formally nominated for NHL designation, and was favorably recommended to the Secretary of the Interior.

³⁵ Boggess, "Birthplace of the Model T," 18.

³⁶ Nevins and Hill, *Ford*, 271, 648. Other than the photographic evidence of women assembling Model T Ford magnetos, there is no information on the origins of this practice. There was a general belief among automobile manufacturers that women performed better than men in "delicate" manufacturing where small parts were involved like the magnets that went into a magneto. They would also work for lower wages than men.

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to perform most of the manufacturing and assembly operations.³⁷

There is little published research on the labor history of the Ford Motor Company before it moved to Highland Park. Henry Ford personally opposed paying workers “by the piece” and always paid them a day rate. Ford workers initially worked a ten-hour day and six days a week at the Mack Avenue Plant and during the first year at the Piquette Avenue Plant. They worked a nine-hour day from 1905 until 1910, when the company reimposed the ten-hour day. Starting in March 1908, Ford ran a day shift and a night shift at the Piquette Avenue Plant and continued the practice during the rest of the company’s tenure at Piquette Avenue.³⁸

Henry Ford operated all of his plants on an “open shop basis,” i.e., with no recognition of labor unions, until 1941. This is not to suggest that there were no union members present in the plant. Charles Sorensen, Ford’s production manager at the Piquette plant, recalled one small labor disturbance. The men who painted the wheels for the Ford Model N, a skilled job that involved painting stripes on the spokes, demanded higher pay and went on strike to win their demands. Ford Motor Company solved the dispute and saved production costs by eliminating the striping.³⁹

Ford Motor Company was a member of a powerful association of Detroit manufacturers, the Employers’ Association of Detroit (E.A.D.), established in 1902 to prevent unionization of factories in the city. Using a combination of tactics, including blacklists and labor spies, the E.A.D. began an assault on organized labor in Detroit in 1903 and drove unions from most Detroit factories within three years. The Employers Association kept Detroit industry union-free until the 1930s. The Ford Motor Company became a member of this association shortly after opening the Piquette Avenue plant.⁴⁰

Henry Ford’s revolutionary vision of the organization of work, his increasingly repressive labor relations, and his explicit paternalism become evident after his move to his Highland Park plant in 1910 and continued there through the late 1920s. As Ford introduced the moving assembly line in 1910-1913, work in the plant was characterized by the extreme division of labor and the speeding up of production. Two results of Fordist production were extremely high rates of turnover and absenteeism among his workers. Ford introduced the revolutionary Five Dollar A Day Wage in January 1914 to counteract these costly trends. He also introduced two paternalistic elements into his relationship with labor—the Ford Sociological Department and the Ford English School. In order to qualify for the Five Dollar A Day Wage, Ford workers had to prove themselves “worthy” by undergoing an examination by Sociological Department investigators. Ford workers who were not U.S. citizens were required to attend the Ford English School and to apply for citizenship. Henry Ford abandoned his paternalistic programs at Highland Park by 1920, largely because of their costs.⁴¹

³⁷ Steve Babson, *Working Detroit: The Making of A Union Town* (Detroit: Wayne State University Press, 1986), 29 and Stephen Meyer III, *The Five Dollar Day: Labor Management and Social Control at the Ford Motor Company, 1908-1921* (Albany, NY: State University of New York Press, 1981), 47.

³⁸ Nevins and Hill, *Ford*, 375-377, 384.

³⁹ Sorensen, *My Forty Years With Ford*, 83-84.

⁴⁰ Thomas A. Klug, “Employers’ Strategies in the Detroit Labor Market, 1900-1929,” in Nelson Lichtenstein and Stephen Meyer, eds., *On the Line: Essays in the History of Auto Work* (Chicago: University of Illinois Press, 1989), 48-51 and Babson, *Working Detroit*, 20-21. For a detailed history of the E.A.D., see Klug, “The Roots of the Open Shop: Employers, Trade Unions, and Craft Labor Markets in Detroit, 1859-1907,” Ph.D. Dissertation, Wayne State University, 1993.

⁴¹ Ford’s labor relations and paternalistic practices at Highland Park are well-documented in Stephen Meyer III, *The Five Dollar Day: Labor Management and Social Control in the Ford Motor Company, 1908-1921* (Albany, NY: State University of New York Press, 1981); Clarence Hooker, *Life in the Shadows of the Crystal Palace: Ford Workers in the Model T Era* (Bowling Green, Ohio: Bowling Green State University Press, 1997); and David L. Lewis, *The Public Image of Henry Ford: An American Folk Hero and His Company* (Detroit: Wayne State University Press, 1976). Perhaps the most critical treatment of Henry Ford comes

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By any definition, the Model T was an enormous success in the market and with its success, the Ford Motor Company had outgrown the Piquette Avenue Plant. The overwhelming success of the Model T Ford in the automobile market and Ford's inability to satisfy demand at the same time forced and emboldened Henry Ford to take the next "giant step" and build an enormous new factory in nearby Highland Park. After moving to its Highland Park Plant in January 1910, the Ford Motor Company could rapidly expand the production of the Model T Ford and begin the slow process of developing the moving assembly line, which revolutionized automobile production and made possible the mass consumption of automobiles in the United States.

The Studebaker Period

The Ford Motor Company sold the Piquette Avenue property to the Studebaker Corporation in January 1911. Although it had been a major manufacturer of wagons and carriages in South Bend, Indiana since the 1850s, Studebaker was a latecomer to the automobile industry. It established itself in Detroit by an indirect route. The Wayne Automobile Company, founded in 1904, built a factory at the northwest corner of Piquette Avenue and Brush Street in 1906. It merged with the Northern Motor Car Company in 1908 to form the E-M-F Company. Three Detroit automotive pioneers—Barney Everitt, William Metzger, and Walter Flanders—launched E-M-F, thus the corporate name. E-M-F established a selling arrangement with Studebaker Brothers whereby the wagon company would sell E-M-F automobiles through its retail outlets. The two firms fought over the operation of their agreement from 1909 until 1911, when Studebaker acquired E-M-F outright and put its name on all the cars the following year. Already operating a large manufacturing complex along Piquette Avenue on the west side of Brush Street, Studebaker needed additional space for assembly operations, so buying the Ford Piquette Avenue property was a logical move.⁴²

Studebaker used the three-story Ford Piquette Avenue factory building for automobile assembly and identified it as Studebaker Plant No. 10. As part of its Detroit expansion program, Studebaker built an L-shaped four-story reinforced concrete Service Building along Piquette Avenue immediately west of the 1904 factory. Designed by Albert Kahn Associates and completed in 1920, the Studebaker Detroit Service Building was connected to the southwest corner of the Ford Piquette Avenue Plant at the second and third floors. A Sanborn fire insurance map from 1921 shows the new Service Building, with two substantial buildings that were standing in 1908 removed—the Chassis Room fronting on Piquette Avenue and the Metal Grinding Room located slightly to the north of the Chassis Room. All the remaining buildings shown in the 1908 Detroit Fire Department Inspection Report were still standing in 1921. As its wagon business declined and its automobile sales increased, Studebaker moved its automobile production from Detroit to South Bend starting in the early 1920s and vacated its Piquette Avenue Plant in 1926. Studebaker Plant No. 10 was later engaged in the production of one Studebaker model, the Erskine, from 1927 to 1929. Early in the Depression, in January 1930, Studebaker informed Mayor Frank Murphy that the City of Detroit could use these buildings as a Detroit Emergency Lodge, which would provide homeless men with a place to sleep and some meals. The Studebaker Lodge officially opened on 20 January 1930, but remained open only through 30 June, the victim of Detroit budget cuts.⁴³

from the muckraker Upton Sinclair, *The Flivver King: A Story of Ford-America* (Chicago: Charles H. Kerr Publishing Company, 1984 reprint of the original 1937 edition).

⁴² E-mail communication, Trent E. Boggess to the author, 11 September 2004; Yanik, *The E-M-F Company*, 8-9, 56-72, 118-121.

⁴³ Albert R. Erskine, *History of the Studebaker Corporation* (South Bend, IN: Studebaker Corporation, 1924), 83, 88; Sanborn Map and Publishing Company, *Insurance Maps of Detroit, Michigan*, vol. 3 (New York: Sanborn Map and Publishing Company, 1921), sheet 92; Thomas E. Bonsall, *More Than They Promised: The Studebaker Story* (Stanford, CA: Stanford University Press, 2000), 135-137, 178; and Sidney Fine, *Frank Murphy: The Detroit Years* (Ann Arbor: University of Michigan Press, 1975),

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Studebaker Plant No. 10 returned to production in December 1931, when it was used to assemble the Rockne, a Studebaker model which lasted only two years. The Studebaker Real Estate Corporation sold Plant No. 10 to the Minnesota Mining and Manufacturing Company in 1936. The Sanborn Insurance Company map of this area published in May 1938 identified the property owner as "Minnesota Mining & Manufacturing Co., Mfg. Non-Adhesive Paper Tape & Rubber Auto Parts," but shows only two buildings standing—the original 1904 factory and the 1920 reinforced concrete Service Building. Since no revisions to this particular map, dating from 1921, were made in May 1934 or earlier, the rest of the buildings were presumably razed sometime between May 1934 and May 1938, most likely in 1936 or 1937. The 3M Corporation ultimately sold the property in 1968 to Norman Shuveltz, who owned Cadillac Overall, a supplier of work clothes to the automobile industry. Heritage Investment Company then bought the Ford Piquette Avenue Plant in 1989, but not the adjoining 1920 Studebaker building. Since the early 1990s, General Linen & Uniform Service has occupied about three-quarters of the first floor of the building, while the remainder is vacant. The 1920 Studebaker building is currently owned by First Ford Properties, and is used to store medical records for Henry Ford Health Systems, formerly Henry Ford Hospital. The Model T Automotive Heritage Complex, Inc. (T-Plex), a non-profit organization established to preserve the building, bought the 1904 building from Heritage Investment Company in April 2000 and is the current owner.⁴⁴

Conclusion

The Ford Piquette Avenue Plant was not only the birthplace of the Model T Ford, but it was also the site where the Ford Motor Company experienced its painful, but successful adolescent growth and maturity into a large-scale automobile manufacturer. This success took place within the context of a rapidly-expanding and increasingly competitive American automobile industry. Between 1904 and the end of 1909, the time that the Ford Motor Company occupied the Piquette Avenue Plant, U.S. automobile production increased from 12,055 to 81,900 units, nearly a sevenfold increase over six years. Ford Motor Company was the fourth largest American automobile company in terms of production in 1904 and 1905. Ford's production accounted for 13 percent and 9 percent of the industry total respectively in those two years. Starting in 1906, Ford became the leading producer and maintained that position until the late 1920s. With the Model N Ford enjoying enormous sales success, Ford Motor Company accounted for 31 percent of U.S. production in 1906 and 36 percent in 1907. Its share of industry production actually fell in 1908 and 1909 to 22 percent in both years despite greater production because the rest of the industry was expanding even faster. Ford Motor Company could have produced many more cars in 1908-1909, but was limited by the size and layout of the Piquette Avenue Plant. Fortunately, this important building has survived and will help illustrate this critical phase in the emergence of the U.S. automobile industry.⁴⁵

273-278.

⁴⁴ Thomas E. Bonsall, *More Than They Promised*, 159-161, 167; Henry Ford Heritage Association and Model T Automotive Heritage Complex, Inc., *Piquette Plant Preservation Project, Detroit, Michigan: Historic Structure Report/Master Plan*, November 1999; and Sanborn Map and Publishing Company, *Insurance Maps of Detroit, Michigan*, vol. 3 (New York: Sanborn Map and Publishing Company, 1921-1961), sheet 92. According to an e-mail communication, Trent E. Boggess to the author, 11 September 2004, the Ford Motor Company photographed the Piquette Avenue Plant, including the Skinner engine and Triumph dynamo, in 1936 and the powerhouse was still standing at that time, suggesting that these outbuildings were razed in 1936 or 1937.

⁴⁵ "The American Car Since 1775," *The Automobile Quarterly* (1971): 138-139.

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Previous documentation on file (NPS):

Preliminary Determination of Individual Listing (36 CFR 67) has been requested.

Previously Listed in the National Register.

Previously Determined Eligible by the National Register.

Designated a National Historic Landmark.

Recorded by Historic American Buildings Survey: #

Recorded by Historic American Engineering Record: # HAER-MI-347

Primary Location of Additional Data:

State Historic Preservation Office

Other State Agency

Federal Agency

Local Government

University

Other (Specify Repository):

10. GEOGRAPHICAL DATA

Acreeage of Property: Approximately 1.2 acres

UTM References: **Zone Easting Northing**

17 329900 4692600

Verbal Boundary Description: The portion of the nominated boundary pertaining to the original 1904 Ford plant is shown on the accompanying map (see Figure 4) identified as parcel 2 of lot 4 of Emily Campau's Subdivision of Fractional Part of Section 31 (Liber 3/ Page 64 of Plats). The additional portion of the nominated boundary pertaining to the 1920 Studebaker Building begins at the southwest corner of the Ford building, and continues along the building line 251' to the west, where the boundary turns 195' to the north along the building line, then turns 100' to the east following the building line, then turns to the south 120' along the building line, and then runs 151' to the east until intersecting with the west facade of the Ford Plant, 75' north of the southwest corner of the 1904 plant.

Boundary Justification: The boundary is defined by the perimeter of the building known as the Ford Piquette Avenue Plant, as built in 1904 at 411 Piquette Avenue, as well as the perimeter of the noncontributing "addition" built by the Studebaker Corporation in 1920. Although the 1920 building postdates the Ford plant's period of national significance, it must be treated as an "addition" for the purposes of this nomination because it is not only attached to the earlier building, but was built with internal connections between the two buildings.

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February 17, 2006