

Sullivan Machinery Company
Main Street
Claremont, New Hampshire
Sullivan County

HAER No. NH-4

HAER
NH
10-CLAR
7-

WRITTEN HISTORICAL AND DESCRIPTIVE DATA
PHOTOGRAPHS

Historic American Engineering Record
National Park Service
Department of the Interior
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HISTORIC AMERICAN ENGINEERING RECORD

SULLIVAN MACHINERY COMPANY
HAER NO. NH-4

Date: Various dates between 1888 and 1927

Location: Both sides of the Sugar River between Pearl and Mill Streets.

Designed by: The Forge Shop, Machine & Erecting Shops constructed before 1905 were designed by Hira R. Beckwith, buildings constructed after 1905, by Arthur S. Coffin.

Owner: Buildings are owned by a variety of public and private concerns.

Significance: The complex of buildings was built between 1888 and 1927 by the Sullivan Machinery Company, manufacturers of mining and quarrying equipment. The firm had been founded in 1888 by J.P. Upham, Albert Ball, and Roger Love, to manufacture diamond drills (invented by Ball) and other quarrying machinery, water wheels, and mill fittings.

The complex consists of five primary buildings; a Forge Shop, three Machine and Erecting Shops, and a Foundry Complex. All buildings are of brick, and vary from one to seven stories in height. Most of the buildings feature arched windows with wooden sashes, pilasters, and corbelled cornices. In addition, several have sawtooth roofs. The complex spans the Sugar River, and was connected by two bridges.

Researchers are referred to a 1978 HCRS study (U.S. Department of the Interior, Heritage Conservation and Recreation Service. Rehabilitation: Claremont 1978; Planning for Adaptive Use and Energy Conservation in an Historic Mill Village. Washington, D.C., 1978.) for rehabilitation proposals.

Transmitted by: Monica E. Hawley, Historian, 1984.

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Addendum to

Sullivan Machinery Company
(Claremont Rehabilitation Project)

HAER No. NH-4

Data pages are addendum to one page of date previously transmitted to the Library of Congress

Location: Main Street between Pearl and Water Streets on south side of Sugar River and south side of North Street between Spring and Hanover Streets on north side of Sugar River
Claremont, Sullivan County, New Hampshire

Date of Construction: 1888-1927

Present Owner: Forge Shop (Site 11): Nicholas Marro
37 Main Street
Claremont, New Hampshire

Machine & Erecting Shops: City of Claremont
(Site 12) City Hall
Claremont, New Hampshire

Machine & Erecting Shop

Rubber Mill/Chain Machine Building

Power Plant

Foundry and Pattern House: Joy Manufacturing
(Sites 12A, 13, 16, 17) River Road
Claremont, New Hampshire

Machine Shop Bourdon, Inc.
(Site 12B) Main Street
Claremont, New Hampshire

Warehouse No. 34: Sugar River Mills Housing
(Site 14) Heritage Drive
Claremont, New Hampshire

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Present Use: Site 11: storage for plumbing supplies
 Site 12: vacant burned out shell
 Site 12A: vacant
 Site 12B: bedding manufacturing and fabric sales
 Site 13: vacant
 Site 14: elderly housing project
 Site 16: not in use
 Site 17: pattern shop in limited use; remainder
 vacant

Significance: The Sullivan Machinery Company originated in the machine works of J. P. Upham and the inventive mind of Albert Ball. Upham and Ball formed the company in 1868 and, soon after, Sullivan produced the first diamond channeling machine. Typical of many American firms which furnish equipment for the mining industry, Sullivan also supplied construction and related industries. Throughout the last half of the 19th century, however, Sullivan continued to introduce new forms of equipment to mining and quarrying firms. Among these innovations were diamond core drills and coal cutters, which increased the productivity of mines all over the world and revolutionized the production of coal fuel.

On this site, in buildings gone and in those remaining, the Sullivan Machinery Company grew from a small, typically diversified nineteenth century machine works to one of the foremost manufacturers of mining equipment. Pioneering the diamond core drill and a line of coal cutters, Sullivan's machines increased the productivity of mines all over the world and revolutionized the production of coal fuel. The inventive mind of Albert Ball, mechanical engineer for Sullivan for nearly fifty years, lay behind many of these innovations. The key to understanding the history of the Sullivan Machinery Company lies in the products which it developed and in its impact, as the largest industrial employer, on the city of Claremont.

Project Information: The Sullivan Machinery Company has been extensively damaged by fire. The city of Claremont has received a Housing and Urban Development Community Development Block Grant for its redevelopment.

Historian: Ann L. Henderson, August 1978

HISTORICAL INFORMATION:

After graduation from Dartmouth College, James Phineas Upham (1827-1895) returned in 1851 to his hometown, Claremont, New Hampshire. A small town on the Sugar River, Claremont had not yet grown to be a center for industry. To the west and east, only a few small companies, a grist mill, woolen mill and paper company, lined the river's edge. Monadnock Mills, a textile firm, had just recently begun operation and was already the town's largest employer.

Upham organized a machine company in his bookkeeper's name, D.A. Clay & Company¹ and rented space in George Emerson's two story brick shop. Soon after, Upham purchased both Emerson's machine works and foundry.² Although the firm manufactured a diversified line of machine tools, it quickly began to specialize in the production of Tyler turbine water wheels, invented by a Claremont resident, John Tyler.³ D.A. Clay's Tyler turbine water wheels were awarded the "highest premium" at the Crystal Palace in New York City.⁴ The company manufactured over three thousand of these wheels; these wheels powered most of the industries of Claremont in the nineteenth century.

During the Civil War, the Upham works made gun manufacturing machinery for a nearby Vermont firm,⁶ and received some type of government contract, possibly for field and siege cannons.⁷ It was not, however, until Upham's mother died, leaving him a considerable fortune,⁸ that the firm had the resources to invest in the inventions of a mechanical engineer, Albert Ball.

Diamond Channelers:

In 1863, Albert Ball (1835-1927) was invited to come to work for E.G. Lamson, a manufacturer of various types of machinery, located in Windsor, Vermont. While in Lamson's shop, Ball obtained several patents for perfecting the repeating rifle and for an engine lathe to turn a sewing machine needle; Ball would receive more than one hundred and thirty patents in his lifetime.⁹ During a train trip, Lamson chanced to meet George Wardwell, the inventor of the stone channeler. Lamson had almost persuaded the inventor to allow him to manufacture his channeler when Wardwell abruptly decided in favor of an old friend. Angered by this decision, Lamson ordered Ball to invent a channeler.¹⁰ Protesting that his channeler would be too close to the patent rights of Wardwell, Ball nevertheless drew up the plans.¹¹ After producing forty channelers, Lamson was served with an injunction against any future sale, pending the outcome of a suit for patent infringement. The legal battle lasted for six years; Wardwell's patent was finally declared to be of a basic nature and the injunction was made permanent.¹²

While on another trip, Lamson met a Reverend Love who had \$40,000 to invest. Lamson convinced Love to invest in his firm, and Love sent his son, Roger, to Vermont to oversee his investment.¹³ Roger Love saw the stone channeler rendered useless by the injunction battle. Although not a mechanic, he conceived of the idea of channeling stone by boring intersecting holes with diamond drills, operating in gangs. After hours, Ball drew up Love's idea and was subsequently fired by Lamson.¹⁴

In May, 1868, Roger Love and Albert Ball drove to Claremont looking for J.P. Upham, who they knew had a foundry and machine shop in the city.¹⁵ Ball and Love brought with them a sketch for a diamond channeling machine.¹⁶ The Sullivan Machine Company was organized quickly on the basis of Upham's property, worth \$75,000 and Ball's patents, which were valued at \$75,000.¹⁷

By August, 1868, work was completed on the diamond channeling machine.¹⁸ The drills of the channeling machine could bore a series of six holes several feet deep in solid rock, forming a continuous channel; a deposit could then be extracted for sampling without blasting or hand cutting. They were used to line drill and undercut large blocks of building stone so that they could be broken out evenly. Earlier channelers had six spindles with a variable speed core drill, moveable on a truck with a gauging device to space the holes. These cores had caused problems, breaking and jamming in the rods. Ball substituted an obtuse angle, conical solid head with holes for the escape of water to clear away debris.¹⁹ These stem-driven channelers could be sunk into marble at the rate of eight to ten inches per minute when run at the usual speed of eight hundred to one thousand revolutions. The wear on the diamond was very small unless flint or quartz was struck. In September of 1868, Sullivan channelers were sent to the quarries of the Sunderland Falls Marble Company in Procter, Vermont.²⁰ Very few channelers were made with six drill spindles; the number was gradually reduced to two.²¹ The following year, Sullivan Machine Company built the first gadder, a single spindle vertical rotary drill, the forerunner of today's core drill.²² The drill was used for drilling shallow holes beneath a marble block to split it from its bed.²³

By 1870, the Sullivan Machine Company was employing fifty men. A local newspaper described the company as "up to their eyes" in work.²⁴ In addition to their quarrying machines, Sullivan was also manufacturing shafting, mill fillings, castings, water wheels and water wheel regulators.²⁵ Contract work for Vermont quarries was undertaken, and for a time, red sandstone at Portland, Connecticut.²⁶ Power for the foundry and machine shop came from two Tyler turbine water wheels, generating 58 H.P.

Sullivan did sell some of their diamond drills, but the demand for the drill did not come up to their expectations. They extended their stock by \$50,000, selling it to William Elliot of Keene, a personal friend of Upham's and President of Cheshire Bank, for a ten percent first margin of the business.²⁷ With some of this money, they erected a new building to the west of their foundry and machine shop. The new wood building was 90' by 40', two stores high. It was probably used for pattern storage.²⁸

Diamond Drills:

Ball turned to prospecting equipment in the late 1870's. The original idea of a diamond prospecting drill had come from France in the 1850's, but it had never been perfected. In 1869, the first diamond drill was brought from France to Bonne Terre, Missouri, and although not terribly efficient, it generated great interest in the mining industry.²⁹ Diamond prospecting drills built in the United States operated on the screw feed principle, which meant that the diamond studded bit drilled into rock at a rate in direct proportion

to the rotation of the bit. Ball's innovation was to use an hydraulic feed, independent of the rotation to give drillers more speed, accuracy and economy of diamond wear.³⁰

The drill which was perfected by 1882, had five inch cylinders with six inch stroke. The water cylinder contained water at both ends of the piston, the feed regulated by the discharge of water from the lower end. The pressure in drilling was on the top of the piston, and below it when the power was reversed. The feed could be regulated by a lever on the water cylinder. Another lever on the top of the water cylinder reversed the power, converting it to a hydraulic jack. A water pressure guage on the cylinder told the miner how much power was on the machine. The drill had all replaceable parts. The rod couplings had only three coarse threads to the inch, requiring six turns to assemble and to take apart. The core barrel was very heavy and had three straight groves for washing. Two patterns of bit were used at first, one hollow core, the other with solid head for bringing up badly broken formations.³¹ The drill was used expecially in the development of mineral lands for coal, but also for gas, oil, water and salt explorations. The drill bore a smooth straight hole to four thousand feet in depth, bringing up a solid core of every stratum which was passed through.³² Sullivan's core drill was awarded a silver medal at the Cincinnati Exposition.³³

In 1875, Roger Love sold his interest in the company to a Boston man, Charles B. Rice. Although Love was carried as a director for a few years, his influence on the firm was effectively over. In his place, Sullivan had acquired a young man with sound financial instincts. Rice, who was to become treasurer of the company, reduced wages in the 1870's and attempted to run the company more economically.³⁴ Sometime between 1873 and 1875, Ball invented and constructed machinery for the making of the Essex Cop Tube, employed in saving cotton waste. For a short time, the manufacture and sale of this line kept the firm solvent.³⁵ Possibly to meet the demand for the machinery for the Essex cop tube, Sullivan enlarged their machine shop with a two story addition on the western end. They also opened a branch office in Rutland, Vermont to service their machines used on contract work.³⁶

Rock Drills/Cop Tubes:

Throughout the 1880's, Sullivan, relying on Ball's patents, specialized to a greater degree on mining equipment. Ball obtained numerous patents in this period; a machine to mold and press artificial paving blocks and tile³⁷ and a pulp machine (1883)³⁸; a shifting drilling machine (1884);³⁹ a core breaker and lifter for annular rock drills (1885).⁴⁰ Ball produced in 1885 Sullivan's first steam-driven, stationary air compressor. Although the air compressor was not developed for itself at this time, it served as the power basis for Ball's 1889 reciprocating pneumatic rock drill.⁴¹ Rock drills represented a different method of prospecting than core drills. Instead of bringing a core to the surface, a rock drill brought up a fine dust. A hole was made and the chips were washed out with air or water. Dynamite was then inserted in the hole.

By the late 1880's, Sullivan Machine Company was on a sound financial basis, largely through the efforts of Charles Rice. The company was able, for the first time, to pay dividends on both their classes of stock.⁴² The company's plant was now inadequate for their volume of business. In 1884, the company's buildings spread over four or five acres, fronting on Main Street, sloping down to the Sugar River. Approaching the complex from the west, the first building was a two story wooden frame pattern shop/cop shop, followed by a small one story wooden frame office/boiler house. A large two and three story wooden "L" building lay eastward, which was used as a machine shop/blacksmith shop; it was here that diamonds were set in the drills. The foundry bounded the complex on the east. Two low story wooden pattern houses and a wheel/pump house were situated behind the main complex on the river's edge.⁴³

Beginning in 1888, the company embarked on an ambitious building campaign. At an expense of fifteen to twenty thousand dollars,⁴⁴ Sullivan erected a large brick structure on Main Street, which turned toward the river to form a "u" shape.⁴⁵ The earlier office building, machine shop and pattern shop/cop shop were razed for this building. In order to maintain proximity to the wheel house, situated on the head race coming off Dam #3, the new machine shop was located both on Main Street and in the "u" shaped wing. The castings which were made in the foundry to the east were easily transported for finishing to the machine shop. Bisecting the eighteen bay Main Street frontage was a cupola topped port cochere; the windows in this two story section were decorated with striped awnings. A three story bay window office was located to the west of the machine shop on Main Street, followed by the old two story wooden frame wood-working paper can roving machinery wing.⁴⁶ A new brick one story lumber house, which had a steam boiler for heat, formed the west end of this new complex.⁴⁷ Electric lights were introduced to some of the buildings. This large complex as well as two double tenement houses Sullivan built on North Street in 1889 were contracted and designed by a local man, Hira R. Beckwith.⁴⁸

Sullivan had always done some business in textile machinery; in the new complex, however, an entire wing was designed for the paper can machinery operations. Ball had patented two inventions in the late 1880's for the manufacture of cotton goods; a paper roving can and a flexible woven cop tube. The cop tube was introduced at a time when cotton was very expensive. The flexible woven cop tube was more economical to use than ordinary tin or paper and prevented waste. As the price of cotton fell during the century, this type of manufacturing became less important to Sullivan. The roving cans were made of 10 layers of strong manilla, heavily calendered.⁴⁹ Additionally, Sullivan continued to produce a small line of corn crackers and small machines for milling purposes.⁵⁰

Ball's inventions at the end of the 1880's tremendously increased mining productivity in the U.S. and through Sullivan's international branches, in many parts of the world. In 1889, he introduced the first electric-driven diamond core drill.⁵¹ In the same year, he produced a chain breast cutter which had a cutter bar, much like a chain saw in principle, about 44' wide, that could be forced into the bottom of a coal seam. After a cut had been made, the machine was moved across the face and another cut was made.⁵²

Attacking one of the worst jobs in mining, undercutting, Ball engineered the direct-acting, air-driven coal pick machine, or board puncher. Undercutting the coal face was necessary so that the coal could be blast down without disturbing the roof. This slot under the coal was cut by a miner using a hand pick, lying on his side, often on a wet mine floor. Ball's solution was a pick machine or board puncher, a compressed air-powered version of a star drill. Mounted on a sloping board which kept the pressure of the cutting bit against the coal, the puncher used a slow hammering action to chip away at the coal at the bottom of the face. After one area had been chipped away, the machine was moved to the next area.⁵³

Two years later, in 1891, Ball introduced the first coal cutter capable of making a continuous undercut across the face, called a longwall cutter machine. In 1894, he invented the shortwall cutter. When at the mining face, this machine skidded off a truck and into position through the take up of a cable by an internal hoisting drum; this system was used to maneuver the machine up to the face as it made a continuous cut.⁵⁴ Much of the heavy labor of cutting the so called kerf under the coal was eliminated.⁵⁵

A year after the first Sullivan diamond drills were sent to Lake Superior Iron Range, two drills were sent to a coal mining company in Iowa. The president of the company, Frederick Copeland, was so impressed with Sullivan's machinery, that he organized a small firm to operate drills on contract. Copeland's firm, Diamond Prospecting Company, merged in 1892 with Sullivan.⁵⁶ April, 1892 Sullivan Machinery Company was incorporated in the state of New Hampshire, succeeding Sullivan Machine Company.⁵⁷ Frederick Copeland was elected president, a position he held until his death in 1928.

The Claremont works remained the main complex, although the new company was headquartered in Chicago. One hundred and twenty-five men were now employed in Claremont on a payroll of four to five thousand dollars per month.⁵⁸ Sullivan's plant had been enlarged with an addition to the lumber house and another large foundry. A newly built pattern house lay north of the lumber house near the river. The machine shop had also grown three stories on its north end (1899) and had a northern (1892) addition. Sullivan now had a forge shop, indicating that perhaps the company did some machine repair work for the textile, paper and other industries of Claremont.⁵⁹

Air Compressors:

The company's business slacked off somewhat in the 1890's. The machine shop ran on reduced hours⁶⁰ and the annual report of 1897 admitted it had been the "most disastrous year in the history of the company". Diamond drills and channeling machines, which had been the staples of Sullivan in the 1880's did not sell well. Throughout the period, the company chose to invest much of their money on new lines of production, such as rock drills and coal mining machines (shortwall and longwall cutters).⁶¹ By 1900, Sullivan was manufacturing hoists and fans for mines, as well as a line of hand-held drills for the construction industry.⁶²

In 1901, Sullivan bought Bullock Manufacturing Company in Chicago, their principal competitor in diamond drills, Bullock also made heavy hoisting and hauling machines, ventilating fans and Corliss engines.⁶³ Employing two hundred and forty men in Claremont, the company devoted much of its energy to developing a line of cross-compound and two stage air compressors. Previously, Sullivan had purchased compressors in the open market which was expensive and undependable. It also placed the firm at a disadvantage with competitors who manufactured their own.⁶⁴ Although the drawings for the compressors were made in 1899 and patterns finished for two sizes, it took until July, 1901 to complete the first compressor. The line proved immediately rewarding; the compressors were sold as quickly as they were made.

Embarking on a building program at the turn of the century, Sullivan again turned to Hira Beckwith, the city's most successful architect/contractor. The water power canal and water wheels were improved. A power plant (1900-1903), consisting of two 125 H.P. boilers and one 125 H.P. high speed engine, was constructed and connected to Holyoke-Jolly twin horizontal turbines so that the engine could be used as a supplement. An electric lighting dynamo was installed furnishing light for all rooms and power for the electric cranes in the shop and foundry.⁶⁶ Additions were made to the main building; a two story addition to an iron warehouse and a room for iron storage, cutting off machines and wood-working machinery. The three bay window office section of the 188 Main Street building and the port cochere were extensively remodeled. Capital stock was increased by \$100,000 to raise money to build and equip a new machine shop to manufacture air compressors.⁶⁷ An erecting shop with a 15 Ton electric travelling crane was added to the east end of the complex (1900).⁶⁸ The foundry was greatly enlarged, a new forge shop erected on the south side of Main Street,⁶⁹ a four story brick pattern house and six story supply store house were constructed between 1899 and 1902.⁷⁰

By 1903, the largest year in company history, Sullivan realized that its business had reached its limits within the existing plant. New construction began first on the south side of the river. The company, feeling the local contractor, probably Hira Beckwith, had mismanaged the work, asked that the company secretary, Tom Officer, in charge of the Claremont works, personally supervise construction.⁷¹ Chicago architect, Arthur S. Coffin, was hired to design the buildings. To the west of the office on Main Street, the two story wooden frame pattern-making and wood shop was built on the river's edge (1905).⁷² The forge shop on the south side of Main Street was enlarged in the rear (1907).⁷³ Concluding the largest real estate deal in the history of Claremont, Sullivan bought a large tract of land on the north side of the Sugar River; the tract had four hundred feet of footage on the street and backed to the river.⁷⁴ A mammoth new foundry and pattern shop were designed in 1906 for this tract; construction began in 1907 and was completed in 1909. Previously, the company had been forced to contract for some castings, which had proven too costly and slow.⁷⁵ A 160 foot span, Baltimore Petit with sub-tied steel bridge was erecting in 1905 to connect the buildings on the north and south sides of the river. The bridge, constructed by the American Bridge Company, was large and strong enough to carry a team of horses.⁷⁶

Despite some unsatisfactory business years between 1905 and 1915, Sullivan did not reduce its expansion of the Claremont plant or cut back in the engineering/drafting department. In 1910, a seventh floor was added to a part of the warehouse; this new story housed the offices.⁷⁷ The port cochere was removed from the Main Street facade of the 1888 building.⁷⁸ After tearing down some small structures adjacent to their forge shop,⁷⁹ Sullivan built a large addition, increasing the forge shop's size by two hundred percent. A tunnel was constructed under Main Street, connecting the forge shop with the erecting shop.⁸⁰ Hand trucks (later electric trucks) were used to transport parts from the machine shop.⁸¹ The property of Maynard Shoe Company, lying adjunct and to the west of Sullivan on the south side of the river, was purchased by Sullivan in 1912.⁹² The sale included an interest in Maynard's dams which strengthened Sullivan's water power.⁸³ A large warehouse was located in the old saw mill's yard on River Street.⁸⁴ Around 1910, the Sullivan plant converted from water power to water power boosted by steam turbines. Electric lights were run off the hydro power. Voltage regulators or reactors were in the basement of the machine shop. They isolated out any voltage surge from the main circuit. At the end of 1913, a large brick four story addition connected to the brick machine shop fronting on Main Street and sloping westward down Main Street was ready for occupancy. This addition was to be used primarily for the manufacturing department; the building was planned so that the production of the plant could be largely increased by the addition from time to time of new tools.⁸⁵

From 1905 and 1913, Sullivan Machinery Company was incorporated in the state of Maine,⁸⁶ in 1913 it became a Massachusetts corporation to "make use of the state's liberal laws toward corporations."⁸⁷ The beginning of the war brought changes for Sullivan. It cut deeply, of course, into the company's foreign business; Sullivan had 15 foreign branches at this time, spread from Tien Tsin China to Petrograd, Russia to the Andes. The contract drilling department was nearly shut down because new development of mineral property was one area that mining companies could curtail.⁸⁹ Sullivan decided not to undertake any munition work despite profit possibilities; the management decided it would be disadvantageous to have the plant and equipment tied up in such specialized equipment.⁹¹ The machine shop went on a five day week⁹² because of the scarcity of labor, slow deliveries and reduced orders.⁹³ Albert Ball went into semi-retirement about the time of the war. Although he continued to occasionally visit the drafting/engineering department, his former work was divided among four men: Morris Homes, who designed coal cutters (succeeded by Joe Joy); William Hoidsworth,⁹⁴ air compressors; George Gilman, drills, and Harry H. Mercer, channelers.

Cutters

After the war, a large (91' x 4½') steel sign topped the 1888 Main Street building of Sullivan Machinery Company.⁹⁵ Sullivan increased their capital by five and half million and again expanded their plant. Arthur S. Coffin was the architect for all new buildings and additions. A four story extension of the machine shop begun in 1913 was finished in September of 1917;

this extension was to enable the company to increase the turret and automatic machine department.⁹⁶ In 1918, a new power plant was built on the north side of the Sugar River across from the old Maynard factory. A penstock on concrete pillars was constructed on the river's north bank, bringing water off Dam #3 to the new plant. The plant was filled with five boilers, 300, 280, 80, 150 and 150 h.p., two engines with a combined force power of 500 and a Corliss compressor of their own manufacture. Extensive coal pockets were located just north of the power house. The plant was reached by trolley; cars ran over the coal pockets and dumped coal; carried by cranes to the engine room to the south. The chimney, built by Heine Chimney Company of Chicago, had the name Sullivan on the stack.⁹⁷ A covered foot bridge was erected to carry workers from the power plant to the Chain Machine Building.⁹⁷ A fourth story, used as an extension of offices, was added to the 1888 Main Street plant in 1919.⁹⁸ A large erecting wing built along the river adjacent to the river fronted machine shop. An increase in export business and a demand for heavy tools outside the mining field after the war necessitated this addition.⁹⁹

Because of geographical location and limited rail access, Sullivan decided in 1922 that the Claremont plant could not be further developed. They preferred to move nearer to their market for raw materials and nearer to the territory in which their products were distributed. The Chicago plant was also dismissed for further growth because of limited space. Sullivan purchased 1200 acres in Michigan City, Indiana, and moved their Chicago plant and offices there.¹⁰⁰ With the move to Michigan City, the Claremont plant concentrated on producing air compressors, coal cutters, hammer drills and hoists.¹⁰¹

These postwar additions effectively ended all alterations and additions to the Claremont plant.¹⁰³ The process for manufacturing at Sullivan in the 1920's was basically as it had been in the nineteenth century although the buildings were new. Beginning in the pattern shop on the north side of the river, patterns were made of wood, and occasionally for big usage parts, of metal. A mold was made of sand, using the patterns. Castings were then poured into the adjacent foundry. Removing the castings from the molds, they were cleaned in the scratch room. The castings were then taken across the river on the bridge to the machine shops for turning, grinding, or cutting. Parts which were hand-forged from bar stock were manufactured in the forge shop on the south side of Main Street. These parts were transported by hand truck (c. 1925 by electric truck) through a tunnel underneath Main Street to the machine shops.¹⁰⁴ The parts were then assembled in the erecting area--the eastern wing of the 1888 Main Street building, the western section of the river fronted machine shop or the top floor of the 1888 Main Street building. Depending on the size of the equipment, the products were shipped from the 1888 Main Street building, or directly from the erecting shops; these areas had loading docks and trolley tracks running into the buildings. The trolley took the finished goods to the Claremont depot or to Claremont Junction for shipment on the railroad.¹⁰⁵

In the 1920's, the seven floors of the pattern storage house on the north side of the river housed all the patterns. The wood shop had boilers in the basement and a wood shop for making boxes on the second; pattern-making was done on the third. Wood was aged in an adjacent building as patterns cannot be made of green wood. In the foundry, castings of iron and steel were done on the ground floor. The scratch room which cleaned the castings was on the river bank.¹⁰⁶ A core room, which made small cores for molds, and a brass foundry lay nearest North Street.

The castings were then transported to the south side of the river. The forge shop housed a chemical laboratory in the northern section of the second floor, and a heat treatment shop on the ground level in the rear of the building.¹⁰⁷ Approximately twenty-five blacksmiths were employed here, making tool steel cutters and forged parts for the company's machines.¹⁰⁸

The 1888 Main Street building contained a shipping department on the first floors. There was some wood working machinery within the shipping room for making boxes. In the erecting wing on the east, there were two loading platforms, one for trucks, one for trolleys. In the erecting shop, channelers and coal cutters were assembled, utilizing the building's full height. The northern machine shop of the building was equipped with engine lathes and drills on all three floors. A boiler house with a stack was located on a level below the street on the river's edge. On the top floor of the 1888 Main Street building were the offices. The accounting department used the space fronting Main Street. The engineering department, employing thirty or forty engineers, and the managerial offices occupied the area over six floors of the warehouse.¹⁰⁹ Between 1904 and 1916, Frederick Copeland added a rectangular cantilevered wooden frame bay to his office on the river, giving him an unobstructed view of the entire Sullivan complex and Mount Ascutney. The room just east of this office was Copeland's bedroom.¹¹⁰

The building to the west of the office section was a machine shop. On the street level, gear cutters made gears for all the machines; the top floor contained a tool room (previously the drawing room), which produced jigs and fixtures. The two western most machine shops were fitted with automatic lathes. A wide elevator on each floor brought up bar stock, brass and steel, in round, hex and square forms from the basement. In the machine shop/erecting shop on the river, coal cutters, air compressors, stationary and portable, and later drilling rigs, were assembled. The former Rubber Mill of Maynard Shoe Company was used for storage.¹¹¹ The warehouse on River Street was used for storage of machine parts; the ground floor became the welding department in the 1930's when electricity welded cars replaced the earlier riveted ones.¹¹²

Streamlining the Production Line:

As befitted a company with an international and national market, Sullivan began after the war to recruit new board members. These men were in banking or related fields, but they did not replace the relatives of long-time officers of the company, such as John Elliot, J.O. Upham and Preston Upham and Lowell Copeland.¹¹³ Frederick Copeland died in 1928 and after two presidents who served short terms, was succeeded in 1938 by his son, Frederick Copeland, Jr.¹¹⁴ The secretary of the corporation, Tom Officer, remained in charge of the Claremont works from at least as early as 1895 through 1929.¹¹⁵ Sullivan, under Officer's supervision, employed 1,200 men in Claremont and was the largest employer in the city¹¹⁶ as well as the largest machine company in the state.¹¹⁷

The depression effected the coal mining industry, and therefore Sullivan, earlier than many in other areas of the economy. As early as 1924, Sullivan reported an "unusual" depression in the industry.¹¹⁸ By 1930, the purchase of equipment which Sullivan manufactured had almost come to a halt.¹¹⁹ The machine shops in Claremont were operating only half time in 1932¹²⁰ and continued on this basis throughout the 1930's. When Copeland, Jr. assumed the presidency, he decided that Sullivan needed revitalization. The company, he felt, had too many partially developed products, and he moved to narrow the line of products Sullivan sold. As the channeling method of mining was no longer widely used, channelers, steam-driven and electric, were no longer manufactured in Claremont. Portable air compressors, and the air component part were made in Claremont until just after the war. Claremont came to concentrate their production line on core drills, drilling rigs, hammer drills, hoists and picks.¹²² The headquarters of the firm were transferred to Michigan City, Indiana.

The advent of war aided Copeland's plans. With foreign sales decreasing, Sullivan became a sub-contractor to the Army, Navy and other federal purchasing agencies. Many of their products, such as air compressors, hammer drills and hoists, were used in arsenals, battleships, fortifications and construction work.¹²³ When the war actually broke out, Sullivan compressors were rushed to Pearl Harbor and the Burma Road. Ten per cent of the work of the Claremont plant was government subcontracting for various tool machine manufacture.¹²⁴ Some non-standard items were produced especially for the armed forces - propeller hubs in Michigan City and bomb hoists in Claremont, however, the majority of Sullivan's production remained mining machinery.¹²⁵

Near the close of the war, Sullivan announced that it was about to release for sale the first rubber-tired coal-cutting machine, designed specifically for "trackless mining".¹²⁶ In November of 1916, Joe Joy, a young coal miner, had devised and received a patent for a high production coal-loading machine. It was a machine with crab-like loading arms. Although he originally tried to produce the machine for Pittsburgh Coal, he eventually organized his own firm, Joy Manufacturing Company. The first commercial model was built in 1922, a crawler-mounted unit with crab arms which scooped up the coal onto a conveyor to carry it to waiting mine cars. The same principle is used today by all manufacturers of underground coal loaders. Joy's loaders did not need track at the face, but track had to be laid up to the face to haul away coal. Joy engineers then invented a shuttle car, battery-powered, which used the entire floor of the car as a chain conveyor to move coal off one end. This spelled the end of laying track in any part of a mining operation, and made the work more flexible. In 1925, Joe Joy sold his interest in the company which was then incorporated as Joy Machine Company. He later founded Joy Brothers Company, a firm concerned with the development of coal saws. Joy Brothers was purchased by Sullivan in 1934.¹²⁷ Joe Joy came to Claremont for a short time in the 1930's as general manager of the coal mining division, designing coal cutters.¹²⁸

In 1946, Joy Machine Company, Sullivan Machinery Company and LaDel Conveyor and Manufacturing Company, producer of belt conveyors, merged to become Joy Manufacturing Company. At the time of the merger, Joy stated that Sullivan had not pursued an aggressive sales policy for some time. It had been the management's policy to limit stocks of merchandise available for purchase, which restricted the sales volume and delayed promotion of new products. When war orders were completed, no anticipatory sales program was ready as a replacement. Joy also felt that the Claremont works had not been well-maintained.¹²⁹

Joy has maintained a leadership role in mining engineering. After the Sullivan-Joy merger, Joy produced a continuous miner. This machine removed coal from a solid face through the rapid rotation of cutting chains. The cutting head sumped in at the bottom of the coal seam, moved upward, breaking out the coal in lumps rather than a fine dust. It then carried the coal back to a conveyer and into a shuttle car. The machine was ready for sale in 1948.¹³⁰ The continuous miner and most of Joy's other innovations, such as the Pushbutton Miner,¹³¹ have also been used for mining flat-bedded minerals other than coal, such as potash, gypsum and salt.¹³²

Joy has grown by acquisition. The Mines Equipment Company, manufacturer of electrical connectors which could be safely used in wet mining conditions, was bought in 1949. In 1954, Baash-Ross Tool Company, which made tools for oil well drills, was acquired.¹³³

Joy Manufacturing Company continues to operate in Claremont, New Hampshire, but for the most part, not in these historic buildings. Joy decided in the 1960's to move the majority of their operations to a new plant on the outskirts of town. Joy does still occupy the river-fronted machine shop/erecting shop for use by their welding department; the pattern shop is occupied currently on a very limited basis; until June, 1978 they used the foundry on the north side of the river. The Claremont plant of Joy again manufactures Sullivan's most famous product, core drills. Today, hard rock mining equipment is made in Claremont; only castings and gears for Joy's line of coal cutters are produced in the city. The Joy plant makes hand-held tools - paving breakers, jack hammers, pile drivers and tampers--the air end of air compressors, track drills, and a variety of underground mining equipment.¹³⁴

Labor :

A job with Sullivan or with its successor, Joy Manufacturing Company, was, and is today, considered a "good job" in the town of Claremont. A machine works such as Sullivan employs largely skilled labor and pays relatively high wages to maintain a stable work force. Although Sullivan employed only 50 men in 1870,¹³⁵ the number in its employ rose steadily,¹³⁶ in 1880, 60 to 70 workers; in 1892, 125 men,¹³⁷ 900 in 1906,¹³⁸ and between 800 and 1000 today. It has been the largest industrial employer in the city for most of the twentieth century.

To help insure an adequate skilled work force, Sullivan ran a night school.¹³⁹ Apprentices, age 16 to 20, were required to attend; others could attend if they chose. The school help twice weekly,¹⁴⁰ taught mechanical drafting.¹⁴¹ Mr. Bennett of the company's engineering department,¹⁴² succeeded by Lee Knight, ran the school.¹⁴³

Sullivan never had labor problems of any magnitude, however, in the twentieth century, there were occasional labor incidents. The company was proud to note that the strike by their mechanics in Chicago in 1901 was settled "without recognizing the union."¹⁴⁴

The first labor trouble at the Claremont plant occurred in 1903. One hundred and thirty-five machinists and handy men went out on strike because of the discharge of a foreman. Sullivan claimed the foreman had been "disloyal" to the company.¹⁴⁵ The men went over to the Claremont National Bank and drew their pay. During the following week they formed a union.¹⁴⁶ Although the paper reported that new workers were soon hired, and the strikers forced to move to find new work,¹⁴⁷ the company stated that they hired back all but three of the strikers.¹⁴⁸

In 1905 Sullivan hired a number of Italian workers to work on construction projects,¹⁴⁹ probably the new pattern shop on the north side of the river. July 8, 1905, forty of these Italian workers struck because of the brutality of one of the foremen. Reportedly the foreman swore at the workers and used a club on them.¹⁵⁰ A month later the workers were receiving aid, seven dollars per week, from a national union, possibly the International Association of Machinists.¹⁵¹ The union had decided that the strike had been justified because the workers, union men, had been victims of discrimination.¹⁵² The strikers held a ball and other fund-raising events.¹⁵³ By 1905, however, Sullivan could claim that the "expense and annoyance caused by combating the strikes of the past three years has borne good results."¹⁵⁴

The financial reversals of the first part of the twentieth century and labor problems in nearby Springfield, Vermont, caused uneasiness to some employers in Claremont.¹⁵⁵ A number of Socialists visited the city in this period, such as W.B. Killingbeck and James F. Carey, addressing audiences which presumably included workers.¹⁵⁶ It was, however, under the auspices of the American Federation of Labor that the first concerted effort at organizing was made. John Luthringer of New York, a general organizer for the International Association of Machinists, an affiliate of the A.F. OF L. visited Claremont in 1914; he claimed that the A.F. of L. had decided to make an organizing drive in New Hampshire, Vermont and Maine. Luthringer was assisted in Claremont by John Burke of Franklin, New Hampshire, vice president of the State Labor Organization. Luthringer went door to door, collecting signatures for a local union. After collecting 50 signatures, the Board of Trade organized a committee to visit him and to persuade him to leave. The police were instructed to arrest anyone attempting to block the streets with meetings.¹⁵⁷ A meeting was held but "without arousing much enthusiasm."¹⁵⁸

Interest was aroused by the selectmen's notice, which the police rigidly enforced, "forbidding the making of public speeches holding of public meetings or doing of any other thing tending to cause the assembling of a crowd within or on any of the public highways without permits."¹⁵⁹ Luthringer and Burke persisted and were joined by representatives of the State Federation of Labor. Luthringer believed the selectmen's notice was unconstitutional and invited arrest by staging a public meeting in front of Sullivan. Luthringer was arrested, found guilty and fined. In the trial, two of Claremont's leading citizens, Hosea Parker and Ira Colby, represented the town. The selectmen continued to refuse permits to the organizers and would not allow the Town Hall to be used for an address for Samuel Gompers. Vacant and private lots were offered for Gompers' address, but the organizers refused.¹⁶⁰ In an attempt to counter descriptions of a "czardom"¹⁶¹ in Claremont, Frederick Copeland, president of Sullivan, addressed 900 workers on the position, ideals and past benefits of Sullivan.¹⁶²

Although the Superior Court sustained the ordinance against public meetings without permit,¹⁶³ In February of 1914, the selectmen did grant the use of the town hall to the A.F. of L. A meeting on February 2 drew 900 people "of all classes". Speakers from Providence and Washington and from various unions addressed the enthusiastic crowd. The following day, two of the speakers were arrested when they spoke to crowds on Main Street.¹⁶⁴

By the end of February of 1914, the agitation had been nearly forgotten. Luthringer and his fellow organizers were granted permits to speak in the streets. The cases against the organizers were not pressed by the town.¹⁶⁵ Men from the International Association of Machinists did return to Claremont, but their efforts were "quiet".¹⁶⁶ Throughout the 1920's, organizers would address Sullivan employees from soapboxes during the lunch hours, without attracting much interest.¹⁶⁷

Some of the organizers who had visited Claremont with the A.F. of L. such as John Burke, were socialists. It was through Eli Bourdon, his friend Joe Daley, and his son, Earl Bourdon, that Socialism came to have an influence in Claremont and on Sullivan. Eli Bourdon was born in Woodstock, Vermont and came to work as a young boy in one of the city's shoe factories. Of Alsatian descent, he was an admirer of Eugene Debs, also from Alsace. In 1919, he "re-established the boxing game in Claremont," spent the next 30 years of his life at evening bouts and preaching socialism. He was the Socialist candidate for the governor of New Hampshire in 1936.¹⁶⁸ Earl Bourdon grew up in his father's household, entertaining Joe Daley and other prominent Socialists, such as Norman Thomas.¹⁶⁹

After working for shoe factories in Newport and Claremont, Earl Bourdon came to work for Sullivan in 1942. Although he quit shortly afterward, he rejoined the firm, working in the heat treatment plant. Bourdon began organizing for a local of the U.S. Steelworkers after Thanksgiving Day in 1942. Claremont, which had been silent during the steelworkers uprisings of the 1930's, and so apathetic to earlier calls, responded quickly to Bourdon. December 21, 1942, James Hanely, staff representative of the Steelworkers, notified Alexander Miller, works manager, that the union represented a majority of the Sullivan workers.¹⁷⁰ Although there was a steelworkers local formed in Rutland, Vermont in September of 1942, Claremont local 2944, was the first in New Hampshire.¹⁷¹ On February 4, 1943, elections supervised by the National Labor Relations Board were held.¹⁷² Sullivan felt confident that the foundry workers would not favor the union, but the vote was 492 to 311 for unionization.¹⁷³

The goals of Local 2944 were defined by the war; unable to negotiate for wage increases, the union concentrated on issues such as seniority. In 1946, because of a failure to agree in negotiation on a wage reopening, there was a nationwide steelworkers strike; Claremont strike, beginning January 26, 1946 and lasting ninety-two days, was a part of this national strike.¹⁷⁴ On March 30, Norman Thomas walked the picket line which the strikers had set up around the Sullivan complex. About forty men broke the picket line to go to work, but no workers were brought in to replace the strikers. The Claremont strikers established a strike headquarters, established a relief fund and a central strike board, headed by Bourdon. Considerable financial support came from the national union and from local townspeople in the form of loans and rent abatements.¹⁷⁵ The strike was settled with an immediate eight cent increase and a ten cent increase for the next year.¹⁷⁶

Local 2944 participated in the founding of the Industrial Union Council of the state and has had a local union man on the State Executive Board since its organization. Earl Bourdon was made a staff representative for the International Union in 1957.¹⁷⁷ Local 2944 is the largest affiliate of the Sullivan County Council, which represents several thousand workers, including the Steelworkers, Amalgamated Clothing Workers and the State, County and Municipal Employees Union. Every president of Sullivan Labor Council since 1945 has been a Socialist. Bourdon estimates that presently there are about 100 Socialists in the Claremont area.¹⁷⁸

There have been no other strikes at Sullivan or Joy. The chief negotiating items have been streamlining the grievance procedures and pensions.¹⁷⁹

Women have not generally played an important role in machine works, yet women have worked intermittently at Sullivan. In 1882 when Sullivan was manufacturing woven flexible roving cans, approximately twenty-five women worked on twenty-four looms and did finishing work, producing two thousand tubes per day.¹⁸⁰ Sullivan ran an advertisement for one hundred women to work as core-makers in 1909.¹⁸¹ From 1909 to perhaps World War II, approximately twenty women worked in the North Street side of the foundry in a small room, called the "girls' core room". These women made sand cores for small patterns; the work was considered "women's work" because of the size of the patterns. The doors to the "girls' core room" were kept locked to discourage any socializing between the women and the male foundry workers. These women were paid higher wages than their sisters in the nearby textile firm, Monadnock Mills.¹⁸² During World War II, women were hired to do bench work, work bill presses and hammer drills, and even duplex millers.¹⁸³ The women who worked at Sullivan during the war were unionized and left voluntarily after the war.¹⁸⁴

Claremont has been home for a number of nationalities. In the first decades of the twentieth century, Russians and Poles were the largest ethnic groups in the city and the largest groups employed by Sullivan.¹⁸⁵ In the period between 1919 and 1930, only one Russian and none of the Poles rose to the rank of foreman. One reason undoubtedly the language barrier.¹⁸⁶ Ethnic background has had no apparent influence on unionization. Leadership in the Local 2944 has been ethnically diverse.¹⁸⁷

Significance:

Sullivan, like many other American firms which furnished equipment for the mining industry in the United States, also supplied equipment for construction and related industries. Portable air compressors, rock drills, and pneumatic equipment of other types are often identical with those used by the mining industry. Many mining machines, however, have no counterpart in these industries. Much of the equipment is specially designed for track gauge and voltage for particular mines. Substantial sums are needed to develop new equipment and new processes.¹⁸⁸

Although typical of mining engineering firms in some aspects, Sullivan Machinery Company has played its own unique role. Much of the machinery used to construct the Panama Canal was Sullivan's. In 1905, 25 Sullivan rock drills were used on the Bas Obispo Cut, the most difficult section of rock which had to be removed. One drill then could bore two 20 foot deep holes in a day. Originally, the drills were stream powered, but in 1905, they were used in quarry work and light excavation. In 1907, 24 Sullivan Diamond Pointed Channelers were used to cut through 15 miles of solid rock. They were to cut the locks at Gatun and Mira Flores.¹⁸⁹

The Rand mines in the Transvaal of South Africa were at first considered rather disappointing. The value of the ore decreased as the vein dipped away from the outcrop in either direction. An American geologist, John Hays Hammond, convinced Cecil Rhodes that the gold increased in value at greater depths. Using Sullivan drills, they drilled to six thousand feet, deeper than ever before. More than 250 Sullivan drills were used to block out an ore body over 40 mile area; over 125 mines were opened.¹⁹⁰

Albert Ball was the mechanical engineer for Sullivan Machinery Company for nearly 50 years. Although his mechanical genius was not confined to mining engineering, the diamond core drills, the diamond channeler and his coal cutters expanded the output of mines throughout the world and caused a revolution in the production of coal fuel. Modern machinery has been employed in mines before use in factories; the steam engine, for example, was used in mines as early as 1760 to pump mine water.¹⁹¹ Albert Ball helped to maintain the leadership of mining engineering in the history of technology through his adaptation of hydraulic feeds and air compressors to the field.

As the largest industrial employer in the city, Sullivan (and now Joy) is an intergral part of many Claremont families. It would be difficult to walk around Tremont Square in Claremont and not talk with a man who worked at the Sullivan plant. In the abandoned office building on Main Street, there is still posted Sullivan's roll of honor - a list of men who worked for the company thirty-five, forty, forty-five and fifty years. As an employer of mostly skilled machinists, Sullivan has always been a good place to work. Local 2944 of the United States Steelworkers was the second union in the town.¹⁹² It is the Socialist strand represented by Earl Bourdon and his followers, which helps to make Claremont unique among New England mill towns.

FOOTNOTES

¹George Baxter Upham, "The Beginnings of a Great New Hampshire Industry," in The Historical Papers of George Baxter Upham, ed. by Bertha Emond (Claremont, New Hampshire: The Claremont Print Shoppe, undated), p. 77.

²At least as early as 1824 Roswell Elmer built a foundry on this site and subsequently sold it to George Emerson.

³National Eagle, April 14, 1859.

⁴"Joy at the Coal Show", paper prepared by Joy Manufacturing for the Coal Show, 1951, p. 2. (type script)

⁵James A. Drain, Machines that Changed the Way the World Works (Princeton: Princeton University Press, 1968), p. 8.

⁶National Eagle, May 9, 1861., p. 2.

⁷Dun & Bradstreet Credit Ledgers, Vol. 1, p. 86, Dun & Bradstreet Collections, Manuscript Division, Baker Library, Harvard University.

⁸ibid., Vol. 1, p. 278.

⁹James Duane Squires, The Granite State of the United States, Vol. 11 (New York: American Historical Company, Inc., 1956), p. 456.

¹⁰Gary Hubbard, "Development of Machine Tools in New England, Part 18." American Machinist, 60 (June 26, 1924), p. 953.

¹¹Upham, "The Beginnings," p. 78.

¹²Hubbard, "Development of Machine Tools," p. 953.

¹³Gardner Robert, Small Arms Makers (New York: Bonanza Books, 1963), p. 11.

¹⁴Upham, "The Beginnings," p. 80.

¹⁵National Eagle, October 13, 1921

¹⁶Upham, "The Beginnings", p. 78.

¹⁷Dun & Bradstreet, Vol. 2, p. 773.

¹⁸Upham, "The Beginnings," p. 78.

¹⁹National Eagle, October 17, 1868.

²⁰Upham, "The Beginnings," p. 80-82.

²¹Claremont Advocate, January 15, 1890.

²²"Joy at the Coal Show," p. 2.

- ²³Upham, "The Beginnings," p. 82-83.
- ²⁴National Eagle, August 27, 1870.
- ²⁵United States Department of Census, Ninth Census of the United States, 1870: Manufacturing.
- ²⁶Upham, "The Beginnings," p. 82.
- ²⁷Dun & Bradstreet, Vol. 2, p. 278.
- ²⁸Northern Advocate, May 30, 1871.
- ²⁹T.A. Richard, A History of American Mining (New York: McGraw-Hill Book Company, 1932), p. 173-174.
- ³⁰Orain, Machines, p. 10.
- ³¹Claremont Advocate, May 16, 1882.
- ³²Claremont Advocate, January 15, 1890.
- ³³Claremont Advocate, October 28, 1884.
- ³⁴Dun & Bradstreet, Vol. 3, p. 641.
- ³⁵Dun & Bradstreet, Vol. 2, p. 773.
- ³⁶J.N. McClintock, "Sketch of Claremont," Granite Monthly, February, 1880, p. 178.
- ³⁷Claremont Advocate, April 3, 1883.
- ³⁸Claremont Advocate, October 23, 1888, p. 3
- ³⁹Claremont Advocate, March 25, 1884, p. 3
- ⁴⁰Claremont Advocate, April 28, 1885.
- ⁴¹"Joy at the Coal Show," p. 2-3.
- ⁴²Dun & Bradstreet, Vol. 2, p. 878.
- ⁴³Sanborn Map Company, Insurance Maps, 1885.
- ⁴⁴Dun & Bradstreet, Vol. 2, p. 878.
- ⁴⁵Site 12 (See Appendix A).
- ⁴⁶Sanborn Maps, 1884, 1889.
- ⁴⁷Claremont Advocate, January 15, 1890. The buildings are not extant
- ⁴⁸Claremont Advocate, November 29, 1889.
- ⁴⁹Claremont Advocate, January 15, 1890.

⁵⁰Claremont Advocate, December 5, 1887.

⁵¹Claremont Advocate, January 15, 1890.

⁵²Drain, Machines, p. 14.

⁵³Ibid, p. 13-14.

⁵⁴"Joy at the Coal Show," p. 3.

⁵⁵Drain, Machines, p. 14.

⁵⁶Ibid, p. 10.

⁵⁷Claremont Advocate, April 6, 1892.

⁵⁸Manchester Union, October 8, 1892, p. 116.

⁵⁹Sanborn Maps, 1894.

⁶⁰Claremont Advocate, December 29, 1897.

⁶¹Sullivan Machinery Company, Annual Report to the Stockholders, 1898.

⁶²"Joy at the Coal Show", p. 2.

⁶³Sullivan, Annual Report, 1901.

⁶⁴Sullivan, Annual Report, 1899.

⁶⁵Sullivan, Annual Report, 1901.

⁶⁶Sullivan, Annual Report, 1900.

⁶⁷Sullivan, Annual Report, 1899.

⁶⁸Sullivan, Annual Report, 1900.

⁶⁹Site 11 (see Appendix A).

⁷⁰Sullivan, Annual Report, 1902.
Sanborn Map, 1899 The buildings are not extant.

⁷¹Sullivan, Annual Report, 1905.

⁷²Site 12B (See Appendix A).

⁷³Sanborn Map, 1904, 1915.

⁷⁴Claremont Advocate, February 11, 1905.

⁷⁵Sullivan, Annual Report, 1906.
Site 17 (See Appendix A).

⁷⁶Claremont Advocate, April 29, 1905.

FOOTNOTES

- ⁷⁷Sullivan, Annual Report, 1910.
- ⁷⁸Claremont Advocate, September 13, 1910.
- ⁷⁹Claremont Advocate, December 29, 1911.
- ⁸⁰Sullivan, Annual Report, 1911.
- ⁸¹Oral Interview, Leslie Currier, August 17, 1978.
- ⁸²Sullivan, Annual Report, 1912.
Site 13, originally built by Maynard Shoe Company c. 1896 (See Appendix A).
- ⁸³Sullivan, Annual Report, 1913.
- ⁸⁴Claremont Advocate, August 9, 1912.
Site 14 (See Appendix A).
- ⁸⁵Sullivan, Annual Report, 1912.
- ⁸⁶Sullivan, Annual Report, 1913.
Site 12B (See Appendix A).
- ⁸⁷Sullivan, Annual Report, 1914.
- ⁸⁸Claremont Advocate, January 2, 1917.
- ⁸⁹Mine and Quarry Bulletin, 70-D, July 9, 1917.
- ⁹⁰Sullivan, Annual Report, 1914.
- ⁹¹Sullivan, Annual Report, 1915.
- ⁹²Claremont Advocate, March 6, 1914.
- ⁹³Sullivan, Annual Report, 1916.
- ⁹⁴Oral Interview, Leslie Currier, August 17, 1978.
- ⁹⁵Claremont Advocate, November 24, 1916 , p. 5.
- ⁹⁶Sullivan, Annual Report, 1917.
- ⁹⁷Claremont Advocate, July 12, 1918, p. 1.
Site 16 (See Appendix A) The compressor was probably made at the Chicago plant.
Joy later tried to remove "Sullivan" from the stack.
- ⁹⁸Claremont Advocate, July 25, 1919.
- ⁹⁹Sullivan, Annual Report, 1919.
- ¹⁰⁰Sullivan, Annual Report, 1922.

FOOTNOTES

- ¹⁰¹Oral Interview, Leslie Currier, July 18, 1978.
- ¹⁰²Oral Interview, Leslie Currier, August 17, 1978.
- ¹⁰³In 1926, a small addition was made to the foundry; In 1927 a Fire Pump House was built near the power plant; c. 1970 a small addition was made to the river side of the western most machine shop.
- ¹⁰⁴The shop was active until c. 1950 when the company began to purchase drop parts.
- ¹⁰⁵Oral Interview, Leslie Currier, August 22, 1978.
- ¹⁰⁶Oral Interview, Leslie Currier, July 18, 1978.
- ¹⁰⁷Oral Interview, Leslie Currier, August 22, 1978.
- ¹⁰⁸Oral Interview, Leslie Currier, July 18, 1978.
- ¹⁰⁹Oral Interview, Leslie Currier, August 22, 1978.
- ¹¹⁰Sanborn Map, 1904.
Oral Interview, Leslie Currier, August 22, 1978. Copeland did not like hotels and preferred to stay at the shop.
- ¹¹¹Sullivan owned a quarry on Elm Street and later in nearby Unity, New Hampshire to test their new equipment. The rubber mill became the Chain Machine Building where chain machines of all types, mostly coal cutter, were manufactured. In the 1960's, it became the Experimental building where models, mostly drills were built and tested.
- ¹¹²Oral Interview, Leslie Currier, August 22, 1978.
- ¹¹³Sullivan, Annual Report, 1895-1926.
- ¹¹⁴Sullivan, Annual Report, 1932-1938.
- ¹¹⁵Sullivan, Annual Report, 1928-1934.
Officer was succeeded by his son, Charles, followed by a Mr. Lincoln and Alexander Millar.
- ¹¹⁶General Committee, Sullivan County Centennial Celebration at Newport, New Hampshire, July 4 and 5, 1927 (Newport, New Hampshire: Argus Press, 1927), p. 36
- ¹¹⁷Pillsbury, Hobart, New Hampshire, A History (New York: The Lewis Historical Publishing Company, Inc. 1928), p. 1220.
- ¹¹⁸Sullivan, Annual Report, 1924.
- ¹¹⁹Sullivan, Annual Report, 1930.

FOOTNOTES

- ¹²⁰Sullivan, Annual Report, 1932.
- ¹²¹Sullivan, Annual Report, 1937.
- ¹²²Sullivan, Annual Report, 1938. Core drill production was moved to Michigan City and returned to Claremont only recently.
- ¹²³Sullivan, Annual Report, 1940.
- ¹²⁴Sullivan, Annual Report, 1941.
- ¹²⁵Sullivan, Annual Report, 1942-44.
- ¹²⁶Sullivan, Annual Report, 1944.
Coal cars which did not track, but operated by battery.
- ¹²⁷Drain, Machines, p. 15-18.
- ¹²⁸Oral Interview, Leslie Currier, August 17, 1978.
- ¹²⁹Sullivan, Annual Report, 1945.
- ¹³⁰Drain, Machines, p. 19.
- ¹³¹A man above ground at a control console sends a continuous miner into the coal seam; conveyor cars follow the miner and bring back the coal; electronic sensing devices advise the operator of the machine's position in the seam.
- ¹³²Drain, Machines, p. 19.
- ¹³³ibid., p. 20-21.
- ¹³⁴Oral Interview, Norman Grover, August 23, 1978.
- ¹³⁵United States Department of Census, Ninth Census of the United States, 1870 Manufacturing.
- ¹³⁶McClintock, "Sketch of Claremont," p. 178.
- ¹³⁷Manchester Union, October 8, 1892.
- ¹³⁸Gertrude Jones Bartless, "Claremont: The Picturesque and Progressive," Granite State Magazine, Vol. 11, No. 3 (September, 1906), p. 119.
- ¹³⁹Oral Interview, Norman Grover, August 23, 1978.
- ¹⁴⁰Oral Interview, Leslie Currier, August 17, 1978.
- ¹⁴¹Claremont Advocate, May 1, 1908.
- ¹⁴²Claremont Advocate, May 3, 1907.

FOOTNOTES

- 143 Oral Interview, Leslie Currier, August 17, 1978.
- 144 Sullivan, Annual Report, 1901.
- 145 Sullivan, Annual Report, 1903.
- 146 Claremont Advocate, February 21, 1903.
- 147 Claremont Advocate, February 28, 1903.
- 148 Sullivan, Annual Report, 1903.
- 149 Claremont Advocate, June 24, 1905, p. 5.
- 150 Claremont Advocate, July 8, 1905.
- 151 Claremont Advocate, January 23, 1914.
- 152 Claremont Advocate, August 5, 1905, p. 5.
- 153 Claremont Advocate, August 19, 1905., p. 5
- 154 Sullivan, Annual Report, 1905.
- 155 Claremont Advocate, August 13, 1909.
- 156 Claremont Advocate, January 15, 1890.
- 157 Claremont Advocate, January 23, 1914.
- 158 Ibid.
- 159 Ibid.
- 160 Claremont Advocate, January 30, 1914.
- 161 Ibid.
- 162 Claremont Advocate, February 6, 1914.
- 163 Ibid.
- 164 Ibid.
- 165 Claremont Advocate, February 9, 1914.
- 166 Claremont Advocate, June 9, 1914.
- 167 Oral Interview, Leslie Currier, August 17, 1978.

FOOTNOTES

- 168 Thomas R. Brooks, "A Steelworkers' Local in New England," Dissent (Winter), 1972, p. 49.
- 169 Oral Interview, Earl Bourdon, July 24, 1978.
- 170 Daily Eagle, October 20, 1964, p. 83.
- 171 Ibid.
- 172 Oral Interview, Earl Bourdon, July 24, 1978.
- 173 Daily Eagle, October 20, 1964, p. 83.
- 174 Brooks, "A Steelworkers' Local," p. 47.
- 175 Oral Interview, Earl Bourdon, July 24, 1978.
- 176 Brooks, "A Steelworkers' Local," p. 47.
- 177 Daily Eagle, October 20, 1964, p. 83.
- 178 Brooks, "A Steelworkers' Local," p. 49.
- 179 Oral Interview, Earl Bourdon, July 24, 1978.
- 180 Claremont Advocate, December 26, 1882.
- 181 Claremont Advocate, March 5, 1909.
- 182 Oral Interview, Leslie Currier, August 22, 1978.
- 183 Oral Interview, Leslie Currier, July 17, 1978.
- 184 Oral Interview, Earl Bourdon, July 24, 1978.
- 185 Kathryn Grover, "The Russian Experience in the United States," (unpublished Senior Project, Kirkland College, April 30, 1975), p. 59 (typescript)
- 186 Ibid., p. 63, 68.
- 187 Oral Interview, Earl Bourdon, July 24, 1978.
- 188 Paul M. Tyler, From the Ground Up (New York: McGraw-Hill Book Company, Inc., 1948), p. 79, 82.
- 189 "The World of Joy," (pamphlet, undated in file at Joy Manufacturing Company, Claremont, New Hampshire, Personnel Office, file "History,"), p. 3 (typescript).

FDDTNOTES

¹⁹⁰Drain, Machines, p. 12.

¹⁹¹Tyler, From the Groud Up, p. 78.

¹⁹²The first was the United Textile Workers at Dartmouth Woolen
Company.

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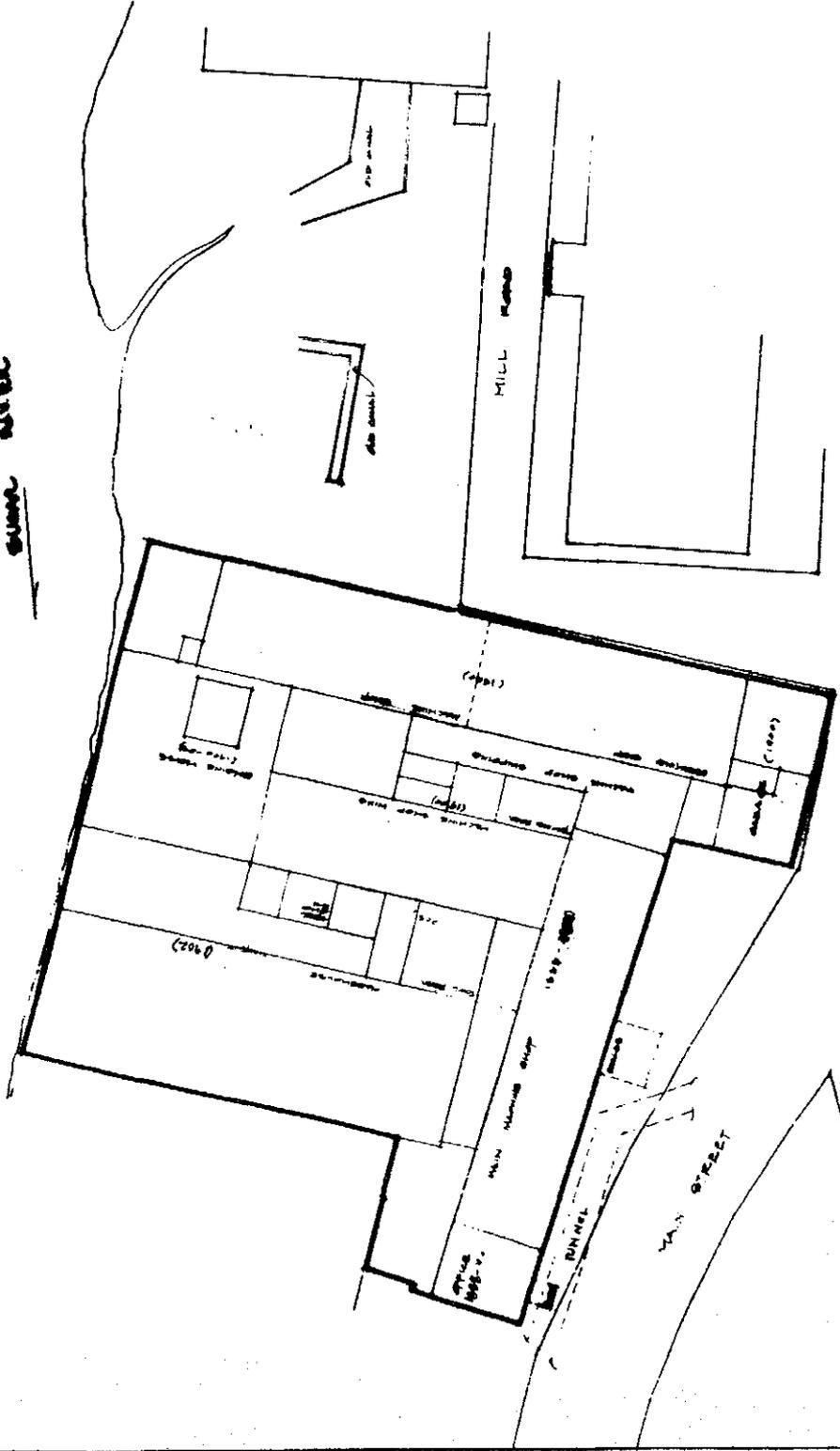
Grover, Norman, August 23, 1978.

SULLIVAN MACHINERY COMPANY (Claremont
Rehabilitation Project)
HAER No. NH-4 (Page 30)

SKETCH PLAN
CONCEPT PLAN FOR THE REHABILITATION OF THE
SULLIVAN MACHINERY COMPANY BUILDING



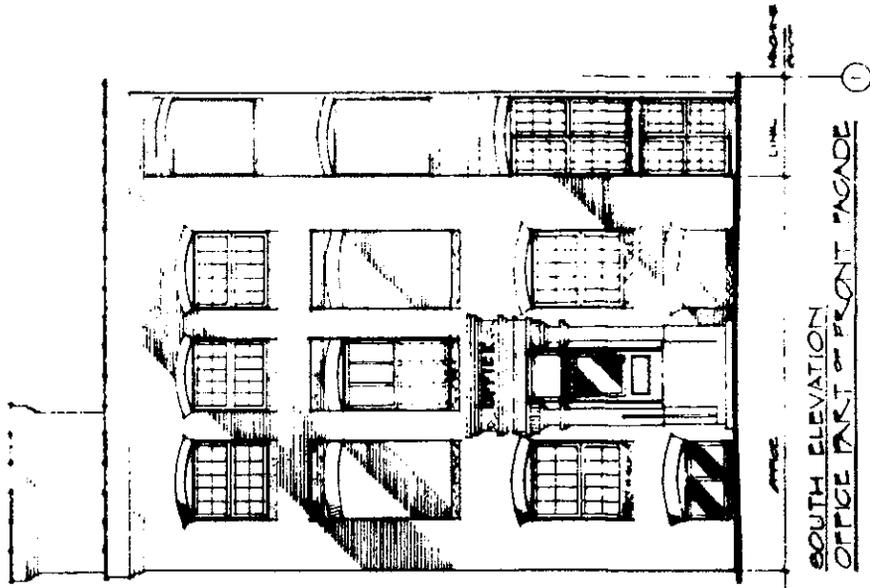
WATER ST.



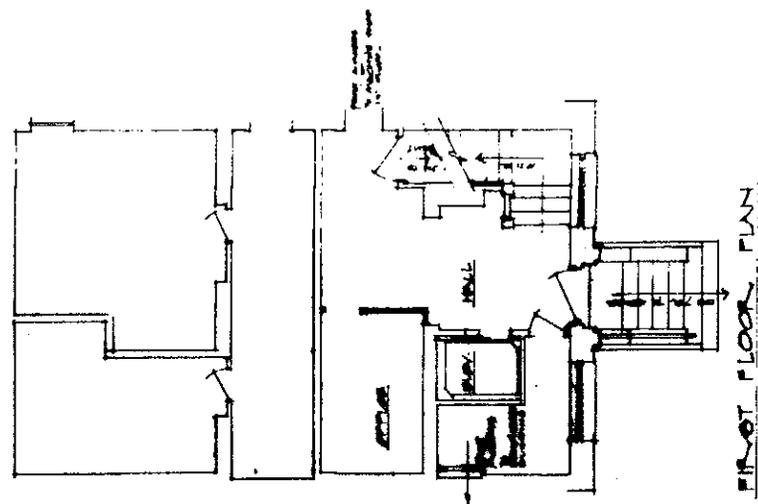
WATER ST.

CENTRAL ST.

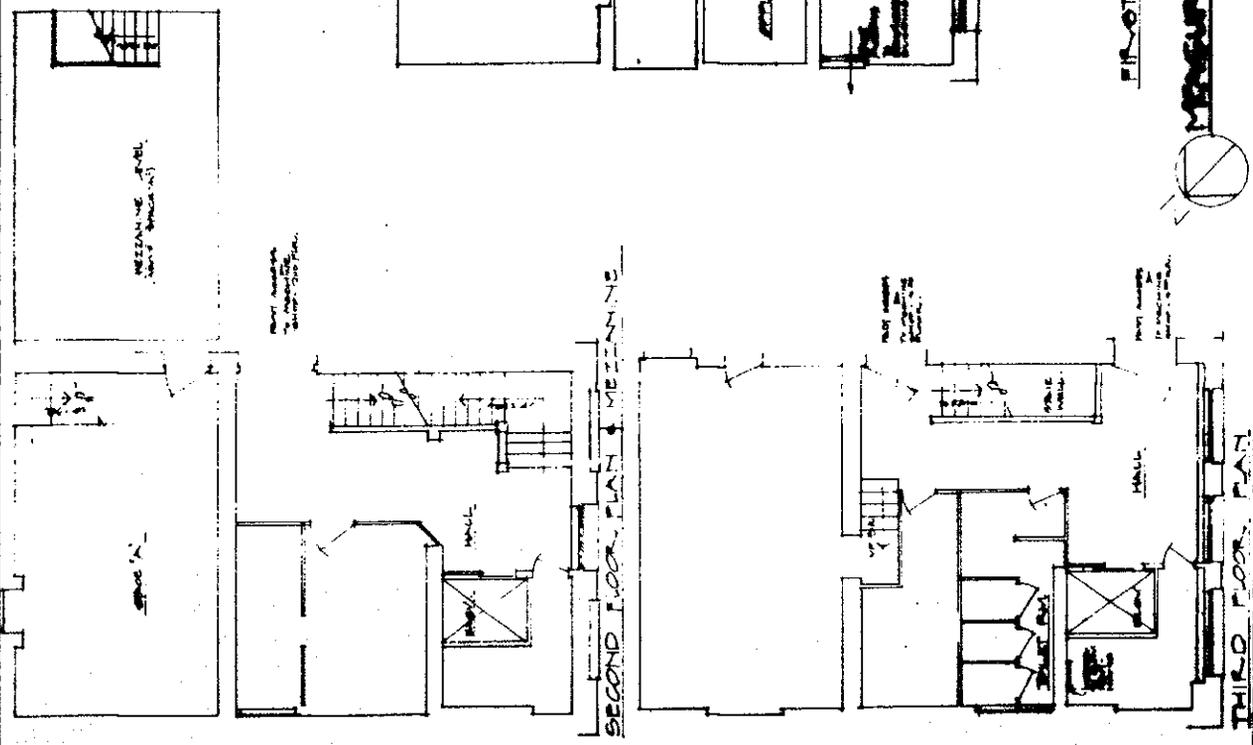
RINKEL STREET



SOUTH ELEVATION
OFFICE PART OF FRONT FACADE



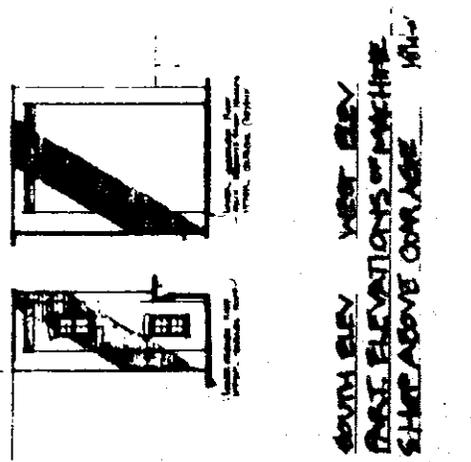
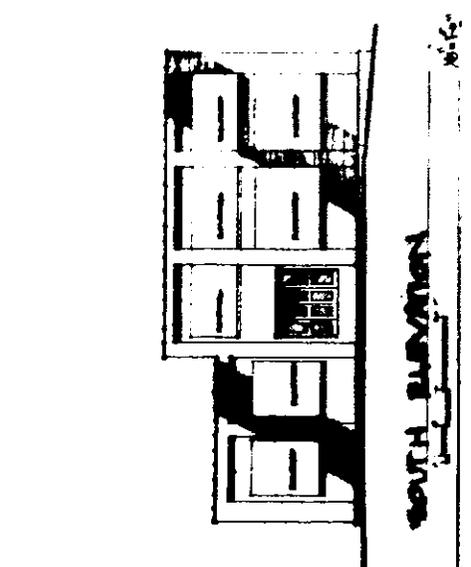
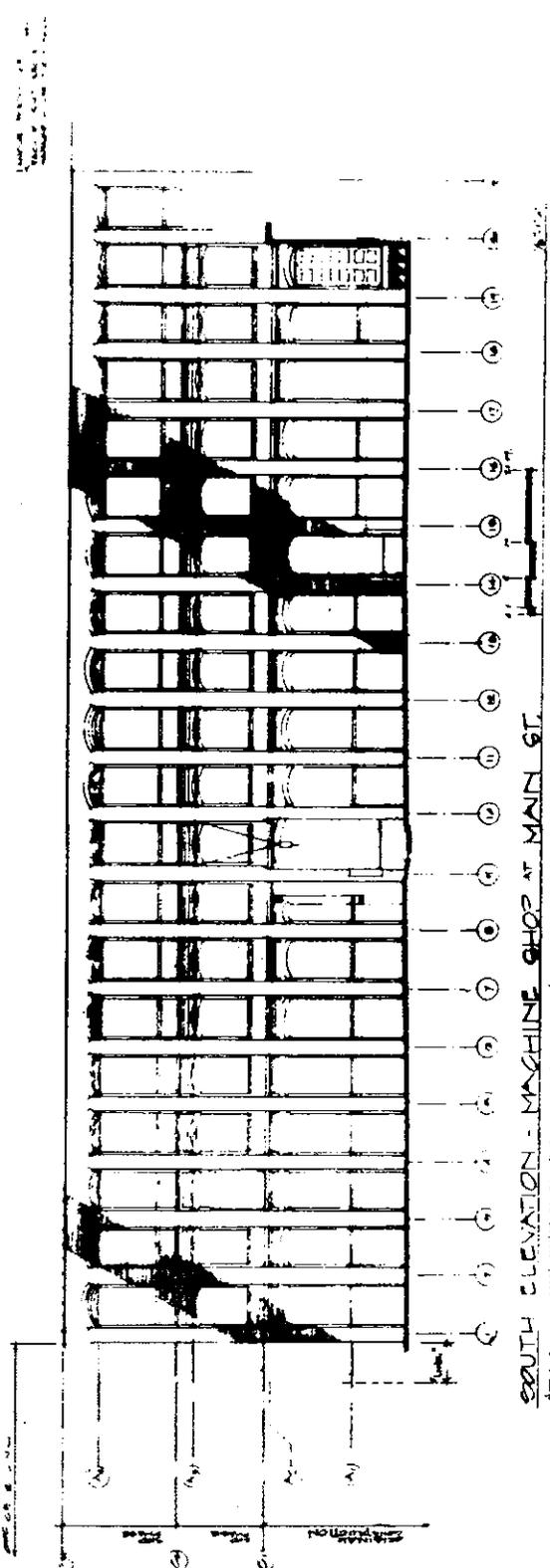
FIRST FLOOR PLAN



SECOND FLOOR PLAN

THIRD FLOOR PLAN

MEASURED FLOOR PLANS



SOUTH ELEV. MACHINE SHOP
 WEST ELEV. MACHINE SHOP
 SOUTH ELEVATION
 WEST ELEV. MACHINE SHOP