NPS Form 10-900
(3-82)

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United States Department of the Interior
National Park Service

National Register of Historic Places Inventory—Nomination Form

For NPS use only
received AUG 6 1986
date entered MAR 12 1987

See instructions in *How to Complete National Register Forms*
Type all entries—complete applicable sections

1. Name

historic I. and E. Greenwald Steam Engine #1058

and/or common N/A

2. Location

street & number 3898 Shipping Avenue N/A not for publication

city, town Miami N/A vicinity of

state Florida code 012 county Dade code 025

3. Classification

Category	Ownership	Status	Present Use	
___ district	___ public	___ occupied	___ agriculture	___ museum
___ building(s)	X private	___ unoccupied	___ commercial	___ park
___ structure	___ both	X work in progress	___ educational	___ private residence
___ site	**Public Acquisition**	**Accessible**	___ entertainment	___ religious
X object	___ in process	X yes: restricted	___ government	___ scientific
	___ being considered	___ yes: unrestricted	___ industrial	___ transportation
	N/A	___ no	___ military	X other: Private Coll.

4. Owner of Property

name Finlay B. Matheson

street & number 240 San Lorenzo

city, town Coral Gables ___ vicinity of state Florida

5. Location of Legal Description

courthouse, registry of deeds, etc. N/A

street & number N/A

city, town N/A state N/A

6. Representation in Existing Surveys

title N/A has this property been determined eligible? ___ yes X no

date N/A ___ federal ___ state ___ county ___ local

depository for survey records N/A

city, town N/A state N/A

7. Description

Condition		Check one	Check one
X excellent	___ deteriorated	X unaltered	___ original site
___ good	___ ruins	___ altered	X moved date 1926, 1984
___ fair	___ unexposed		

Describe the present and original (if known) physical appearance

SUMMARY

The I. & E. Greenwald steam engine, serial No. 1058, was built in Cincinnati, Ohio in 1906.[1] The horizontal cross-compound engine weighs 124,500 pounds and has overall dimensions of 23' 6" in length, 14' 1" in width and 13' in height. Its two cylinders are arranged horizontally astride a 16' diameter flywheel, the lower portion of which revolves in a pit near the center of the engine. The cylinders, one high pressure and one low pressure, have dimensions of 20" x 42" and 36" x 42" respectively. The engine is constructed primarily of cast iron but has components of steel and alloy materials. It is painted harvester red and butterscotch, period tones specially formulated by Robert I. Johnson[2] who has done extensive restoration work for museums including the Ford Museum at the Edison Institute and the Smithsonian Institution. The engine rests on a concrete foundation bed raising the base of its cylinders 11" and 21" above the floor, as was standard practice for such engines. The engine has automatic cut-off slide valves which are activated by external 2" diameter polished steel shafts running parallel to the cylinders which are in turn geared directly to the main shaft. The shafts in turn operate a series of cams which open and close the four valves for each cylinder. The governor system is a 72" high polished steel shaft employing the "Watt" type of spherical controls.

An integral part of the engine is its American style or continuous rope drive power transmission system. The engine is perhaps the only surviving example of this type of power transmission system, which was manufactured by the Dodge Engineering Company of Misawaska, Indiana. The system is comprised of an idler pulley, a take-up pulley and a tensioner carriage linked by 1,200 feet of continuous, four strand, 1-1/2" manila transmission rope. The rope is laid in 18, 1-1/2" deep machined and polished grooves on the flywheel and corresponding grooves on the take-up pulley. The system's tensioner carriage rides on two, 14-foot parallel steel rails suspended from the ceiling of the engine room by eight steel stanchions, measuring 3" x 32". The configuration of the pulleys and tensioner carriage conforms directly to original rope manufacturers diagrams.[3] The rope drive is fully functional and powers pulleys on line shafting suspended from the ceiling of the engine room.

RELOCATION AND RESTORATION INFORMATION

Extensive attention was taken to photo document the engine and its related components prior to their relocation from Beaumont, Texas to Miami, Florida in 1984. Subsequent to photo documentation of the engine prior to disassembly, a complete system of tagging individual pieces was accomplished. An additional safeguard measure was accomplished by photo documentation of the piece labeling system. Following these procedures, the engine was disassembled over a two week period. Disassembly required the full time (seven days a week) efforts of a two man team, augmented periodically by numerous laborers for particular labor intensive tasks. Removal of the 16-ton flywheel and the 4-1/2-ton crankshaft required demolition of part of the mill roof in order to allow the components to be lifted out by an 80-ton crane.

8. Significance

Period	Areas of Significance—Check and justify below				
___ prehistoric	___ archeology-prehistoric	___ community planning	___ landscape architecture	___ religion	
___ 1400–1499	___ archeology-historic	___ conservation	___ law	___ science	
___ 1500–1599	___ agriculture	___ economics	___ literature	___ sculpture	
___ 1600–1699	___ architecture	___ education	___ military	___ social/ humanitarian	
___ 1700–1799	___ art	___ engineering	___ music	___ theater	
___ 1800–1899	___ commerce	___ exploration/settlement	___ philosophy	___ transportation	
X 1900–	___ communications	X industry	___ politics/government	X other (specify) Technology	
		X invention			

Specific dates 1906 **Builder/Architect** I. and E. Greenwald Company

Statement of Significance (in one paragraph)

SUMMARY

The I. and E. Greenwald steam engine is significant for reasons both industrial and technological in nature. The industrial significance of the engine is derived primarily through its association with the East Texas rice industry. Prior to 1926, for an undetermined amount of time, the engine was used for irrigation purposes. Subsequently, the owner of the Beaumont Irrigation Company and Beaumont Rice Mill, Joe Broussard, Sr., finding a need for more power for his rice mill, had the engine moved to Beaumont where it powered his rice mill for over half a century. Demonstrating ingenuity and efficiency, the rice mill recycled spent rice hulls by forcing them into the boiler by steam injection, thereby running the engine on the product it helped produce. The engine is also significant technologically because of its unusual valve system and its power transmission system. The engine has a plane plate (gridiron type) sliding valve system actuated by a cam shaft which has a co-incident rotary motion with the main crank shaft.[1] This is believed to be the only example of this specific Greenwald type valve system. Technological significance is also demonstrated through the engine's rope drive power transmission system. Rope drive as a form of power transmission was introduced in America in the 1840's but did not come into prominence until the late 1880's.[2] There are no known examples of an American rope drive engine such as this on display or in any museum. The engine was moved from Beaumont, Texas, to Miami, Florida, in 1984 in an effort to secure its preservation and restoration. Although the industrial significance of the engine is not directly associated with its present Florida location, the technological significance of the engine has not been compromised by its relocation. Further, the subsequent restoration of the engine has served to only further enhance its technological importance.

THE I. AND E. GREENWALD COMPANY

American manufacturing and industrial empires were in many cases created by immigrants bent on pursuing the American dream free of old world constraints on their labor and inventiveness. Isaac and Ezra Greenwald pursued their dreams and forged them through just such hard work and inventiveness. By 1846 Isaac had established himself with a partner in the carpentry business. Within the next five years they had expanded their skills and were now iron founders and millwrights. By 1858 Isaac had joined his brother Ezra, combining one's technical expertise with the other's business acumen. In 1863 they were involved in the manufacture of steam engines and by 1885 they had branched out into other products, including mill gearing, for which they were credited as having the "largest variety of patterns in the country."3

9. Major Bibliographical References

See Continuation Sheet

10. Geographical Data

Acreage of nominated property Less than 1

Quadrangle name South Miami **Quadrangle scale** 1:24,000

UTM References

	Zone	Easting	Northing
A	17	574180	2846110
B			
C			
D			
E			
F			
G			
H			

Verbal boundary description and justification The engine is contained within a 24.00' x 100.25' shed located on the western portion of Lots 1 through 9 inclusive, Block 13 of Realty Securities Subdivision of Coconut Grove. Reference attached survey plat.

List all states and counties for properties overlapping state or county boundaries

state	N/A	**code**	N/A	**county**	N/A	**code**	N/A
state	N/A	**code**	N/A	**county**	N/A	**code**	N/A

11. Form Prepared By

name/title Brien Doran, Michael Zimny/Historic Sites Specialist

organization Bureau of Historic Preservation **date** July 1986

street & number The Capitol **telephone** (904) 487-2333

city or town Tallahassee **state** Florida

12. State Historic Preservation Officer Certification

The evaluated significance of this property within the state is:

X **national** ___ **state** ___ **local**

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

State Historic Preservation Officer signature George W. Percy

title State Historic Preservation Officer **date** 7/29/86

For NPS use only

I hereby certify that this property is included in the National Register

Carol D. Shull **date** 3-12-87

Keeper of the National Register

Attest: **date**

Chief of Registration

GPO 911-399

Once transported to its present site at Miami, Florida, the task of cleaning and restoration began. Procedures used in this process included cleaning of all greases and oils by 180 degree caustic soda baths, followed by steam cleaning to remove all traces of the caustic soda. Cast iron parts were then carefully sand-blasted, all machined surfaces securely covered during the process. The engine castings were then primed and sealed with two coats of Dupont Corlor (824S or 825S) and areas that needed filling were treated to gain a smooth surface texture. This was all done following procedures recommended by Robert I. Johnson.[4] The surfaces were then sanded and primed again for the third coat of Dupont primer/sealer. After this coat, two coats of Dupont Dulux alkyd enamel paint were applied in colors typical of those used at the turn of the century (the original color scheme is not known). Corresponding to the work on the cast and painted surfaces, the machined surfaces were to be polished and coated with "Magnus FF-11," a clear coating formulated by the Magnus Chemical Company.

Following this procedure, a detailed physical inspection of the engine was undertaken. The purpose of the inspection was not only to locate any damage such as cracks, repairs, etc., but also to determine if there were any extraneous bolt holes indicating evidence of some missing or altered parts. No such evidence was detected. Secondly, the existing parts were correlated directly to line drawings of similar heavy duty frame type engines in an original Greenwald factory catalog.[5]

After this phase, the actual reassembly of the engine began. The engine was first placed on raised concrete foundations which were laid utilizing a transit for leveling the surfaces. Once the cylinder assemblies were set on the foundation and aligned, the careful placement and alignment of the 4-1/2-ton crankshaft was initiated. Taking several days and requiring the repeated blueing, turning and removal of the crankshaft, the babbit surfaces of the main bearings were meticulously hand scraped. The alignment of the crankshaft and cylinders required days of careful effort utilizing piano wire, calipers and a transit to obtain the exact alignment.

As a result of these efforts, the engine appears today as it would have when first assembled, unaltered by the addition of any unauthorized parts or the removal of any of the original equipment. It remains the only known Greenwald engine and one of the very few large cross-compound engines in the United States.[6]

NOTES

[1] A foundation plan provided by the Beaumont Rice Mill for this engine indicated that the date of manufacture was 1906. The serial number stamped on many of the engine's parts agrees with information provided by the Beaumont Rice Mill, confirming that the serial number of the engine is 1058.

[2] Robert Wernick, "The Singular Vision of a Reincarnated Victorian Millwright," The Smithsonian Magazine, Vol. 16, No. 7. (October, 1985), p. 193.

3 Hunt, C. W. Manila Rope Transmission and Hoisting. New York: C. W. Hunt and Company, 1872, p. 34.

4 Robert Wernick, The Smithsonian Magazine.

5 Greenwald Automatic Cut-Off Engine Catalog #5, pp. 27-30, 46.

6 Vogel, Robert M., Curator, Division of Engineering and Industry, National Museum of American History, Smithsonian Institution. Correspondence to Finlay B. Matheson, December 3, 1985, and interview by Lamar Noriega, May 16, 1985.

ANALYSIS OF INTEGRITY

LOCATION: The engine and rope drive assembly described above was used to power a rice mill in Beaumont, Texas until its replacement by a more modern and cost effective system in 1984. Its preservation in situ or at an alternate on the mill site was not possible. Therefore, its relocation was an essential prerequisite to prevent its loss through demolition for scrap. However, the resulting compromise of its locational integrity by removal to its present site does not materially detract from its primary historic significance as the only known surviving example of a major technological innovation in the development of stationary steam power machinery for industrial application. Such stationary engine and drive assemblies were installed and used in a wide variety of applications configured to meet individual needs and circumstances in locations throughout the country.

DESIGN: The integrity of design is in no way compromised. The engine and rope drive assembly, including its innovative valve system, appears today as it would have when first erected, unaltered by either the addition of non-engine parts or the removal of any original equipment. It has been completely and authentically restored to operating condition as originally designed.

SETTING: The present setting approximately reflects the environment in which such power and drive assemblies were typically installed. The assembly is housed beneath a steel frame and corrugated metal sheet attached to an industrial warehouse located in an industrial section of Miami. The setting is thus appropriate to the industrial and utilitarian character of the engine.

MATERIALS: The integrity of materials remains totally intact, and has been enhanced by the restoration and preservation treatment carried out since the relocation of the assemble. All work involved in the disassembly, shipment, and reassembly of the engine and power drive was performed under competent supervision and carried out to museum quality standards.

FEELING: The assembly continues to impart an impressive feeling of its historic character through its massive size, functional design, and mechanical complexity. This feeling is particularly impressive when the engine is set in motion and reflects the predominance of steam driven, mechanically transmitted power systems in nineteenth and early twentieth century industrial development.

ASSOCIATION: Although the direct association of this particular engine and rope drive assembly with its historic use in the Beaumont Rice Mill has been lost, its integrity of design, materials, and workmanship, together with its authentic restoration in an appropriate evocative setting, provide a sense of the typical purpose and use of stationary power lant installations in American industry.

IN SUMMARY: The I & E Greenwald engine and rope drive assembly is the only remaining example of a significant technological development in the design and construction of industrial power machinery. It retains the physical and aesthetic integrity of its original design, materials, and workmanship to a remarkably high degree. Its meticulous restoration in an appropriately prepared setting effectively mitigates the effects of its relocation.

As with many burgeoning dynasties, sons followed their fathers in work. Members of both brothers' families went into the industry in various capacities, Isaac's son Thomas Lambert Greenwald worked his way up through the hierachy of the plant from bench laborer to Vice President of the company by 1895. But by 1888 the fortunes of the company and the family were failing. In 1888 Isaac was killed in an industrial accident at the shop and by 1895 his brother Ezra was also dead. Financial reverses followed and pressures mounted from other family members for liquidation rather than investment of more capital for improvements. In 1913 nature delivered the fatal blow in the form of a devastating flood which inflicted such damage to the Greenwald plant that it was forced into receivership. The demise of the I. and E. Greenwald Company was the end to a long chapter in the history of American industry and to the history of Cincinnati as well.

INDUSTRIAL AND TECHNOLOGICAL SIGNIFICANCE

The I. and E. Greenwald engine #1058 has a documented history of powering the Beaumont Rice Mill for over 56 years of continuous service. It was retired not due to mechanical inefficiency or failure but rather because the mill was unable to obtain a 24 hour engineering staff to monitor the engine's operation. Prior to its installation in the rice mill, the engine was used on the San Jacinto River for an unspecified amount of time by the Beaumont Irrigation Company. Prior to its use in the irrigation of Texas rice fields, it may have been employed in any one or a number of mills, mines or factories which would have required the use of its tremendous motive force. It is inherent in the character of this type of engine that it would never have been expected to remain in one place for its entire working life.[4] In this way it can be argued that the technological significance of the engine is not dependent upon its location and accordingly that the relocation of the engine from Texas to Florida has not compromised this area of its significance.

The engine's second technologically significant component is its valve system. The I. & E. Greenwald valve system is unique although other engine manufacturers had their own versions of an efficient valving system. The engine makes use of an efficient automatic cut-off valve system using traditional slide valves such as was a hallmark of the I. & E. Greenwald Company. This system permitted the long-term operation of the engine with no erratic wear on the valve surfaces which otherwise might have been cause for frequent interruption of service for repair. The reliability of this system is evident in the almost constant operation of the engine for over 50 years with no significant repair down time.[5] The Greenwald automatic slide valve system was recognized as a leader in the field of engine manufacturing. "Plane sliding valves are so well known, their great durability and other good qualities so unquestionable an established fact, that mechanics and engineers justly regard them as the highest standard in use,"[6] noted the Greenwald catalog. While this type of valve gear not only increased the efficiency of the system from a maintenance point of view, it also increased the smooth flow of power

in the engine due to the quick action of the gridiron type slide valves activated by trip latches and aided by dash pots. The only known examples of a similar valve system, although different, are three engines in the Henry Ford Museum, Dearborn, Michigan, each making use of C. H. Brown valves.

NOTES

1 I. & E. Greenwald Catalog #5, Cincinnati: I. and E. Greenwald Company, undated pp. 19 and 21.

2 Flather, John J., Rope Driving, 1st Edition. New York: John Wiley and Sons, 1897, pp. 1 and 3.

3 Roe, George Mortimer, "Cincinnati: Queen City of the West," Cincinnati: Cincinnati Times Star Co., 1895, p. 116.

4 Vogel, Robert M., Curator, Division of Engineering and Industry, National Museum of American History, Smithonian Institution. Correspondence to Finlay B. Matheson, December 3, 1985.

5 Thallman, Robert, engineer for the Beaumont Rice Mill, interview by Finlay B. Matheson, February, 1984.

6 I. & E. Greenwald Catalog #5, p. 19.

PUBLISHED SOURCES

"Beaumont: The Twentieth Century City" Beaumont, Texas: Beaumont Chamber of Commerce, 1912.

Cist, Charles. Sketches and Statistics of Cincinnati in 1859.

"The City of Cincinnati," copyright Montague and Irving, Cincinnati Times and Star Company, 1891.

Collins, Hubert E. Shafting, Pulleys, Belting, Rope Transmission and Shaft Governors. 1st Edition. New York: McGraw Hill Co., 1908.

Cromwell, John Howard. A Treatise on Belts and Pulleys. 1st Edition. New York: John Wiley and Sons, 1894.

Dodge Sales and Engineering Company Catalog Number C 16. Mishawaka, Indiana: The Dodge Sales and Engineering Co., 1916.

Flather, John J. Rope Driving. New York: John Wiley and Sons, 1897.

Greenwald Automatic Cut Off Engine Catalog Number 5. Cincinnati: I. & E. Greenwald Company, undated.

Greenwald, Dr. W. J., Jr. and William J., Sr. Mabel Tell Us About....The Greenwalds in America. 1985.

Hunt, C. W. Manila Rope Transmission and Hoisting. New York: C. W. Hunt Company, 1872.

Kenyon, Edward. "Transmission of Power by Ropes," American Machinist, July, 1909.

Lenard, J. W. Centennial Revue of Cincinnati, 100 Years. J. M. Elstner and Company, 1888.

Linsley, Judith Walker and Ellen Walker Rienstra. Beaumont: A Chronicle of Promise. California: Windsor Publications, Inc., 1982.

"A Little Blue Book on Rope Transmission". 3rd Edition. New York: The American Manufacturing Company, 1902.

"Mesta Rope Drives". Pittsburgh: Mesta Machine Company, 1923.

Roe, George Mortimer. "Cincinnati: Queen of the West". Cincinnati: Cincinnati Times-Star Company, 1895.

UNPUBLISHED SOURCES

Broussard, Joseph II. Interview by Finlay B. Matheson, February 1984, Beaumont, Texas. Mr. Broussard is the present owner of the Beaumont Rice Mill and his family has owned it since its inception.

Greenwald, Mabel. Interview by Brien Doran, May 1985, Cincinnati, Ohio. Mabel Greenwald is the granddaughter of Isaac Greenwald, one of the founders of the I. & E. Greenwald Company.

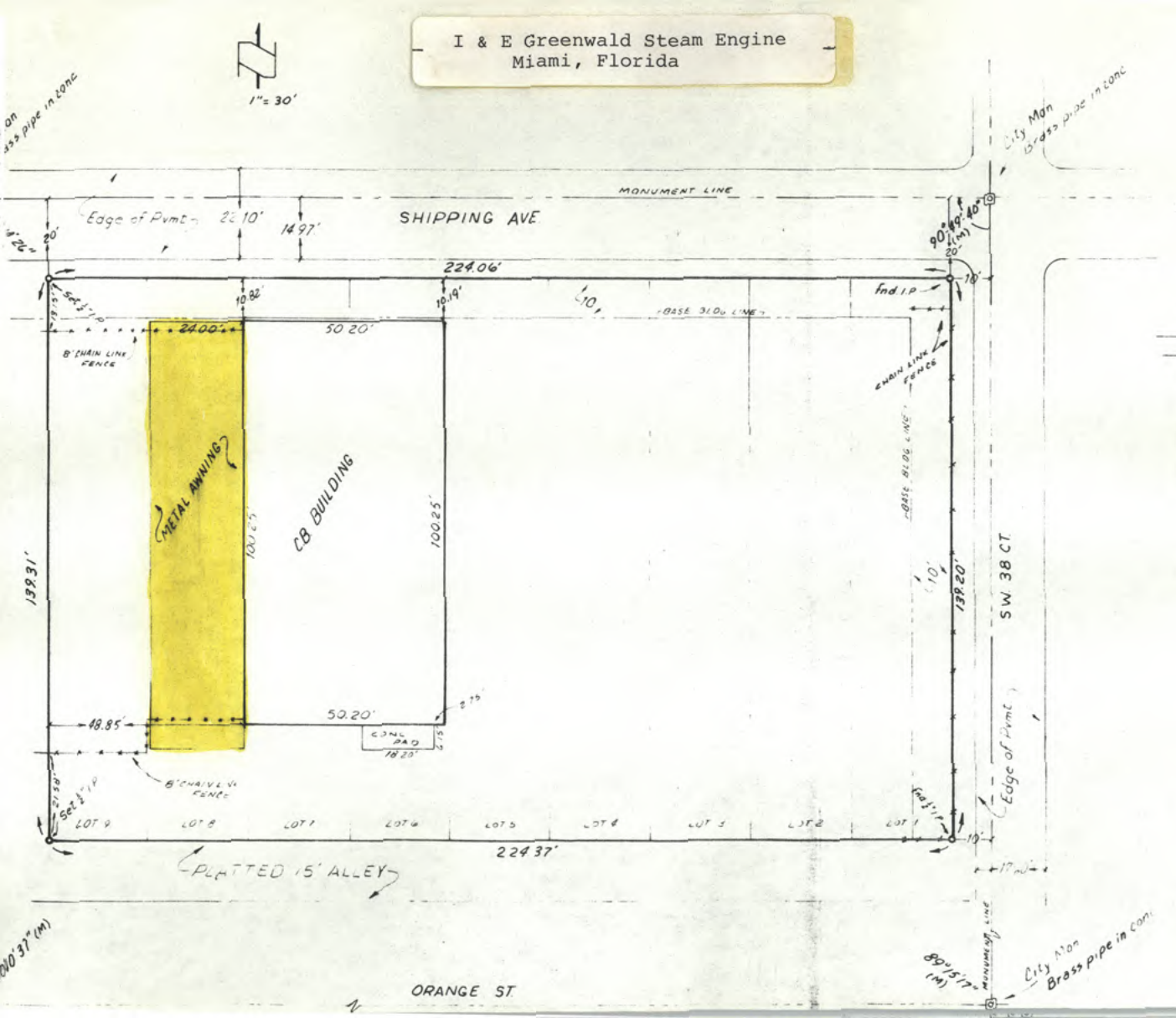
Hartford Steam Boiler Inspection and Insurance Company. Correspondence dated 1923 between Walter Gerner, Chief Inspector, and H. B. Vandereb, Superintendent, Engineering Department. Original correspondence in the Smithsonian Institution's files.

Thallman, Elmer. Interview with Finlay B. Matheson, February 1984, Beaumont, Texas. Mr. Thallman worked for the Beaumont Rice Mill for 63 years and was present when the I. & E. Greenwald engine was installed in 1926.

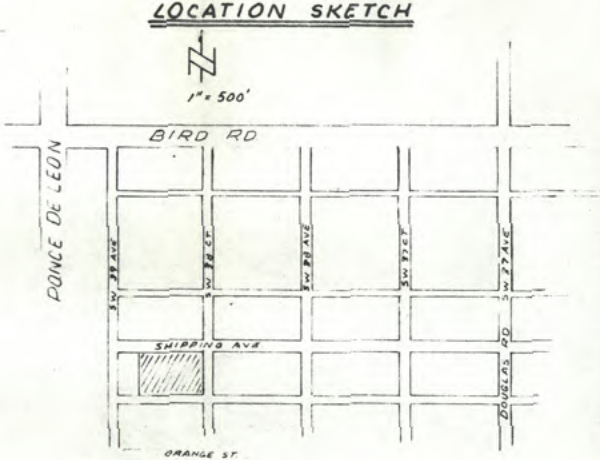
Vogel, Robert M., Curator, Division of Engineering and Industry, National Museum of American History, Smithsonian Institution. Interview by Lamar Nariega, May 16, 1985, Washington, D.C.

Vogel, Robert M., Curator, Division of Engineering and Industry, National Museum of American History Smithsonian Institution. Correspondence to Finlay B. Matheson, December 3, 1985.

I & E Greenwald Steam Engine
Miami, Florida



LOCATION SKETCH



LEGAL DESCRIPTION

LOTS 1 THROUGH 9 INCLUSIVE, BLOCK 13, OF REAL SECURITIES SUBDIVISION OF COCONUT GROVE PLAT BOOK 2, PAGE 85, DADE CO. FLA.

SURVEYOR'S NOTES

1. This property not abstracted for rights-of-way or easen
2. Field survey performed 3 OCT 1984
3. No encroachments were found on this property
4. All improvements are as shown
5. Property is not to scale