



The American Society of Mechanical Engineers

*Jackson  
Ferry*  
**SHOT  
TOWER**



NATIONAL HISTORIC  
MECHANICAL ENGINEERING  
LANDMARK  
May 1981

## LOCATION

Shot Tower Historical State Park is located where US 52 crosses the New River, 8 miles south of Fort Chiswell, Virginia.

By Interstate it is adjacent to I-77 eight miles south of I-81. Exit from I-77 at Poplar Camp onto US 52 and travel north for two miles, bearing left at the Jackson's Ferry Farm.

As described later, a proposed ASME Historical Marker may be in place to guide the traveler to the landmark location.

## INTRODUCTION

The Jackson Ferry Shot Tower is a unique, single-purpose structure with an interesting history that verifies that it has served our nation and people well.

Lead projectiles have been produced for centuries, primarily by two methods: casting (molding) and dropping in a free fall. Both processes continue in use today in both limited and mass-production quantities. Additional processes have also been developed, such as grinding, tumbling, punching/trimming, and combinations of these techniques.

Projectiles, either spherical or of other configuration, larger than 20 caliber (0.200 in. diameter), are usually molded regardless of the quantity produced. Smaller sizes are normally produced only in large quantities and by "dropping" in a free fall. Shotgun pellets as large as FF size (0.23 in. diameter) have been made, but the BB size (0.18 in. diameter) is the largest drop shot made today.

The shot tower on the New River is the only one of its kind in Wythe County and is one of only three such remaining antiquities in the nation. It is a surviving relic of the drop process and has been preserved for succeeding generations to gain a glimpse of frontier industry. This brochure is also dedicated to that purpose.

Cover photo: Shot Tower before renovation, circa 1967.

## HISTORY

The origin, development, and use of the Jackson Ferry Shot Tower are joined with the history of the nearby lead mines.

Colonel John Chiswell, aristocrat, discovered outcroppings of lead all along the New River and, being an enterprising businessman, he formed a partnership with his friend William Byrd and son-in-law John Robinson to mine the lead. The mines were developed in the wilderness despite problems with transportation, materials, equipment, workers, and hostile Cherokees or their French allies. Both open pit and shaft mining were used here.

Colonel Byrd, leading an army against the Indians and the French, stopped to build a fort on the main trail to protect the lead mines. It was named Fort Chiswell and grew from a refuge and trading post into the community that today bears the name.

On a return trip to his Williamsburg home in June 1776, Colonel Chiswell became involved in a drunken brawl with an inebriated Scotsman. The Scot was run through the heart with the Colonel's sword as he lunged forward over a table. Out on bail, the brooding Colonel committed suicide in his home in October 1776 at the time of his trial.

John Robinson defaulted as Treasurer of Virginia, and the Colony placed a lien on his interests in the lead mines. With the advent of the Revolution, William Byrd and Chiswell's heirs sided with the Crown, and the Commonwealth of Virginia confiscated the lead mines. Subsequently, they were operated by the government.

Freeholders gathered at Lead Mines and declared their independence from the Crown by the "Fincastle Resolutions" of 1775, which preceded and may have contributed to the Declaration of Independence.

After the Revolutionary War, Virginia sold the lead mines to Stephen and Moses Austin, who operated them until they left to operate similar mines in Missouri in 1800. Moses Austin's son Stephen was born at Lead

Mines along the New River. He was 6 or 7 years old at the time of his family's departure for Missouri; he later became the "Father of Texas." The Austin brothers had recruited experienced miners and skilled workers from Pennsylvania to improve and supplement the mine's work force. Thomas Jackson, who emigrated to the U. S. in 1781-1783 and began work at the mines in 1785 as a mining smith, was one of these.

The Austin brothers altered the operation from mainly open pit to sinking vertical shafts 70 feet deep. This method increased productivity to yield 6 to 8 tons of ore per day.

Several other individuals operated the mines for a time before the property was returned to the Commonwealth of Virginia.

Thomas Jackson, meanwhile, purchased land in the vicinity of the mines and founded a ferry crossing of the New River. After the Austins' forfeiture of the lead mines property to the Commonwealth, Thomas Jackson purchased them at a public auction in Richmond in 1806; he paid about \$19,000 for the property. Subsequently, he became partners with David Pierce. The two businessmen found that they were unable to work together, however, and they continued in partnership with each operating his own half of the mines as he desired. Thus, it has been suggested that Thomas Jackson designed and began construction of his shot tower in order to relocate the operation under his own control and to take advantage of the large commercial market for shot for small game hunting.

About the time the tower was completed in 1812, Jackson sent his nephew, Robert Raper, to Baltimore to observe the operation of a similar tower there and to learn the skills needed to start the Jackson Ferry shot tower operation. The Baltimore tower owner was suspicious and prevented communication and observation, but Raper was undaunted and recruited a skilled Baltimore tower operator to return with him to Wythe County. Thomas Jackson produced shot until his demise in 1824, when Robert Raper assumed the responsibility and continued the operation until 1839, when production ceased.

Thomas Jackson, a lifelong bachelor, died at his home near the mines and was buried near his brother John and other family members in a small cemetery at Lead Mines (now Austinville, Virginia).

After the production of shot ended, the tower stood unused but remained a local attraction. A descendant of John Jackson presented it to the Daughters of the American Revolution for perpetual care in 1929.

The lead mines remained in the control of the Raper family until 1901, when the largest stockholders, William and John Raper, sold them for \$400,000 to the New Jersey Zinc Company, which is the current operator.

A new life as a potential tourist attraction began for the shot tower in 1952, when the Lead Mines Ruritan Club accepted title to the tower and the surrounding 3/4 acre from the Stuart Chapter, DAR. Restoration began when the Wytheville-Wythe County Chamber of Commerce and the Lead Mines Ruritans completed a fund-raising campaign to purchase additional surrounding property in 1964. As joint sponsors, these two organizations deeded the property titles to the Commonwealth of Virginia to establish the Shot Tower Historical State Park. Restoration was completed by the Virginia Division of State Parks, and perpetual care was ensured.

## **DESIGN AND OPERATION**

The ancient drop principle of shot towers has been known for centuries. At the top of the device, lead is melted and poured through a sizing sieve to produce small droplets. Surface tension causes the molten drops to assume a spherical shape during a 150-foot fall through still, cool air. Solidifying as it falls, the shot is collected and cooled in a water-filled container at the bottom. The drop can be completely through a tower (to ground level) or, as in a modern drop device, completely through an underground vertical shaft.

The Jackson Ferry Shot Tower is unique because the design comprises a 75-foot tower and a 75-foot shaft. A horizontal tunnel 150 feet long connected the bottom of the shaft to the riverbank, providing access for

removing the cooled shot and refilling the water container from the nearby New River.

The tower walls are 2-1/2 feet thick. The base is 20 feet square, tapering to a 15-foot-square top. A single door on the north side at ground level allows entrance to the upper level of the shaft. Winding wood stairs encircle the interior walls to the upper level, where a furnace with a chimney was used to melt the lead in a ladle preparatory to pouring. A single small window at this level looks out to the west. A single door in the south wall opens onto a roofed porch, which obviously allowed for easy resupply by rope lift.

The smelted lead came from the nearby mines, and the furnace was probably fueled by wood or coal. Arsenic is often added to the melt to increase the surface tension and improve sphericity; also, 2 to 6.5% antimony is often alloyed to increase lead hardness.

The sieves of differing mesh sizes were changed according to the size of shot desired. After it was removed from the cooling vessel, the shot was sorted by size and bagged for transport by wagon to commercial markets in Baltimore initially and later in Richmond or North Carolina. The freight cost to Richmond in those days was \$100 per wagon load.

Typically, shot towers can produce 3 to 4 tons of small shot per hour or 1 to 2 tons of large shot.

Today a Norfolk & Western Railroad line parallels the New River below the shot tower. The river end of the horizontal tunnel was closed when the railroad bed was cut and graded.

## **CONSTRUCTION**

The shot tower walls are of limestone quarried from a deposit about a mile away. The walls taper slightly as they rise and give a fortress-like appearance. The roof of treated pine shingles is supported by wooden log beams and rafters.

Both the vertical shaft and the horizontal tunnel were hand-dug. Because shaft mining was common at the lead

mines during this period, it is conceivable that this method was used to reduce costs and/or to keep a work force intact. In a small cemetery nearby, the bodies of seven Negro slaves were buried as worker fatalities that occurred during construction of the tower.

## **RESTORATION**

The following reconstruction work was performed under the direction of the Lead Mines Ruritan Club:

1. Concrete floor poured inside at base level with the shaft opening corresponding to the original.
2. Wooden entrance opening lintel replaced with one of concrete.
3. Retaining walls added at exterior sides of tower to control erosion, and ground level restored to original contour by fill.
4. Concrete entry walk constructed.

Additional work performed by the Virginia Park Service included the following:

1. All wall joints pointed up with mortar.
2. Interior stairs replaced and safety fencing added.
3. Roof repaired.
4. Porch flooring and railings repaired. Safety fencing added.

Additional work, such as roads and other facilities, has been necessary to meet State Park minimum requirements. Because these items are independent of the shot tower, they are not enumerated here.

## SIGNIFICANT DATES

<u>Year</u>	<u>Event</u>
1756	Colonel John Chiswell discovers lead at "Lead Mines" (now Austinville, Virginia)
1760	Colonel William Byrd builds Fort Chiswell
1762	Fincastle County formed with Lead Mines as the county seat
1775	"Fincastle Resolutions" written
1780	Austin brothers take over mine operations
1781	Thomas Jackson emigrates to America (1781-1783)
1789	Stephen and Moses Austin purchase the mines
1800	Austin brothers depart for Missouri
1806	Thomas Jackson buys lead mines and forms partnership with David Pierce
1808	Construction of shot tower begins
1812	Shot tower completed
1824	Death of Thomas Jackson
1839	Production of shot at Jackson Ferry shot tower ceases
1929	Shot tower presented to the Stuart Chapter, Daughters of the American Revolution, by descendants of the Raper family
1952	Shot tower title acquired by the Lead Mines Ruritan Club
1964	Shot tower and surrounding land deeded to the Commonwealth of Virginia Division of State Parks to establish the Shot Tower Historical State Park



## MYTHS, FABLES, AND FOLKLORE

Like most artifacts, the Jackson Ferry Shot Tower is not immune to myths or fables and tales about its purpose, use, and product generated by enthusiastic protectors or critics. Some of the legendary beliefs are summarized here.

- Although it may be true, the tradition that the shot tower supplied ammunition for our forces in the War of 1812 or any other war is not an established fact. Most records and dates indicate that its product was produced only for commercial markets from 1812-1839.
- It is said that Daniel Boone, Thomas Jefferson, and other notables were developers or visitors to the tower, but there are no verifiable data available.
- The statement that "this crude method of manufacture would be prohibitive today because of the cost" is conjecture because the principle is still in use as a shot production method.

## EPILOGUE

After suitable and successful investigative efforts by the History and Heritage (H&H) Committee Chairman, C.E. Trent, P.E., The ASME Virginia Section nominated the Jackson Ferry Shot Tower as an ASME National Historic Landmark during November 1979. An ASME Headquarters letter dated August 1, 1980, notified the Section that the nomination had been approved.

The Section H&H Committee Chairman expanded the Committee from three to eleven members to plan and implement the dedication of the Shot Tower as a landmark.

After a visit to the Shot Tower Historical State Park, it was evident that it is an ideal attraction for a Sunday afternoon drive from any location in southwest Virginia. Long-distance travelers from Ohio to Florida will find the Park a convenient rest stop and location for a picnic lunch.

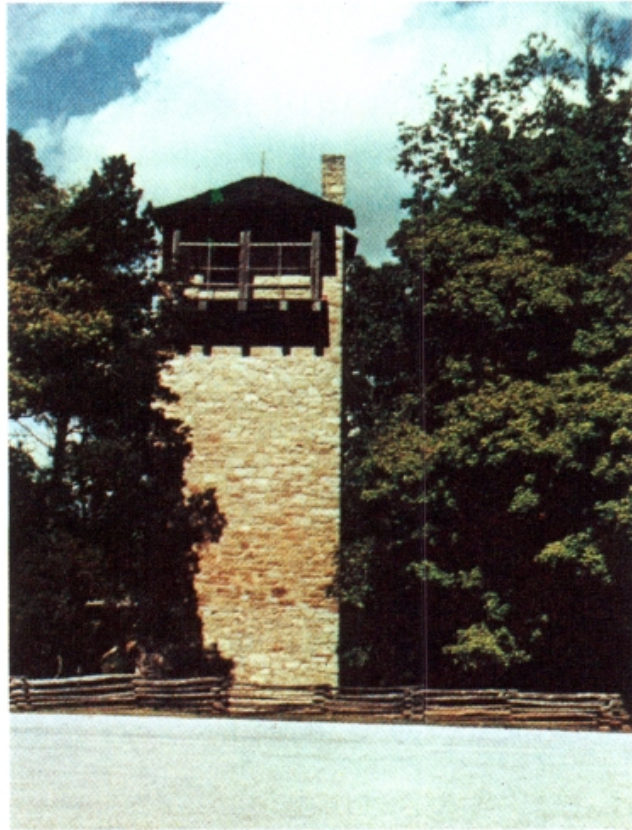


The upper level pouring ladle (or kettle) is now located in the Jackson Ferry Farm front yard and used as a flower garden centerpiece. The pouring lip is visible at the top on the near side.



This kettle was the water-filled container used to collect the shot at the bottom of the shaft; it is also at the Jackson Ferry Farm now.

The Shot Tower as it  
Appeared in September  
1980



West Side and Entrance  
at Rear (North) Wall

## ASME LANDMARK ROAD MARKER CONTEST

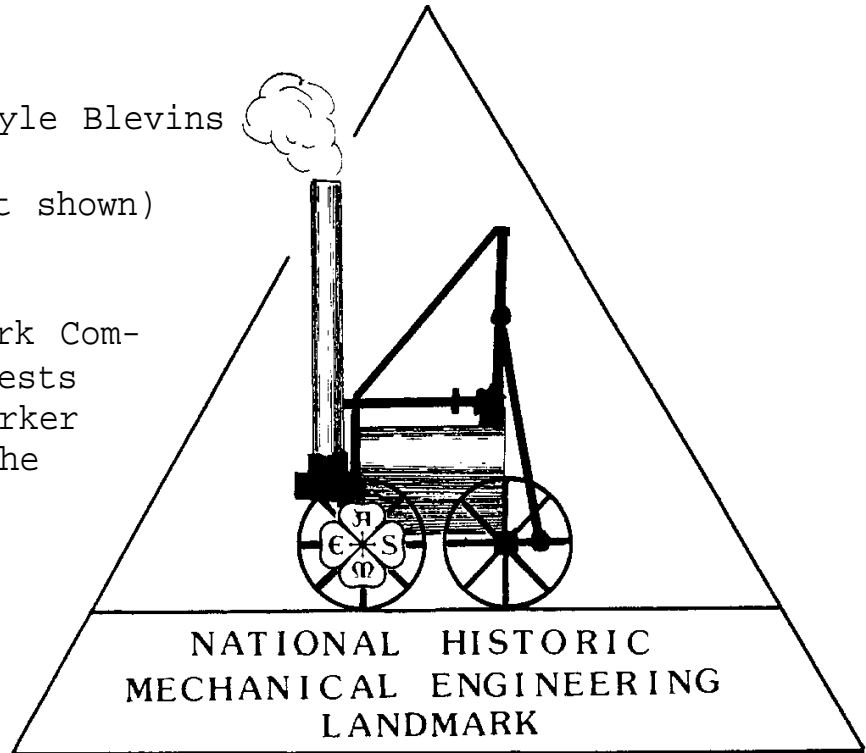
The ASME Virginia Student Section held a contest to select a suggested highway marker for ASME Landmark locations. The contest winners named and the winning design are shown below.

At the right:

First place by Lyle Blevins

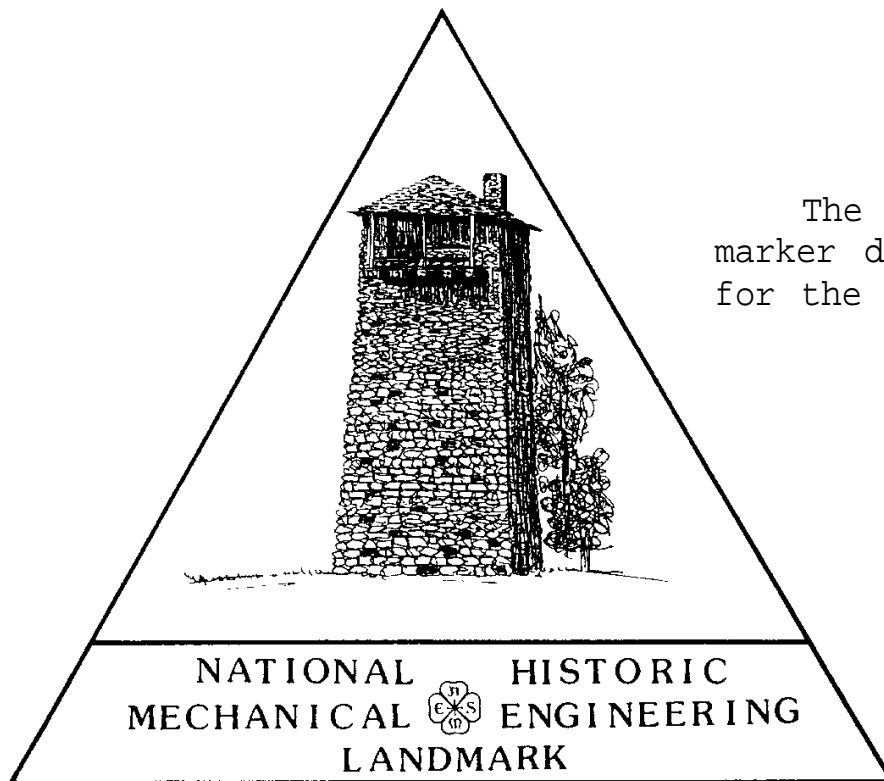
Second place (not shown)  
by David Engel

Note: The Landmark Committee also suggests that the road marker should display the landmark of interest, as below.



At the left:

The proposed road marker design adapted for the Jackson Ferry Shot Tower



COMMONWEALTH OF VIRGINIA  
PROCLAMATION



*CERTIFICATE of RECOGNITION*

*By virtue of the authority vested by the Constitution  
in the Governor of the Commonwealth of Virginia,  
there is hereby officially recognized:*

THE ASME SHOT TOWER HISTORIC LANDMARK  
1981

Often overlooked among the fabled exploits of Virginia's early frontiersmen and of Confederate riflemen was their dependence on lead shot, much of it mined at Austinville lead mines and given its final form in the famous shot tower of Thomas Jackson, dedicated May 9, 1981, as an Historic Landmark.

I join the distinguished gathering for its dedication in tribute to those who produced this early example of military technology and to those who now call the importance of this example of engineering ingenuity to the attention of present day Virginians.

*John N. Dalton*  
Governor

## THE ASME PLAQUE

The ASME plaque presented to the Virginia Division of State Parks for attachment to the shot tower is worded as follows:

NATIONAL HISTORIC MECHANICAL ENGINEERING LANDMARK  
JACKSON FERRY SHOT TOWER  
1807-1939

This facility was typical of others in the country which made small spherical lead shot for the fowling pieces of frontiersmen and settlers. Smelted lead from the nearby Austinville mines was melted at the top of the tower and poured through a sizing sieve to produce small droplets. Surface tension caused the molten lead to assume a spherical shape which solidified during its 150-foot fall. The shot was then collected in a water-filled kettle at the bottom of the shaft. The "drop process" was patented in England in 1769 by William Watts, a craftsman of Bristol, England. He profited handsomely from its prevalent use.

The tower was built by Thomas Jackson, an English immigrant, in 1807. The tower and grounds were restored through the efforts of local organizations, individuals, and the Commonwealth of Virginia.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS  
1981

## NATIONAL HISTORIC MECHANICAL ENGINEERING LANDMARK PROGRAM

In September 1971, the ASME Council reactivated the Society's History and Heritage program with the formation of a National History and Heritage Committee. The overall objective of the committee is to promote a general awareness of our technical heritage among both engineers and the general public. A charge given the committee is to gather data on all works and artifacts with a mechanical engineering connection which are historically significant to the profession - an ambitious goal, and one achieved largely through the volunteer efforts of the Section and Division History and Heritage Committees and interested ASME members.

Accordingly, two major programs are carried out by the Sections and Divisions under the direction of the National Committee: (1) a listing of industrial operations and related mechanical engineering artifacts in local Historic Engineering Records, and (2) a National Historic Mechanical Engineering Landmark program. The former is a record of detailed studies of sites in each local area; the latter is a demarcation of local sites which are of national significance - people or events that have contributed to the general development of civilization.

In addition, the Society cooperates with the Smithsonian Institution in a joint project which provides contributions of historical material to the National Museum of History and Technology in Washington, D. C. The Institution's permanent exhibition of mechanical engineering memorabilia is under the direction of a curator, who also serves as an ex officio member of the ASME National History and Heritage Committee.

The Jackson Ferry Shot Tower is the 58th National Historic Mechanical Engineering Landmark; the others are listed on the next two pages.

## MECHANICAL ENGINEERING LANDMARKS

Ferries and Cliff House Cable Railway Power House, San Francisco, California

Leavitt Pumping Engine, Chestnut Hill Pumping Station, Brookline, Massachusetts

A. B. Wood Low-Head High-Volume Screw Pump, New Orleans, Louisiana

Portsmouth-Kittery Naval Shipbuilding Activity, Portsmouth, New Hampshire

102-Inch Boyden Hydraulic Turbines, Cohoes, New York

5000-kW Vertical Curtis Steam Turbine Generator, Schenectady, New York

Saugus Iron Works, Saugus, Massachusetts

Pioneer Oil Refinery, Newhall, California

Chesapeake & Delaware Canal, Scoop Wheel and Engines, Chesapeake City, Maryland

USS Texas, Reciprocating Steam Engines, Houston, Texas

Childs-Irving Hydro Plant, Irving, Arizona

Hanford-B Nuclear Reactor, Hanford, Washington

First Air Conditioning, Magma Copper Mine, Superior, Arizona

Manitou and Pike's Peak Cog Railway, Colorado Springs, Colorado

Edgar Steam-Electric Station, Weymouth, Massachusetts

Mt. Washington Cog Railway, Mt. Washington, New Hampshire

Folsom Power House No. 1, Folsom, California

Crawler Transporters of Launch Complex 39, J. F. Kennedy Space Center, Cape Canaveral, Florida

Fairmont Water Works, Philadelphia, Pennsylvania

USS Olympia, Vertical Reciprocating Steam Engines, Philadelphia, Pennsylvania

5-Ton "Pit-Cast" Jib Crane, Birmingham, Alabama

State Line Generating Unit No. 1, Hammond, Indiana

Pratt Institute Power Generating Plant, Brooklyn, New York

Monongahela Incline, Pittsburgh, Pennsylvania

Duquesne Incline, Pittsburgh, Pennsylvania

Great Falls Raceway and Power Station, Paterson, New Jersey

Vulcan Street Power Plant, Appleton, Wisconsin

Wilkinson Mill, Pawtucket, Rhode Island

New York City Subway System, New York, New York

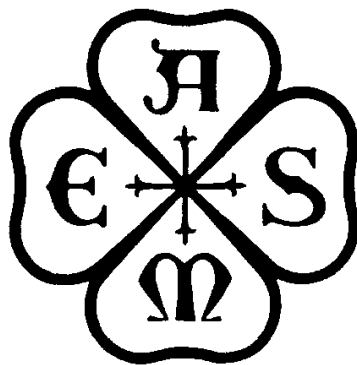
Baltimore & Ohio Railroad, Baltimore, Maryland

Ringwood Manor Iron Complex, Ringwood, New Jersey

Joshua Hendy Iron Works, Sunnyvale, California



Hacienda la Esperanza Sugar Mill Steam Engine, Manati, Puerto Rico  
RL-10 Liquid-Hydrogen Rocket Engine, West Palm Beach, Florida  
A. O. Smith Automated Chassis Frame Factory, Milwaukee, Wisconsin  
Reaction-Type Hydraulic Turbine, Morris Canal, Stewartsville,  
New Jersey  
Experimental Breeder Reactor No. 1 (EBR-1), Idaho Falls, Idaho  
Drake Oil Well, Titusville, Pennsylvania  
Springfield Armory, Springfield, Massachusetts  
East Wells Power Plant, Oneida Street Station, Milwaukee, Wisconsin  
Watkins Woolen Mill, Lawson, Missouri  
C-E First Welded Steam Drum, Chattanooga, Tennessee  
Georgetown Steam Plant, Seattle, Washington  
Equitable Building, Portland, Oregon  
Shippingport Atomic Power Station, Pittsburgh, Pennsylvania  
Edison Jumbo No. 9, Greenfield Village, Dearborn, Michigan  
Marine-Type Triple Expansion, Greenfield Village, Dearborn, Michigan  
Port Washington Power Plant, Port Washington, Wisconsin  
CFR Engine (First International Landmark), Waukesha, Wisconsin  
Saturn V Rocket, J. F. Kennedy Space Center, Cape Canaveral, Florida  
Blood Heat Exchanger, Buffalo, New York  
Rocky River Hydro Power Plant, New Milford, Connecticut  
Kaplan Turbine, York Haven Hydroelectric Station, York Haven,  
Pennsylvania  
Holt "Caterpillar" Track-Type Tractor, Stockton, California  
Lake Superior Hydroelectric Plant, Sault Ste. Marie, Michigan  
SP No. 4294 Articulated Steam Locomotive, Sacramento, California



## ACKNOWLEDGMENTS

The Virginia Section of the American Society of Mechanical Engineers gratefully acknowledges the efforts of all who cooperated on the landmark designation and dedication of the Jackson Ferry Shot Tower at Fort Chiswell, Virginia.

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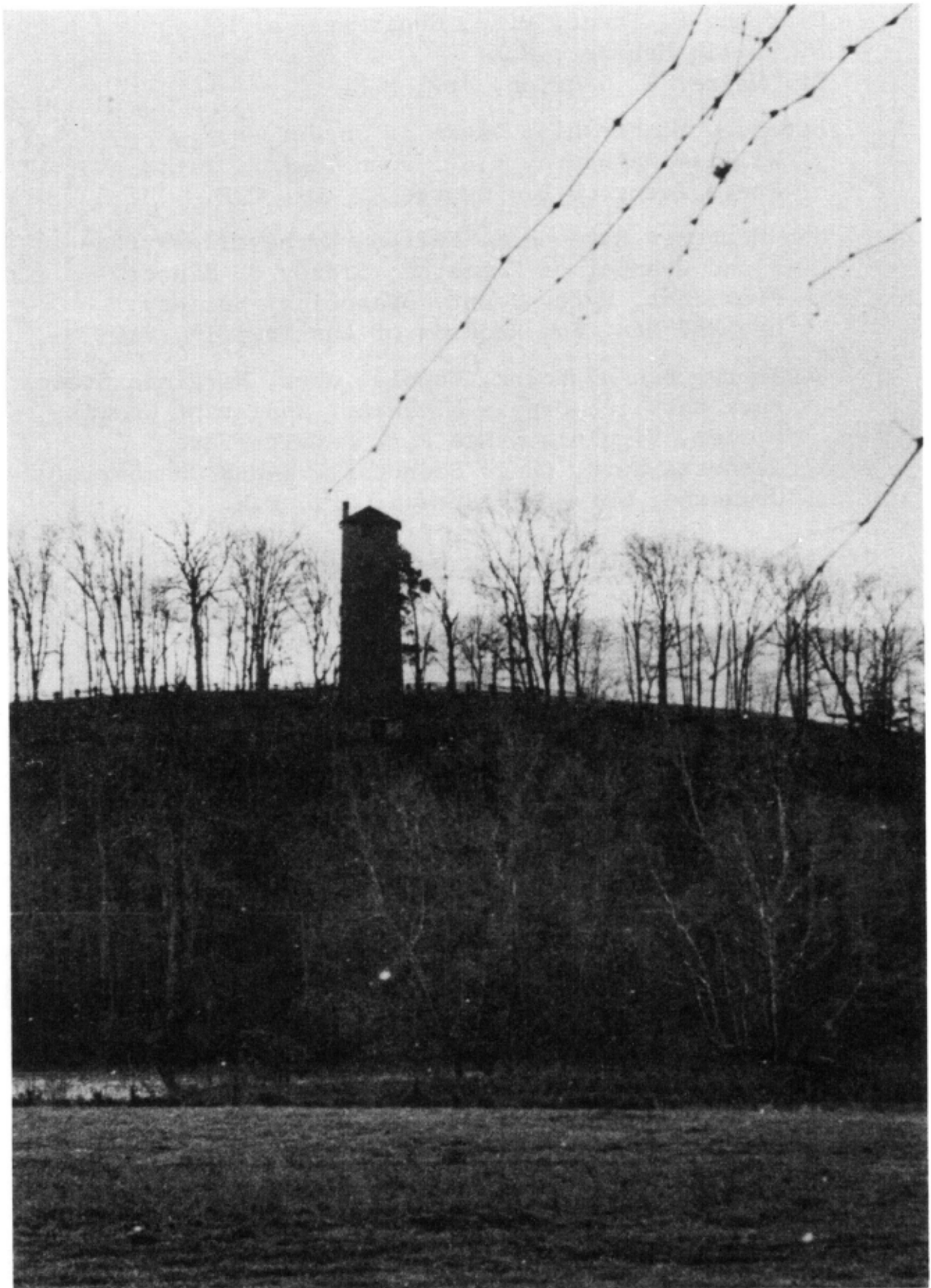
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Credits

Historical research and documentation: C. E. Trent  
Dedication ceremony arrangements: Walter F. O'Brien  
Brochure: Glenn J. Snyder, Ruth Lancaster, Barbara  
Eanes. Photographs courtesy of Thomas M.  
Jackson, Jr., and Dave Dayton.

Back cover photo: North side of shot tower across the  
New River from US 52.



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