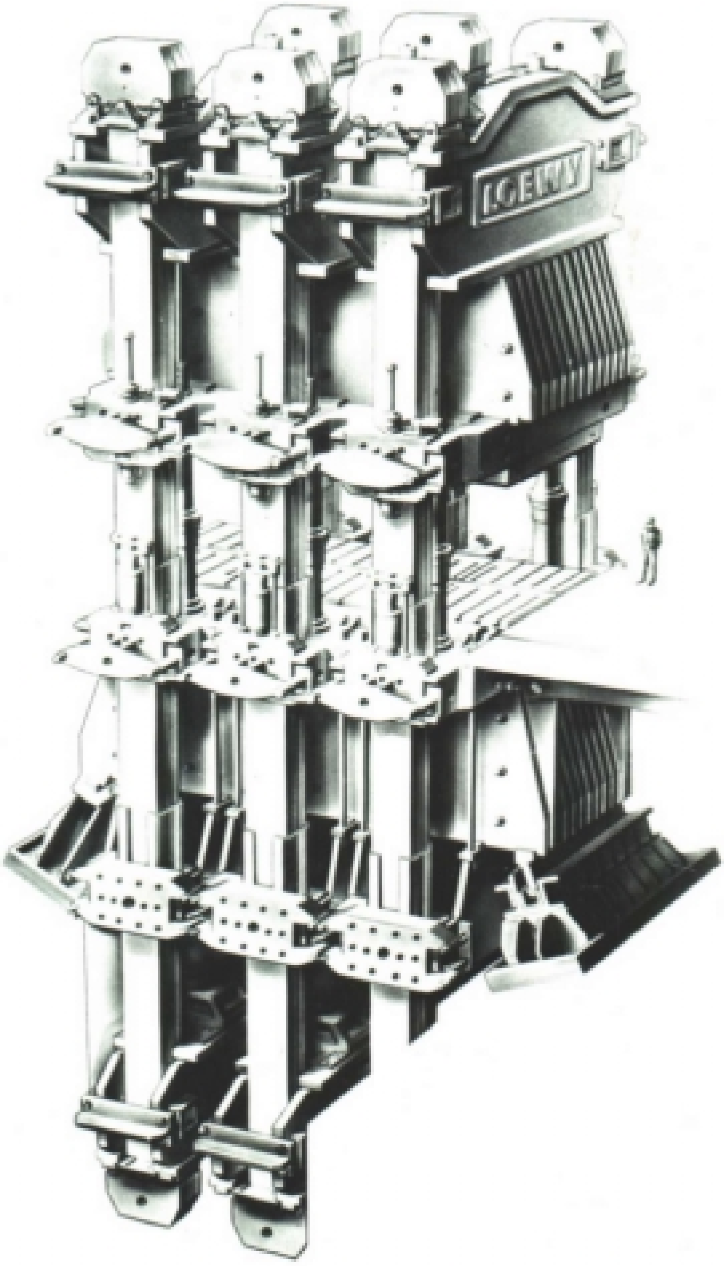
The American Society of Mechanical Engineers Dedicates a National Historic Mechanical Engineering Landmark

The Wyman-Gordon 50,000-Ton Forging Press

Grafton, Massachusetts
Thursday, October 20, 1983



DEDICATION PROGRAM

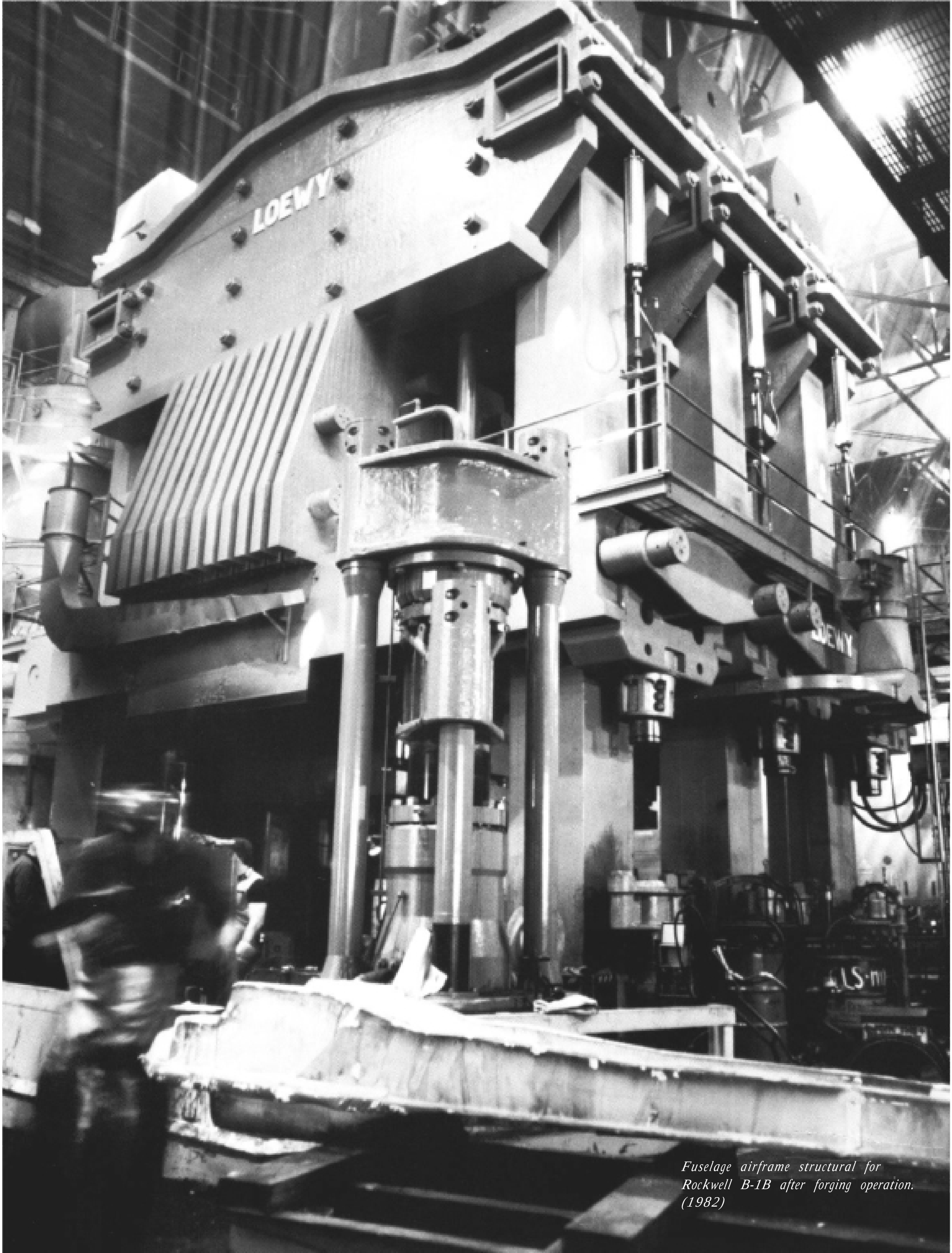
NATIONAL HISTORIC MECHANICAL ENGINEERING LANDMARK
THE WYMAN-GORDON 50,000-TON FORGING PRESS
Thursday, October 20, 1983

4:00 PM	Tour
Welcome	Dr. Ernest Gardow, Vice-President, ASME Region I
Remarks	Charles Innis, Chairman, ASME Worcester Section
ASME Landmark Program	Robert F. Metcalf, Jr., Chairman, Region I History and Heritage Committee
History of the Wyman-Gordon 50,000-Ton Forging Press	John W. Owen, Vice-President, Materiel (Retired), Wyman-Gordon, Eastern Division
Presentation of Plaque	Donald N. Zwiep, Past-President, ASME
Acceptance	J. Richard Bullock, President and Chief Executive Officer, Wyman-Gordon
5:00 PM Adjourn	

NATIONAL HISTORIC
MECHANICAL ENGINEERING LANDMARK
WYMAN-GORDON 50,000-TON FORGING PRESS
1955
NORTH GRAFTON, MASSACHUSETTS

THIS HYDRAULIC CLOSED-DIE PRESS IS AMONG THE LARGEST FABRICATION TOOLS IN THE WORLD. IT HAS HAD A PROFOUND INFLUENCE IN AMERICA'S LEADING ROLE IN COMMERCIAL AIRCRAFT, MILITARY AIRCRAFT AND SPACE TECHNOLOGY. DESIGNED AND BUILT BY LOEWY CONSTRUCTION COMPANY AS PART OF THE UNITED STATES AIR FORCE HEAVY PRESS PROGRAM.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS—1983



Fuselage airframe structural for Rockwell B-1B after forging operation. (1982)

WYMAN-GORDON 50,000-TON FORGING PRESS

It took two wars and a temperamental metal to bring about the need for the gigantic 50,000-ton press nicknamed "The Major."

An early indication that advances were needed in forging technology came during World War II, when examination of captured German planes revealed large forgings of magnesium—forgings much larger than those possible under Allied manufacturing methods.

These forgings from the German aircraft were made of magnesium, a material one-third lighter than aluminum, but a difficult substance to work with. Under the impact of heavy hammers, magnesium tended to rupture; it became apparent that the Germans (who suffered from a shortage of aluminum) made their magnesium forgings with presses larger than any previously thought practical.

The War Production Board took a strong interest in development of similar facilities in the United States. In 1944, it was determined that an 18,000-ton closed-die hydraulic press would be built in North Grafton, Massachusetts. The Mesta Machine Co. of Pittsburgh was contracted to build the press. Wyman-Gordon Company, which had specialized in forgings since its beginning in 1883, was selected to operate the plant.

Wyman-Gordon's new plant, located about five miles away from the main offices in Worcester, was built on a tract of land known as the Bonny Brook Farm. The project was not completed when World War II ended, but work went on; the aircraft industry, it was decided, needed at least one heavy press to continue to carry out research into large forgings.

The Grafton plant was finished in 1946, built completely around the 18,000-ton press, at that time the largest press ever built in this country.

But in Germany, much larger presses had been in operation. This was discovered by a team of experts who went into Germany in the summer of 1945, virtually on the heels of the Allied advance. As had been suspected because of the forgings found in captured aircraft, the Germans had been operating enormous presses: one was a 33,000-ton press, then the largest in the world. This press was claimed by the Soviet Union. The United States was able to dismantle two other 16,500-ton presses and ship them to this country.

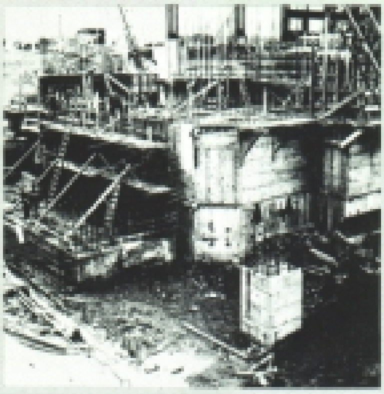
The Germans, incidentally, had not been able to complete the crowning achievement of their forging program—a 55,000-ton press. It was reported that the plans for that press fell into the hands of the Soviets.

In the U.S., two factors soon pushed heavy press production into new realms. First was the growing interest in supersonic aviation: The jet engine and airplane required large components of tremendous strength, but at a minimum of weight. And the rumblings of the Korean War increased interest in development and production of aircraft.

The outgrowth of the need for larger, stronger aircraft parts was the Air Force Heavy Press Program. Air Force Lt. Gen. K. B. Wolfe, one of the team who had visited post-war Germany to inspect the presses, was the originator and prime motivator of the program.

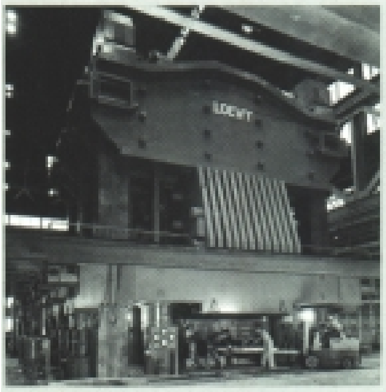
Expansion of the Grafton plant to house the 35,000- and 50,000-ton hydraulic presses took place in 1951, five years after the 18,000-ton press began operation. Above, George Motherwell, vice-president of Wyman-Gordon, breaks ground as George Fuller, former chairman of the Board, and Gen. K. B. Wolf, U. S. Air Force, Wright-Patterson Air Force Base, look on at June 26, 1951 ceremony.

An April 1953 aerial of partially completed 50,000-ton press foundation (center) and excavation and coffer-dam for 35,000-ton press nearby. Forge shop extension (left), pump station (right) under construction.



Lower part of 50,000-ton press foundation, some 100 feet below floor level to bedrock.

Movement of components was a major undertaking.



Aluminum alloy wing spar for Century series fighter was an important early program on the press. (1956)

The final placements under the plan called for two 50,000-ton presses, one at Wyman-Gordon's Grafton plant and the other at Alcoa's plant in Cleveland. Alcoa and Wyman-Gordon would each also gain a 35,000-ton unit under the program.

Ground-breaking for the expanded United States Air Force facility in North Grafton took place in 1951. The building, designed to accommodate the 35,000- and 50,000-ton presses, contained more than 730 railroad cars of reinforcing and structural steel; enough concrete to build 33 miles of highway; a production floor which covers six city blocks.

Upon completion, the expanded plant was self-contained: it had its own engineering and die-sinking departments. Now the plant is one of the largest users of natural gas in New England, and uses enough electricity to meet the needs of 8,000 average Massachusetts households.

Both the 35,000- and 50,000-ton machines were designed and built by the Loewy Construction Company. Operation of the 35,000-ton heavy press began at the North Grafton plant in February of 1955. The 50,000-ton press began turning out forgings in October of that year.

The larger press, often referred to simply as "the 50" was a startling engineering feat — it was, at the time, the largest machine ever built. Foundations go 100 feet into bedrock, which was believed to be the deepest excavation for a machine ever made in the United States. Elevators run from the pits to the working floor of the shop.

Standing ten stories high, the 50,000-ton press is somewhat reminiscent of an iceberg, in that 48 feet are above the shop floor and capable of exerting a pressure of 106 million pounds. The holding platens —which could comfortably accommodate four parked autos—handle dies weighing up to 50 tons per pair. There are 25,000 individual parts to the press, some of which are among the most massive items ever moved by ship and train.

After four years of construction, the machine swung smoothly into operation. The first part forged was a landing gear support rib for a Lockheed Super Star Constellation. The part was superb; the 50,000-ton press had worked perfectly, the first time it was used, and there were no significant adjustments or changes needed.

Wyman-Gordon's 50,000-ton press is, interestingly, controlled by only a handful of people. Most of these workers manipulate the metal in and out of the forge. One operator alone is responsible for controlling the press; with 106 million pounds of pressure at his command, he is sometimes dubbed "the most powerful person in the world."

The Heavy Press Program confirmed that the closed-die forging technique was practical and economical. Heavy presses made it possible to forge extremely large, and complex pieces, pieces essential to modern aircraft design. The equipment also allowed manufacture of large components with exceptionally close tolerances and reduced drafts. Much less machining was required, and the physical properties of the final product were superior. These advantages continue.

Steel alloy in finish forge operation. Shown is spindle, used with box beam in Rockwell's B- 1B. (1983)

Military aircraft components for Rockwell's B- 1B and other programs, have been a continuing part of the 50,000-ton Press's production.

Ironically, physical properties of the forgings were further increased by abandoning magnesium—the metal which prompted development of the heavy press program in the first place—in favor of alloys of aluminum. It was found that two aluminum alloys were better for the process. These alloys, though, were eventually replaced by others, and today the Wyman-Gordon heavy presses forge a variety of alloys, stainless steels, refractory metals and titanium.

The 50,000-ton press has had a significant role in this forging evolution. One of the most dramatic illustrations, as depicted in the cover insets, was in the early 1960's during the development of a new jetliner, the Boeing 747. When bids were solicited for a massive support beam for the main landing gear system, only Wyman-Gordon was able to meet the challenge—perhaps the most difficult production challenge in the company's history.

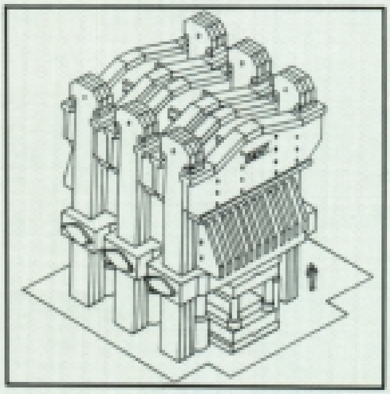
Engineers wanted a forged beam that would save weight and eliminate the need for many assembled components. Using a procedure developed during work on the SST project, Wyman-Gordon produced the largest closed-die titanium forging made anywhere in the world. The beam measured 20 feet long by four feet across. It weighed over 4,000 pounds. Since then, over 2,000 have been produced without a rejection.

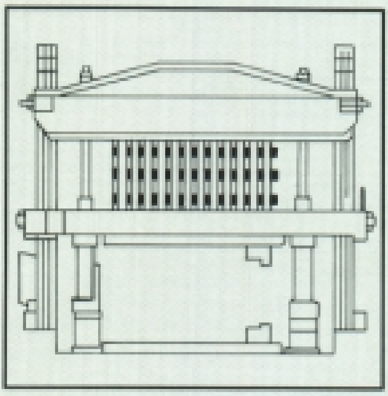
The use of titanium and other sophisticated metals, and the 50,000-ton press, continues today. Still the largest fabrication tool of its type in the United States, the press regularly turns out airframe and structural components in a variety of shapes and sizes, including fuselage bulkheads, wing spars and rotor hubs for helicopters. This versatility enables Wyman-Gordon to serve as one of the nation's largest “job shops” handling the divers and exacting needs of its various customers.

In 1951, Lt. Gen. K. B. Wolfe foresaw the possibilities. “The Heavy Press Program,” he said, “will revolutionize plane making.” It has.

Note: The Grafton plant, including the three heavy presses, was purchased by Wyman-Gordon from the federal government in 1982.

ACKNOWLEDGEMENTS





The ASME Worcester Section gratefully acknowledges the efforts of all who cooperated on the landmark designation of the Wyman-Gordon 50,000-Ton Forging Press.

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THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

The American Society of Mechanical Engineers (ASME) was founded in 1880 as an educational and technical society. ASME has consistently sought to provide an impetus for the continuing professional development of its individual members and advancement of the state-of-the-art of mechanical engineering.

The principal goals and objectives of ASME are:

- To provide a forum for the development, exchange and dissemination of technical information, particularly on mechanical engineering.
- To develop mechanical standards, codes, safety procedures and operating principles for industry.
- To encourage the personal and professional development of practicing and student engineers.
- To aid members of the engineering profession in maintaining a high level of ethical conduct.

The Society consists of more than 105,000 members, of whom between 15,000 and 20,000 are engineering students. ASME members are active in private engineering firms, corporations, academic and government service. A ten-member board governs the Society. Its headquarters are in New York City and it has five field offices: Chicago, Dallas, San Francisco, Danbury, Conn., and Burke, Virginia, plus a government relations office in Washington, D.C.

THE HISTORY AND HERITAGE PROGRAM

The History and Heritage Landmark Program of the ASME began in September 1971. To implement and achieve the goals of the landmark program, ASME formed a History and Heritage Committee, composed of mechanical engineers, historians of technology, and a curator of mechanical engineering from the Smithsonian Institution who serves in an ex-officio capacity. The committee provides a public service by examining, noting, recording, and acknowledging mechanical-engineering achievements that were significant in their time.

The program, as with any study or record of history, illuminates our technological heritage. It also serves to encourage the preservation of the physical remains of historically important works; provides an annotated roster of landmarks for engineers, students, educators, historians and travelers; and calls attention to our industrial past. By dedicating mechanical engineering landmarks, we are establishing presistent reminders of where we have been, where we are and where we are going along the divergent paths of discovery.

WYMAN GORDON

LANDMARK DESIGNATION

Mechanical engineering accomplishments that are proclaimed landmarks fall into three categories: regional, national, and international. International landmarks have been given this status because they represent a technology that has had a broad influence geographically. Such artifacts are designated in the United States as well as in other countries, recognizing either American contributions that have influenced foreign technology or vice versa.

Mechanical engineering landmarks are characterized by being unique, first ever, oldest extant, last surviving examples of once widely-used types of works, or possessing some other important distinction.

The Wyman-Gordon 50,000-Ton Forging Press is the 66th National Landmark since 1973 when the first designation was made. Since then fourteen International Landmarks and six Regional Landmarks have also been recognized by the Society. Each represents a progressive step in the evolution of mechanical engineering and each reflects its influence on society, whether it is of significance in its immediate locale, in the country, or throughout the world. For more information about this and other programs sponsored by the ASME National History and Heritage Committee, please contact the ASME Public Information Department, 345 E. 47th St., New York, NY 10017, (212) 705-7740.