

## Restoring the Statue of Liberty: a monumental job

*Let liberty shine*

The fireworks may be over, but Frederic Auguste Bartholdi's 100-year-old Statue of Liberty continues to stand proud, thanks to the restoration efforts of 500 workers and many donations of materials and expertise by manufacturers.

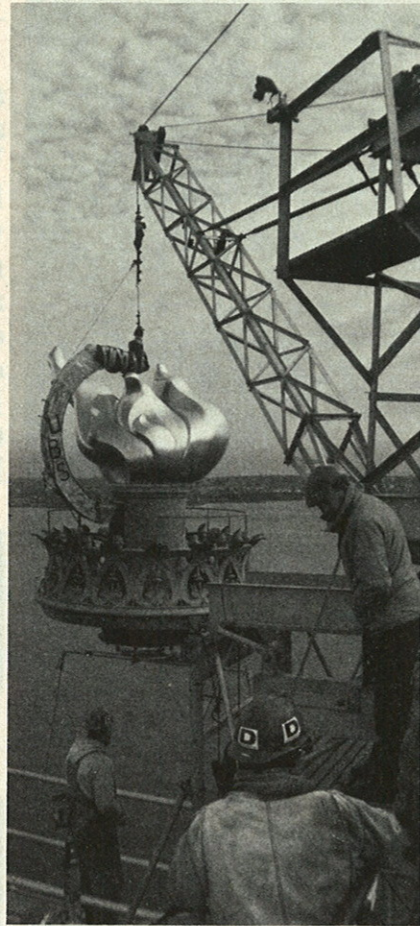
The two-and-a-half-year, \$30 million restoration drew on the talents of contractors from every building union. Many of the workers had parents or grandparents who first saw the statue as they entered New York harbor in search of a new life. For them the job stirred strong emotions.

"I grew up hearing stories about Ellis Island," says Victor Strauss, president of Ben Strauss, Inc., the New York City firm that removed 100 years of paint and coal tar from the interior of the statue. "My mother, who was nine when she arrived, had a cough and was afraid she'd be considered tubercular and sent back. My father was 20 and remembers the sight of the statue after so many days of ocean."

Although he has done many other big jobs—removing paint from bridges, hotels and Yankee Stadium—nothing, Strauss says, "can compare with the work on the Statue of Liberty."

Peter Lehrer, president of Lehrer/McGovern, Inc., the New York City construction management and consulting firm that served as general contractor, also had an emotional involvement. His father left Austria as a teenager, landing at Ellis Island on his 19th birthday.

Many of the crew members have similar stories. "Most of the workers are immigrants or children of immigrants and when you go on site you sense their excitement," says a Lehrer/McGovern spokesperson.



The newly constructed torch, with gold leaf flame, was placed on the statue's upraised arm on November 25, 1985.

"I think everyone involved feels a true sense of pride," adds Gene McGovern, Lehrer/McGovern executive vice president and director of operations.

Part of the pride may be attributed to solving technical challenges of the restoration. The job involved a blend of age-old crafts with space-age technology and even invention of new tools.

Among the specific challenges: Repairing a copper skin as thin as a penny—and doing it so no seams would show and the color of the new sections would match the 100-year-old patina.

Creating a new torch and flame by hand from 100-year-old drawings.

Applying the ancient art of 24-carat gold leafing on the flame.

Constructing a 305-foot free-standing scaffolding, the world's largest.

Replacing the statue's 1,700 interior support ribs 12 at a time.

Finding a paint remover strong enough to remove 98 years of paint and coal tar from inside the statue, but mild enough not to damage the thin copper "skin." (Crushed walnut shells and liquid nitrogen removed the paint. The tar was bombarded with baking soda.)

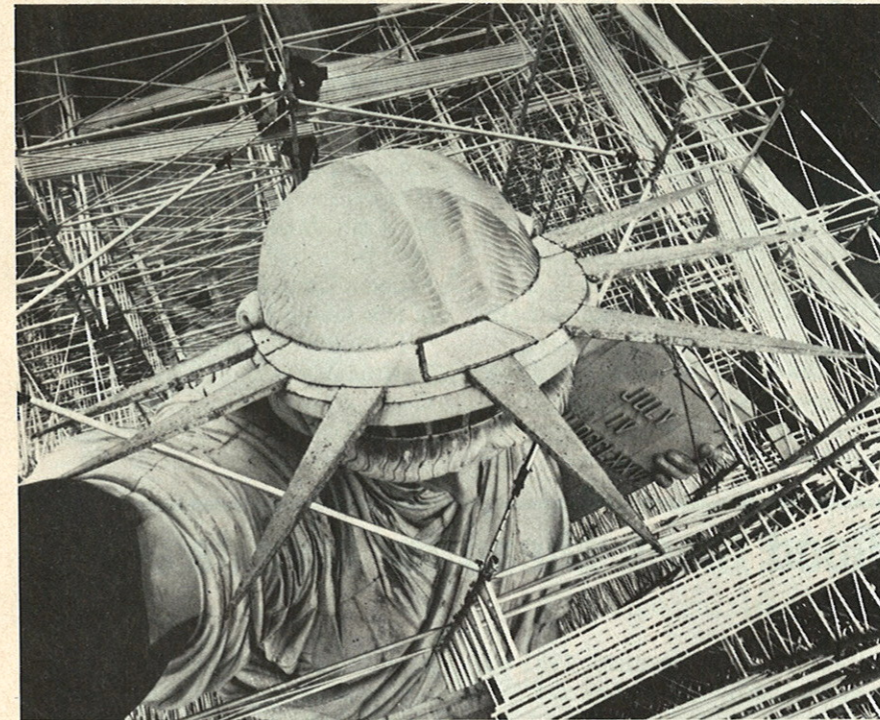
Coordinating the work that went on around the clock for two years.

Working on an isolated island where access is determined by the tides.

And, finally, doing the job with the whole world watching.

Lehrer/McGovern began the project in January 1984 by building a dock to receive materials transported by barge. Then Universal Builder's Supply, Inc., constructed the \$2 million scaffolding. Standing 18 inches from the statue but never touching it, the scaffolding is anchored only at the base yet is built to withstand hurricane force winds.

On July 4, 1984, the monumental torch and flame, corroded beyond repair, were lowered from the statue's arm. A team of French artisans from Les Metalliers Champenois, Reims, began duplicating them by hand-hammering. Sculpting the flame was



The world's highest and most expensive scaffold surrounded the Statue of Liberty for 20 months while 500 workers restored the statue.

the hardest part, says Jean Wiart, who headed the group. "Copying is always more difficult than creating an original. And we had to constantly refine our work until there was no doubt that it mirrored Bartholdi's genius."

Another French company, Robert Gohard Etablissements, then gilded the flame, donating both their expertise and materials. After applying four layers of organic lacquer to waterproof the structure and increase its corrosion resistance, and a final lacquer to provide a tacky surface, they applied the gold leaf with tweezers—completing a few square inches at a time.

The new flame is not illuminated from within as before. Instead, it glitters in the sunlight and is lighted at night by incandescent lamps at the base of the statue and lamps mounted on the torch.

General Electric contributed the lights for the restoration, including two specially developed lamps and a new reflector. One lamp projects a cool white light emphasizing the folds and shadows of Liberty's robe. The other projects a warmer light complementing the green patina of the copper. The result is that the color of the statue looks the same day and night.

Parts of the statue's copper skin—especially the nose, eyes, some of the curls of hair and the left shoulder—were badly corroded and needed replacement. Copper specialist Joseph Fiebiger, president of P.A. Fiebiger, New York City, combined space-age materials with techniques he had learned from his grandfather to create molds of the eroded areas, inset the new copper and chemically induce a patina to match that of the rest of the statue.

Fiebiger also worked with NAB Construction, New York City, to replace most of the 1,700 iron ribs of the interior web-like system that supports the statue. To maintain proper support, no more than 12 could be removed at a time.

Once removed, the ribs were taken to specially constructed workshops on Liberty Island and in New York City, where they were duplicated in stainless steel and imprinted with an identification number. At the end of the day the bars were sent to a laboratory in New York City where they were bathed in nitric acid to remove impurities that could invite rust. The next morning they were shipped back to the island to be installed so that 12 more could be removed.

Another complex interior job was removing 98 years of paint, dirt and coal tar from the inside of the copper skin. The job was made more difficult by the small work space and the prohibition against use of harsh chemicals that might cause an explosion or damage the thin copper skin.

After considerable experimentation, Victor Strauss came up with the idea of using sodium nitrate to remove the tar and invented a tool that would blast and vacuum at the same time. This cut down on dust and increased visibility. It is a technique he plans to use on other restoration projects.

Underground work included removing 17 feet of concrete beneath the base of the statue so crews could drill the shaft for a new 90-foot elevator, the largest hydraulic lift of its type in the United States.

The circular stairway leading to the crown was revamped with railings and new rest platforms. As visitors climb the stairs they can view the new armature work and restored copper interior—all highlighted by new internal lighting.

*Katrina R. Mason, Design Editor*