

The USS *Maine* inadvertently helped usher the United States onto the world stage.

## The Corps and the Cofferdam: Raising the USS *Maine*

**T**HE USS *MAINE* WAS ALWAYS something of a cursed vessel. According to *How the Battleship Maine was Destroyed*, by U.S. Navy Adm. Hyman G. Rickover (published by the Navy's Naval History Division in 1976), the battleship “had caught fire while under construction; it had run aground in February, 1896; five men were washed overboard off Cape Hatteras [North Carolina] on February 6, 1897 (only two were recovered); and two men were injured two days later when a piece of ammunition exploded.”

But its date with history—the dramatic and, for decades, mysterious explosion that sank the ship in Havana Harbor in 1898, killing 266—not only launched the Spanish-American War but proved to be the decisive transition from the U.S. conquest and settlement of its own frontier to its emergence as a world power.

What is as remarkable as the story of what sent the *Maine* to the bottom of Havana Harbor is how a team of Army engineers, more than a decade later, managed to raise the wreck back to the surface.

In 1886, Congress authorized construction of the *Maine*, and the 319 ft long ship was built between 1888 and 1895. The lengthy construction time, Rickover wrote, was emblematic of how far American naval prowess had fallen in the decades after the Civil War. Changes in armor and challenges in executing the engine—the “first vertical, inverted, three-cylinder, triple-expansion engines built for the Navy”—meant the ship was already a second-rate vessel by the time it set sail, according to a 1914 congressional report authored by

Col. Edward Burr, then the acting chief of engineers for the U.S. Army Corps of Engineers (*Final Report on Removing Wreck of Battleship Maine from Harbor of Habana, Cuba*).

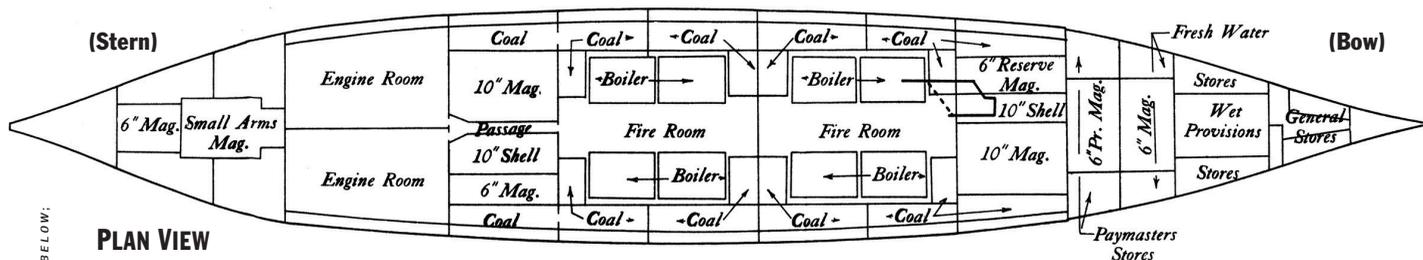
Still, the *Maine* was well armed, including four 10 in. guns, six 6 in. guns, and torpedo tubes—and it was deemed sufficient to safeguard American interests in Cuba.

The people of Cuba, approximately 90 mi off the coast of Florida, had been rebelling against Spanish control for decades. After a Cuban revolt against the Spanish broke out in 1895, the United States debated whether to stay neutral or pursue a more interventionist role. America was hardly a disinterested party; it had offered to buy Cuba from Spain as early as 1848, and it developed significant business ties with the island, especially around sugar, in the ensuing decades.

As tensions built, the *Maine* was made ready to be deployed to Cuba by October 1897 and had been dispatched to the Naval station at Key West, Florida, in December. There were risks if the ship were sent to Havana. “A ship might well have a calming effect and protect American lives,” Rickover wrote. “On the other hand, [Spanish ambassador Enrique] Dupuy [de Lôme] had just warned that Spain would regard the presence of an American Naval vessel as a dangerous and unfriendly act.”

President William McKinley urged Spain to end hostilities with Cuba—otherwise the Americans would be forced to act.

Soon after Spanish residents rioted in Havana on January 12, 1898, McKinley dispatched the *Maine* to Cuba, where the battleship entered Havana Harbor on January 25 with a



**PLAN VIEW  
OF THE USS MAINE**

crew of about 350. A tense few weeks followed, but the Navy wasn't planning to keep the ship there indefinitely; the *Maine*, according to Rickover, was scheduled to depart for New Orleans by February 17.

Still, the ship's captain, Charles Sigsbee, took care to secure his ship: no visitors were allowed to wander the ship unescorted, Rickover wrote, and no small vessels were allowed to approach without being challenged. "Marines carried small arms ammunition in their belt."

On the night of February 15, around 9:40, a massive ex-

plosion sank the ship. According to Rickover, the wreckage rested upright at the bottom of the harbor. "The stern superstructure was above the water and the mainmast was upright and nearly vertical; amidships the vessel was a shambles of twisted wreckage; of the forward part of the battleship—about a third of its length—nothing remained above the water except a few jagged pieces of metal," he wrote.

Rickover added that "parts of bodies were still drifting ashore. From the moment of the explosion, Spanish and Cubans had risked their lives to pick up survivors; these were being cared for at hospitals."

At once, debate brewed in Washington over whether the explosion was internal—likely an accident—or external—likely an act of war. Both the United States and Spain conducted their own investigations into the explosions. The Navy's court of inquiry, headed by Capt. William Sampson, found that the *Maine* had been rocked by two explosions. "The first had sounded like a gunshot; it lifted the forward part of the ship and forced the keel into the inverted V and some of the bottom plates upward," wrote Rickover in summarizing the report issued in March 1898. The court concluded the explosion was caused by a mine under the ship's port side. The first explosion caused a second, setting off one of the vessel's magazines where ammunition was stored.

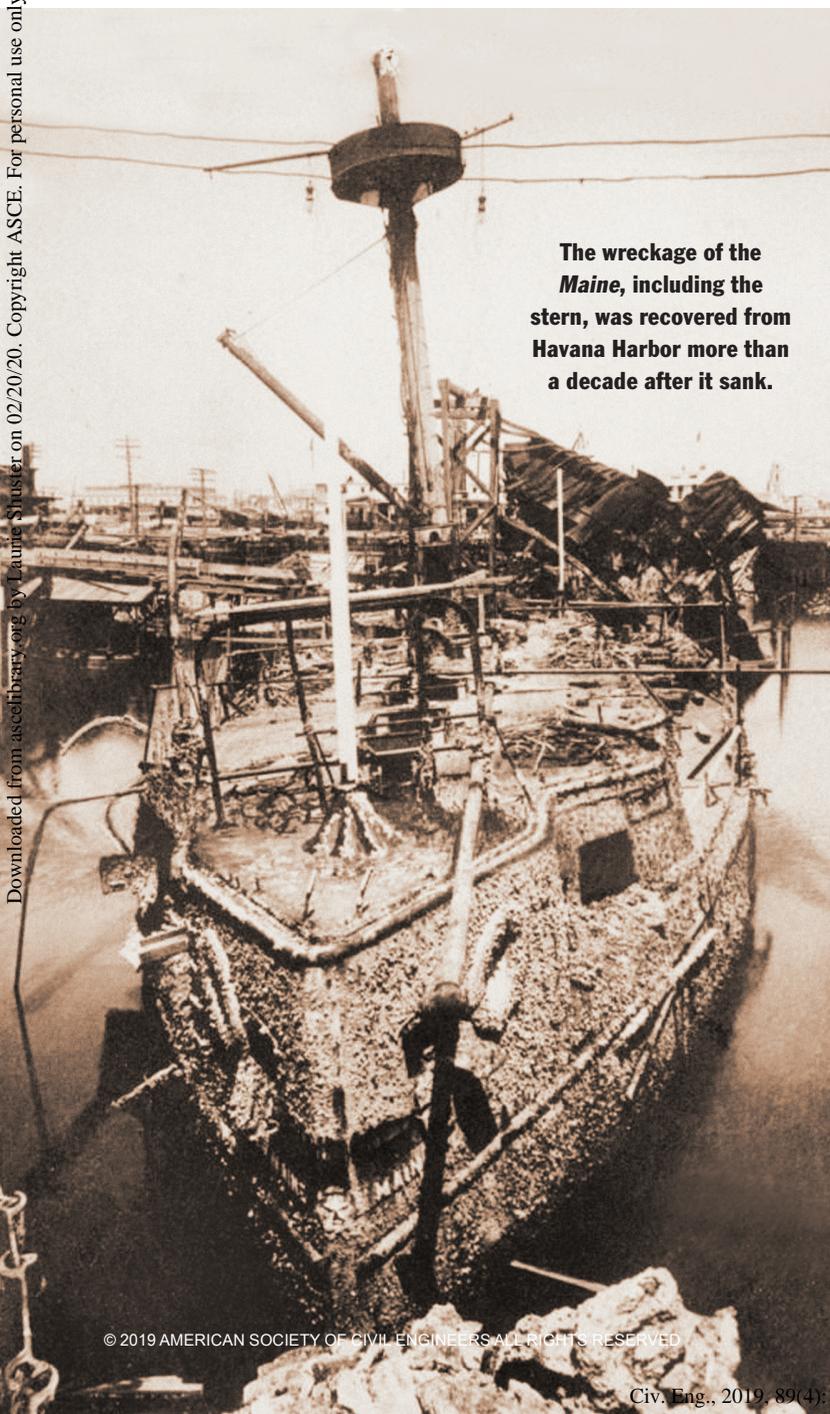
While the report assigned no responsibility, U.S. leaders were drawing closer to war. They might have been egged on by *New York Journal* publisher William Randolph Hearst, who tried to sensationalize the brewing conflict, placing blame for the disaster squarely on Spain in an effort to win a circulation battle with Joseph Pulitzer's *New York World*, facts be damned, a prime example of what came to be known as yellow journalism.

The Spanish inquiry disputed the assertion that a mine had blown up the *Maine*, noting that no mines had ever caused a ship's magazine to explode. But it was too late. On April 19, Congress passed a joint resolution recognizing Cuban independence (but not the Cuban government), Rickover wrote. Diplomatic relations between Spain and the United States ended two days later, and Congress declared war on Spain on April 25.

The Spanish-American War lasted only a few months; fewer than 400 Americans died. At the end of the war, Spain gave up control of Cuba and relinquished other territories to the United States, including Puerto Rico and the Philippines.

But the fate of the ship and much of its crew remained unresolved.

**The wreckage of the *Maine*, including the stern, was recovered from Havana Harbor more than a decade after it sank.**



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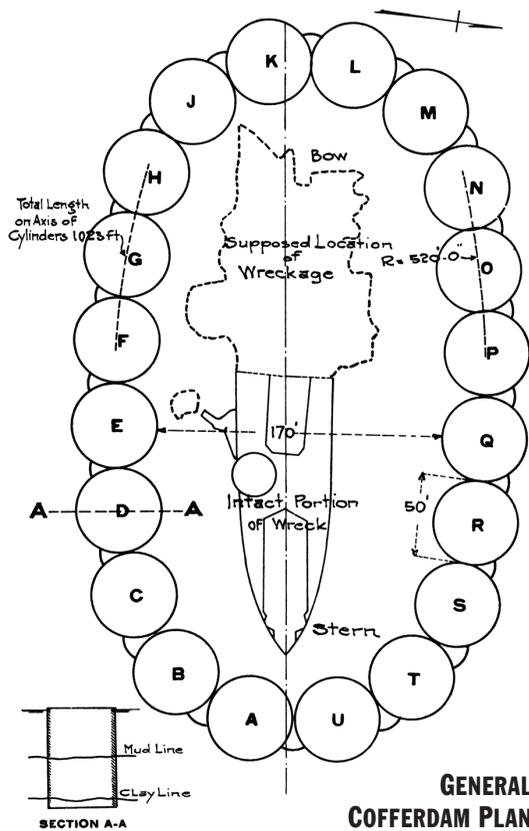
Though divers had tried to salvage part of the wreck and recover bodies, it wasn't until 1910 that Congress appropriated funds for the ship's removal, according to Burr's report. The work was overseen by a trio of officers in the U.S. Army Corps of Engineers: Col. W. M. Black, Lt. Col. Mason M. Patrick, and Maj. H. B. Ferguson.

The engineers planned to construct an interlocking circular cofferdam around the wreckage—about 350 by 170 ft—driven 38 ft into the harbor floor, according to Rickover. To find the right combination of strength and ease of construction and dismantling, they settled on a plan to build 20 cylinders, each with a 50 ft diameter, made of interlocking steel sheet piles and set nearly tangentially to one another. These would enclose the wreck site in an oval shape. The cylinders would be connected by “short arcs” with three-way piles in each, according to the report. The Cuban government loaned the operation a 50-ton floating derrick, a pile driver, and several barges. But other floating gear had to be brought by the U.S. Navy and overhauled for the work at hand.

The center of each cylinder was marked with a wooden pile, which was attached to a circular form that the steel piles would be placed around, Burr noted. But the first cylinders showed considerable movement due to waves, so “full circular forms, made of comparatively light material, had to be built and placed inside these finished cylinders.”

The work was difficult; strong winds buffeted the piles, bending them and, on one occasion, knocking them out of plumb. In total, about 3,200 piles were driven in the cylinders and the connecting arcs over the course of four months between December 1910 and March 1911.

A nearby shoal composed of heavy clay was used to backfill the cylinders; 70,000 cu yd was needed. Engineers realized the fill could dry and harden only as the water level within the cofferdam was lowered, so the water level was lowered in stages until the fill in the cylinder fully consolidated.



**The stern mast of the *Maine* was recovered and used in a memorial at Arlington National Cemetery to honor sailors who died when the ship exploded in 1898.**



Further, the fill from the inner half of each cylinder was removed and placed atop the outer half. This was done for two reasons, according to Burr's report. The fill was expected to settle as the water drained; placing the fill on the outer half would compensate for shrinkage. It would also lessen “the bursting pressure on the inner parts of the cylinders from which the opposing water pressure would be removed as the dam was unwatered.”

At first the cylinders showed no movement or deformation. But by mid-June the tops of the cylinders had begun to tilt inward toward each other. The movement was not uniform. To correct this, 14,900 cu yd of stone was placed on the inner portions of the cylinders. But the cylinders continued moving, so engineers installed rakers that would halt the inward

tilt of the cylinders.

As expected, Burr wrote, “the internal pressure, due to the filling of the cylinders, would tighten the piling in the interlocks and practically close all these joints so that the leakage through them would be very small.”

Once the cofferdam was stabilized, pumps began to dewater the wreck site. Approximately 5,300 cu yd of mud was also removed, some by pumps and some by shoveling the upper decks of the wreck and then, as Burr's report noted, “sluicing into the space between the ship and the cylinders.”

With the cofferdam in place and the wreck site dewatered, recovery crews turned to clearing mud from the wreck site. Bodies were removed to be properly interred at Arlington National Cemetery, and the ship's stern mast was also recovered and eventually became part of a memorial at the cemetery.

As for the ship itself, workers found a metal husk encrusted with shells and similar marine growth, but the plating of the ship was in



**A cofferdam consisting of 20 interlocking cylinders, each 50 ft in diameter, surrounded the wreck site so that the *Maine* could be recovered.**

good shape, and the coal still onboard was also in “excellent condition.”

After pieces of wreckage were cut up using oxy-acetylene torches and removed, the portion of the ship left intact was prepared to be floated by building a system of bulkheads around it. This was, Burr wrote, composed of 3 in. plank “placed vertically and supported against 10 by 10 inch horizontal timbers (spaced to suit the water pressures), which were in turn backed by 10 by 10 inch verticals, spaced from 3 to 5 feet centers and braced to the framing of the ship, to the adjacent boilers, and to such other points as would afford good support.”

Weak points of the wooden armature were supported, he wrote, “by concrete or cement mortar, and especial care was taken to make water-tight all joints between the planking and the ship.” Gradually, water was reintroduced into the wreck site, raising the wreckage and allowing it to be towed out of the harbor, where it was sunk for good on March 16, 1912.

The cofferdam was removed, and later that year the harbor itself was dredged to a depth of 37 ft to remove any remaining debris.

At the same time that the engineers were planning to raise the remains of the battleship, Congress authorized a new examination into the mysterious explosion. Rickover wrote that the 1911 board of inspection, headed by Rear Adm. Charles E. Vreeland, was more technically competent than the Sampson-led court of inquiry, which had not relied on any technical experts. Still, the 1911 report also concluded that the destruction of the *Maine* was caused by a mine placed under the ship that ignited the 6 in. reserve magazine on the ship’s port side, exploding between 10,000 and 20,000 lb of gun powder.

In 1975 the Navy commissioned a new report by Ib Hansen, an engineer with the Navy’s Naval Ship Research and Development Center, and Robert Price, a Navy physicist,

who studied the physical pieces of the wreckage and reviewed witness statements. (The 1975 report is included as an appendix in Rickover’s book.)

Hansen and Price concluded that the 1898 report’s claim of two explosions was likely erroneous. “Witnesses probably heard the sound from one explosion, transmitted first through water, then later through air.”

Further, this report contended that the mines available in the late 1800s would be incapable of igniting the ship’s magazines if “they exploded on the harbor bottom or against the ship side.”

That left internal causes. Hansen and Price considered several, including sabotage by the crew, a small arms accident, and a bomb planted by a visitor. They concluded the most likely cause was a fire in a bunker adjacent to the 6 in. reserve magazine on the ship’s port side. “Frequent bunker fires did occur on warships of that period,” they wrote. Additionally, the type of bituminous coal on board the adjacent bunker was known to have caused spontaneous fires.

There were skeptics who might have drawn a similar conclusion in 1898; it’s difficult to speculate how America’s fortunes might have turned if the initial inquiry had been more dispassionate. Nevertheless, as Rickover points out, the destruction of the *Maine* was a turning point in American history. In 110 short days, Cuba proclaimed independence from Spain, Puerto Rico became an American possession, and the United States annexed Hawaii and acquired the Philippines from Spain. In short, the United States emerged as a world power. —T.R. WITCHER



*T.R. Witcher is a contributing editor to Civil Engineering.*