

TO THE NEW YORK TIMES
VIA THE NEW YORK TIMES WASHINGTON BUREAU
FROM ROBERT THRUMBULL

REPAIR: III

PEARL HARBOR, Dec. 18 (Passed by naval censor)---Pearl Harbor's engineers made salvage history when they raised the sunken battleship Nevada, first of five front-line fleet units put on the bottom by the Japanese Dec. 7, 1941. But this feat, tremendous as it was, stands today as a mere warm-up for the second round, which was the raising of the USS California.

This monster's 32,600 tons of steel were rent by bombs and torpedoes, and left in 40 feet of water as scrap iron bound together in a shape resembling a battleship. The upper decks, portions of which had been burned out by raging fires, were regarded by now as routine damage. A wedgeshaped hole near the water-line and toward the bow was ugly evidence of what a bomb can do when it misses---but closely.

An uneven slash made by a torpedo could be disregarded as a cut susceptible to first aid, in comparison to the major surgery required to renew the section blasted out below.

This huge gash was 40 feet long, and in some places the torpedo's explosion had torn out the ship's tortured side to depths as great as 10 feet. It was not possible to seal off this gaping wound from the inside by closing watertight compartments, as had been done with the Nevada's punctures.

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A further complication was the immense weight of the sea that lay over her decks. The topside breaches which let water in would have to be closed before the hull could be pumped free of the sea already inside, and the ship brought up through the blanket of water that held her down.

Again the engineers turned to the cofferdam to solve their problems. This time they worked out an amazing modification of the cofferdam principle.

Since the first problem was water over the California rather than water inside her, they made the cofferdams literally an upward extension of her hull. In effect, then, this cofferdam was a strong board fence of four-inch planks with steel angle-irons, attached by anchoring devices to the California's sheer line. There were two of these fencing arrangements, one going about the entire after part of the ship, the other sealing the forecastle.

Erection of these wooden walls posed their own difficulties. First, the wooden section had to be pushed down into the water against the strong upward force of its own buoyancy; then, it had to be held down until it was attached to the ship. That accomplished, the engineers foresaw that once the balancing pressure of the water above decks and inside the fence were removed, the sea outside would push down the timbers like a flood flattening grass, in the anxiety of water to seek its own level.

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The answer to this was a network of immense timber bracing that formed almost another deck above the hull, and connecting to it.

The pumping that followed had a dual benefit, not only easing the weight from on top of the California, but also laying bare her topside wounds.

Now it was found that, the superstructural cofferdam working so well, it would be necessary only to pump out the inside water to get buoyancy, once the hull was whole. So the deck damage was left with safety for drydock, and the diving crews turned to the holes below the normal waterline.

Once more, the cofferdam principle was utilized, this time with profit from the modification tried but found wanting on the Nevada.

Individual cofferdams to close off each hole were constructed to lie over the gaping wounds like giant poultices. These patches were constructed of four-inch planks bound together by massive 10 by 12 timbers and steel angle irons. Each cofferdam was 16 feet wide, and shaped to cover the entire depth of a hull section. The bottom was cupped so as to grip the vessel underneath the bilge line, 20 to 30 feet below the water level. The cup, or hook, in which the lower end of the patch was shaped, would adhere to the hull below the opening it was to protect. The top of the patch extended above water--- the ship still being on the bottom---and the entire wooden

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bandage was sealed at the bottom and sides.

Admiral Furlong described the ingenious sealing method as borrowed from the Mason jar rubber gasket principle. Long, slim stockings of canvas were stuffed with oakum until they resembled Brobdinghagian sausages. These were attached to the patch around its entire circumference, as the rubber ring is attached to the glass jar---though, in this comparison one must imagine the rubber ring as attached to the lid rather than to the jar.

When the patch was bolted to the side of the ship, its great weight pressed on the sausage and sealed out the water. Because of the oakum-stuffed stocking's malleability, in which its value lay, the device was called a "pudding".

Carpenters labored long to build the great patches at the yard's coal docks. When they were ready, floating cranes picked up the heavy structures and carried them to the California. Lowering them into position against the torn hull offered again the problem of forcing wood straight down into the sea and making it stay there, when by all the laws of physics it wants to float. This was easily solved by attaching lead blocks to the bottom of the patch by a steel framework. In place, these weights exerted a downward pull on the patch of some 21 tons.

With the patch finally in the position painstakingly

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charted, it was necessary to bolt them into place so that they would not fall off. Again, the divers descended with their underwater cutting tools. They burned away the ragged steel skin around the punctures, then drilled holes into the ship's side to correspond with similar holes already in the patch. Then, giant steel bolts were lowered and threaded through.

The last step was for the divers to go inside the ship, sometimes picking their way through the shambles between decks and occasionally entering through the same hole that was being patched. Inside, they threaded nuts onto the in-board ends of the bolts, and made them fast. Now, at last, the California could be called "patched".

A paradoxical problem was involved in pumping out the interior water. As the patches were bolted from inside so they would not fall outward, they also had to be braced from inside so that, when the balancing pressure inside was removed by pumping out the water, the weight of the ocean outside would not stove them in. So down went the divers again, with the most burdensome impedimenta yet of timbers, immense metal bars, tools and machinery.

With weight on her top---her great cage mast, guns, and deck structures---long since removed, the California was ready for the pumps. This operation was a more delicate problem than it was on the Nevada, for the California lay on an uneven

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and irresponsible bottom. With all the care that was taken, several times she listed precariously as the water's weight was eased. On one alarming occasion, she tipped 20 degrees.

It took four months to get the California into drydock. During this time, bargeload after bargeload of miscellaneous material was carried away, much of it reclaimable.

Great vats of caustic fluid stood on the deck, which was now relatively neat, for the endless dipping of oil-coated machinery. Every sort of engine aboard, down to the smallest electric fan, had to be cleaned of oil, dipped, and scraped. The oil was a blessing in one sense, for it preserved metal that otherwise would have corroded beyond repair.

The secrets of Pearl Harbor are, in general, well kept by her army of workmen, both civilian and sailor. But one day in April, 1942, hundreds of men, bluejackets and civilian artisans, found excuse to be around the drydock--- and cheer the California into port. It was a proud day at Pearl Harbor for all hands.

With the California perched on keel blocks, the detailed work of cleaning her out, the time-consuming labor of refurnishing the most complex war machine man has devised, was still to begin.

It was by wise design that the yard organization had brought the Nevada in first, for the California had one essential difference in construction that enormously complicated

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the final stage of her reclamation.

She had turbo-electric engines, instead of steam turbines like the Nevada, which were comparatively simple to recondition. The circumstance of her having turbo-electric engines lengthened the normally laborious job of re-wiring the entire ship.

The cosmic housecleaning to follow now would engage as many as 2,000 men at one time. The foul corruption they were to encounter as they labored day and night was enough to make each of them think the California was his private hell.

Eventually, the USS California sailed for the States, and final fitting out for the trip back to the fighting fleet of the Pacific.