ENGINEERING

Breaking Point of Ships Is Learned Through Actual Tests

Old Destroyers, on Way to Scrap Heap, Made to Yield Information Valuable to Proper Design of Future Vessels

USUALLY a naval vessel to be junked is simply torn up into scrap iron—and that's the end of her.

But not so with the U. S. S. Preston and Bruce, two wartime destroyers that have reached the end of their useful life and are eventually to go into the scrap heap at the Norfolk Navy Yard. Before being completely destroyed these vessels were made to yield information about the strength of their steel beams and plates that should be of great value to designers of ships of the future.

"These tests are significant," it is explained by Lieutenant-Commander C. O. Kell of the Navy Department's Bureau of Construction and Repair, "in that it is the first time that the ultimate strength of full-sized ships has been scientifically determined. A great amount of data was obtained which will make possible the design of better ships and the design of ships' hulls of given strength of minimum weight.

"It is not intended that the information and data obtained be considered as at all military, and therefore confidential, but rather that it be made available for study by all with the hope that it may be of the greatest possible constructive benefit to the science of naval architecture."

With Commander Kell in charge both vessels were first drydocked. The Preston was then firmly supported on two cylindrical steel beams driven through the ship near each end and the wood blocks beneath the vessel were pulled out. Then her hold was heavily loaded with water ballast and huge steel chains. Two hundred and twenty tons of this weight were added to the ship, the previous displacement of which was 992 tons.

While the water was high in the drydock the destroyer almost floated and did not feel the additional 220 tons weight. But when the water was gradually pumped out the additional weight bore down heavily amidships and strained the ship's structure as though she were on the crests of two huge waves with a trough beneath her center. The water was pumped down six times; each time to a new low level, which increased the strain on the vessel until she finally cracked in the middle and dropped two feet nearer the bottom of the drydock.

Every time the water was lowered, strains in the steel of the boat were accurately measured at 275 different points and continuous records of the minute elongations and compressions of important beams were made automatically on rolls of paper. The testing was observed by Dr. L. B. Tuckerman, of the U. S. Bureau of Standards, an expert on the strength of materials.

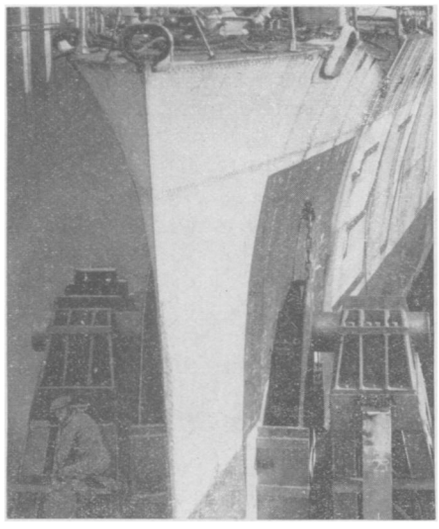
While the Preston received a "sagging" test, the Bruce was given a "hogging" test. The Bruce was supported amidships on two beams only 25 feet apart so that her bow and stern rose clear of the bottom of the drydock. The fury of a storm would deal with a vessel in this fashion by balancing her precariously on top of a wave, leaving the bow and stern almost out of the water. Six hundred and eighteen tons of iron weights were divided between the bow and stern. The water in the drydock was then gradually lowered and tests made until the vessel could no longer hold the weight and cracked amidships.

These tests should enable naval architects to design fighting vessel hulls at a saving in weight over present specifications, and yet make them sufficiently strong. The necessity for this is explained by Captain H. S. Howard, of the Bureau of Construction and Repair, who says:

Reduce Weight in Hull

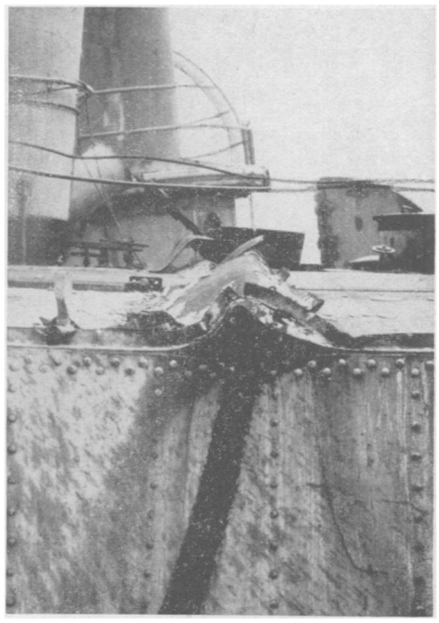
"It is possible to make ships so heavy and strong that failure would be practically out of the question. However, if excess weight for strength be worked into the hull of a ship, the amount of weight available for other qualities will be correspondingly reduced, and the military features of the ship will suffer.

"Since the coming into effect of the Washington and London treaties, it has become more important than ever to use no more weight in the hull of a ship than is absolutely necessary to insure adequate strength. By these treaties all modern naval vessels were designed within certain fixed displacements. It has become imperative, therefore, that the hull and machinery weights be kept to a minimum so that maximum weight may be used for the armament, speed and protection."



PIERCED THROUGH

That is what was done to the ends of the U S.S. Preston when the steel beam was inserted to hold her up as the water was pumped from around her.



WHAT HAPPENED

When the weights were applied to the middle of the destroyer Preston this break occurred on the deck and side.