SOUTHERN AREA

Following the inaugural meetings for the formation of this Branch held last year, and referred to in the Annual Report of Council, 1946, the first technical meeting was held at the University College, Southampton, on Saturday, March 1, 1947, and was attended by some 60 Members.

In the unavoidable absence of the President, Sir John E. Thornycroft, K.B.E., the chair was taken by Engineer-Commander W. A. Graham, O.B.E., R.N.R., I.Mar.E., Vice-President of the Branch. Supporting him was Mr. K. C. Barnaby, O.B.E., B.Sc., Vice-President. The meeting was warmly welcomed by Professor T. R. Cave-Browne-Cave, who kindly invited the Branch to arrange further meetings at the college as required.

A lecture was then given entitled:

MODEL EXPERIMENTS AND THEIR RELATION TO SHIP DESIGN

by Mr. R. W. L. Gawn, R.C.N.C.

(Vice-President, Joint Junior Branch)

of which the following is a summary.

The lecturer reminded his audience that the subject covered a wide field and that his aim was to bring out a few general points to indicate the scope and achievement of model experiments.

Great impetus was given to the movement towards scientific shipbuilding in the last century by the work of William Froude in the inception of model experiments. Prior to this shipbuilding was a graceful and skilful art. Resistance of ships was one of the most backward of the many facets of that art.

Froude's proposals for model experiments were strongly criticized, but he was supported by the Admiralty, who established the Admiralty Experiment Works at Torquay in 1872—the first experiment tank in the world. The work bore remarkable fruit in improving designs of ships and propellers. It cleared the way for building economical ships of large beam, thereby contributing to safety at sea. Nowadays there are upwards of fifty experiment tanks throughout the world, truly a wonderful harvest from such a tiny seed.

The site of the Admiralty Experiment Works was transferred to Haslar in 1887. The experiment tank was originally intended to deal with resistance and propulsion of ships only. This work has expanded considerably owing to the large increase in types of H.M. ships. There has been an expansion of equipment to meet the growing demands. The scope of model experiments has also increased and now includes seaworthiness, steering and vibration of ships.

A large experiment tank was completed in 1932, cavitation tunnel in 1942, and a vibration laboratory in 1945. The Torquay tank was 195 ft. long. The large tank at Haslar is 890 ft. long, with a high speed of 40 ft. per second.

The pitfalls of propeller cavitation first experienced by the Hon. Sir Charles Parsons fifty years ago are now guarded against and to a large extent eliminated by cavitation tunnel tests. Flash photographs at 25 microseconds exposure reveal the cavities. The work has led to improved propeller efficiency and reduction of the wasteful erosion of the material of propeller blades. To quote one example, the speeed of one class of M.T.B. has been increased by 4 knots.

Designers in the past have looked to five-bladed propellers to reduce propeller induced vibration. An advantage is that the individual blade pulses are reduced as compared with propellers of three blades, but blade interference resulted in loss of efficiency. The latter drawback is now largely overcome by cavitation tunnel tests.

Wave generators are provided and comprehensive tests of dynamic models are made to improve the seaworthiness of H.M. ships, including motion and dryness of ships in boisterous seas. Cinema photography is a great help in this work. Experiments are also made in shallow water, an adjustable false bottom being provided in the large tank.

War experience in avoiding attack by bombs and torpedoes has emphasized the importance of quick steering. The *Bismarck* was brought to bay by damage to the rudders. Such lessons have been taken to heart and model experiments carried out on various types of H.M. ships to improve steering.

The holding power of anchors is investigated by model experiments in a special anchor tank and designs improved.

Great improvements have also been made in merchant ships by model experiments. These have not been dealt with in the lecture since merchant ship models are not ordinarily tested at the Admiralty Experiment Works, Haslar. The fundamentals for naval and mercantile ships are the same. Great expansion in research facilities is required to meet future developments. There are alluring possibilities, but the prospects should not be exaggerated. For example, laminar flow or an air-sheath if practical would almost eliminate skin friction and lead to an increase of 5 knots in speed of a destroyer. If an atomic engine of almost zero weight and space were available the speed would be increased by a further 5 knots.

The lecture was followed by a good discussion which brought out the point that the pressure of a vapour cavity when collapsing was about 80 tons per square inch according to mathematical calculation. This had not yet been verified experimentally, but the erosion of propeller blades on service is an indication that the collapsing pressure is large. Super-cavitation, skin friction correction for a curved ship's surface, model experiments on *Bluebird*, and effect of square-cut stern on seaworthiness, were among the matters raised, indicating the thoroughness with which the lecture had been followed.