

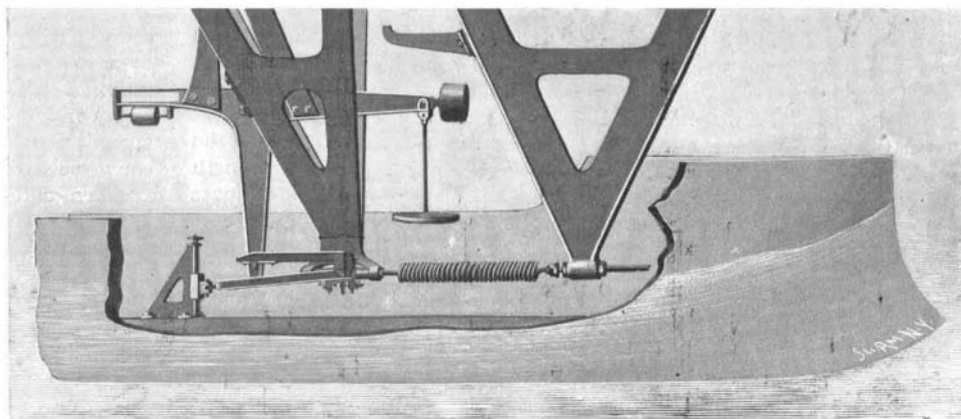
THE UNITED STATES EXPERIMENTAL MODEL BASIN.

The method of determining the resistance of a ship by towing a small-scale model of the same was originated by the late William Froude, who built a small tank for such work at Torquay, England. Demonstrations there made induced the English Admiralty to build a much larger basin at Hasler, near Portsmouth. In time other governments, particularly Italy and Russia, built similar basins, and one firm of private shipbuilders, Denny Brothers, were sufficiently enterprising to build a basin of their own. In this connection it is of interest to remember that the designer of "Shamrock II," carried on a series of experiments in the Denny Brothers' tank, which extended over a period of nine months, and that the model of the new yacht, according to its owner, has been determined largely by the results thus obtained, over sixty different models having been experimented with.

The United States experimental model basin is situated in the Washington Navy Yard. The building is 500 feet in length and 50 feet inside width, the water surface of the tank being 470 feet in length, and the deep portion of the tank 370 feet long. The water surface is 43 feet wide, and the depth from the top coping to the bottom of the basin is a few inches under 15 feet. The basin is spanned by an electrically-driven towing carriage, which is capable of a wide variation of speed, and is provided with a very complete system of stopping and starting control, all of which is operated from the platform of the carriage. The models are attached beneath the platform in the method shown in our engravings. A pair of brackets extends vertically beneath the bottom of the platform. They carry at their lower end a towing rod, which is connected to the dynamometric apparatus by which the resistance of the model is automatically recorded upon a drum, carried upon the platform above. The resistance is measured directly by a spring. The forward end of the spring is attached to a bracket which is

running all the time screws forward or backward the forward bracket, thus increasing or decreasing the tension of the spring until the contact is opened again. After the carriage has been started and a uniform speed is obtained, the operator throws in certain automatic appliances which start the record drum. The drum makes a record of the time, the run,

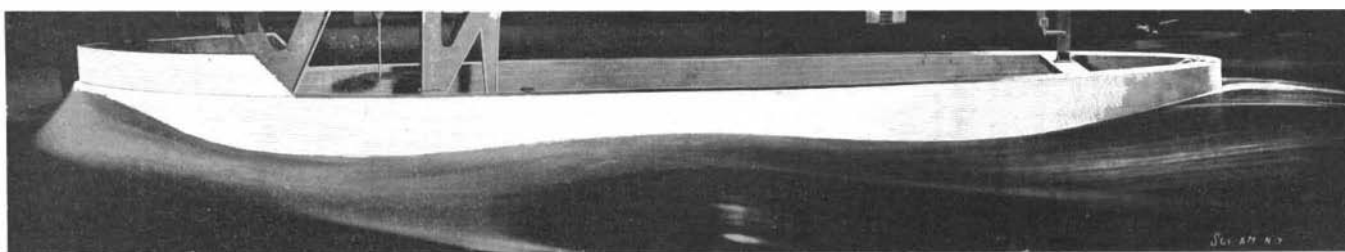
speed to the resistance of the full-sized vessel at the speed at which the latter is designed to run. In making tests the model is towed at various speeds, and a curve of resistance is plotted from which the naval architect is enabled to determine with great exactness the amount of resistance of the full-sized vessel and, therefore, the total horsepower which will be required to drive her at various speeds. Two of our illustrations show the waveline produced by the model of the battleship "Georgia," when it was being towed at speeds of 4.15 knots and 6 knots, which correspond respectively to speeds of 19 knots and 27.50 knots in the full-sized vessel. Regarding the change of level of the models under different speeds, the tests developed the fact that at low speeds of 2 or 4 knots, both bow and stern settle. As the speed increases, the bow gradually ceases to settle, and then begins to rise rather rapidly. A rather rapid rise continues until the bow returns to its original level, and if the speed is pushed high enough



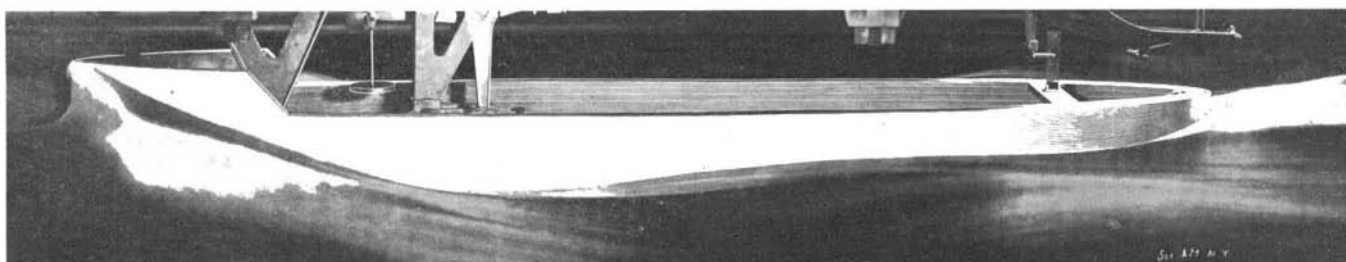
METHOD OF ATTACHMENT OF MODEL TO TOWING PLATFORM.

and the resistance of the model. The amount of the pull of the towing rod, which, of course, represents the resistance of the model, is determined by means of a kind of weighing machine, which is provided with one vertical and one horizontal arm, the machine being delicately balanced. When the model has been connected up and is ready for towing, a knife edge, which bears upon the vertical arm, is connected to the model, and a known weight is put into the scale pan attached to the horizontal arm. The automatic attachment in connection with the dynamometer

it rises above that level. As the bow tends to rise, the stern shows a tendency to sink more rapidly, with the result that the center of the model invariably settles when it is well under way. The fact that the model settles bodily does not necessarily imply greater immersion, since the water level is disturbed by the passage of the model. In conclusion it is interesting to compare the maximum speeds of vessels whose models have been tested with the corresponding speeds of the models. Thus the "Oregon" class, 348 feet in length, showed a speed of 16.8 knots for a model speed of 4.03 knots; the "Kentucky" and "Alabama" class, 368 feet in length, a speed of 17.1 knots as compared with the model speed of 3.99 knots; while the "Georgia" class, for a length of 435 feet and an estimated maximum speed of 19 knots, showed in the models a corresponding speed of 4.07 knots. We are indebted for our photographs to the courtesy of Rear-Admiral Bowles and Naval Constructor Taylor, who has the towing



WAVE-LINE OF "GEORGIA" MODEL AT 6 KNOTS; EQUIVALENT TO 27.5 KNOTS.



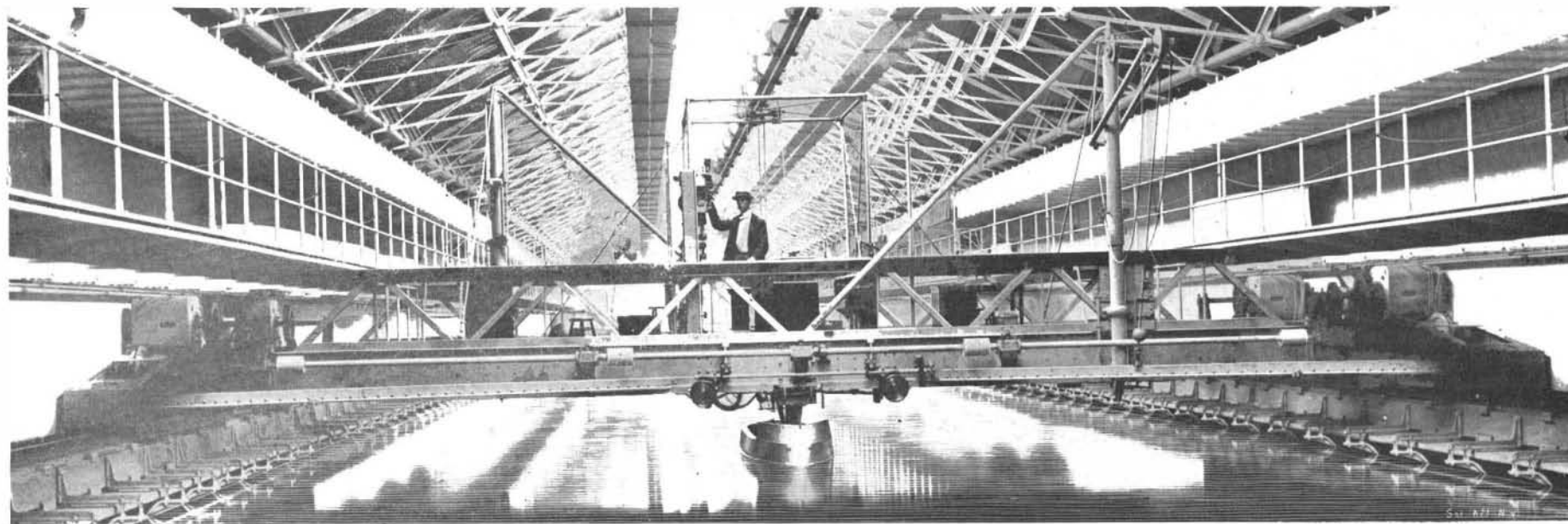
WAVE-LINE OF "GEORGIA" MODEL AT 4.15 KNOTS; EQUIVALENT TO 19 KNOTS.

spring is then thrown into gear, and the weighing machine is screwed forward or backward until it is in perfect balance. Under these conditions the pull of the spring is exactly equal to the weight in the scale pan.

The models are of a uniform length of 20 feet, and they are built with the greatest care exactly to scale, being in their lines and displacements a perfect reproduction of the ship whose resistance is to be determined. Mr. Froude determined a formula giving the ratio of the resistance of the model at a certain

tank immediately under his charge.

The Niagara Falls Power Company is about to proceed with the development of the power of the Horse-shoe Falls. The present plan of the company is to develop 35,000 horse power. A third of this amount will be used to operate an industrial establishment outside Victoria Park, on the Canadian side; a third is to be transmitted to Toronto, and the remainder is to be held in reserve for the use of the Niagara Falls Power Company.



GENERAL VIEW OF MODEL BASIN, SHOWING TOWING-CARRIAGE WITH MODEL ATTACHED.