December 1939

TECHNOLOGY REVIEW

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THE TABULAR VIEW

THROUGH the interest of a friend of the Institute who has for some years carried on correspondence with members of the Pitcairn Island colony, The Review this month offers a document which, slight in itself and in its ultimate importance, is nonetheless of particular interest. DAVID A. YOUNG'S account of life as it is lived by descendants of the mutineers of H.M.S. *Bounty* (page 63) has the odd claim to attention possessed by all statements of simple and direct observation by people whose remoteness from the usual concerns of the times may be expected to give their views freshness and honesty, whether or not it contributes to their substantiality.

MORE remote than Pitcairn Island, and far busier, is the unseen world the exploration of which is discussed this month (page 65) by ARTHUR R. VON HIPPEL, Assistant Professor in the Institute's Department of Electrical Engineering. Dr. von Hippel, who is in charge of the insulation research laboratory which links his Department with the Department of Physics, describes investigations aiming to resolve some of the problems encountered in insulation and employing basic research into the internal structure of matter. Study of electronic and ionic conduction through solids and of the electrical breakdown of insulators — with which Dr. von Hippel became associated some years ago at the University of Göttingen — has resulted in the development at Technology of highly ingenious methods and applications of apparatus, some of which are discussed in Dr. von Hippel's paper. The research program itself is of interest from the point of view of its illustration of co-operation among departments and disciplines possible in an institution such as Technology, where methods and materials, as well as attitudes and approaches, from half a dozen branches of science are collaboratively focused in the effort to solve a major problem.

HALLET is an artist in everything he does," said Kenneth Roberts in connection with *Michael Beam*, the current historical novel by RICHARD HALLET, who, already known to Review readers for an article on Australia in our issue of last May, describes graphically in this month's number (page 68) a kind of nautical engineering with which few laymen have even slight, not to mention firsthand, acquaintance. His observations during a workaday cruise with a lighthouse tender along the coast should provide not a few vicarious shivers for readers allergic to the oncoming of winter.

VARIOUS aspects of the Institute's operations are reported in the Institute Gazette this month, affording a bird's-eye view of administrative policy and practice and an understanding of the matter-of-fact issues presented in the conduct of educational institutions during times of world-wide stress. Enrollment, finance, and long-range administrative procedure are summarized in the reports presented.

MAIL RETURNS

For the Puzzlers

FROM "HEURISTICUS":

The accompanying Double-Crostic may interest Review readers. From Elizabeth Kingsley's *Double-Crostics*, published by Simon and Schuster, I transmit these instructions for attacking such puzzles:

"A Double-Crostic resembles a Cross-Word puzzle only in a list of definitions of words to be utilized and in a box of squares in which to insert these. The words are not an end in themselves, but a means to an end. The letters of the words are inserted in the diagram in scattered, not consecutive order [i.e., each letter is transferred to the correspondingly numbered square on the diagram]. When filled into the proper spaces the letters make an alignment of new words forming a quotation which is read from left to right. Each black area represents the end of a word in the quotation. Words do not necessarily end at the right side of the diagram.

"Further, the initial letters of the words guessed, when placed in vertical order under WORDS, spell the name of the writer [of the quotation] and the person to whom it is written. The whole name of the author may be given, or only his surname, or his initials with surname. In every case the word TO divides the name of the writer from that of the recipient. In the upper right-hand corner of each square is a small index-letter. This index-letter corresponds to the letter under DEFINITIONS in which the quotation-numeral belongs."

Note: The solution to this puzzle will appear in our next issue.

1 P	2 Y	3 T		4 L	5 F	6 G	7 I	8 D	9 $_2$Z		10 T	11 H		12 Q
13 $_2$Z	14 N	15 A	16 E	17 T	18 W	19 Z	20 M	21 S		22 Z	23 T	24 U	25 O	26 Y
27 L	28 $_2$Z	29 V	30 A	31 M		32 H	33 T	34 A	35 C	36 K	37 O	38 P		39 D
40 K	41 S		42 C	43 O	44 Z	45 E		46 A	47 V	48 X	49 Z	50 W		51 J
52 S	53 X		54 E	55 Q	56 V	57 B		58 L	59 M	60 R		61 P		62 O
63 J	64 Y	65 $_2$Z	66 Q	67 G	68 U		69 K	70 J	71 E	72 C	73 W	74 O	75 L	76 R
	77 U	78 K	79 Y	80 W	81 I	82 R	83 F		84 O	85 T	86 P		87 X	88 E
89 I	90 Y	91 X	92 J	93 M	94 O		95 M	96 J	97 R	98 G	99 F		100 $_2$Z	101 Y
	102 M	103 O	104 X	105 S	106 I	107 V	108 B		109 W	110 D	111 J	112 P	113 $_1$Z	114 I
115 S	116 A	117 P	118 X	119 S	120 A		121 I	122 P	123 N	124 H	125 G	126 T	127 Q	
128 F	129 $_2$Z	130 I	131 C		132 $_1$Z	133 D	134 $_2$Z		135 U	136 B	137 Z		138 R	139 J
140 D	141 I	142 A	143 E	144 M		145 G		146 T	147 I	148 P	149 F	150 T	151 S	152 X
	153 E	154 I	155 Y	156 $_2$Z	157 U	158 T	159 N	160 L		161 E	162 H	163 L		164 I
	165 W	166 B	167 Q	168 G	169 U		170 V	171 X	172 O		173 R	174 L		175 O
176 $_1$Z	177 C	178 U		179 S	180 J	181 Q	182 P	183 F	184 M	185 $_1$Z	186 T	187 B		188 Z
189 S	190 P	191 E	192 M	193 I	194 F	195 W		196 $_2$Z	197 S	198 I	199 Q			

DEFINITIONS (each dash represents one letter in the required word)

A. Element of beauty in Gothic windows

B. To incite to pursuit

C. Shaped like an egg

D. Large parrot with brilliant plumage

E. Brings swift medical aid

F. President of well-known university

G. An island possession

H. To puff; to blow

I. Without reservation; absolute

J. Led and described a famous march

K. To praise

L. An abstract

M. Instrument for measuring length

N. A twitching

O. A process of making steel (two words)

P. Philosopher; founder of religious brotherhood (582–507? B.C.)

Q. He knew his Gettysburg address

R. An extremely taciturn person (slang)

S. Illogical; misleading

T. A type of amplifier

U. Musical instrument; a kind of firework; a reptile

V. A quadrant-shaped teacake

W. Name of a popular complex

X. A factory producing cords of twisted or braided strands

Y. Sent away; got rid of (colloquial)

Z. To bring to pass

$_1$Z. Evergreen tree of New Zealand

$_2$Z. Serving to stimulate investigation

WORDS (words and quotation, worked together, are mutually helpful)

142 30 46 116 15 34 120

57 136 166 187 108

42 177 35 72 131

110 133 8 140 39

191 54 161 88 143 153 16 71 45

99 83 194 128 183 149 5

168 67 98 145 6 125

124 162 11 32

154 7 141 147 121 89 164 114 106 81 130 193 198

139 70 92 180 111 51 63 96

69 40 78 36

75 4 27 163 174 58 160

144 59 102 192 31 184 20 93 95

123 14 159

25 62 103 43 84 94 37 74 172 175

148 38 1 112 117 182 122 190 61 86

181 55 127 167 66 199 12

97 60 82 173 138 76

179 189 105 119 151 21 115 52 197 41

3 23 146 10 126 186 158 17 85 33 150

77 178 68 24 157 135 169

47 56 29 170 107

165 109 50 18 80 73 195

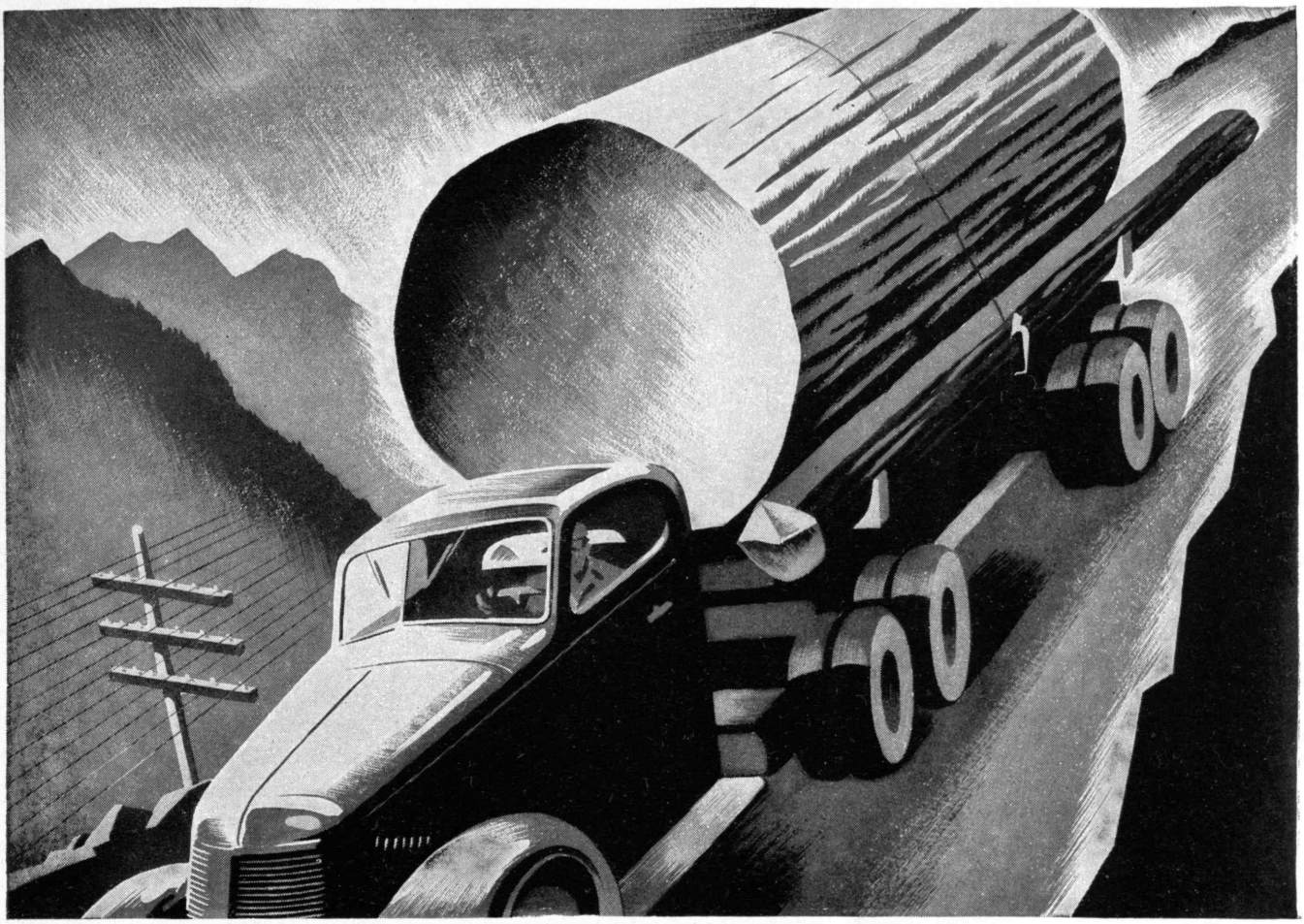
152 171 104 91 53 87 118 48

26 2 90 64 79 101 155

49 19 188 22 44 137

185 176 132 113

100 9 65 196 156 134 28 129 13



SOLVING THE HARD ONES

Many a design problem that used to be troublesome is being worked out these days by the use of modern materials. Take logging trailer brake drums, for example.

Holding back 50 ton loads on long, steep grades and running high temperatures is all in their day's work. But, by making his drums of Chromium-Molybdenum (0.35-0.45% Cr.; 0.35-0.45% Mo.) iron, one of the leading manufacturers has more than met the severe operating conditions.

The iron is strong and tough, with good resistance to abrasion. Furthermore, it retains these qualities after repeated heating to around 900 degrees F. followed by rapid cooling. In addition the Molybdenum content reduces the tendency to distortion due to heating — thus reducing the pounding action that leads to premature failure.

Our interesting booklets "Molybdenum in the Foundry" and "Molybdenum in Steel," containing much practical data, will be sent free on request from any interested technical student.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Mo-lyb-den-um Company
500 Fifth Avenue · New York City

MOLY

Living up to the Greatest Name in Rubber

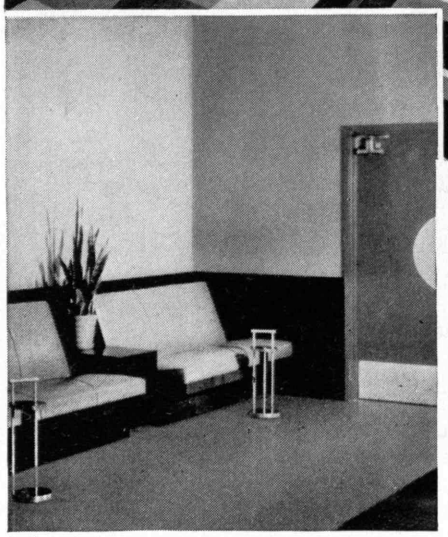
A lasting Beauty Treatment for walls and floors

MODERN architects are turning more and more to rubber for their smartest and most colorful effects in floor and wall design. In Goodyear Wingfoot Rubber Flooring and Wall Rubber they have found a new medium of great warmth and richness, limitless in color and pattern with an enduring beauty that will neither "walk" off nor wash off.

Underfoot, resilient Goodyear rubber floors give incomparable quietness and foot-ease. In hospitals, schools, libraries and offices they hush the tread of busy feet. In homes, apartments and hotel public rooms their handsome luxury makes rugs unnecessary—yet they cost no more than linoleum.

Walls paneled with Goodyear rubber offer exciting new possibilities in decorative treatments of refreshing distinction and appeal. The rare beauty and superb wearing qualities compounded into these two versatile new products are one more measure of Goodyear's preeminence as the greatest name in rubber.

Wingfoot—T. M. The Goodyear Tire & Rubber Company.

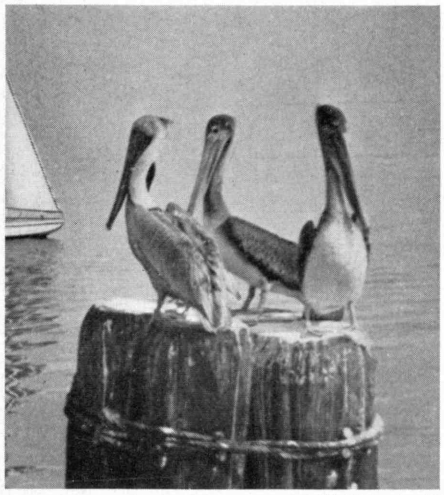


Infinite is the variety of modern floor and wall patterns available with Goodyear Wingfoot Flooring and Wall Rubber as these two smart designs illustrate.

1839 • THE CENTENNIAL OF RUBBER • 1939

Great beyond all other names in rubber is that of Charles Goodyear—discoverer just a century ago of the process of vulcanization that made rubber usable to mankind. To honor him The Goodyear Tire & Rubber Company was named long after his death; from his lifelong effort to extend rubber's utility it takes inspiration and seeks by serviceability to deserve his name.

GOODYEAR



Sail ho!
That so?
Who cares!
Pelicans at St.
Petersburg, Fla.

W. W. Lewis, '89

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THE COVER

SALT MINE AT AVERY ISLAND, LA.

From a photograph by William M. Rittase, by special arrangement with the International Salt Company

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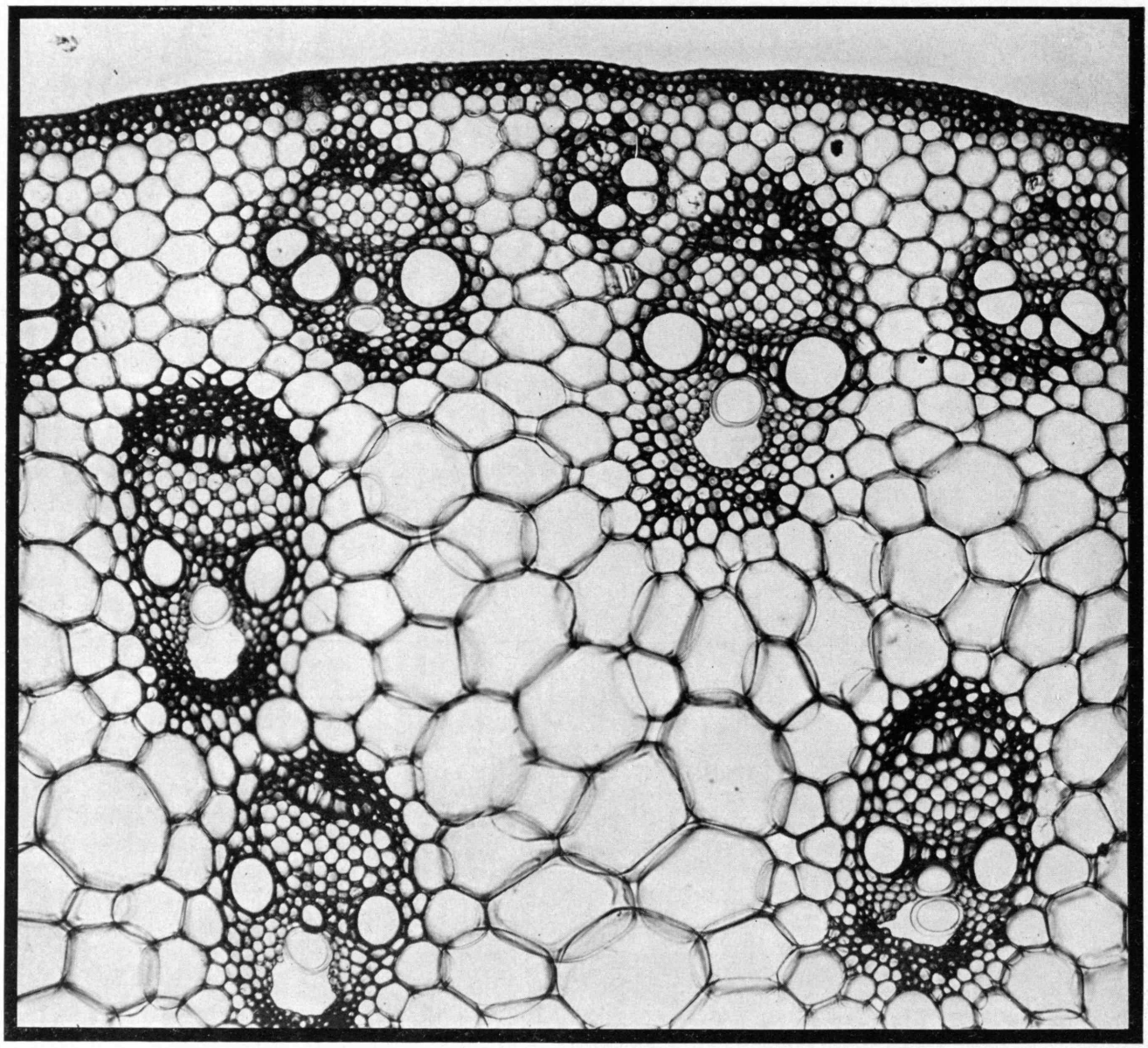

Photomicrograph, x170, of transverse section of corn stem by R. W. St. Clair, '36

These mellow singers
In a cornstalk hid —
They did, they did.

Remote and merry,
They hoarded up their song —
'Twas wrong, 'twas wrong.

So lamps and lenses
Here have brought them out
To sing, to shout

In a photomicrographic minstrel show:
Thanks to the artfulness in x 1 7 0.

THE
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REVIEW

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The Trend of Affairs

Tanks for Testing

THROUGH many press reports, public attention has recently been focused on the United States Navy's new David W. Taylor Model Basin now nearing completion at Carderock, Md., in a gorge of the Potomac some twelve miles from Washington. These stories usually lay stress on the size of the project (the main building is one-quarter mile long) or on the precision with which the rails for the towing carriages are aligned to the curvature of the earth. Yet it is not on either of these aspects that the principal claims to distinction for this development may be rested.

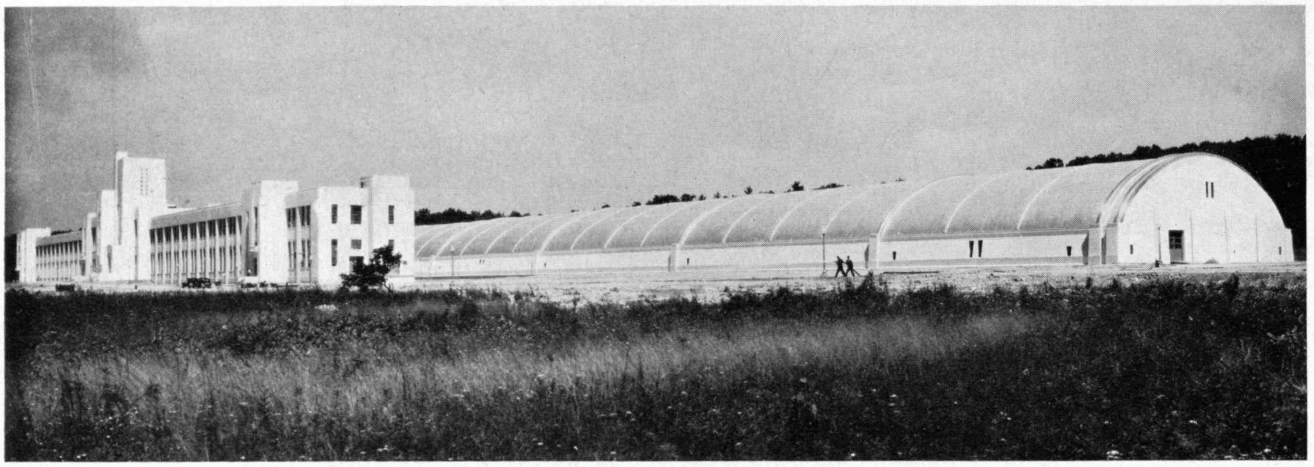
The Hamburg tank, for example, is to all intents and purposes as long. Moreover, at Langley Field back in 1931 the National Advisory Committee for Aeronautics in order to test seaplane floats constructed a towing tank which stretches 2,000 feet, as against the 1,168 feet of the longest of the new navy basins. This same Langley Field tank, moreover, has its rails aligned to the earth's curvature, although on a different basis.

Elsewhere lie the true significances of the splendid new basin which is being constructed under the direction of Harold E. Saunders, '16, technical director of the United States Experimental Model Basin at Washington. To understand them, a search in the past history of ship design is necessary.

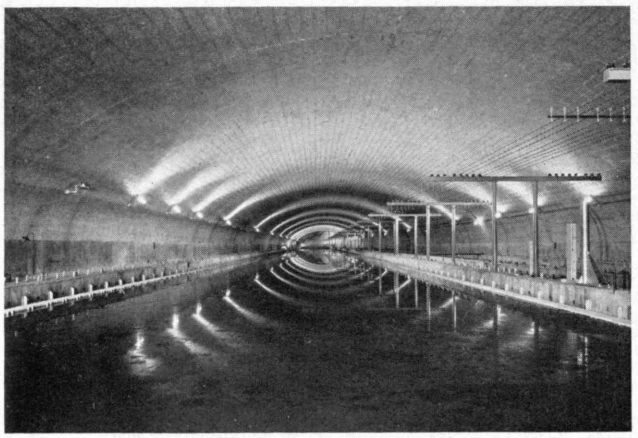
It is hard to realize that only a hundred years ago, despite the tremendous progress which had been made in ship design, the makers of new vessels were able to rely only on the results of trial and the service performance of previous similar ships. As so often happens, the great forward step is credited to one individual: William Froude, the father of modern naval architecture. Born in Devon in 1810, graduate of Oxford, sometime assistant to the great Brunel, Froude began his serious work through experiments with models in the river Dart, contriving with tin and solder delicate and accurate recording apparatus. In model experiments in a creek off Dartmouth Harbor, he towed the models in pairs on each side of a balanced yard beam; in a large storage tank at the top of his house he towed the model with falling weights, a practice still followed for resistance experiments in some of the smaller tanks.

In 1860 the founding of the Institute of Naval Architects gave Froude opportunity to publish his important research. The Admiralty, in 1870, granted him 2,000 pounds for the construction of a tank having suitable towing and recording apparatus. The first tank in this country was built in 1899. By 1910 — one hundred years after Froude's birth — there were four tanks in the yards of British shipbuilders, and the national tank in Great Britain had been opened as part of the National Physical Laboratory and had been named for Froude. In 1912 an important Viennese tank was begun, to be completed in 1916 and to serve as model for Japan, Moscow, Trondheim, Göteborg, Madrid, Rome, La Spezia, and Holland. By July, 1933, the art was sufficiently developed for the first international congress of tank experimenters to be held at The Hague, with Germany, Norway, United States, Italy, Sweden, England, France, Austria, Russia, Japan, and Holland represented. The tanks thus represented nearly a century after Froude's first experiments, embody his principle.

This method provides still-water tows of models at successively constant speeds through the use of carriages spanning the tank while measuring the pull and the trim of the craft, or, if it is of fixed trim, the moment required to hold this trim. Four factors are required for precision: exact models with uniform nondeteriorating surfaces, accuracy of dynamometers, constant speed of the towing carriages, and control of the basin-water characteristics. It is in the latter two factors that improvement may be expected with newly designed tanks.



The building group, David W. Taylor Model Basin, Carderock, Md.



Inside, looking west, showing the large basin

As a result of these measurements and the necessary conversions from model to full scale, it is possible to investigate such matters as skin friction, economies in ship propulsion, propeller behavior. More controversial among experts is the question of studying the effect of artificially stimulated wave motions.

The old basin at Washington was brought into being through the efforts of David Watson Taylor, rear admiral and former chief constructor of the Navy and — for the first fifteen years of the tank's existence — officer in charge of the experimental model basin. Admiral Taylor was born in Virginia in 1864, just as Froude's experiments were being published, and he was graduated from Annapolis with the highest record made to that date, 1885. Fourteen years later, he had constructed the experimental model basin at Washington. A subsequent career of distinguished service to his country has more than justified the honor conferred in naming the new laboratories for him.

Forty years of service have rendered the present tank inadequate and almost obsolete. In size it is but 400 feet by 39 feet, and it is operating 16 hours a day to keep pace with the requirements of current naval and merchant-ship programs. Rebuilding the tank was out of the question, both because the all-important foundations might have been insecure and because there was not enough adjacent room; hence the construction of a new basin was provided for in Congressional appropriations of 1936, 1937, and 1938.

To the designers the principal requirements of the new plant were seen to be: (1) a firm and unyielding foundation, preferably of bedrock, to permit the accurate track level and alignment which were needed; (2) a group of individual model basins for specific work rather than a portmanteau basin; (3) lengths of basin sufficient to permit towing at a constant velocity for at least eight seconds, and breadths and depths such as to eliminate wall and bottom interference for models which might be towed at speed-length ratios higher than those now employed; (4) facilities for fundamental research and for expansion (since the future fundamental research requirements could not even be guessed at, utmost flexibility was sought and expansion of each division of the basin is possible); (5) convenience of the site as respects transportation, water supply, quiet, cleanliness. This factor, with the first, governed the selection of Carderock as the location for the basins.

To meet the second and third requirements, three major basins are provided. Longest of these is the high-speed basin, 1,168 feet long, 21 feet wide, and 10 feet deep, for the testing of motorboats and other high-speed craft. This basin was originally projected to be 1,600 feet long. Such a length would have permitted a carriage speed of 30 knots. Reduced appropriations shortened the length to the present dimension and lowered carriage speed to 20 knots, which, however, for a 10-foot model of a 100-foot ship will still be the equivalent of a ship speed of 62 knots.

Largest of the basins is 963 feet long, 51 feet wide, and 22 feet deep, for testing ship models. This is separated by a caisson from a shallow basin of the same width, 303-foot length, and 10-foot depth. The top water level of these two basins is the same, so that at times one longer, wide basin can be provided by opening the caisson.

Shallow basins elsewhere, used principally for testing tugboats, river craft, and the like, have false bottoms for changing water level. These yield and leak. In the new navy laboratory the water level itself will be raised and lowered, even though doing so requires a model-towing device which can be lowered to different water levels. The high-speed basin runs parallel to the deep