July 1939

TECHNOLOGY REVIEW

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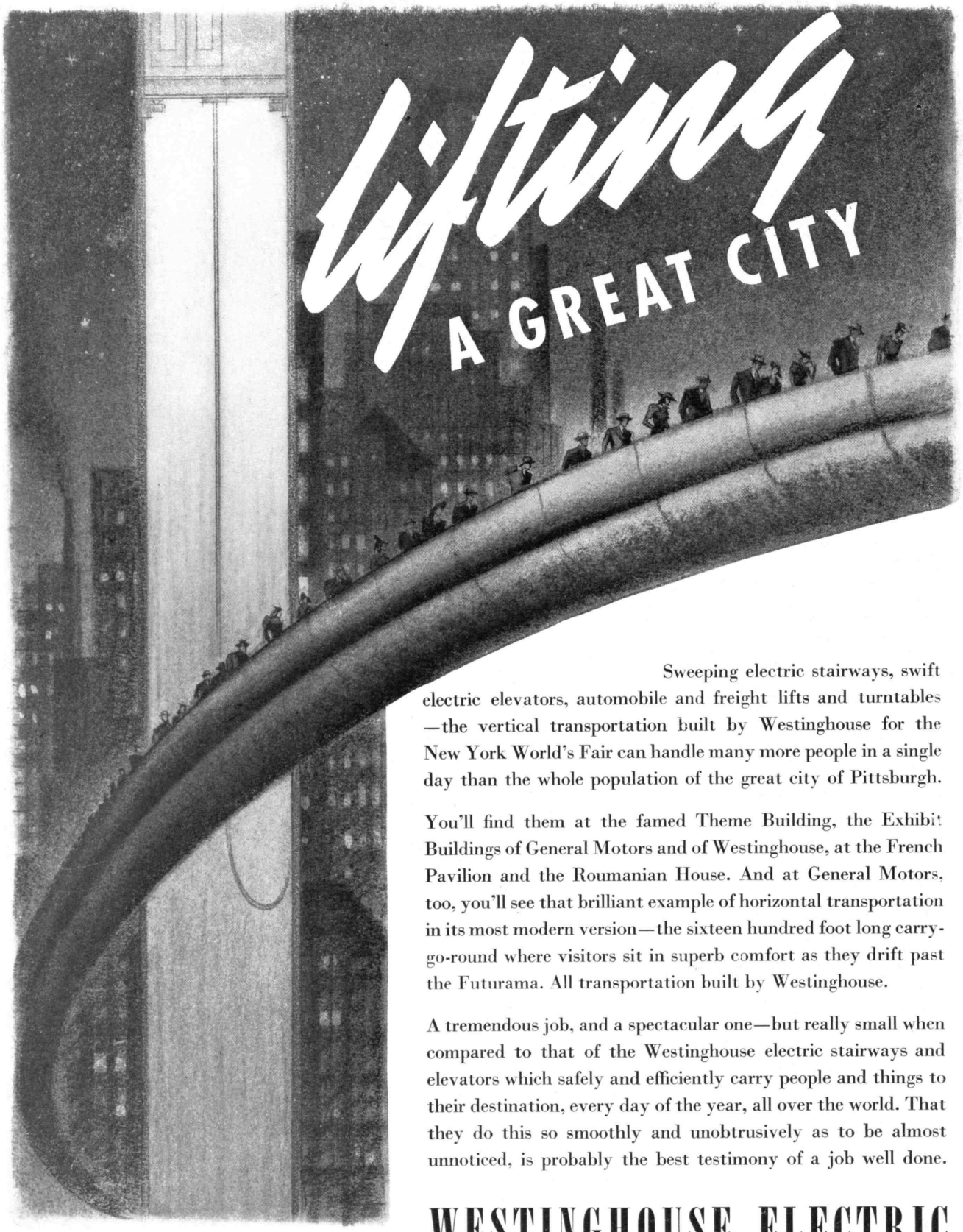


Sweeping electric stairways, swift electric elevators, automobile and freight lifts and turntables—the vertical transportation built by Westinghouse for the New York World's Fair can handle many more people in a single day than the whole population of the great city of Pittsburgh.

You'll find them at the famed Theme Building, the Exhibit Buildings of General Motors and of Westinghouse, at the French Pavilion and the Roumanian House. And at General Motors, too, you'll see that brilliant example of horizontal transportation in its most modern version—the sixteen hundred foot long carry-go-round where visitors sit in superb comfort as they drift past the Futurama. All transportation built by Westinghouse.

A tremendous job, and a spectacular one—but really small when compared to that of the Westinghouse electric stairways and elevators which safely and efficiently carry people and things to their destination, every day of the year, all over the world. That they do this so smoothly and unobtrusively as to be almost unnoticed, is probably the best testimony of a job well done.

WESTINGHOUSE ELECTRIC ELEVATOR COMPANY

JERSEY CITY, N. J.

THE TECHNOLOGY REVIEW, July, 1939. Vol. XLI, No. 9. Published monthly from November to July inclusive at 10 Ferry Street, Concord, N. H. Publication date: twenty-seventh of the month preceding date of issue. Annual subscription $3.50; Canadian and Foreign subscription $4.00. Entered as second-class matter at the Post Office at Concord. N. H., under the Act of March 3, 1879.

THE TABULAR VIEW

INCREASINGLY, the applications of science and technology create demand for direction and action by men of good will and men of free mind; few other characteristics of the practical culture engendered by the combination of democracy and scientific enterprise stand out more clearly than does this fact. Concurrently, however, the necessity for defending the first partner in this joint undertaking is spurred and spurred again — often as a result of economic or ideological maladjustment. Both of these issues are considered in The Review this month — the first through articles drawn from addresses incident to the graduation of the Institute's Class of 1939; the second in addresses presented at the Alumni Day conference, "The Technology of National Defense." ¶ The importance of the questions is matched by the competence of the writers: VANNEVAR BUSH, '16, formerly Vice-President of the Institute, now President of the Carnegie Institution of Washington (page 397); SIR HAROLD HARTLEY, formerly lecturer in physical chemistry at Oxford, now Vice-President and director of scientific research of the London Midland and Scottish Railway (page 400); LOUIS A. JOHNSON, The Assistant Secretary of War (page 404); HAROLD R. STARK, Rear Admiral in the United States Navy, recently named chief of naval operations (page 405). The ninth M.I.T. library reading list (page 402) was compiled by MARGARET PAIGE HAZEN. ¶ The notable events of Alumni Day we report this month (pages 403, 406). Particularly significant is PRESIDENT COMPTON'S delineation of the relation of the Institute and the future (page 407). ¶ JULIUS A. STRATTON, '23, Associate Professor of Physics and chairman of the Staff-Administration Committee, contributes to the Institute Gazette a discussion of the work of the committee, another recital of Institute activity in which Alumni will be interested (page 410). The Gazette presents likewise the remarks of DAVIS R. DEWEY, Emeritus Professor of Political Economy, at the 25th anniversary of Course XV (page 408). ¶ To the cover this month returns Harold E. Edgerton, '27, Associate Professor of Electrical Measurements, with a stroboscopic photograph (exposure 1/50,000 second) of a Pelton wheel. Enthusiasts who would emulate will find an Edgerton stroboscope at the New York World's Fair, in the photographic garden of the Eastman Kodak Company's exhibit, to provide opportunities for amateurs to use their own cameras for split-second work.

The Review is not published during the summer months following July. This issue, therefore, concludes Volume 41. Number 1 of Volume 42 will be published on October 27 and dated November. Readers who bind their copies are reminded that if they possess nine issues of Volume 41, their files are complete. An index to the volume will be ready on August 15 and will be supplied post-free upon request.

MAIL RETURNS

Keep the Laboratories Open

FROM ALBERT J. GRACIA, '28:

The closing of Professor P. W. Bridgman's laboratory to citizens of totalitarian states (*Science*, February 24) will, I presume, not greatly hinder the advance of science in those states. But it indicates an alarming trend in scientific thinking. Carried to a logical end, this way of thinking would use science as a counterblow of reciprocity in whatever field the battle raged — politics, religion, or race.

Germany has barred the Jews from its universities; Bridgman has closed his laboratory to citizens of dictator countries. Wherein do these acts differ except in degree? To what lengths will Bridgman's ban be carried? What shall we say to the citizens of totalitarian countries of South America? Shall we permit Cubans to enter our halls of learning? Or shall we bar only those who have developed the art of dictatorship to the highest degree?

Alumnus Harrison W. Smith, '97 (The Review, June, page 336), makes an even more disingenuous proposal when he suggests that Technology accept citizens of the totalitarian states in the courses in humanities but refuse to open the science courses to them. Next we shall have a plea to drop instruction in the German language, sauerkraut will become democracy cabbage, and we shall be back in the benighted days of 1917.

It seems to me that now, of all times, men of science should cultivate the true scientific outlook, a thing so simple it is easily overlooked. The true scientific attitude is the refusal to regard our own desires, tastes, and interests as affording a key to the understanding of the world. To remember this consistently in matters arousing our passionate partisanship is by no means easy, especially where the available evidence is uncertain and inconclusive. If science is to forge ahead, if it is to be free to build for the future, it must not be bound by the fetters of prejudice and hate today.

Cuyahoga Falls, Ohio

Appreciation

FROM PERCY BUGBEE, '20:

I thought I should express to you my interest in, and appreciation of, the very excellent article, entitled "The Deadly Guest," by Donald Holbrook in the June Review. Those of us who are in the fire-prevention business can appreciate better than anyone else the value of this sort of contribution. The article is certainly well written and ought to interest every reader of The Review.

Boston, Mass.

FROM TRUMAN YOUNG:

May we compliment you upon the fine article entitled "The Deadly Guest," which appears on page 357 of your June issue.

Pyrene Manufacturing Company, Newark, N. J.

Are There Others?

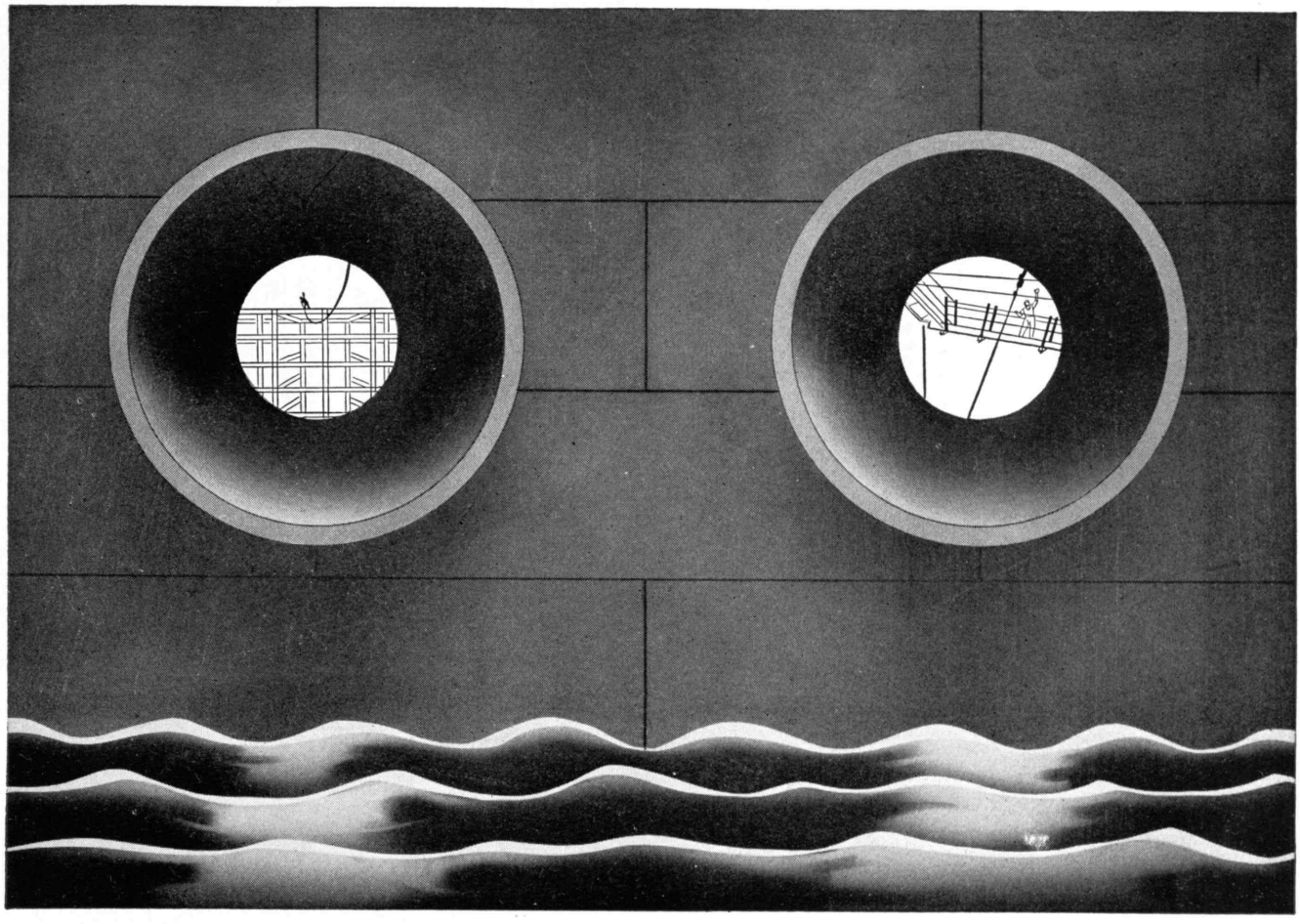
FROM JOHN W. BERETTA, '23:

. . . I found most interesting your article entitled "Technology at the Fair" in The Review for May. This was a most informative article, and I was very proud to note the prominent part that Technology men are taking in connection with the great fairs. I noticed one omission, however, to which I should like to call your attention.

E. E. McKeen, '23, I, has had a very prominent part in connection with the New York Fair, but I noticed no mention of his name at any point. If I am not mistaken, he was resident engineer on the Triborough Bridge in New York and also was resident engineer on the Whitestone Bridge. I believe I am also correct in stating that he was in charge of the steel erection for many of the buildings at the New York Fair, including the Trylon and Perisphere. Mr. McKeen is an engineer with the American Bridge Company. . . .

Mr. McKeen also has another distinction in that he was resident engineer on the Oakland Bay Bridge in San Francisco which made possible the site and location for the Golden Gate International Exposition. This fact, I believe, merited him mention and might possibly give him the distinction of being one of the few Technology graduates who had a vital part in both world's fairs. . . .

San Antonio, Texas



A CAST IRON THAT CUTS COSTS

Especially tough service requirements need not call for expensive alloy combinations. Often a less costly, but judiciously chosen, material will do the work.

Such was the case with castings for reservoir discharge nozzles and lock-gate valves. Physical specifications called for 55,000—65,000 p.s.i. tensile strength, 5,300—6000 lb. transverse strength (12" centers), 220-240 Brinell hardness.

All this plus the ability to withstand the corrosion of water containing sulphuric acid from mine drainage.

Copper-Molybdenum iron containing 0.80 — 1.00% Copper and 0.30 — .40% Molybdenum met all the requirements of strength, hardness and acid resistance. The lock-gate valves have been in service 2½ years without noticeable signs of corrosion or erosion.

We will gladly send our interesting booklet "Molybdenum in the Foundry", containing a great deal of practical data, free on request from any interested technical student. Our booklet "Molybdenum in Steel" is also available without charge.

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MOLY

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Cross section of **AIRFOAM** *seat cushion showing cellular structure through which air "breathes"*

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.

. . .

THERE is no greater boon to human comfort than **AIRFOAM*** —one of Goodyear's newest developments in rubber. **AIRFOAM** is a new kind of cushioning made from pure latex—a buoyant, kitten-soft, pillowy material more gloriously restful than anything heretofore known. So completely does it smother the vibration, absorb the jars of today's high-speed travel, it is already being used in seats in many of the finest new crack trains and buses, in smart 1939 cars, in airplanes, trucks and boats.

In mattresses, too, **AIRFOAM** is de luxe. Its millions of tiny air cells give the body "floating" support that equally relaxes every muscle, insuring deep refreshing sleep. Hospitals find **AIRFOAM** mattresses aid recovery of bed-weary patients. And furniture makers are adopting it because it is dustless, verminproof and lasts indefinitely. A revelation in everything you sit, sleep, rest or ride upon. **AIRFOAM** is a brilliant example of the progress that makes Goodyear the greatest name in rubber.

THE GREATEST NAME IN RUBBER

GOODYEAR

*Trade-mark of The Goodyear Tire & Rubber Company

A Chinese sampan coolie.
Singapore

Robert K. Phelan, '30

THE TECHNOLOGY REVIEW

Title Reg. U. S. Pat. Office

EDITED AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

VOL. 41, NO. 9 CONTENTS JULY, 1939

THE COVER

A PELTON WHEEL

From a photograph by Harold E. Edgerton, '27

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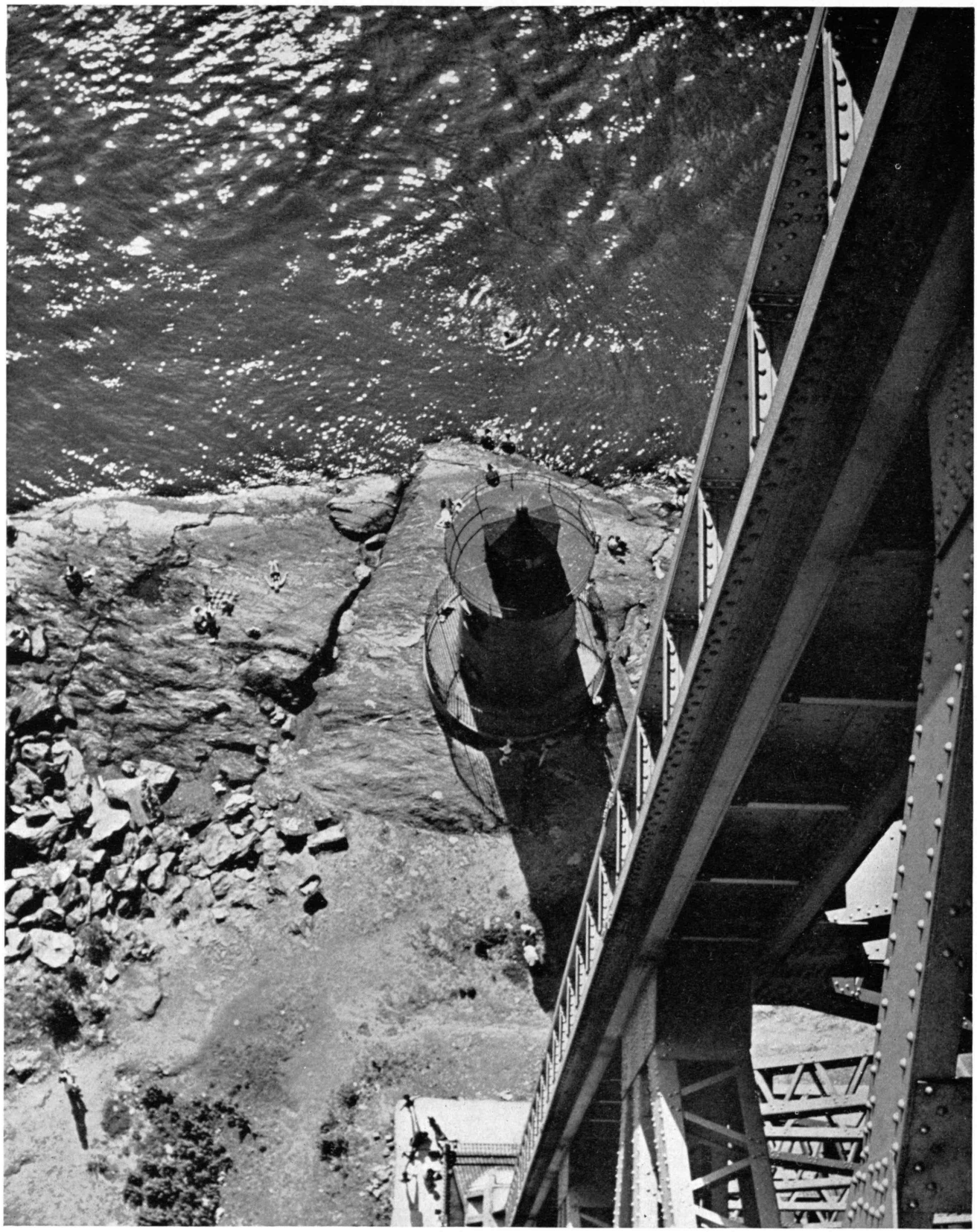

Robert D. Harvey, '38

CITY SUMMER

Swimmers and picnickers make the most of possibilities at the foot of the Manhattan tower of New York's George Washington Bridge

THE
TECHNOLOGY
REVIEW

Vol. 41, No. 9

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The Trend of Affairs

The Inventing Breed

THE fact that, of all forces acting on our society, patentable inventions are creating the most obvious and dramatic changes has not escaped our analysts. Although attention is focused mainly on the economic and social characteristics of the inventions themselves, a little is directed now and then at the men who make them. Recent studies tend to confirm an increasing amount of evidence that inventors are not as other men.

Popular opinion on the major points of difference is tersely summarized by the description which the personnel of one large plant evolved for the line of offices in which the inventors and designers worked. They called it "Bughouse Row." The connotations, however, are not merely libelous but also fallacious, for if inventors differ markedly from the general population in mental balance, we have a real case of everybody's being out of step but Johnny. Actually, these disturbers of the peace — for certainly they keep society in a constant state of turmoil — differ from the masses by their shrewd choice of parents (they tend to pick well-to-do ones), by their mobility, by marrying on a far more intensive scale than ordinary folk, by making more money than most taxpayers, and by staying alive interminably.

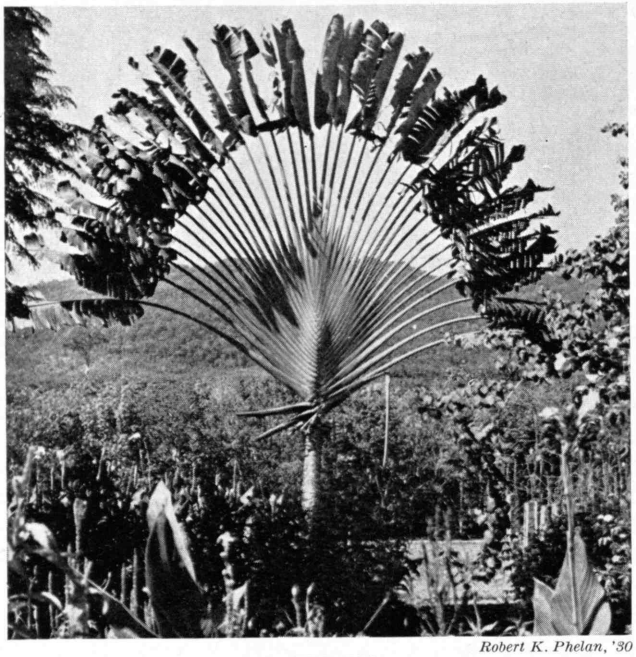
As a coincidence, there died in April a noted inventor, Henry A. Wise Wood, whose career in many respects can be described as typical of the professional inventor. And the once-in-a-lifetime type is not considered in the following conclusions. Wood, holder of over 400 patents, mainly on printing machinery, was born on March 1. 1866, the son of Fernando Wood. The latter was three times mayor of New York and for more than 20 years a member of Congress. Sanford Winston's study of 371 of the male inventors in the "Dictionary of American Biography" shows that, for those men about whom the information could be found, perhaps half came from professional or business classes, the remainder from farming and artisan classes — a ratio that is markedly at variance with the percentage of these classes in the population. Even more striking are the results of a study of leading scientists, made by J. McKeen Cattell. He found that over 40 per cent came from professional classes, that more than one-half came from the *one* per cent of the population best able to produce them, and that the son of a successful professional is 50 times more likely to become a leading scientist than is a boy taken at random from the community. Quoting Mr. Cattell: "If performance were determined by heredity alone, there might be expected to be among one thousand leading scientific men some 40 mulattoes and some 40 of illegitimate birth, whereas there is probably not one of either class."

These findings tie in well with the persistent thesis in writings on achievement and intelligence that "cultural accumulation and cultural processes are inherently more powerful than men in producing changes." A child inherits an environment as well as a set of chromosomes; and many sociologists feel that differences in intelligence between classes and races are due more to the former than the latter. It is therefore to be expected that inventors, that is, professional ones, tend to be considerably better educated than the general public. Most contemporary inventors of note have received an engineering training.

Another characteristic of inventors is mobility, amply illustrated by Wood, who was born in the city of New York, was educated at Media, Pa., traveled considerably in connection with his business and public activities, and further expressed his interest in movement by being a member of the American Geographical Society, the New York Yacht Club, and the Cruising Club of

America. Winston's study of the inventors in the "Dictionary of American Biography" shows that only 35 per cent of those born in this country were living in the states of their birth at the time of their last important work, the comparative figures for the native-born population between 1850 and 1890 being about 77 per cent. Yet it is probable that inventors are slightly less mobile than are most groups of eminent men.

The Russian peasants have a saying that if a man is a fool when he is 20, he will be a fool for the rest of his life; inventors bear this out by producing their first inventions as a rule before they are 30. It is significant that Wood was awarded the Elliott Cresson Gold Medal of the Franklin Institute in 1908 when he was 42 years old. As Winston points out, the evidence does not support Havelock Ellis' dictum that eminent men "live a long time for the excellent reason that they must live a long time or they will never become eminent."



Robert K. Phelan, '30

PATTERN

The traveler's palm, whose leaf-stems shelter a water-filled pocket. This one is in the Malayan state of Kedah

Whatever the reason, however, inventors live a long time. For those in the "Dictionary of American Biography" the average age at death was 71 years — a figure which should be compared with the average life expectancy of men at about 30 rather than with the average age at death, since inventors who die very early don't get into biographical dictionaries. Wood, by the way, died at 73 years.

Wood typifies the inventor also in that he received considerable cash as well as credit. He was president, and later chairman of the board, of the Wood Newspaper Machinery Corporation, and some years ago was affluent enough to present a $100,000 high-speed press to a school for newspaper apprenticeship in New York. Most inventors don't do quite so magnificently well, but again referring to the "Dictionary of American Biography," some 60 per cent were prosperous and less than five per cent could be considered poor. Thomas Edison, Elihu Thomson, Carleton Ellis, '00, Henry Ford, Lee De Forest, the Wright brothers, and Alexander Graham Bell — to name some outstanding examples — are, or were, no fit prospects for the W.P.A.

As with most eminent men, inventors have a very high marriage rate. In one group of 710 inventors, 92 per cent reported that they were, or had been, married; 24 men did not answer. Of the 355 inventors in the group for whom Winston found data, 96 per cent were married. The three who had separated from their wives gave that group a high divorce rate for their times, for the rate for all men who died at 65 or over was 0.31 per cent in 1890 and 0.34 per cent in 1900. But of the 710 inventors mentioned above, only two reported themselves as divorced. Even if the 24 who did not answer this point are likewise considered as divorced, their rate is still far below that of the general population, which dissolves about one out of five marriages. Like most eminent persons, inventors tend to marry late in life.

Were certain character traits, like persistence and independence of tradition, also compared, inventors would differ even more markedly from the plebeians who profit by their genius. But even by those biosocial traits and trends which lend themselves to relatively easy measurement, inventors show that they are much like other aristocrats of achievement, and of a tribe for which the times seem propitious.

Checking the Bleeders

A DISEASE, the sole visible symptom of which is the disease itself, treatment of which may prove to be the chief means of its spread, and which may be allayed but probably never cured, may prove to be one of the most curious enigmas of medical science, in spite of the fact that its action and cause appear to be comparatively well understood.

Hemophilia, the affliction wherein the victim's blood clots so slowly that death may result from a minor cut and wherein a tooth extraction becomes a major operation, has been a subject of medical concern for about 150 years. Discussion of the disease from year to year has centered about successively new methods for clotting the blood artificially — none of them wholly satisfactory.

New hopes for the hemophiliacs have been acclaimed since the day, several months ago, when two physicians of Philadelphia — Drs. William R. Brown, Jr., and Arthur Steinberg — announced that oxalic acid can be used effectively to clot blood in the normal length of time. This was an instance of stumbling upon a previously camouflaged scientific fact because, although the acid had long been known to be present in the blood, doctors believed that it was responsible for the lack of coagulation. It is yet too early to be sure that oxalic acid can do more to save the lives of hemophiliacs than can any of the parade of remedies for which claims have been made in the past.

This parade was led by the sulphate of soda which was the household remedy of a century and a half ago. Our best description of its use lies in a short article by Dr. John C. Otto, as it appeared in 1803 in the *Medical*