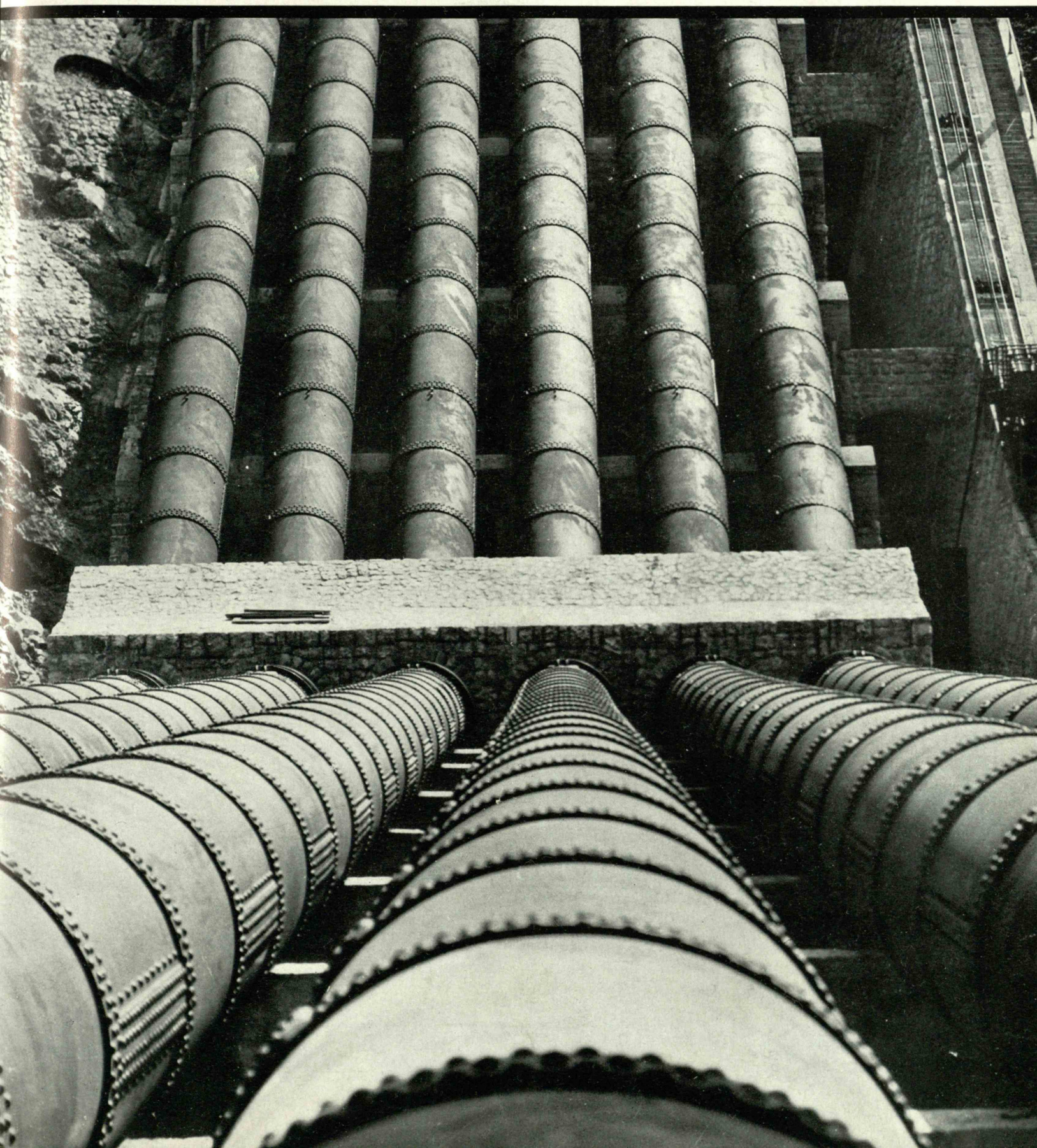
April 1937

TECHNOLOGY REVIEW



THE TECHNOLOGY REVIEW, April, 1937. Vol. XXXIX, No. 6. 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

THE COVER

STAND this issue of The Review on a table or bookcase and view the cover photograph at a distance of about one foot. Then move backward, viewing the picture from successively greater distances. Note how the length of the pipes in the foreground seems to increase, the length of those beyond the anchorage, to decrease. Note, also, how the center pipe at the bottom rounds out, how the depth of the entire photograph increases.

This photograph shows, better than any other we have ever seen, the distortion that appears in photographs if they are not viewed from the correct distance. This distance should be such that the eye in viewing the print subtends the same angle as the camera lens in recording it. If you view a photograph of the same size as its original negative and if the picture was made with a lens of two-and-one-half inch focal length, your eye should be two-and-one-half inches from the photograph if no distortion is to occur. Of course the eye does not accommodate at such short distances, and the print should be enlarged to a size enabling the eye to view it at a distance of at least 10 inches (the minimum distance for good accommodation) if it is to be seen distortion free. For an interesting discussion of photographic distortion readers are referred to "Perspective Considerations in Taking and Projecting Motion Pictures," by A. C. Hardy, '18, and R. W. Conant, '23, in the *Transactions* of the Society of Motion Picture Engineers, Volume XII, Number 33, 1928, pages 117 to 125.

THE Tabular View in its capacity as toastmaster at the banquet table of this issue knows that introduction of two of the present contributors is not necessary for veteran readers. They have appeared before you more than once and have always been welcome. Thus, the following material about PHILIP M. MORSE and FREDERICK G. FASSETT, JR., both Review Associates, is for the few who do not know them as expositors and commentators. Dr. Morse, Associate Professor in the Institute's Department of Physics, is a graduate of the Case School of Applied Science and recipient of a doctor's degree from Princeton. He is the author of important papers dealing with the dissociation and energies of chemical molecules and has recently published a book on acoustics. On page 237 he stresses the techniques as well as importance of the new science of solids. Assistant Professor Fassett, ex-newspaper man and present inspiration and guide for undergraduate journalists at the Institute, displayed his philosophical bent in a "Soliloquy in a Laboratory," published in these pages in March, 1936. His article on page 235 is a provocative study of the relation of science and politics. ¶ B. K. HOUGH, JR., '28, who makes his bow as a Review contributor in this issue (page 232), is a civilian engineer with the Army Engineer Corps. At Passamaquoddy he was in charge of the soil mechanics laboratory. ¶ ELISABETH COIT, '19, is a New York architect.

MAIL RETURNS

OUT of the tourbillion of mental fireworks that greeted Professor Hudson's article, "Can You Solve Them?" came the following letter which we feel compelled to publish, despite a decision not to publish any of the reams of friendly letters which accompanied solutions to the problems.

To the Editor:

One of the two oldest living Alumni of M.I.T., Mr. D. M. Wheeler, C.E., 22 Harding Street, Pittsfield, Mass. — a dear friend of mine — handed to me a few days ago the March number of your Review, and in it I noticed Number 5 in "Can You Solve Them?" As it has that intriguing quality particularly attractive to a mathematical hobbiest, I am herewith inclosing the simple solution. Mr. Wheeler and, I think, one other member of the Class of '68 are in the nonagenarian class; Mr. Wheeler, still in excellent health, is consulting engineer on the N.Y., N.H., and H. R.R. I am also a "juvenile member" of the '76 Class, Worcester Polytechnic Institute, Worcester, Mass.

Chatham, N. Y. L. M. Muzzey, C.E.

If we could hold the banquet we would like to have for all the genial brain-tester fans who participated in our contest, we would give seats of honor — seats of youth, if you please — to Messrs. Muzzey and Wheeler.

THE WINNERS

The following people (and note that they are not all men) are dubbed perfect or nearly perfect and worthy of entering into the exclusive inner circle where Review subscriptions are free: Robert T. Billings, '32, Arlington, N. J.; Robert D. Faunce, '34, Manchester, N. H.; Karl R. Kennison, '08, Waban, Mass.; Perry H. Ware, '35, Medford, Mass.; (Miss) Vera Wilson, Newton, N. H.

Nine others missed only one problem each, and unless we hear objections from the individuals themselves, we will publish their names in the next Review along with any others whose answers arrive too late to catch this issue.

THE ANSWERS

No. 1. Fifteen inches. Note: This is an unstable position for a block of this density. In the stable position one corner of the block would be about 19 inches from the bottom of the tank. Either answer was accepted.

No. 2. James, where John had had "had had," had had "had"; "had had" had had the professor's approval. Note: The quotations "had had" and "had" may be interchanged in the first clause.

No. 3. The president is Mr. White; the professor, Mr. Brown; the instructor, Mr. Black; the janitor, Mr. Green.

No. 4. The percentage of water in the wine glass is the same as the percentage of wine in the water glass.

No. 5. The diameter is 58 inches.

No. 6. Nine trains.

No. 7. (a) The use of "46 B.C." as a date would have been prophetic. (b) The names of kings are not numbered until there is more than one of the same name. Note: While not intended to be an examination in numismatics, all valid answers utilizing numismatic lore were accepted.

No. 8. Four weights: 1, 3, 9, and 27 pounds placed in either pan.

No. 9. Typical answers: $99+9-9+\frac{9}{9}$; $(9+\frac{9}{9})\ (9+\frac{9}{9})$;

$$9\times 9+9+9+\frac{9}{9};\ \frac{999-99}{9};\ \frac{99}{9}\times 9+\frac{9}{9};\ (99)^{\frac{9}{9}}+\frac{9}{9};\ \frac{99+\frac{9}{9}}{\frac{9}{9}};\ (99+\frac{9}{9})^{\frac{9}{9}};$$

and so on. Note: One respondent was able to send in only 1,227 combinations!

No. 10. He said that he was a knight, because nobody in that country would answer otherwise.

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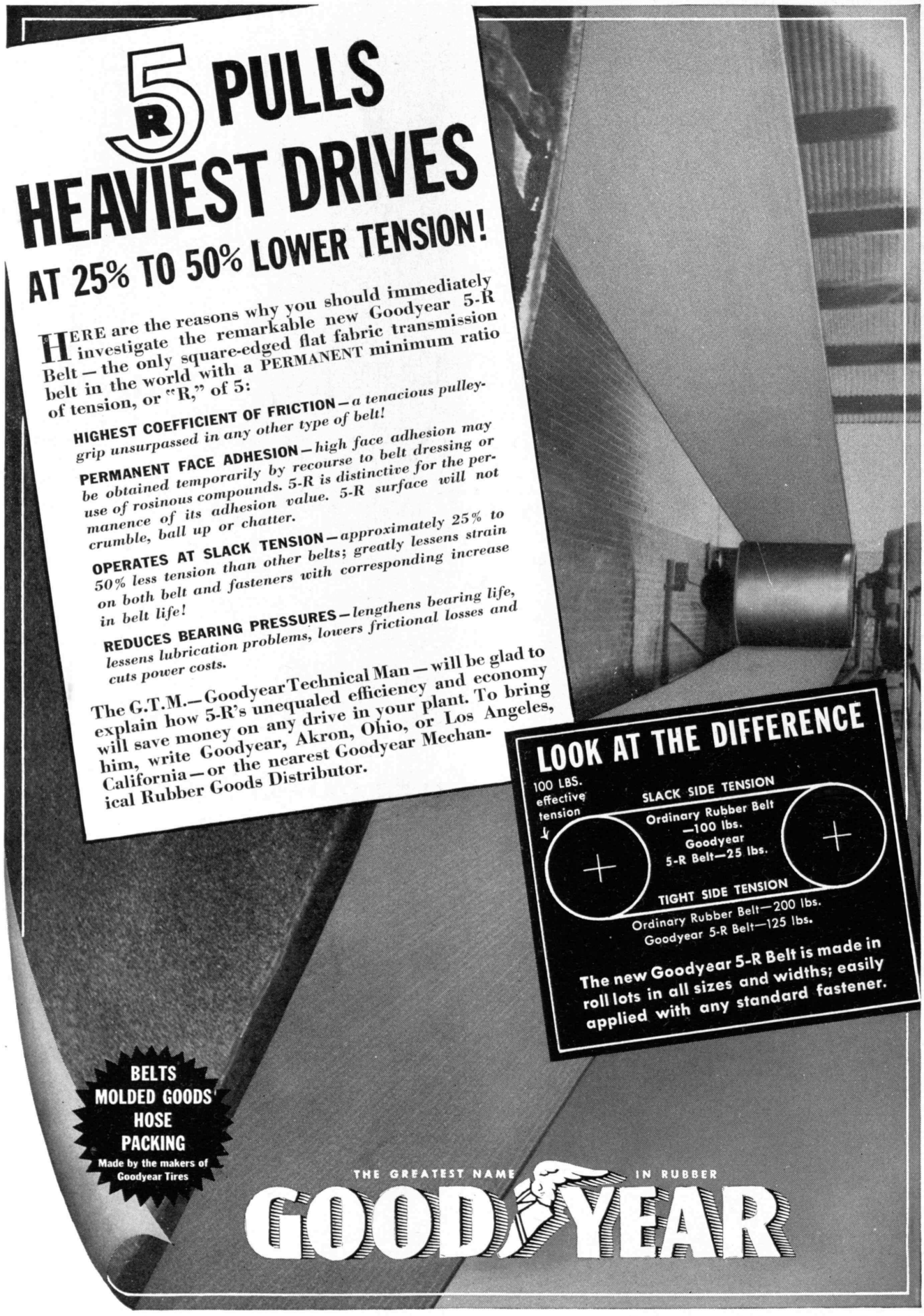
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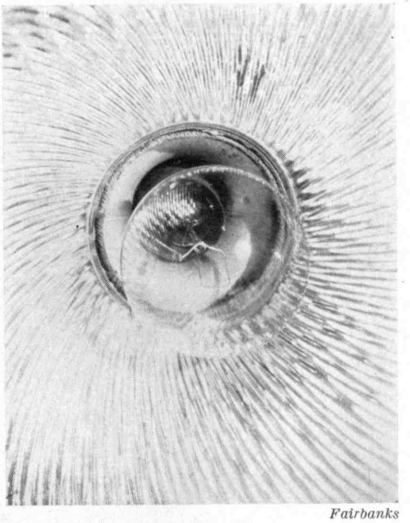


Fairbanks

THE TECHNOLOGY REVIEW

Title Reg. U. S. Pat. Office

EDITED AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

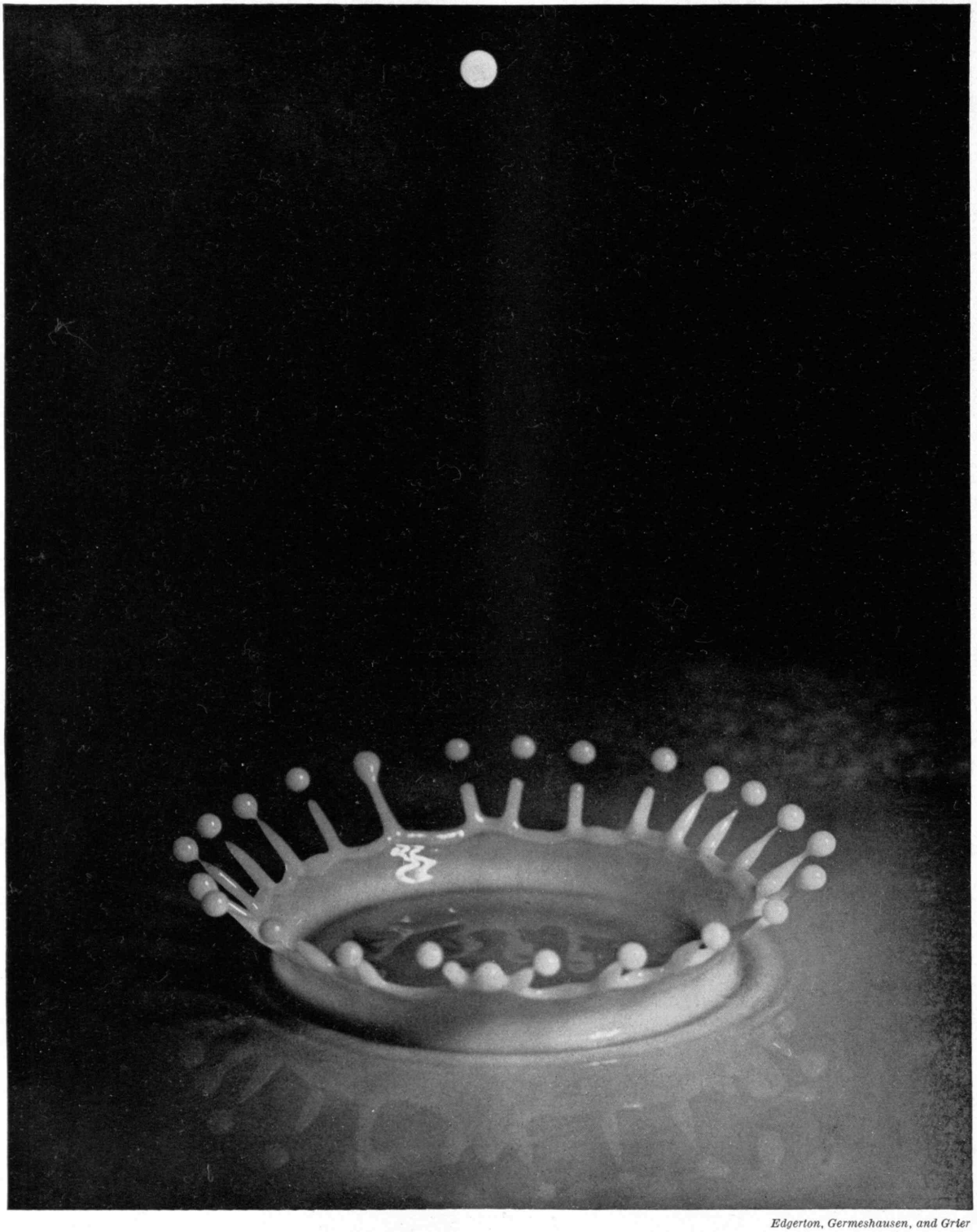
VOL. 39, NO. 6 CONTENTS APRIL, 1937

THE COVER

PERSPECTIVE

From a photograph by Hoppe from Black Star
(See note on page 217)

PUBLISHED MONTHLY FROM NOVEMBER TO JULY INCLUSIVE ON THE TWENTY-SEVENTH OF THE MONTH PRECEDING THE DATE OF ISSUE AT 50 CENTS A COPY. ANNUAL SUBSCRIPTION $3.50; CANADIAN AND FOREIGN SUBSCRIPTION $4.00. PUBLISHED FOR THE ALUMNI ASSOCIATION OF THE M.I.T. DONALD G. ROBBINS, PRESIDENT; C. A. SAWYER, JR., H. B. RICHMOND, VICE-PRESIDENTS; CHARLES E. LOCKE, SECRETARY; J. RHYNE KILLIAN, JR., TREASURER. PUBLISHED AT THE RUMFORD PRESS, 10 FERRY STREET, CONCORD, N. H. EDITORIAL OFFICE, ROOM 11-203, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE A, MASS. ENTERED AS SECOND-CLASS MAIL MATTER AT THE POST OFFICE AT CONCORD, N. H. THREE WEEKS MUST BE ALLOWED TO EFFECT CHANGES OF ADDRESS. BOTH OLD AND NEW ADDRESSES SHOULD BE GIVEN.



Edgerton, Germeshausen, and Grier

FOR THE CORONATION SEASON

The high-speed camera captures a new design for coronets. At the top is another drop on its way to form another coronet

THE
TECHNOLOGY
REVIEW

Vol. 39, No. 6 April, 1937

The Trend of Affairs

The Proper Study of Mankind

SCIENCE, through the misuse of which man has created a world inimical to himself, may yet, if properly put to work, save man's civilization. But for this end to be achieved, it is essential that man apply his science to himself. So argued Dr. Alexis Carrel of the Rockefeller Institute, in an address upon the occasion of his receiving the Cardinal Newman Award for 1936 at the University of Illinois recently. Suggesting that civilization is breaking down because, though constructed by men for men, it is calculated for men who do not exist, he maintained that the "dreams of sociologists and philosophers" are not a solid base for a culture. "Man differs profoundly from the abstractions created by economists, social workers, psychologists, physiologists, educators, historians, and other specialists," Dr. Carrel declared. "He is a concrete object, which must be apprehended directly and not viewed through philosophical or scientific systems."

But this concrete object has a soul, which modern society, concerned exclusively with the dissection of man, has separated from the body and then neglected, Dr. Carrel asserted. The application of science to man, which he desires, would not merely synthesize the various specialized departments of knowledge concerning man; it would go on to deal "not with mere aspects of man, but with man as a specific entirety inserted in a group, a nation, and a race." By this means, civilization may be based on the knowledge of man as he really is, and so it must be based, Dr. Carrel held, if it is to endure. To implement the process he suggested a new institution to be called an institute of man or institute of civilization, which should be the center of study of man as "the individual, a physiological and spiritual whole bound to his environment."

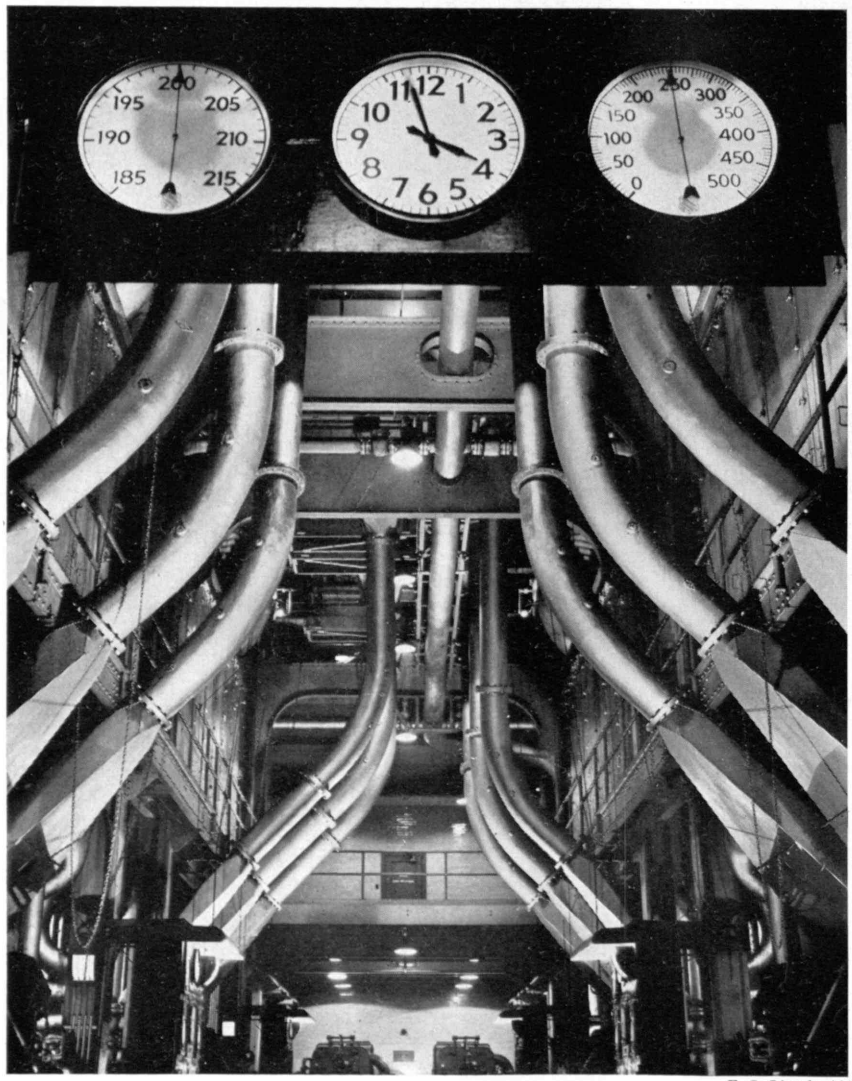
Dr. Carrel's pronouncement epitomizes an event which Dr. Max Mason, former President of the University of Chicago, now of the California Institute of Technology, declared a turning point in human history — the realization by scientists that "the proper study of mankind is man." Dr. Mason's statement was made before the American Medical Association's congress of medical education and licensure, whom he told that "our need is now adaptation to our self-made social environment. We must consciously control our mental and physical growth."

One avenue to this conscious control and to the dissemination of acquaintance with science that probably must precede the application of science to mankind, urged by Dr. Carrel, was opened recently by Dr. Frederick P. Keppel, President of the Carnegie Corporation of New York and self-styled philanthropoid. Addressing a gathering of representatives of foundations administering funds in aid of research, Dr. Keppel called upon them to coöperate in a nation-wide clearing house for the popular diffusion of scientific knowledge through adult education. The oldest learned society in the country, the American Philosophical Society, he invited to undertake the task of supervising the establishment of relations between leaders in science and the agencies of adult education.

In spite of American leadership in many scientific fields, Dr. Keppel said, science is generally a neglected subject; classroom opportunities for its study by adults through such means as extension courses are less than six per cent of the total offering. Asking whether the individual American adult had not the "right not merely to worship but to learn," Dr. Keppel chided most colleges and universities engaged in adult education thus far for having "interested themselves almost exclusively in the adult who has a vocational rather than cultural

incentive for further study," and asserted that the college doors must be opened, laboratories and study collections must be made available, and traveling scientific units must be provided to serve areas lacking fixed facilities. Funds for such a program should come in part from the coöperating foundations, he maintained, and in part from student fees, public moneys, and individuals.

Dr. Keppel's listing of intellectual assets included about 2,500,000 living graduates of colleges and universities. The scheme of adult education in science which he proposed may be expected to aid in correcting an intellectual anomaly pointed out by Dr. Joseph K. Hart, Professor of Educational Psychology at Teachers College, Columbia University, who declared in a recent study that though America has more Ph.D.'s per square mile than any other population has ever had, it cannot claim as many first-class minds as could have been found in Attica about 430 B.C. in a population about one per cent as large. Should the Keppel plan contribute to the development of more first-class minds, they in turn, through the Carrel program, may work toward the correction of the gloomy biological picture presented by anthropologists who see the race degenerating through the use of science to keep the unfit alive and breeding.



F. S. Lincoln, '22

Vital Statistics of Steam

IN determining the performance of projected steam power installations, the power-plant engineer and the mechanical engineers who build his equipment have recourse to sets of tabulated data on the properties of steam. These steam tables, so called, are of vital assistance not only in the preparation of estimates for an installation but also in the construction of plants. In past years engineers used to limit their equipment to pressures of 200 or 300 pounds per square inch, and to temperatures of 500 or 600 degrees F.; for these, previously existing steam tables were sufficient.

Nowadays, however, in the well-designed power plant, pressures to 1400 pounds per square inch, and temperatures to 800 degrees F. are not unusual. The temperatures are still going up; the advantages of still higher pressures are continuously being explored; and the formerly satisfactory steam table, as a result, is outmoded. Many other demands, less extreme than those of the plant engineer, but nevertheless exacting, are put on the steam table by the manufacturer of condensers and the air-conditioning engineer. Beyond these are the requirements of the scientist, who asks of the table precise and definitive data concerning water in its various phases.

These circumstances mark the importance of the completion of a long series of investigations and the publication, as a result, of "Thermodynamic Properties of Steam Including Data for the Liquid and Solid Phases," by Professors Joseph H. Keenan, '22, and Frederick G. Keyes of the Institute. Through their work, the properties of steam have been detailed more precisely than ever before, and they have been determined to 5,500 pounds per square inch and to 1,600 degrees F.

The most important part of a steam table, covering the usual working range of steam-engine practice, is roughly bounded by the saturated liquid line at the bottom and the 900-degree F. line at the top, with pressures extending from a small fraction of one pound to 200 pounds per square inch. This part of the table is now determined with a high degree of precision. But, since there is usually more than one way to solve a problem with steam-table data, of almost equal importance with precision is the consistency attained.

First of all a matter of smoothness, consistency requires that not merely the difference between adjacent tabulated figures but even the differences between differences of differences must vary in an orderly fashion. More than this, consistency