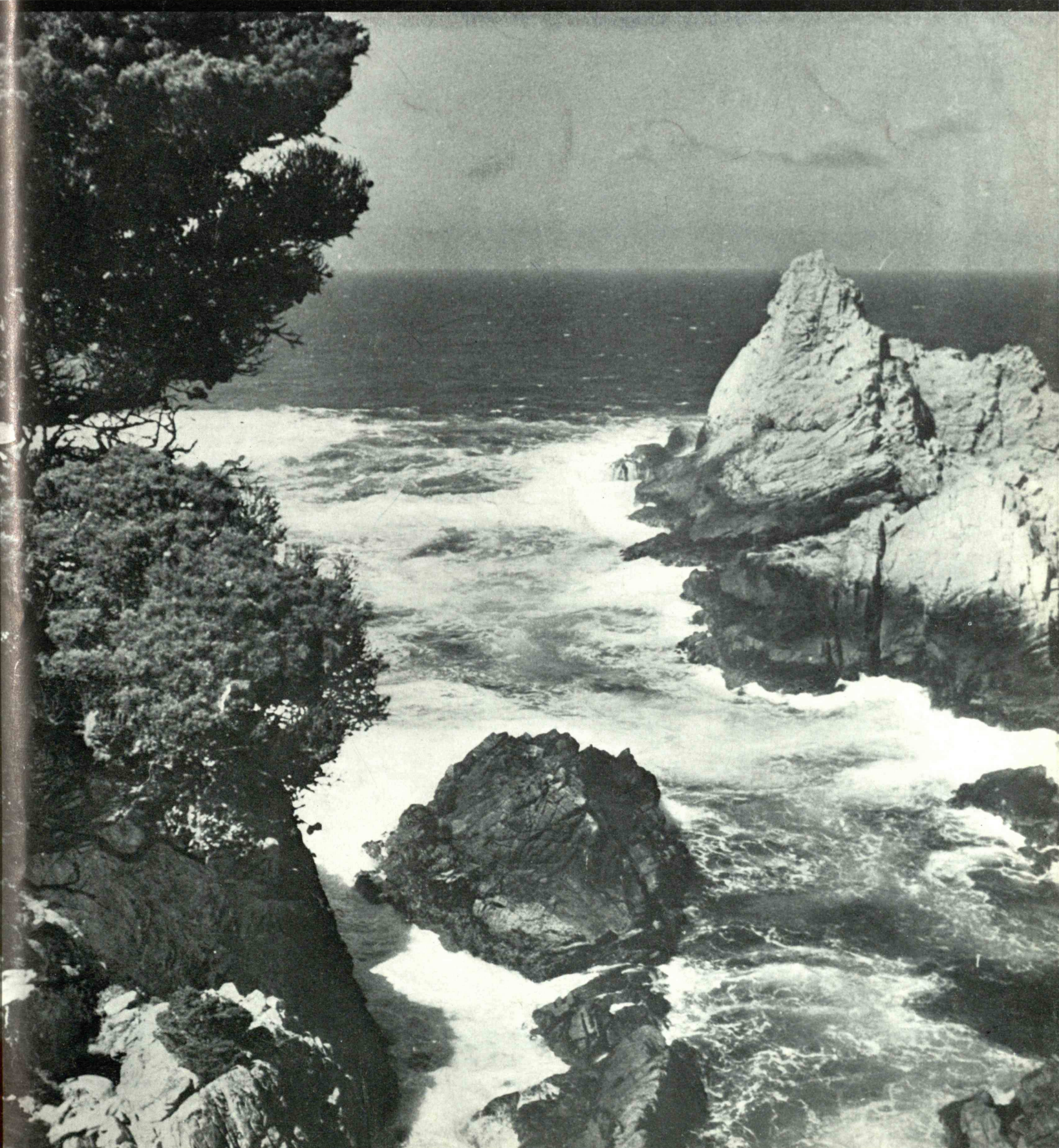


June 1941

# TECHNOLOGY REVIEW

Title Reg. in U. S. Pat. Office





# BADGER.....

*three C<sup>s</sup> and a G*  
*in Chemical Engineering*

**C**ooperation with clients' engineers in working out the flowsheet details of the process and construction details of the entire plant.

**C**oordination of the construction, purchases, fabrication, inspection and delivery of equipment and materials.

**C**ompletion of the project under the direct supervision of skilled construction superintendents and foremen making use of local labor both skilled and unskilled.

**G**uarantee fully met.

... and all under one contract with undivided responsibility. From plan to plant, the owner will have the mature and experienced services of skilled chemical processing engineers, manufacturers and construction men.



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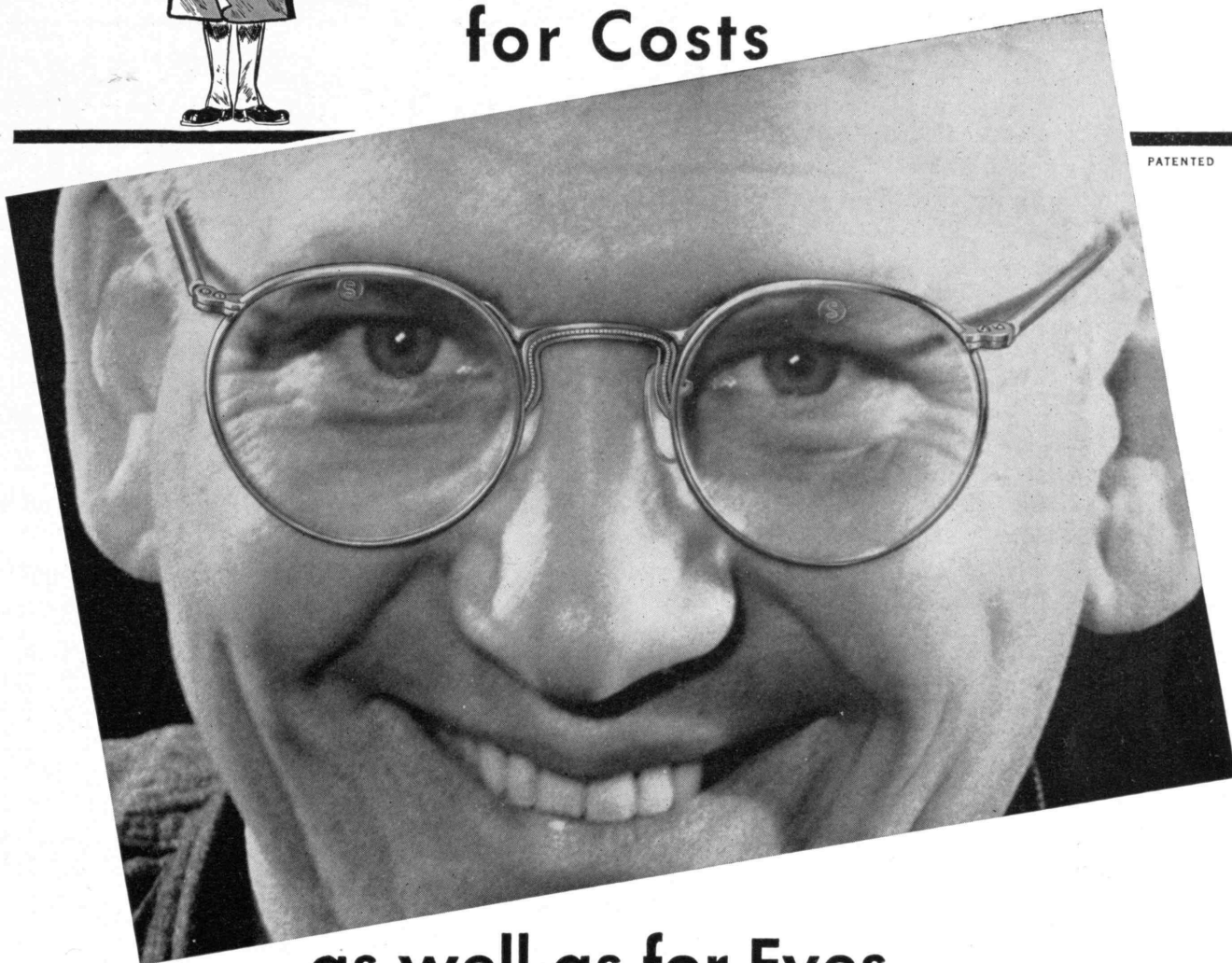
*Chemical Engineers and Contractors Specializing in Distillation, Evaporation, Extraction and Solvent Recovery*





# Goggles Do **GUARD DUTY** for Costs

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## as well as for Eyes...

American Goggles guard against flying chips that might destroy or injure workers' eyes, upset work-schedules, boost production costs. Equipped with Super Armorplate Lenses, American Goggles provide greater resistance to impact. De-

signed and made by experienced optical craftsmen, they are light, cool and comfortable to wear.

Do you have a *complete* eye protection program in your plant? It *pays* to have one . . . to provide *every one* of your workers with the

type of American equipment designed to protect his sight—and *your* dollars. Ask your AO representative to show you the entire American line and the *figures* of what well planned eye safety programs are doing for other manufacturers.

## American Optical Company

SOUTHBRIDGE, MASSACHUSETTS, U. S. A.



MANUFACTURERS, FOR MORE THAN 100 YEARS, OF PRODUCTS TO AID AND PROTECT VISION

# THE MIRACLE OF MARCUS HOOK



THIRTY YEARS AGO, on December 19, 1910, a group of engineers and scientists gathered in a new, unusual plant at Marcus Hook, Pa. This was to be the first commercial production of a man-made textile fiber in the U.S.

Finally, someone gave a signal. Machinery sprang to life. And from the equipment there began to issue slender filaments which were led through a chemical solution, then collected in the form of yarn.

A new American textile industry was born!

The progress of America's rayon industry in the thirty years that have passed since that first successful production in the Marcus Hook Plant of American Viscose Corporation is now history. Rayon has marched steadily ahead as it has made possible new, more beautiful and more durable fabrics. Today, it employs 49,000 American men and women, and annually produces more than 300 million pounds of yarn. An outstanding example of American achievement.

From the first, American Viscose Corporation has figured prominently in every major development. It pioneered many vital advances for cost reduction, price reduction, and quality improvement. It established the Crown\* Quality Control Plan to assure consumers the quality they want in rayon merchandise. It instituted the "Textile Unit," a full-sized textile research plant, in order to better serve the industry.

American Viscose Corporation is proud of its 30-year record of achievement. And now, embarking on its fourth decade, it pledges continuance of the progressive policies which have stimulated the growth of the American rayon industry.

## Roster of M.I.T. Men in American Viscose Corporation



Paul G. Woodward . . . . .	'17	X
Hobart O. Davidson . . . . .	'20	II
Hugh D. Haley . . . . .	'22	VI
Bernard M. Morgan . . . . .	'26	XV
Alvin Lodge . . . . .	'29	II
Ross M. Pfalzgraff . . . . .	'29	VI
D. B. Wicker . . . . .	'29	X
W. F. R. Griffith . . . . .	'31	VI
John E. Spalding . . . . .	'31	X
Stanley L. Whitche . . . . .	'31	V
W. Stewart Roberts . . . . .	'32	II
Ivanhoe P. Denyssen . . . . .	'34	VI
Scott Brodie . . . . .	'40	IX
Nicholas E. Carr . . . . .	'40	X
William P. Dooley . . . . .	'40	X
N. B. Duffett . . . . .	'40	X
Mason B. Lindsey . . . . .	'40	X

## AMERICAN VISCOSE CORPORATION

350 Fifth Avenue, New York • World's Largest Producer of Rayon Yarn

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PLANTS IN . . . MARCUS HOOK, PA.  
PARKERSBURG, W. VA. • NITRO, W. VA.



ROANOKE, VA. • LEWISTOWN, PA.  
MEADVILLE, PA. • FRONT ROYAL, VA.

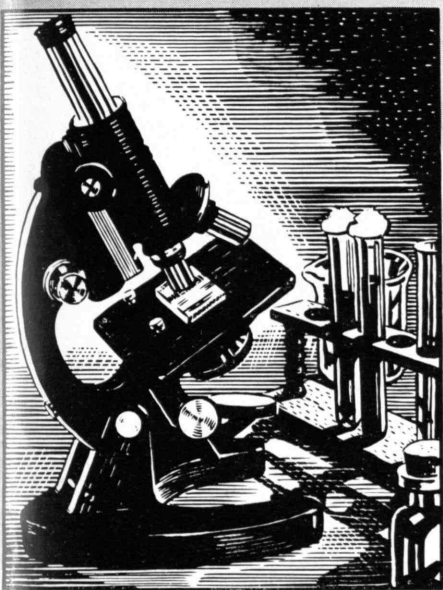
\*Reg. U. S. Pat. Off.

Copy, 1941—American Viscose Corp.

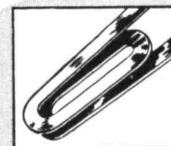


# RESEARCH.

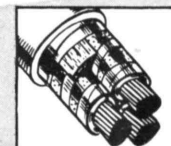
To Phelps Dodge Copper Products Corporation



*research is not an abstract policy. It is a carefully directed and powerful group-effort to effect industrial progress. By imagination, perception and scientific curiosity, its research staff has combined technical knowledge and realistic concept, to make research a dynamic tool for progress.*



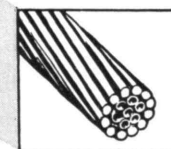
**P.D.C.P. COPPER.** Ordinary electrolytic copper cathode is plastically converted by tremendous pressure into smooth, dense copper bars, rods and strips.



**"TITEBILT" PAPER CABLE** is so constructed as to undergo cyclical expansion and contraction with daily variations in power load without deterioration.



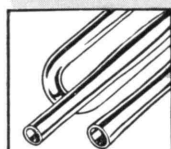
**FORMVAR**—a new synthetic type resin insulated magnet wire, highly resistant to abrasion, and resistant to water absorption.



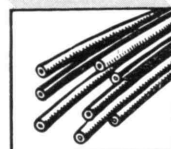
**P.D.C.P. HOLLOW TRANSMISSION CABLE** consists of solid wires stranded around a core of hollow wires which saves weight and reduces corona losses.



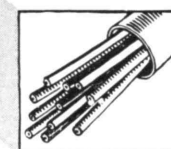
**P-M-G** a casting metal hardener for manufacture of silicon bronze metal with higher physical properties and lower specific gravity than conventional tin bronzes.



**DUAL-GAUGE TUBING** provides heavier wall thickness by changing the outside diameter at points of support, at tube ends, and on return bends.



**SYNTHETIC SMALL DIAMETER BUILDING WIRE** has an insulation of synthetic resin and is highly resistant to moisture, oil, acids, alkalis and sunlight.



**SMALL DIAMETER BUILDING WIRE** makes it possible to deliver wattages approximately three times greater than ordinary building wire using existing conduits.

**PHELPS DODGE COPPER PRODUCTS CORPORATION**

GENERAL OFFICES: 40 WALL STREET, NEW YORK, N. Y.

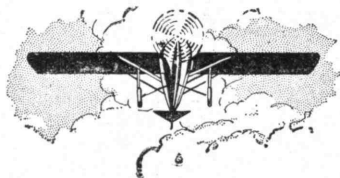


## Just for Fun!

# A CHALLENGE

### TO YOUR INGENUITY

SEE if you can specify (approximately) *all* possible starting points for an aeroplane flight in which the pilot is first to fly 600 miles due south, next 600 miles due west, then 600 miles due north to his initial position.



Answer:

column in the *Newark* [N. J.] *Evening News* of the bear?" puzzle from G. L. Kaufman's the new life for this old "What was the color pole (n=a positive integer). We got much of about  $[600+95.5/n]$  miles north of the south The north pole, or any properly chosen point

We specialize in industrial physics and offer a  
"GUARANTEED RESEARCH SERVICE"

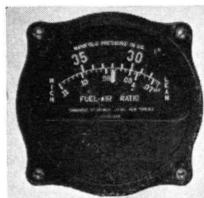
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Courtesy of TWA

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This flight instrument determines the Fuel-Air Ratio by analyzing a sample of the exhaust gas. It provides a continuous guide enabling the pilot to control accurately the all-important mixture ratio from sea level to the highest altitude. This instrument is used on air transports and military ships throughout the world. Cambridge Precision Instruments are available for both science and industry.

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## THE TABULAR VIEW

**Choice.** — Inability or unwillingness to make a firm decision between alternatives lies at the root of Europe's present tragedy, as KARL T. COMPTON, President of the Institute, clearly points out in his penetrating essay (page 347) which opens this issue of *The Review*. In its calm counsel of a course for America, Dr. Compton's essay, based on his commencement address at Webb Institute of Naval Architecture, is an apt tract for the times.

**Short?** — Modern warfare is so much a function of supplies that appraisals of who has how much of what are among the most important factors determining the course of events. The petroleum supplies of the Axis powers, drain on which is increasing with every conquest, are hence a center of speculation. ROBERT E. WILSON, '16, President of the Pan American Petroleum and Transport Company and consultant, petroleum unit, Office of Production Management, surveys this situation for *The Review* (page 349) in an authoritative article. Dr. Wilson is to be commencement speaker at the Institute this month.


**Levels.** — Devotees of lens and film, with the summer opening before them, will find sound guidance in PAUL J. WOOLF's discussion of composition in photography (page 351). Mr. Woolf, many of whose photographs have in the past contributed distinction to *The Review's* pages, is a shrewd critic as well as a sensitive and able photographer.

**Denominator.** — From the time when the sling replaced the thrown stone, practically every war has witnessed the use of new weapons, so that the observer of war today is confronted by a confusing array of lethal instruments. Efforts to find a basis of comparison among them are necessarily hampered by lack of knowledge and by the great disparities differentiating the foot soldier, for instance, from the bombing plane. JOHN W. MEADER, '19, economist and statistician whose ingenious mind is well known to *Review* readers, proffers in this issue (page 355) a theory of one common denominator of tactical power.

**Oldsters.** — As the median age of the population increases, and as civilization so shapes as to profit more and more from experienced skill, the problems of the diseases of oldsters become of greater social import. Dr. EDWARD J. STIEGLITZ, who discusses them for *The Review* (page 358), speaks with authority which is his as a member of the unit on gerontology, division of chemotherapy, National Institute of Health, of the United States Public Health Service. Dr. Stieglitz' essay is drawn from a lecture which he delivered at Technology under the auspices of Delta Omega, honorary public health society. Introducing him then, Samuel C. Prescott, '94, Dean of Science, cited Dr. Stieglitz' work and remarked that "science looks forward, not to terrestrial immortality but to fullness of life, and previsions a time when the fires of life may lessen gradually and naturally." (Concluded on page 336)



**Cost was no factor — Yet a low cost  
Molybdenum Steel proved the best.  
Such steels are worth investigating**



High stresses and severe weight limitations make material specifications for airplane structural parts and fittings exceedingly strict — which explains the wide use of Chromium-Molybdenum (SAEX4130) steel.

This steel has an excellent strength-weight ratio and

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Write for our free publication, "Molybdenum in Steel" for complete technical information.

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**500 Fifth Avenue • New York City**



# ALUMNI DAY AT TECHNOLOGY—JUNE 9

## June 6-7-8 and earlier

CLASS REUNIONS — Classes whose numerals end in 1 or 6 hold reunions in 1941. All class gatherings, however, whether they precede or follow Alumni Day, include in their programs an opportunity for members of these classes to return to Technology for Alumni Day, Monday, June 9.

## June 8

Dr. Compton's supper — Engineers Club, 2 Commonwealth Avenue, Boston — for Honorary Secretaries and Officers of Alumni Clubs. Informal Dress.

## June 9—Alumni Day

### MORNING

8:30 A.M.—10:00 A.M. Registration for Alumni, Alumnae, and their guests in the Rogers Lobby. Tickets previously ordered may be obtained at the registration desk. There will be a registration charge of \$1.50 for those not purchasing blanket tickets. Payment of this registration fee will permit Alumni to attend the conference on "Science and Engineering as Allies of Medicine" and the Luncheon.

*Tickets for these events cannot be purchased in advance of June 9 except by the purchase of a \$5.00 blanket ticket.*

10:00 A.M. Conference, "Science and Engineering as Allies of Medicine." Huntington Hall (Room 10-250). Admission by ticket only, until 9:55 A.M.

Presiding Officer — Dr. Samuel C. Prescott, Dean of Science and Head of the Department of Biology and Public Health, Massachusetts Institute of Technology.

### SPEAKERS

□ Frank H. Lahey, M.D., Harvard College, 1904; assistant professor and later professor of surgery, Tufts Medical School, 1913-1917; director of surgery, American Expeditionary Forces, Evacuation Hospital No. 30, and Major, Medical Corps, World War; professor of clinical surgery, Harvard Medical School, 1923-1924; at present director of surgery, The Lahey Clinic, Boston; surgeon-in-chief, New England Deaconess Hospital; surgeon-in-chief, New England Baptist Hospital; member, American Surgical Association, American Association for Study of Goitre, International Surgical Association, Société des Chirurgiens de Paris; fellow and member of the board of governors, American College of Surgeons; President-elect, American Medical Association.

### Subject:

"THE ACCOMPLISHMENTS OF SCIENCE IN MEDICINE"

□ George R. Harrison, A.B., Stanford University, 1919; A.M., 1920; Ph.D., 1922; instructor, Stanford 1919-1923; National Research fellow, Harvard University, 1923-1925; assistant professor of physics, Stanford, 1925-1927; associate professor, 1927-1930; Professor of Physics and Director of the Research Laboratory of Experimental Physics, M.I.T., since 1930; Director of Applied Physics

since 1935; awarded Rumford Medal, 1939; author, *Atoms in Action*, 1939, M.I.T. *Wavelength Tables*, 1939; editor, *Journal of the Optical Society of America*; inventor, automatic comparator, spectroscopic interval sorter, interval recorder, high-speed spectrophotometer; director, Optical Society of America; member of the board of governors, American Institute of Physics; member, American Physical Society, American Academy of Arts and Sciences, American Astronomical Society.

### Subject:

"NEW TOOLS OF THE PHYSICIST FOR THE PHYSICIAN"

□ Detlev W. Bronk, A.B., Swarthmore College, 1920; honorary Sc.D., 1937; M.S. University of Michigan, 1922; Ph.D., 1926; assistant professor of physiology and biophysics, Swarthmore, 1926-1927; associate professor, 1927-1928; professor, 1928-1929; chairman of the department of zoology, 1927-1929; dean of men, 1927-1929; National Research Council fellow in medical science, Cambridge and London universities, 1928-1929; Johnson professor of biophysics and director of the Eldridge Reeves Johnson Research Foundation for Medical Physics, University of Pennsylvania, 1929-1940; professor of physiology and chairman of the department of physiology and biophysics, Cornell University Medical College, New York City; managing editor, *Journal of Cellulose and Comparative Physiology*; member of the editorial board, *American Journal of Physiology*, *Proceedings of the Society of Experimental Biology and Medicine*, *Biological Abstracts*, *Journal of Applied Physics*; fellow, American Association for the Advancement of Science; member, National Academy of Sciences, American Philosophical Society, American Physiological Society, British Physiological Society, American Physical Society, division of physics of the National Research Council, Optical Society of America, American Neurological Association, American Society of Naturalists, Society for Experimental Biology and Medicine; honorary member, Harvey Society, American Society of Anesthetists; corresponding member, Société Philomathique de Paris.

### Subject:

"FUTURE OPPORTUNITIES OF THE PHYSICAL SCIENCES IN MEDICINE"

## Exhibits

This symposium program, with extensive exhibits in both the Main and Rogers Lobbies showing working models of apparatus developed by scientists and engineers for the diagnosis and cure of disease, offers Alumni a noteworthy opportunity to inform themselves on the growing importance of the work of the scientists and engineers in aiding the progress of medicine. Included among the exhibits will be the following:

### (1) Brain-Wave Apparatus

Apparatus used in recording and analyzing brain waves will be set up and in operation. This exhibit will include descriptive material showing how several types of abnormalities can be detected by brain-wave analysis.



# ALUMNI DAY AT TECHNOLOGY—JUNE 9

## (2) *Electrocardiography*

The wave form of the electric impulses accompanying heart beats will be continuously recorded, and a projection oscilloscope will give a continuous visual record of heart beats. This exhibit will be accompanied by appropriate sound effects.

## (3) *Ultraviolet Light*

Apparatus and illustrative material relating to the bactericidal and vitamin-producing effects of ultraviolet light will be exhibited.

## (4) *Radio-active Indicators*

An exhibit illustrating the many uses in science and medicine of artificially radio-active materials as "indicators" will be prepared. In this exhibit a biological specimen will be inoculated with a submicroscopic amount of artificially radio-active material, the presence of which will be made evident by Geiger-counter apparatus.

## (5) *Vitamins and Food-Concentrates*

This is an exhibit showing fluorophotometric apparatus for measuring vitamin content. In addition it will show the practical and strategic possibilities of highly concentrated foods.

## (6) *Spectrographic Analysis*

Apparatus will show the usefulness in medical science of spectrographic analysis employing visible and ultraviolet light.

## (7) *High-Voltage X-Ray Generators*

A scale-model exhibit will show the progressive development in recent years of high-voltage x-ray apparatus for cancer treatment. A 1.25-million-volt x-ray generator will be part of this exhibit.

## (8) *Cyclotron and Nuclear Generator*

A one-quarter-scale model of the M.I.T. cyclotron will be set up in the lobby with descriptive material on both the cyclotron and the high-voltage nuclear generator.

## (9) *Flow by Refringence*

Double refraction of flow will be demonstrated, in which the flow patterns produced by goldfish swimming in a dilute solution of tobacco mosaic virus are revealed by polarized light.

### PERMANENT EXHIBITS

Cyclotron Laboratory  
X-Ray and Cathode-Ray Laboratory  
High-Voltage Nuclear Laboratory  
Solar Energy Laboratory  
Spectroscopy Laboratory  
Electron Microscope Laboratory  
X-Ray Diffraction Laboratory devoted to proteins, sterols, and viruses

### AFTERNOON

12:30 P.M. Luncheon for all Alumni and their guests in Du Pont Court. Tickets required. Special tables for the 50th (1891) and the 25th (1916) reunion classes, and for their lady guests.

2:00 P.M. Class Day Exercises in Lowell Court, featuring the Senior Class and the Classes of 1891 and 1916.

Prominent speakers, including representatives of the Alumni Association, 50th year, 25th year, and Senior Classes. During the Class Day Ceremonies, the present Senior Class of 1941 will be initiated officially to membership in the Alumni Association.

4:00 P.M. Special ceremonies celebrating 25 years of Technology's home on the Charles, including the dedication of a memorial to our former President Maclaurin. Main Lobby.

4:30 P.M. Unveiling of portrait of President Compton in the Rogers Lobby.

### EVENING

7:00 P.M. Alumni Banquet at the Hotel Statler. The high lights of the evening will be a short program on "Twenty-five Years of Technology on the Charles" and remarks by Dr. Compton on the progress of Technology during the past year. Informal dress.

Tables will be provided for nonalumni members of the Corporation and Institute Staff.

## *Program for the Ladies*

8:30–10:00 A.M. Registration in Lobby of Rogers Building.

9:00–10:00 A.M. Coffee served in Emma Rogers Room.

10:00 A.M. Conference "Science and Engineering as Allies of Medicine."

12:30 P.M. Luncheon in Du Pont Court.

2:00 P.M. Class Day Exercises.

4:00 P.M. Special ceremonies celebrating 25 years of Technology's home on the Charles, including the dedication of a memorial to our former President Maclaurin. Main Lobby.

4:30 P.M. Unveiling of portrait of President Compton in the Rogers Lobby.

4:00–5:30 P.M. Open house at the home of Mrs. Karl T. Compton, just below Walker Memorial on Charles River Road.

5:30 P.M. Busses leave from President's House and proceed to Brae Burn Country Club, 326 Fuller Street, Newton.

6:00 P.M. Dinner at the Brae Burn Country Club. Informal Dress.

8:00 P.M. Busses leave the Brae Burn Country Club for Hotel Statler in time for program following the men's dinner.

### ALTERNATE PROGRAM

2:00–5:00 P.M. Sight-seeing in Cambridge and Boston.

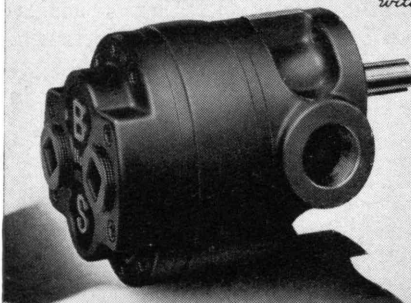
4:00–5:00 P.M. Motorboat trip on Charles River Basin leaving from, and returning to, M.I.T. Sailing Pavilion in front of Walker Memorial.

Tickets for ladies, covering Registration, Conference, Luncheon, Boat Trip, and the Ladies' Dinner at the Brae Burn Country Club, may be ordered with the men's blanket tickets at the nominal charge of \$3.00. Separate luncheon tickets may be purchased at \$1.50 on June 9; Ladies' Dinner tickets at \$2.00.

**For Hydraulic Installations —**

*the* **500** *Series* **ROTARY GEARED PUMPS**

with HERRINGBONE GEARS



—Quiet in operation  
... for pressures up to 500 lbs.

Ask for circular

Brown & Sharpe Mfg. Co.,  
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**BROWN & SHARPE**  
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## SKEIN REELING

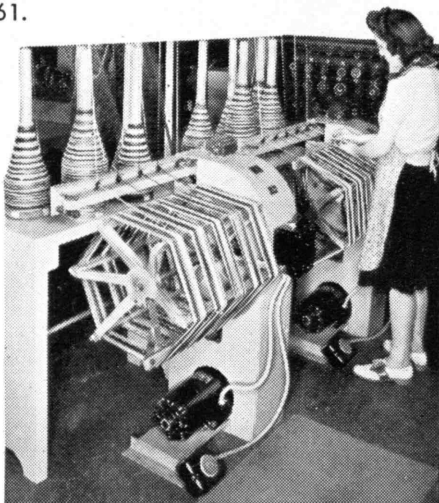
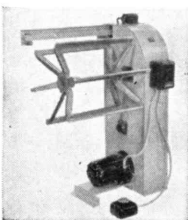
with unique efficiency

for ALL Kinds and Counts of Yarn

By this new twin-unit, single-operator method of skein reeling, FIDELITY machines quickly pay for themselves by savings that include time and floor space as well as cost. Result:—greater output per shift at a handsome saving—also less operator fatigue.

If increased output and savings interest you, send for Bulletin 361.

Single-end type for heavier yarns and shorter skeins; double-end type for yarns of finer count in longer skeins.



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## MAIL RETURNS

### *Fire Protection at School*

FROM EDWARD R. SCHWARZ, '23:

Mail Returns for May carries a letter from Frank L. Ahern, '14, who notes the fact that in an article appearing in the March, 1940, Review he placed emphasis on the suggestion that fundamentals of fire protection and safety engineering be included in engineering and architectural courses. . . . It will be of interest that work in safety and fire protection engineering has been offered at Technology since 1919. Until 1934 it was a fourth-year elective in the Course in Mechanical Engineering and since then has been a part of the industrial-plant engineering elective in Course II, fourth year. . . . From 1927 on, the work has been handled by me.

On page 291 of the May issue are reviews of two books in the field of fire protection engineering: One, the Crosby-Fiske-Forster *Handbook of Fire Protection*, is the standard reference work (in the earlier editions) used in the M.I.T. course; the other is the volume *Fire Defense*, which deals in large measure with arson and sabotage. As industrial vice-president of the Massachusetts Safety Council, I have organized and directed the operation of two special fifteen-week courses offered at the Institute by the Massachusetts Safety Council to groups totaling over two hundred men. In addition to the emphasis placed upon safety engineering, time was devoted under my immediate direction to a thoroughgoing discussion of fire protection engineering and the present situation in regard to arson and sabotage.

It has always seemed to me that the men taking work in building construction and in architecture should be more cognizant of fire protection and prevention and with safety engineering than they are at present. The work might well be offered as a part of some existing course or as an elective unless the present already crowded schedule would prohibit the extra hours. My one suggestion in emphasizing the matter at the present time is the considerable importance of, and interest in, the subject at the moment. Even though such elective courses might not be continued after the present emergency, consideration could well be given to handling them on a temporary basis while the emergency lasts. *M.I.T., Cambridge, Mass.*

### *Editors*

FROM PERCY BUGBEE, '20:

This letter is to express to you the thanks of the National Fire Protection Association for the reviews of our two recent books [May Review, page 291]. The editor of the *Handbook of Fire Protection* was our technical secretary, Robert S. Moulton, '17, and the editor of *Fire Defense* was our chief engineer, Horatio L. Bond, '23. *Boston, Mass.*

## THE TABULAR VIEW

(Concluded from page 332)

**Fences.** — S. PAUL JOHNSTON, '21, aviator, editor, author, co-ordinator of research for the National Advisory Committee for Aeronautics, describes with gusto the organization of America's naval aviation (page 360) in a chapter taken from his *Flying Fleets*, a volume soon to be published by Duell, Sloan and Pearce, Inc., of New York.

**Figures.** — The opportunities for industrial mathematics are numerous and important, as is explained for The Review (page 362) by an industrial mathematician of experience. T. C. FRY, who lectured on electrical engineering at the Institute in 1927, has been with the Bell Telephone Laboratories since 1924 and has written widely on his subject.