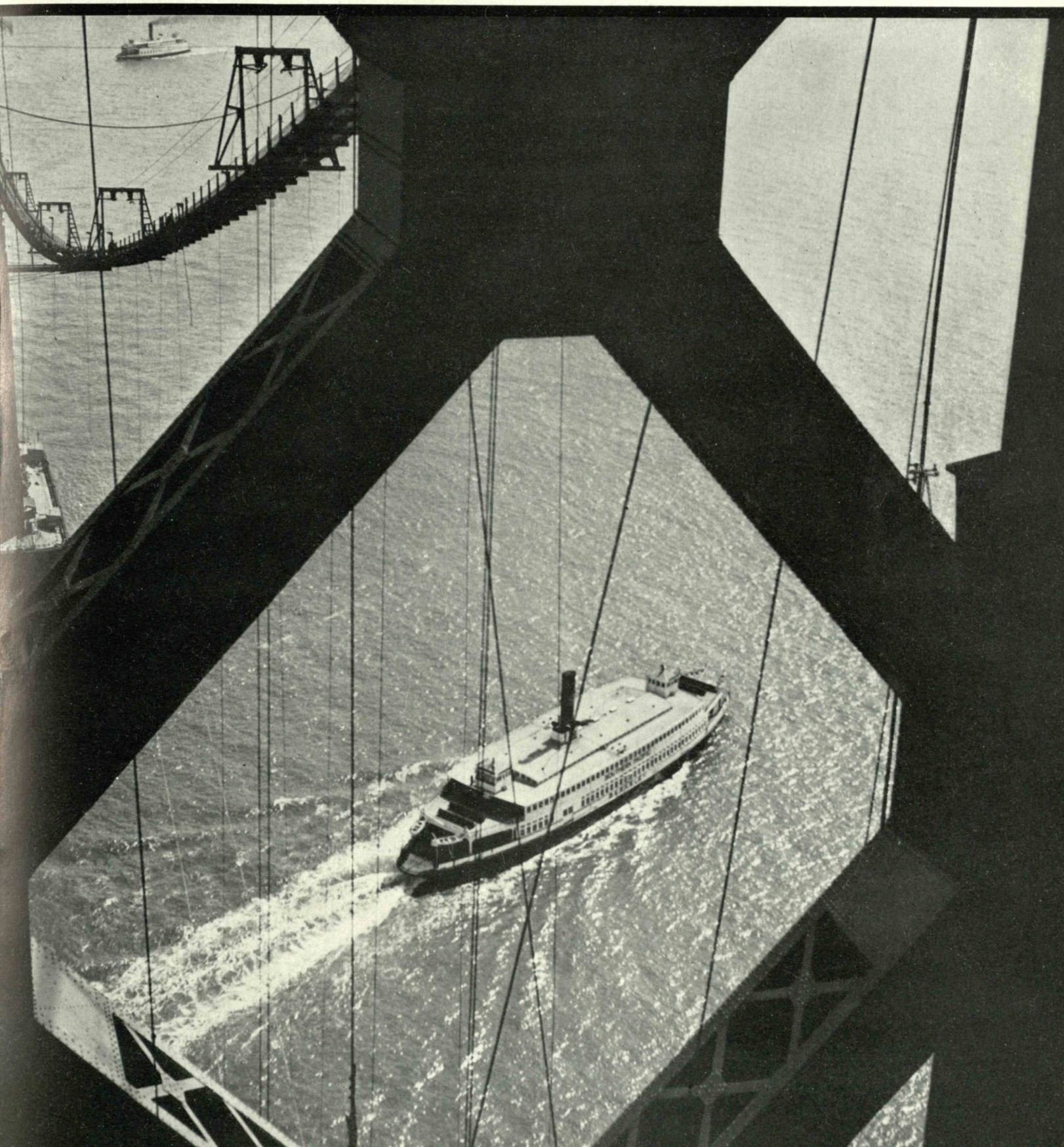
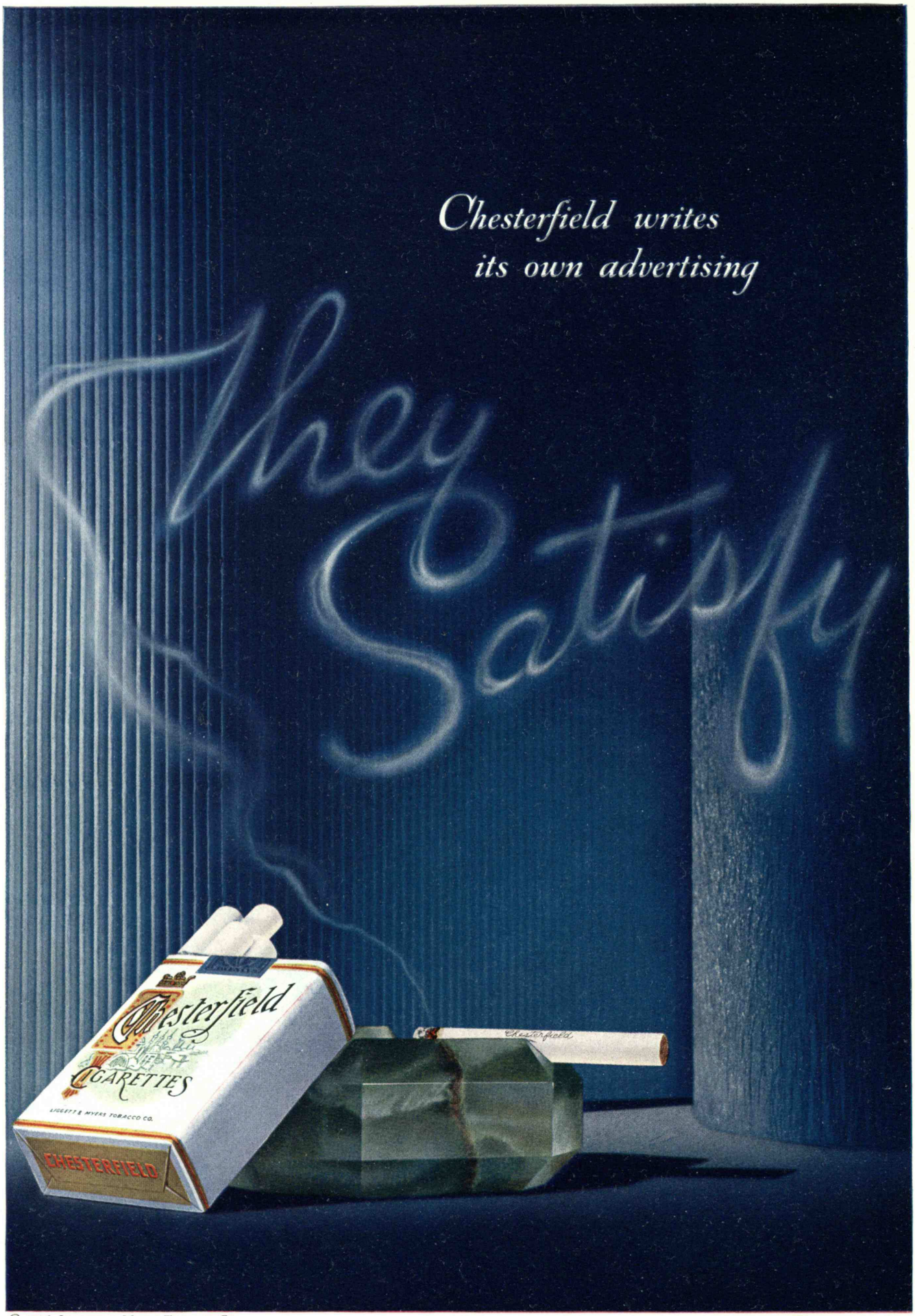
May 1936

TECHNOLOGY REVIEW





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THE TABULAR VIEW

THE author of "Science and the Fine Arts" (page 339), RALPH G. HUDSON, '07, is Professor of Electrical Engineering at the Institute and is in charge of the Course in General Science and General Engineering. He is the author of five books in the technical field and for many years has been chairman of the Committee on Graduation Exercises and Senior Week at Technology. ¶ Professor Hudson, prompted by the conundrums submitted by Review readers and published in the last issue of The Review, has submitted the following problem:

Each dash in the following sentence represents a letter; each group of dashes contains all the letters of the preceding group plus one new letter; the sequence of the letters need not be the same. The problem, of course, is to supply the missing words.

– DO NOT LIKE –– SAID THE MAN WITH THE BLACK ———. THE ———— WE HAVE WITNESSED IS IMPRESSIVE BUT WHEN YOU ———— A MAN YOU ——— A ——— POWER OF INVESTIGATION. THERE IS BOUND TO BE A ——— AGAINST ——— WHEN THE ——— OF THIS IS REALIZED. IF THE PRACTICE SHOULD PROVE TO BE AN ——— OTHER ——— MIGHT FOLLOW.

SINCE leaving M.I.T. in 1925 MALCOLM G. DAVIS has been engaged in various types of work in the utility industry. Several years of this period were spent in California, first with one of the large electric utility systems and later as a member of the technical staff of the California Railroad Commission. Subsequently he has been engaged in rate work in the East as director of rates for one of the larger utility systems. As a member of the firm, Public Utility Consultants, in Pittsburgh, he has devoted a portion of his time to general consulting work in the field of public utility economics, rates, and sales development. ¶ PHILIP M. MORSE, who reviews Mr. Gray's book in the Trend of Affairs section, is Associate Professor in the Department of Physics at M.I.T. Last month he contributed the article on metallurgy entitled, "Wolf's Clothing," and in the February issue, a paper on the neutron. ¶ Other contributors to the Trend of Affairs section include FREDERICK G. FASSETT, JR., Assistant Professor of English at the Institute, and members of The Review Staff.

AS the fourth member of the Cover Club we present WILLIAM E. DAVIDSON, graduate in civil engineering from Rensselaer in 1934, now working as timekeeper for the American Bridge Company on the San Francisco-Oakland Bay Bridge. The photograph on the cover of this issue was taken from a catwalk looking down through the X bracing of one of the bridge towers. In the water, far below, may be seen the ferries which operate in the Bay. ¶ Several readers have requested reprints of the reading list in the March Review. Unfortunately it was not reprinted, but if there is sufficient interest, future lists will be reprinted.

MAIL RETURNS

Unity

From R. E. DIMOCK, '04:

Recently my wife read in The Review "Soliloquy in a Laboratory," and remarked, "What a fine bit of poetry to be published in a magazine devoted to science." The reply was: "Would you expect The Review to publish anything other than fine material?"

"But," she said, "this is an unusual bit of poetry."

"And," I replied, "The Review is an unusual magazine."

Answered — "I agree it must be so."

For once The Review created harmonious unity.

Sydney, Nova Scotia

Unbelievable Odds

From H. B. RICHMOND, '14:

I assume that the large number of names that have been associated with the development of photographs by telephone, a subject covered admirably in the April issue of The Technology Review, prevented you from making any direct reference to any particular person. I think, however, that somewhere appropriate mention should be made of Austin G. Cooley, '24 (see page five of the March, 1936, issue of *Electronics*).

The reason for mentioning Cooley is that he worked against almost unbelievable odds and did not have placed at his disposal the elaborate facilities of Bell Laboratories. This latest development of low-cost wire transmission by the New York *Times* subsidiary is the work of Cooley.

Cambridge, Mass.

Nature of the Capitalist Crisis

A reader of The Review, inspired by Dr. Dewey's article, "No Economist Can Be Indifferent," in the March issue, writes: "I have been trying for some time to get arguments against [John] Strachey, but have had small success, and am writing in hope that you know of a few good pieces that specifically refute the arguments that he puts forth."

The Review referred this request to B. A. Thresher, Assistant Professor in the Institute's Department of Economics and Social Science, and he writes:

I do not know of any refutation which is directed specifically at Strachey's "The Nature of the Capitalist Crisis." I think, however, that the relevant material might be roughly divided into three parts:

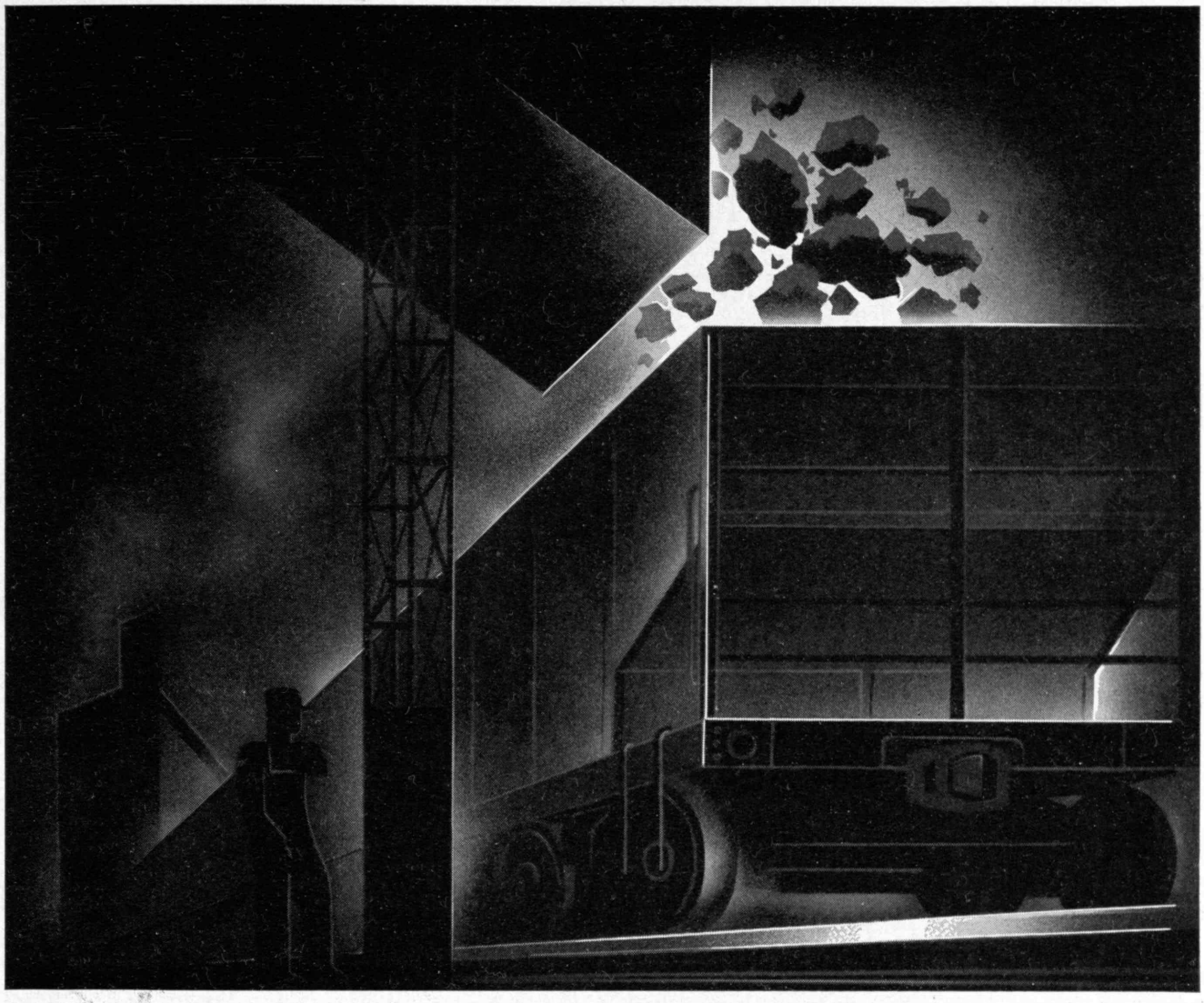
(1) General criticism of the whole Marxian position, for which I think M. M. Bober's "Karl Marx's Interpretation of History" is very useful, as well as Harold J. Laski's book on "Communism."

(2) The Marxian theory of commercial crises, which is Strachey's particular concern. This of course opens up the entire huge area of business cycle theory, to which the best introduction on a scientific plane remains Wesley C. Mitchell's "Business Cycles: The Problem and Its Setting."

(3) The large literature on the feasibility and desirability of economic planning, which of course is implied in any kind of communist program. Here again the range is enormous, but I might mention three books of which I wrote a brief comparative review which appeared in *Mechanical Engineering* for February, 1936. These are Harold Loeb's "The Chart of Plenty"; Barbara Wootton's "Plan, or No Plan"; and Walter Lippmann's "The Method of Freedom." These three books are not all equally valuable, but I selected them for joint review because I think they illustrate very nicely the contrasting points of view from which the subject may be approached.

Miscellaneous

On page 284 of its April issue, The Review published a picture of Technology's champion 1887 tug-of-war team and asked if anyone could identify the stalwarts. Reponses, prompt and in complete agreement, were received from several readers including George C. Wales, '89, the noted artist, and R. G. Luther of the What Cheer Mutual Fire Insurance Company and Hope Mutual Fire Insurance Company.



Where weight and expense are partners

It is estimated that reducing the empty weight of a railroad car one ton means an annual operating saving of $17.97 per car. The high weight-strength ratio of the "Moly" steels used in car construction permits an average reduction of 4.5 tons per car. Result: $89.85 annual savings per car.

That is vitally important itself. But — Moly steels are also exceptionally well fitted to withstand the terrific manhandling, abuse and corrosion that is the ordinary lot of rolling stock. Lower operating costs plus longer service permit greater profits.

Your steel problems may be—probably are—"different." They may involve creep strength or fatigue strength, or temper brittleness, or just plain fabricating economy. Whatever they are, it will pay you to investigate Molybdenum.

The wide experience of the engineers in our experimental laboratories is at your disposal. Our technical book, "Molybdenum," and our news-sheet, "The Moly Matrix," will gladly be sent you on request. Climax Molybdenum Company, 500 Fifth Avenue, New York City.

Visit the Climax exhibit in booth 116 at the Foundry and Allied Industries Exposition in Detroit, May 4-9.

CUTS COSTS CLIMAX Mo-lyb-den-um CREATES SALES

MOLY

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In many industries this practical expert is effecting important operating economies by the scientific application of rubber to all operations involving the transmission of power and the conveying of materials.

If your equipment is over 10 years old—and 65% of all that in use today is—it is expensively obsolete in face of recent developments. Read here what the G.T.M. is accomplishing in other industries, then, perhaps you would like to talk with him. A line to Goodyear, Akron, Ohio or Los Angeles, California, will bring him promptly.

THE GREATEST NAME IN RUBBER

GOODYEAR

Construction

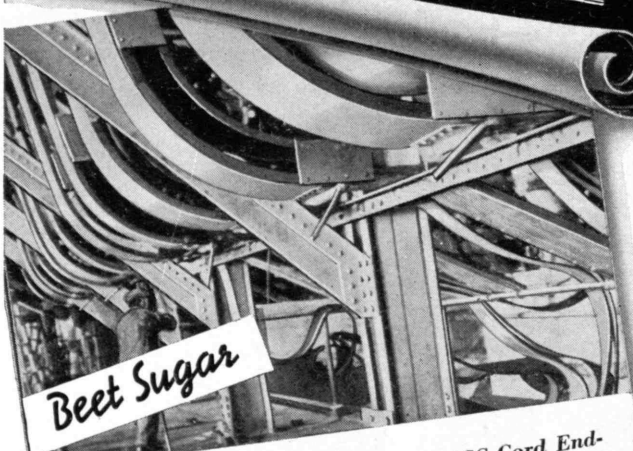
Four months was long service for air hose on this canal job until the G.T.M. recommended Goodyear Emerald Cord Air Hose. Now hose is lasting 18 months—at 80% less cost!

Coke

This Goodyear Hot Coke Conveyor Belt specified by the G. T. M. has handled 417,871 tons—90% more than best previous belt—at a saving of 25% per ton

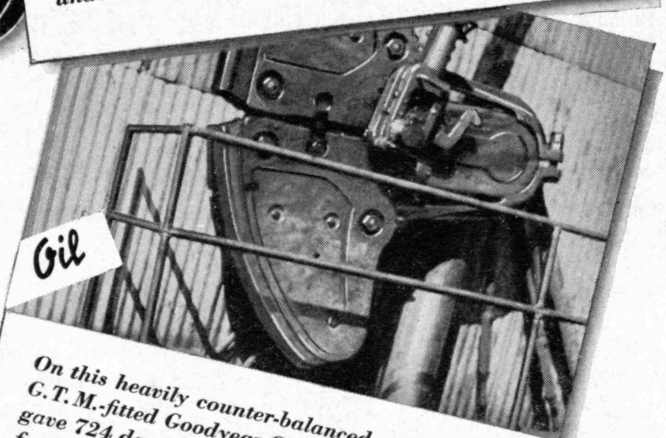
Paper

With increased production this plant is operating at 53% less belting cost since installing Goodyear Belts under the G.T.M. Plant Analysis Plan



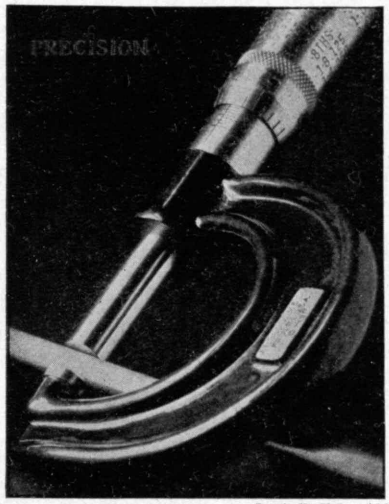
Beet Sugar

G. T. M.-specified Goodyear COMPASS Cord Endless Belts reduced belting expense 50%—eliminated 90% of shut-downs on this battery of white centrifugal machines



Oil

On this heavily counter-balanced pump drive a G.T.M.-fitted Goodyear COMPASS Oil Well Belt gave 724 days' service against 81 days' average for 5 previous belts—nine times longer service!



Lewis P. Tabor, '22

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THE COVER

From a photograph taken from the San Francisco-Oakland Bay Bridge by William E. Davidson

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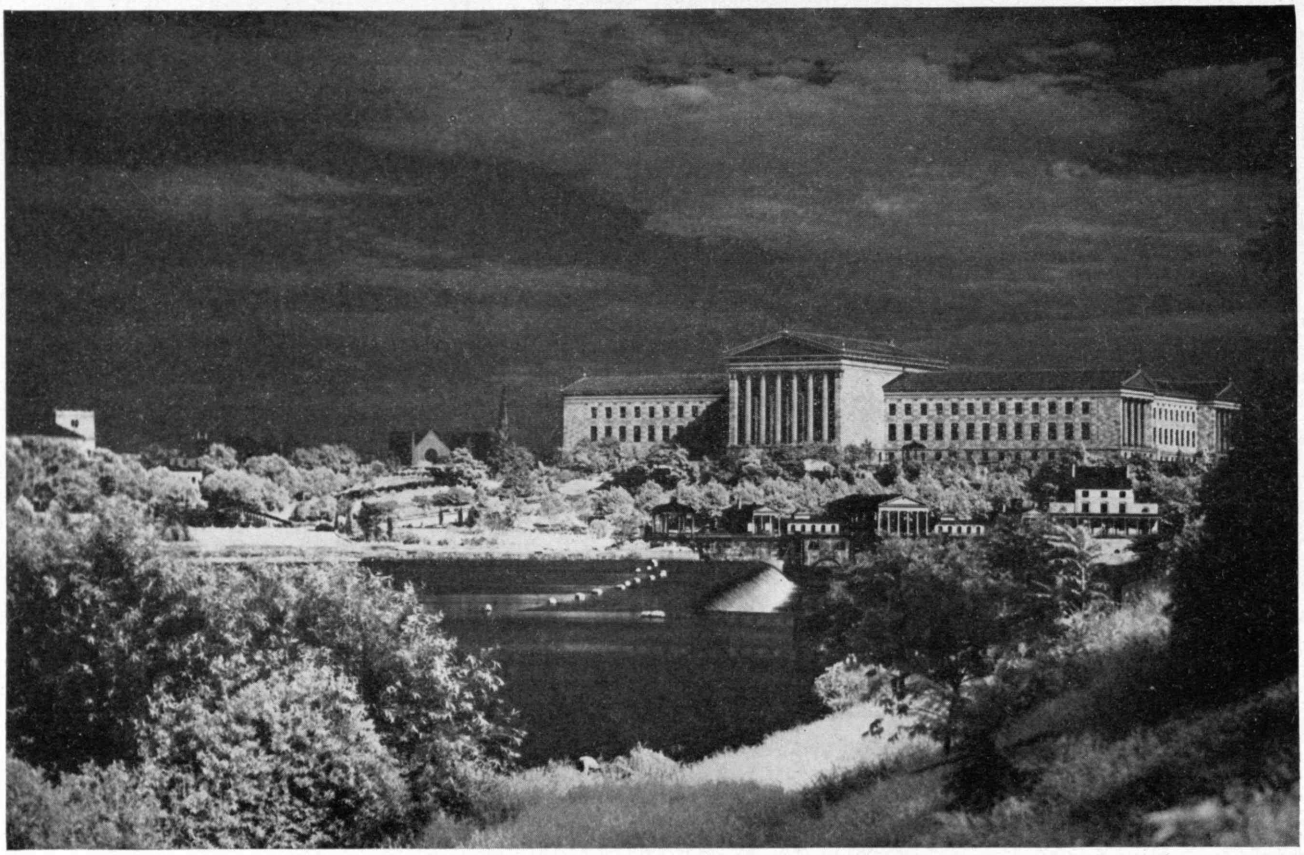

Infrared

In the foreground, the Schuylkill River; beyond, Philadelphia's great Art Museum. The eerie quality of the picture is the result of exposing with infrared light which the eye never sees. From a photograph by Lewis P. Tabor, '22

THE
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The Trend of Affairs

Specks of Dust

WHEN a particle of soil from a Kansan wheat field whirls into the air on the wings of a dust storm it joins a motley host of microscopic fragments, a world fellowship of dust that fills the atmosphere and roves with the winds for thousands of miles. Dust specks know no class distinction, for theirs is a community which draws its incalculable multitude from the earth and from interplanetary space in the timeless process of comminution. As civilization advances and the industry of man adds new forms or hastens the natural process of attrition, the world of dust becomes a problem of great scientific concern to which more attention is now being devoted than ever before.

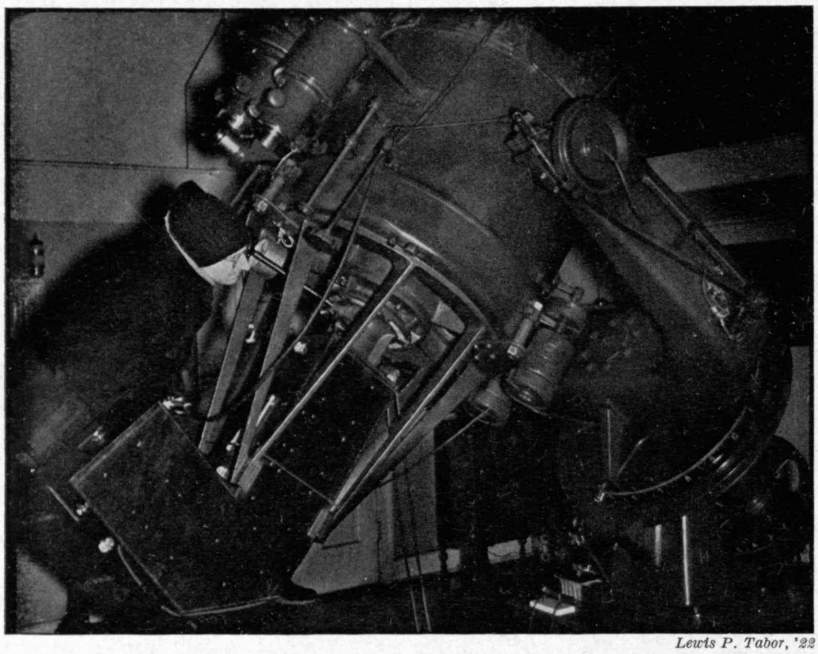
A great deal of the dust of the atmosphere is composed of the earth's soil and vast quantities of particles from the smoke of cities. It is estimated that London alone gives up 7,000,000 tons of smoke a day, thus releasing at least 400 tons of soot particles, a somber legion of fragments that reduces London's share of summer daylight by one sixth. A study by the United States Public Health Service of the effects of smoke in reducing light in New York in January, 1927, showed an average loss of daylight on sunny days of approximately 42% at eight o'clock in the morning. The loss at the same hour in June was approximately 33%, while at noon it was but six per cent. Therefore, smoke abatement, one of the goals of public health engineers for many years, is of paramount importance.

That the number of dust particles in the air varies greatly is indicated by observations at various locations and levels. For example, a cubic foot of air on a New York street has been found to contain 118,000 particles, while at the tenth floor of the Woolworth Building a count of only 72,000 was obtained; at the 58th story the count dropped to 23,000 particles. The inquisitive nose that ventures into an iron grinding room, however, encounters from 14,800,000 to 48,700,000 dust particles per cubic foot. A New York subway platform has given counts ranging from 1,130,000 to 2,320,000 particles, while a cubic foot of business-office air may contain from 128,000 to 172,000 dust motes.

Analysis of a dust cloth in a New England household might at various times of the year show a strange company of tiny particles. It would not be surprising to find a few lonely specks whipped from a Texan garden by a dust storm, smoke particles from a forest fire in northern Canada, volcanic dust from a Pacific island, industrial fragments from factories for miles around, salt particles snatched from the spindrift of the sea by the east wind, and possibly some star dust. There would likely be representatives from the plant and animal kingdom, including scales, seeds, spores, bacteria, plant cells, algæ, rotifers, microscopic fragments of hair, feathers, tissue, and fibers. The mineral world might have as its representatives silica, aluminum silicate, calcium carbonate, calcium phosphate, magnesia, iron oxide, sodium chloride, and many others.

Dust apparently exists at great heights above the earth's surface, for samples of air collected by the Institute's meteorological observation airplane at an altitude of 20,000 feet held many interesting specimens. This study of the distribution of dust and bacteria in the atmosphere is continuing under the direction of Professor Bernard E. Proctor, '23, of the Department of Biology and Public Health. Some investigators believe the air is sterile many miles above the earth.

It must not be concluded that all the inhabitants of the world of dust are malevolent. Some dust is highly desirable, for these infinitesimal particles are the nucleuses upon which water vapor condenses to form rain and



Lewis P. Tabor, '22

Guiding a telescope during the making of a spectrogram on a winter's evening at Gustavus Wynne Cook's Roslyn House Observatory outside Philadelphia

clouds. Through their influence as bearers of raindrops and fog particles, dust specks control humidity and temperature to a remarkable degree. So thank the dust when clouds form and mask the face of the burning sun on an August day.

To the casual observer dust is just dust, but to the scientist there are any number of dust classifications, some of which raise humble specks to positions of great importance. For the sake of simplicity let us consider atmospheric dust as the common variety that mars the polish of the piano. Under ordinary conditions this dust group is simply a household nuisance, perhaps a bit irritating to the nose and eyes, though not particularly dangerous. Add a few particles from the dried sputum of a person suffering from a communicable disease and the potentialities are quite different. The dust then becomes host to germs and if enough of the right kinds are present, there is danger of contagion.

Medical research in recent years indicates that atmospheric dust under ordinary conditions is not so dangerous to health as was once believed. Dr. Samuel C. Prescott, '94, and Dr. Murray P. Horwood, '16, in their recent revised edition of "Sedgwick's Principles of Sanitary Science and Public Health" recall that at one time the danger of atmospheric infection was considered so great that the air of operating rooms in hospitals was disinfected with carbolic sprays. The practice has been abandoned in favor of aseptic surgery, because the danger of infection from the atmosphere is considered remote. Nevertheless, the air of operating rooms is frequently washed today to remove most of the dust particles and bacteria present. In consequence of the newer and sounder knowledge of the significant sources and modes of infection, the old and terrifying pesthouse, which once stood in gloomy isolation on the outskirts of almost every community, has been replaced by the modern hospital for communicable diseases. Often it may be found in the very heart of a congested district.

Concerned as it is with the effects of all dust, science, particularly in the fields of public health and medicine, is interested in the many complex dust forms produced in industrial processes, which include products of combustion and chemical processes, as well as mechanical operations in which abrasion occurs. Dust is one of the most widespread and dangerous occupational hazards to which much attention has been given in recent years. It was in 1914 that the United States Public Health Service, working in coöperation with the Bureau of Mines, began a study of workers subjected to dust in the lead and zinc mines of Missouri. Later studies were made in a cement mill, a granite cutting plant, a cotton textile mill, a municipal street sweeping department, slate, granite, marble, and talc quarries, as well as a silverware manufacturing plant, anthracite mines, and sand-blasting operations. The studies showed that workers in certain of these fields were subject to various diseases, including tuberculosis, silicosis, anthracosis, and pneumoconiosis; but the workers in the silverware plant and the municipal street sweeping department showed no marked tendency to respiratory diseases.

In all these studies investigators were constantly concerned with the quantity of free silica present in the various forms of dust. In "Preventive Medicine and Hygiene," Dr. Milton J. Rosenau, former director of the School of Public Health of Harvard University and Technology, says that from the evidence gathered on the injurious effects produced by inhaling dust it is apparent that knowledge of the properties of a given dust is essential. "Numerous investigations of the industrial dust problem," he adds, "indicate that these properties are the chemical and mineralogical composition of the dust, its concentrations, and its particle size." The latter consideration, Dr. Rosenau finds, is of great importance, for the examination of silicotic lungs has revealed that virtually all the dust particles are less than 10 microns in their longest dimension. Apropos of this observation it might be noted that studies have shown that the average size of dust particles in the working atmosphere of many industries is smaller than 10 microns, while larger and heavier particles apparently settle quickly and are not found in large numbers.

Although much progress has been made in overcoming the hazards of dust in industry, a great deal remains to be done. Dr. Rosenau finds that there are many industrial dusts about which little or nothing is known. Among these he cites tripoli, a free silica composed of quartz and amorphous silica, vitreous quartz, the dusts of the foundry and ceramic industries, as well as pure talc and soapstone from which it is manufactured. New industries produce new and complex dust forms, recruits to that vast community of floating particles that fill the atmosphere and travel great distances at the will of the winds. The industrial hazards of dust probably