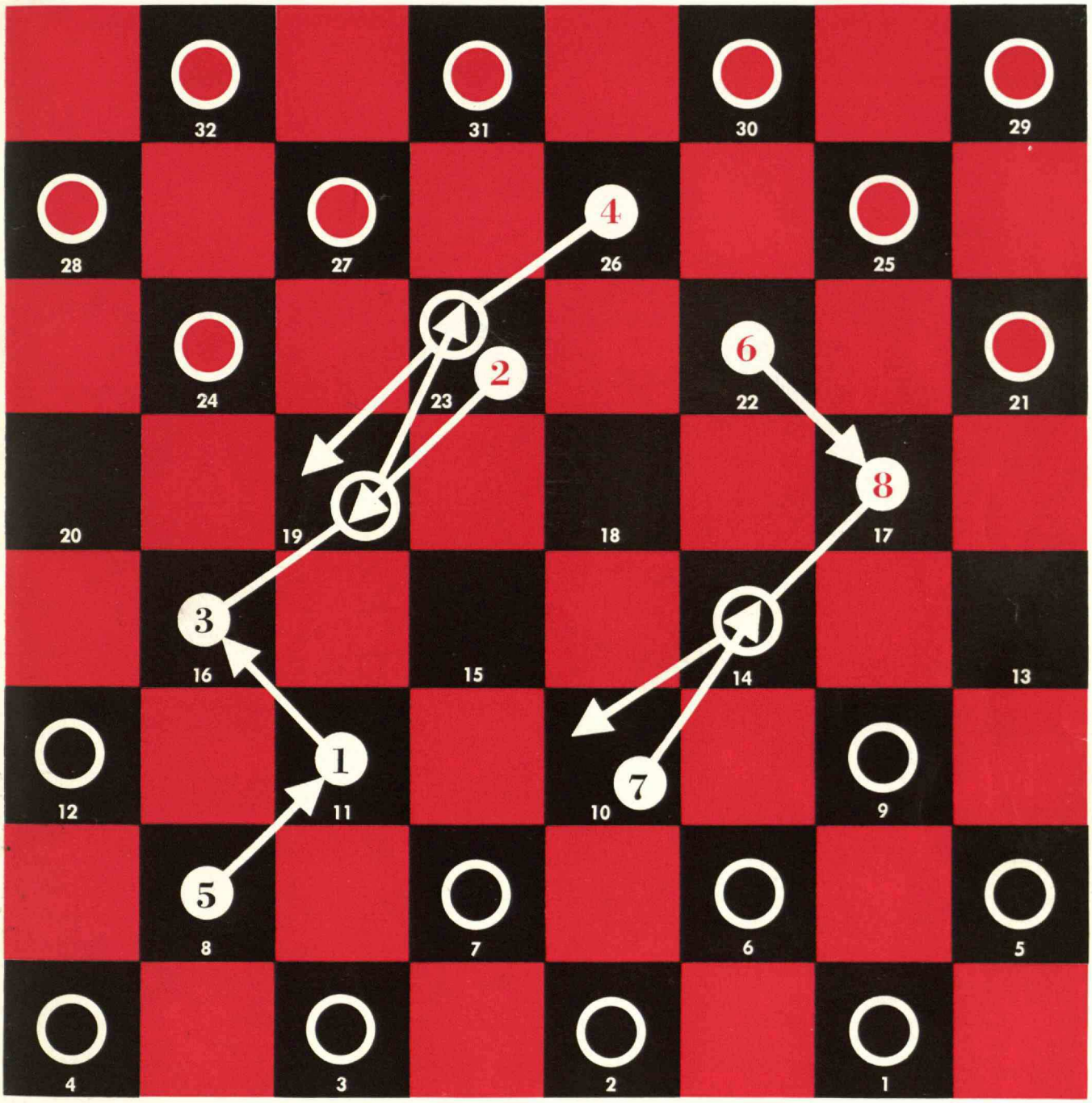
Technology Review



Machine Learning, page 42

Athletics at M.I.T., page 30

NOVEMBER 1959

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Soon, one dependent man will be in a capsule, orbiting in outer space. This astronaut will rely on Transitron's semiconductors from launching pad into orbit and back under environmental extremes of temperature, radiation and acceleration. They'll help guide, communicate and record this historic adventure. At Transitron, more than 4000 skilled employees work exclusively to develop super-reliable silicon and germanium semiconductors. In rockets and missiles, as in radar, computers, atomic subs, communications, jets and thousands of other military and commercial applications — wherever there's electronics, there's Transitron, leading the field in advanced semiconductor reliability.

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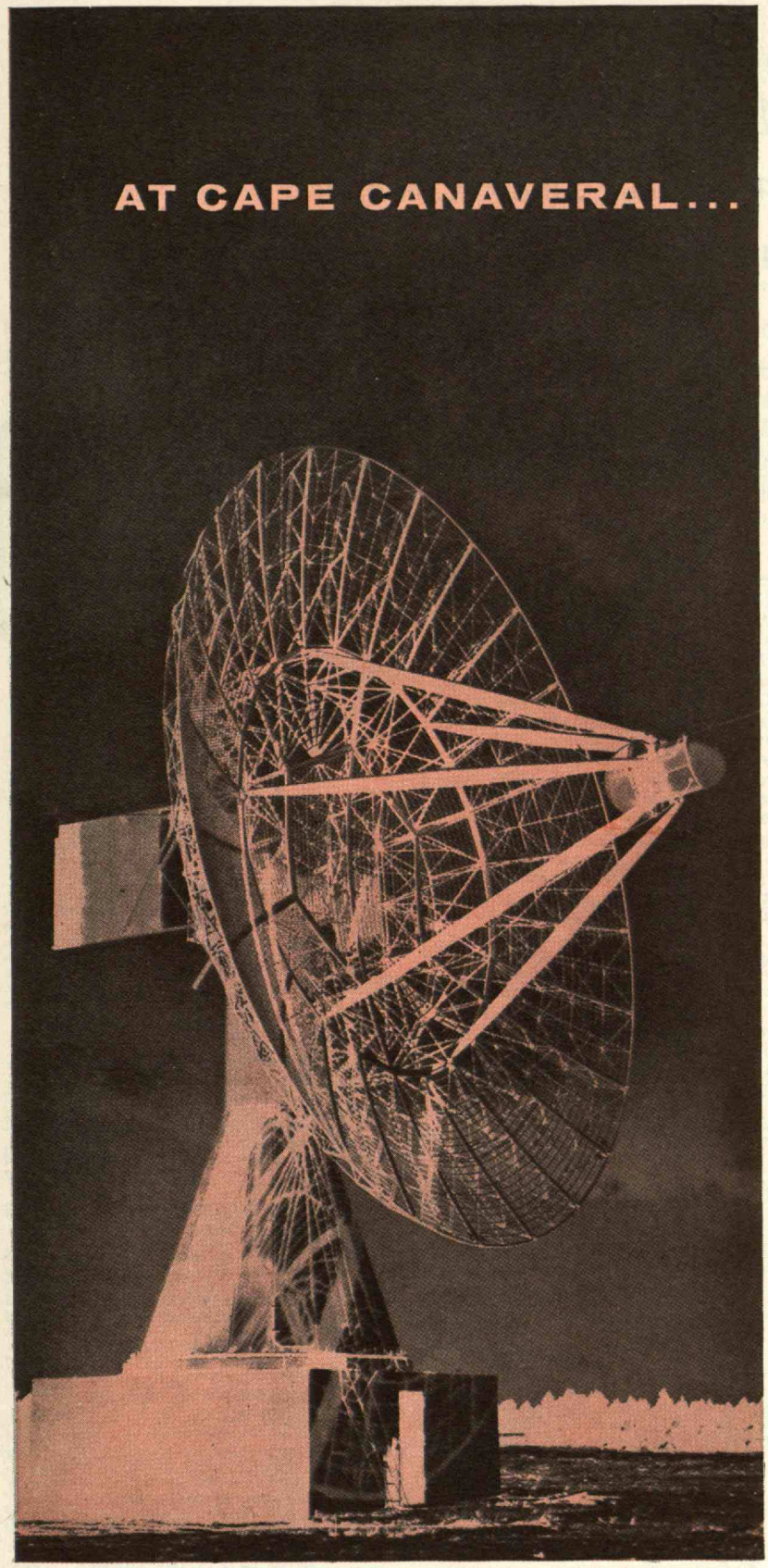

Styroflex® Coaxial Cable

is a vital part of the Air Force Automatic-Tracking Antenna System!

The powerful TLM-18 telemetry antenna now in service at the Air Force Missile Center, Cape Canaveral, Fla., is used for the automatic tracking of missiles and earth satellites. This huge "mechanical ear," specifically designed by Radiation, Inc., Melbourne, Fla., has an effective data reception range of over 1000 miles.

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Styroflex® coaxial cable has earned an outstanding record for these qualities in a variety of industrial, mass communication and telemetering applications. Perhaps this cable can answer your particular high frequency cable problem. We invite your inquiry.

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Important news about the first books to come out of the Physical Science Study Committee

THE SCIENCE STUDY SERIES

During the past three years the Physical Science Study Committee, a group formed at M.I.T., has been working on a program of fundamental importance: to reshape the teaching of physics in secondary schools in the United States.

One vital part of this work has been the commissioning of distinguished scientists to write books which will explain the essence and satisfactions of their work to searching minds of all ages. The first five Science Study Series books, in soft covers and designed for wide distribution and sale at popular prices, are now being published by Doubleday Anchor Books.

During the coming year, at least fifteen of these cogent, readable, illustrated books will be made available. Ultimately, the Science Study Series will comprise more than seventy paper-back volumes. They will range over the key topics of modern physics and geophysics. They will highlight the relationships between the physical sciences and the life sciences. They will revive the most stirring eras in scientific history and the lives of the great scientists. Although an occasional classic will be included in the Series, most of the titles are being especially written to meet the vast and ever-growing needs of an American public whose future may well depend on its scientific awareness.

In addition to the books listed elsewhere in this advertisement, future volumes are now being prepared by such eminent scientists and authors as I. Bernard Cohen, Rene Dubos, Freeman J. Dyson, Laura Fermi, Donald G. Fink, William A. Fowler, Alan Holden, Bernard Jaffe, Alexander Kolin, Philip Morrison, Robert M. Page, Bruno Rossi, Victor F. Weisskopf, Jerome B. Wiesner, and Robert R. Wilson.

"There just weren't any such books when I was a high school student. How lucky those who want to learn about science will be to have them. These books are written by men who know first-hand what is important and what isn't, what is known and what still is not understood, what can be validly explained in simple terms and what can't. And, through the facts and explanations glows a true and real background of science and scientists which no non-participant could provide . . ."—JOHN R. PIERCE, Director of Research, Communications Principles, Bell Telephone Laboratories.

"The Series is superb . . . The discussions are clear and to the point, and certainly should prove thrilling and exciting reading, not only to youngsters but to intelligent oldsters as well."—CHAUNCEY D. LEAKE, President-Elect, American Association for the Advancement of Science.

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Forthcoming titles available early in 1960 include:

The Physics of Television • Galileo • Crystals and Crystal Growing • Radio Astronomy • The Birth of a New Physics • Waves and the Ear

The Science Study Series is available wherever Anchor Books are sold, and is distributed to high school students and teachers by Wesleyan University Press, Columbus, Ohio.

For further information, please write to

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Technology Review

Reg. U.S. Pat. Off.

Volume 62, Number 1 *Edited at the Massachusetts Institute of Technology* *November, 1959*

Feedback

On Solar Sailing

FROM T. C. TSU, 2-44:

In the May, 1959, issue of The Technology Review, Professor Sutton stated that "solar sailing is applicable only in the general direction away from the sun." This statement is misleading and does not do justice to the solar sail.

Professor Sutton's statement is correct only if the sail surface is black and non-reflecting. If the surface is reflecting, then the sail could be so oriented that the force acting on it would have a component either in the direction of motion of the sailing ship or opposed to it. In the former case the force would increase the energy of the ship, causing it to move away from the sun. In the latter case the force would decrease the energy of the ship, causing it to move toward the sun. The latter case is analogous to that of an artificial earth satellite falling back to earth when its energy is depleted sufficiently.

For further details and quantitative relations, please refer to the writer's paper on "Interplanetary Travel by Solar Sail" in the June, 1959, issue of the *ARS Journal*, page 422.

Research Laboratories
Westinghouse Electric Corporation
Pittsburgh 35, Pa.

FROM G. P. SUTTON:

Photons coming from the sun always go in a general direction away from the sun. The forces that can be obtained on a solar sail are therefore always exerted in a direction generally away from the sun. It is correct that by inclining the surface of the sail it is possible to obtain components in other directions but the net total force will never be in a direction toward the sun. The sentence on solar sailing in the article in the May issue of The Review should be interpreted to mean that forces from solar sails can only be obtained in a direction generally away from the sun (plus or minus approximately 70 degrees).

If there is a lot of time available and if you apply these forces at the proper time during a space trajectory, it is possible to alter the trajectory so that the vehicle unit could eventually come closer to the sun.

I appreciate Mr. Tsu's comments.

Advanced Research Projects Agency
Washington 25, D.C.

This Month *The Cover*

The numbers on the checkerboard show the system used to designate squares, and trace opening moves in a game played against an IBM 704 computer. The method of playing checkers with a computer is explained in the article on page 42.

EDITOR: Volta Torrey; BUSINESS MANAGER: R. T. Jope; CIRCULATION MANAGER: D. P. Severance; EDITORIAL ASSOCIATES: J. J. Rowlands, Francis E. Wylie, John I. Mattill; EDITORIAL STAFF: Ruth King, Diana de Filippi; BUSINESS STAFF: Madeline R. McCormick, Louise E. Ryan; PUBLISHER: H. E. Lobdell.

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Individuals Noteworthy

Floe Is Vice-president

CARL F. FLOE, '35, (above) Administrative Vice Chancellor since 1956, has become Vice-president, Research Administration, for M.I.T. Dr. Floe now has general jurisdiction over the Division of Sponsored Research. He works closely both with Paul V. Cusick, Comptroller, in determining and supervising administrative policies of sponsored research, and also with the Deans of the several Schools to make certain the sponsored research contributes importantly to the educational aims of the Institute.

Dr. Floe has been a member of the Faculty since 1935. In addition to his teaching duties as Professor of Metallurgy, he has held various administrative posts, including that of Assistant Provost.

B. E. Proctor: 1901-1959

THE Head of the Department of Food Technology at M.I.T., Professor Bernard E. Proctor, '23, died in his office in the Dorrance Building on September 24. He had served the Institute since 1925, had pioneered in many kinds of research including most recently the sterilization of food by radiation, and had given much time to public service as a consultant on food problems.

Professor Proctor was born in Malden, Mass., on May 5, 1901. He was salutatorian of his class in the Malden High School, and received both his bachelor's and doctor's degrees from M.I.T. For three years he was an instructor in biochemistry at Boston University School of Medicine. He then joined the M.I.T. staff as an instructor in biology and public health, and became professor of food technology in 1944, director of the Samuel Cate Prescott Laboratories in 1945, and head of the department in 1952.

During World War II, Professor Proctor was expert consultant on foods to the Secretary of War and director of Subsistence and Packaging Research and Development for the Office of Quartermaster General. He also served on a number of National Research Council committees and as a consultant to the U. S. Public Health Service. He had been president of the Institute of Food Technologists and chairman of the Food and Nutrition Section of the American Public Health Association, and was a member of the U. S. delegation to the United Nations Conference on Peaceful Uses of Atomic Energy in 1955. The Appert Medal, highest honor in the field of food technology, was given to him.

Professor Proctor made his home at 100 Memorial Drive, Cambridge. He is survived by his wife, the former Miriam Patten of Andover, Mass.

A. L. Townsend: 1892-1959

LAST August 17, Arthur L. Townsend, '13, died after 40 years' service as a member of the Department of Mechanical Engineering at M.I.T. He was vice-president of the Alumni Association in 1937-1939, and since 1944 had been the director of the Lowell Institute School.

Born in Boston in 1892, Professor Townsend came to M.I.T. from the Boston English High School. When graduated, he joined the Globe Indemnity Company as engineering inspector and soon became New England inspector and chief engineer for the Massachusetts Bonding and Insurance Company. He returned to the Institute as an instructor in 1919, became assistant professor in 1929, and associate professor in 1937. His teaching was in machine design, applied mechanics, and patent relations. He also served for many years as undergraduate and alumni placement officer for the Mechanical Engineering Department.

Professor Townsend was a former chairman of the mechanical engineering division of the American Society for Engineering Education, and received that society's $500 James H. McGraw Award in 1957 for his work as Director of the Lowell Institute School.

W. R. Maclaurin: 1907-1959

W. RUPERT MACLAURIN, Professor of Economics at M.I.T., who was largely responsible for the establishment of his Department's Industrial Relations Section, died on August 17. He was the son of Richard C. Maclaurin, the sixth President of the Institute, and had been on the Faculty since 1936.

Professor Maclaurin was born in New Zealand in 1907. After finishing his course in Harvard College in 1929, he attended the Graduate School of Business Administration and received his M.B.A. in 1932 and the D.C.S. in 1936. He was at Trinity College, Cambridge, England, for a year as a Fiske Scholar in Economics from Harvard, and in Australia for a year as Sheldon Traveling Fellow in Economics. He became an assistant professor at M.I.T. in 1936, associate professor in 1940, and professor in 1942.

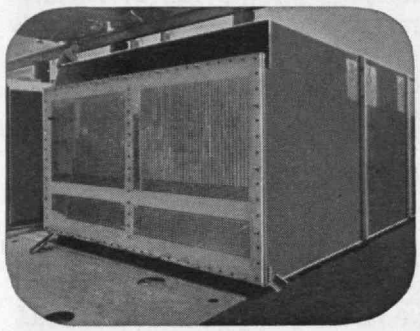
He was the author of *Economic Planning in Australia, The Movement of Factory Workers* (in collaboration with Professor Charles A. Myers), and *Invention and Innovation in the Radio Industry*. He helped to strengthen the Department of Economics and Social Science at M.I.T., and was the first director of its Industrial Relations Section.

Survivors include his wife, Elfriede Carter Maclaurin, and four children, Katharine, Robert, Joan, and Nancy. His brother, R. Colin Maclaurin, died last May 4.

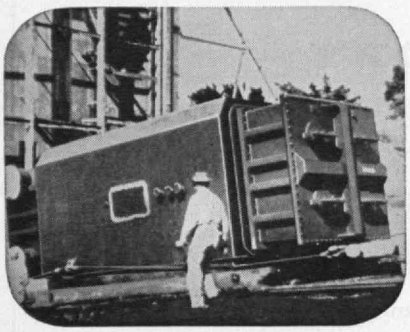
(Continued on page 6)

and auxiliary equipment

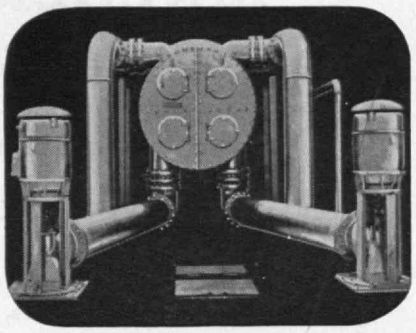
HOW C.H. WHEELER CONDENSER DESIGN saves space...



Head Room problems are solved by compact condensers like this one. Turbine floor to basement floor, in this case, is only 20 ft. The Unit has 65,000 square feet of condensing surface.

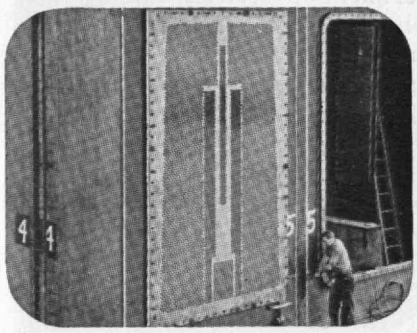


Rectangular Cross Section makes C.H. Wheeler Condensers adaptable to nearly any space or condenser arrangement because the length, width and height of any Wheeler Unit can be varied almost-at will.

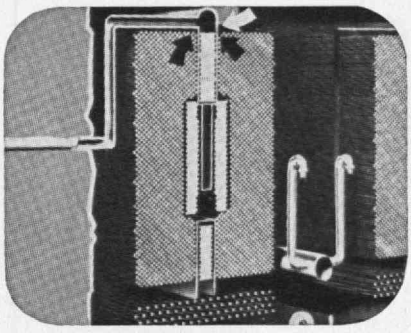


But Wheeler Doesn't limit itself to rectangular design. A round cross section worked out better here, for example, at the first planned gas-steam turbine station ever designed and built in United States.

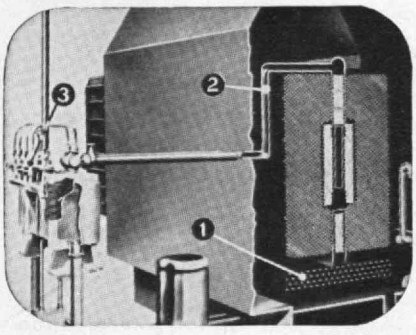
improves power generating efficiencies...



Triple Lane tube layout, another design feature, provides 3 pathways for steam travel, utilizes maximum cooling surface and produces higher condenser vacuums for power generating stations.

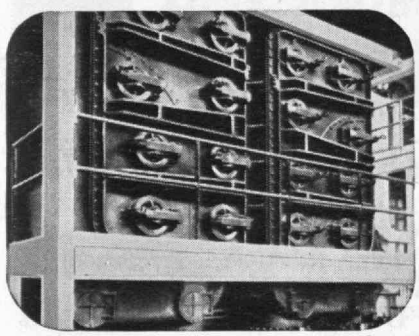


Location of air-vapor takeoff speeds steam travel and allows steam to penetrate to the peripheries of all tubes. It thus improves condenser efficiencies and overall power station operation as well.

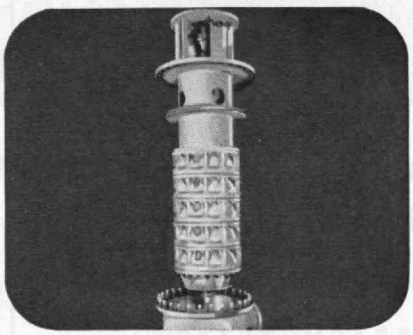


Deaeration of condensate not to exceed 0.01 cc. oxygen/liter is available with special Wheeler designs. Note the Deaerating Bars (1), the Air-Vapor Suction Line (2), and Tubejet® Ejectors (3).

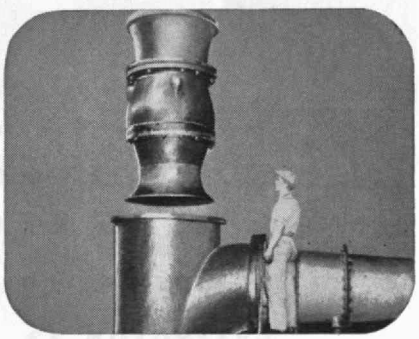
and reduces maintenance



Patented Reverse Flow permits flushing tubes and sheets without shutting down Unit, during full load with either or both circulating pumps operating. No additional circulating water inlet or discharge piping necessary with C.H. Wheeler's Reverse Flow.



"Pull-Out" Condensate Pumps simplify maintenance because entire pumping element, including all rotating parts, can be removed without disturbing either the pump barrel or the piping connections.



C. H. Wheeler Circulating Pumps, like Condensate Pumps, are easy to inspect and maintain because of "Pull-Out" design. In addition, shafts are heat treated alloy steel and impellers are statically and dynamically balanced for trouble-free operation.

C. H. Wheeler has been designing and building condensers since 1903; has developed such features as Dual Bank Design and Reverse Flow.

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Individuals Noteworthy

(Continued from page 4)

Appointed to the Faculty

RECENTLY appointed associate professors on the M.I.T. Faculty are:

Warren G. Bennis, '53, in the School of Industrial Management, who received his doctorate at M.I.T. in 1955 and has since taught at Boston and Harvard Universities.

Lincoln P. Bloomfield, in the Department of Economics and Social Science, who has served as special assistant to the Assistant Secretary of State for International Organization Affairs and director of the United Nations Project at the M.I.T. Center for International Studies.

William F. Schreiber, in the Department of Electrical Engineering, who received his B.S. and M.S. degrees from Columbia University and Ph.D. from Harvard, and since 1953 has been a research physicist for the Technicolor Corporation.

Assistant professors recently appointed and the departments in which they will teach are:

Ali S. Argon, '53, Mechanical Engineering.

Pierre J. Brosens, '55, Mechanical Engineering.

Alfred R. Cooper, Jr., Metallurgy.

Paul H. Cootner, '53, School of Industrial Management.

Robert G. Dean, Civil Engineering.

Robert Evans, Jr., '54, Economics and Social Science.

James W. Graham, '52, Electrical Engineering.

Alan L. McWhorter, '55, Electrical Engineering.

Ronald Melzack, Economics and Social Science.

John R. Myer, '52, School of Architecture and Planning.

Gordon C. Oates, Aeronautics and Astronautics.

Ronald E. Rosensweig, Chemical Engineering.

Abner E. Shimony, Humanities.

Yehuda Stavsky, Civil Engineering.

Egons Tons, '54, Civil Engineering.

Michael A. Wallach, Economics and Social Science.

(Continued on page 10)

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