

TECHNOLOGY

REVIEW

January 1959



Right off the Wire

Before the first nuclear-powered merchant vessel is launched, a new reactor system which has been designed is expected to reduce the cost of a comparable installation by forty per cent.

After leaving a new electric shaver plugged into an outlet overnight it can be used for a week without recharging.

A radio operator's vest, with pockets for dry cells, can be worn under outer garments in arctic cold. The batteries, when kept warm by body heat, are said to last ten times longer.

Automobile batteries are now made with cells which can be removed and replaced in a few minutes.

A new electronic surveying technique, now in use in highway layout work, enables engineers to establish numerous ground control points and measure distances in a matter of minutes. Maximum possible error is only 11 inches in 40 miles.

Copper strip is being made from powdered metal. The process can also be used for other metals which can be combined in no other way.

A portable building for use in the arctic has hollow walls of nylon fabric. When the walls are inflated the building stands erect.

A research program has begun for the study of new semiconductors for use in transistors. The materials are indium phosphate, gallium arsenide, aluminum antimonide.

An insulated guard rail for the end of the boom is made to protect a crane operator in case of contact with a power line.

More and better rayon is the object of a study of cellulose growth in living trees. Two-year-old pines are injected with radioactive carbon and are later cut down for examination.

A new plastic adhesive used in aircraft construction is semi-elastic and stronger than the metals it joins.

A new titanium alloy is made into sheets that will withstand air pressures of over 100 tons per square inch.

The "world's loudest noise" can be produced by a new compressed air loud speaker that is capable of projecting the human voice for ten miles.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

Twelve pneumatic tires, each supporting a load of 20,000 pounds, enable a new lift to pick up and move concrete pipe sections at five miles per hour.

The Post Office Department has awarded a contract for the development of a mechanical letter-sorting machine.

Aerodynamic shapes designed to travel at over 8,000 miles per hour can be tested in a new wind tunnel.

Layers of steel, bronze and a mixture of lead and plastic compose a new dry bearing material that requires no lubrication.

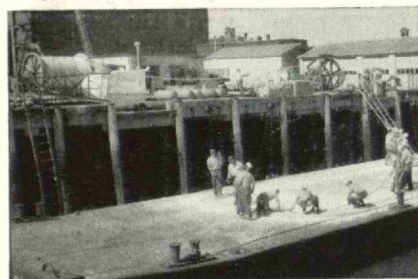
Coils of aluminum, plastic or steel, up to 82" O.D., can now be spiral wrapped by machine.

A new method of producing electricity uses a fuel cell that converts hydrogen and oxygen into direct current by means of a catalyst.

A new recording instrument measures heat absorption in any area and is used for allocating air conditioning or heating charges to tenants.

Quartz tubing is being made so small that fifty feet contain only one drop of water.

A new heat resistant paper is made of ceramic fibers.



Simplex Goes To Sea

The 36,000-foot "sea section" of the Simplex submarine communication cable, for use between Cape Neddick, Maine, and Boone Island Light, was loaded in August at Boston.

The cable came off a giant reel (dia. of head 126 inches) and was carried over a capstan to the 126-foot barge.

The cable is described as "4-conductor, No. 9 AWG stranded, ANHYDREX insulated, armored submarine communication cable."

The reel and its load of more than six miles of cable weighed 68 tons.

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

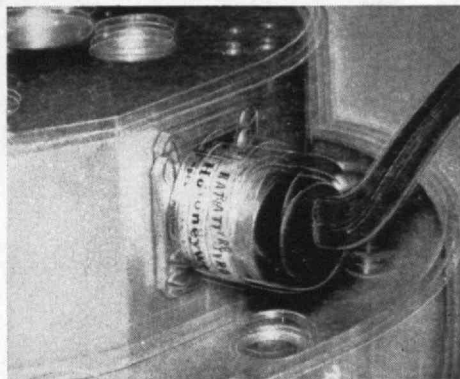
Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

HONEYWELL MINIATURE RATE GYROS

Rugged enough to withstand 100 G shock



Model M-1
shown actual size



Typical M Series Gyro undergoes 20 G Linear Vibration Test with no deterioration of performance.

Sensitive enough to detect 0.005° per second

Honeywell's newest miniature rate gyros, Type M Series, are rugged enough to withstand repeated shocks and linear accelerations up to 100 G yet sensitive enough to detect turn rates of only 0.005 degrees per second. A damping ratio variation of 2 to 1 or better is maintained without heaters by a unique fluid damped, temperature compensated system that assures reliable operation over the entire operating temperature range.

Type M Series Gyros are specifically designed for autopilot damping, radar antenna stabilization and fire control applications. Their small size, high performance and ruggedness suit them particularly for high performance military aircraft and guided missile applications. Write for Bulletin M to Minneapolis-Honeywell, Boston Division, Dept. 1, 40 Life Street, Boston 35, Mass.

DESCRIPTIVE DATA

FULL SCALE RANGE: to 400 degrees per second

THRESHOLD-RESOLUTION: 0.005 degrees per second

LINEARITY: 0.1 % to 2 % depending on range

DAMPING: 2 to 1 (or better)

TEMPERATURE RANGE: -65 to +200 and +250°F

SHOCK AND ACCELERATION: 100 G

VIBRATION: 20 G to 2000 cps

PICKOFF: Variable Reluctance type providing infinite resolution and high signal-to-noise ratio

MOTOR EXCITATION: 26 volts, 400 cps (standard)
2 phase and 3 phase

SIZE: 1" diameter, 2 3/4" long

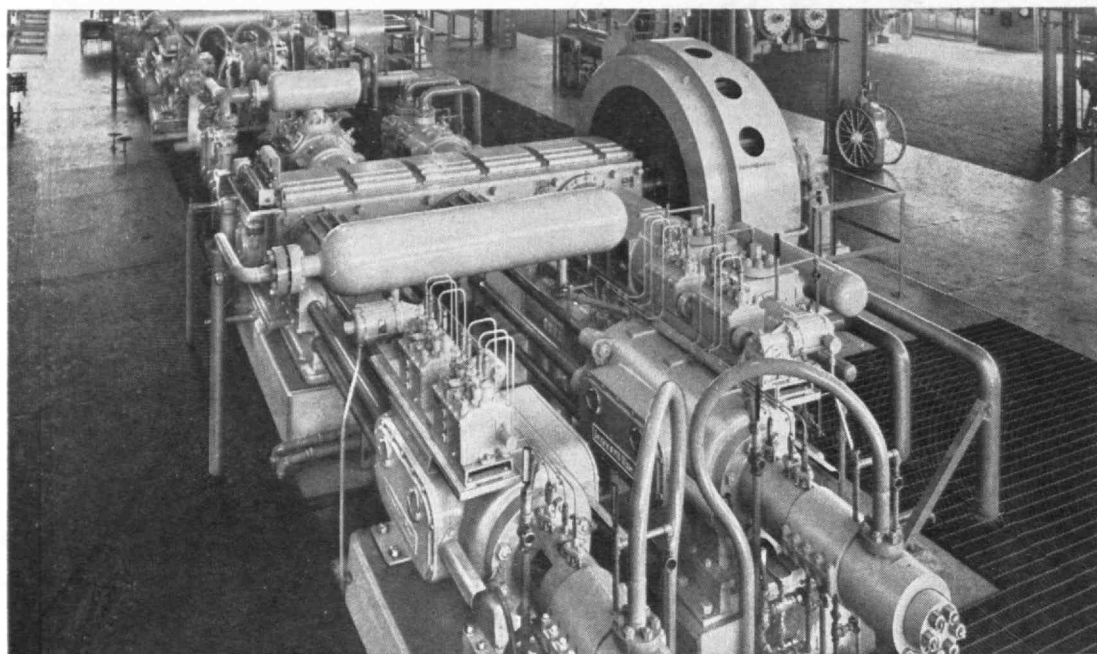
WEIGHT: 4.5 ounces

Honeywell

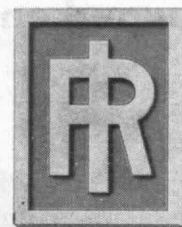


Military Products Group

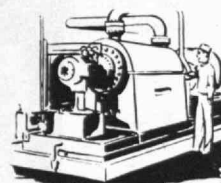
with **INGERSOLL-RAND**



Seven electric-driven Ingersoll-Rand reciprocating compressors totaling 21,900 horsepower are at work in this large ammonia synthesis plant. The units in the foreground compress mixed gases to more than 12,000 pounds per square inch.



also means
LEADERSHIP
in



Centrifugal Pumps

Here's What Compressor Engineering at Ingersoll-Rand can mean to you...

TODAY, air power is one of the industry's most vital requirements. Compressed air and gases are the "breath of life" to chemical and process industries, refineries, power plants, steel mills, manufacturing plants, mines and all types of construction jobs. Hence, compressor and blower engineering offers an exciting and ever-expanding field of challenging opportunities that are virtually industry-wide.

Ingersoll-Rand is the world's largest manufacturer of air and gas compressors and Turbo-Blowers — supplying over 1000 different sizes and types, ranging from 1/2 hp to

17,250 hp, in pressures from vacuum to 35,000 psi.

Ingersoll-Rand also manufactures pumps, rock drills, diesel and gas engines, vacuum equipment, blowers, air and electric tools and specialized industrial machinery as illustrated at the right. These products require engineering know-how in their design, manufacture and field application.

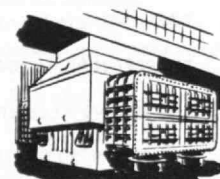
If you are looking for a leadership career with long-range job security and excellent opportunities for advancement, you'll find it at Ingersoll-Rand. For further details, contact your Placement Office, or write to Ingersoll-Rand, 11 Broadway, New York 4.



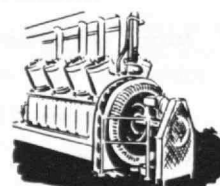
Rock Drills



Air & Electric Tools



Steam Condensers



Diesel & Gas Engines

OPPORTUNITIES for ENGINEERS NOW AVAILABLE:

- Sales Engineering
- Design Engineering
- Production Engineering
- Business Engineering

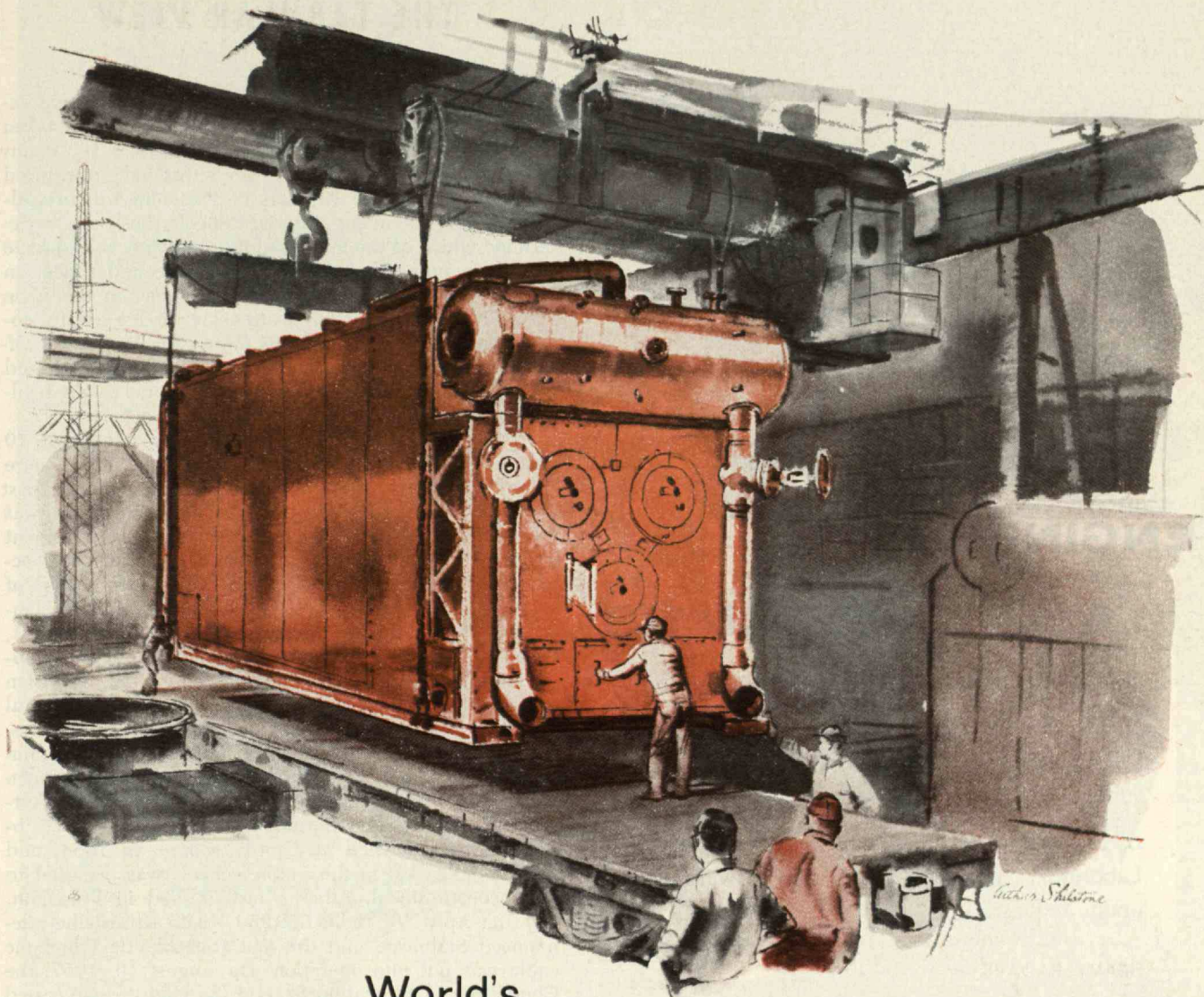
Ingersoll-Rand

1-711

11 Broadway, New York 4, N. Y.

*Among the many graduates of Massachusetts Institute of Technology at Ingersoll-Rand are:
L. C. Hopton, 1926, First Vice-President and Secretary; P. J. Bentley, 1925, Vice-President.*

"CREATIVE ENGINEERING" PROVIDES NEW TYPE OF PACKAGE BOILER TO MEET TODAY'S STEAM NEEDS



World's highest capacity Package Boiler removes traditional space and performance limitations

The flat car pictured above is carrying an engineer's dream. It's a space-saving steam generator which makes electric utility performance standards available to industrial plants. It's a unit of large capacity—yet it's factory-assembled and ready to be installed as a one-piece "package." It's a product which reflects C-E's record of developing steam equipment that introduces new standards of performance.

For the first time, here's a boiler capable of producing over 100,000 pounds of steam every hour . . . and at pressures and temperatures previously unobtainable in a 'packaged' unit. These results are made possible by utilizing *C-E Controlled Circulation*, the most notable development of this decade in the field of large utility boilers.

In short, here's a new alliance of performance with economy. This is what progressive management demands of its capital equipment. This is what you can count on *Combustion* to deliver.

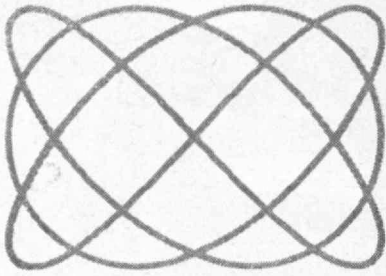
"CREATIVE ENGINEERING" is the reason for the leadership attained by C-E products. The products which bear this mark of leadership include:

all types of steam generating, fuel burning and related equipment • nuclear power systems • paper mill equipment • pulverizers • flash drying systems • pressure vessels • soil pipe

COMBUSTION ENGINEERING

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.





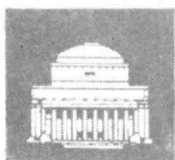
PHYSICISTS ENGINEERS MATHEMATICIANS

are invited to join the Lincoln Laboratory scientists and engineers whose ideas have contributed to new concepts in the field of electronic air defense.

A brochure describing the following Laboratory programs will be forwarded upon request.

- HEAVY RADARS
- MEMORY DEVICES
- TRANSISTORIZED DIGITAL COMPUTERS
- SCATTER COMMUNICATIONS
- SOLID STATE
- AEW (air-borne early warning)
- SAGE (semi-automatic ground environment)
- SYSTEMS ANALYSIS

In certain of these programs, positions of significant professional scope and responsibility are open to men and women with superior qualifications.



Research and Development

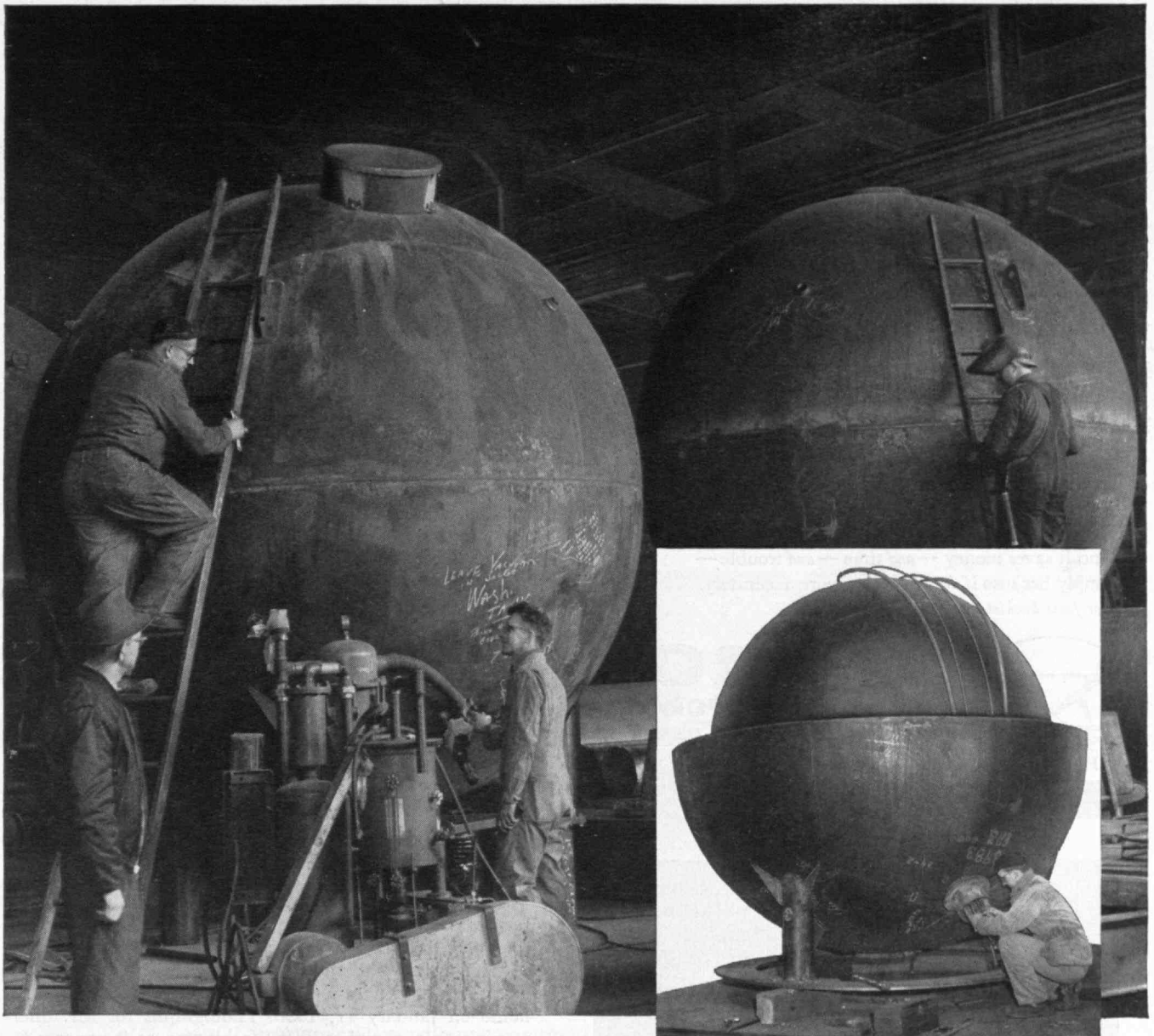
MIT

LINCOLN LABORATORY
BOX 28
LEXINGTON 73, MASSACHUSETTS

Decade in Review. — Perhaps the term “explosive expansion” best describes the changes that have taken place at M.I.T. since the end of World War II. At any rate, in preparing a survey of events that have transpired at M.I.T. during the 10 years of President Killian’s administration, the major editorial difficulty has been to determine which of the many significant events would have to remain unmentioned for lack of time and space. In writing *THE TECHNOLOGY REVIEW REPORT* in this issue (page 137), the editor wishes to acknowledge helpful cooperation from the Treasurer’s Office, the Registrar’s Office, the Office of the Dean of the Graduate School, and the Office of Physical Plant, whose personnel made available the statistical data included in this article.

In reviewing the progress at M.I.T. for the past 10 years, we found it interesting to recall some of the more important events that took place elsewhere in the past decade. The North Atlantic Treaty Organization was formed in 1949, and in September of that year President Truman announced that an atomic explosion had occurred in the Soviet Union. During 1950, Jacob Malik of the U.S.S.R. walked out of the United Nations in January; six months later, Korea was invaded. In 1951, General Douglas MacArthur was relieved of his command, and on September 4 transcontinental television service was inaugurated. In November, 1952, General Eisenhower was elected President of the United States. Three significant events occurred in 1953: Joseph Stalin died; the U.S.S.R. announced a test of the hydrogen bomb; and Elizabeth II was crowned queen in Westminster Abbey. The *Nautilus*, first atomic-powered submarine was launched at Groton, Conn., in 1954, and racial segregation in the public schools was declared to be unconstitutional. Albert Einstein died in Princeton, N.J., on April 18, 1955. In 1956 Nikita Khrushchev denounced Stalinism, and the first transatlantic telephone cable was put into operation. On August 10, 1957, the Committee on Education Beyond the High School issued its report, predicting crises in college education. The Russians launched their first artificial satellite on October 4 and their second on November 4. On November 7, President Eisenhower named Dr. Killian to be his Special Assistant for Science and Technology.

Education, with Perspective. — As society becomes ever more complex, the problem of providing training programs, for properly educating a nation’s citizens to fulfill their obligations, becomes increasingly difficult. Today, educators in many advanced nations are struggling heroically with this task which probably has no single “best” solution, even within a given country. The debate of the liberal arts versus technical education is giving way to the general recognition that significant elements from both programs are essential for an educated person of today. The importance of history in helping to provide the essential ingredient of perspective (which every successful educational program supplies) is discussed (page 147) by ROBERT S. WOODBURY, ’28, Assistant Professor of English and History in the Institute’s Department of Humanities. After having been graduated in 1928 from the Institute’s Course IX-C, where he studied mathematics and theoretical physics, Professor Woodbury continued studies in mathematics at M.I.T. for another two years. In 1936, Harvard University awarded him the A.M. degree in the history of science. (Concluded on page 122)



LINDE SELECTED GRAVER To Build These Liquid Oxygen Storage Spheres

To keep oxygen liquid—at 297° below zero—for prolonged periods, requires quality fabrication of the container. Otherwise, losses from heat-leak, and consequent evaporation, would increase oxygen cost.

To meet these severe requirements in fabrication, Linde Company (Div. of Union Carbide), a leading producer and shipper of liquid oxygen, chose Graver to fabricate these 9 ft. diameter, double-shell spheres. The inner shells are constructed of 304 stainless steel, and the outer jackets of carbon steel. Insulation is by Linde-patented powder-vacuum. Fabricated with air-tight

welding to assure holding the vacuum between the shells, the spheres were delivered complete with instruments ready for installation.

The fabricating and welding skills in these liquid oxygen spheres are the result of many years of experience. Graver's extensive background in the field of cryogenics is but one of the many reasons why companies regularly turn to Graver to fabricate storage and processing vessels in alloys and carbon steels—especially those calling for the special skills required for quality production to meet severe operating conditions.

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12-1/4

THE TABULAR VIEW

(Concluded from page 120)

ence. Except for seven years as Commander in the Navy during World War II, since 1929 Professor Woodbury has been engaged in teaching intellectual history, history of science, and history of engineering to M.I.T. students.

Fort Washington. — Few of the ever-growing number of M.I.T. students, or members of the Institute's Faculty or staff, are acquainted with the historic gun emplacements erected during the early years of the American Revolution on land that is virtually in the Institute's "back yard." Bostonians, too — whether proper or improper — are equally insouciant concerning this historic spot which bears the name of Fort Washington. The fort (now a small park) is not far from the Tech Boat House; it is located in an industrial section of Cambridge, just across the Boston and Albany tracks from the Westgate housing unit for married M.I.T. students. The history of this fort was recorded several years ago by the late CHARLES W. SHERMAN, '90, who brought it to the attention of The Review's editor. Mr. Sherman's manuscript was held for the obviously propitious occasion of celebrating the centennial of the gift of the park to the City of Cambridge, and appears on page 150 of this issue. Mr. Sherman received the S.B. degree in Civil Engineering from M.I.T. in 1890 and in 1895 received the master's degree in the same field from Cornell University. He was a member of the firm of Metcalf and Eddy for many years, and after his retirement in 1938, served as consultant to his well-known firm. From 1937 until 1954, he was president of the Belmont Savings Bank in Belmont, Mass. After 1954, he became a vice-president of the bank. He was also a director of the Merchants Cooperative Bank of Boston, and a former water commissioner of the Town of Belmont, Mass., where he lived for 58 years. Mr. Sherman was former president of the New England Water Works Association, former vice-president of the Boston Society of Civil Engineers, and a member of many educational, engineering, and historical associations. He died at his home on January 17, 1958. Photographs for Mr. Sherman's article, showing Fort Washington as it appears today, were made by the late Raymond E. Hanson, '03.

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Chapman, Evans & Delehanty,
Architects



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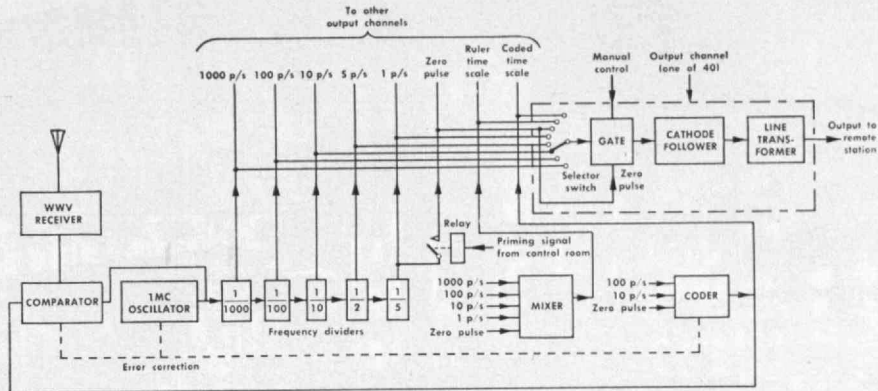
W. J. BARNEY CORPORATION

Founded 1917

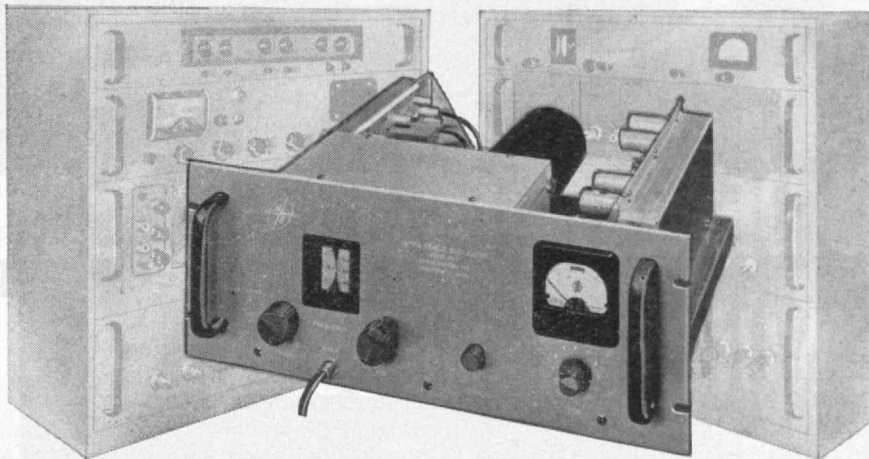
INDUSTRIAL CONSTRUCTION
101 Park Avenue, New York

Alfred T. Glassett, '20, President

AN INTEGRATED TIMING SYSTEM FOR TRACKING AND CONTROL OF MISSILES



Schematic diagram of Central Timing Station



The Hycon Eastern Integrated Timing System, when used as a central station timer, meets the requirements of most range instrumentation with one comprehensive unit. At pre-programmed times during the shoot, time markers are supplied to recording instruments and switching pulses are supplied to recording and control instruments located in remote slave stations.

At the heart of the Timing System is the Hycon Eastern Ultra Stable Oscillator with guaranteed stability of one part in 10^9 and even greater stability in actual practice. A WWV Receiver corrects for drift error of the time base oscillator over long time periods and a time scale is available with resolutions accurate to 1 microsecond.

Solar or sidereal time is displayed visually and is available for both input to automatic computers and as an index to data being recorded during the test run. Capable of operating anywhere in the world, this system is also suited for astronomical measurements and navigation systems. Write for Bulletin TS-00.

Tomorrow's Timing Systems . . . Today

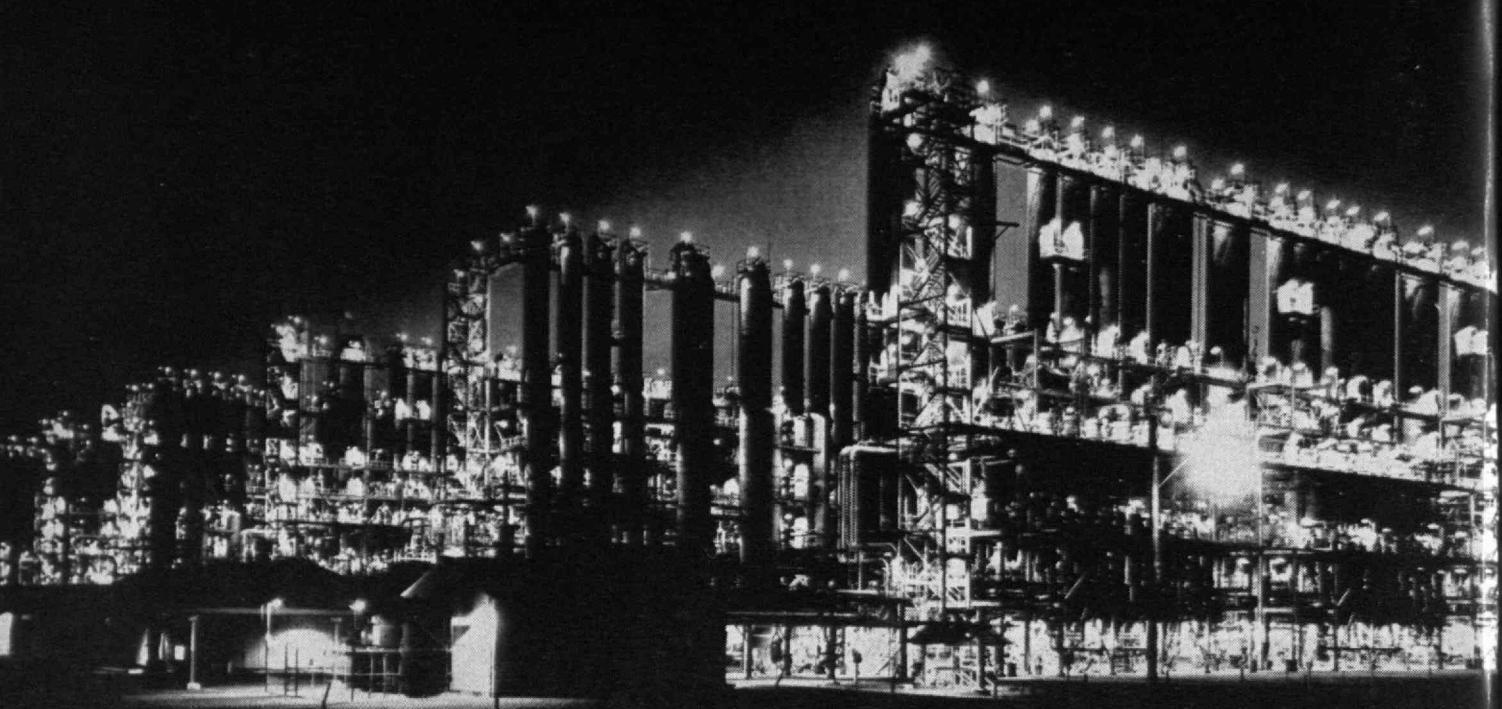


HYCON EASTERN, INC.

75 Cambridge Parkway

Dept H

Cambridge 42, Mass.

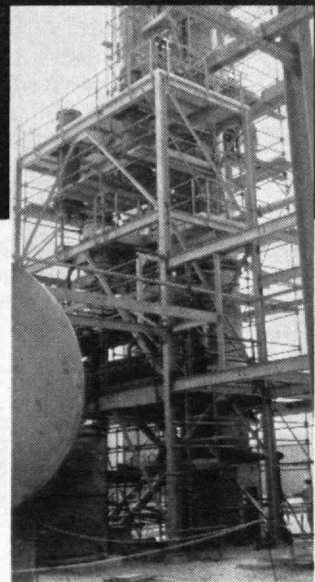
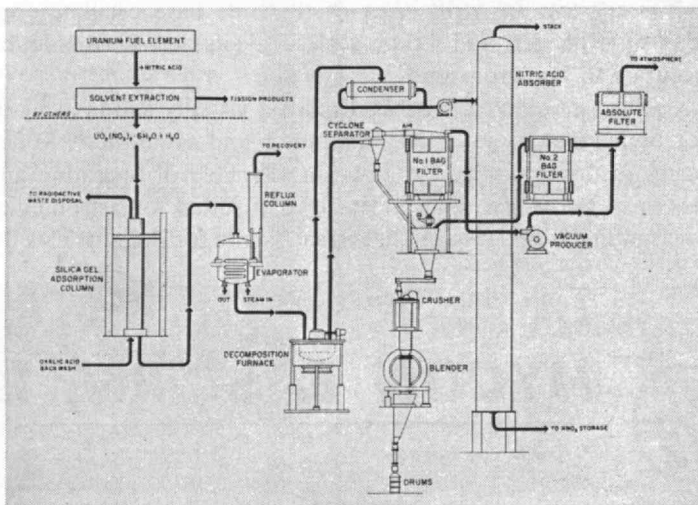


LUMMUS DESIGNS, ENGINEERS, CONSTRUCTS FOR THE NUCLEAR INDUSTRY

World-wide designers, engineers and constructors of over 800 major plants for the process industries in the last half century, Lummus now offers its experience for the development of atomic energy installations. Here are some current examples of Lummus work in this field:

Heavy Water Area, Savannah River Plant. Lummus handled design, engineering, procurement and construction liaison of this area.

Uranium Oxide Recovery Unit of the Savannah River Plant. Lummus handled design, engineering, procurement and construction liaison of this unit.



Nitric Acid Recovery Unit of the Savannah River Plant Chemical Separations Plant. Lummus handled design, engineering, procurement and construction liaison of this unit.