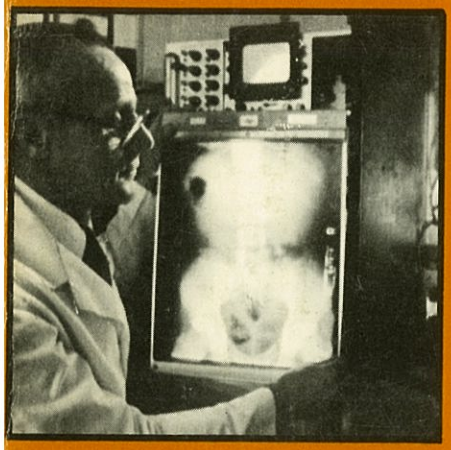
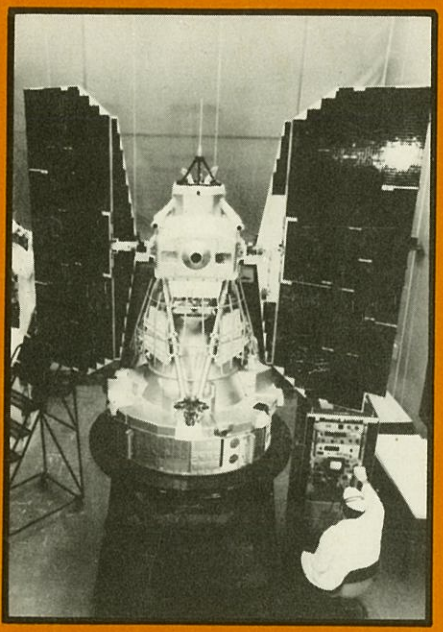
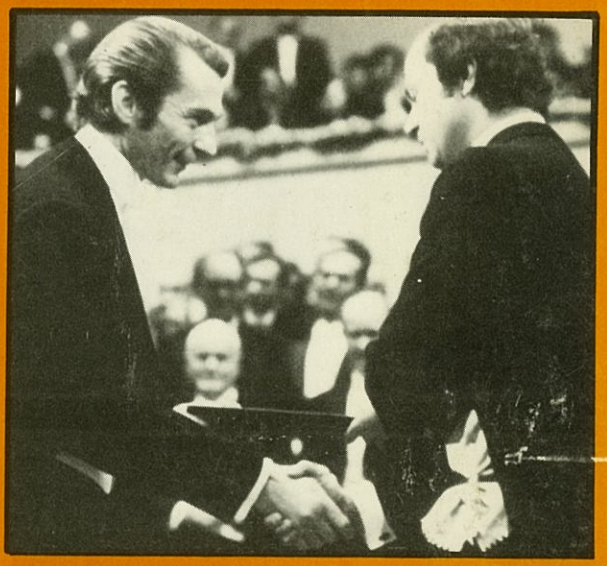
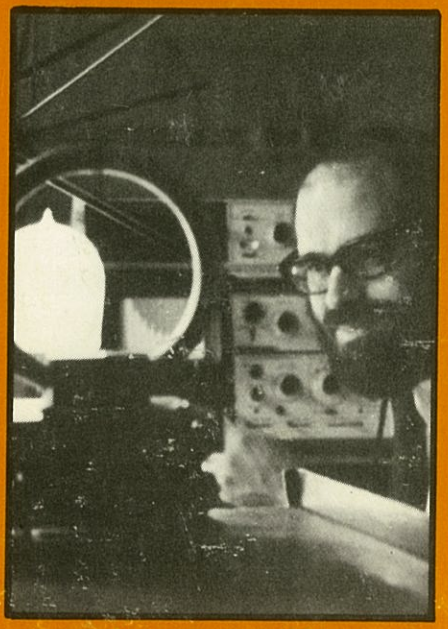
PATHWAYS OF PROGRESS

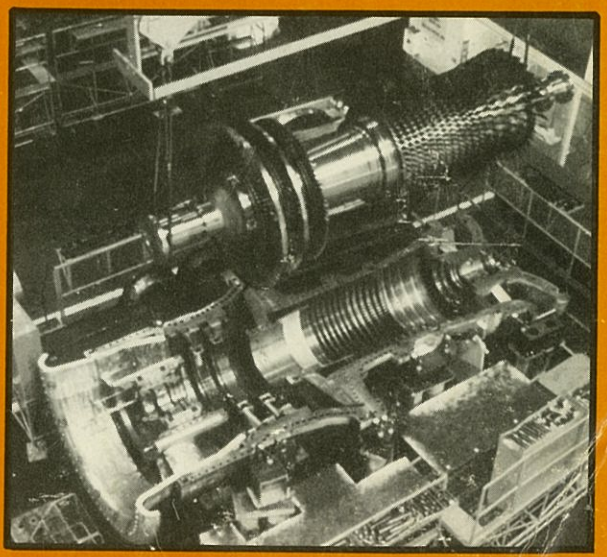
1947-1978

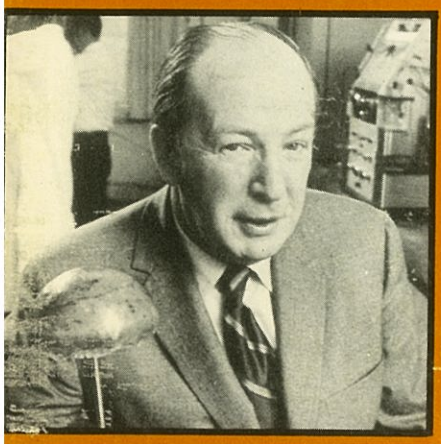












The General Electric Story

Volume 4
A Photo History

Hall of History Publication

THE ELFUN SOCIETY

An organization of present and retired employees of the General Electric Company, dedicated to the encouragement of cooperation, fraternity, and good fellowship and to the betterment of the community in which they function.

THE HALL OF HISTORY

A multi-faceted project designed to serve as a focal center for the gathering, preservation and display of valuable historical documents and memorabalia about the people, products and places of the electrical industry, and to share this heritage with America.

This publication is a joint project of the Elfun Society and the Hall of History, with all proceeds for the benefit of the Hall of History Foundation.

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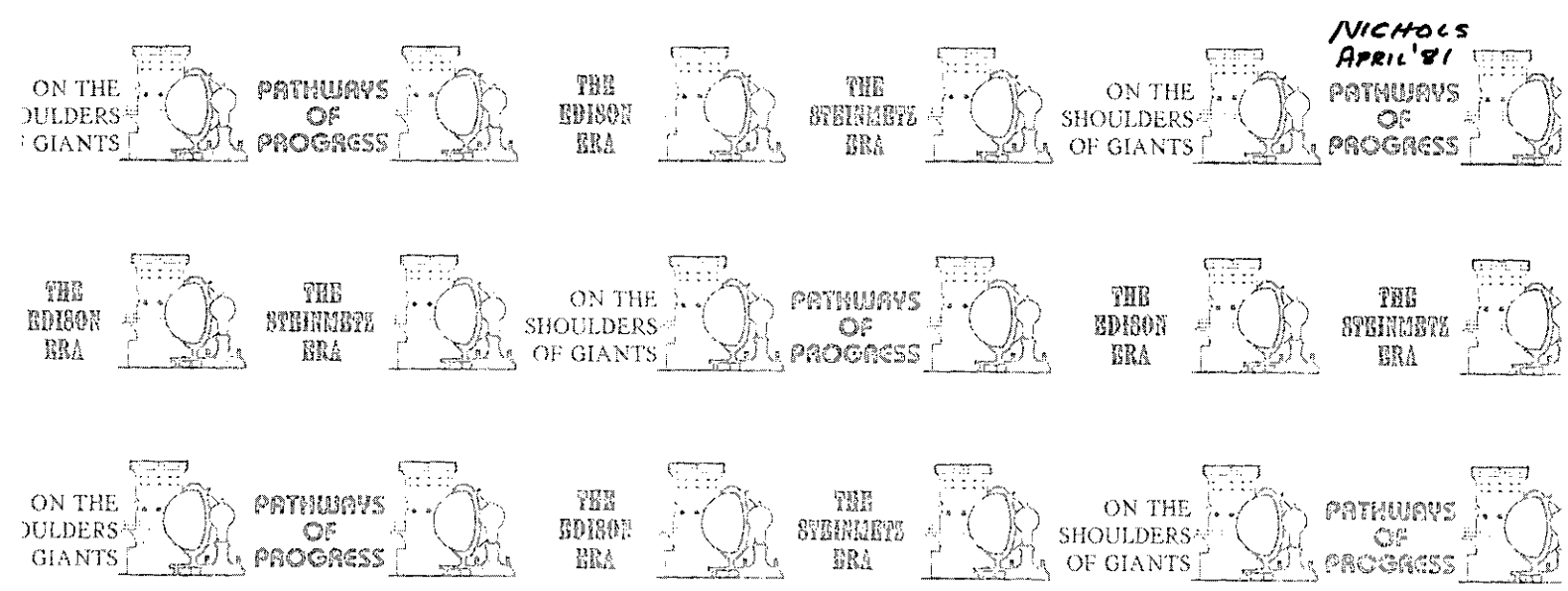


NICHOLS APRIL '81

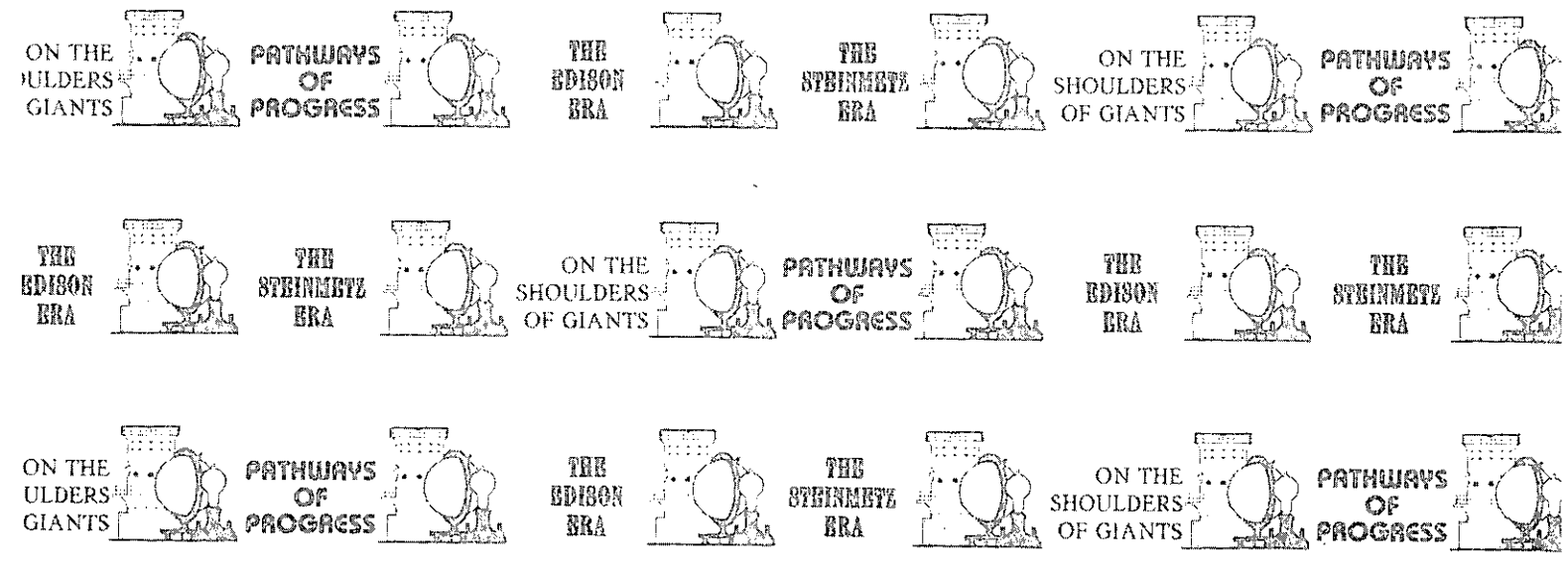
PATHWAYS OF PROGRESS

1947—1978

THE GENERAL ELECTRIC STORY

A Photo History Volume IV

Hall of History
Schenectady, New York
November 1980



CONTENTS

FOREWORD

In selecting material for the fourth volume of **The General Electric Story**, we were faced with a challenge of far greater dimensions than any encountered previously. The preparation of the first three volumes involved the assembly of bits and pieces of prerecorded GE history into cohesive chronologies, illustrated with some of the best prints from a treasure house of some 800,000 historic photographs.

In the case of **Pathways of Progress, 1947-1978,** there was little, if any, pre-recorded history in certain areas and no centralized collection of photographs that spanned the time period. So, for the story of the growth and diversification of the Company during the last three decades of its first century, we turned to the people who had made it all possible — the people in GE's components, and affiliates, including the organizations whose function it is to plan, market, install, service, maintain, and even finance the products of GE technology on a worldwide basis. The result was an embarrassment of riches!

More than 70 organizations, worldwide, responded to our requests for contributions to Volume 4. The materials that they supplied could have filled several books of this size. Distilling these and other inputs to the proportions of this photo history carried with it the certainty that many notable events and personalities would go unmentioned, despite the best intentions of the editors and the contributors whose names are listed in the acknowledgements. For any serious omissions, we invite the contributions of our readers.

Volume 4 tells the story of human achievement on many frontiers, and of outstanding leadership which directed and nurtured that achievement. It is dedicated to the General Electric men and women who will be helping to create **Pathways of Progress** . . . for people, in GE's second century.

September, 1980
Schenectady, New York

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INTRODUCTION

The Jet Age, The Nuclear Age, The Computer Age, The Space Age, The Electronics Age. These were the terms popularly used to describe some of the most spectacular areas of technological development during the decades after World War II. Considering the impact on society of jet air transportation, nuclear energy, data processing, space exploration, and electronics, these characterizations were particularly appropriate. It was also no coincidence that General Electric scientists and engineers played a key role in the birth and continuing growth of these technologies and others.

The commitment to push back the frontiers of technology had its roots in the 1878 formation of the Edison Electric Light Company and in the establishment of a Research Laboratory in 1900 by the first President of General Electric, Charles Coffin. At the conclusion of World War II, that commitment was renewed by Charles E. Wilson who, having successfully mobilized the Company and the United States to meet the needs of national defense, returned from government service to redirect GE in meeting the needs of a peacetime economy.

Electronics Park in Syracuse, New York, the Coolidge X-Ray Laboratory in Milwaukee, Wisconsin, the Knolls Atomic Power Laboratory, a gigantic 20-acre turbine-generator facility, and a new and larger home for the Research Laboratory in Schenectady were a few of the material symbols of the new post-war resurgence. A multitude of products and services stemming from new developments and from the continuing refinement of existing technologies led to unprecedented business growth. But vigorous growth also brought with it a critical challenge in the need for effective management of a far-flung and diverse organization. A succession of management teams headed by Ralph Cordiner, Fred Borch and Reginald Jones were to prove equal to the task.

A decentralized management organization, pioneered by Cordiner and further implemented by Borch, gave increased decision-making responsibility and accountability to local managements. Strategic planning, introduced by Jones, provided the means for the efficient allocation of resources to foster the growth of new businesses and to enable established businesses to compete more effectively. Evidence of the success of this strategic planning system was readily apparent when the Company marked its 100th birthday, late in 1978. General Electric was, in fact, quite different in composition and in size from what it had been only ten years earlier.

In 1968, the traditional electrical equipment businesses — power systems, consumer products, industrial and electronic equipment — provided 80% of GE earnings. In 1979, they would provide 47%. This was not so much from any diminution of their importance but from the strong growth of other areas. Man-made materials and natural resources, which accounted for 6% of Company earnings in 1968, would account for 27% in 1979. Services, such as credit financing, worldwide information processing, and apparatus maintenance and repair would grow from 10% to 16% of the Company's income; and transportation equipment, mostly in the form of aircraft engines and locomotives, would more than double, from 4% to 10% of earnings.

The shrinking of the globe wrought by improved transportation and communications and a global outlook in technology and in business brought new opportunities for growth on an international scale. Under Jones' direction, international business was to account for some 40% of all Company earnings by the end of 1978.

Behind the abilities of an enterprising and enlightened management to anticipate the needs of a rapidly changing society and to chart the directions that would create these business statistics was an impressive record of achievements—in science, engineering, manufacturing, finance, advertising, sales, and numerous other disciplines. This brief history can only scratch the surface of those accomplishments and the stories of the people who made them possible.

1947

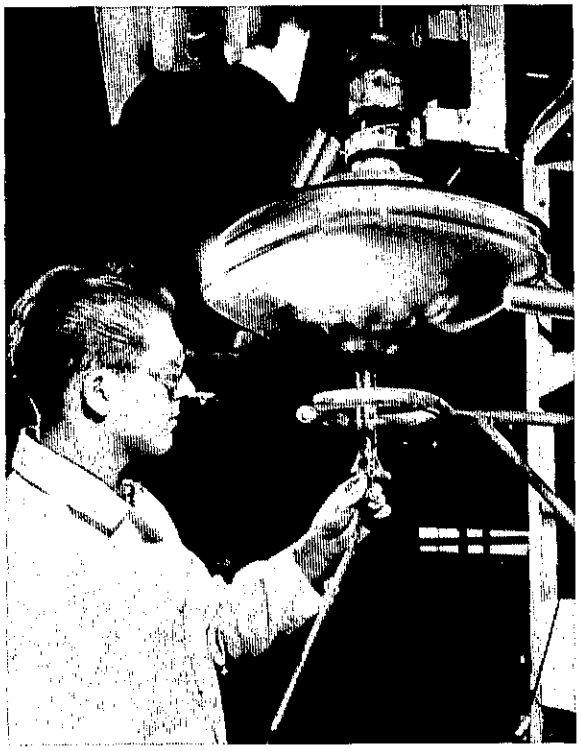
ELECTRONICS AND COMMUNICATIONS

The Audio Electronics Department announces the first radio phonograph combination with variable reluctance cartridge, providing improved sound reproduction of recordings and greater convenience in a home entertainment package.

A two-to-one brightness improvement in black and white television is achieved through a patented picture tube aluminizing process.

Mobile radio communications systems for police, fire and other emergency uses reach a new level of mobility with the development of the first single-unit set, housing both the mobile transmitter and the receiver in the same package.

The first microwave relay system is put into commercial operation between New York City and Schenectady, relaying television programs to WRGB at Schenectady for rebroadcast.

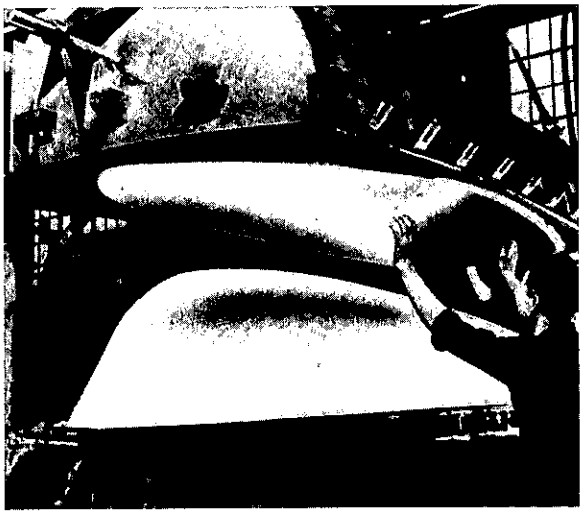


Preparing television picture tube bulbs for aluminizing.

INDUSTRIAL EQUIPMENT

Appliance Motor Department pioneers the use of aluminum magnet wire to replace copper wire in producing lighter weight motors used in appliances and other applications.

The first application of high-performance feedback control in the metals industry takes place on a 42-inch tandem cold rolling mill built for Jones & Laughlin Steel Company. An amplidyne regulating system coordinates the drives of each of its five stands with a precision that permits much higher speeds and greatly increased output.



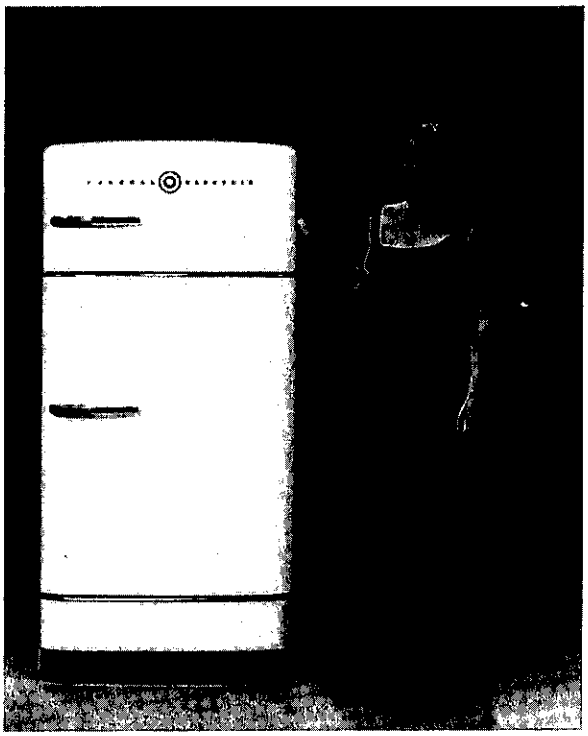
Molding the first all-plastic boat at Pittsfield.

MATERIALS

The production of plastic refrigerator inner doors is begun at a new plant is Coshocton, Ohio. These panels eliminate heavy steel inner doors and breaker strips and improve thermal insulation.

The Chemical Department produces the first all-plastic dinghy for the Beetle Boat Company. Weighing only 80 pounds, the boat is capable of holding loads of more than 1500 pounds, while its plastic foam seats and gunwales make it virtually unsinkable.

1947



The first two-door refrigerator-freezer.

APPLIANCES

Hotpoint introduces the first custom-matched cooking equipment for fast food service operations. An electronic oven for restaurants is developed and is being used in food heating experiments. It is designed to heat pre-cooked frozen foods to table temperature in about a minute.

The Erie Plant produces the first two-door refrigerator-freezer combination. In this 7.5 cubic foot unit, the freezer compartment keeps frozen foods protected at zero to 10°F, while the refrigerator section maintains about 38°F for normal food storage and does not have to be defrosted.

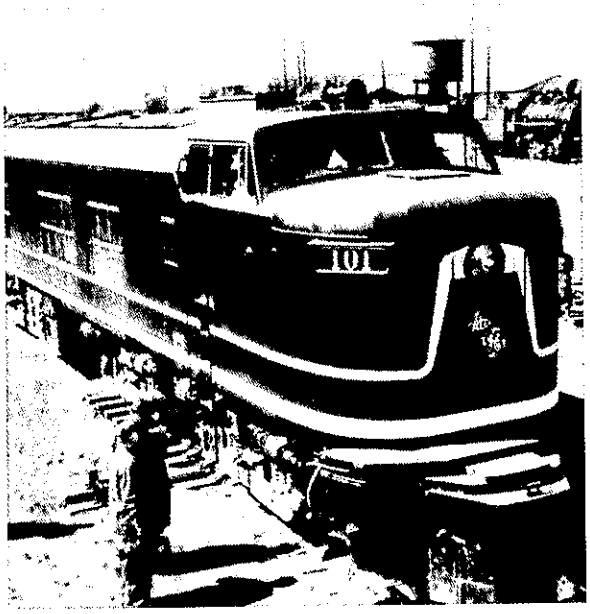
The first completely automatic clothes washer is introduced. An added advantage is the mechanical design which reduces vibration to the point that the washer no longer need be bolted to the floor.

WALTER SORMANE

At Hotpoint's Commercial Equipment Dept., Sormane established and motivated plans which resulted in products that have electrified nearly half of all commercial food cooking and warming equipment, bringing fast food service within reach of millions.

Hotpoint cooking equipment for fast food service restaurants.

1948



Alco-GE 4500-hp gas-turbine locomotive.

TRANSPORTATION

The first American gas-turbine electric locomotive, an Alco-GE 4500-hp unit, begins track tests at the Erie plant prior to shipment to the Union Pacific Railroad.

A new "supertanker" is launched. This ocean-going giant is powered by a GE turbine operating at the highest combined steam temperature and pressure ever used in a merchant ship and capable of delivering 12,500 horsepower.

LIGHTING

A new fluorescent lamp is developed to provide the same light for only 85 watts that the former lamp gave for 100 watts. Responsible for the increased output is the use of the rare gas, krypton, in place of argon which had previously been used.

MEDICAL EQUIPMENT

Largest of its kind in the world, the William D. Coolidge Laboratory of the General Electric X-Ray Corporation is dedicated to commemorate and perpetuate the tradition of x-ray development symbolized by its namesake.

William D. Coolidge (c.) inventor of the modern type of x-ray tube, and his wife Dorothy (r.) at dedication of new Coolidge X-Ray Laboratory with Dr. A.C. Christie (l.), nationally known radiologist.

1948

I-50 watthour meter, with disk and shaft suspended magnetically.

INDUSTRIAL EQUIPMENT

A new 66-inch reversing hot strip mill produces steel strip at the record speed of 3900 feet per minute using GE motors and a new magnetic side register control which automatically guides the strip along its predetermined path.

The first completely new watthour meter in 50 years, the type I-50, is introduced. Its magnetic suspension virtually eliminates the wear problems associated with conventional bearings and results in an estimated life of over 60 years, eight times the service expected of conventional meters.

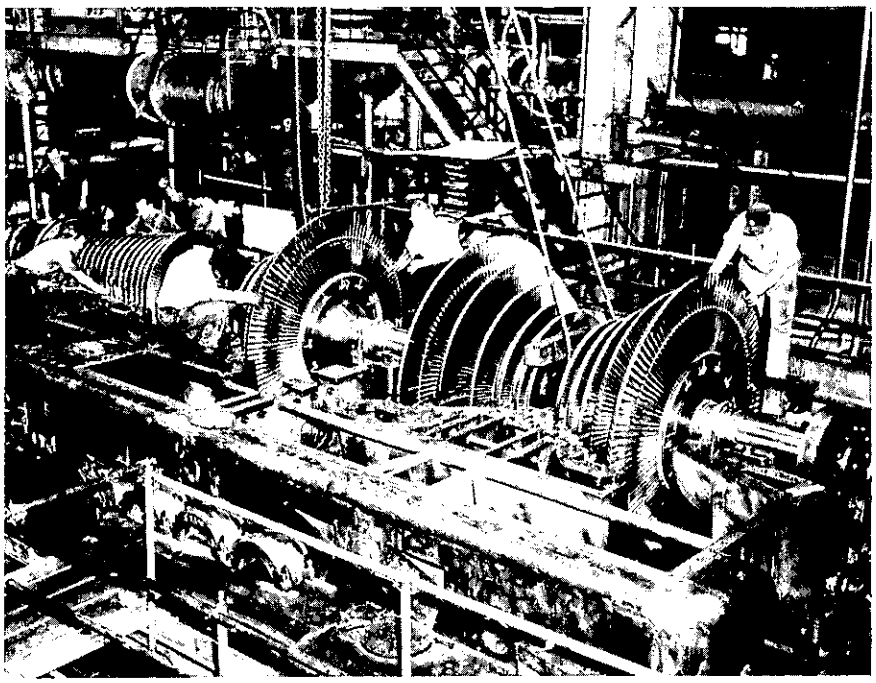
POWER GENERATION

A 100,000-kilowatt turbine generator is put into service at the Sewaren, New Jersey, station of the Public Service Electric and Gas Company. Operating at 1050°F, it is the largest of its type in the world.

The Knolls Atomic Power Laboratory (KAPL) initiates the use of digital computers for the design of naval propulsion reactors. KAPL was organized at Schenectady, New York, two years earlier for the purpose of developing nuclear reactors for the U.S. Atomic Energy Commission. (See Volume 3)

ISAAC F. KINNARD

As manager of engineering for the Meter and Instrument Dept. from 1930-1946, Kinnard had a profound influence on the growth of watthour meters and electrical indicating instruments. The analysis and reduction of watthour meter errors resulted in many of the most accurate meters in use today.



Rotor for 100,000-kw turbine-generator being lowered into position.

1949

Experimental model of "heat pump" unit for year-round air conditioning.

APPLIANCES

Ten experimental models of the "heat pump" are installed around the country as GE engineers test the system's capability for year-round air conditioning. The heat pump works like a refrigerator, reversible to pump either warmed or cooled air into the house at the turn of a switch.

MATERIALS

Man-made mica paper insulating tapes are introduced by the Insulating Materials Department. The precise control of thickness and porosity in the paper-making process produces an insulation with superior high voltage and high temperature capabilities.

INDUSTRIAL EQUIPMENT

The first successful molded instrument transformer, Type JKM-3, 5 kv, is introduced. A new formulation of butyl rubber molding compound and new molding techniques make possible exceptional indoor and outdoor stability.

Molded instrument transformer proves its durability in steam-chamber test.

Marvin Pipkin of Nela Park compares the even diffusion of "Soft White" lamp, on left, with standard frosted lamp on same wattage, on right.

LIGHTING

The Q-coat process, developed by Marvin Pipkin of Nela Park, results in an improved household lamp known as the "Soft White." By coating the inside of incandescent lamp bulbs with tiny particles of silica, the process provides an excellent light diffuser and reduces glare with almost no loss of light.

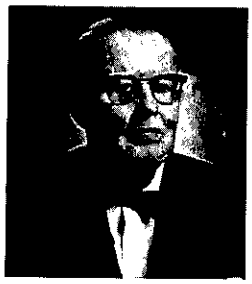
1949

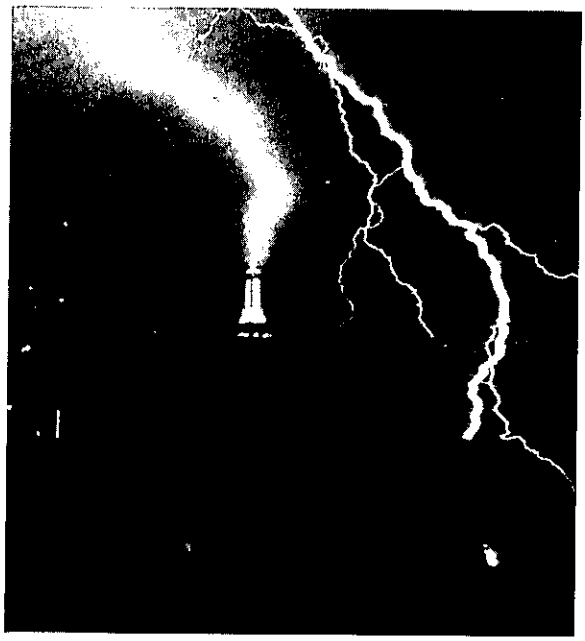
TRANSPORTATION

Driven by six J35 jet engines, a Boeing XB-47 Stratojet bomber averages 607 miles per hour and sets a new coast-to-coast speed record of three hours and 46 minutes. The new J47 turbojet will boost the Stratojet's total power by 25%.

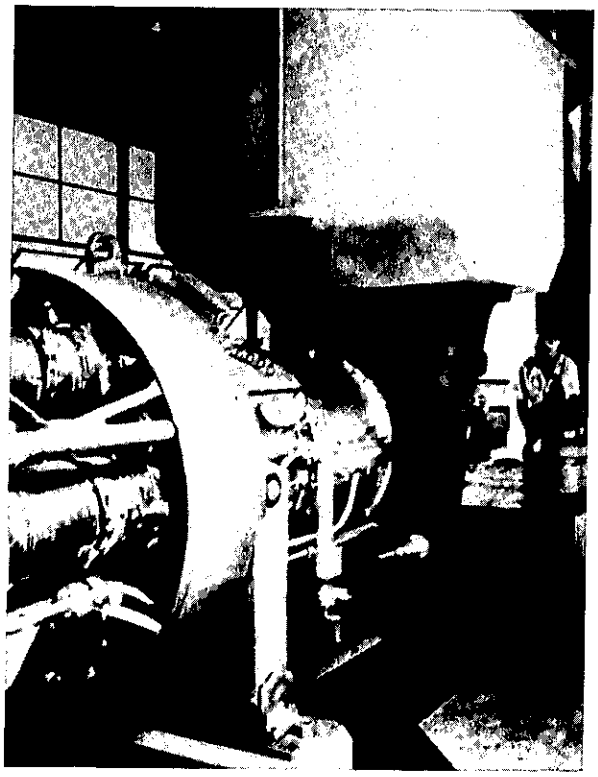
JULIUS H.E. HAGENGUTH

An international authority on lightning and high voltage phenomena, Julius Hagenguth developed basic information on methods for lightning protection of rotating equipment connected to power transformers. He played a major role in the development of plans for Pittsfield's new High-Voltage Laboratory, built in 1949.





Lightning strikes the Empire State Building during high voltage tests by Pittsfield's High Voltage Laboratory.



First gas turbine for power generation in the U.S.

POWER GENERATION AND TRANSMISSION

The first gas turbine for power generation, the GE MS3001, rated at 3500 kw, is shipped to the Oklahoma Gas & Electric Company's Belle Isle Station. One innovation is the use of the exhaust to preheat the boiler feed water for a 52,000-kw steam station.

Completion of the new High Voltage Laboratory in Pittsfield gives GE the world's most modern facility to understand the effects of lightning and switching voltage on power equipment.

The largest industrial building constructed after World War II is occupied by the Steam Turbine Department in Schenectady. Floor space of the new facility extends over more than twenty acres.

LEADERS OF GENERAL ELECTRIC

CHARLES E. WILSON

Charlie Wilson's career follows a certain classic American pattern. He was born in 1886 on the lower West side of New York. His mother was English, his father Irish. At the age of twelve he left P.S. 32 while in the seventh grade to take a job as office boy with the Sprague Electrical Works, a GE subsidiary. He was soon made a factory hand and augmented his on-the-job training with night courses in accounting, engineering, and mathematics. By the time he was twenty-one he was assistant superintendent of the plant and married to Elizabeth Marsh on a $20-a-week salary.

In 1923 he was transferred to Bridgeport, with the title of managing engineer. As Bridgeport became heavily involved in the production of appliances, Wilson's duties expanded rapidly. In 1928 he became assistant to the Vice President in charge of the Merchandise Department, and in 1930 Vice President in charge of all appliances. As these lines lengthened — sun lamps, electric clocks, washing machines, irons, heaters, air conditioning — Charlie Wilson's role in GE's management broadened.

In December 1937, Wilson was elected executive vice president of General Electric, a new position involving responsibilities for all Company departments. Two years later he was elected President of the Company, succeeding Gerard Swope.

For two and one half years, Wilson served as a vigorous and imaginative president. Then, in September 1942, with the United States struggling to increase production of war material, Wilson went to Washington, at the request of President Roosevelt, to become vice chairman to the War Production Board. Mr. Swope came out of retirement to resume the duties of GE President.

As wartime boss of the huge U.S. production effort, Wilson achieved some spectacular successes. Aircraft, shipbuilding and munitions programs boomed under his direction. He served in this capacity until August, 1944, when he returned to GE and was again elected a director and President.

He is particularly well known for his industrial production achievements, and for his demonstrated interest in expanding distribution of goods to absorb unemployment and to promote higher living and working standards.

In 1946, President Truman named Wilson chairman of the Civil Rights Committee, whose members studied and recommended new civil rights legislation to protect "all parts of our population."

Because of the worsening international situation, an Office of Defense Mobilization was set up in 1950 and in December, President Truman asked Wilson once again to come to Washington and become its director. Concurrently, Wilson resigned his GE presidency and all his directorates.

After having completed 51 years of continuous service with General Electric, Wilson took on a job which was described in Washington as second in importance only to the Presidency of the United States. His public service did not end with that position. In 1956, he became President of the People-to-People Foundation, a non-partisan program promoting international friendship and understanding.

John G. Forrest, writing in the *New York Times*, said, "Charles Wilson is a big man by any standard, physical moral, or mental." Mr. Wilson died in 1972 at the age of 85.

Philip Reed found his way to the helm of General Electric in an altogether different way from that traveled by Charles Wilson. He was born in comfortable circumstances in Milwaukee in 1899, the year Wilson went to work as an office boy.

Reed attended the public schools of Milwaukee and in 1917 entered the University of Wisconsin, but quit in his freshman year to join the Army. An appendix operation kept him out of the American Expeditionary Forces; when the Armistice came he was at Fort Monroe, training for the heavy artillery.

Reed returned to Wisconsin to complete his degree in electrical engineering. GE, then scouting for engineering talent, offered Reed a job at $115 a month, but he refused it. Instead, because he wanted to marry Mabel Mayhew Smith, he got a $2,000-a-year job with a firm of patent lawyers in New York. Reed had no special desire to be a lawyer, but the salary looked "as large as the setting sun." By studying nights at Fordham, he got his law degree in 1924, and in due course was admitted to the New York Bar.

In 1926, a lawyer friend of Reed's told him that Judge C. W. Appleton, a GE vice president, was looking for an assistant. Contact was made, and as a result, Reed went to work for Appleton in GE's law department in New York. There he had frequent contact with Swope and Young, who gave him an assortment of special assignments.

Reed was transferred to the Incandescent Lamp Department in 1927 and became its general counsel in 1934. Because he was an effective speaker and had Owen Young's gift of grasping the essentials of problems and stating them lucidly, he was invited by plant managers to talk on labor relations, Company policies, and pension plans. In December 1937, he was appointed assistant to the President and two years later, Reed was elected Chairman of the Board.

In February 1941, Mr. Reed began his government wartime service, becoming senior consultant to the Priorities Division of the Office of Production Management, which later became the War Production Board. He was subsequently named Chief of the Bureau of Industries, War Production Board, and in July 1942, went to London as deputy to W. Averill Harriman who headed a

PHILIP D. REED

lend lease mission to England. In 1943, the President created the United States Mission for Economic Affairs in London and appointed Reed its chief, with the rank of Minister. He returned to private life on January 1, 1945.

A month later, Reed, who had resigned all his posts with General Electric when he went abroad, was again elected a Director and Chairman of the Board. In addition, he was elected Chairman of the Board of the International General Electric Company.

Reed continued to take part in public affairs. In 1945, he was consultant to the U.S. delegation to the United Nations Conference on International Organization. From February 1945 to July 1947, he was chairman of the U.S. Associates of the International Chamber of Commerce, which submitted the Montreux Plan for Economic Stability to the State Department.

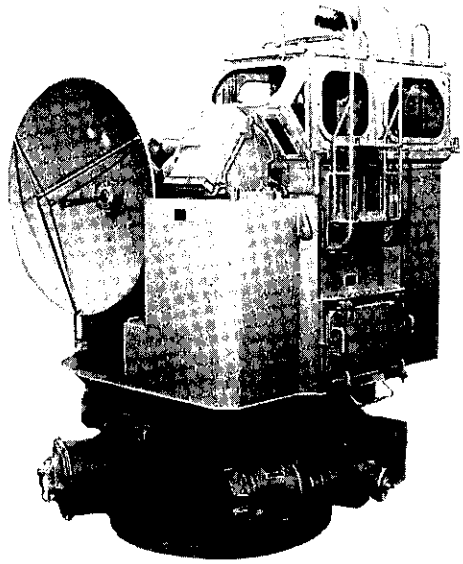
Reed was elected chairman of the Research and Policy Committee of the Committee for Economic Development in August 1948. It was a private research organization supported by contributions from individuals for the purpose of studying and attempting to solve the economic problems of the United States.

Philip D. Reed retired from GE in 1959 after 32 years of service.

1950-1951

NATIONAL DEFENSE

The Korean War starts and the Ordnance Systems Department begins production of the MK 56 gunfire control, the first fully automatic system to become a vital part of the Navy's anti-aircraft strength.



Pittsfield-built MK 56 gun director.

INDUSTRIAL EQUIPMENT

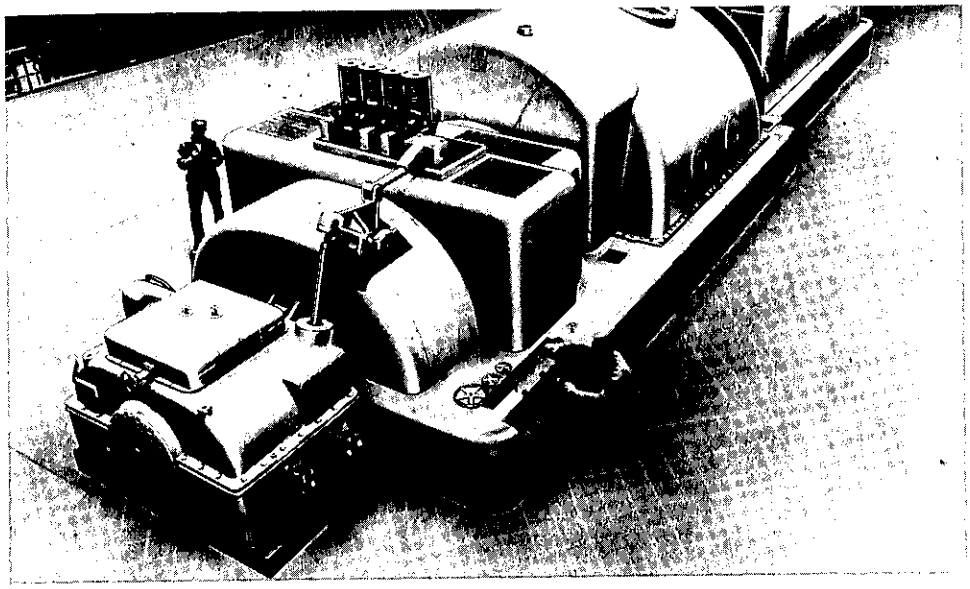
The successful development of a commercial xerographic unit by Haloid (forerunner of the Xerox Corporation) results in the first production of copy machine power supplies by the Specialty Transformer Department.

Design and material improvements result in ½-hp motors that are smaller and weigh almost 50% less than similarly rated units manufactured twenty years earlier.

Two 65,000-hp synchronous motors, the world's largest, are installed at the pumping plant of the Grand Coulee Dam.

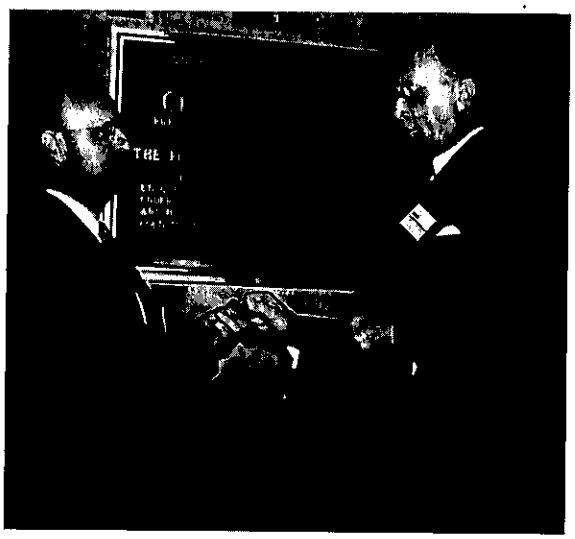
POWER GENERATION

The Steam Turbine Department delivers the first single shaft 3600-rpm, double-flow, reheat steam turbine-generator to the Dunkirk, New York, station of the Niagara Mohawk Power Company. The 80,000-kw unit introduces a unique construction which is especially compact and efficient.



80,000-kw, single shaft, double-flow, steam turbine-generator for Niagara Mohawk Power Company.

1950-1951

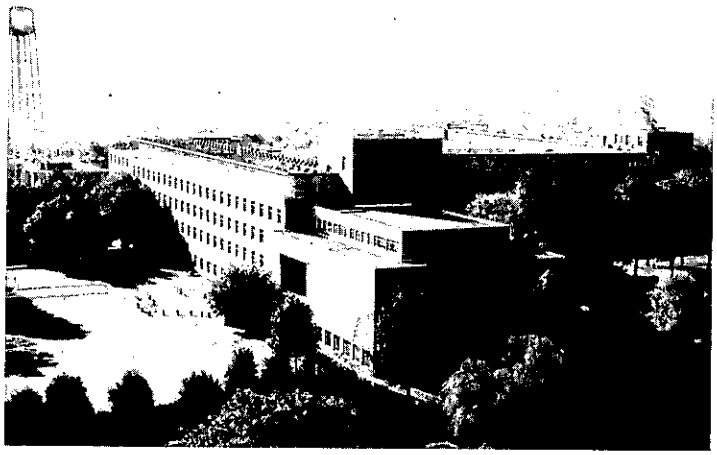


C. Guy Suits (left), Vice President and Director of Research, accepts the key to the new home of the Research Laboratory from Charles E. Wilson, President of the General Electric Company, at dedication ceremonies on October 9, 1950.

ORGANIZATION

Completing 51 years of service, Charles E. Wilson resigns his position as President of General Electric to become Director, Office of Defense Mobilization. Ralph J. Cordiner is elected as his successor.

The buildings of the new site of the Research Laboratory are dedicated on the fiftieth anniversary of its founding. They constitute one of the world's largest and most modern research laboratories.



The new main building of the Research Laboratory.

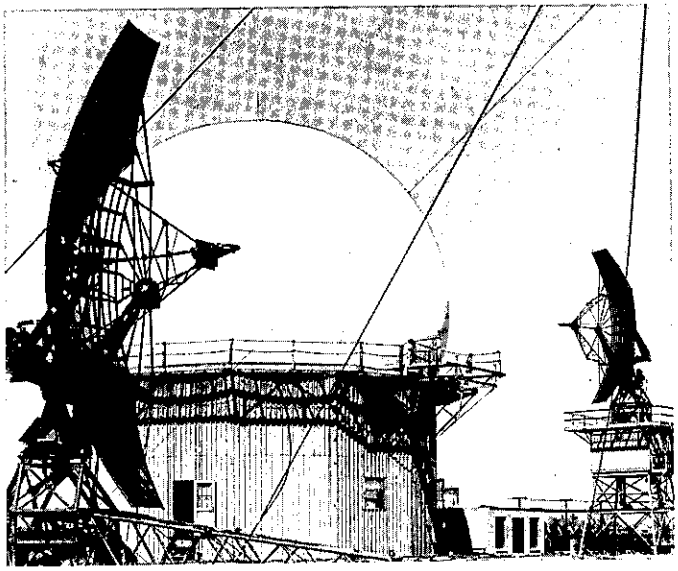
MATERIALS

The introduction by the Hughes Tool Company of the first rolling cutter drill bit containing cemented carbide compacts marks the culmination of a five-year effort by Carboloy Co., a GE subsidiary, aimed at applying this material to hard rock drilling for mining and the drilling of oil and gas wells.

KENNETH R. BEARDSLEE

As a sales engineer for Carboloy Co., Ken Beardslee devised many successful applications of cemented carbide dies in wire, bar, and tube mills. He rose through the ranks to become chief executive of the company, and when it changed its status from wholly owned GE subsidiary to the Carboloy Dept., Beardslee became its first general manager.

1950-1951



One of the first high-powered air defense radars.

ELECTRONICS AND COMMUNICATIONS

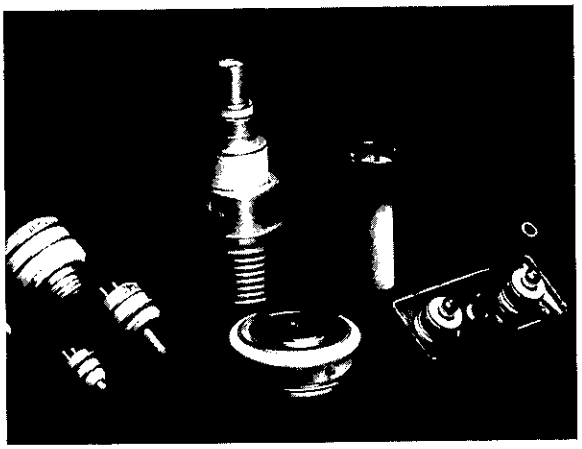
A new radar system for commercial airports is developed by the Electronics Department. By accurately positioning all aircraft within a 30-mile range and detecting larger aircraft up to 60 miles, the system will greatly aid air traffic control in times of both good and poor visibility.

The first ultra-high-frequency (UHF) transmitter for TV broadcasting is made possible by the development of a new klystron tube.

The polarization-twist duplexer, a new radar waveguide coupling system, is invented by Burton P. Brown of the Electronics Department. It makes possible the construction of the first high-powered air defense radars.

Fosterite ceramic planar microwave tubes are introduced by the Tube Department for high frequency, low noise, high gain applications.

Robert N. Hall of the Research Laboratory finds that indium and germanium can be used to make alloyed P-N junctions—the basic elements of power rectifiers and some transistors.



Ceramic-metal microwave tubes.

Robert N. Hall, pioneer in early semiconductor research.

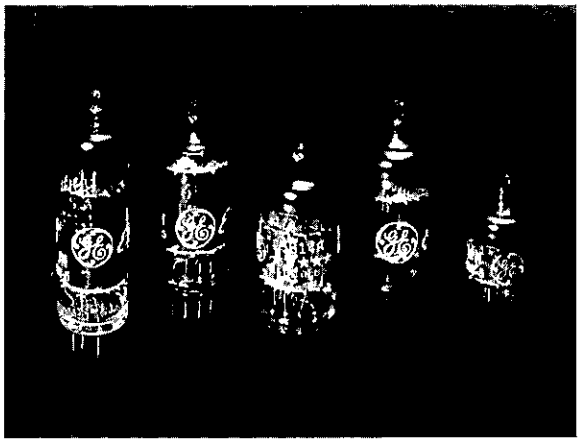
JOHN J. FARRELL

Under his leadership, the Heavy Military Electronics Dept. developed and produced the world's largest and most powerful radars and other electronic products vital to the nation's defense.

THE MORE POWER TO AMERICA SPECIAL

General Electric's "More Power to America Special," a ten-car exhibit train, begins a nationwide tour which will continue through 1950 into 1951. Visiting principal industrial centers, it displays opportunities which the electrical industry offers for increasing the nation's productivity. The quarter-mile long travelling showcase, of which the 4500-hp diesel-electric engine itself is a part, contains more than 2000 products and ideas for commerce and industry, for civic improvement, and for national defense.

1952-1953



The "5-star" line of high performance electron tubes.

ELECTRONICS AND COMMUNICATIONS

The Tube Products Department introduces the 5-star line of high reliability, rugged electron tubes for military and other high performance applications. The Electronics Division starts mass production of semiconductor diodes (low-power rectifiers) to replace vacuum tubes in many of its electronic products, including television receivers.

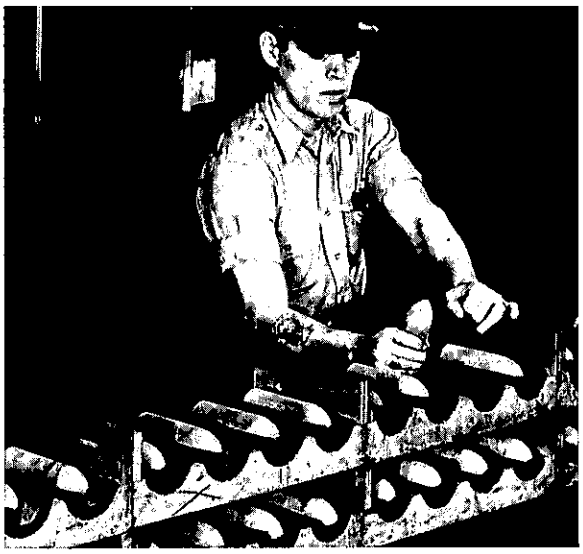
L. BERKLEY DAVIS

When GE acquired the Ken-Rad Company electron tube operations in 1945, an important asset was Berkley Davis who had engineered many of Ken-Rad's outstanding developments. The remarkable growth of the receiving tube business under his direction led to his appointment as general manager and vice-president of the Electronic Components Division in 1956.

MATERIALS

Carboloy is cited for its hitherto top secret role in the development and production of armor-piercing tungsten carbide cores for anti-tank shells during World War II and the Korean War.

Seeking an improved wire enamel, chemist Daniel W. Fox makes discoveries leading to the development of Lexan® polycarbonate resin—a transparent plastic of unsurpassed impact resistance.



Carboloy production line for armor-piercing cores for anti-tank shells.

DANIEL W. FOX

The invention of Lexan® polycarbonate resin and Alkanex® wire enamel were but two of Fox's many valuable contributions which merited him induction into the Plastics Hall of Fame as its youngest living member (1976).

NATIONAL DEFENSE

Push-button control of the Navy's high-speed jet interceptors is brought closer to realization with the development of a new automatic pilot which relieves pilots of 90 percent of their "stick and rudder" work.

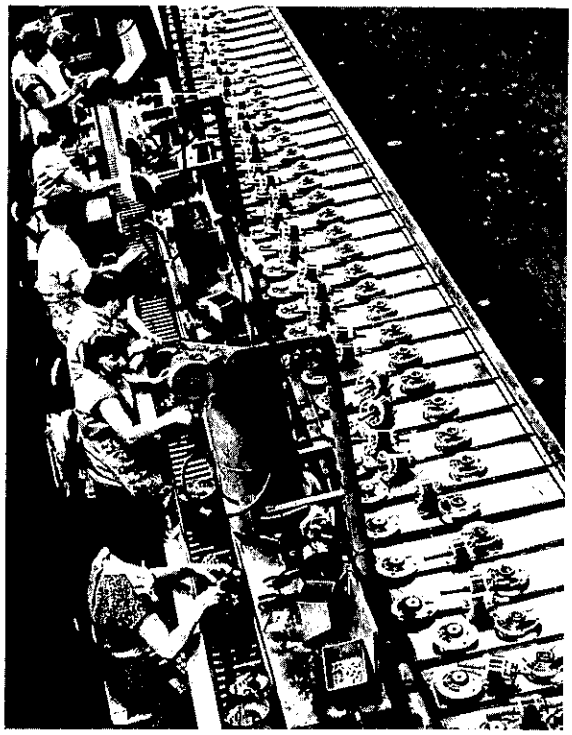
Two modified turbojets are provided to power the cargo-carrying XH-17, the world's largest helicopter, built by Howard Hughes Aircraft Company for the U.S. Air Force.

1952-1953

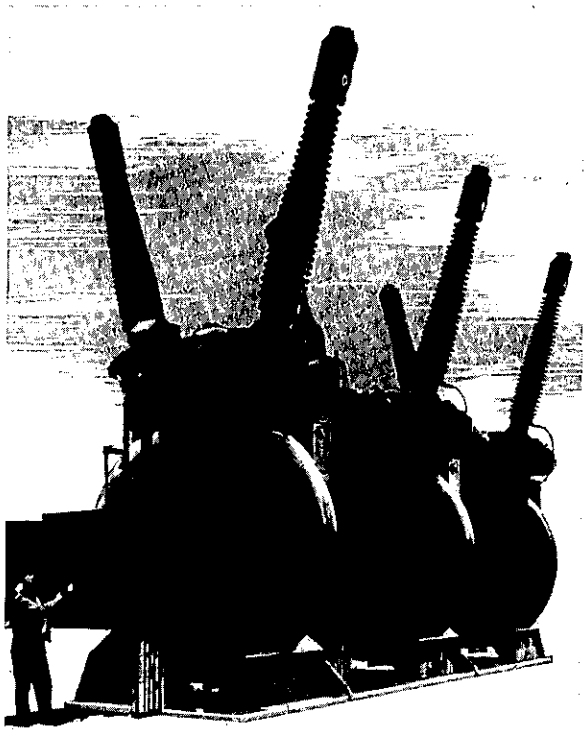
INDUSTRIAL EQUIPMENT

Canadian General Electric develops electrical equipment for the world's largest hydraulic dredge.

The new Form "G" line of fractional horsepower motors is 25 to 50% lighter and up to 40% smaller than previous motors of similar power ratings.



Matching motor parts at Taylor Street plant, Ft. Wayne, Indiana.



World's largest circuit breakers for 300,000-volt transmission line.

POWER GENERATION AND TRANSMISSION

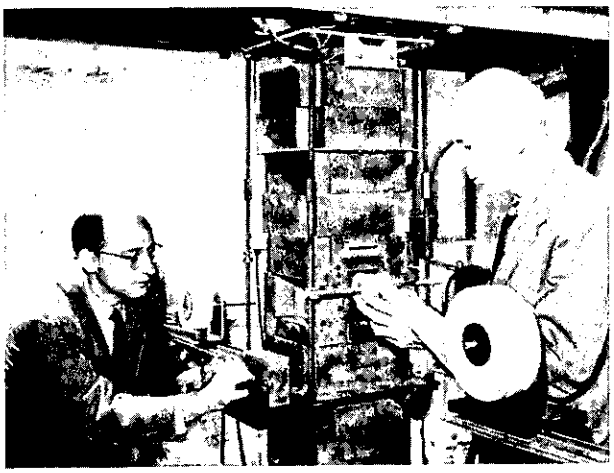
KAPL, under the direction of the Division of Naval Reactors, AEC, develops the major containment concept for nuclear reactors, including the philosophy and equipment for design safety. This concept is used to design the West Milton Hortensphere which houses the prototype plant for the submarine Seawolf.

The Switchgear Department builds the world's largest circuit breakers for a 300,000-volt transmission line, highest in the United States.

Research and development leading to the reduction of power losses in steels for transformers results in a power transformer weighing 35 tons less than similar units of half the capacity shipped only three years earlier.

The first regenerative cycle heavy-duty gas turbine, the MS3002, rated at 6200 hp, is delivered to the El Paso Natural Gas Company's Pecos River Station in New Mexico. It will be used to provide power for natural gas pipeline pumping.

1954



Arthur M. Bueche (l.) and Elliot J. Lawton exhibit their method of cross-linking polymers by irradiation.

MATERIALS

Arthur M. Bueche and Elliot J. Lawton develop a method of cross-linking polymers by irradiation with an electron beam. This work leads to the widespread recognition of the value of irradiated polymers for such uses as insulating materials and food wrappings.

The Medium Transformer Department pioneers the use of Formex wire insulation in power transformer windings manufactured at its newly opened plant at Rome, Georgia. This tough, long-life insulation makes for smaller, lower-weight designs.

LIGHTING

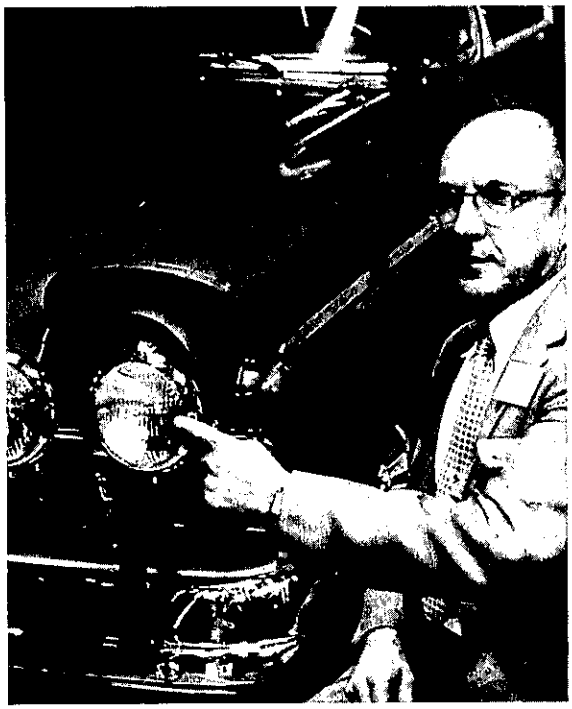
With the introduction of quartz bulbs, Incandescent Lamp Department engineers increase the power of tungsten filament infrared heat lamps while significantly reducing their size. Initial applications for the new lamps are in the reprographic industry.

The all-weather headlamp is developed as a result of innovations in reflector design. Driver visibility is dramatically improved in all types of inclement weather.

The first all-glass baseless miniature lamp for auto instrument panels is introduced. It provides lower socket and lamp cost as well as simplified installation.

VAL J. ROPER

After joining GE's first auto lab at Nela Park in 1925, Val Roper was instrumental in the expanded use of more effective exterior and interior lighting for automobiles. His 1935 concept for the first sealed beam headlamp for cars was acclaimed an outstanding engineering innovation and has since been extended to many other lighting applications.



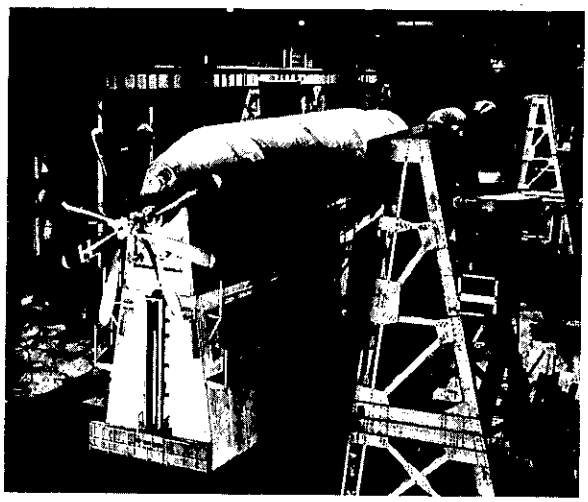
New all-weather headlamps improve driver visibility.

1954

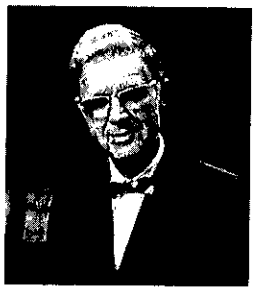
APPLIANCES

The first truly automatic portable dishwasher, the Mobile Maid, is shipped from the recently completed (1952) Appliance Park facility in Louisville, Kentucky.

The new Mobile Maid automatic dishwasher.



30,000-hp propeller test stand built by Medium Steam Turbine Department for U.S. Air Force.



ALFRED E. BLAKE

In 1954, Blake established the Applied Research and Development Laboratory as an integral part of the Foundry Department. Under his direction, the Laboratory has brought the Department to the forefront in quality and performance in high technology, large sand castings in the world-wide foundry industry.

TRANSPORTATION

A 30,000-hp propeller test stand for developing and testing high horsepower, turbo-prop aircraft propellers is designed and built by Medium Steam Turbine Department for the Wright-Patterson Air Force Base in Ohio.

The Locomotive and Car Equipment Department develops a 4000-hp rectifier locomotive utilizing electronic tubes to convert ac power to dc power, promising many new railway applications.

INDUSTRIAL EQUIPMENT

The Kinamatic 1 small dc motor is produced at the recently completed dc motor manufacturing facility at Erie, Pennsylvania. Kinamatic motors are designed for use in applications requiring continuous adjustable motor speed.

The newly formed Specialty Motor Department introduces the 39-frame motor, used primarily in central heating and air conditioning units where its high reliability makes it particularly suitable.

POWER GENERATION

The Foundry (later, Engineered Cast Products) Department establishes the Applied Research and Development Laboratory to develop new processes for the production of high quality, large turbine castings.

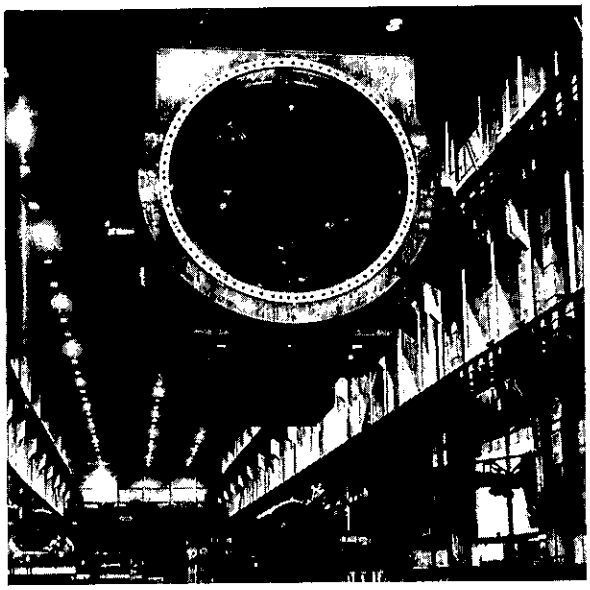
1955

POWER GENERATION

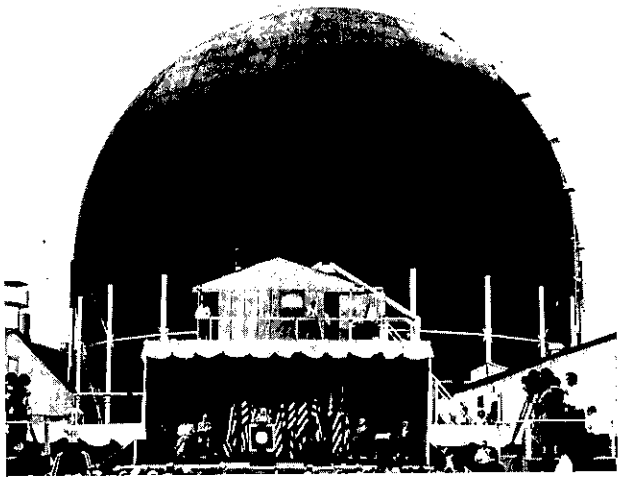
America's first commercial nuclear power is distributed over the Niagara Mohawk Power Company system. A GE turbine-generator and the Seawolf submarine nuclear reactor prototype are used to produce electric power from a plant at West Milton, New York.

A new air-blast circuit breaker for 138,000-volt transmission lines is the first of its rating in the U.S. It uses high-pressure compressed air to "blow out" a hot electric arc and, for a split second, interrupt flow of electricity when lightning strikes or a fault occurs on a transmission line.

The first large generator with liquid cooled stator is completed by the Turbine Division. Rated at 260,000 kva, the unit is capable of supplying the household electrical needs of 700,000 people.



Portion of 260,000-kva generator with liquid-cooled stator.



Ceremonies marking first commercially distributed nuclear power at West Milton, New York.

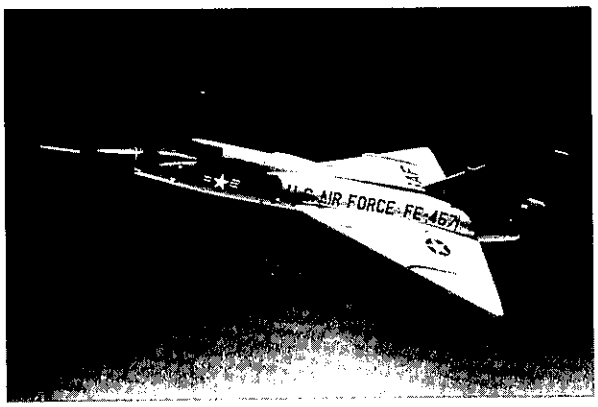
KENNETH A. KESSELRING

At the Knolls Atomic Power Laboratory, "Kess", was a man whose organizing abilities and technical contributions played a major role in many early successes in atomic power development. His involvement in the development of nuclear propulsion plants for the submarine Seawolf and the destroyer Bainbridge contributed to the foundations for GE's participation in the growth of the nuclear Navy.

NATIONAL DEFENSE

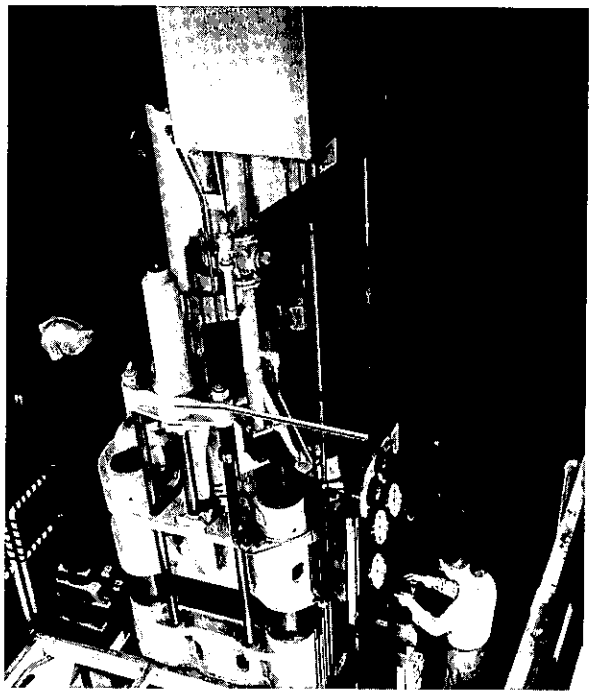
The free world's largest, most powerful radar is installed in central Turkey for the U.S. Air Force. The GE FPS-17 radar is part of the Air Force's SPACETRACK global surveillance system.

As part of Project SABRE, a major effort in upgrading the radar of the U.S. fighter aircraft, Aerospace Electronic Systems Department equips the F-106 all-weather interceptor with its advanced electronic counter-countermeasures equipment.



F-106 all-weather interceptor carries Project Sabre with electronic counter-countermeasures equipment.

1955



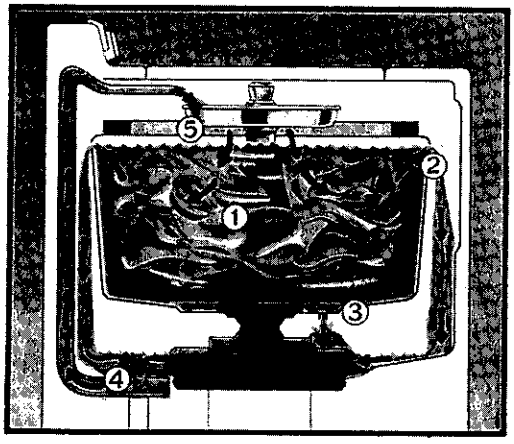
1000-ton press in which GE man-made diamonds were produced.

MATERIALS

The Research Laboratory announces the invention of the first reproducible process for making diamond — a landmark achievement that had eluded some of the world's top scientists for centuries.

The development of Alkanex® magnet wire insulation by Daniel W. Fox and Frank M. Precopio permits the operation of motors at higher temperatures, setting new standards for the motor industry in operating efficiency and size reduction.

Research Laboratory industrial diamond synthesis team. From the left are Francis P. Bundy, Harold P. Bovenkerk, Robert H. Wentorf, Anthony J. Nerad, and Herbert M. Strong (not shown, H. Tracy Hall).



HERE'S HOW THE FILTER-FLO SYSTEM WORKS . . .

1. Dirt loosens as clothes are individually cleansed by thorough Activator® washing action.
2. Lint and soap scum are carried out of washbasket as wash water continuously overflows into the outer tub.
3. Heavy sand and silt drop out here.
4. Pump continuously forces water up and through the filter and 5. only cleansed sudsy water flows back into the wash basket.

APPLIANCES

John Bochan of Appliance Park invents the Filter-Flo System for automatic clothes washers. It removes lint from the wash as it is generated.

Phillip Hughes invents the safety start switch for use in home clothes dryers. By interlocking the timer with a separate "start" switch, access to the dryer can be safely obtained by the user without altering the drying time cycle.

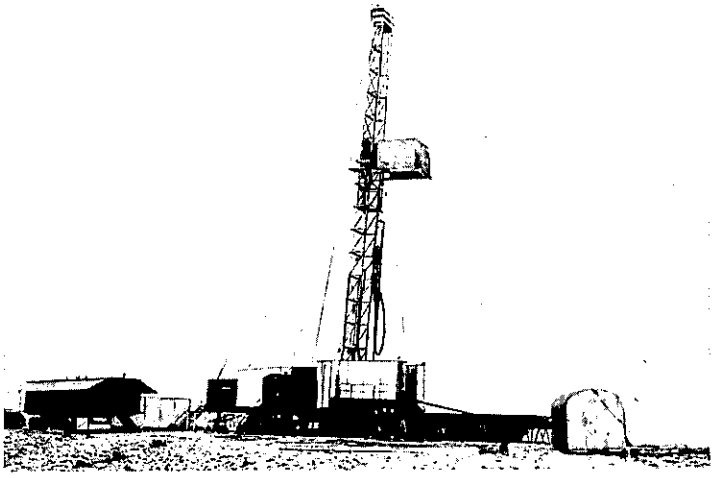
1955

INDUSTRIAL EQUIPMENT

Numerical control of machine tools is demonstrated at the Chicago Machine Tool Show using a punch card controlled Sundstrand shaft-turning lathe. The development is referred to as "the greatest innovation in metalworking of this century."

The hermetically sealed micro-miniature relay is introduced for aircraft and aerospace applications. Numerous versions of this product are now in use in virtually every U.S. commercial and military aircraft.

An offshoot of diesel-electric locomotive technology, the GE 752 Drilling Motor/Generator System, is introduced as a self-contained power source for oil well drilling rigs.



Oil well drilling rig with GE 752 Drilling Motor/Generator System.

ELECTRONICS

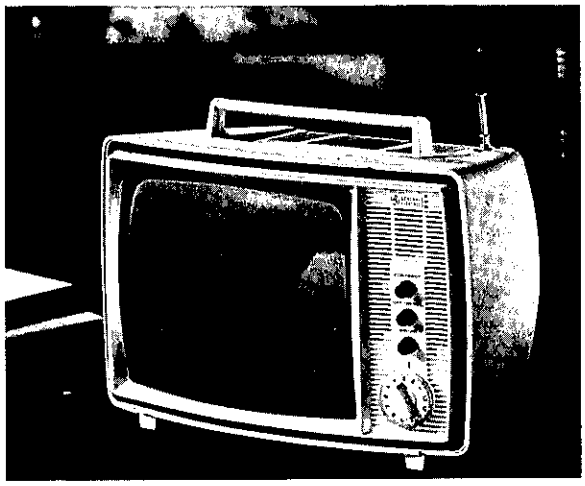
The first portable television receivers are built by the Television Business Department, Syracuse. Radios using transistorized circuitry in place of vacuum tubes are introduced by the Audio Electronics Department.

New voltage tunable magnetrons extend the tube's use to microwave relay systems, aircraft altimeters, electronic test equipment and telemetering.

Micro-miniature relays for use in aircraft and aerospace applications.

TRANSPORTATION

The GTS John Sergeant, a converted Liberty ship, is the world's first large merchant ship to be propelled solely by a gas turbine. With the 6600-hp regenerative cycle, two-shaft gas turbine, coupled to a controllable-pitch propeller, the vessel's maneuverability is outstanding and its speed is improved from 11 knots to 18 knots.



RALPH J. CORDINER

Credited with developing GE's postwar reorganization and decentralization program which brought new flexibility and a sharper focus on specific markets, Ralph J. Cordiner was the fifth President of General Electric.

He was born in 1900 on a 1280 acre wheat farm in Walla Walla, Washington. He worked his way through Whitman College by doing odd jobs and selling washing machines. He graduated in 1922 with a degree in economics, and joined the Pacific Power and Light Company as a commercial manager. Within a year he joined the Edison General Electric Appliance Company, a GE affiliate, where he became Northwest manager and then Pacific Coast division manager in 1930. He transferred to Bridgeport, Connecticut, in 1932 and became a leader of the Company's expanding appliance business, rising to manager of the Appliance and Merchandise Department in 1938.

Cordiner left GE in 1939 to become president of Schick, Inc., and is credited by *Time* magazine with putting that company "back on its feet" in a brief three-year tenure. In 1942, he went to Washington to work with GE president Charles E. Wilson on the War Production Board, returning to GE in 1943 as Wilson's assistant. In 1950, he was elected the Company's President, succeeding Wilson who, at President Truman's request, resigned to become director of the Office of Defense Mobilization.

Cordiner was elected Chairman of the Board and Chief Executive Officer in 1958, and also served as President of the Company during 1961, prior to the election of Gerald L. Phillippe as President in August of that year.

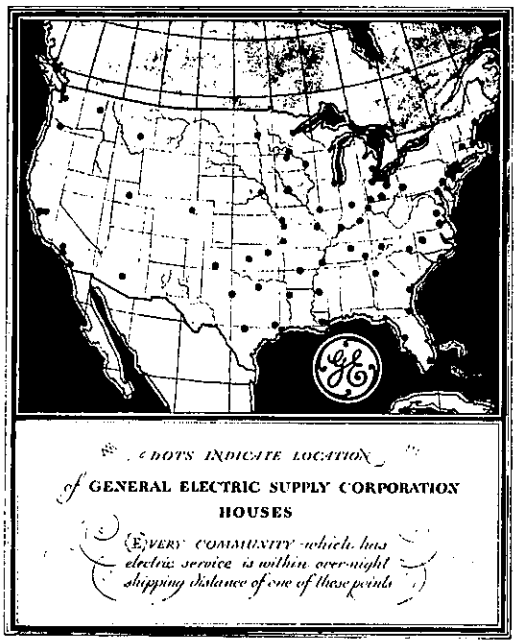
To better cope with General Electric's burgeoning growth, Cordiner established a new organizational structure based on the concept of decentralization — an idea that had been adopted by some segments of American industry since Du Pont pioneered it at the time of the First World War. He made each of some 120 department general managers responsible for a particular segment of GE business, handling assignments that he described as "not too big for one man to get his arms around." The organization reflected the view that the natural aggregate of many individually sound decisions will be better for the business than centrally-planned and controlled decisions. Cordiner outlined his decentralized management philosophy in the book *New Frontiers for Professional Managers* in 1956. He also established the GE Management Development Institute at Crotonville, New York, which opened an entirely new approach to the education of personnel for advanced management.

Cordiner was President of the Business Council, a group of business leaders who advised the government on business affairs. He also served as Chairman of the Defense Advisory Committee on Professional and Technical Compensation in the Armed Forces.

The first Gold Medal Award of the Economic Club of New York City was conferred on Ralph Cordiner in recognition of his contributions to "principles of management and to the strength and prosperity of the nation."

In 1963, Cordiner retired after forty years of service to General Electric. He died in 1973.

DISTRIBUTING THE PRODUCTS OF TECHNOLOGY



Helping to fulfill Edison's Dream

WHEN THOMAS ALVA EDISON developed the first practical incandescent lamp, he made possible the many economic, social and industrial benefits which we now enjoy because of increased hours of light.

It is for this outstanding achievement that we today pay homage to the great inventor.

However, Mr. Edison's original contributions to lighting did not stop with the invention of the lamp. In common with many other pioneers, he found his first contribution of limited use until other problems had been solved. One of the most important was the development of a comprehensive system of distributing electric current, which would make possible the widespread use of the lamp he had created.

These great fundamental accomplishments largely furnished the foundation for electric service as we know it today.

Fifty years ago this problem of electrical distribution was one of the greatest confronting the infant industry. Today that industry, grown to giant proportions, is again faced with a problem of distribution, but of a different kind—the problem of prompt and economical distribution of electrical supplies and appliances.

The General Electric Supply Corporation, a national wholesale distributing organization, extends sincere congratulations to Mr. Edison, and pledges its best efforts, and those of the General Electric Company which stands back of it, to the performance of its part in the great task of bringing the blessings of electricity to the American people.

GENERAL ELECTRIC SUPPLY CORPORATION

Main Office: Bridgeport, Conn.

101-929
Saturday Evening Post, October 19, 1929

Electrification in the United States saw one of its most rapid periods of expansion during the decade after World War I. In 1919, 24% of America's homes were served by electric lines. By 1929, the number had grown to 65% and the increased need for electrical supplies in the newly equipped households presented General Electric with an opportunity to create a nationwide distribution network. In October, 1929, fourteen company-owned distributors and their 76 outlets were merged to form the General Electric Supply Company (GESCO). Headquarters were established at Bridgeport, Connecticut, with Gerard Swope chairman of the Board and C.E. Patterson president and director. Another director was Charles E. Wilson.

GENERAL ELECTRIC SUPPLY COMPANY

GESCO's network of supply houses, such as this one in Phoenix, Arizona stock over 85,000 different items.

In 1956, GESCO became a division of the Company, and two years later a young GE executive named Reginald H. Jones was appointed general manager. During the six years that he led GESCO, it experienced record growth and became firmly established as a full-functioning wholesale distributor of lamps, lighting equipment, electrical apparatus and supplies manufactured by GE and over 3000 other companies.

In 1976, GESCO's business took on an international flavor when the Saudi Electric Supply Company in Alkhobar, Saudi Arabia became an authorized distributor. Distribution centers were also opened in Riyadh and Jeddah.

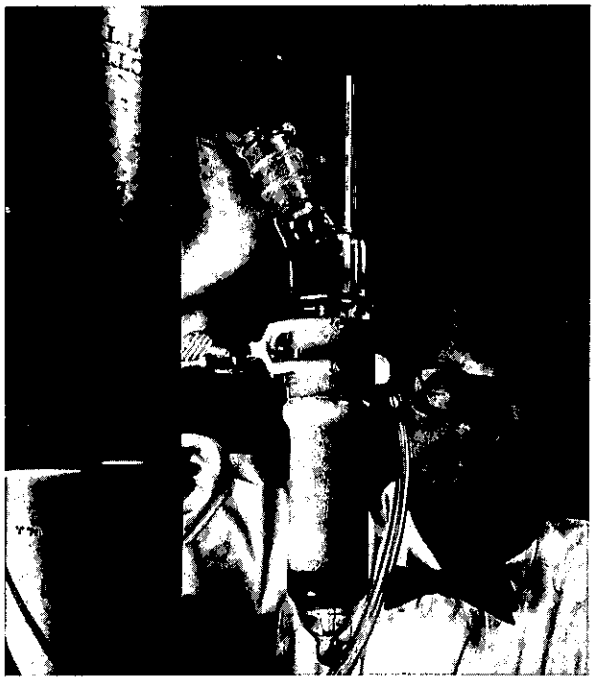
In 1978, GESCO entered the Carribean market in Puerto Rico by assuming responsibility for General Electric del Caribe, Inc.

The General Electric Supply Company ranks high as one of the lesser known segments of General Electric. But it occupies a unique position in which it purchases products from some 46 GE manufacturing departments and seeks opportunities to sell its merchandise to all of GE's plants as well as to outside companies. Its 3300 people in 183 distribution centers in the United States and in growing international markets have built an unchallenged reputation for service to the customer and have made significant contributions to the Company's growth.

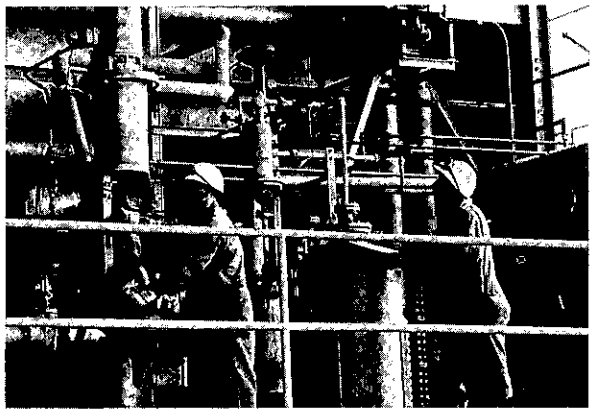
GESCO sales representative reviews customer's needs outside the world's largest underground mine in San Manuel, Arizona.

GESCO in Saudi Arabia.

1956



Allan S. Hay demonstrates oxidative coupling technique.



Fluid bed reactor for manufacture of silicones at new plant in Waterford, New York.

MATERIALS

Allan S. Hay of the Research Laboratory discovers a technique for polymerization by oxidative coupling. It leads to polyphenylene oxide and finally to Noryl® resin, a widely used engineering plastic with unusual strength at high temperatures and flame retardant characteristics.

The Waterford, New York, plant of the Silicone Products Department starts up its first fluid bed reactor with technology which becomes the basis for the worldwide economical production of silicones.

Copper-clad laminates for printed circuit boards are developed for radio and television applications, providing lighter weight, lower cost assemblies than had previously been possible.

INDUSTRIAL EQUIPMENT

Industrial Control Department announces the industry's first analog control system for a machine tool. It consists of electronic tube circuitry and amplidyne generator excitation for motor control.

The first motor specifically designed for appliance applications is the Form "R" produced by the Appliance Motor Department.

LIGHTING

The increased surface area offered by the "power groove" tube design leads to power outputs as much as twice those of straight tube fluorescent lamps.

"Power groove" tube design doubles light output of fluorescent lamps.

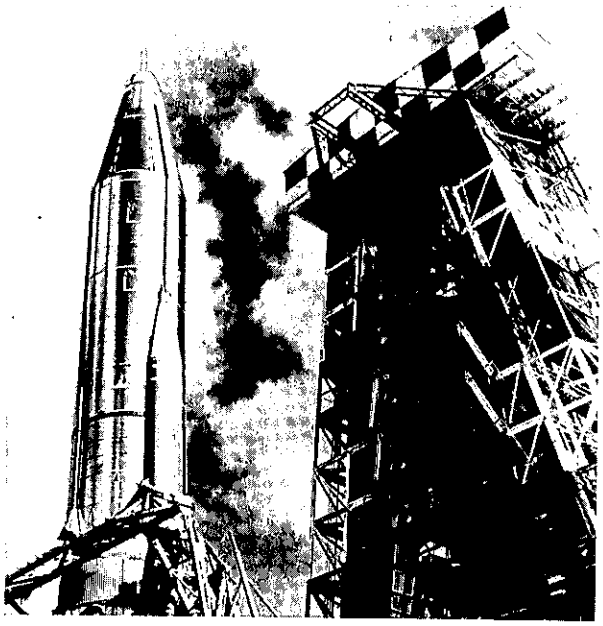
1956

NATIONAL DEFENSE

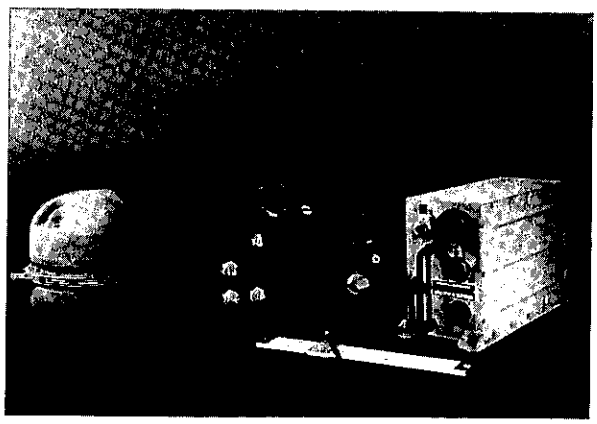
At the request of the U.S. Air Force, GE starts development of the reentry vehicle for the free world's first intercontinental ballistic missile, the Atlas. The system must house and protect payloads from the 12,000°F temperature encountered during reentry into the earth's atmosphere. Manufacturing will take place at Burlington, Vermont. Aerospace Electronic Systems Division develops the crucial radio guidance system for the Atlas.

FRITHIOF V. JOHNSON

Johnson's invention of the floated rate integrated gyro and the lead computing gyro and optical sight provided key sensors for missile guidance and aircraft navigation and enabled Aerospace Controls Systems Dept. to become a leader in flight and weapon control technology.



Atlas intercontinental ballistic missile on launching pad.



Lead computing gyro and optical sight system for F-4 Phantom II fighter

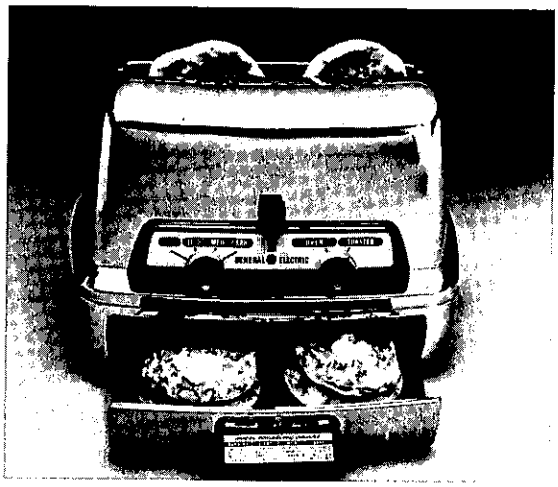
TRANSPORTATION

The CJ 805 turbojet and turbofan versions of the J79 jet engine are selected to power the Convair 880 and 990 jetliners. The J79, with its variable stator compressor, is the free world's first Mach 2 engine. It is used on military aircraft such as the B-58 Hustler, the F-104 Starfighter and the F-4 Phantom II, enabling them to set 44 world records for time-to-climb, speed and altitude. The McDonnell/Douglas Phantom II, equipped with two Evendale J79 engines in addition to Binghamton's (AESD) lead computing gunsight and all-transistorized autopilot, is considered one of the most successful military fighter aircraft ever produced.

APPLIANCES

Housewares Division introduces the T-93 Toast-R-Oven, the first of a line which later will include broiling capabilities and larger toasting and baking capacity in a compact, energy saving appliance.

The first automatic drying termination cycle is devised for clothes dryers. It increases drying efficiency while bringing added convenience to home laundering.

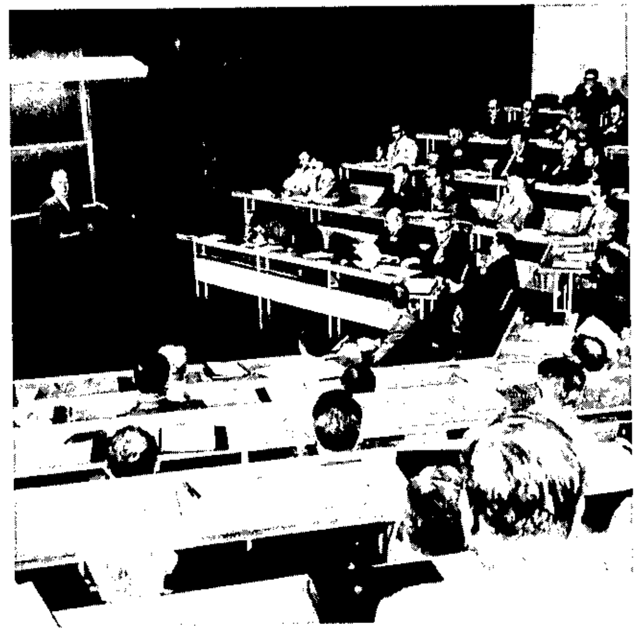


1956

ORGANIZATION

The General Electric Management Development Institute is opened at Crotonville, New York. It resulted from a three-year investigation initiated at the request of Ralph Cordiner who saw the need to develop an expanded number of managers trained in additional skills to satisfy the requirements of the new decentralization program and to meet the predicted growth of the Company. From 1956 until 1961 over 1500 managerial and professional employees participated in the Advanced Management Course. It was unique in the industry for its scope and length, and its approach to managerial work. During the same period, the Institute trained over 500 course leaders for the Professional Business Management Course conducted at many of the Company's locations.

Over the years, activities at Crotonville have reflected changing concepts in education and in management techniques and philosophy. Executive education programs have been complemented by learning opportunitites specifically appropriate to the individual's level of responsibility in a wide variety of disciplines.

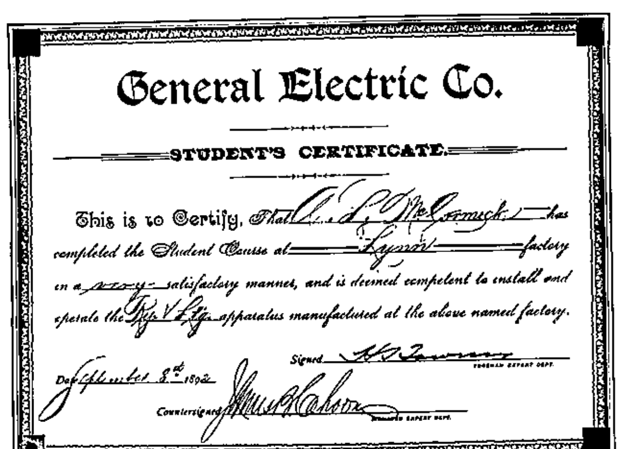


GE President Ralph Cordiner addresses the first class of the Advanced Management Course at the newly opened Crotonville Management Development Institute.

A TRADITION OF EDUCATION

The recognition of the need for continuing, post-school education goes back to the earliest days of General Electric, when the Experts Course was organized to develop engineers who could deal with the new technologies that produced the Company's products. This was followed by the Apprentice Course, the Test Course, organized by Albert Rohrer; and the Business Training Program. "Test" as it is fondly and proudly referred to by its alumni, offered technically trained college graduates opportunities for a series of assignments at a variety of Company locations, augmented by formal classroom education, before a decision would be made on career concentration. Later, the Advanced Engineering Program was formulated to develop problem solving and analytical capabilities at levels equivalent to graduate engineering school educations. In the 1970's a number of programs were established which combine the best features of "Test", for example, with those of other courses of study in technological areas. The Edison Engineering Program is the most recent of such programs. The same has been true of non-technical areas -- as exemplified by the Financial Management Program, which has provided individuals with a broad base of familiarity with the Company's diversified operations, and has been a training ground for many of its business leaders.

The philosophy of career-long opportunities for development is centered not only in the formal training programs but in a great variety of technical and non-technical courses to meet the needs and interests of virtually every type of employee -- and where the pertinent educational opportunities do not exist internally, they are provided by financial support of external programs. In looking to the individual self-betterment of its employees General Electric is continually building the resources for its own progress.



General Electric Co.

STUDENT'S CERTIFICATE.

This is to Certify, That ______ has completed the Student Course at Lynn factory in a very satisfactory manner, and is deemed competent to install and operate the ______ apparatus manufactured at the above named factory.

Date September 8th 1892

Signed ______

Countersigned ______

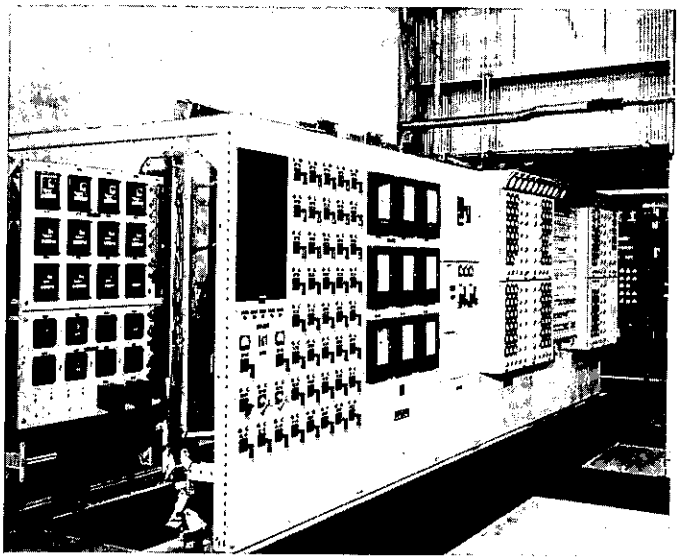
Student Certificate issued the same year that the General Electric Company was formed—1892.

1957

Tri-Clad brushless generator for computer power supply, under test by engineer E. H. (Ed) Perkins.

LOUIS T. RADER

A key contributor in the development and design of numerical control, computer and automation equipment throughout his industrial career, Rader was formerly Vice President and General Manger of the Communication and Control Division. His technological achievements were recognized by his nomination to the National Academy of Engineering.



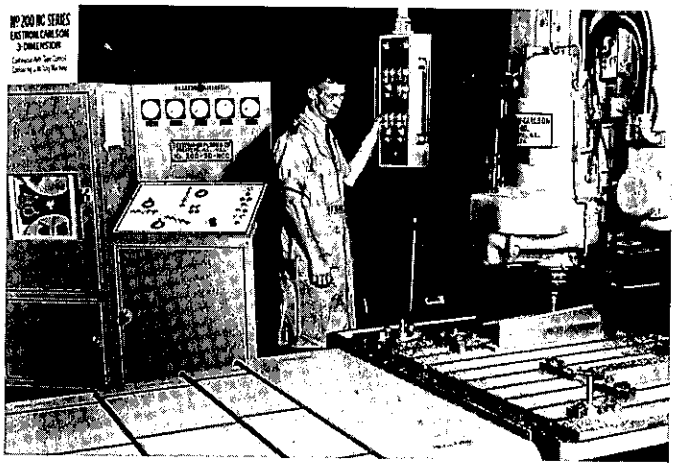
Static logic switching control panel for Inland Steel Company.

INDUSTRIAL EQUIPMENT

Silicon-controlled rectifiers are incorporated in a new class of small synchronous generators that eliminate brushes and add reliability and cost advantages.

Punched paper tape input for numerical control of machine tools is announced by the Industrial Control Department. This new industry standard is known as the GE "Mark Series" line.

Static magnetic digital switching and solid-state analog electronic amplifiers are introduced to the metal industry in the automation of an Inland Steel slabbing mill. Mill operation is controlled by a punched card program control system.



Continuous path tape control contouring and milling machine.

1957

MATERIALS

GE announces the full commercial availability of manufactured industrial diamonds for use in metal-cutting and other difficult materials processing operations ranging from glass-grinding to commercial drilling and dentistry.

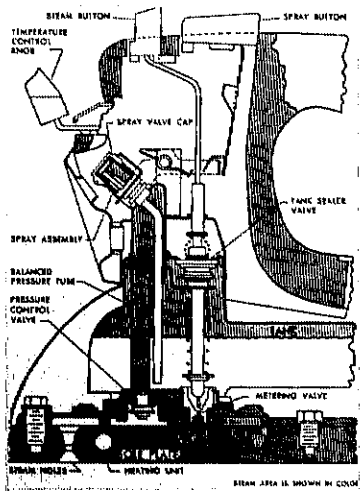
Robert H. Wentorf, Jr. synthesizes Borazon® cubic boron nitride, a material not found in nature and second in hardness only to a diamond. Its potential use in materials processing is enhanced by the ability to remain hard at temperatures where diamond will burn.

The first successful hydrostatic pressing of massive molybdenum billets is made by Howard Green, George Kaiser and Walter Brinn. Refractory Metal Products Department is the first commercial producer of large hydropressed tungsten and molybdenum billets used for forging rocket nozzle and other high temperature, high performance parts.

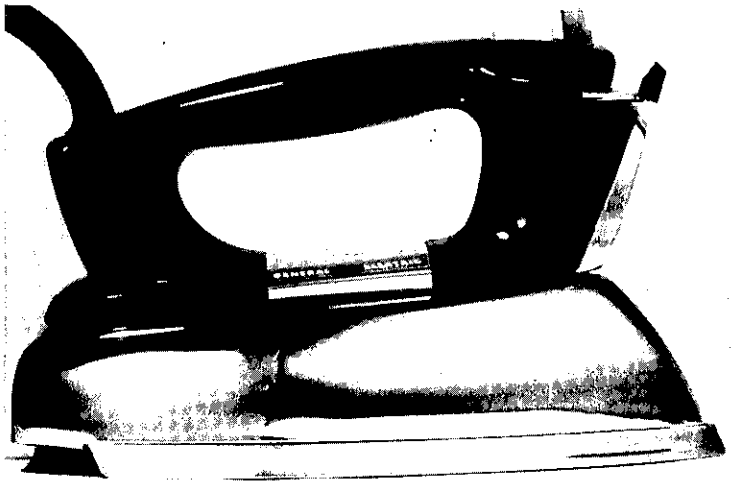
Robert H. Wentorf demonstrates that Borazon is hard enough to scratch diamond.

APPLIANCES

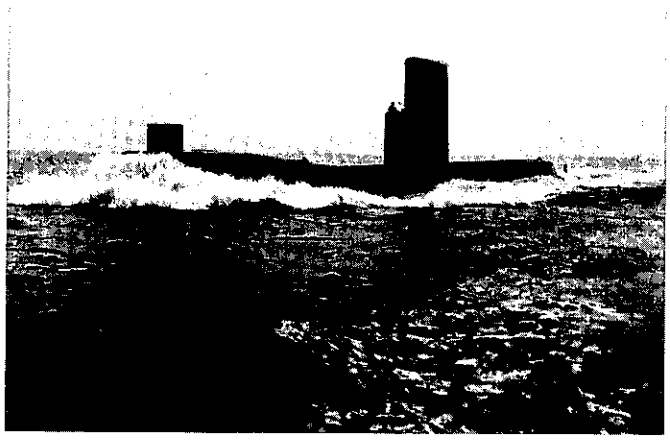
Housewares Division introduces the first commercially feasible combination spray, steam and dry iron, increasing the range of fabrics that can be conveniently handled with a single, household iron.



Cross-section of spray, steam and dry iron.



1957



USS Seawolf, the U.S. Navy's second nuclear-powered submarine. (General Dynamics Photo)

POWER GENERATION

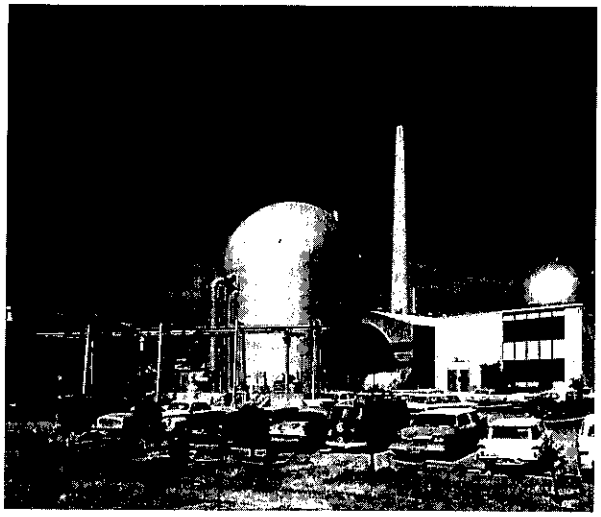
GE receives the U.S. Government's first nuclear reactor license for its five megawatt Vallecitos Boiling Water Reactor near Pleasanton, California. The unit goes into operation as a generator of electricity for the Pacific Gas and Electric Company and also serves as an operator training center and reactor component test complex.

Enriched uranium-oxide fuel pellets for nuclear reactors are first developed and produced by Carboloy (now the Metallurgical Products Department).

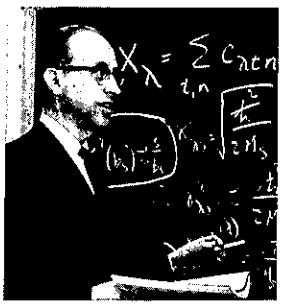
The Navy's second nuclear powered submarine, the USS Seawolf, contains a reactor plant designed by KAPL, under the direction of the Division of Naval Reactors, AEC; and uses the liquid sodium cooling concept. It is commissioned at the Electric Boat Division of the General Dynamics Corporation in Groton, Connecticut.

TRANSPORTATION

The Erie Works makes its first shipment of a standard export universal locomotive to Chile. It is a 900-hp, six-axle U9C diesel-electric.



Vallecitos Boiling Water Reactor, recipient of first nuclear reactor license.



KARL PALEY COHEN

An early advocate of reactor concepts which the U.S. ultimately adopted for commercial power generation, Cohen made major contributions to the development of the gaseous diffusion and centrifuge processes for enriching uranium.

1958

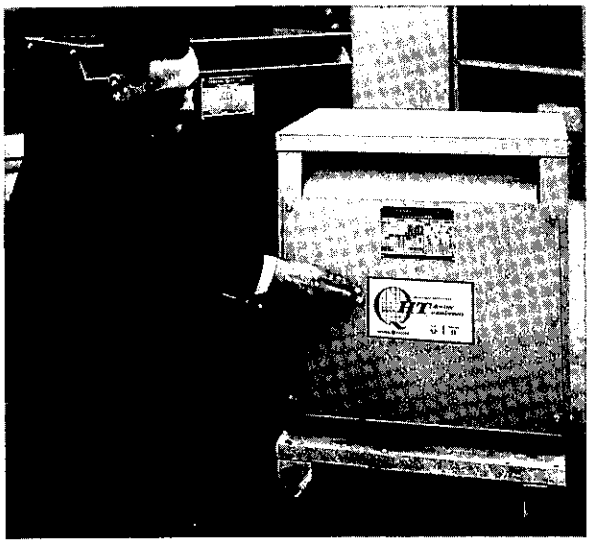
POWER GENERATION AND TRANSMISSION

The Advanced Reactor Systems Department pioneers a fast breeder reactor theory indicating that such reactors can be economically viable. It also develops a ceramic oxide fuel for use in fast breeder reactors.

The Specialty Transformer Department introduces industry's first guaranteed noise level, high temperature transformer, the "QHT" (Quiet, High Temperature).

PAUL GREEBLER

Starting in the late 1950's, when he joined GE's nuclear breeder reactor team, Greebler contributed many of the discoveries that made breeder reactors possible. He first described the Doppler effect in a fast, mixed-oxide-fueled breeder and the key role this phenomenon plays as an inherent safety mechanism.



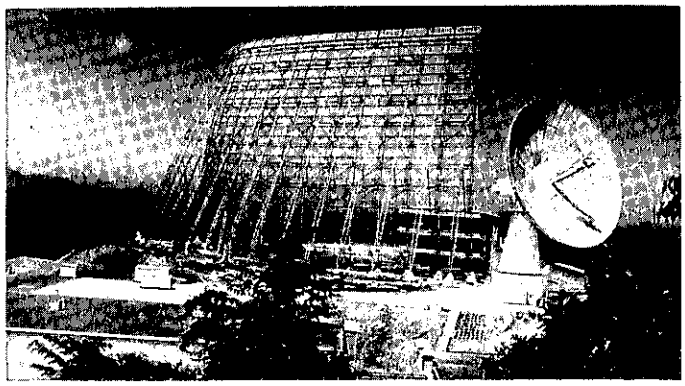
QHT dry type transformer, with old type D in background.

Testing the Vulcan gatling gun at Burlington, Vermont, firing range.

NATIONAL DEFENSE

The largest operational radar laboratory in the free world is developed and operated for the U.S. Air Force on the island of Trinidad, down range from Cape Canaveral.

Armament Systems at Burlington, Vermont, produces the first linkless ammunition feed system, reliable at rates up to 7200 rounds per minute. It is used for the M-61 Vulcan gun installed on the Air Force F-105 fighter plane.

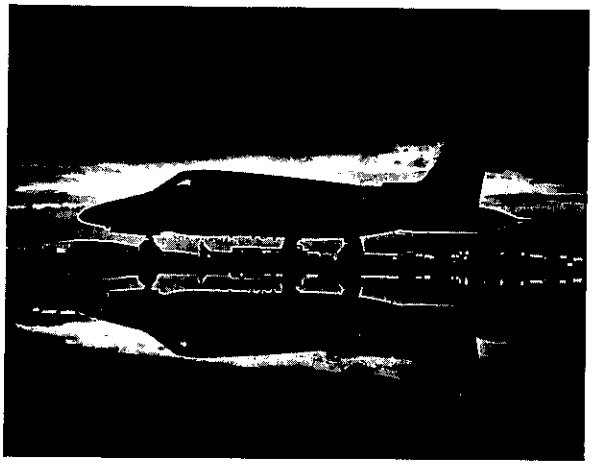


Trinidad radar laboratory, largest in the free world.

MATERIALS

The Wire and Cable Department announces Vulkene, an insulation utilizing cross-linked polyethylene technology. Vulkene's high temperature properties will revolutionize the cable industry and usher in a new generation of solid dielectrics for cable insulation.

1958



CJ610 turbojet-powered Gates Learjet.

TRANSPORTATION

Jet engine power is introduced for use in business aircraft with the development of the CJ610 turbojet. The J85, its supersonic military predecessor, was first used to power the F-5 Freedom Fighter.

SPACE EXPLORATION

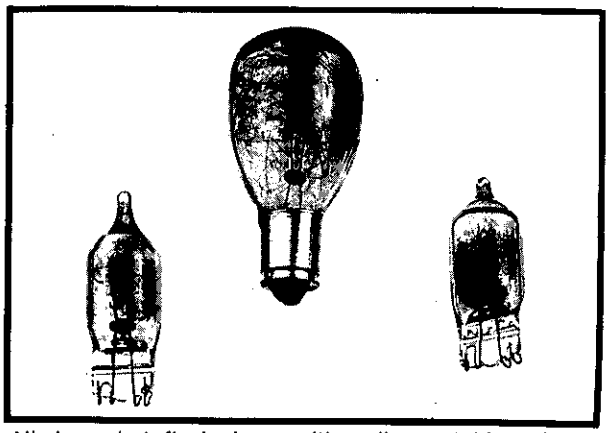
The first payload ever recovered from outer space is a data capsule ejected from a Mark 2 reentry vehicle built for the U.S. Air Force. The vehicle also serves as the nation's first space laboratory, carrying scientific experiments which will help pave the way for future space exploration. Its precise, predetermined path is controlled by a radio-guidance system developed by the Electronic Systems Division.

APPLIANCES

Housewares Division markets its automatic electric can opener, freeing consumers from the awkwardness of manual types.

Rotary compressors are developed for use in room air conditioners. The new design has fewer parts and its size, weight and quiet operation make it particularly suitable for window and wall mounting. The invention of the SPINE FIN heat transfer surface, with continuous refrigerant tubing and thousands of heat transfer spines, permits flexibility in design that results in the development of many new air conditioner applications.

SPINE FIN heat transfer surface developed for air conditioners.



All-glass photoflash shown with earlier, metal base lamp.

LIGHTING

Development of the first all-glass photoflash, the AG-1, provides a smaller, yet more powerful lamp and is the forerunner of photolamp arrays that will bring a new dimension of automation and convenience to photography.

1959

LIGHTING

A team led by G.E. Reinker, E.L. Woodall and R.D. Jones is successful in the identification of a domestic source of quartz sand and the development of a purification process that ends U.S. dependence on imported quartz. This high temperature material is used not only in lighting and heating devices but for applications requiring good chemical resistance.

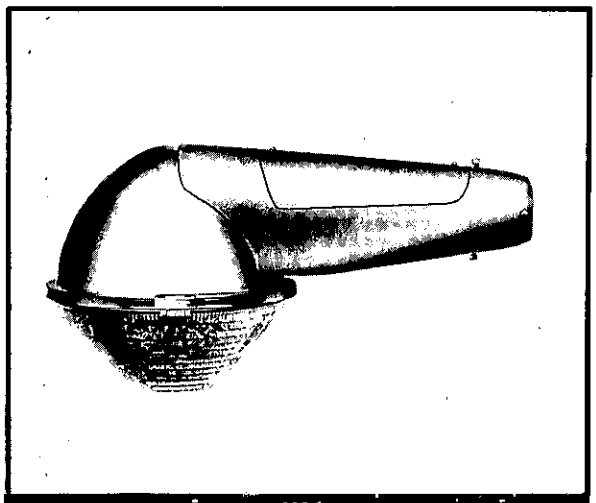
The Quartzline® halogen lamp is perfected as Ed Zubler, Stanley Ackerman, Al Foote and Fred Mosby develop the tungsten-iodine regenerative cycle, a chemical reaction that prevents blackening of the inside walls of the lamp bulb. The result is a compact lamp with greatly increased brightness and extended life. The Miniature Lamp Department introduces a 150-watt unit as a marker light for aircraft navigation.

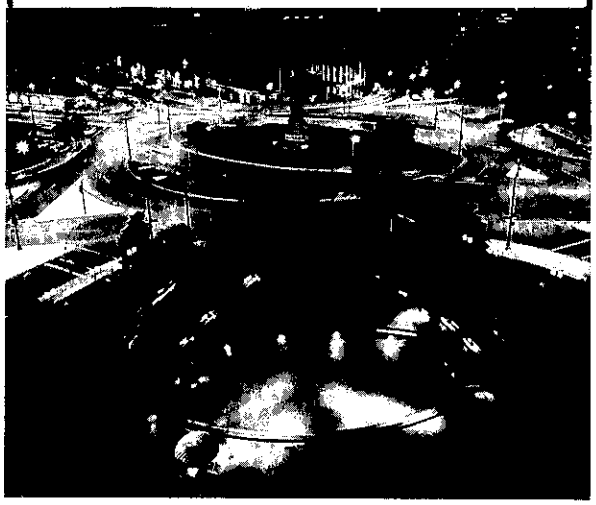
The first totally integrated roadway lighting system is announced by Lighting Systems. Consisting of housing, reflector, refractor, lamp and ballast, the unit lowers the cost of outdoor lighting and increases driving safety.

As a consequence of fundamental sintering research, a new pore-free polycrystalline alumina oxide is invented by Robert C. Coble and Joseph Burke at the Research Laboratory. The material, called Lucalox®, will make higher efficiency discharge lamps a reality.

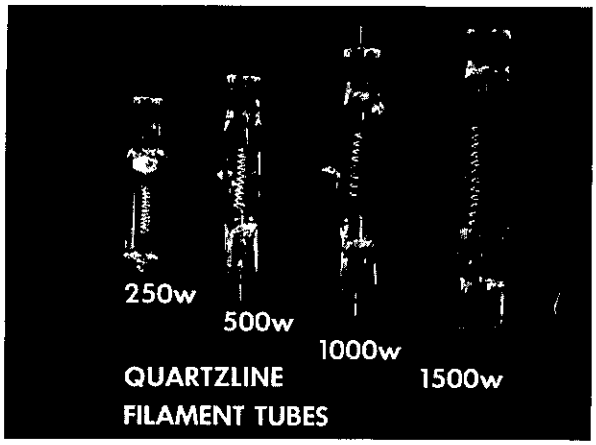
GERALD E. REINKER

The discovery of an urgently needed new domestic source of quartz sand for use in making quartz and the initiation of studies which led to the highly successful Lucalox ® family of sodium lamps were two of Gerry Reinker's many achievements as head of the Lamp Glass Technology Laboratory.





Integrated roadway lighting system lights the streets of Washington, D.C.



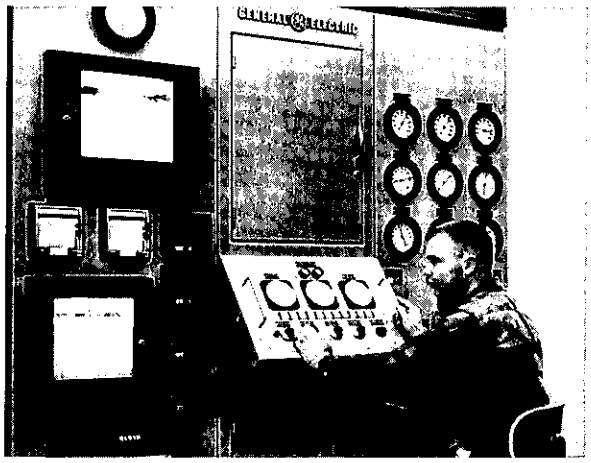
Quartzline halogen filament lamp for high intensity lighting.

SPACE EXPLORATION

The first photographs of our planet taken from outer space are returned to earth in the Mark 2 data capsule.

The RVX-1, launched by a Thor-Able rocket, flies 4,939 miles and is the first re entry vehicle to be recovered in its entirety. The feat is made possible by a lightweight, ablative heat shield which replaces the heavier and bulkier copper shield of the original Mark 2 vehicle.

1959



World's first electro-hydraulic control system for steam turbines installed at Dow Chemical plant by Medium Steam Turbine Department.

INDUSTRIAL EQUIPMENT

The world's first electro-hydraulic control system for steam turbines is introduced at Dow Chemical by the Medium Steam Turbine Department. The replacement of mechanical hydraulic controls provides greater accuracy and lower maintenance, making the new system the forerunner of all GE turbine control systems.

GE supplies the first integrated power control room (PCR) for a Jones & Laughlin Steel continuous annealing line. The self-contained, enclosed units include interconnecting wiring and ventilation and offer faster and less costly field installation.

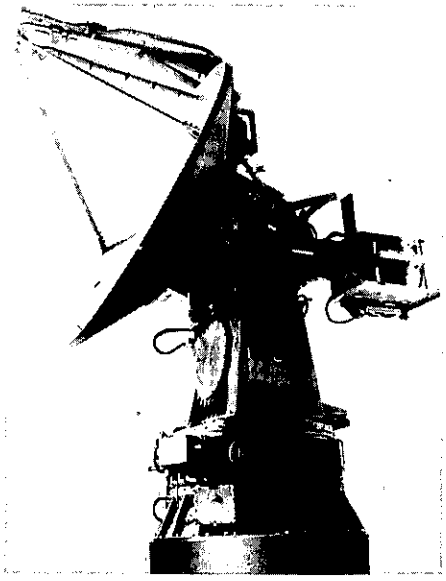
USS Triton (GENERAL DYNAMICS PHOTO).

NATIONAL DEFENSE

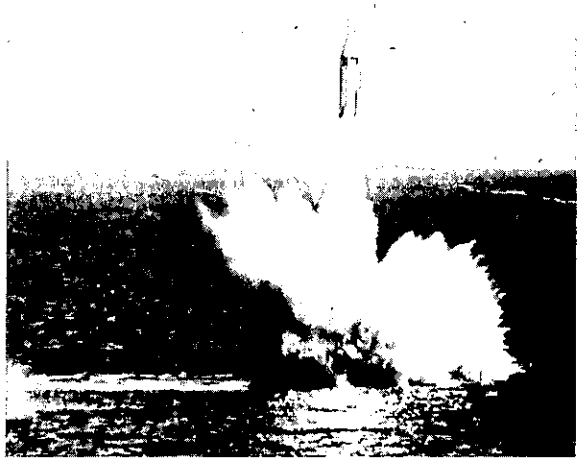
USS Triton makes the first round-the-world voyage without surfacing. During the 83-day, 36,000-mile trip, the nuclear dual reactor plant, designed by KAPL under the direction of the Division of Naval Reactors, AEC, demonstrates ample power to move the ship at cruiser task force speeds.

Pittsfield's Ordnance Systems produces fire control and guidance equipment for the Navy's Polaris Missile System, one of the nation's leading deterrent weapon systems.

The MK 73 director for guided missiles of the Navy's Tartar System goes into production at Ordnance Systems, which has been a continuous supplier of gun mounts and directors for 38 years.



MK 73 guided missile director.



Polaris missile launch.

1960

SPACE EXPLORATION

On the threshold of manned space-flight — The Discoverer XIII is the first man-made object to be recovered from an orbiting space vehicle. The experimental reentry vehicle, RVX-2A, is the largest vehicle recovered from outer space and provides the first color photographs of earth from altitudes of up to 700 miles.

The Van Allen Radiation Belt is explored by the Nuclear Emulsion Recovery Vehicle (NERVA) built for the National Aeronautics and Space Administration. The satellite reaches altitudes as high as 1250 miles.

Center of attention is the U.S. Air Force Discoverer XIII capsule following its successful recovery August 11, 1960. President Dwight D. Eisenhower holds the 50-star flag recovered from the capsule. Looking on is Gen. Thomas D. White, Chief of Staff, U.S. Air Force.

OTTO KLIMA

Associated with rocket and space technology since the Hermes Project in 1946, Otto Klima contributed to the design of virtually every reentry system developed by the Reentry and Environmental Systems Division and its predecessors.

PHILLIP R. MILROY

A long list of patents that range from dishwashers to lighting fixtures, demonstrates Milroy's broad expertise. At the Lighting Systems Dept., he pioneered a complete new family of roadway lighting products and engineered specialized high-intensity discharge systems for industrial and other enclosed area lighting.

LIGHTING

The "bonus electrode" makes a major improvement in mercury lamp performance, increasing the rated life to over 24,000 hours. The innovation helps trigger a massive conversion of incandescent street lamps to mercury vapor, producing an estimated annual energy savings of four billion kilowatt-hours or the equivalent of six million barrels of oil.

New electronic computers for business and scientific data processing.

INDUSTRIAL EQUIPMENT

The first application of a high power static exciter is on a 25,600-kw generator for the International Paper Company at Bastrap, Louisiana.

The Computer Department announces its GE 225 system, filling the need for flexible, high speed, lower cost computers for business and scientific data processing.

Logic designs developed for the GE 200 series of computers are incorporated in the first all digital solid-state Mark Century series of numerical machine controls.

1960

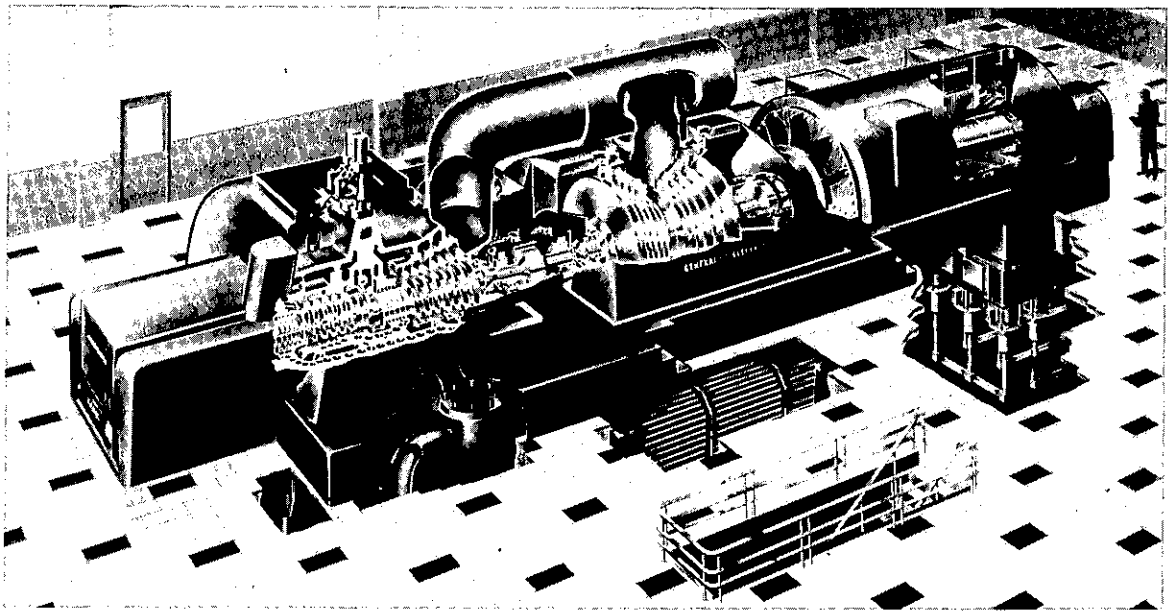
Pioneers in the develoment of utility boiler feed pumps (l. to r.): Harry Mayor, Stanley Styrna, John Cunningham, and Edwin Pace.

POWER GENERATION

The first large-scale, privately financed nuclear power plant goes into service. It is the 210-MW Dresden 1 unit of the Commonwealth Edison Company near Chicago, Illinois. The Large Steam Turbine-Generator Department supplies the first turbine built to operate on steam from a nuclear reactor. The 192,000-kw unit operates at 1800 rpm and uses 950 psi saturated steam.

A new type of turbine is designed to drive boiler feed pumps supplying water to the boilers that produce steam for main-turbine generator units. The boiler feed pumps integrate into the total power plant cycle, resulting in greater efficiency of power output and water usage.

Turbine Department's Applied Research and Development Laboratory develops processes for producing turbine castings.



Anatomy of tandem-compound, double-flow reheat steam turbine-generator.

1960

MATERIALS

Carboloy develops its tiniest product, cemented carbide balls for new ball-point pens. The result is a writing instrument with low cost, long life, and smooth performance.

WALTER G. ROBBINS

After becoming president of Carboloy, Inc. in 1936, Robbins opened a new period in Carboloy's history which included the manufacture of improved cemented carbide products, permanent magnets, vacuum-melted superalloys, and the development of high pressure technology needed for diamond synthesis.

GE's smallest and possibly lowest priced product. Costing less than a penny apiece. Carboloy cemented Carbide balls (1 mm. diameter) are used for new ball-point pens.

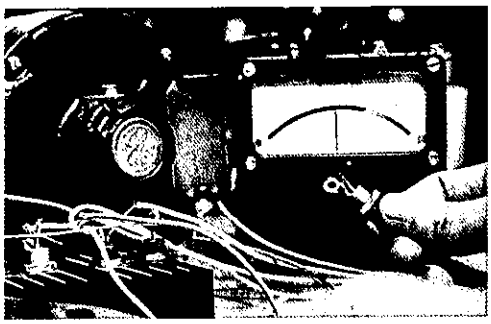
First transistorized two-way radio.

ELECTRONICS AND COMMUNICATIONS

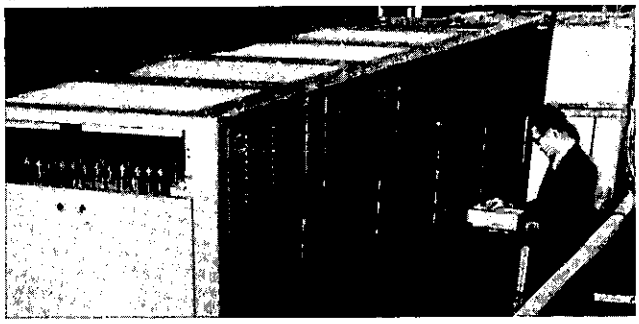
The advent of magnetic amplifiers and silicon control rectifiers provides opportunities to eliminate rotating exciters for ac generating machines and thereby make a major improvement in the reliability of utility power generation.

The National Academy of Television Arts and Sciences awards an "Emmy" to the Tube Products Department for outstanding engineering and technical achievement in developing an Image Orthicon TV Camera Tube with unsurpassed optical sensitivity in poor lighting conditions. Special credit for the development is given to Peter Wargo and Herb Hannan.

Communications Products Department introduces the first transistorized portable two-way radio for police and fire departments.

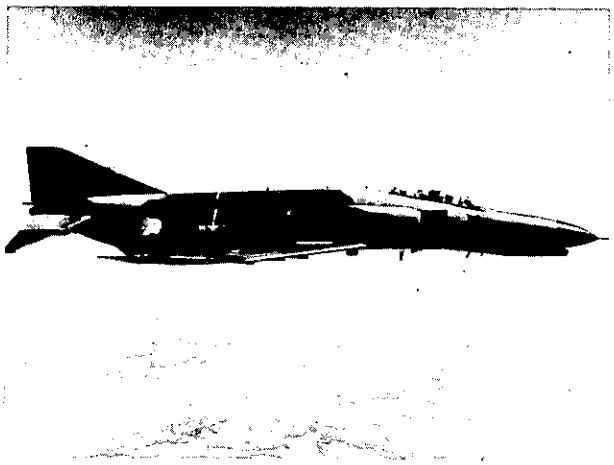


Silicon control rectifiers promise to revolutionize machine control.



Semiconductor power rectifier system, world's largest, powers a chlorine generating process line.

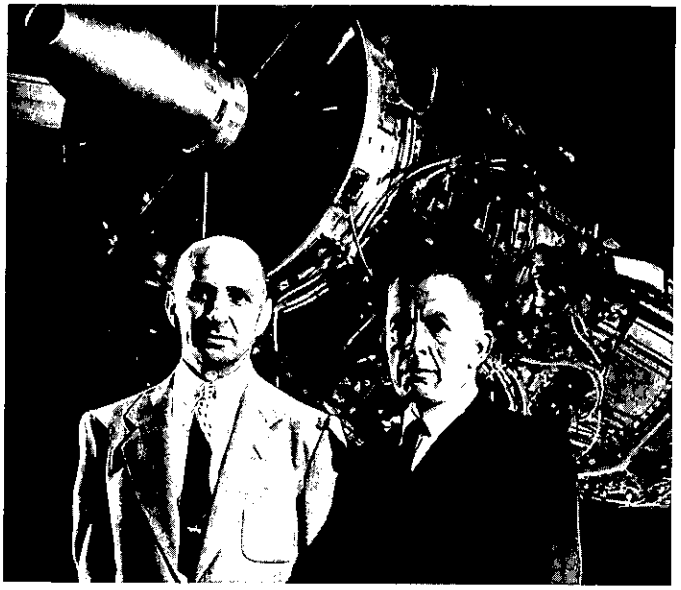
1960



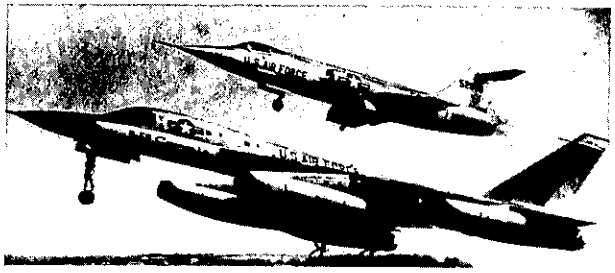
The F-4 Phantom II with twin J79 engines—one of the most successful military aircraft ever produced.

TRANSPORTATION

Twin CT58 gas turbine engines, produced at Lynn's Small Aircraft Engine Department, are used to replace piston-driven types in their first application to commercial helicopters. The U.S. Navy awarded GE a contract to develop the XT58 in 1953.

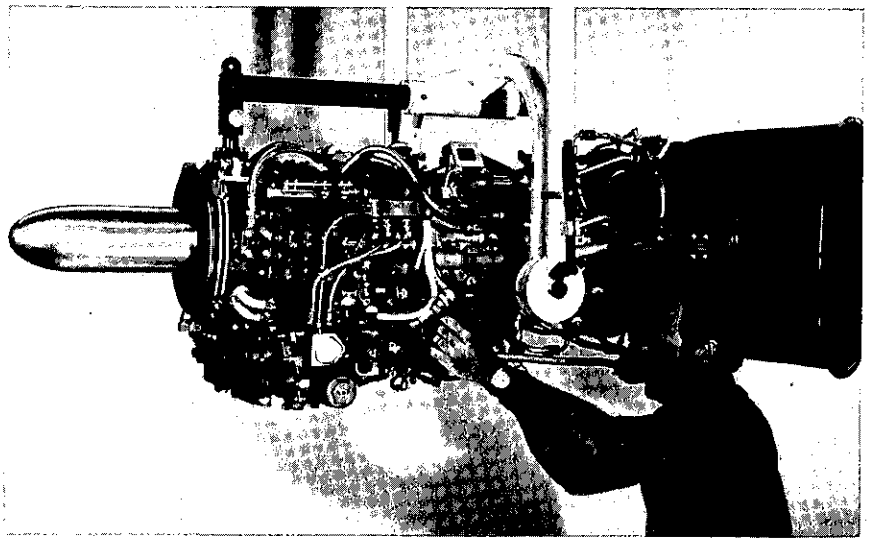


In 1959, Gerhard Neumann (left) and Neil Burgess, designers and developers of the J79 turbojet (above), were named to receive aviation's coveted Collier Trophy Award. They shared the award with the designer of the Lockheed F-104 Starfighter and two Air Force pilots who, in 1958, captured speed and altitute records flying the F-104.



Revolutionary J79 jet engines power the B-58 supersonic bomber and F104A fighter interceptor.

S-62 commercial helicopter with twin CT58 engines shows its lifting power.



T58 engine at Lynn plant.

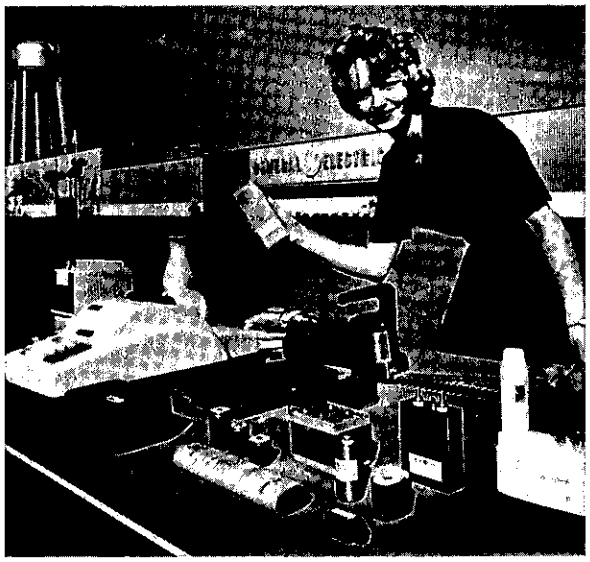
1961

APPLIANCES

The use of a powerful, compact motor and rechargeable battery leads to the introduction of an automatic toothbrush and is the forerunner of the development of other lightweight, handheld appliances such as electric hair dryers and an electric slicing knife, featuring twin reciprocating blades.

The newly established Battery Business Section of the Capacitor Department develops rechargeable nickel-cadmium batteries for a full range of portable products from toothbrushes to grass shears and hedge clippers.

A recognized need for larger capacity clothes washers leads to the introduction of the V-12 washer, the first automatic washer of 12-pound capacity available to the public.



Portable appliances with new rechargeable nickel-cadmium batteries.

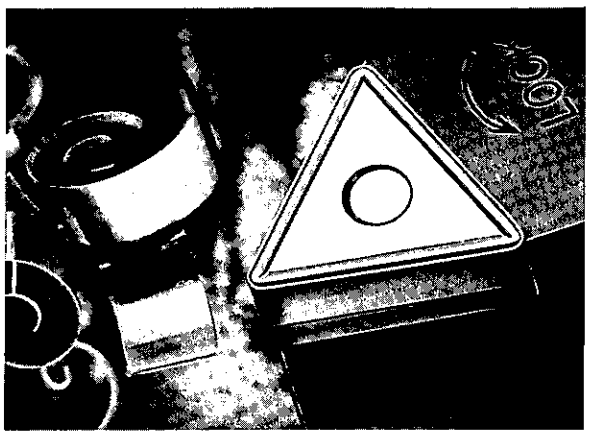
ARTHUR J. CATOTTI

As a member of a special Capacitor Department study team, Catotti's recommendations led to the 1961 establishment of what is now the Battery Business Department at Gainesville, Florida. He has been responsible for the development of rechargeable sealed lead-acid, nickel-cadmium, and other improved batteries for portable product applications.

MATERIALS

Dallas T. Hurd, John Pugh and Lufti Amra, of the Refractory Metals Products Department, develop tungsten-rhenium lamp wire, the first new wire composition in over 40 years. The initial application of this new alloy as a photoflash lamp igniter wire produces superior flashability and improved reliability in flash photography.

Carboloy (Metallurgical Products Department) introduces Carb-O-Lock, a unique metalcutting tool combining a simple, rugged toolholder design with an economical, unground cutting insert produced by newly developed precision powder metallurgy techniques. Carboloy becomes the established leader in tool design as well as cutting alloys.



NATIONAL DEFENSE

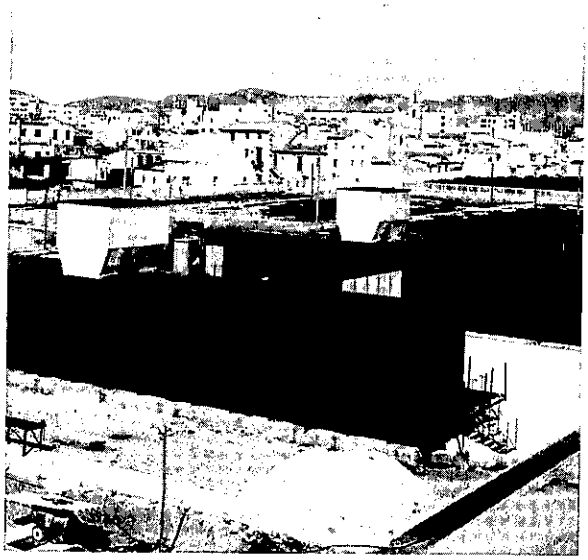
The Navy commissions its first "quiet" nuclear ballistic missile submarine, the USS Jack. The Lynn-built steam propulsion turbines and gears are designed by Melvin A. Prohl and Erwin C. Rohde to meet the stringent requirements for quiet machinery to avoid enemy detection.

1961

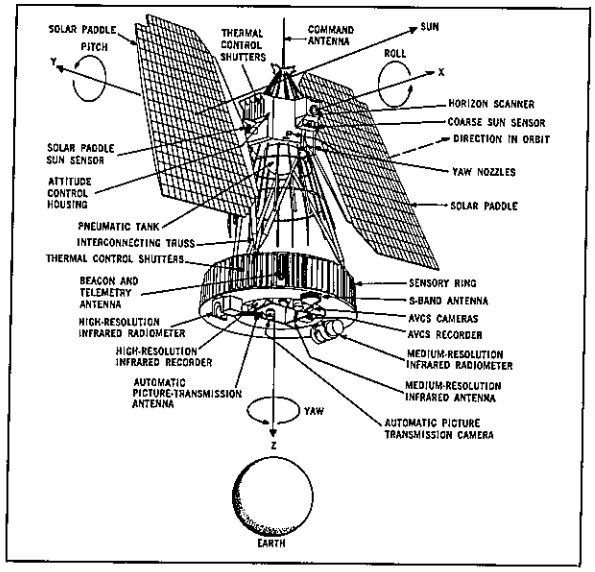
POWER GENERATION AND TRANSMISSION

The first "Package Power Plant" is supplied to the electric utility industry with a shipment to South Carolina Electric and Gas Company. The unit is a completely self-contained gas turbine-generator, almost entirely factory assembled and tested, and ready for installation as a peaking station to provide extra system capacity, or as a standby power source for emergencies.

The introduction of the high capacity vacuum interrupter for protection and control of medium voltage power systems enables the development of smaller, lighter, power breakers requiring less maintenance.



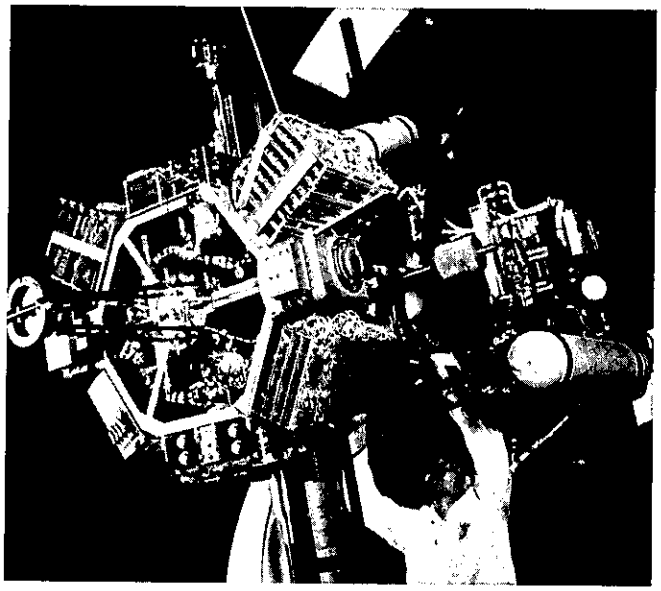
Two "Package Power Plants," each rated at 14,000 k w, operated by Gas y Electricidad, Mallorca, Spain.



The NIMBUS meteorological satellite.

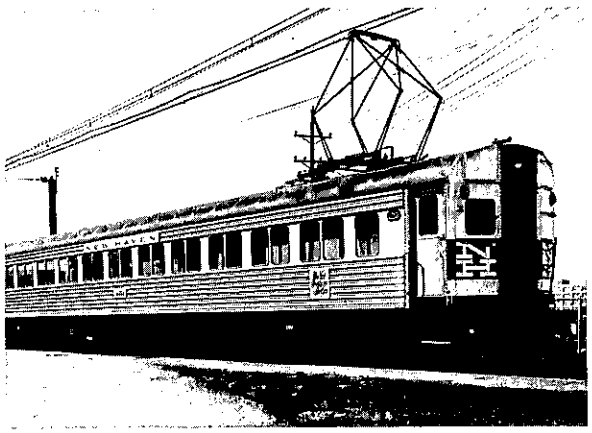
SPACE EXPLORATION

The Space Division develops NIMBUS, an earth-oriented meteorological satellite, the first of a series of seven that supply scientific data on atmospheric and environmental conditions.



Preparing NIMBUS prototype for test in Valley Forge space simulation chamber, one of the largest in the world.

1961



New York, New Haven & Hartford commuter car, first railroad application of solid state silicon rectifiers.

TRANSPORTATION

The Erie Works builds the country's largest diesel-electric locomotive. The U25B is a 2500-hp four-axle unit designed for high speed freight service on domestic railroads.

The first railroad application of solid state silicon rectifiers is on New York, New Haven & Hartford Railroad commuter cars.

GUY W. WILSON

At the Erie Works, Wilson pioneered the dieselization of America's railroads and played a prominent role in the development and marketing of some of the world's most powerful locomotives — gas turbine electric and diesel electric types.

The U25B diesel-electric locomotive.

ELECTRONICS AND COMMUNICATIONS

The Compactron, an electron tube allowing multi-functional receiving capability within one glass tube, is introduced by the Tube Products Department.

The Federal Communications Commission approves GE's proposed standards for FM stereophonic broadcasting and GE's Schenectady station, WGFM, starts broadcasting in stereo.

ANTAL CSICSATKA

After fleeing his native Hungary in 1956, Csicsatka joined the Radio Receiver Dept. in Utica where his pioneering contributions in radio engineering included the invention of the stereophonic broadcast system that was adapted as the U.S. standard and is used in 90% of the countries of the world.

Stereophonic table model radio with detachable speakers.

GERALD L. PHILLIPPE

Gerald L. Phillippe, who became Chairman of the Board of General Electric in 1963, was widely known for his leadership in the nationwide effort to enlist the support of business in attacking urban problems, and unemployment. He was founder of the Urban Coalition.

Born in Ute, Iowa, September 27, 1909, Phillippe spent his boyhood in Basin, Wyoming. Early in his youth he acquired the nickname of "Flip," by which he came to be known throughout the business and financial communities.

During World War II Phillippe moved into his first managerial position as manager of the Statistics Division, with some 200 people reporting to him. He immediately won their admiration for his managerial skills.

In 1947 Phillippe was appointed auditor for the Apparatus Department, and in 1950 was named comptroller for the department. In November, 1951, he was appointed manager-finance of the Apparatus Sales Division. Two years later he was elected Comptroller, chief financial officer of the Company. He served in this position and as general manager of the Company's Accounting Services until his election as President and a member of the Board of Directors on August 2, 1961. He became Chairman of the Board in 1963, succeeding the retiring Ralph Cordiner in that post.

Gerald L. Phillippe's term was cut short by his death in 1968, at the age of 59, but his astute leadership had left its mark on the growth of the Company. His service to humanity also left its mark on the spirit of the Company.

In honor of his leadership in public service, General Electric established the Gerald L. Phillippe Awards, recognizing outstanding social contributions by the award of a medal and an opportunity to designate a charity or educational institution for a $1000 grant from the General Electric Foundation.

GE Board Chairman Gerald L. Phillippe at dedication of new Power Transformer Department building in Pittsfield (1968). At his side is transformer invented by William Stanley in 1885.

PLANNING THE UTILITY SYSTEMS OF TODAY. . . AND TOMORROW

The first commercial central generating station in the United States was Thomas Edison's Pearl Street Station in New York City. Completed in 1882, it used six of Edison's "Jumbo" dynamos, with a capacity of 600 kilowatts, to provide electric current for lamps in the homes and businesses of 85 customers served via fourteen miles of underground cables. The success of that pioneering installation was due not only to Edison's inventive genius, but to his thorough planning of the overall system based on an understanding of the interactions of its components. This applications engineering expertise has taken many forms during the almost 100 years that General Electric has been supplying the needs of electric utilities.

Today, these services are centered in the Electric Utility Systems Engineering Department (EUSED) in Schenectady, New York. But the common denominator throughout has been the participation of people whose skills have been able to provide practical solutions to complex problems as well as the development of new theories and analytical methods to cope with ever-increasing equipment and utility system complexities.

In the space available here, it is possible to mention but a few of the many individuals who were part of EUSED's predecessor organizations and who made outstanding contributions in areas related to utility systems engineering.

Edith Clarke

Edith Clarke was the first woman to receive an electrical engineering degree from Massachusetts Institute of Technology (1919) and the first woman to be elected a Fellow of the American Institute of Electrical Engineers. A member of the GE Central Station Engineering Division from 1922 until her retirement in 1945, she made significant contributions to symmetrical component and circuit analysis theory and to the solution of long-distance power transmission problems.

A 1942 winner of the Coffin Award, Charles Concordia is the author of over 65 publications, including a textbook, which still serves as a foundation for the design and prediction of synchronous machine performance. He pioneered in the application of differential and digital computers to power system studies, and was the first chairman of the AIEE Committee on Computing Devices.

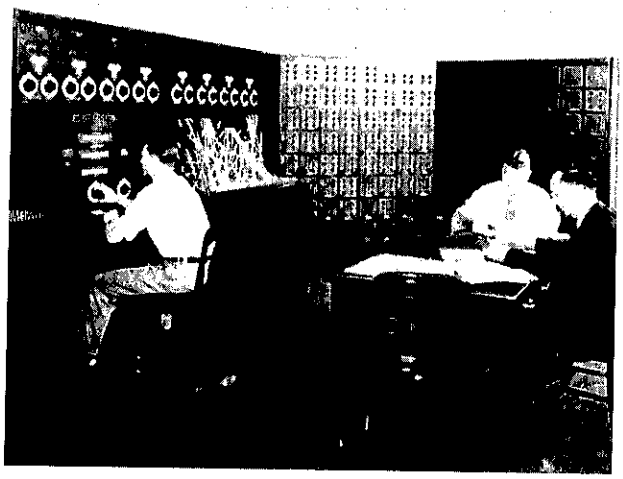
Charles Concordia

Selden B. Crary

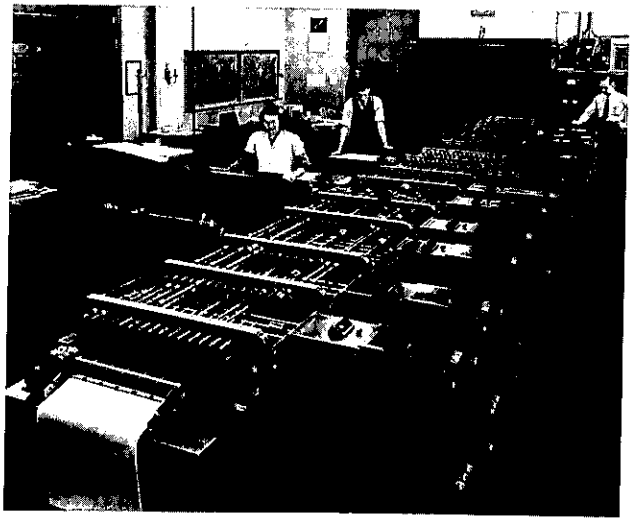
Ten years after he joined GE, Selden B. Crary received GE's highest honor, the Coffin Award for 1937, for his work on the theory of performance of synchronous machines. He became an internationally known authority in the field of electric utility system design and made important contributions to the stability, reliability and economics of bulk power transmission systems.

ELECTRIC UTILITY SYSTEMS ENGINEERING DEPARTMENT

The Applications Engineering Department, a predecessor of EUSED, was an early leader in the use and application of computers and computer technology. As early as 1915, a dc network analyzer board was constructed to assist in the solution of power system problems. The General Engineering Laboratory supplied an ac network analyzer in 1937. These were followed by transient network analyzers and mechanical and electronic differential analyzers.



The ac network analyzer being used to solve a power company operating problem (1938).

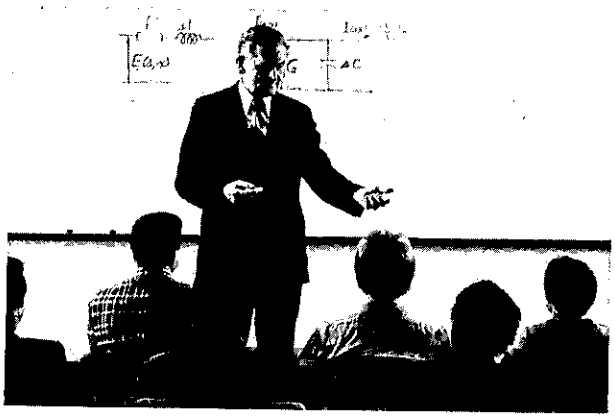


Mechanical differential analyzer in use (1948).

The use of the CPC (card programmed calculator) and several generations of IBM computers heralded in the period of large scale digital studies as we know them today. EUSED continues to provide analytical leadership in the field of electrical utility systems by means of the development of new generations of equipment which can be used to model and simulate machine performance and system interactions -- and by means of personnel whose combination of talents can provide a unique integration of technological and economic assessment of products and system operation.

EDUCATION -- A KEY TO FUTURE DEVELOPMENT

The ability of utility systems engineering to stay abreast of changing technologies and environments requires a broad educational service to General Electric and utility industry engineers. A major element in this service is the masters' level, thirty-week Power Systems Engineering Course. This course, established in 1949 at the recommendation of Selden B. Crary, has graduated nearly 1,000 utility engineers from the United States and various countries around the world. Many alumni have distinguished themselves, not only technically, but by advancing to leadership positions in the utility industry.



Homer M. Rustebakke, Manager-Power Systems Engineering Course, lectures before class of utility systems engineers.

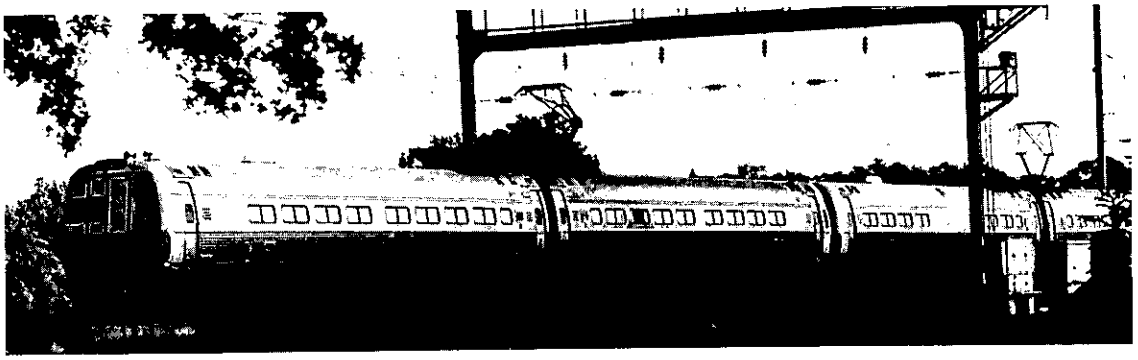
1962

MATERIALS

The Silicone Products Department introduces the use of RTV sealants to industry and subsequently to construction and consumer markets. In 1958, room temperature-curing RTV silicone rubber was developed.

High power, solid state silicon rectifiers (SCRs) are made possible through the development of a tungsten substrate that matches the expansion characteristics of silicon yet serves as an excellent conductor of both heat and electricity. Produced by the Refractory Metals Department, these pressed and sintered tungsten discs serve as the basis for many new forms of power conversion.

RTV silicone rubber is demonstrated by Silicone Products' Charles A. Berridge.



Metroliner service between New York and Washington, D.C.

TRANSPORTATION

Ernest F. Weiser invents a staged phase control rectifier propulsion system that provides smooth, stepless control for rail cars and reduces wayside equipment costs. It is first introduced in "Silverliner" cars for commuter service in the Philadelphia area.

The USS Bainbridge with its power plant designed by KAPL under the direction of the Division of Naval Reactors, AEC, is commissioned as the Navy's first nuclear powered missile frigate.

INDUSTRIAL EQUIPMENT

The Drive Systems Department pioneers the first successful application of digital computers to control hot strip steel mills at McLouth Steel Company. Use of the GE 312 computer provides the means for more accurate control operations, more uniform product quality and higher productivity.

Industrial Control Department builds industry's first solid state control and applies it to a battery-powered fork lift truck.

FREDERICK T. SCOTT

When Fred Scott joined the Industrial Control Department shortly after World War II, he brought with him a solid background of field sales experience. He provided the marketing leadership that increased the Department's business more than sixfold during a period of 20 years.

1962

GE's new 18.8-cu. ft. Spacemaker Refrigerator-Freezer fits in same space as old 10-cu. ft. model.

APPLIANCES

The Mini-Basket washing system is added to the automatic washer to improve small load washing efficiency and to permit the handling of delicate handwashables. It uses 25 percent less energy than the small load setting on the same washer.

The first Package Terminal Air Conditioner is the ZONELINE which can be installed through the wall in apartments, motels, schools and other institutions to allow individually controlled heating or cooling at the touch of a button.

The first foamed-in-place urethane insulated refrigerator is built at Appliance Park. The new 18.8-cu. ft. capacity Spacemaker fits in the same space as the 1947 version of a 10-cu. ft. model.

LIGHTING

The Cool Beam dichroic reflector PAR lamp is developed for use in places needing increased light and reduced heat, such as food storage facilities. Its operation is based on a filtering process which permits all visible light to be reflected and more than two-thirds of the infrared (heat) radiation to be reabsorbed by the parabolic aluminized reflector.

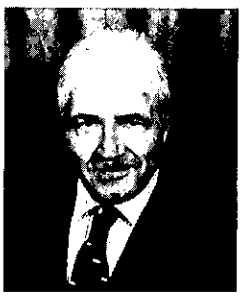
POWER GENERATION AND DISTRIBUTION

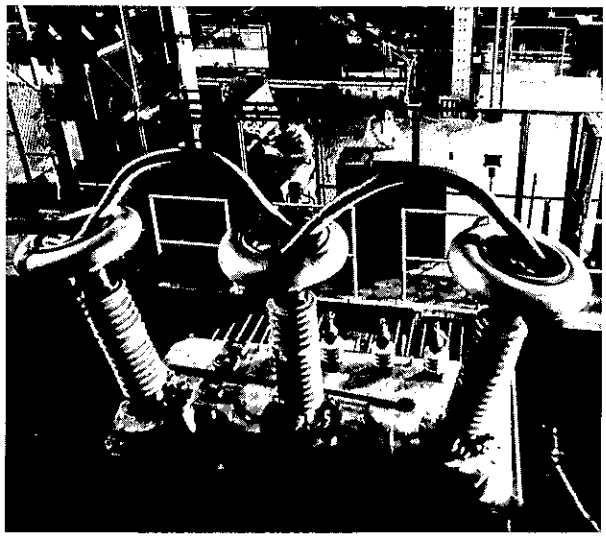
The development of a patented system for detecting and locating corona sources (partial discharges) in power transformers significantly improves their reliability and life expectancy.

A standardized line of geared turbine-generator sets is developed for marine applications. These units drive electric generators to supply all electrical power aboard vessels ranging from LNG container ships to nuclear attack submarines.

JOHN C. DUTTON

At the Medium Transformer Dept., Dutton pioneered the programming of the first computer designs of GE production transformers in 1952. His early exploratory approaches to vaporization cooling would later culminate in the development of the revolutionary VaporTran® transformer.





Corona testing power transformers at Medium Transformer Department, Rome, Georgia.

1963

POWER GENERATION

A predecessor of GE's modern STAG combined-cycle generating system (in which steam and gas turbine generating units work together to achieve very high efficiencies) is built for Oklahoma Gas and Electric Company. The OG&E installation consists of a gas turbine-generator that produces 25,000 kilowatts of electricity and a steam turbine-generator rated at 194,000 kw. Rather than venting the gas turbine's exhaust to the atmosphere, these hot gases are channeled to the plant's steam boiler, where they serve as pre-heated combustion air. By making use of this otherwise wasted heat energy, the efficiency of the combined plant is significantly higher than that of a comparably rated plant of conventional design.

A world's record 100,000-gauss field is produced by a magnetic coil wound with niobium-tin superconducting wire developed by Research Laboratory scientists D. Luther Martin, Mark G. Benz, Charles A. Bruch and Carl H. Rosner.

Research Laboratory scientists work on superconducting wire and coils: (l. to r.) D. Luther Martin, Charles A. Bruch, Mark G. Benz, and Carl H. Rosner.

NATIONAL DEFENSE

The Armament Systems Department develops a new 7.62-mm Minigun suitable for use in small aircraft such as helicopters. The new weapon is 50 percent lighter than the 20-mm Vulcan gun.

Electric Motorized Wheel propulsion of 85-ton capacity Unit Rig Haulage truck.

TRANSPORTATION

William Speicher of the Transportation Equipment Products Department invents the first successful electric drive system for large off-highway haulage trucks. The motorized wheel propulsion system is introduced on 85-ton capacity Unit Rig Haulage trucks used at open pit mining sites, resulting in greatly increased productivity.

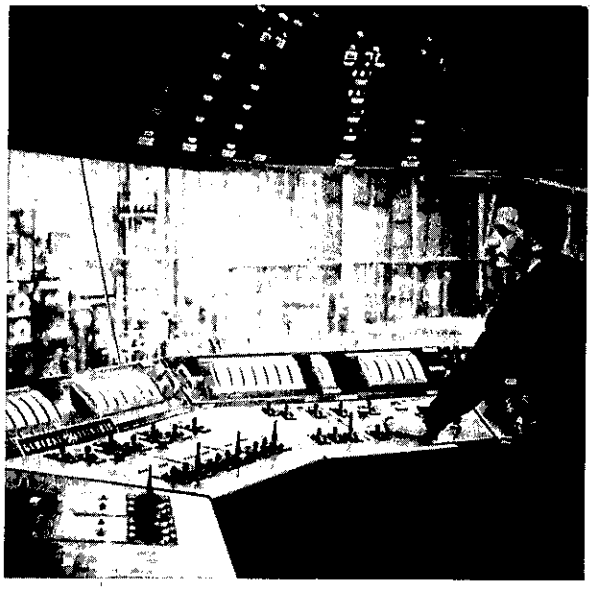
WILLIAM SPEICHER

His pioneering efforts in improving the power, fuel economy and reliability of GE's diesel engines won Speicher the Steinmetz Award in 1973. His invention of the motorized wheel made possible the construction of a whole new class of huge off-highway vehicles used in mining and road building.

ORGANIZATION

Fred J. Borch is elected President and Chief Executive Officer and Gerald L. Phillippe is named Chairman of the Board, as Ralph J. Cordiner announces his retirement.

1963



Hot strip mill control room, with computer-directed position regulators, at Taranto, Italy.

INDUSTRIAL EQUIPMENT

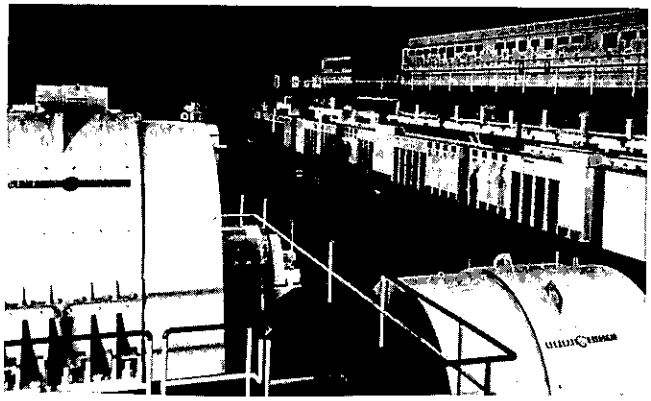
The popular ½-hp motor reaches a stage in its evolution where it is about one sixth the weight of the same rating at the turn of the century.

The capabilities of the static exciter system (1960) are extended to the utility industry with the installation of a unit on a new 224,000-kva generator at Southwestern Public Service.

The first completely thyristor-powered rolling mill drive system is installed at Bethlehem Steel's Burns Harbor facility, with 28,000 kw of thyristor power supplies. Reductions in equipment size and weight are accompanied by increased reliability and efficiency.

Worldwide use of GE electronic controls with computer-directed, time-shared digital position regulators is initiated with installations in new hot strip mills in Taranto, Italy; Newport, England; and Abbey Vale, Wales.

Evolution of ½-hp motor.

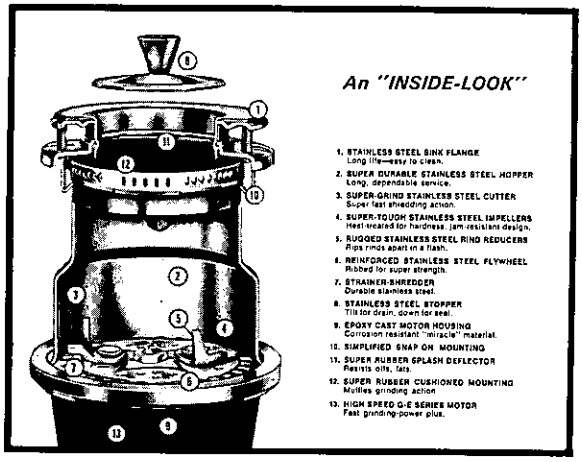


Thyristor-powered rolling mill drive on Bethlehem Steel plate mill.

APPLIANCES

Mark P. Hogue of Appliance Park develops a unique, food waste disposer design incorporating an encapsulated series motor and the use of stainless steel throughout the water bearing components. The results set new standards for high reliability and long life, at a moderate price.

The P-7® self-cleaning oven is introduced. In developing the oven, which uses a pyrolytic system to remove food soil, GE engineers were granted some 100 patents.



Anatomy of the Disposall®.

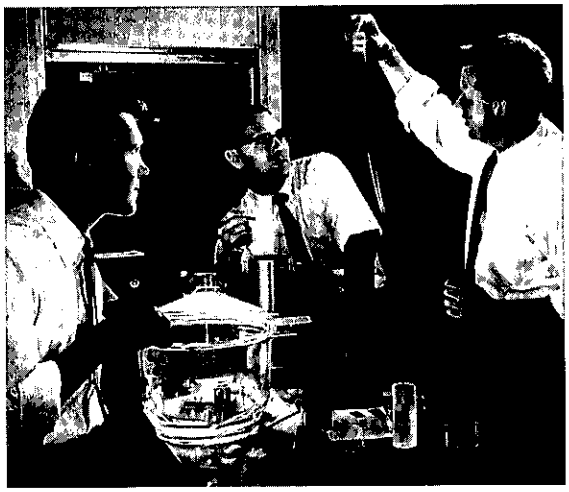
1964

MATERIALS

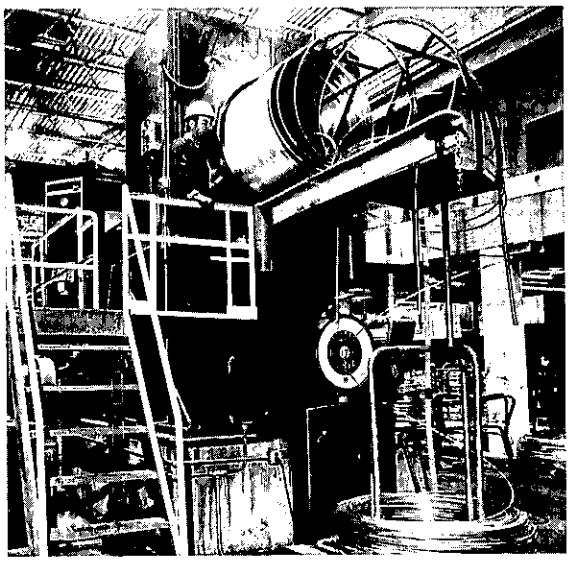
A process for revealing charged particle tracks in minerals, plastics and glasses is developed by Robert L. Fleischer, P. Buford Price and Robert M. Walker. One application of particle track etching is the determination of the amount of cosmic radiation that would be encountered in space by future astronauts. A unique plastic filter with superfine holes is another offshoot of these studies.

The invention of the MAGVAR (Paper/Film) Capacitor dielectric system by E.B. Cox revolutionizes the design of power capacitors. Use of polypropylene film, which replaces a portion of the Kraft paper in the dielectric system, produces capacitors with a ten-fold reduction in internal electrical losses and permits the design of smaller, lighter weight units.

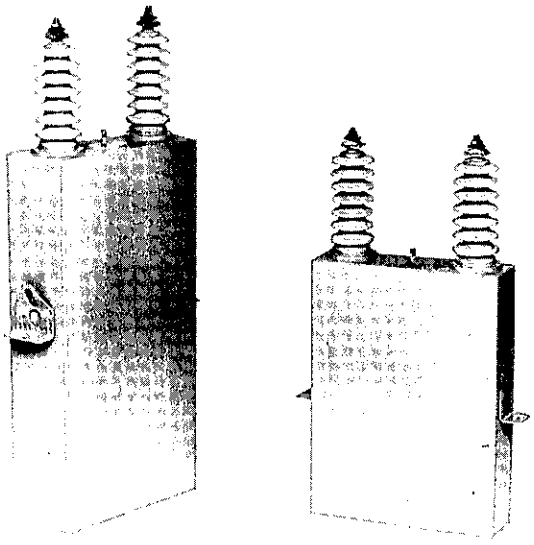
Engineers and metallurgists at the Research Laboratory and at the Wire and Cable Department develop the "Dip Form" process for continuously casting copper to form oxygen-free rod for wire making. The process converts copper cathode to high quality rod in long lengths without welds.



New plastic filter is offshoot of research on fission fragment tracks in solid materials by (l. to r.) P. Buford Price, Robert L.Fleischer, and Robert M. Walker.



Dip Form system produces continuous oxygen-free rod for wire making.

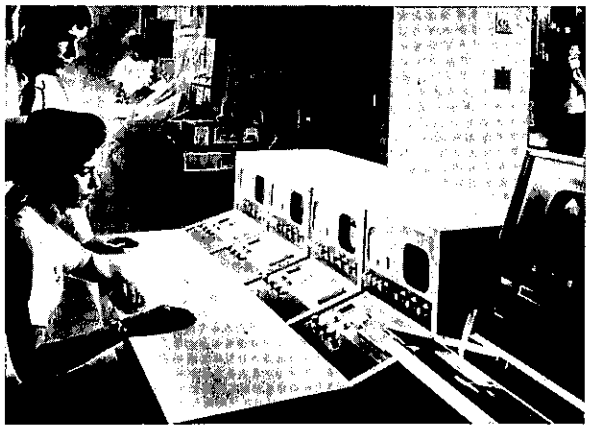


Conventional paper dielectric capacitor (l.) compared to MAGVAR capacitor (r.) of same size (100 kvar).

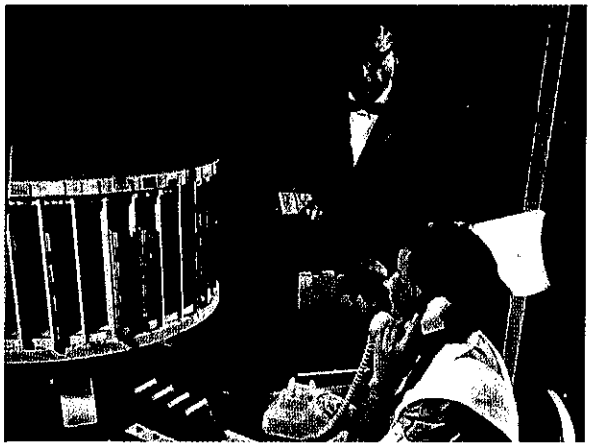
OLIVER H. WINN

The development of Light Military Electronic Department's monopulse track radar system during the mid-1950's won Winn the Charles A. Coffin Award. At the Capacitor Products Dept. from 1960-1968, he led the development of innovative products such as MAGVAR power capacitors and nickel-cadmium batteries.

1964



Electronic Patient Monitoring System.



Automatic Dial Paging System for doctors.

Vulcan Air Defense System (VADS).

MEDICAL EQUIPMENT

An electronic patient monitoring system for critical care applications is introduced by the Medical Systems Business Department.

A new automatic Dial Paging System is available for hospital and industrial use.

POWER GENERATION

Plans are formulated for SEFOR, the nation's first fast reactor fueled with plutonium-uranium oxide. This 20-MWe demonstration plant near Fayetteville, Arkansas, verified the theoretical work of GE scientists and demonstrated the feasibility of Liquid Metal Fast Breeder Reactors.

The first POWER BLOCK arrangement of gas turbines is built for Oklahoma Gas and Electric Company's Enid Station. These units, operating under a single control, consist of four General Electric MS 5000 units, rated at 14,000 kw each.

NATIONAL DEFENSE

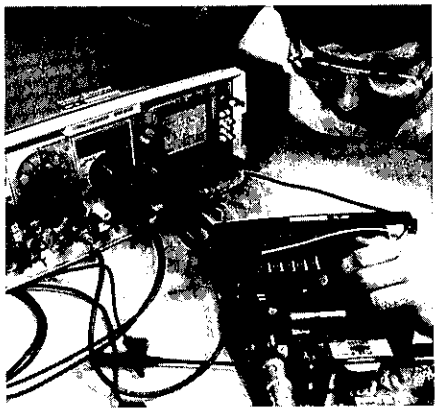
GE receives U.S. Army authorization to develop the ground-based Vulcan Air Defense System. This rapid-fire system is a vital part of NATO and other U.S. ally anti-aircraft defense equipment.

C. HERBERT RIDGLEY

Until his retirement in 1967, Ridgley guided the Missile and Armament Department in its vital armament system role in support of the nation's defense efforts.

INSTALLING AND SERVICING THE PRODUCTS OF TECHNOLOGY

The concept of equipment installation and service and specialized engineering support for its products dates back to the early years of General Electric. The Thomson-Houston Company opened a field service shop in Philadelphia in 1882. A year later, in order to assure satisfactory on-site installation, adjustment and maintenance of its arc lamps, the Company trained and established an organization of "experts", ancestors of today's Installation and Service Engineering field engineers. The first "expert" was Edwin Rice who later became the Company's president.



Testing circuit board during electronic instrument repair.

APPARATUS SERVICE BUSINESS DIVISION

The Apparatus Service Business Division encompasses a network of more than 190 Service Shops in 19 countries worldwide – with the International Service Department headquartered in London. It employs more than 12,500 skilled technicians and craftsmen.

KEY EVENTS (1947-1978)

1949 The first International Service Shop is opened in Rio de Janeiro.

1955 One hundred Service Shop employees are flown into six Northeastern states to help repair electrical equipment at industrial plants and utilities damaged by record flooding after two hurricanes.

1959 Schenectady Instrumentation Service, begun in 1896, opens its first shop dedicated exclusively to instrument service.

1966 The introduction of the GEGARD® motor rewinding and insulation process sets a new standard in motor maintenance and repair.

1973 A mobile transformer test van, with portable generator rated at two million volts, is placed in service. It provides factory-quality dielectric testing on-site, saving down-time and costs involved in transporting the transformer to a test facility.

1975 A new Measurement Service helps locate invisible mechanical faults and potential equipment failures faster and more efficiently using state-of-the-art analytical tools such as thermographic surveys and acoustic emission tests.

PETER C. VAN DYCK

Starting in 1954 as Finance Manager of the Service Shops Department, the Schenectady native became its General Manager in 1961 and in 1971, Vice President and General Manager of the newly-formed Apparatus Service Division. He held that position until his retirement in 1979. Under Van Dyck's leadership, the Division grew rapidly to its present worldwide network, introducing service innovations such as GEGARD, instrument rentals, measurements and diagnostic services, nondestructive testing, mechanical repairs and locomotive rebuilding.

Minneapolis Service Shop applies new wire to heavy apparatus.

INSTALLATION AND SERVICE ENGINEERING DIVISION

The Installation and Service Engineering Division has evolved to a worldwide organization of 170 offices, with 20 located outside of the United States. Its staff consists of some 4,200 people, the majority of whom are engineers whose skills and talents match the profile of customer needs in the geographic areas in which they are stationed.

KEY EVENTS (1947-1978)

1951 An Aircraft Gas Turbine Section, predecessor of I&SE's Aviation Section, is established to install and flight-test General Electric jet engines.

1955 Twelve Field District Engineering components and a foreign Installation-Turbine Section are incorporated into the newly established Installation and Service Engineering Department. William M. Denny becomes its first manager.

1964 Transfer of the Power Plant Engineering Operation to I&SE adds utility and industrial plant capabilities and system design expertise.

1966 To help supply the growing need for field engineers, the Field Engineering Program for graduate engineers is established.

1970 The Pacific HVDC Intertie Project, the country's first high-voltage dc transmission line, is installed by I&SE.

1974 The Field Engineering Program moves to a new Field Engineering Development Center on Balltown Road in Schenectady.

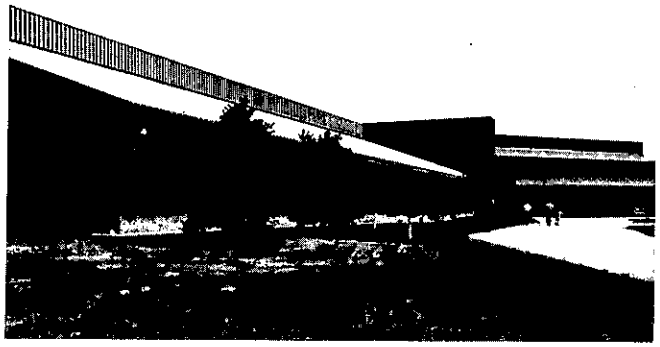
W. G. ELY
1901 - 1927

F. P. WILSON
1927 - 1942

W. M. DENNY
1942 - 1964

CHARLES C. THOMAS

Early in his career, Charles (Tip) Thomas was involved in a number of international projects that gained him a worldwide reputation as an outstanding systems engineer. From 1953-1964, he held key managerial assignments in Advanced Technology Systems, Construction Engineering and Power Plant Engineering. Among the pioneering projects that he managed was the design and turnkey installation of the first large steam-gas cycle power plant for the Oklahoma Gas and Electric Company and the first large computer-controlled steam plant for the Southern California Edison Company. In 1976, Thomas was elected Vice President of the I&SE Division.



I&SE Field Engineering Center houses classrooms and laboratories containing mechanical, electronic and electrical equipment that field service engineers are likely to encounter.

1965

ELECTRONICS AND COMMUNICATIONS

The first portable color television receiver, featuring the in-line picture tube, is marketed by the Television Business Department.

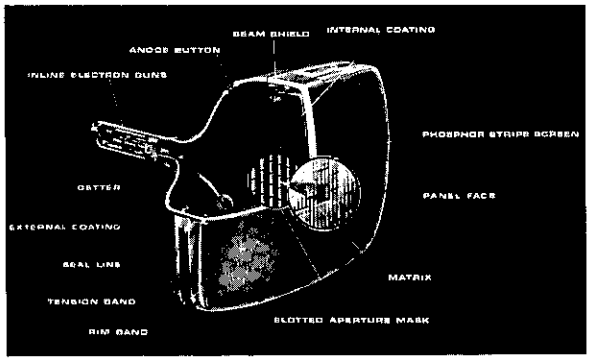
Closed circuit TV is introduced for viewing medical fluoroscopy.

The free world's largest ship sonar, the SQS-26, provides advanced high power, long-range capabilities for U.S. Navy submarines.

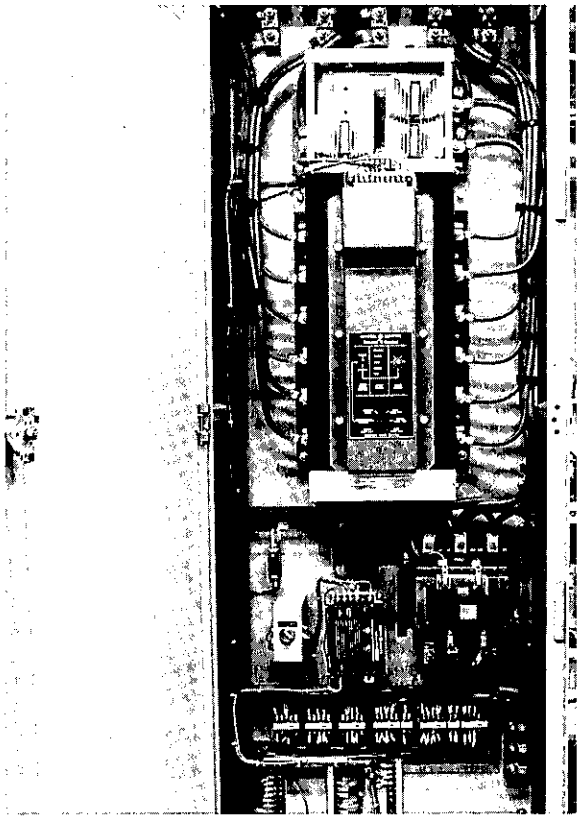
First portable color TV, the Portacolor.

INFORMATION PROCESSING

GE announces the world's first commercial computer time sharing service, called "Mark I Service." In 1963, the concept of shared use of computers was developed jointly with Dartmouth College utilizing a new computer language dubbed "BASIC."



Anatomy of the in-line picture tube.



Heart of ac motor control, the Tirastat II.

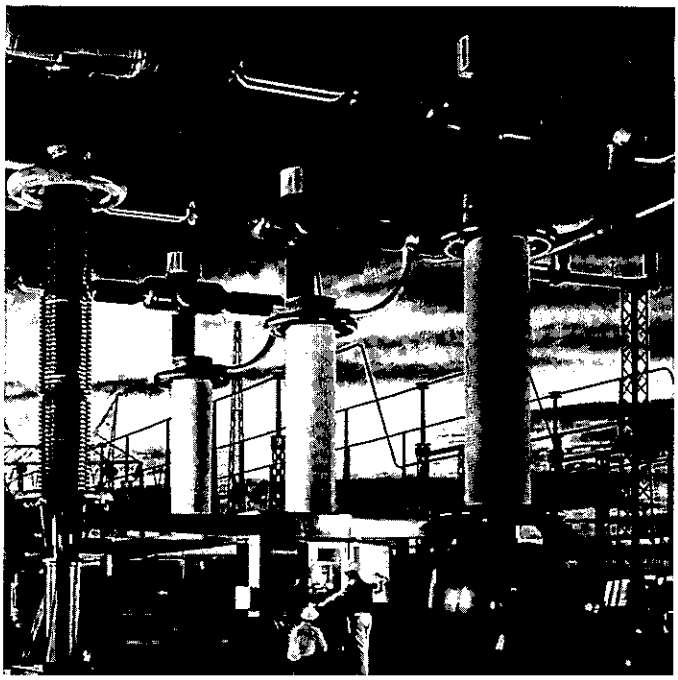
INDUSTRIAL EQUIPMENT

The Industry Control Department uses SCR s in place of contactors to obtain a highly reliable, stepless, solid state adjustable speed control for ac motors, the Tirastat II Control (TI-time, RA-ratio, STAT-static).

PAUL CHAUSSE

Within the Drive Systems Department, Chausse is recognized as the leading contributor to advancing drive systems technology throughout five generations of control equipment — vacuum tubes, magnetic amplifiers, discrete semiconductors, integrated circuits, and large scale integration/-microprocessors.

1965



New 500-kv air blast circuit breakers protect Arkansas Power and Light EHV line.

Underground distribution of power is more feasible with the development of new transformers.

NEW TRENDS IN POWER DISTRIBUTION

ORGANIZATION

The Research Laboratory and the Advanced Technology Laboratories (successor to GEL) are combined in a new organization to be called the General Electric Research and Development Center. Arthur M. Bueche is named to the newly created post of Vice-President-Research and Development. He is shown here, seated between his two predecessors, C. Guy Suits (left), Vice President and Director of Research, and George L. Haller, Vice President—Advanced Technology Services.

TRANSPORTATION

The high bypass turbofan TF39 jet engine is developed to power the world's largest aircraft, the Lockheed C-5 military transport. Its fuel consumption efficiency is 25 percent better than any previous jet engine.

1965

POWER GENERATION AND TRANSMISSION

Ten J79 type aircraft gas turbine engines are combined to provide hot gas to drive a single stage 1200-rpm gas turbine capable of producing 100,000 k w. The plant, built for the Cincinnati Gas and Electric Company's Dick Creek Unit #1, can burn either natural gas or liquid fuel by changing fuel nozzles and is designed for fully automatic, unattended operation.

The nation's first 500-kv power transmission system is protected by GE 500-kv Air Blast Breakers, the first power breakers of this rating. The breaker features the largest nonporcelain insulator column ever applied — a GEPOL unit, 4 ft. in diameter and over 15 ft. in length.

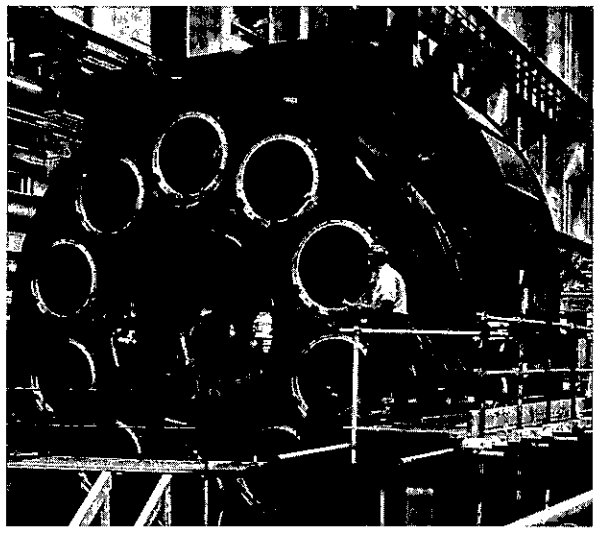
Canadian General Electric supplies EHV equipment for Quebec's 735,000-v transmission line, operating at the highest voltage of any commercial line in the Western World.

Introduction of the Load-Vac tap changer increases transformer operating levels and the time between required maintenance.

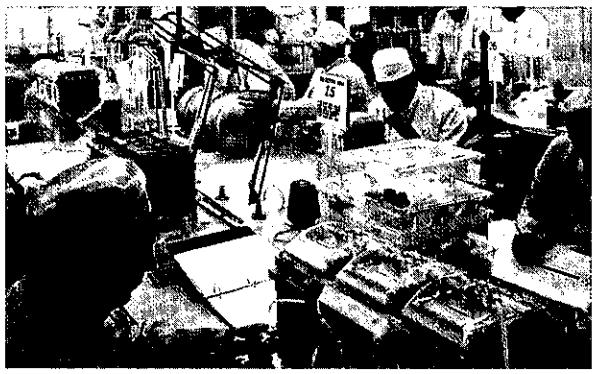
Fuel cells developed by the Direct Energy Conversion Operation are the first used in space flight as they power the Gemini 5 and Gemini 7 missions. An ion-exchange membrane, invented by Research Laboratory scientists Leonard W. Niedrach and W. Thomas Grubb, is a vital link in the construction of these highly efficient devices for converting fuel directly to electricity.

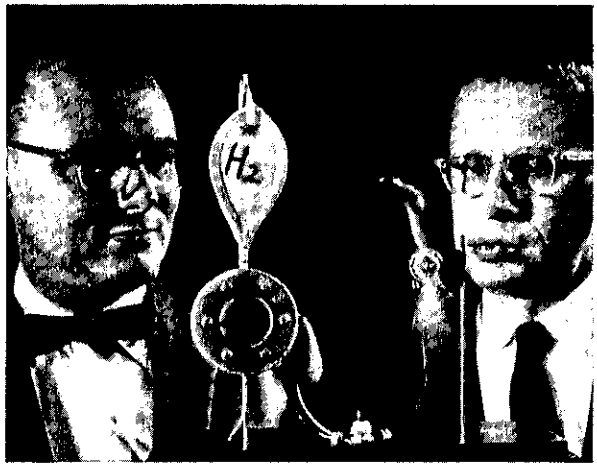
PIER A. ABETTI

Design of the first electromagnetic model of a transformer won Pier Abetti the Charles A. Coffin Award in 1953. He later pioneered a computer method for automatically translating customer specifications into power transformer design data, and when Pittsfield's EHV experimental transmission line was energized at a record-breaking 720,000 volts, Abetti was manager of the project.



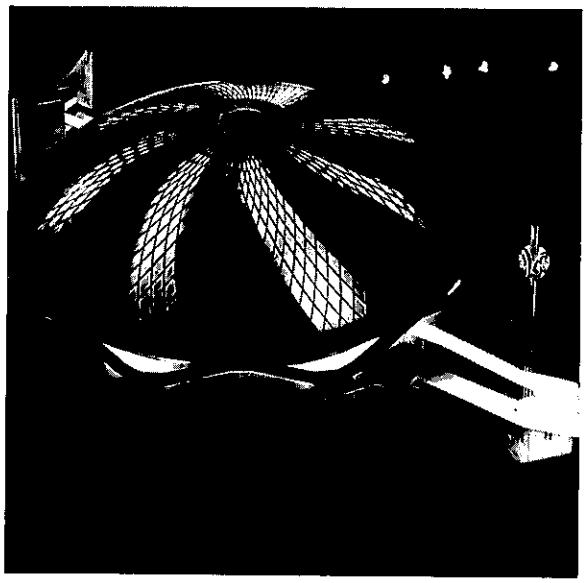
Power of 10 aircraft jet engines will drive new turbine-generator.





Leonard W. Niedrach (l.) and W. Thomas Grubb demonstrate fuel cell membrane.

1965



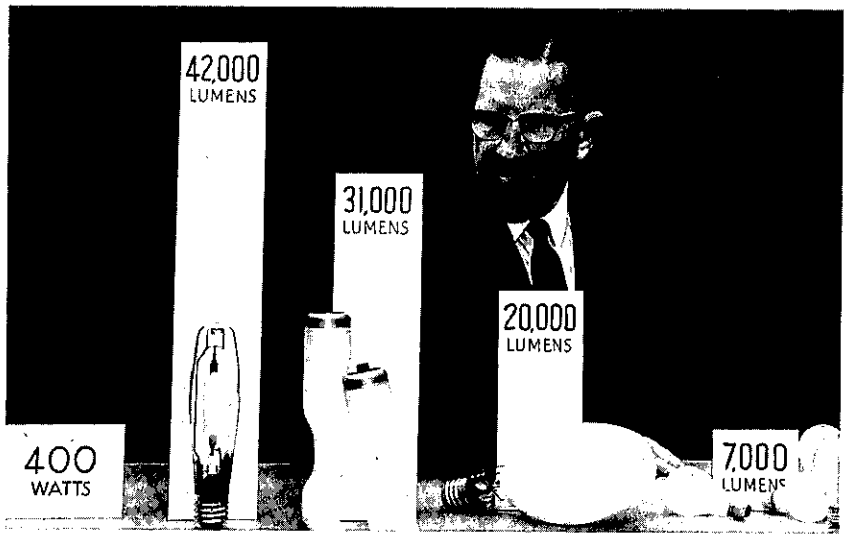
General Electric's Progressland Pavilion at the New York World's Fair.

LIGHTING

Lucalox® lamps display the highest efficiencies known for a white light source. In 1961 William Louden and Kurt Schmidt developed this high-pressure sodium vapor discharge lamp which operated at pressures and temperatures never before possible in an electric lamp. The development was made possible by the invention of Lucalox polycrystalline alumina arc tubes in 1962 by Robert C. Coble and Joseph Burke of the Research Laboratory.

Multi-Vapor® lamps are introduced at the New York World's Fair. This new discharge light source, based on Gilbert Reiling's addition of other metallic vapors to a mercury discharge, improves color and efficiencies for lamps in commercial and industrial use. Process and equipment for continuous drawing of improved Type 214 fused quartz tubing used in the construction of these lamps was developed by M.C. Riggert and others at the Lamp Glass Products Department.

The first enclosed, high-intensity arc projection lamp, the MARC 300, is developed for use with sound projectors to produce greater screen brightness at long projection distances. A 300-w MARC lamp is up to four times as effective as a 1000-w incandescent lamp for screen illumination.



Efficiency of the new Lucalox® lamp is dramatized by Thomas M. Wallace, general manager of the Large Lamp Department. The relative light output (lumens) is shown for four types of light sources using 400w of electrical power: (l. to r.) a single Lucalox® lamp, two 96-inch-long Power Groove fluorescent lamps, a mercury discharge lamp, and four standard 100-w household lamps.

MARVIN C. RIGGERT

Marv Riggert's design of the All Weather headlamp in 1954 was the most important in automotive headlighting since the introduction of the Sealed Beam Lamp which he had helped create ten years earlier. It is credited with saving thousands of lives. His work on the development of lower cost clear fused quartz tubing was key to its widespread use in the chemical and lamp glass industries.

1966-1967

POWER GENERATION AND TRANSMISSION

The ALTERREX® excitation system for large steam turbine-generators is introduced to the electric utilities. By replacing dc exciters and amplidynes with an ac alternator and diode rectifiers, this system greatly increases the reliability of operation of steam turbine-generators and becomes a standard for other excitation systems.

The Power Transformer Department supplies transformers and power bushings for the Pacific HVDC Intertie Project, bringing power from the Pacific Northwest to Southern California in the first large scale demonstration in the U.S. of high voltage, direct current power transmission.

Transformers and power bushings for the Pacific HVDC Project on the Columbia River in Oregon.

DONALD E. GRAVES

His breakthrough designs in x-ray generators and controls dramatically improved the ability of physician-radiologists to obtain precise diagnostic information with minimum patient radiation exposure.

MEDICAL EQUIPMENT

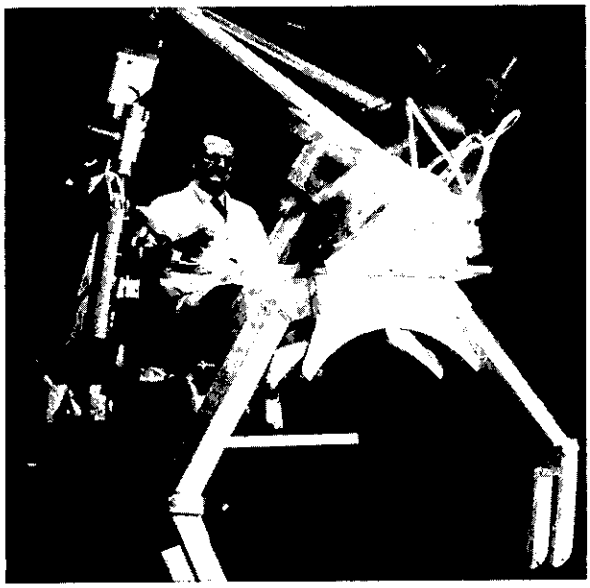
Donald Graves of the Medical Systems Department designs the first 500-cycle, battery-powered mobile x-ray generator which makes possible fast response, high quality examinations at bedside in cases where it is inconvenient to move the patient. Improved x-ray tube loading, higher energy, faster exposures and significantly reduced radiation per exposure result from his development of the world's first solid state, three-phase x-ray generator.

INDUSTRIAL EQUIPMENT

The Large Motor and Generator Department develops zero leakage, "canned" (sealed) pump motors for use in the U.S. Navy's nuclear propulsion program.

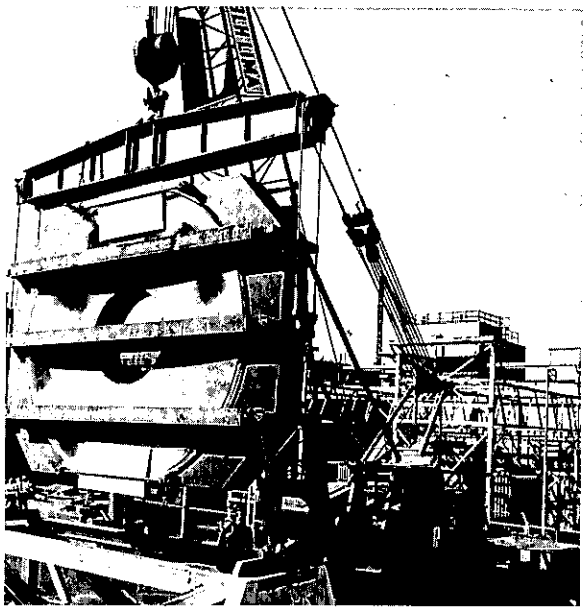
Hyper-Servo® motors developed for computer uses are 50 times faster in response than standard dc industrial motors.

Japan Steel Company purchases "Man-Mate" to handle hot billets and improve mill efficiency. This new type of materials-handling machine simulates human motions while magnifying strength and reach capabilities.



Man-Mate materials handling machine using new feedback and control technology.

1966-1967



Quartz blank for the 158-inch Kitt Peak Observatory mirror.

MATERIALS

The largest fused quartz mirror blank ever produced is supplied for the 158-inch Kitt Peak Observatory telescope.

ELECTRONICS AND COMMUNICATIONS

The first airborne laser ranging system is delivered to the Air Force. Experimental flight control equipment also used by the Air Force makes use of the first metal oxide semiconductor (MOS) circuits.

General Electric Cablevision Corporation, a wholly owned GE subsidiary, starts operations with four cablevision systems. Cable TV is expected to usher in a new era of home entertainment and communications.

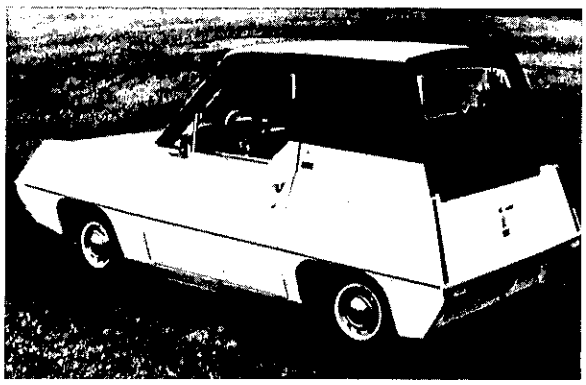
SPACE EXPLORATION

The Biosatellite II primate-carrying space vehicle completes a successful two-day test in orbit, further demonstrating the possibilities for manned space flight.

Vice President Hubert Humphrey (r.) discusses model of primate-carrying Biosatellite with (l. to r.) Mark Morton—General Manager, Re-entry Systems Department; V. DeLiberato, RSD; and Hilliard V. Paige—Vice President and General Manager, Missile and Space Division.

APPLIANCES

Donald S. Cushing and Thomas E. Jenkins of Appliance Park design a dishwasher motor and water circulating pump combination whose improved efficiency reduces energy and operating costs to the consumer.



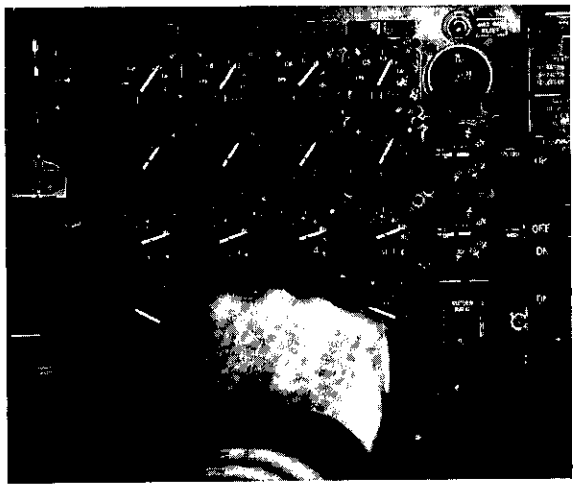
Research and Development Center experimental electric car.

TRANSPORTATION

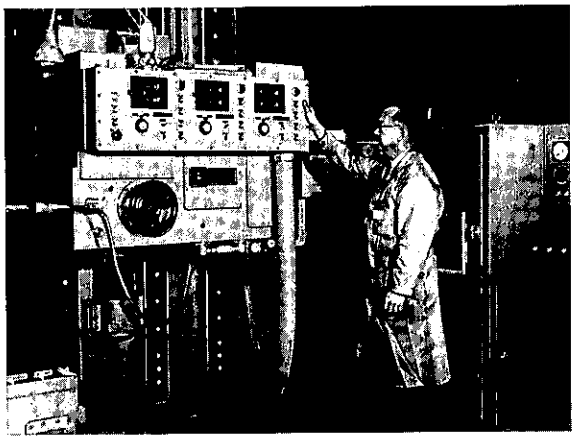
Research and Development Center engineers demonstrate the possibilities of personal transportation in an "electric car." Project results indicate the need for major improvements in batteries, motors and controls before a vehicle with general usefulness can be produced.

1968

Light valve television projector.



Integrated Engine Instrumentation System for aircraft use.



Numerical control machining center.

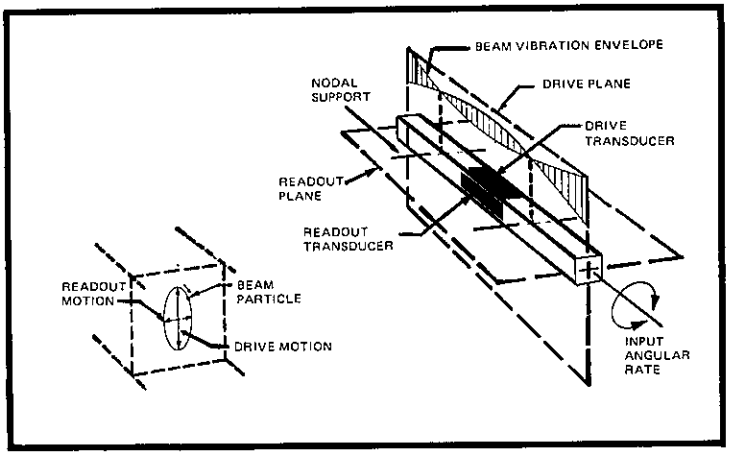
ELECTRONICS AND COMMUNICATIONS

The first commercial light valve television projector is announced. Capable of displaying color TV pictures up to 20 feet wide, the projectors are expected to find worldwide applications for military, commercial and educational uses.

An early spinoff of space technology, the integrated Engine Instrumentation System, is introduced by the Aircraft Equipment Division and accepted as standard equipment on wide-body transport programs, including the 747 and the DC-10.

Integrated circuitry, employed for the first time in the Mark Century series numerical control, makes possible machining centers, controlling both point-to-point positioning and continuous path contouring.

The Aerospace Control Systems Department develops VYRO, an angular rate sensor for flight control systems. With no moving parts to wear out or require lubrication, the result is essentially unlimited life and the high reliability required for aircraft use.



VYRO angular rate sensor for flight control.

WILLIAM J. KUEHL

Bill Kuehl led the Aerospace Control Systems Dept. as it became a key developer of airborne, missile and space communications and navigation products.

(Electronics and Communications continued)

A Specialty Control Department team established by Lewis T. Rader produces the first of a series of high speed teleprinters using state-of-the-art electronics to operate at 30 characters per second. Dow Jones Company installs the machines in several thousand brokerage offices to take advantage of their rapid response. A similar product, the TermiNet 300®, is made available to the electronic data processing industry to complement the growing number of "time share" computers.

Mark II® Service is announced, with businesses in 42 cities in more than 20 metropolitan areas able to access GE 600 series computers via a local telephone call. Around the world, in 17 countries, over 100,000 customers can make use of the service.

GE mobile telephones are supplied for the high-speed Metroliner trains by the Communications Systems Division.

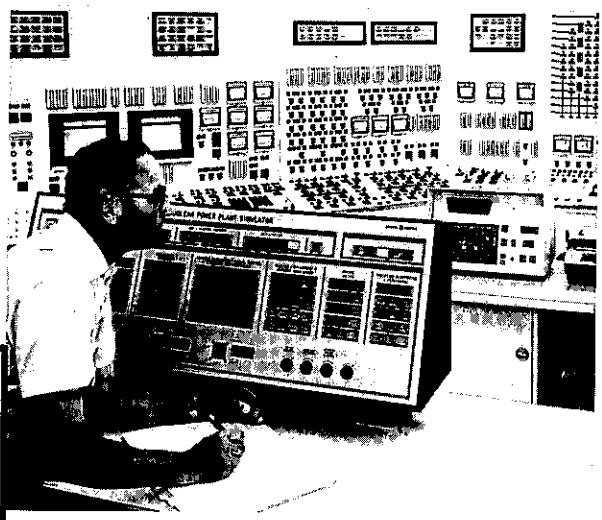
J. Kirk Snell, at the TermiNet 300 teleprinter, received the Steinmetz Award in 1978 for his contributions to the development of products which became the basis for the Data Communications Products Business Dept.

POWER GENERATION

The first GE combined steam and gas cycle Power Plant (STAG®) is shipped to the Wolverine Electric Cooperative. Overall thermal efficiency is the highest of any obtained with a fossil-fueled power plant.

The SPEEDTRONIC® governor for heavy-duty industrial gas turbines replaces mechanical governors with an all-electronic system that provides improved levels of speed, temperature and load control.

The first light water reactor simulator, a computerized hands-on Boiling Water Reactor (BWR) control room, is built as part of GE's BWR Training Center located at Morris, Illinois. It is used for training nuclear plant operators and qualifying them for Nuclear Regulatory Commission (NRC) operator licenses.



First light water nuclear reactor simulator.

Combined steam and gas cycle Power Plant (STAG) increases fossil-fuel power plant efficiency.

1968

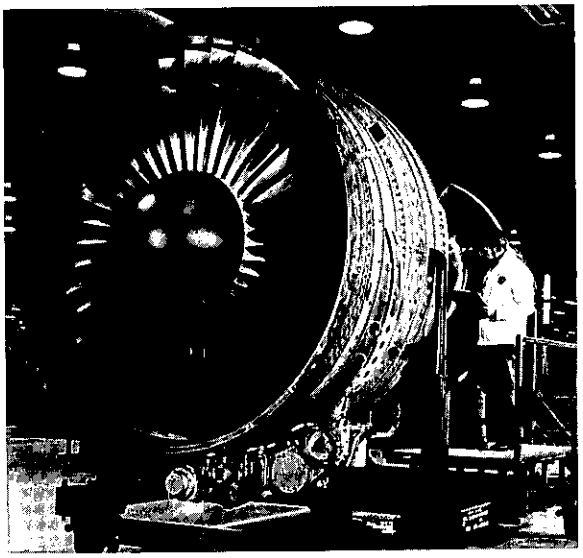
MATERIALS

Jacob G. Rabatin develops a high efficiency x-ray phosphor permitting major reductions in patient exposure to medical x-rays.

Extruded Lexan sheet is developed for applications in glazing and sign materials. Improvement in its properties expands its use to include bullet resistant enclosures and virtually unbreakable windows for transportation and institutional use.

JACOB C. RABATIN

His innovations at the Quartz and Chemical Products Department span a wide range of phosphor technologies which have improved the quality and efficiency of fluorescent lamps, TV picture tubes and x-ray screens. Rabatin's development of the Lanthanum oxybromide family of phosphors made possible x-ray screens that are capable of reducing patient exposure to one-quarter of previous levels.

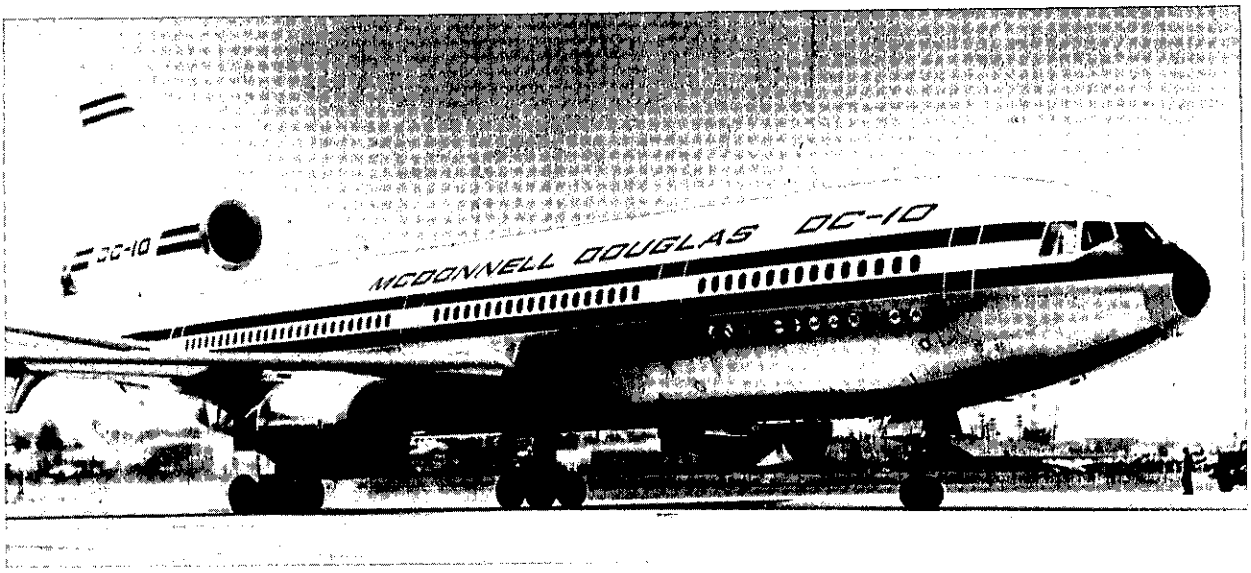


CF6 jet engines for new wide-body airliners.

TRANSPORTATION

The first solid state electronic train-running controls see use in the Metroliner service between New York and Washington, D.C. Propulsion systems are capable of 160-mph performance on adequate track.

GE CF6 engines with 40,000-pound thrust are chosen to power the McDonnell Douglas DC-10 trijet wide-bodied airliner. Increased thrust versions of the CF6 will be designed for the European-built A300 Airbus, the DC-10 series 30 and a number of Boeing 747 aircraft.



FRED J. BORCH

Chosen Businessman of the Year for 1970 by the *Saturday Review* (January 23, 1971), Fred Borch received twice as many votes as any other candidate for that honor in American business, finance, or government. He had been elected Chairman of the Board at General Electric only two years earlier.

Borch was born on April 28, 1910, in Brooklyn, New York, where his father was an electrical engineer with the Brooklyn Edison Company, now a part of Consolidated Edison Company of New York.

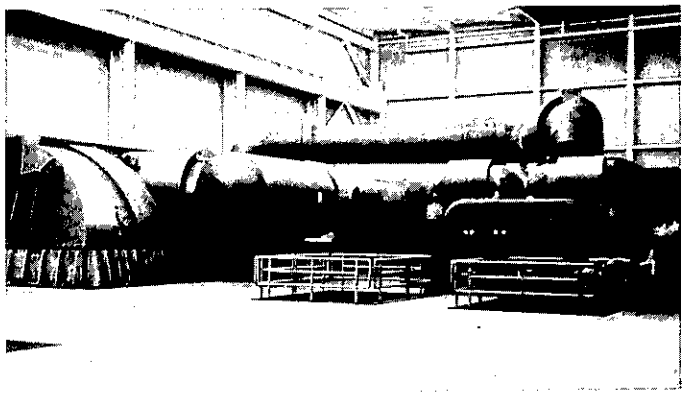
Most of Borch's schooling took place in Ohio, mainly in the Cleveland area. Schoolboy jobs included two summers as an office boy with *The Cleveland News*. Later, while a student at Case Western Reserve University, which he entered in 1927, he held a summer job as a timekeeper on a construction project for an electric power transmission line. In 1931, he received his B.A. in economics and went to work as an auditor with General Electric in the Lamp Division at Nela Park.

By 1940, Borch had become Manager of the Lamp Division's customer service organization and, in 1947, he was named manager of the Sales Operation Department. In 1952, he joined the administrative department of the Lamp Division, and later the same year undertook a special assignment with the Company's Management Consultation Services in New York.

In 1953, he was entrusted with the task of restructuring the Lamp Division into six operating departments as part of the Company-wide decentralization program. The following year he was named Vice President for Marketing Services, and from there on worked closely with Ralph J. Cordiner, the man he succeeded as Chief Executive of General Electric.

In September, 1959, he was appointed Vice President and Group Executive for the Company's Consumer Products Group, the post he held until his election as Executive Vice President in July, 1962. In this position he was elected to the Board of Directors and given responsibility for the operating components of the Company on a worldwide basis, jobs he continued to handle after he was elected President and Chief Executive Officer in December, 1963, and Chairman on December 20, 1968. During his tenure Borch essentially added another General Electric to the one whose direction he assumed. Sales and earnings of the Company almost doubled between 1963 and 1972, the year that he retired. That phenomenal growth was, at least in part, due to Borch's keen judgement and motivation of people — his well recognized ability to choose "the right man for the job, for sizing up people and then getting the best out of them." (*World-Telegram and Sun*, December 22, 1964). The management team that Borch left in place at the time of his retirement was ample testimonial to this talent.

1969



TVA turbine-generator, rated at 1,104,000 kw.

POWER GENERATION AND TRANSMISSION

The largest GE turbine for a plant using fossil fuel is built for the Paradise Unit No. 3 of the Tennessee Valley Authority. Rated at 1,104,000 kw, it has a 3600-rpm shaft driving one generator and an 1800-rpm shaft driving another generator.

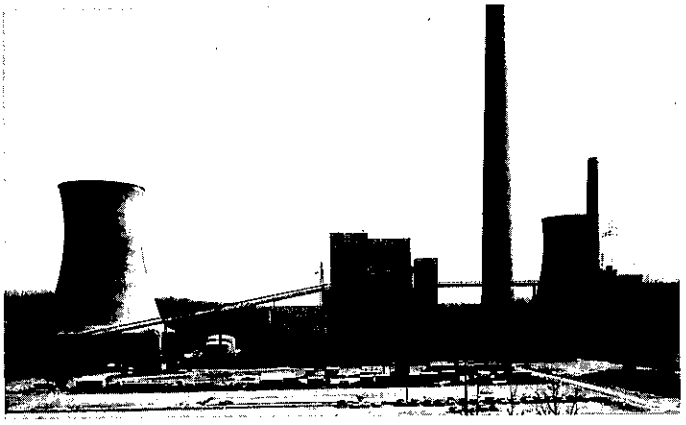
The Big Sandy Unit No. 2 of the Kentucky Power Company, rated at 737,000 kw, is the Steam Turbine Division's largest double reheat turbine.

The first large scale production of nuclear fuel bundles and other components for boiling water reactors takes place at a newly opened manufacturing facility in Wilmington, North Carolina. Previously, such components were fabricated in laboratories and other prototype operations.

Nuclear fuel bundle production at Wilmington, North Carolina.

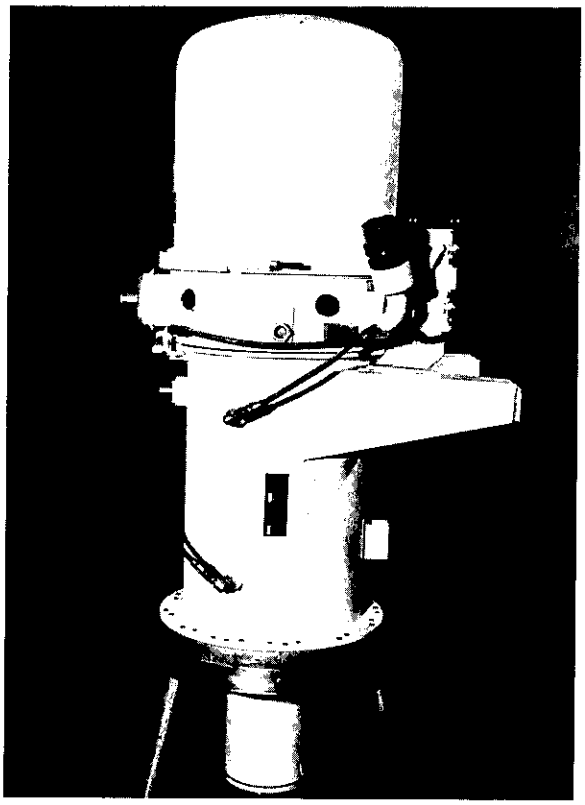
STUART G. MILLER

As Manager of the Wilmington Manufacturing Department of the Nuclear Energy Products Division from 1972 until 1977, Miller developed and implemented unique computer applications for manufacturing, process control, and quality testing of nuclear fuel systems.



Big Sandy Station No. 2 of Kentucky Power Company, housing a 737,000-kw double reheat turbine.

1969



Klystron tube for Airborne Warning and Control System (AWACS).

NATIONAL DEFENSE

A klystron tube, with very wide microwave frequency range and without mechanical tuning, is developed for the Airborne Warning and Control System (AWACS) by the Microwave Tube Operation in Schenectady.

MATERIALS

Neil Armstrong takes the first step on the moon with boots made from GE silicone rubber. Astronauts' helmets use visors fabricated from Lexan® polycarbonate.

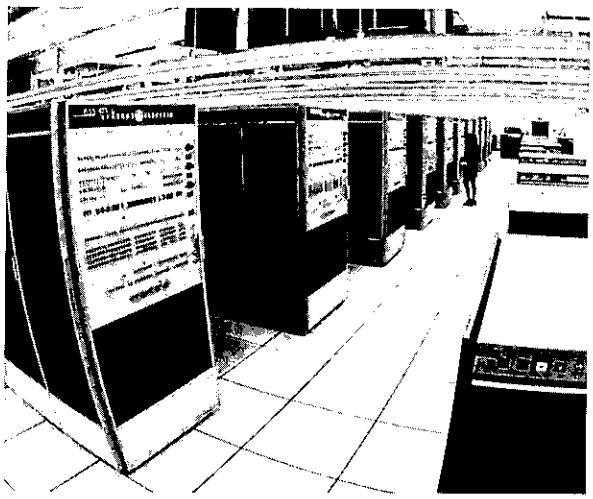
The Specialty Materials Department announces the industrial availability of Borazon® CBN crystals, produced at its new plant in Worthington, Ohio (see 1957). Man-Made® diamonds are also manufactured at this location, now providing the two hardest materials known to man and made by man.

INFORMATION PROCESSING

Regional computing centers are consolidated into GE's first Information Services "supercenter" near Cleveland, Ohio, providing computer power and remote batch and time-sharing services coast-to-coast.

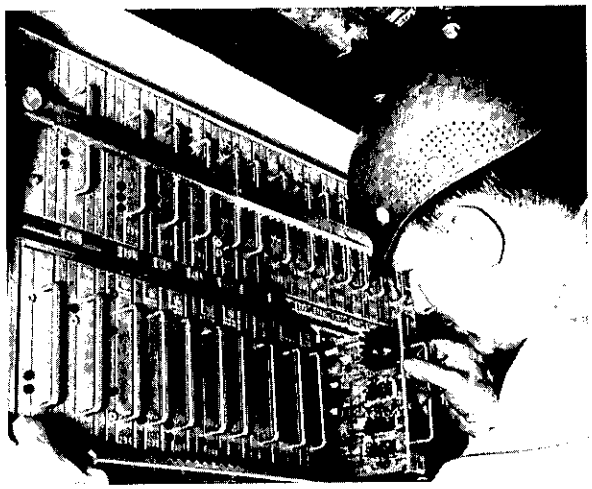
SPACE EXPLORATION

The Space Division builds the first earth resources satellite system, the LANDSAT. This forerunner of a fully operational global system is being used by over 100 nations for earth resources inventory and management.



Information Services "supercenter" for time-sharing information processing.

1969



TRANSPORTATION

A special gear transmission system, based on design principles developed for both aircraft and marine gearing, is provided by the Medium Steam Turbine Department to meet the confined hull requirements of hydrofoil ships.

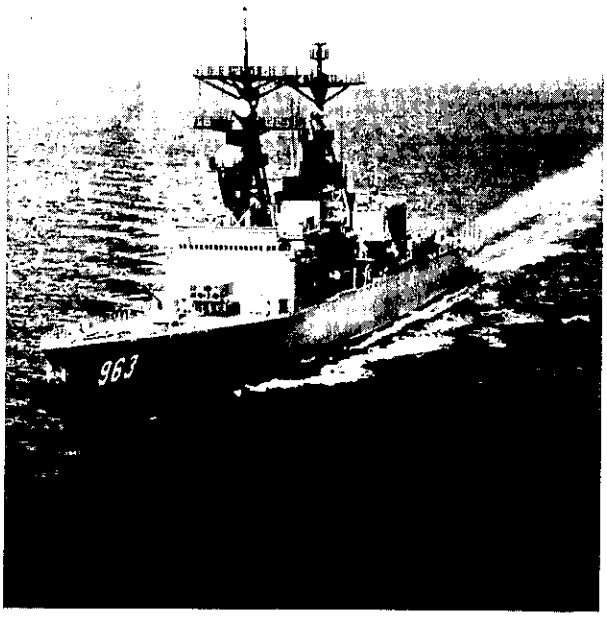
The first "Super Rapid Transit" propulsion system is introduced on the PATCO transit line from Philadelphia, Pennsylvania, to Lindenwold, New Jersey. High performance motors and controls and on-board automation equipment provide smooth acceleration, speed regulation and positioned station stops.

New "Super Rapid Transit" system with on-board automation equipment (above) sets new standards in commuter transportation.

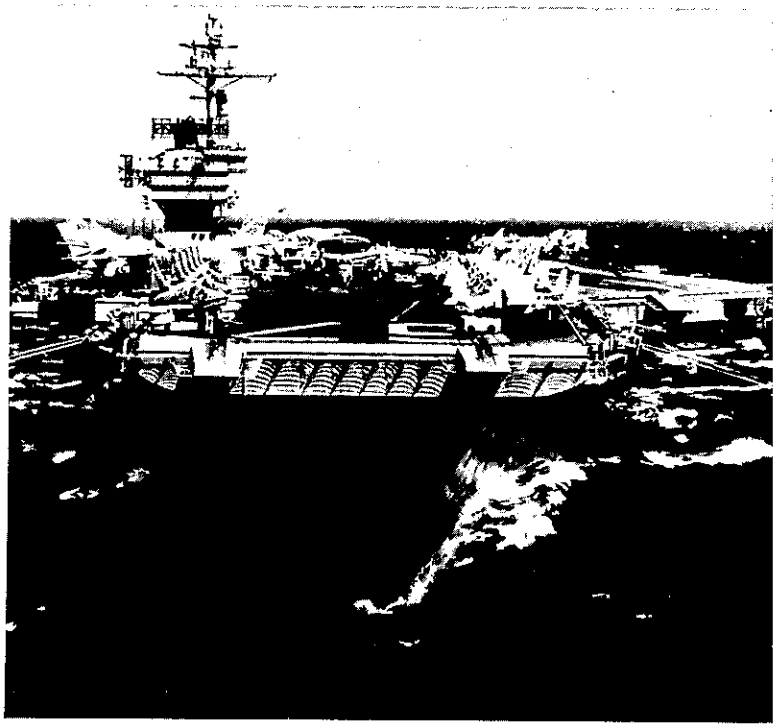
APPLIANCES

Appliance Park announces the first side-by-side refrigerator-freezer with an automatic dispenser for ice cubes and chilled water through the door.

Side-by-side refrigerator-freezer with automatic ice cube and chilled water dispenser.



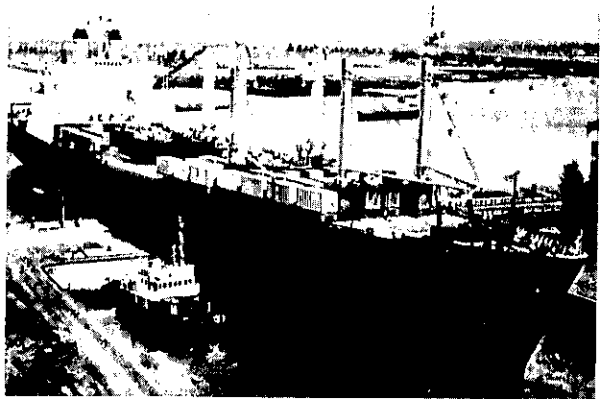
Four LM2500 turbines power Spruance-class destroyer.



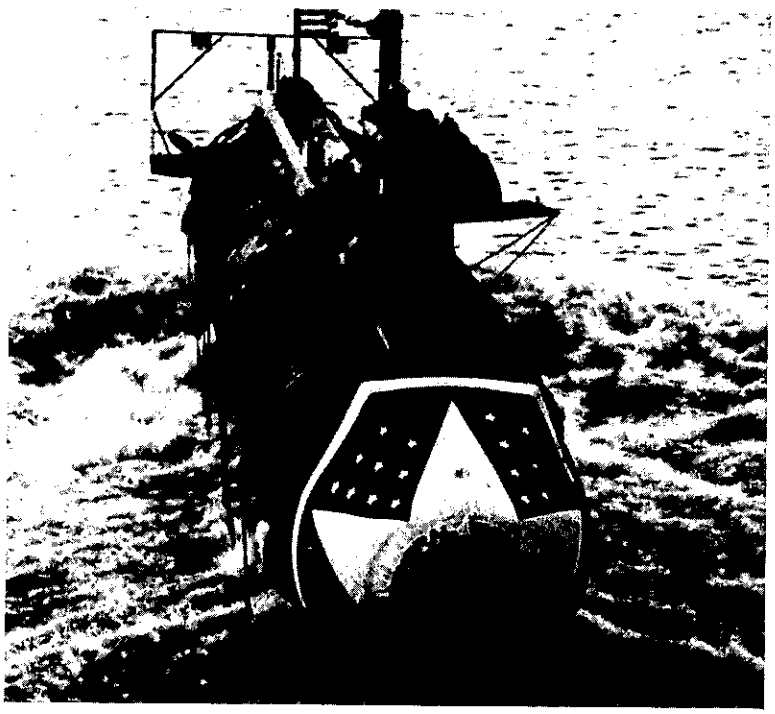
Geared marine steam turbines drive U.S. Navy aircraft carrier, USS John F. Kennedy.

SHIPS AT SEA

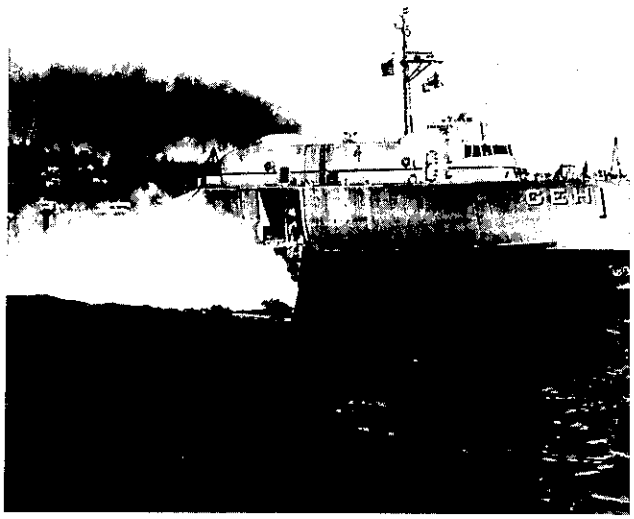
General Electric jet engine, steam turbine, nuclear, and mechanical gear technologies help power and propel sea-going vessels for national defense (above), commerce (right), oceanographic research (bottom, left) and high-speed transportation (bottom, right).



LM2500 marine turbines first applied to roll on/roll off high-speed cargo ship, GTS Admiral William M. Callaghan.

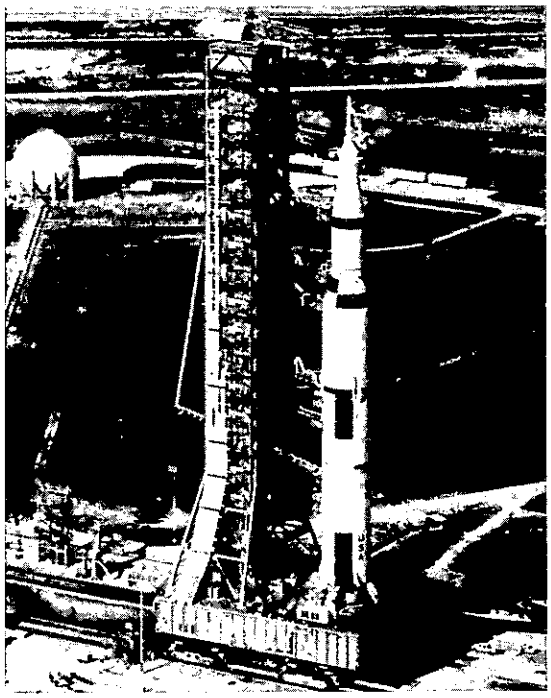


Nuclear powered NR-1 deep submergence research vessel.
(General Dynamics Photo)



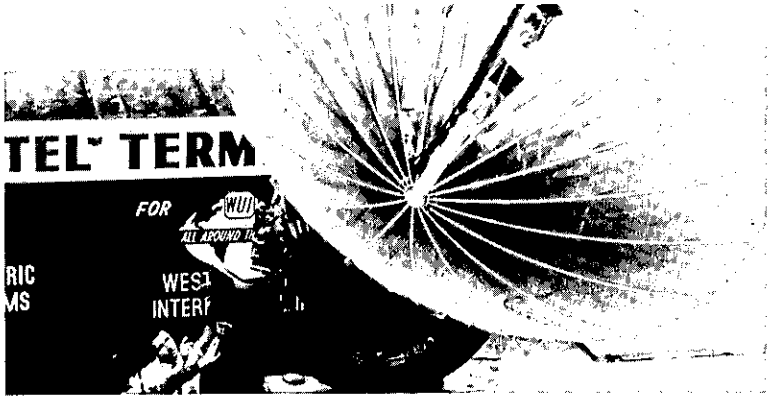
Hydrofoil ship uses special gear transmission system.

"The Eagle has landed".



Transporter with Apollo 11 atop Saturn moves to Cape Kennedy launch site.

Apollo Acceptance Checkout.



Transatel TV system brings Apollo recovery to the world-live and in color.

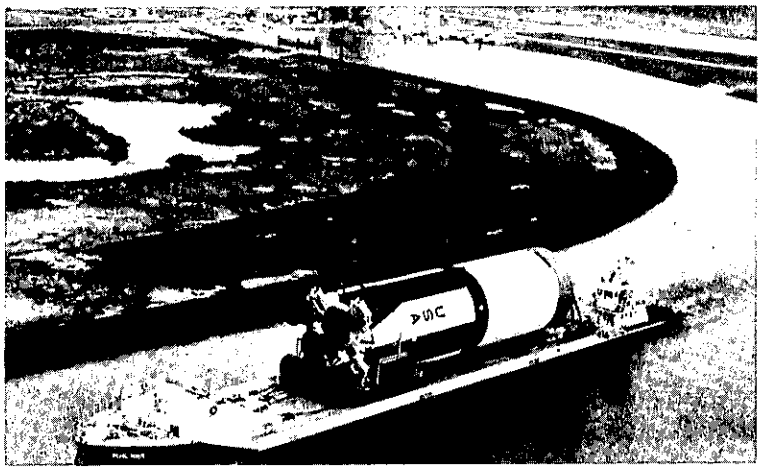
GE IN SPACE

"That's one small step for man, one giant leap for mankind." Neil Armstrong-July 20, 1969. When Apollo 11 landed astronauts Neil Armstrong and Edwin Aldrin on the moon, 37 different GE operations and 6000 employees could take credit for having helped put them there. All manned flights through Apollo relied on GE radio command guidance equipment. The Space Division supplied overall quality control, systems engineering support, check-out equipment, Saturn launch vehicle test facilities and the ship-to-satellite system that provided the first live color TV pictures of splash-down and recovery.

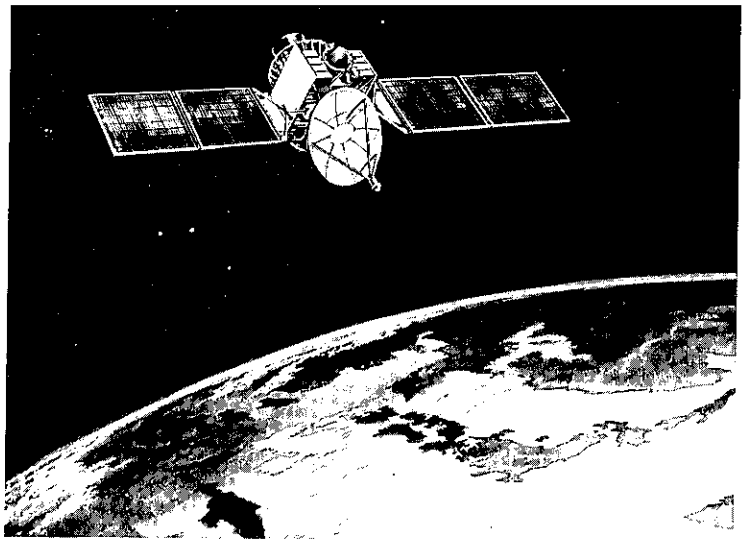
SNAP-27 radio-isotope power generators provided the energy to run lunar surface experiments for years after the last astronaut left the moon.

STORY OF A SPACE RESCUE

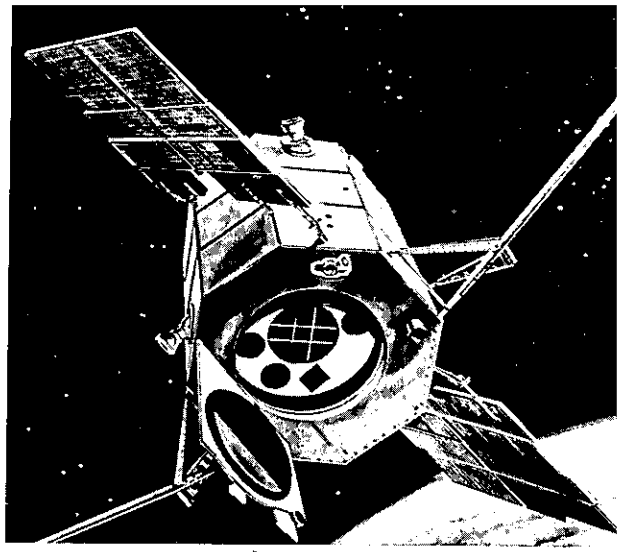
During the lunar orbit phase of the Apollo 13 mission, a malfunction occurred in the Command Module power system. Specialty Control Department engineers were rushed from Waynesboro to Grumman Aircraft, builder of the Lunar Module. They worked out a procedure to isolate the faulty power supply (built by another contractor) and connect the Lunar Module power to the Command Module. Instructions were radioed to the astronauts and the heavily overloaded Specialty Control power supply helped bring the astronauts home.



Barge Pearl River carries Saturn rocket stage at NASA's Mississippi Test Facility.



Japanese Broadcast Satellite.



Orbiting Astronomical Observatory

The nation's manned space program of the 1980's will be covered on the Space Shuttle, and the Space Division will play a key role in providing check-out and support facilities for the vehicle's factory, approach and landing test series, payload integration, and materials processing in space.

Man's ventures into space have been accompanied by unmanned satellites such as the Nimbus and Landsat series which are providing valuable information about our planet's weather and natural resources, on a daily basis. The Japanese Broadcast Satellite has advanced the state-of-the-art of television communications to remote locations.

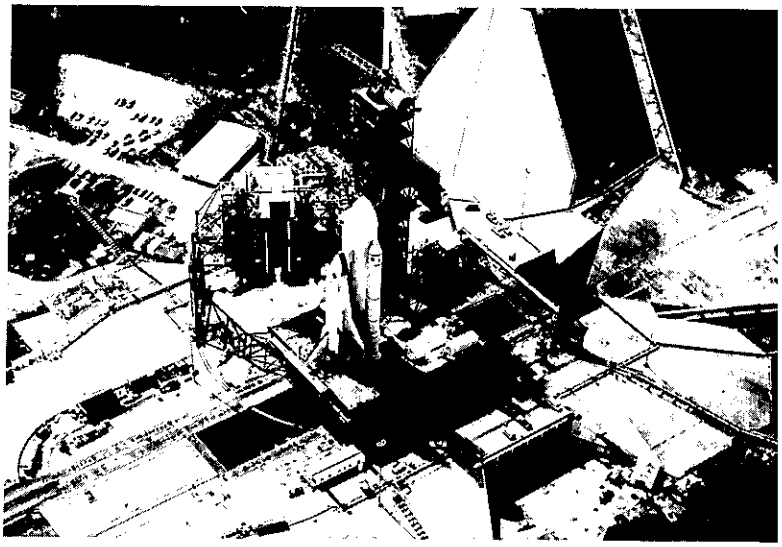
In search of an increased knowledge of our universe, two GE-equipped Viking spacecraft made the long journey to Mars. And for Voyager, the U.S. mission destined to travel the farthest through the universe, GE-built thermoelectric generators power the two Voyager crafts and their ten scientific experiments.

Perhaps as important as the airborne achievements of space technology have been its earthbound offshoots, including solar and fuel cell energy research, microelectronics, information processing and communications.

DANIEL J. FINK

Recipient of the Collier Trophy, the nation's most prestigious aerospace award, Fink made outstanding contributions to a host of Space Division programs, including LANDSAT — the first earth resources satellite system, computer generated image technology, communications systems development, and laser technology.

Landsat.



Space Shuttle on test pad.

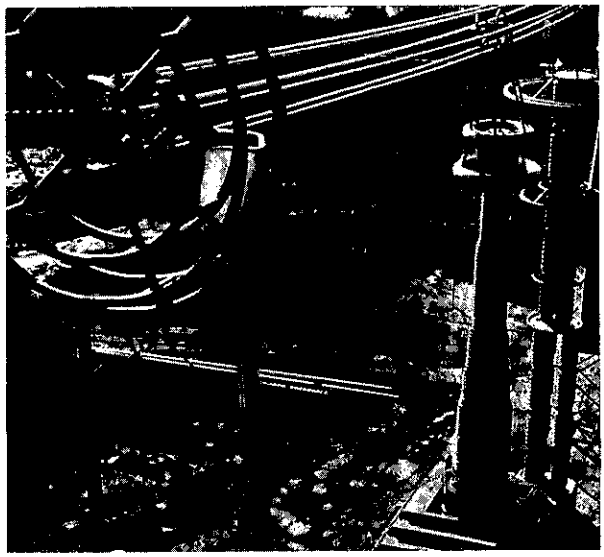
1970

POWER GENERATION AND TRANSMISSION

Pittsfield's ultra-high-voltage program tests the world's highest voltage transformer, at 1,500,000 v.

Europe's largest hydroelectric plant is built at Alcantara, Spain, and supplies water pressure to turn hydro-generators built by the GE Spanish affiliate, GE Espanola.

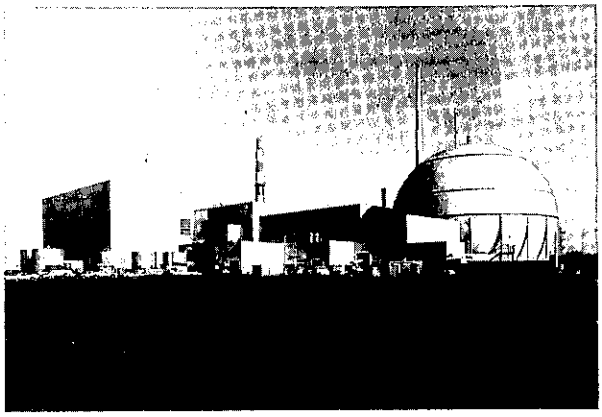
Ten years after the installation of the 210-mw Dresden boiling water reactor and steam turbine-generator, Dresden 2 and 3 are supplied to the Commonwealth Edison Company. Each unit is rated at 809 mw.



The 1500-kv transformer for ultra-high-voltage research program at Pittsfield.

CHARLES W. ELSTON

In 1974, the American Society of Mechanical Enginners cited Charles Elston "for his outstanding technical contribution and leadership in developing power generation in the building of gas and steam turbines and electric generators." A brilliant career of more than 43 years with GE includes positions as general manager of the Gas Turbine and Large Steam Turbine-Generator Departments and Manager-Operational Planning of the Steam Turbine-Generator Products Division.



Dresden 2 nuclear power station, supplying 809 mw of electricity.

Fred Holub (l.) of the Research and Development Center and Elwood Betts of the Wire and Cable Department lead development of Flamenol XL and other flame resistant insulations.

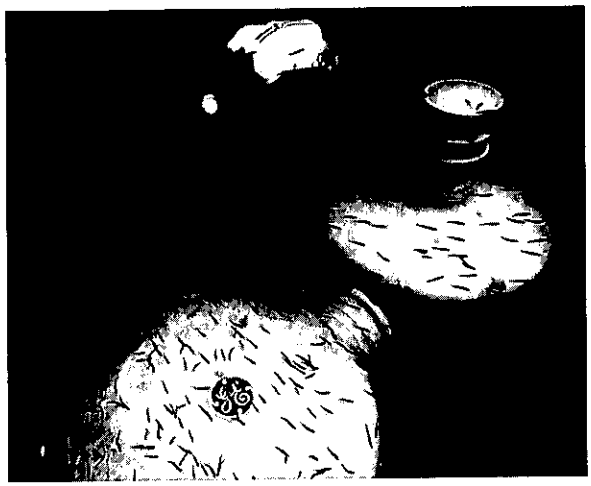
MATERIALS

Synthesis of gem-quality diamonds is achieved by Herbert M. Strong and Robert H. Wentorf of the Research and Development Center.

Carboloy introduces "500" Series titanium carbide-coated, cemented carbide cutting inserts to the metalworking industry. They increase productivity by allowing cutting speeds to be increased up to 50 percent without loss of tool life.

The Wire and Cable Department supplies the first crosslinked vinyl insulation, FLAMENOL XL. This new insulation provides superior flame and heat resistant properties and outstanding mechanical toughness.

1970



Tektite II undersea habitat for long-term oceanographic research.

UNDERSEA EXPLORATION

The Tektite II Program, an undersea habitat for prolonged underwater investigations, is the most ambitious of its kind ever attempted. Under the leadership of the Department of the Interior, GE makes contributions which include design, installation and maintenance of this habitat where over 50 scientists and engineer-aquanauts engage in scientific studies.

INDUSTRIAL EQUIPMENT

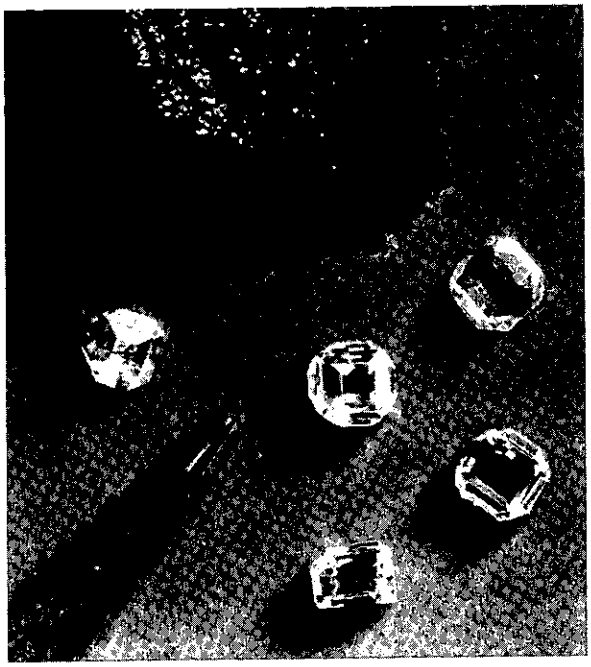
The first adjustable-speed ac drive is introduced, using solid state inverter technology.

GERHARD NEUMANN

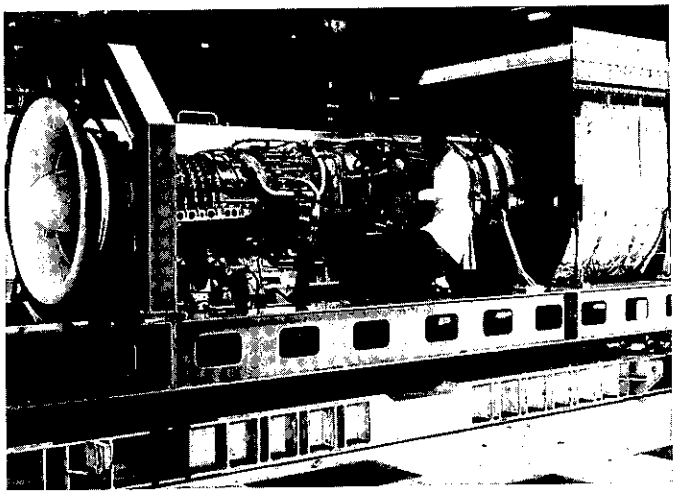
Neumann's innovative work in lightweight and high performance engine designs led to the record-breaking J79 engine and its successors. As Vice President and Group Executive, he established the jet engine in new areas of military, marine, commercial and industrial applications.

NATIONAL DEFENSE

For the Air Force Minuteman ICBM program, the Re-entry Systems Department develops and produces the Mark 12 re-entry system. Modified versions of the Mark 12 will be used on the U.S. Navy's Trident ballistic missiles. In 1963, the Mark 6 vehicle became operational as part of the Air Force's Titan II deterrent missile system.



Synthesized gem diamonds created in the laboratory by subjecting graphite (dark powder) to extreme pressures and temperatures.



LM2500 gas turbine for ship propulsion.

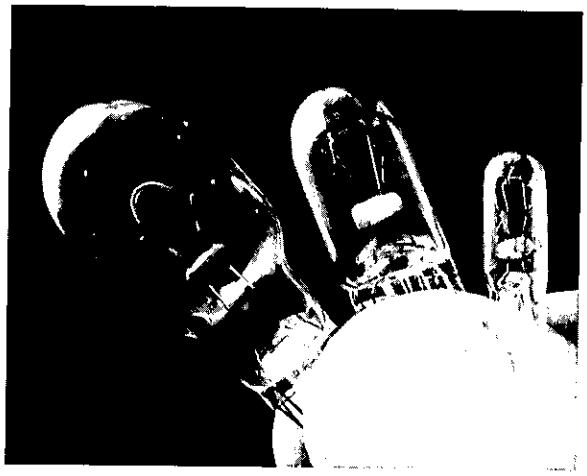
TRANSPORTATION

Gas turbines based on the CF6 jet engine technology are chosen to power the newest Spruance-class Navy destroyers. A year earlier the LM 2500 heavy duty gas turbine demonstrated its capabilities on a merchant vessel. Other versions of the power plant are used for 25,000-hp drives for gas pipeline pumping.

1971-1972

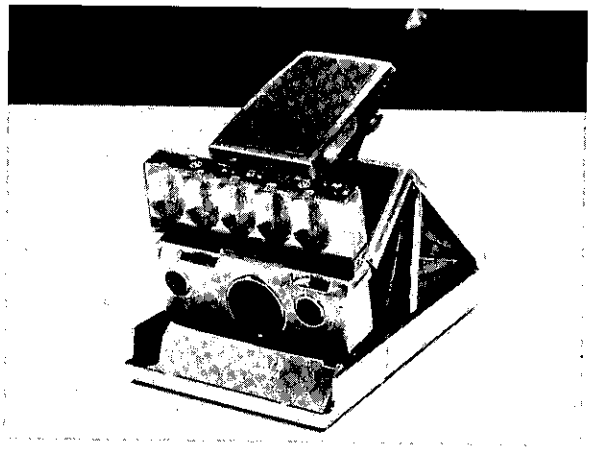
LIGHTING

The first all-glass, baseless subminiature lamp is developed for automotive use. The lamp contributes to even smaller, lighter-weight and less costly instrument panel assemblies.



Subminiature baseless all-glass lamps.

The Flashbar 10® multiple flash unit is developed and is initially used in Polaroid's new automatic SX-70 camera. The Flashbar combines electronics and lamp technology in the first of a new generation of compact, high performance photoflash lamps.



Flashbar 10 on Polaroid's new SX-70 camera.

MATERIALS

Valox® thermoplastic polyesters are introduced, offering special resistance to solvents, oil and gasoline, along with high strength and heat resistance.

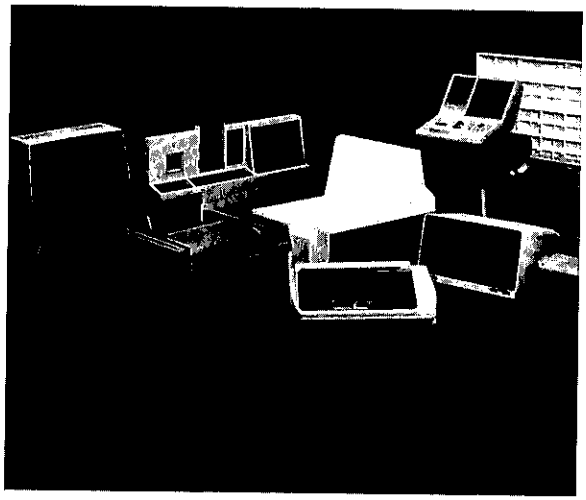
Lexan® , Noryl® and Valox are all specially designed as structural foam resins for applications requiring extremely high strength in lightweight assemblies.

INFORMATION PROCESSING

A satellite link to London, extending to cities in western Europe, makes General Electric Information Services Mark II Service the only international computer time-sharing service. Growth of the network to Japan and Australia is planned for 1973.

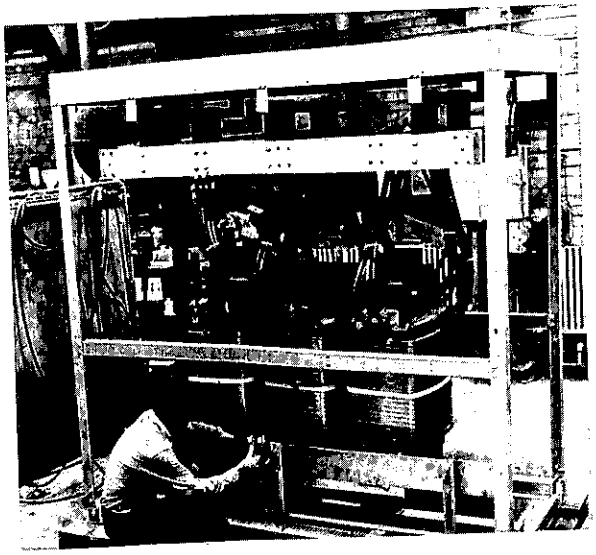
CHRISTOPHER T. BROOK

His design of the world's first and still largest teleprocessing computer network enabled the GE Information Services Co. to provide users around the world with the ability to get timely business data rapidly via computer terminals and business telephones.



Housings for computer readout terminal copiers and printers made of Lexan structural foam.

1971-1972



Power transformer being prepared for shipment to offshore oil well drilling rig.

INDUSTRIAL EQUIPMENT

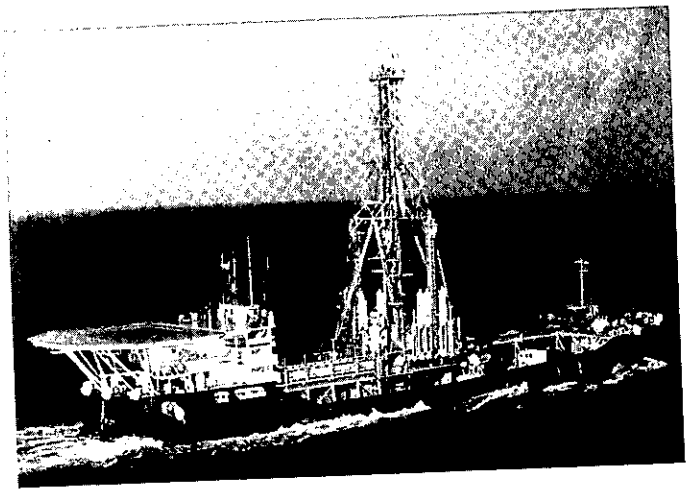
The new AMRAC, computer-operated, two-way power-line communication system is introduced to the electric utility industry. The system provides communication for three options: load control, time-of-day metering and distribution automation. Its dial position meter encoder supplies billing information more reliably and accurately than can be obtained with manual meter reading.

The Large Motor and Generator Department participates in the modernization of U.S. steel manufacturing facilities with the construction of a 10,000-hp, 40-rpm dc mill motor, the largest ever built.

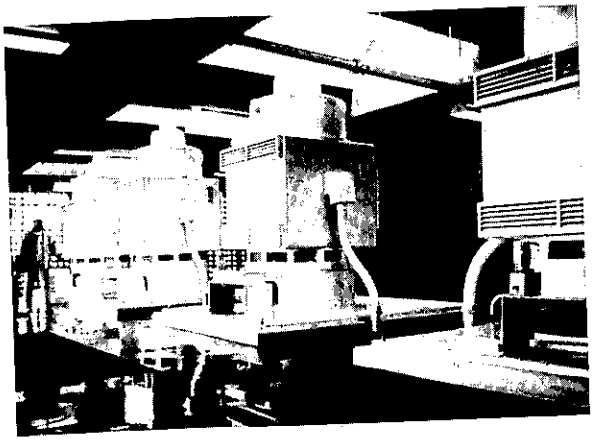
The Drive Systems Department supplies its first drive system control to the oil well drilling industry for an oil well drilling ship. The Specialty Transformer Department supplies transformers to power the drilling rig.

CARL H. RINNE

During almost two decades as General Manager of the Specialty Transformer Dept., Carl Rinne led its growth into a host of new product areas, keeping abreast of the needs of new industries and technologies.



The Glomar Coral Sea oil well drilling ship with drive systems controls, power transformers and other components supplied by GE.



Nine-foot-high vertical motors drive massive pumps at San Jose-Santa Clara water pollution control plant.

HOWARD D. SNIVELY

Major factors in the success of GE's large motors and generators were Howard Snively's designs of the machines and his analyses of their use in steel mills, marine propulsion drives and other demanding applications.

1971-1972

POWER GENERATION AND TRANSMISSION

The new GECO method for the production of nuclear reactor fuel is placed in operation at Wilmington, North Carolina. Conversion of uranium hexafluoride to high quality uranium dioxide is accomplished pyrolytically without the complex wet chemical process required earlier.

The first prototype of a zinc-oxide arrester is installed as part of the development of systems for the improved protection of transmission lines and equipment.

Canadian GE and turbines help make Labrador's Churchill Falls hydroelectric generating station one of the largest single-site producers of electricity in the world. The station feeds ac power to the Eel River, New Brunswick, station, which converts it to dc and reconverts it to ac for transmission to eastern Canada's population centers. The conversion system, built in cooperation with Philadelphia's Power Delivery Group, overcomes synchronization problems between the adjacent ac transmission systems.

Canadian GE generator being installed at Labrador's Churchill Falls.

The Carry-Cool portable room air conditioner, low in weight and in cost.

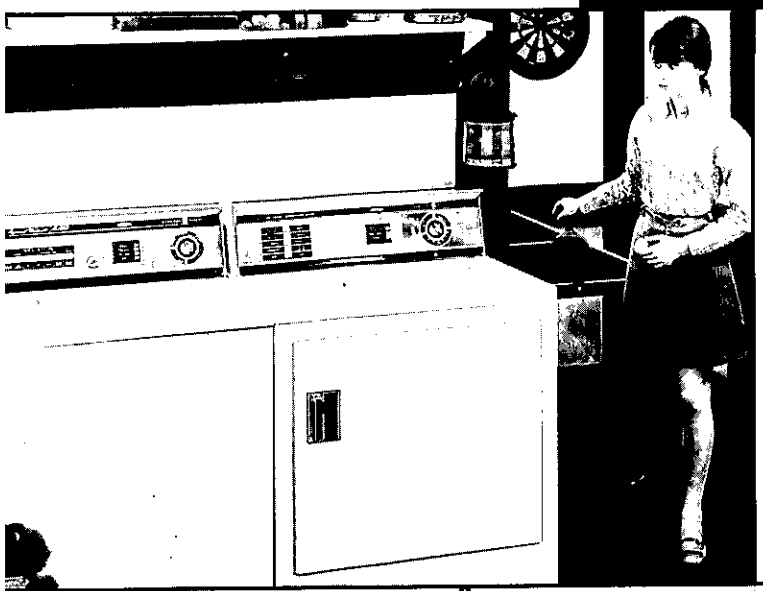
APPLIANCES

The Carry-Cool® portable room air conditioner is introduced. Its light weight and rugged construction bring cool air in a package with convenience and cost previously unattainable. The extensive use of reinforced plastic produces, in one piece, an internal structure which would have required 27 formed and painted sheet metal parts.

NATIONAL DEFENSE

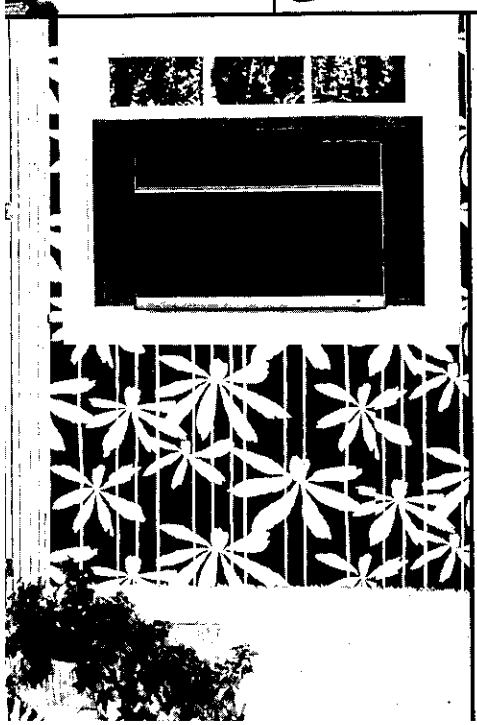
A new 1500-hp helicopter engine, the T700, developed for the U.S. Army, establishes a model for aircraft maintenance. It can be disassembled and maintained using only the ten standard tools included in the G.I. tool kit.

Ordnance Systems develops hydro-mechanical power trains which provide for rapid maneuvering and simplified operation at the high speeds required of the Army's infantry fighting vehicle. An electric stabilization system is also designed for the new combat vehicle.



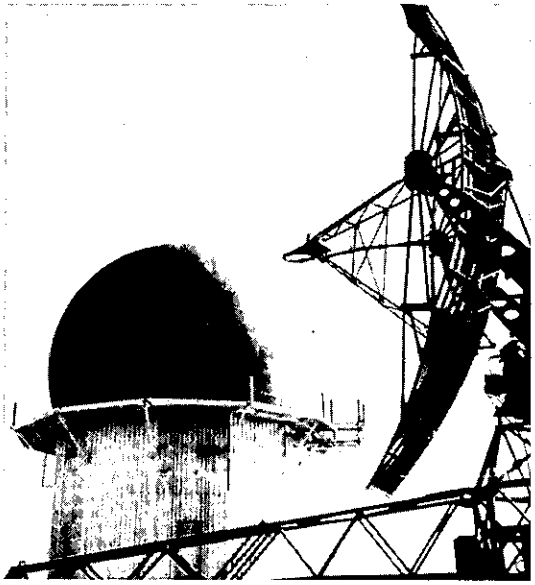
New Major Appliances for Home Comfort and Convenience in the 1970's.

Backed by Customer Service ..... Everywhere.

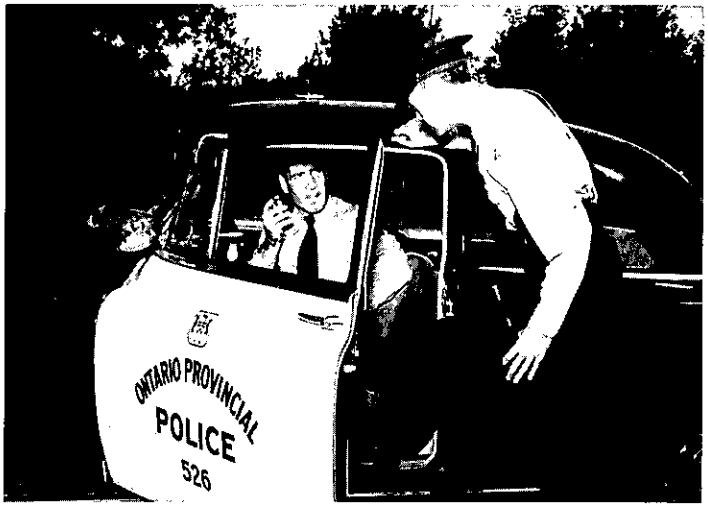


CANADIAN GENERAL ELECTRIC COMPANY LIMITED

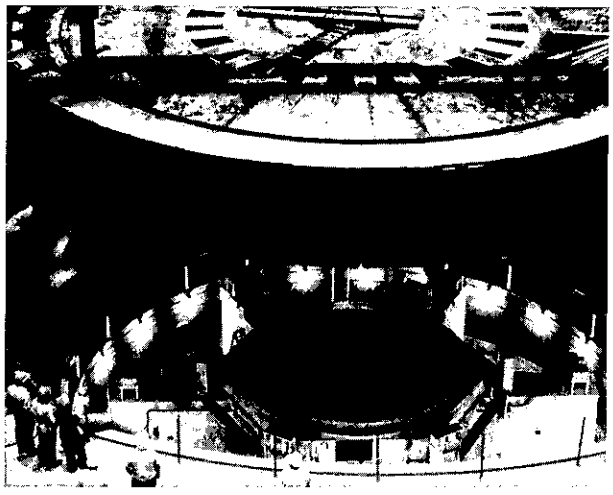
Largest and most diversified of General Electric's multi-industry affiliates is the Canadian General Electric Company, Ltd. With a history of manufacturing experience that traces back more than a century, CGE has consistently been in the forefront of new engineering technology. It is one of the world's leaders in the development of nuclear and hydroelectric power generation and high-voltage transmission equipment. These and the manufacture of a broad spectrum of products, such as major appliances, housewares, defense radars, plastics, motors, marine propulsion equipment, transformers, communications gear, and heavy industrial equipment, have contributed to a record of growth which, in 1979, resulted in revenues in excess of $1.3 billion in Canadian dollars. A few of the highlights of CGE's history in the period after World War II are depicted below.



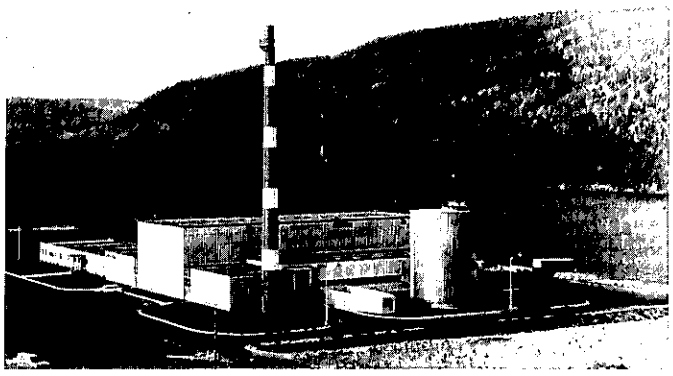
A vital link in the North American air defense system are altitude-monitoring radars, first built by CGE in Canada in 1959.



CGE's first major mobile radio production, for the Ontario Provincial Police (above), evolved into the development, in 1974, of one of the first computerized radio systems on the continent.



In 1978, CGE built the world's largest water-cooled hydroelectric generator for the Grand Coulee Dam. The 718-mva unit is shown above, being readied for assembly.

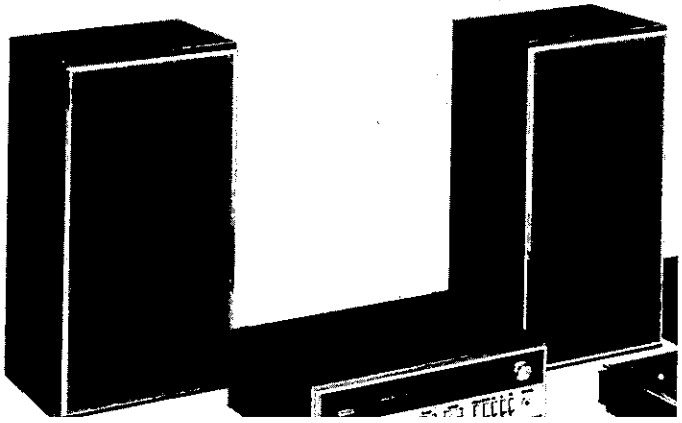


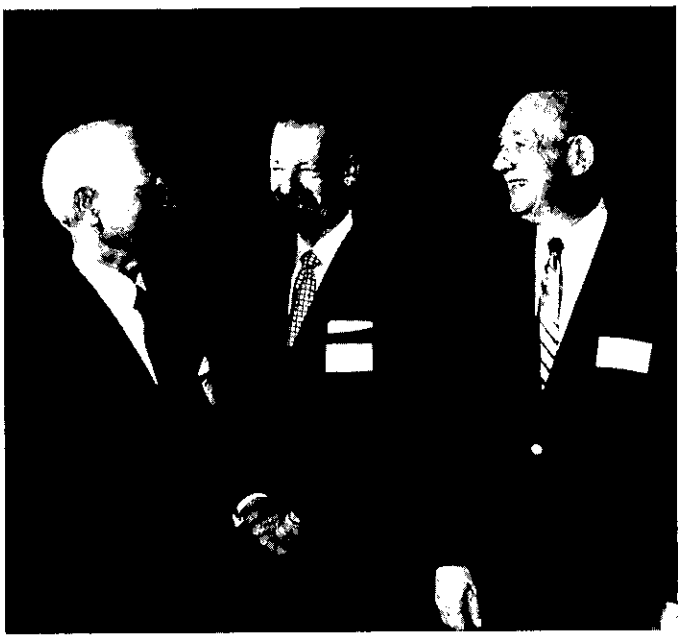
In 1955, CGE formed a partnership with Atomic Energy of Canada, Ltd. and Ontario Hydroelectric Co., Ltd. to develop the Candu nuclear reactor. The first such unit was built at Rolphton, Ontario (above).

New Audio Equipment and House wares for the 1970's. . .a sampling

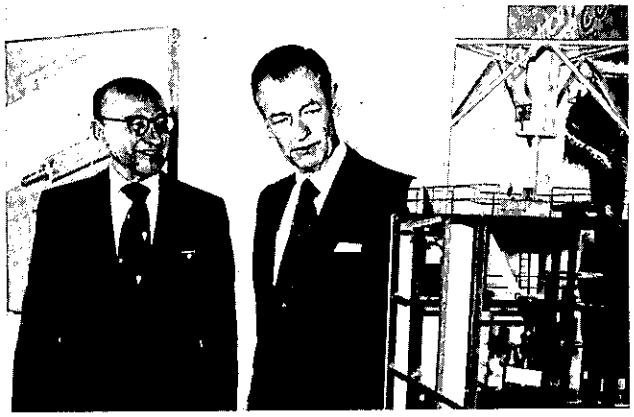
WILLARD H. SAHLOFF

In July 1967, *Business Week* named Willard Sahloff "Mr. Housewares" in recognition of his leadership in product innovation and marketing. As General Manager of the Housewares Division from 1953 to 1969 he made a significant impact on the growth of the small appliance business in GE.





Three "generations" of leaders meet. Ralph J. Cordiner (l.) with new Chief Executive Reginald H. Jones (c.) and Fred J. Borch, his predecessor.



Arthur M. Bueche (l.) Senior Vice President Corporate Technology and Board Chairman Reginald H. Jones inspect one of many exhibits depicting GE technological achievements at the GE Centennial Hall of History exhibition at the Schenectady Museum in 1978.

The Corporate Executive Office in GE's centennial year. Chairman Reginald H. Jones (c.), with Vice Chairmen Walter D. Dance (l.) and Jack S. Parker (r.).

"What will be expected of managers in the future? Intellectual breadth, strategic capability, social sensitivity, political sophistication, world-mindedness, and above all, a capacity to keep their poise amid the cross-currents of change."

If anyone could serve as a model for this specification for the manager of the future, it is its author, Reginald H. Jones.

Mr. Jones' entire business career has been with General Electric. He joined the Company's Business Training Course in 1939. Three years later, he began an eight-year tour as a travelling auditor, an assignment that took him to nearly every plant in the Company. Then he moved into general management, serving as manager of various company businesses in consumer, utility, industrial, construction, and distribution fields. In 1968, he became the Company's Chief Financial Officer, and was elected Senior Vice-President two years later.

In 1972 he became President, then Chairman and Chief Executive Officer of General Electric. There he has brought fresh vitality and new strategic direction to one of the most diversified enterprises in the world. Most of that diversification has come from strong internal growth fostered by research and development, strategic planning and the introduction of the sector structure which "prepared the organization and the people to meet General Electric's long-range growth opportunities in the decade ahead". There have been exceptions to the pattern of internal growth, most notably the merger of GE with the Utah International Corporation in 1976 — at that date the largest acquisition in U.S. corporate history.

Under Jones' administration, the Company's sales have more than doubled ($10 billion to $22 billion) and earnings have grown even faster ($572 million to $1.4 billion) in seven years. A major thrust has been into international markets, and General Electric is now one of the nation's leading industrial exporter's, with a trade surplus of $2.5 billion at a time when the U.S. as a whole has a trade deficit of about ten times that amount. As Chairman of the President's Export Council, he has become an eloquent voice for the expansion of world trade and the restoration of U.S. competitiveness.

REGINALD H. JONES

But Mr. Jones is best known to the public for his role in changing the relationship between business and government. As Chairman of the Business Council and Co-Chairman of The Business Roundtable, he has been a leader in the movement to develop a constructive business-government dialogue. Three Presidents and their Cabinets have chosen to call on him frequently, for sophisticated counsel on economic policy. His most significant achievement in the policy arena is recognition in Washington of the nation's capital formation problem, but he has also been a powerful spokesman on the issues of tax policy, trade, monetary reform, unemployment, and human rights.

His work as a thoughtful and public-spirited counsellor on public policy has won him broad acceptance not only in the Administration, but also in both Houses of Congress, and both parties — a credibility most unusual for an executive of big business. *U.S. News and World Report,* in its 1979 and 1980 surveys of "Who Runs America", reported that his peers regard Jones as the most influential person in business today; and a 1980 survey by the Wall Street Journal confirmed that finding. He has used this well-earned influence to advance fresh ideas for the solution of economic and social problems.

If the corporation today is evolving into a more responsive — and responsible — element of the body social, it is due to the leadership of the people like Reginald Jones.

1973

TRANSPORTATION

The Locomotive Department delivers the world's first 50,000-v, 6000-hp thyristor-controlled locomotives for the Black Mesa and Lake Powell Railroad.

World's first 50,000-v, 6000-hp thyristor-controlled locomotive.

FREDERICK W. BAUMANN

A Steinmetz award winner in 1975, Baumann is credited wtih conceiving and developing eleven major Small AC Motor Dept. product lines. These included an aluminum frame redesign that resulted in a significant improvement in the construction of lightweight efficient motors.

Engineer Bill Smith at SAC plant in Hendersonville, Tennessee, removes motor frame from fully automatic casting machine. It can produce a 10-hp frame, weighing 13 pounds, every two minutes.

INDUSTRIAL EQUIPMENT

The development of centrifugally cast aluminum alloy stator frames and end shields results in performance improvements and reductions in the weight of small ac motors produced at the recently completed plant at Hendersonville, Tennessee.

The Drive Systems Department makes the first application of large cycloconverter technology in a 16,800-hp wound-rotor induction motor, opening the way for the development of even larger ac drives.

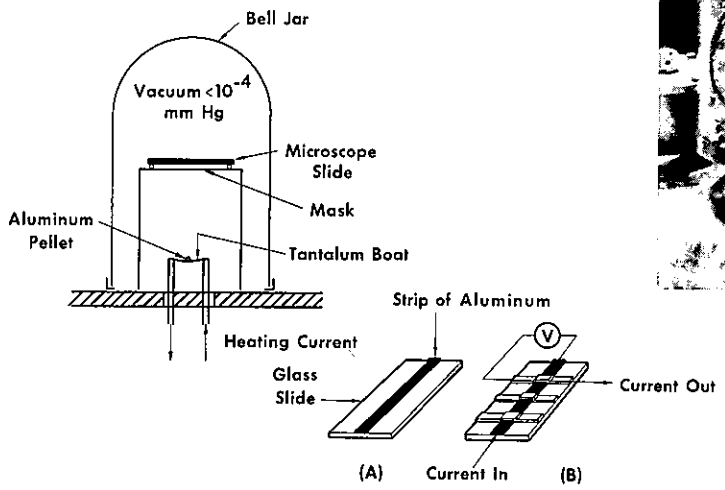
ELECTRONICS

The first solid state imager based on charge injected device technology is invented at the Research and Development Center by Gerald J. Michon and Hubert K. Burke. The stamp-sized device, which converts an optical image into an electrical video signal, replaces bulky video vacuum tubes used in conventional TV cameras.

Gerald J. Michon (l.) and Hubert K. Burke (r.) display solid state imager held by Michon. An experimental TV camera, built around the invention, is aimed at the imager and displays it on the television screen.

IVAR GIAEVER WINS NOBEL PRIZE
1973 AWARD IN PHYSICS
RECALLS LANGMUIR'S 1932 PRIZE

In 1960, Ivar Giaever, a physicist at GE's Research and Development Center, conceived the idea of using electron tunneling to measure the energy gap in a superconductor. This technique, disclosed in a pathbreaking paper, both provided a new method for studying superconductivity and opened the possibility of a new class of electronic devices. The importance of the work was highlighted by the award of a 1973 Nobel Prize, shared with Leo Esaki and Brian D. Josephson.

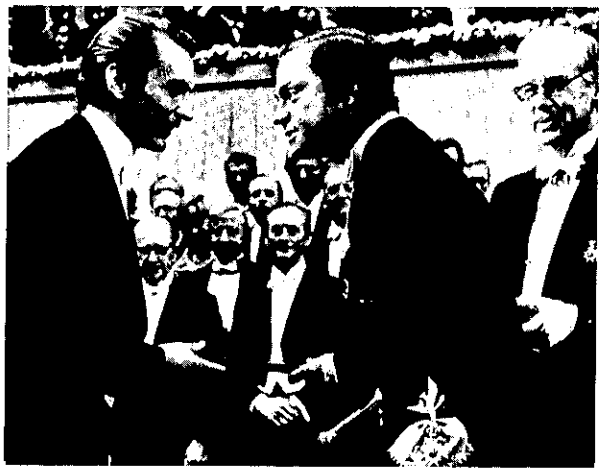


A bell jar in which Ivar Giaever performed his key experiments is shown in photo above and in diagram at left. At bottom of drawing, sketches A and B show how thin films were laid down, inside the evacuated bell jar, on glass slides.

"The Nobel Prize is the highest honor that a scientist can receive, and we are delighted that the Nobel Committee has this year recognized Dr. Giaever's outstanding contributions to the study of phenomena that occur at temperatures near absolute zero," said Dr. Arthur M. Bueche, GE vice president for research and development.

"The only other GE scientist to receive a Nobel Prize was the late Dr. Irving Langmuir, who won the award for chemistry in 1932," Dr. Bueche pointed out. "Dr. Langmuir was the first industrial scientist in the U.S. to receive the Nobel Prize."

GE Chairman of the Board Reginald H. Jones said: "It's poetic justice that today, October 23rd, the 100th birthday of one of General Electric's greatest scientists, Dr. William D. Coolidge, living in Schenectady, N.Y., that another GE scientist should also reach a significant milestone in his lifetime. We are proud beyond words. Dr. Giaever does honor to his profession, his associates, and his company."



Ivar Giaever accepts Nobel Prize from King Carl Gustav of Sweden in Stockholm ceremony.

100 YEARS OF TECHNOLOGICAL INNOVATION

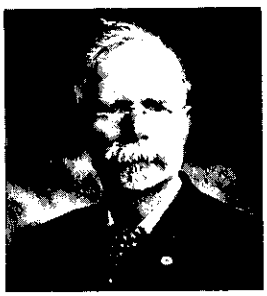
*HATS OFF TO GE INNOVATION

THREE AND A FOURTH new U.S. patents every working day. That is the 1978 record for General Electric Co.; a total of 865 new U.S. patents last year. Little wonder, then, that GE has become the first organization in history to be assigned its fifty-thousandth U.S. patent.

One can hardly resist the temptation to refer to GE as being patent potent. Its giant Corporate Research and Development section has been structured and staffed by its present leader, Dr. Roland W. Schmitt, by Dr. Arthur M. Bueche before him, and by others to be what very likely is the world's most-productive research and development operation. They build on a history that goes back 101 years to the founding of GE's predecessor, Edison Electric Light Co. It is there that we find the start of this tradition of innovation and the first records of some individuals who helped GE to reach this innovation milestone.

[Ranking No. 1 and No. 3, respectively, on the list of the most prolific inventors in U.S. history were Thomas A. Edison, with over 1000 patents; and Elihu Thomson, with almost 700 patents. The evolution of the General Electric Company from the Edison Electric Light Company and the Thomson-Houston Company brought together the talents of these two men and the contributions of a number of others who were among the giants of invention of the late nineteenth and early twentieth century. William Stanley (transformers and electrical transmission); James J. Wood (motors and dynamos); Charles F. Brush (arc-lighting and dynamos); Charles J. Van Depoele (dc motors and electric streetcars); and Frank J. Sprague (motors and electric traction equipment), compiled upwards of 100 or more patents each during their careers.

One of the least well known of GE's early inventors was Hermann Lemp, who came to America from Switzerland in 1882 to work with Thomas Edison. He later became a long-time collaborator with Elihu Thomson and was a consulting engineer at the Erie Works. He was awarded more than 300 patents in areas such as welding equipment, x-ray apparatus, and components for transportation equipment. His design of automatic control systems for diesel-electric locomotives were considered by many to be among the most significant contributions in the history of railroad transportation.



Hermann Lemp

George B. Benander

Theodore A. Rich

During the last half of GE's first century there have been a number of its inventors who reached the 100 mark in numbers of patents. Perhaps the best known is radio and television pioneer, Ernst F.W. Alexanderson, with over 200 patents. Among the others are George B. Benander (switches and other small wiring devices); Frank M. Clark (motor insulations and capacitor and transformer insulating fluids); Theodore A. Rich (measurement and detection equipment); Burnice D. Bedford (electronics for motor control and power transmission); and David C. Prince (welding controls, switches and relays).

In 1978, the list was joined by John Bochan of Louisville, with 100 patents relating primarily to major applicance components; and Fred F. Holub, Research and Development Center chemist with 100 patents in organic and polymer chemistry and materials.]

Those performances are very impressive and worthy of much respect. After noting the tremendous patent accomplishments of these men, however, we are aware that in addition to their patents, there are more than 47,000 U.S. patents that were issued to thousands of other GE employees over the years. And two more points of interest: GE's 50,000th U.S. patent was issued in the name of Dr. Douglas E. Houston, a physicist, for a thermal migration process for creating fine grids in semiconductor devices. And, fully a third of GE's 50,000 U.S. patents are unexpired and are still in force.

On the 20th of this month we will present the 17th annual I•R 100 Awards for significant innovation. At that time it will be shown that GE has won more awards in this international competition for innovation during 1978 than any other firm. This performance will boost GE's total of I•R Awards to 124, more than twice the number earned by the next-highest contender.

Many excuses are given for declining U.S. innovation, a weakening of this nation's dominance in U.S. patents, and presumed technological stagnation. Let us remember that GE operates in the same world. At GE they don't know the meaning of technological stagnation. Innovation is alive and well at Schenectady and Syracuse and other GE lab sites.

Our hats are off to GE!

Robert R. Jones
editor
Industrial Research/Development

*Exerpts from an editorial in *Industrial Research/Development* magazine—September 1979. Insert, in brackets, prepared by *Pathways of Progress* editor.

Burnice D. Bedford

John Bochan

Fred F. Holub

1974

Directo-Matic® Logic Control for steel plant process automation.

INDUSTRIAL EQUIPMENT

Directo-Matic® Logic Control is introduced for steel plant process automation. Its electronic memory stores an intricate program of instructions which can be easily expanded and changed to guide manufacturing or process equipment through sophisticated production sequences.

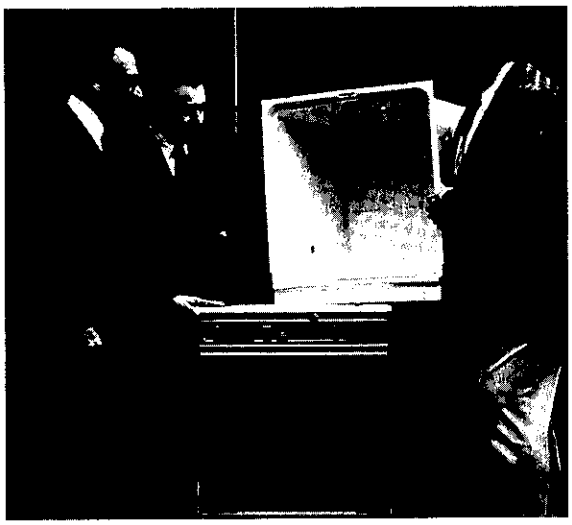
Microprocessor technology is incorporated in the GE Mark Century® 1050 numerical control. The great flexibility afforded by software design permits almost limitless control features and functions for automated large machining centers.

ORRIN W. LIVINGSTON

During his GE career, which started in 1927, Livingston was awarded fifty-seven patents, many of which were fundamental to the technologies of the Specialty Control and Industrial Automation Dept. businesses.

APPLIANCES

The first molded thermoplastic dishwasher tub is produced at Appliance Park. The one piece tub reduces the number of fabricated parts required and gives the consumer a longer-lived, maintenance free product than is obtained from coated metals.



New, one-piece thermoplastic dishwasher tub—being examined by John Vance (left), Edward McInerney (center) and Richard Butsch (right) of Appliance Park.

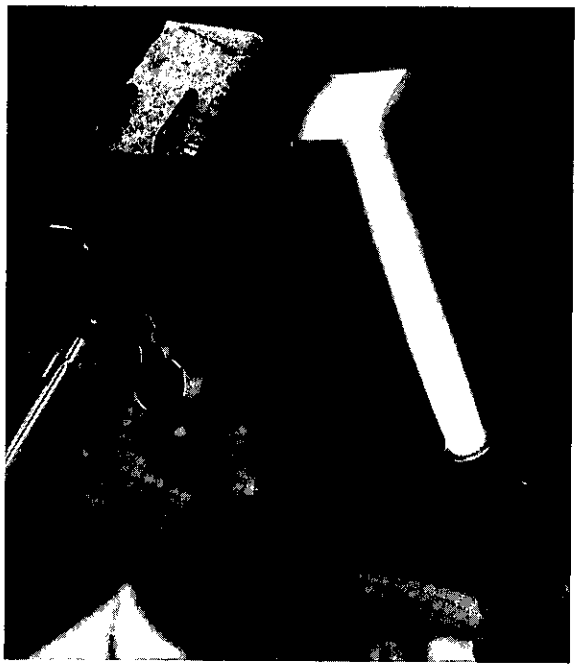
COMMUNICATIONS

The first three-axis stabilized TV broadcast satellite, built for the Japanese government by the Space Division, is in orbit over the Pacific. The satellite provides the capability for TV distribution directly to home receivers, cable heads, or terrestrial broadcast systems.

1974

MATERIALS

Research and Development Center ceramist Svante Prochazka develops the first simple and inexpensive technique for fabricating ceramic parts from silicon carbide, one of the most heat resistant materials known to man. The new fabrication technique may significantly boost the efficiency of gas turbines.



Turbine vane made from silicon carbide is subjected to high temperature flame test by Svante Prochazka, inventor of the new fabrication process.

POWER GENERATION

The first GENERREX static exciter system, a 377,000-kva unit, is installed at Colstrip, Montana, for the Montana Power Company. The GENERREX integrates the power transformer and reactor elements within the generator housing, resulting in major design simplification and improved performance.

The first nuclear power plant to generate more than 1,000,000 kw of electricity is the Tennessee Valley Authority's 1098-MWe Browns Ferry 1 BWR unit near Decatur, Alabama. The Large Steam Turbine Department also participates in the project as it supplies a single shaft turbine operating at 950 psi saturated steam.

New General Electric Corporate headquarters at Fairfield, Connecticut.

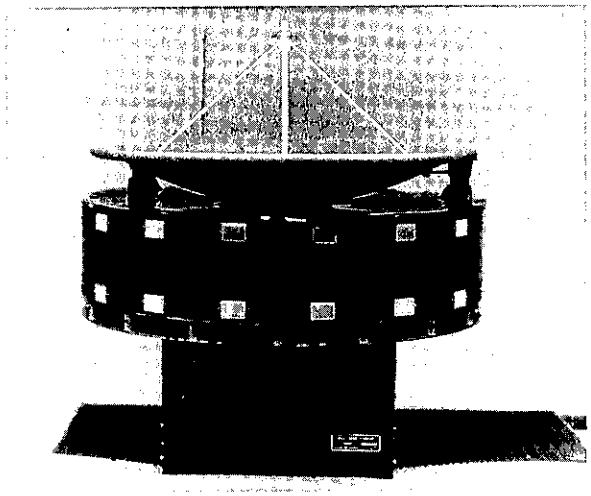
ORGANIZATION

The General Electric Company officially transfers its Corporate headquarters from New York City to a new facility at Fairfield, Connecticut.

INFORMATION PROCESSING

The introduction of the Genigraphics® image generation system heralds the beginning of the world's largest computer slide art service. Working at a Genigraphics console, an artist can create and photograph up to 10 color visuals for slides in an hour. The material can then be stored in a minicomputer and returned at any time for corrections or updating.

1975



GEOS-3 Radar Altimeter built by the Aerospace Electronic Systems Department.

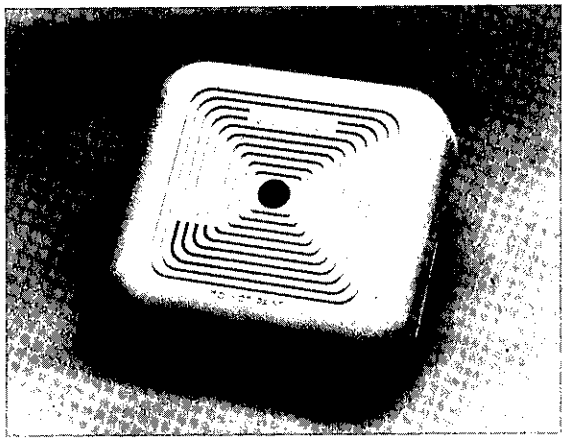
ELECTRONICS AND COMMUNICATIONS

The Space Division designs the DSCS III, the Defense Satellite Communication System, for unprecedented orbital life and operational utility, with features directly applicable to future commercial communications. Launch is scheduled for mid-1980.

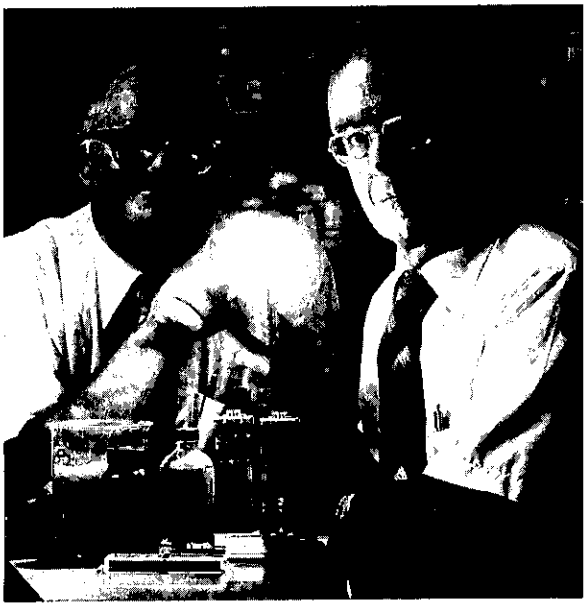
The Aerospace Electronic Systems Department builds the GEOS-3 Radar Altimeter: GEOS, the Geodynamics Experimental Ocean Satellite, studies, measures, and maps the ocean from orbit, transmitting data from storage in earthbound computers.

APPLIANCES

The HOME SENTRY SMOKE ALARM is the first of a line of home protection devices produced by General Electric. Its detector is sensitive to the presence of small quantities of smoke produced in the earliest stages of a fire and emits a high pitched alarm, providing an extra measure of time for escape.



Home Sentry Smoke Detector and Alarm.



Fred F. Holub (l.) and Harold F. Webster (r.) demonstrate chemical-polymer switches that automatically sequence lamp triggering in FlipFlash photo lamp array.

LIGHTING

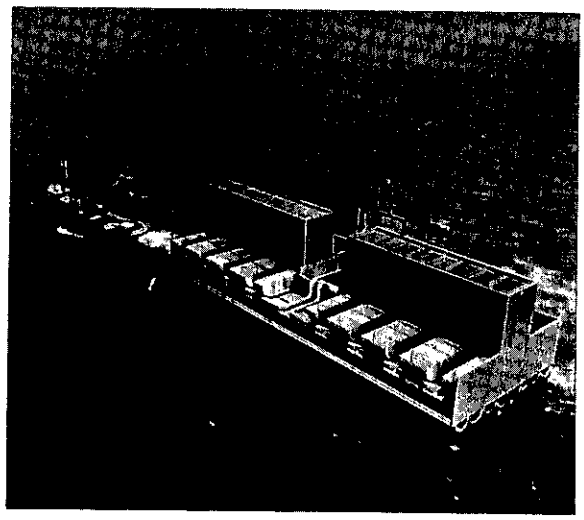
The Photo Lamp Department develops FlipFlash lamp array for a new line of Kodak pocket cameras. Using automatically sequenced lamp triggering and a piezoelectric crystal as a power source, FlipFlash matches the compactness of the cameras and provides error-proof operation.

1975

POWER GENERATION

Introduction of the MS-9001 gas turbine, rated at 100 mw and designed for use in 50-Hz systems, opens the door for large-scale use of these units internationally.

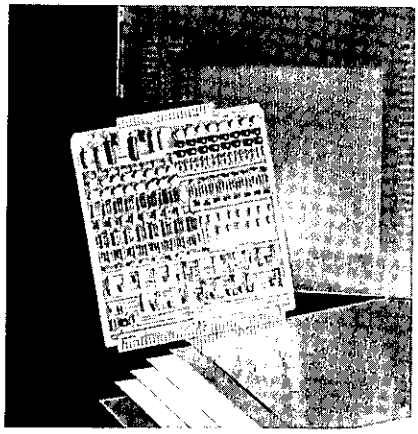
Static excitation is adapted for use in hydro-electric generators at an installation of twelve generating systems for the Chief Joseph Dam on the Columbia River in Washington.



Barge-mounted, self contained, gas turbine units ready for transportation to Brazil.

MATERIALS

PC-75 copper clad composite laminate is introduced to the electronics industry. The new printed circuit material combines the strength and electrical qualities of epoxy glass laminates and the cost advantages of phenolic paper.



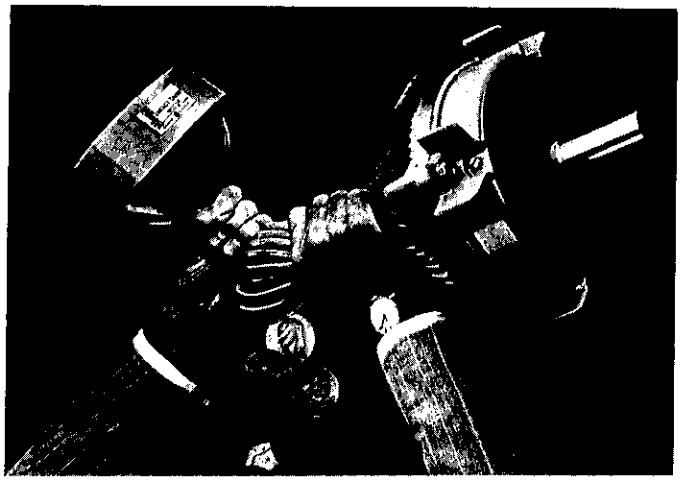
PC-75 copper clad laminates.

GEORGE T. WRIGHT

Wright provided marketing leadership that successfully introduced many new fractional horsepower motors, including the "51" for refrigerators and the new, more efficient energy-saver models.

INDUSTRIAL EQUIPMENT

Energy $aver Serv-S-Line motors are introduced for heating and air conditioning replacement service. Efficiencies are up to 40 percent higher than shaded-pole design motors.

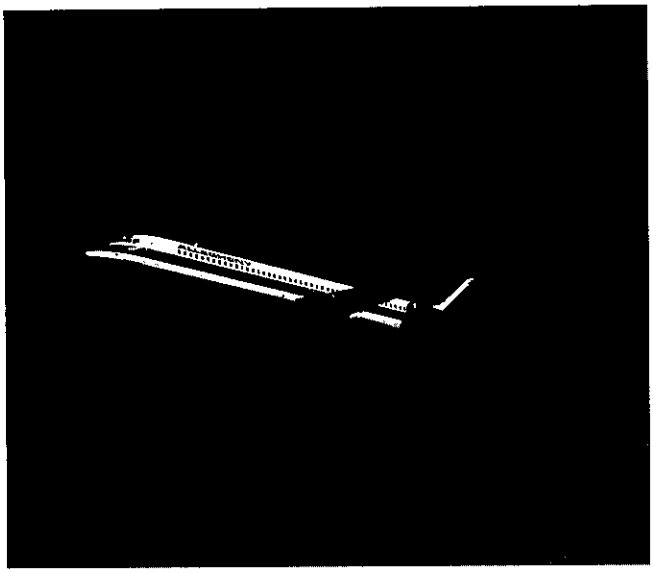


Let General Electric show you how high-efficiency motors can squeeze more profits from your plant operations.

HELPING TO FINANCE CONSUMER AND INDUSTRY NEEDS

The General Electric Credit Corporation has been part of the General Electric family since 1932. First known as General Electric Contracts Corporation, it was organized for the purpose of financing the purchase of consumer appliances. In that capacity it stimulated demand for appliances during a critical period of economic recovery from the nation's most severe depression.

Today, GECC is still a leading lender in the home products field, providing a broad spectrum of services to retailers and consumers, including casualty and life insurance through its Puritan Insurance Companies. In addition, it has become the largest non-manufacturing company in commercial and industrial equipment financing and leasing.



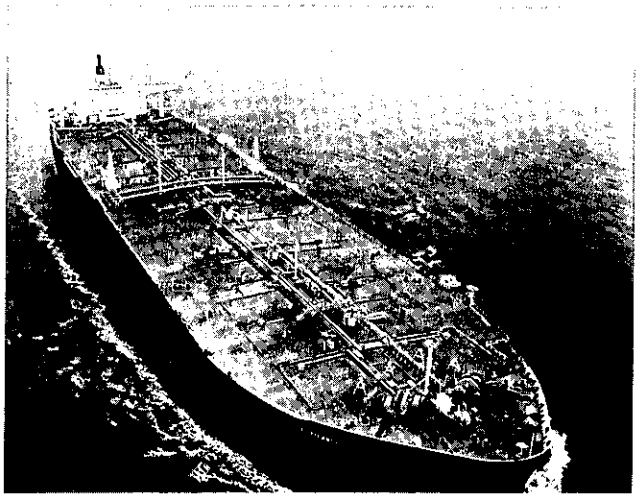
GECC is not a commercial airline. . .but in 1978 it had the ninth largest fleet of commercial airliners in the U.S., with 77 commercial aircraft on lease.

In 1967 GECC leased three DC-9 aircraft to Allegheny Airlines in the first such transaction in the aviation industry. In 1969, it signed a lease that provided United Airlines with 29 aircraft over a four-year period.

GECC is not a railroad. . .but it has accumulated more than 22,000 pieces of rolling stock–enough to make up a train 250 miles long.

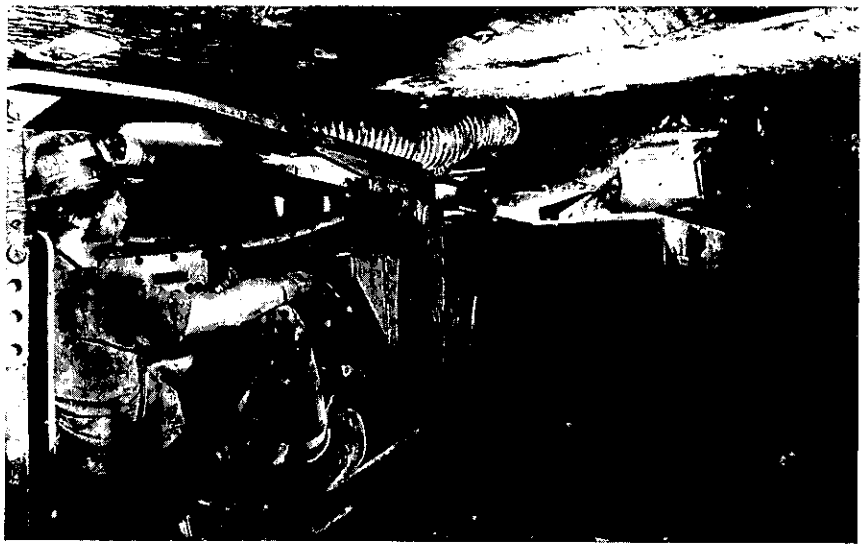
In 1975, GECC participated in the largest leveraged lease in railroad history and provided some 9,500 boxcars for American commerce.

GENERAL ELECTRIC CREDIT CORPORATION



GECC is not a maritime shipping company. . .but its fleet, leased to oil carriers, includes seventeen tankers that have an aggregate of 2,527,000 deadweight tons, the most of any fleet in the U.S. Merchant Marine.

The 368,000-deadweight-ton UST Atlantic, the largest tanker ever built in the Western Hemisphere, was acquired by General Electric and leased to the Shell Oil Company.



A Continuous Miner, shown here, is typical of equipment acquired by Quarto Mining, a subsidiary of North American Coal Company, through a lease by GECC. The lease arrangement allowed Quarto to acquire the equipment with no out-of-pocket investment and with much lower interest expenses than if Quarto had financed the venture conventionally.

Over the years, the General Electric Credit Corporation has provided similar services to a wide variety of industries requiring large capital investments to remain viable. Through these activities it has also played a key role in the continuing development and application of the products of technology.

General Electric Credit CORPORATION

Administrative Offices:
260 Long Ridge Rd. • Stamford, CT 06902

One of the biggest names in almost everything.

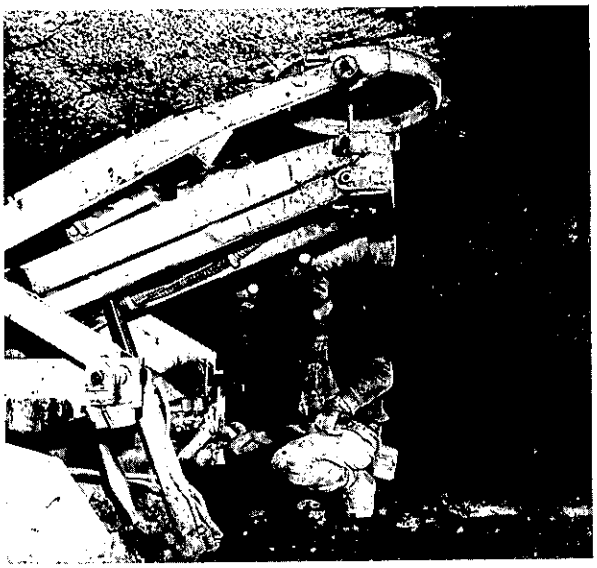
1976

NATIONAL DEFENSE

The Electronic Systems Division demonstrates a new solid-state, computer managed radar, the AN/TPS-59 tactical air-defense radar, developed for the U.S. Marine Corps.

HERMAN F. KONIG

As the first General Manager of the Aerospace Electronics Systems Dept. (first known as Light Military Electronics Dept.), Konig led its growth into new areas of electronic technology vital to the nation's military and space efforts.



Installing grouted bolt reinforcement system in mine roof.

MATERIALS

A high-speed curing resin system is jointly developed by Carboloy and Laminated and Insulating Materials Business Department to improve the safety of underground coal mining. Used in a unique package, it provides efficient and economic grouted bolt reinforcement of mine roofs, minimizing the possibility of collapse under the most difficult of conditions.

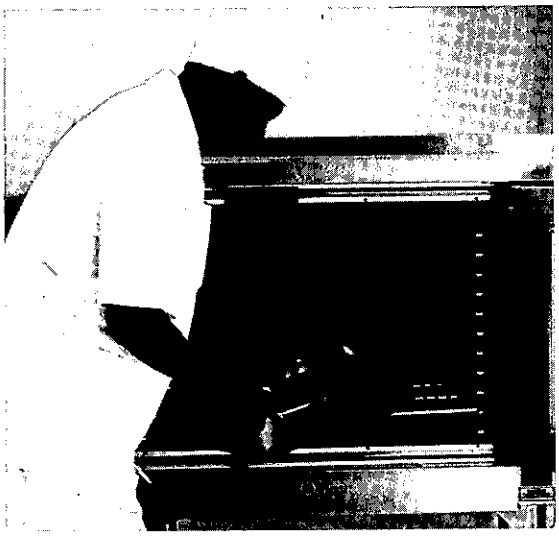
Environmental concerns related to capacitor impregnants consisting of polychlorinated biphenyls (PCBs) lead to the development of a substitute fluid, DIELEKTROL. This achievement permits the Capacitor Products Department to lead the industry in the conversion to non-PCB capacitors.

APPLIANCES

The Food Service Equipment Department introduces the Cook-N-Hold convection oven for restaurant use. It uses stored energy that would otherwise go to waste to complete the cooling cycle.

DATA COMMUNICATIONS

A complete family of line printers, called TermiNet® 340, is introduced to provide printing speeds of 90 to 340 lines per minute. Used for "distributed data processing", the new printers enable remote minicomputers to handle routine chores and release main-frame computers for more sophisticated tasks.



Cook-N-Hold convection oven for restaurant use.

1976

Computed tomography scanner takes detailed cross-section X-ray pictures of the body in less than five seconds.

MEDICAL EQUIPMENT

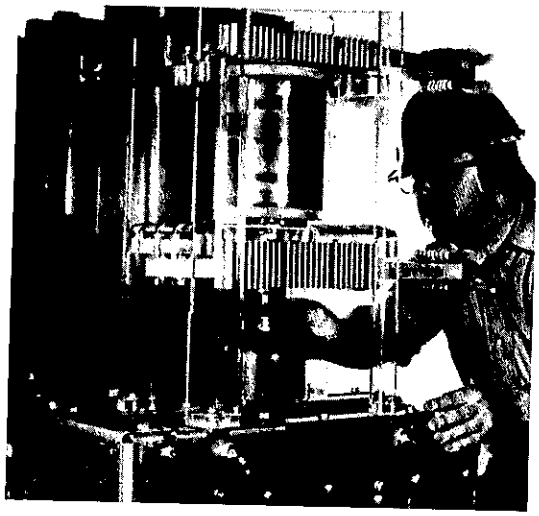
A computed tomography scanner developed by a team from the Research and Development Center and the Medical Systems Division takes detailed cross-section X-ray pictures of the human body in less than five seconds—four to 60 times faster than other total-body scanners in use. The high speed minimizes image blurring due to patient motion and provides superior detail.

POWER GENERATION AND TRANSMISSION

The largest geothermal turbine in the world is the Turbine Division's 132-mw, four flow, low pressure unit. Representing another promising technology for energy production, the geothermal turbine operates on natural, underground steam from wells at 100psig and 338°F.

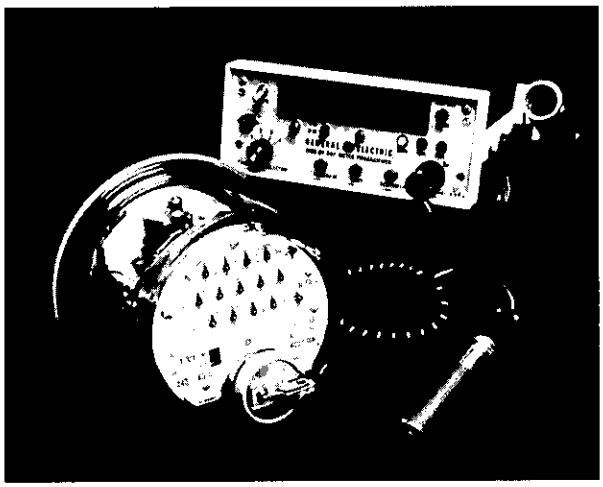
Power/Vac metalclad switchgear is developed for power systems ranging from five to 15 kv. Hailed as the most significant switchgear innovation in 40 years, the design was first to fully capitalize on the inherent space and maintenance saving features of vacuum interruption protection of medium voltage systems.

The world's largest hydraulic turbine is installed at the Grand Coulee Dam by Canadian General Electric's Dominion Engineering Works.



Power/Vac vacuum circuit breaker. Cover removed to show detail.

1977



IR-70 programmable time-of-day watthour meter.

INDUSTRIAL EQUIPMENT

The first major breakthrough in the gearmotor industry since the 1930's is represented by the Helix 2000®. The Small AC Motor Department development, spearheaded by R.A. (Ron) Blair, reduces cast iron construction by 40% and utilizes a modular approach with plug-in motor designs so that off-the-shelf motors and gears can be mixed and matched for maximum machine flexibility.

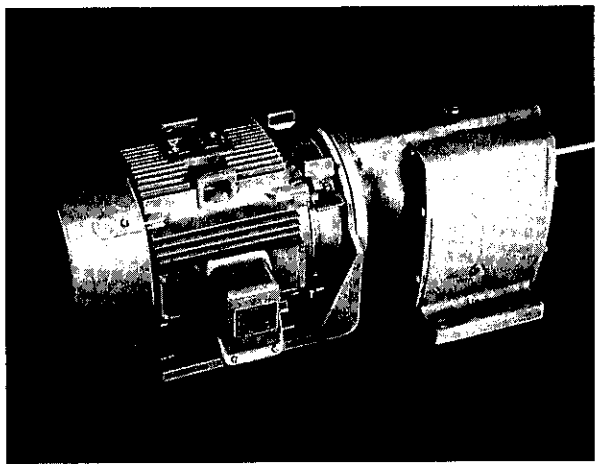
The GE IR-70 programmable time-of-day watthour meter is introduced. Its self-contained integrated circuit chip allows virtually unlimited combinations for measuring kilowatt hours at time-of-day and day-of-week intervals. The IR-70 can also alert utility customers of their use of power during on-peak periods and can optionally limit such on-peak usage of high load appliances.

POWER GENERATION AND TRANSMISSION

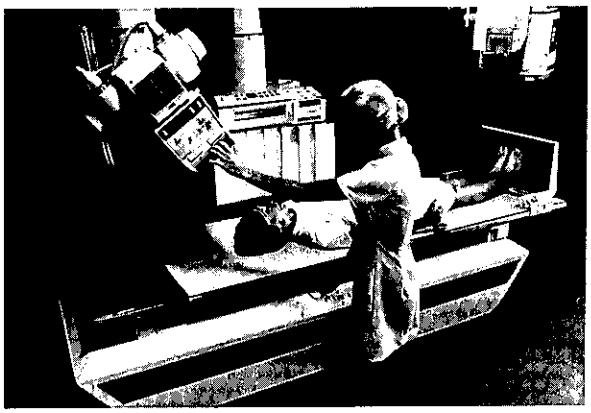
The nation's first solid-state high voltage dc (HVDC) transmission system uses GE converter equipment to bring power to Duluth, Minnesota, from a generating station located 456 miles away, near lignite coal mines in North Dakota. The "coal by wire" project sets a pattern for others where natural resources are not conveniently served by means of transportation.

APPLIANCES

Microprocessor computerized cooking control is introduced to the fast food restaurant industry in the Dimension II series of fryers. Programming of the frying cycle provides food consistency, versatility and energy savings.



Helix 2000 gearmotor brings improved machine flexibility.



New RFX x-ray examination table.

MEDICAL EQUIPMENT

The Medical Systems Division announces the RFX x-ray examination table and MPX programmable x-ray generator for faster, more precise conventional radiography.

1977

LIGHTING

The high output halogen "power plus" headlamp is developed for two and four headlamp systems. It provides up to twice the light straight ahead on high beam.

A new phosphor developed by Research and Development Center physicist William W. Piper, and produced at the Quartz and Chemical Products Department, results in the greatest single boost in fluorescent lamp efficiency since the 1950's. Used on the new 35-watt Watt-Miser II lamp, it enables it to produce 97 percent as much light as a standard 40-watt fluorescent light, and can cut lighting-system energy costs by as much as 14 percent.

William W. Piper and new phosphor for energy-saving Watt-Miser II lamps.

INFORMATION PROCESSING

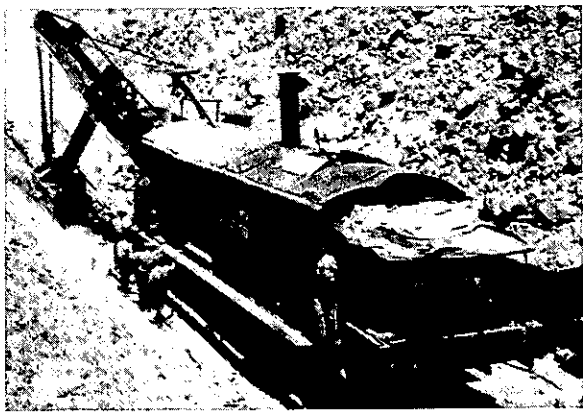
Computational capabilities for financial as well as technical applications are made available worldwide as the GE Mark III time sharing service opens its first overseas computer "supercenter" in Amsterdam, the Netherlands. Linking Europe with the Cleveland, Ohio and Rockville, Maryland headquarters supercenters, the system now covers over 600 cities in 21 countries and 21 time zones.

"Emmy" awarded for VIR automatic color control.

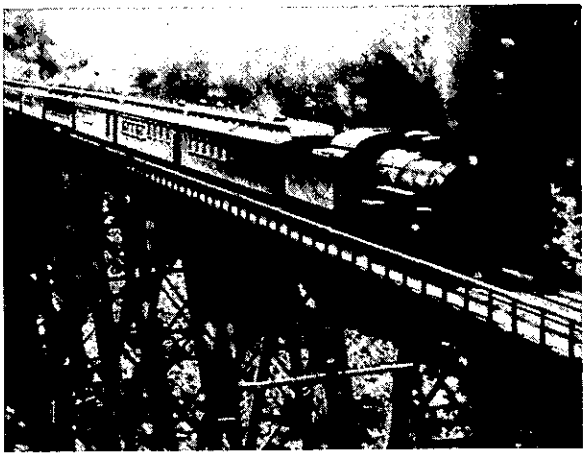
ELECTRONICS AND COMMUNICATIONS

GE is awarded an "Emmy" by the National Academy of Arts and Sciences for VIR automatic color control for television developed by the Television Department.

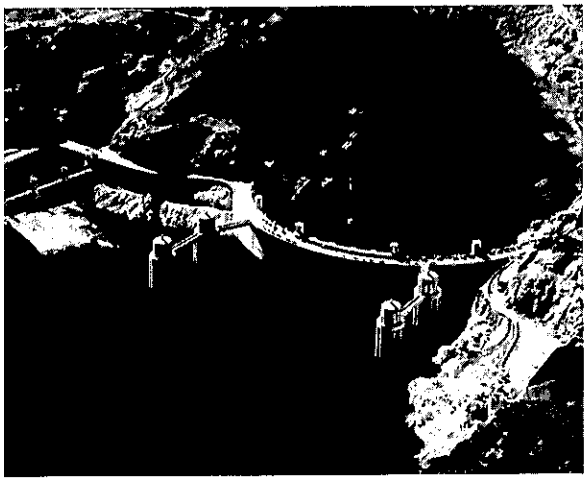
GE'S NEW DIMENSION IN NATURAL RESOURCES



Steam-powered shovels, mechanical marvels of the early 1900's, replaced the pickaxe and hand shovel.



Utah's railroad construction included trestles, tunnels, bridges, grading and track-laying.



Hoover Dam on the Colorado River required 5000 workers for its construction.

Utah International joined the GE family in December 1976 when a merger was approved by the share owners of both companies. This merger gave General Electric a new business dimension in natural resources and an acceleration of growth in international markets.

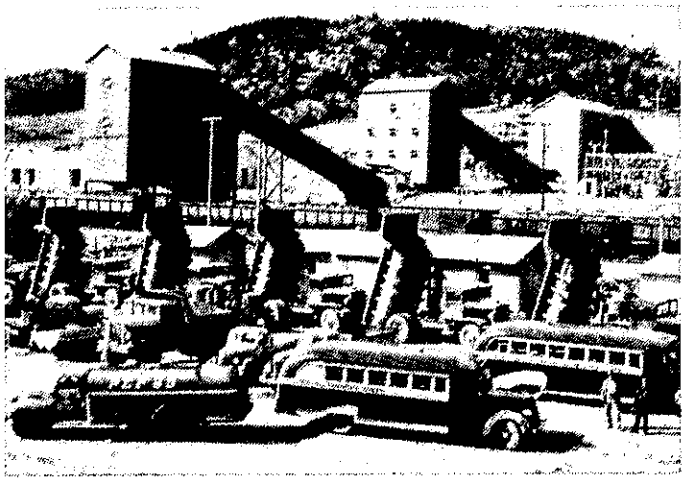
BEGINNINGS

Founded in 1900 as The Utah Construction Company, the enterprise spent the better part of the first 50 years of its existence as a heavy construction and engineering company. Most of the work in its first 20 years was the building of railroads, and the Company was the leading railroad contractor in the far West.

By 1920, the railroads were largely built, and the company turned its efforts toward heavy engineering construction efforts, such as dams, tunnels and earth moving. It was one of the leaders in the joint ventures that built such great structures as Hoover (1936), Bonneville (1940), and Grand Coulee (1942) Dams.

In the period shortly before and immediately after World War II, Utah's construction activities extended outside of the United States to Australia, Canada, Mexico, Peru, Brazil, Colombia, Indonesia, Guam, Korea and the Philippines. The Company utilized its earth-moving skills to enter into mining ventures in the U.S. and in many of these countries.

By 1971, Utah had removed itself from the heavy construction business and was committed mainly to natural resources -- on an international scale.

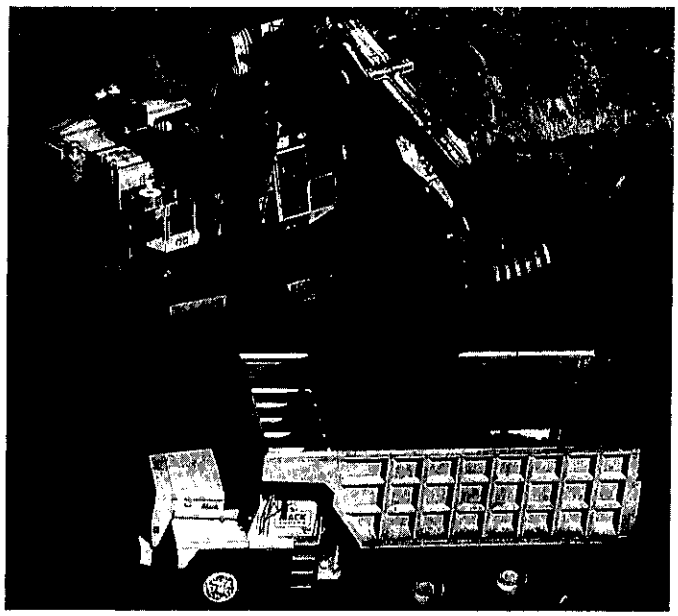


After World War II, Utah's earth-moving skills were applied in this Cedar City, Utah, iron ore mine.

UTAH INTERNATIONAL TODAY

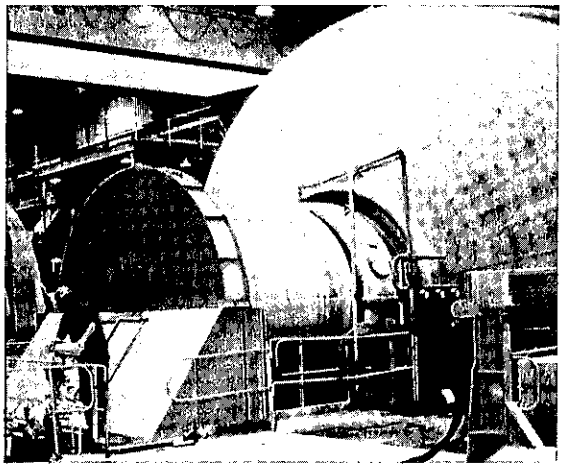
- Utah's largest sphere of activity is in Australia — mining coking coal and iron ore for the steel industry.
- On Vancouver Island, British Columbia, it is developing the Island Copper Mine, producing copper concentrates and by-products such as gold, silver, molybdenum, and rhenium.
- Utah's domestic mining operations include steam coal in New Mexico and Colorado, iron ore in Utah, and a copper interest in Arizona.
- Uranium mining operations are conducted in Wyoming by the Lucky Mc Uranium Corporation, manager of all of Utah's uranium business.
- Through its interest in Samarco Mineracao, S.A., Utah is participating in a vast new iron-ore-producing venture in Brazil.
- Ladd Petroleum Corporation, a subsidiary, produces oil and natural gas in the U.S. and Canada.
- Utah engages in ocean transportation of ores and bulk cargoes through its subsidiaries.

In addition, a vigorous exploration program spans the globe and includes such areas as the western U.S., Australia, Canada, the South Pacific, Africa, and Brazil, seeking new sources of minerals traditionally mined by Utah.



Loading coal from Utah's Navajo mine in New Mexico.

Edmund W. Littlefield, Chairman of the Board and Chief Executive Officer of Utah International, Inc. "He has taken a relatively small construction company and turned it into one of the most exciting natural resources companies in the world today."
Reginald H. Jones, Dec. 16, 1976



Canadian GE motors power six grinding mills at Island Copper Mine in British Columbia.

Ladd Petroleum oil pumping well.

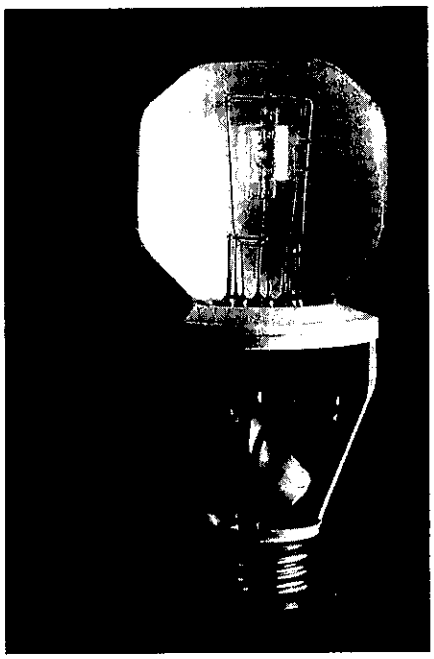
1978

LIGHTING

Laboratory versions of the Electronic Halarc lamp are developed as the forerunners to a family of high efficiency, compact discharge lamps for residential use. An evolution of the Multi-Vapor lamp, the Halarc produces more light than an ordinary 3-way 50/100/150-watt bulb, but uses one-third the energy and will last about four times as long.

Simplified mount, used on 60-, 75-, and 100-watt household lamps, eliminates supports for lead wires and filaments. In addition to large cost savings and productivity gains, there is a two-percent increase in lamp efficiency.

The first commercial all-plastic headlamp housing is designed using the Plastics Division's Lexan. Capable of cutting three pounds from the weight of a four headlamp assembly, it helps meet the needs of the automotive industry to produce lighter weight, more energy-efficient vehicles.



Cutaway model of Electronic Halarc bulb reveals electronic controls in base and arc tube in the top bulb area.

Mark III Distributed Data Processing and Mark-Link Terminal.

INFORMATION PROCESSING

The General Electric Information Service Company announces its Mark III® Distributed Data Processing and Mark-Link Terminal. This minicomputer system with software capability is designed for remote processing to be used in conjunction with the Company's worldwide network of computer supercenters.

INDUSTRIAL EQUIPMENT

Flexible automation units are placed in each domestic plant of the Specialty Motor Department. These units carry out potentially hazardous or less desirable work processes, such as casting with molten aluminum and unloading anneal furnaces.

1978

ELECTRONICS AND COMMUNICATIONS

"The Great Awakening" Programmable Digital Clock Radio.

The Audio Electronics Products Department completes development of the first programmable digital clock radio. Using computer memory capabilities, the radio can store six stations with instant touch button recall.

APPLIANCES

Housewares Division completes development of the Versatron^{T} CTO-2000 countertop oven, featuring automatic, solid state electronic controls in a portable, energy saving appliance.

The FP-1 and FP-2 food processors are introduced, reducing the time for many food preparation chores to seconds. The powerful motor and attachments permit greater versatility in the types of food that can be processed rapidly.

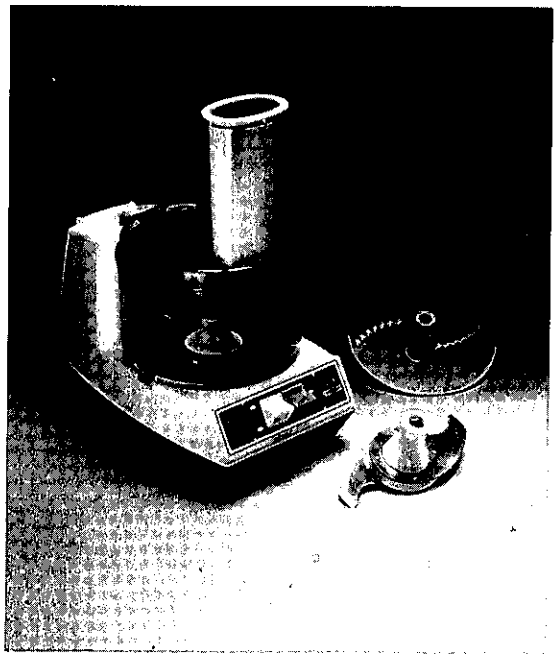
The Major Appliance Business Group announces the first two-door combination refrigerator-freezer with automatically defrosted fresh-food section and separately insulated zero-degree freezer.

TRANSPORTATION

The new Series C30-7 diesel electric locomotives are delivered to the Norfork and Western Railroad. These six-axle 3000 hp units incorporate a GE turbocharger and over 60 improvements that produce significant advances in reliability, maintainability and fuel economy.

SPACE EXPLORATION

The first U.S. interplanetary mission to investigate the atmosphere and weather of the planet Venus is launched. The Reentry Systems Division designs and builds heat shields and separation systems for the four deceleration probes which encounter the planet.



1978

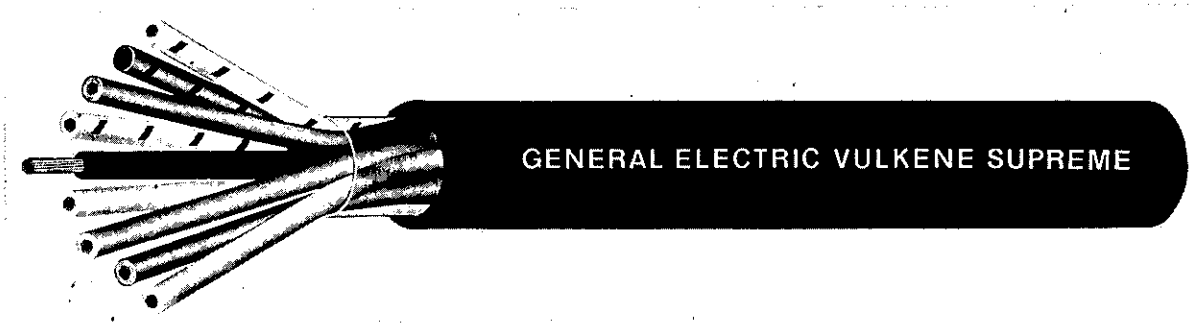
MATERIALS

Vulkene Supreme™, a development of the Wire and Cable Department and the Research and Development Center, is introduced as the first non-chlorinated high-performance, flame-resistant insulation.

The Laminated and Insulating Materials Business Department introduces a line of energy conserving thermosetting resin systems. These materials can be cured without the application of heat, by exposure to ultraviolet light. Energy required for curing can be as little as 15% of that required in a comparable thermal process.

A clear, silicone-coated glazing material with abrasion resistance approaching glass and high impact strength is announced by the Lexan Products Department. Properties of the new LEXAN-based product, called MARGARD™ sheet, make it ideal for glazing applications in transportation and building construction.

Lexan high impact resistance sheet used at rebuilt Yankee Stadium in New York City.

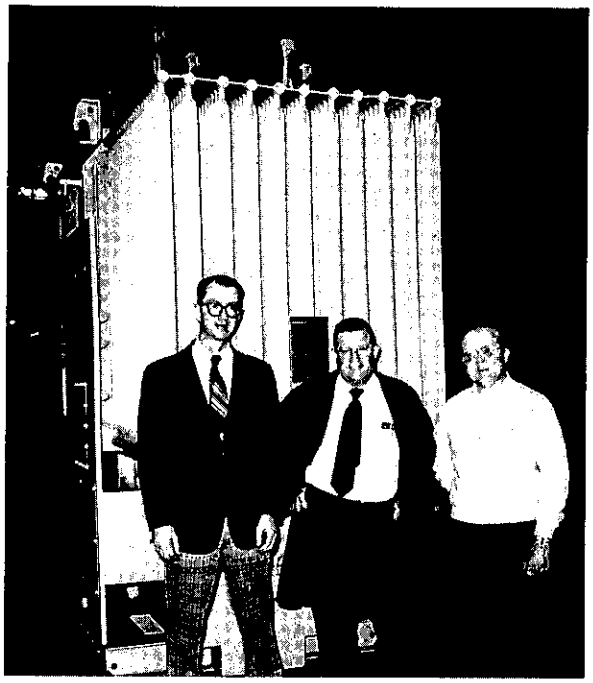


Vulkene Supreme flame-resistant cable.

MEDICAL EQUIPMENT

Preparations are made for the introduction of the Datason ultrasonic scanner system. Medical Systems Division will add this method of imaging to its x-ray, computed tomography and nuclear patient diagnostic tools.

1978



Linden Pierce (l.), Thomas Nichols (c.), and Robert Gearhart (r.) stand in front of new Vapor Tran transformer at Medium Transformer Department plant.

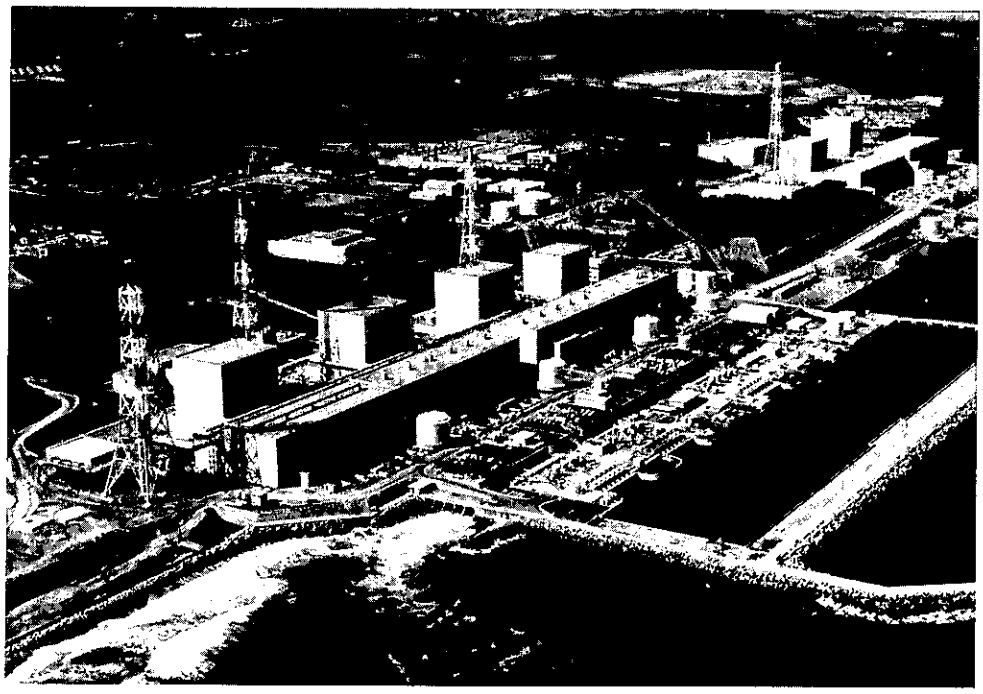
POWER GENERATION AND DISTRIBUTION

The largest nuclear plant in the world is completed in Japan. The Fukushima 6 is a six-unit, 4700-megawatt Boiling Water Reactor station built jointly by GE and three of its licensees in Japan.

Vapor Tran®, the first practical vaporization-cooled transformer, is developed at the Medium Transformer Department. This long-sought-after concept has the added advantage of using a non-flammable insulation fluid.

The largest rated turbine-generator in the world, Palo Verde 1, is shipped to the Arizona Nuclear Power Project. The unit is capable of producing 1,559,100 kva.

The Space Division supplies vacuum tube solar collectors for one of the Department of Energy's largest commercial solar installations for hot water and space heating.



Fukushima 6 nuclear power station in Japan.

EPILOGUE

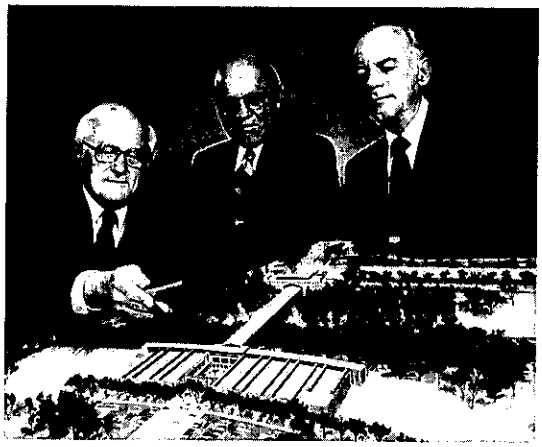
The year 1978 was a special one for the men and women of General Electric. It was the Company's centennial year. In 1878, a small group of investors had the courage and vision to raise $50,000 to support Thomas Alva Edison's incandescent lamp experiments. They formed the Edison Electric Light Company, the earliest predecessor of General Electric.

Celebrations marking that event and the century of growth and achievement that followed were occasions for reflection, not only on the past, but also on the future of the General Electric Company as it entered its second century.

At the 1978 Information Meeting for Share Owners, Chairman of the Board and Chief Executive Officer Reginald H. Jones summed up these reflections as follows:

> "If we were asked what business we are engaged in, we would have to say that we are fundamentally in the business of generating new businessess — and new sources of earnings — from our emerging capabilities. And our future, as our past, lies in the continuous extension of our capabilities into new applications, new markets, new products and services, new or contiguous industries where we can make a contribution that is profitable for our share owners, and profitable for the societies we serve.
>
> What are some of the areas of opportunity, as we try to anticipate the most urgent needs of a changing world?
>
> The energy revolution. Surely the world will need new ways to make and conserve energy.
>
> The need for products and systems that increase productivity — not only in the United States, but in other nations at all levels of economic development.
>
> The consumer desire for new lifestyles, new products and services for a new age.
>
> The shift to a services economy in the United States and other major industrialized countries.
>
> The demand for ever-increasing amounts of minerals and other natural resources, as the nations of the world press hard against available supplies.
>
> The need for man-made materials, with special characteristics not found in natural materials.
>
> And more broadly, the needs of an emerging worldwide economy that expands our strategic horizon as far as the imagination will carry.
>
> How can we summarize what General Electric stands for at the threshold of its second century?
>
> Corporations are responding as public expectations set new and higher standards of performance. We welcome these demands for change. Change is our birthright and our business.
>
> And so our vision for General Electric, built on our heritage, is to be an innovative enterprise at the leading edge of technology, management, and social change.
>
> The philosopher Eric Hoffer says that man is the unfinished creature, driven to continue the work of creation. So too, this very human organization called General Electric is an unfinished enterprise, always evolving, always new, and still — after one hundred years — extending the frontiers of human progress."

. . . .PROLOGUE TO THE FUTURE



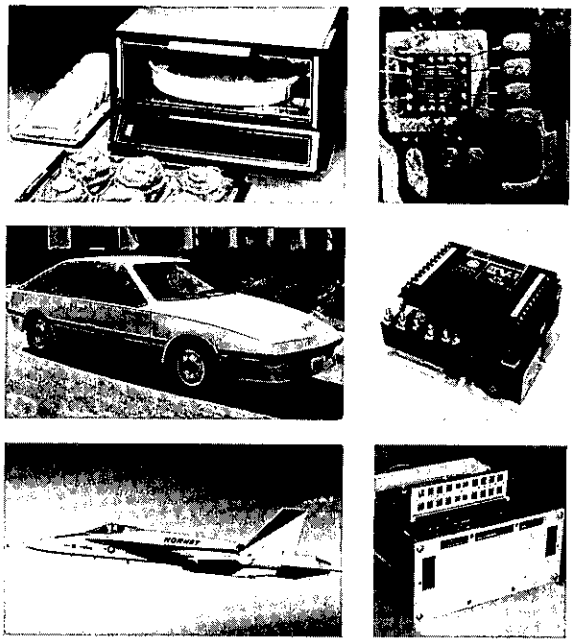
Symbolizing faith in technological innovation as the key to future growth, a $50 million addition to the facilities of the Research and Development Center was announced in 1979 by Roland W. Schmitt (left) Vice President for Corporate Research and Development. He shows a conceptual model of the new construction to George B. Cox (center), Senior Vice President of the Turbine Group and Schenectady area executive; and Porter W. Dobbins, manager of the Center's Technical Services Operation. Over half of the new building effort will be devoted to assembling one of U.S. industry's most modern electronics laboratories.

THE MICROELECTRONICS REVOLUTION has already made its impact on over 200 systems and products used by the Company or developed for its customers –and the list is growing rapidly. Integrated circuit chips serve as "brains" for a variety of consumer appliances, including the new Versatron table-top oven (right), the Potscrubber III dishwasher, and remote controlled VIR color TV receivers.

Other microelectronics applications include "smart" thermostats for the home, time-of-day residential meters, medical systems, controls for electric vehicles (right) and programmable lighting controls to conserve electricity usage.

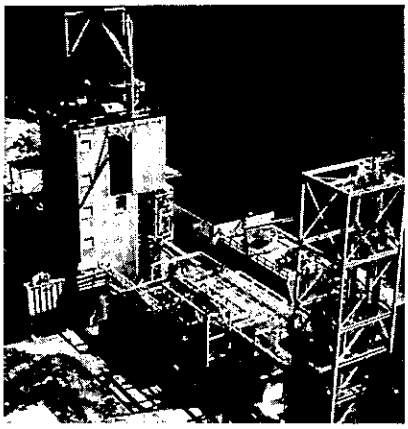
For the aerospace industry, Large Scale Integrated Circuits (LSI), containing 10,000 to 20,000 transistors, are being used in radar control systems and in flight controls for the new F-18 fighter (lower right). In the development stage are Very Large Scale Integrated Circuit modules (VLSI) containing some 100,000 transistors.

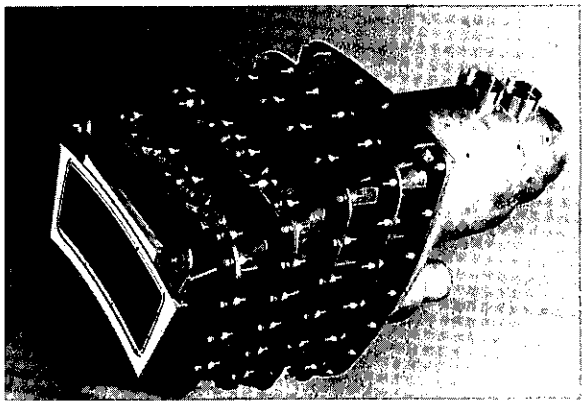
As design, materials and process technologies develop new functional capabilities and lower unit costs, the benefits of microelectronics will have an impact on society comparable to that of the industrial revolution.



THE ENERGY REVOLUTION

In seeking alternate sources of energy to petroleum, the nation will turn increasingly to coal. The integrated coal gasification-combined cycle (IGCC) simulation facility (right) is a prelude to the construction of full-scale plants which will convert coal to gas, clean the gas of pollution causing contaminants and burn it to produce electricity.

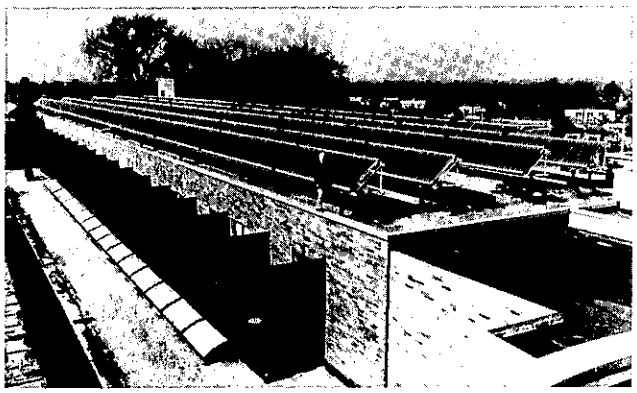


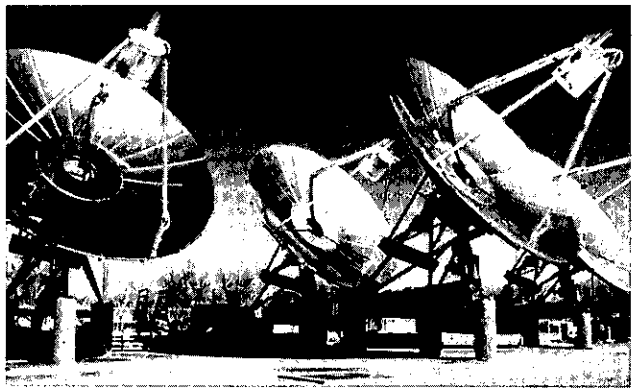


Improvements in materials and methods of heat transfer are aimed at making tomorrow's high temperature gas turbine-steam turbine combination, powered by coal derived fuels, 20 to 30% more efficient than 1978's most advanced generating systems. The sectoral combustor (left) operating at temperatures up to 3000 F, is the heart of a new environmentally compatible super-efficient gas turbine.

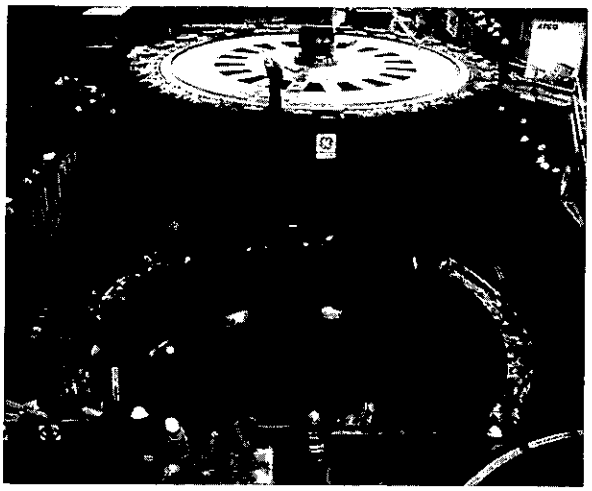
Other means of achieving clean and more efficient output of energy from coal include: the development of a Pressurized Fluidized Bed coal combustion system to provide steam to existing utility turbine generators; and molten carbonate fuel cells that produce electricity and hot gas by the electrochemical interaction of oxygen with hydrogen-rich coal gas.

Solar energy is another option that will help to meet a portion of our energy supply needs. In certain geographic areas, residential hot water and space heating can be provided by solar collectors such as the GE Solartron panels (shown atop the Cherry Hill Inn in New Jersey). In the country's first large-scale solar industrial application, GE working with the U.S. Dept. of Energy is building parabolic dish collectors that will track the sun to meet the energy needs of a textile plant. Another solar project is designed to act as a repowering system to generate as much as 60 megawatts for an existing electric power generation plant.



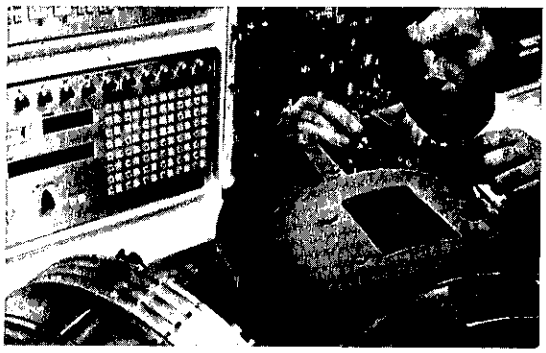


Hydroelectric power for small utility and industrial generating systems can be obtained by making use of some of the 50,000 dams that have either been abandoned or never utilized as an energy resource. The construction of large hydro projects is far from exhausted, and in Quebec, Canada, one of the largest developments of the era is underway. At the La Grande 2 station, eight Canadian GE hydroelectric generators are being installed. By the end of the decade, the complex will provide enough energy to permit a portion of it to be sold to New York State and New England.



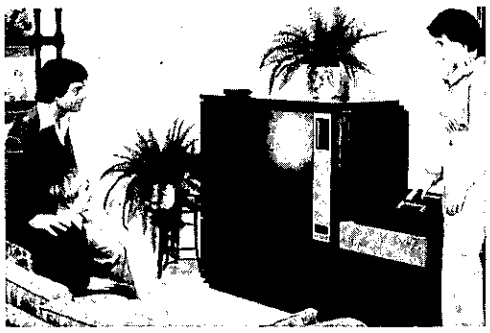
In the United States and in most of the rest of the world, coal and nuclear power generation are the only energy technologies capable of providing large-scale alternatives to imported oil during the remainder of the 20th century. In advancing the technology of boiling water reactor generator stations, GE has placed great emphasis in the training of nuclear plant operators. A new GE training center (above) features two control rooms that simulate actual operating conditions and teach operators to respond to both routine and unexpected situations. The fast breeder reactor, whose development was pioneered by GE scientists, continues to be a viable candidate as the nuclear power generator of the future.

The conservation of energy can play a major role in meeting the energy supply challenge of the 80's and beyond. Contributions are being made in a number of areas, such as: improvements in motor efficiency; the development of strong, lightweight plastics that will reduce automobile weight and gasoline consumption; silicone sealants to reduce home heat losses; and lighting units that use less than 50% of the energy of standard household bulbs.

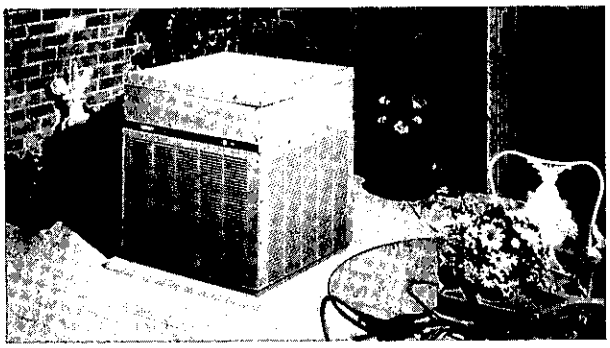


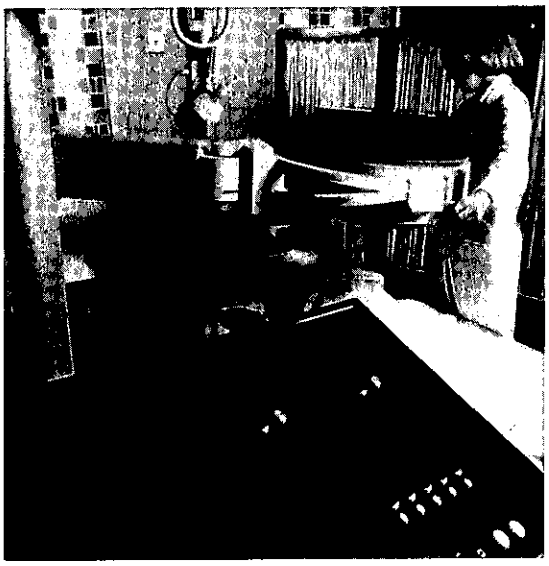
NEW LIFESTYLES

New lifestyles will place greater emphasis on home entertainment, and communications and electronics developments will combine to speed the growth of cable TV and new services that it will provide for entertainment and education.



Microwave ovens, with speed, automatic operation and energy savings features, fit perfectly into the new lifestyle -- as does the new Weathertron Heat Pump which offers heating and cooling convenience in a single, energy-efficient package.



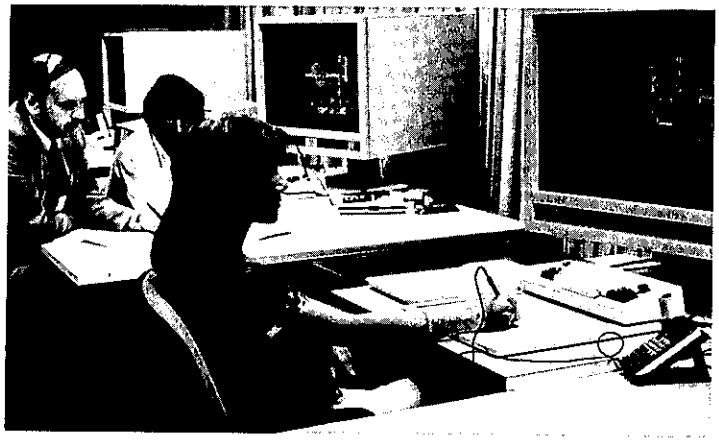


As a result of the development of sophisticated new tools for the medical profession, such as the mobile Data Camera™ (right), many diseases can be diagnosed at a much earlier stage than was previously possible. The growing linkage of electronics, information processing, and other technologies with medicine will provide continuing opportunities for General Electric to make important contributions in the health care field.

PRODUCTIVITY

Improved productivity is key to the ability of American industry to compete effectively on world markets and to play its role in curbing inflation. A wide variety of General Electric products and services, ranging from high speed cutting tools and energy efficient motors to automated machine control systems and worldwide information processing capabilities, are available to meet this challenge.

To help satisfy some of the Company's own productivity needs, a number of design and manufacturing aids are finding widespread use. Computer aided design/computer aided manufacturing (CAD/CAM) was pioneered at General Electric by the Mechanical Drive Turbine Department to assist in the engineering of complex turbine parts. Industrial robots are being introduced in growing numbers to perform tedious or uncomfortable functions, thereby improving product quality and reliability.



MANAGEMENT

As General Electric entered the 1980's a new management team was in place in its Executive Office. Joining Chairman Reginald H. Jones (standing), were (left to right) Vice Chairmen John F. Burlingame, Edward E. Hood, Jr. and John F. Welch, Jr. Their goal to make the 1980's, the opening decade of GE's second century, one of unprecedented accomplishment. . .in business development. . .in international growth. . .in productivity improvement. . .and in technological progress. . .for people.

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ACKNOWLEDGEMENTS

We wish to thank a number of people who gave of their time and talents to make possible the publication of this fourth volume in our Photo-History series:

Linda DeRosa, Tim Sauter and other staff members of the Art and Photographic Units at GE's Research and Development Center were responsible for design, layout and other phases supporting the production of the camera ready copy. Robert L. Fegley of Fairfield, Connecticut, contributed valuable source material as well as helpful suggestions regarding the content. Donna Carpenter, Assistant Editor of *The Monogram*, provided a wealth of information and demonstrated the key role of *The Monogram* as a chronicle of GE's activities–past and present. Catherine Welsh typed a portion of the manuscript and provided constructive ideas on the format.

As we mentioned in the Foreword, *Pathways of Progress* is the culmination of the work of a great many individuals in the General Electric Company who devoted some of their time and effort to research the achievements of their predecessors and their contemporaries, and organized and contributed their findings to the Editors. The list presented below is undoubtedly a partial one, since the contributed historical material may have evolved from the inputs of still others.

The Editors are beholden to all of these "co-editors" for their cooperation:

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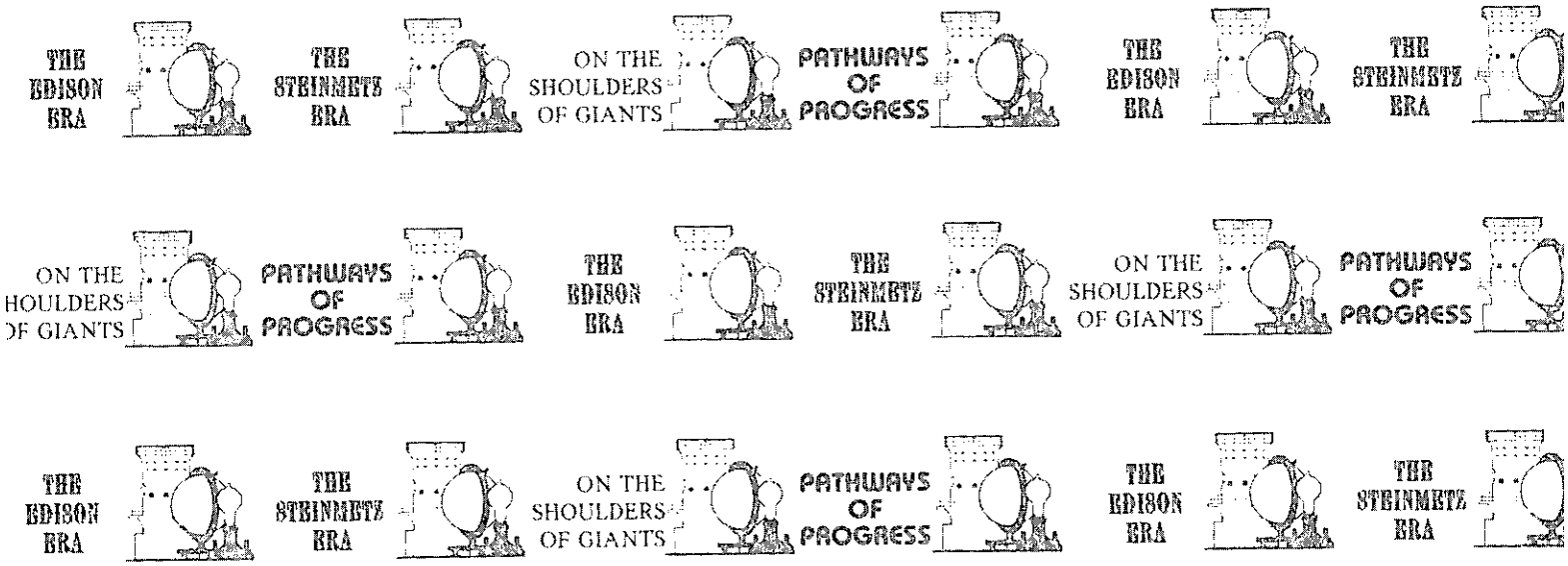
A.E. Lindholm	Mt. Vernon, Indiana	R. Zukowski	Utica, New York
J.S. Lindsay	Hendersonville, North Carolina		

Finally, we wish to pay our respect to the numerous unidentified photographers who recorded for posterity the events of their time.



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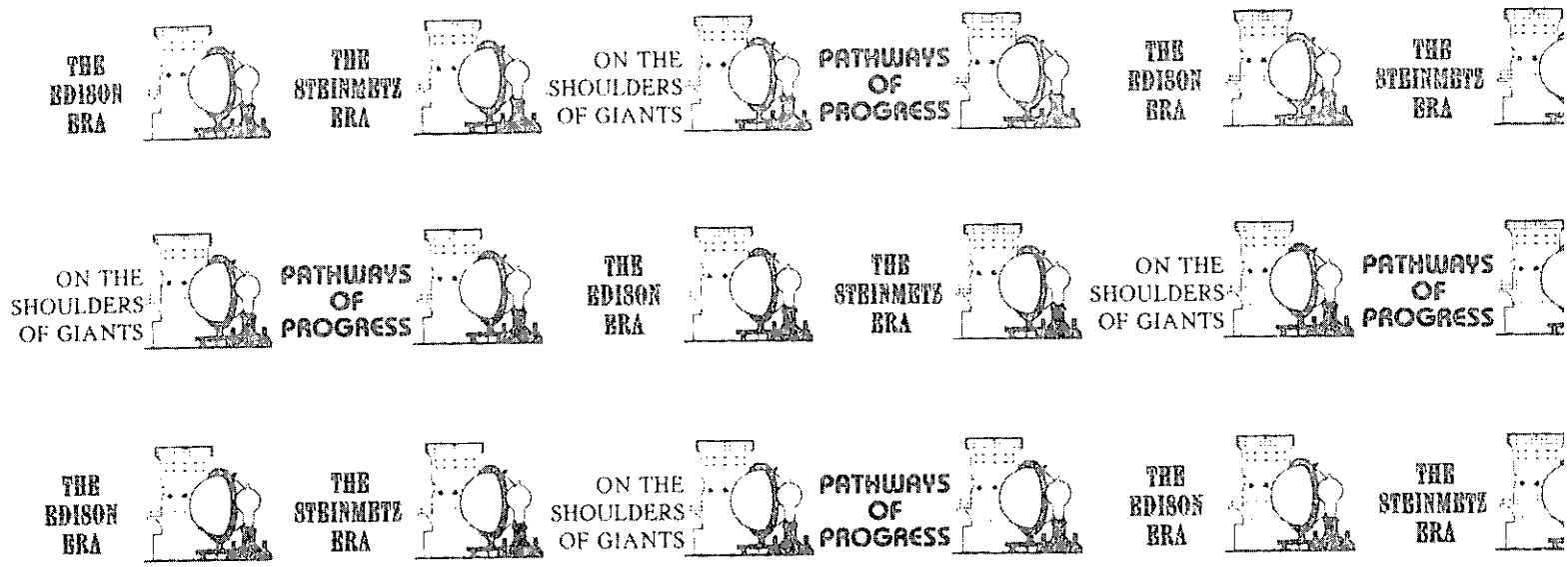

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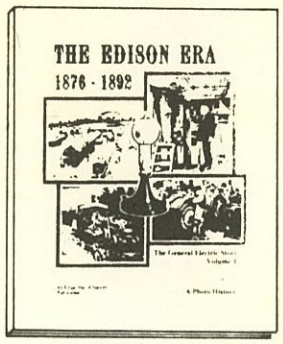

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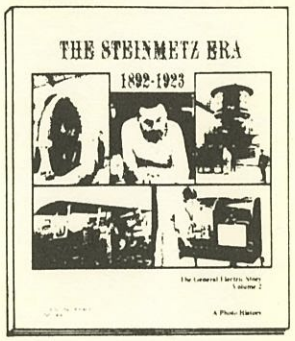

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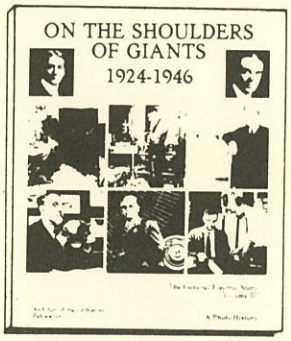

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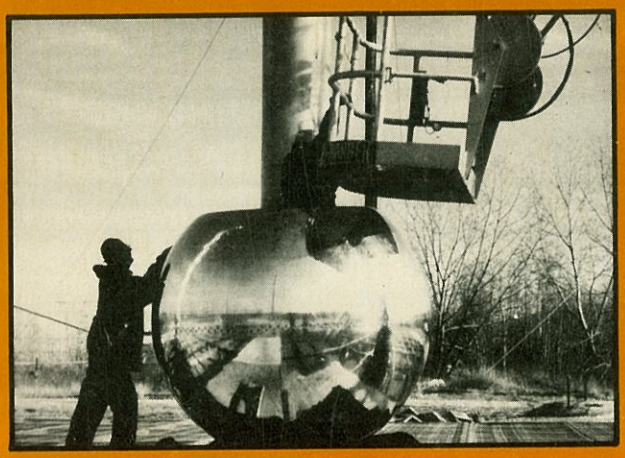

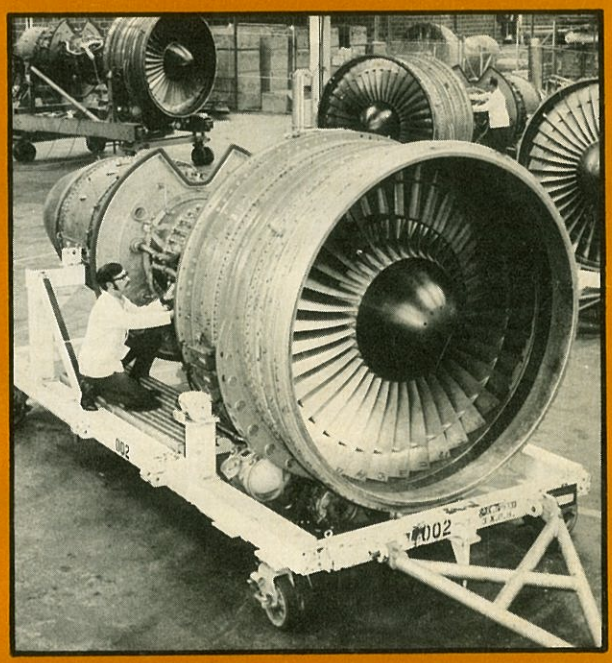

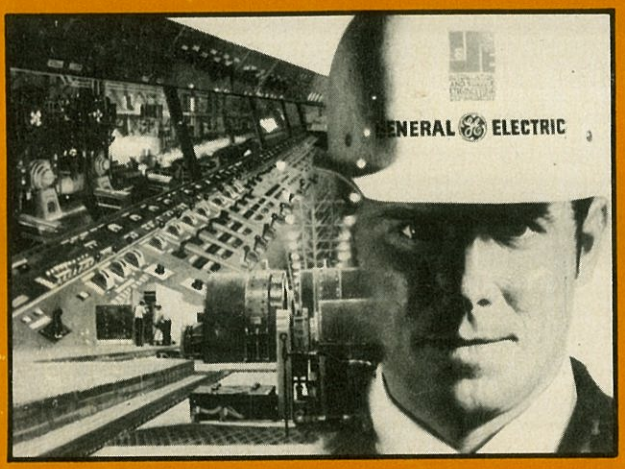
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