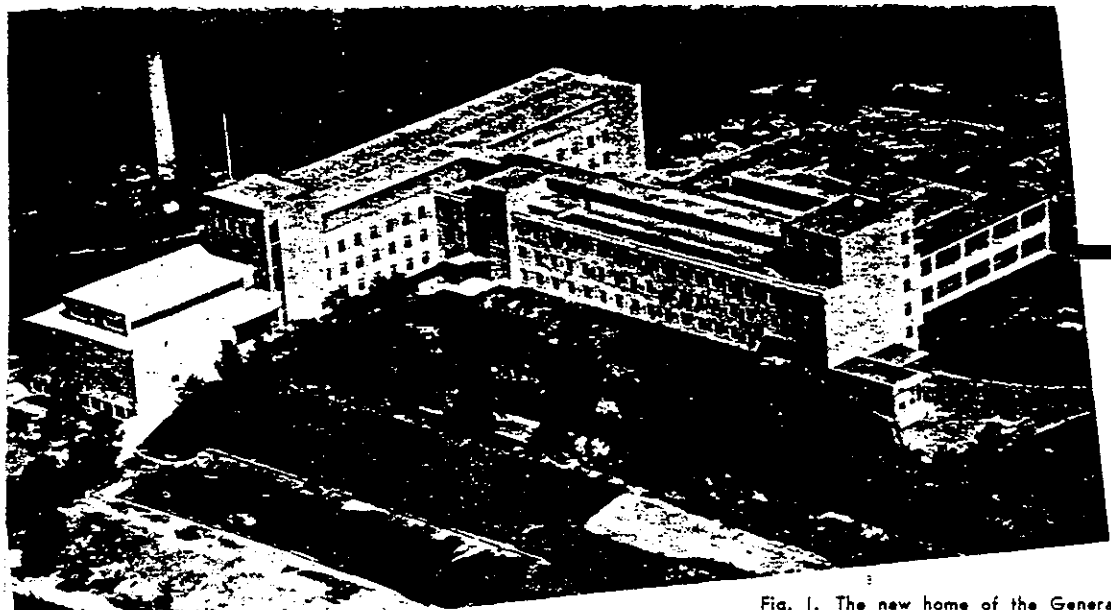

G-E

Fig. 1. The new home of the General Electric Research Laboratory located at the Knolls near Schenectady, N. Y. Five stories high (two stories below ground) it houses 107 laboratory rooms, an auditorium, a penthouse for executive offices, and shop areas

RESEARCH is a magic word. It suggests the thrill of exploration, the power of new knowledge, and the manifold benefits that accrue from a fuller understanding of nature. Fundamentally, research is the lamp of progress. Most of the arts and sciences owe their present stature and hope of future development to the revealing light of research. Modern industry derives its very lifeblood from research and our national security depends upon it.

Yet, only a few decades ago, research was confined to the comparative seclusion of university laboratories. The first industrially-sponsored laboratory in America dedicated to fundamental research was established by the General Electric Co. in 1900, just fifty years ago. That first home of the G-E research laboratory was an exceedingly humble one—a barn back of Dr. Steinmetz's Residence. Dr. Steinmetz, indeed, was one of the promotors of the idea. He, together with A. G. Davis, manager of the Patent Department, conferred with E. W. Rice, Jr., who was then technical director of the company. The proposal met with a hearty reception and immediate steps were taken to make the plan a reality. The first move was to find a man to organize the laboratory and to direct its activities. This man, they found in Dr. Willis R. Whitney, then a young chemist at MIT. He was hesitant to accept the offer because he feared that industrial research would not provide the range of interests and freedom for investigation that made academic research so attractive to him. Mr. Rice reassured him as to the rewards of industrial research in the form of scientific achievement and so far as his own interests were concerned told young Whitney to write his own ticket. Thus, there was established the principle of individual initiative that characterizes the work of the laboratory to this day.

Thus, in Steinmetz's barn Willis Whitney established himself and set about surveying the electrical field for unsolved problems that might appeal to his boundless curiosity. He found plenty of them—enough to provide stimulation and excitement for a long and fruitful career. In that pioneer laboratory there was inaugurated a research program that has grown with the years until its impact is now felt in every American home.

Soon. after the laboratory was established, the barn was destroyed by fire, and in the spring of 1901 the laboratory was transferred to a small building in the Schenectady Works. This was the first of a number of moves that came with the growth of the Laboratory, culminating in the new 18 million dollar laboratory formally dedicated on October 9.

Details of Design

This great new laboratory has been in the making since January 1945, when the project of co-ordinating the planning for new buildings and facilities began. The job was first to ascertain requirements in terms of types and quantities of services and structures needed, and then to help convert plans and new ideas into the buildings which the staff began to occupy this autumn.

The choice of the site, an estate called "The Knolls," about 5 miles from the Schenectady Works was based upon a number of factors of which the natural beauty of the site was perhaps least important. The Mohawk River on which the Laboratory is located can provide practically unlimited quantities of cooling and process water; also it furnishes means for disposing of liquid wastes after they have been properly neutralized and purified. The River furthermore permits barge transportation for fuel oil or for bulky or heavy equipment. It is close to good residential areas and has a branch line of the New York Central Railroad running through the site.

The largest item in a research laboratory budget is pay for the researchers' time. Consequently a large capital investment in specialized buildings is justified if it provides convenient services to make experimentation easier and faster. Therefore, the main building is so designed that in any room there is available any or all of the following services: hot and cold water, distilled water, laboratory drain, hydrogen, nitrogen, oxygen, city gas, compressed air—high and low pressure, rough vacuum, and 125 lb steam. Furthermore, experience teaches that the level of demand for electric service for experimental work is continually increasing so that the following electric services are available in any room: 120/208-volt, 3-phase, 4-wire, 60-cycle power; 265/440-volt, 3-phase, 4-wire, 60-cycle power; and 125/250-volt direct current.

An important part of the laboratory are the shops where special experimental tools and apparatus are made. While certain known items of equipment can be purchased as stock items, innumerable special tools and gadgets become necessary and these are more quickly made in the laboratory's own shops. These are located on the lower floors of the buildings. Here

Dedicates a LABORATORY

General Electric celebrated the 50th anniversary of the nation's first industrial research laboratory by the formal dedication of the G-E Laboratory's new home at the Knolls near Schenectady, on October 9. This new laboratory which has been built during the last few years at a cost of 18 million dollars is, without doubt, the most complete and finest laboratory in the world

the scientists can have the invaluable aid of good craftsmen either in "hay-wiring" together a "quick and dirty" gadget if that is all that is desired or in designing and constructing apparatus of considerable complexity. These shops are as nearly as possible in the physical center of the research space.

As already mentioned the site was not chosen primarily for its natural beauty but it is one of unusual charm. As the visitor approaches the main building he is impressed by the avenue of fine old trees leading to the main entrance. These trees were planted by a former owner of the property and have been left undisturbed. Nearing the entrance, one can look into and even through the lobby, for the near and far walls are entirely of glass panels.

The building has roughly the shape of the letter T, the upright part forming the first wing of the building, which was completed in the autumn of 1948. The cross wing was completed during the past summer and is now fully occupied by members of the laboratory staff.

The lobby is 32 ft wide and 60 ft deep. Through the glazed wall, one obtains a magnificent view of the Mohawk River with the Adirondack Mountains in the distance. At the left of the lobby is an auditorium, seating over 300 persons, fully equipped with modern protection equipment. The back of the stage is normally closed by two large panels of light wood, but these can be rolled back by a motor to expose the projection screen.

On the floor below the auditorium, at ground level because the building is on a ridge, is the cafeteria. From this one can go out to a terrace, and thence to the gardens.

To the right of the reception room one enters a corridor to one of the laboratory floors. Most of this floor, at the entrance level, but which is known as the third floor, is devoted to the Metallurgy Division. This floor also has on it the library, where a scientist about to embark on a new research may look up in books or technical journals earlier work which may have a bearing on his problem.

The central wing of the fourth floor is devoted to electronics research, including the development of high-power tubes for the production

Fig. 2. Thresholds to science and some of the scientists who have crossed them. Right, front to rear: Dr. Willis R. Whitney, founder and first director of the laboratory; Dr. Albert W. Hull, inventor of the magnetron and other electron tubes; and Dr. Saul Dushman, expert on high vacuum. Left, front to rear: Dr. Vincent J. Schaefer and Dr. Bernard Vonnegut, who with Dr. Irving Langmuir are famed for discovery of methods of producing snow and rain from clouds; Dr. James Cobine, expert on high frequency tubes; and Dr. Katherine B. Blodgett, known for her work on invisible films

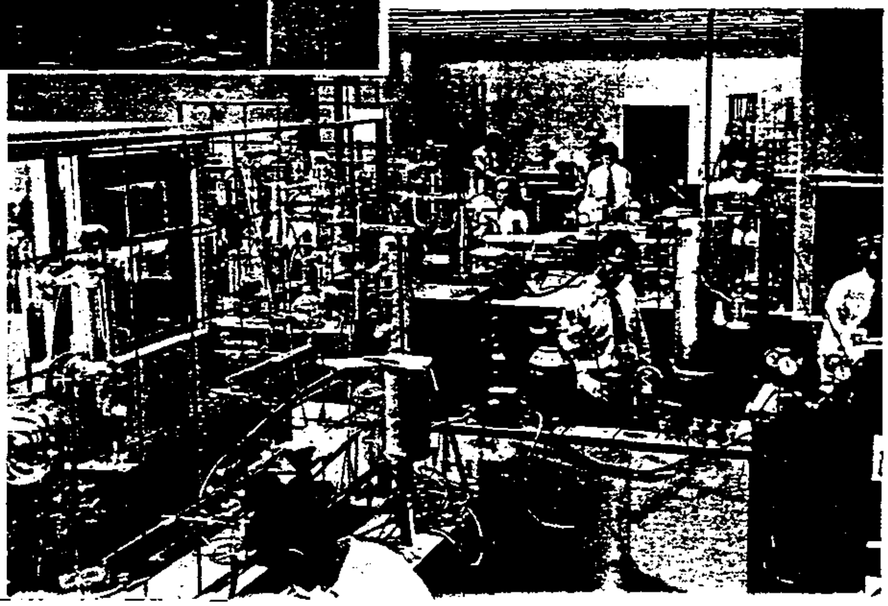

Fig. 3. Typical laboratory room in the new laboratory. Part of the Metallurgy Division, this room is devoted to the investigation of the properties of metals

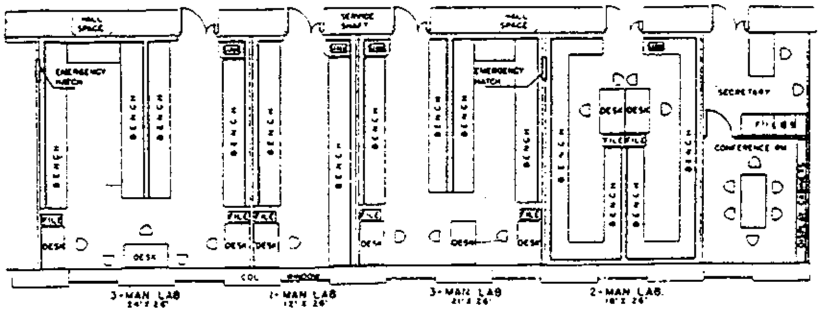

Fig. 4. Typical physics and electronics room arrangement

of short radio waves. Other electronic research, much of it concerned with television, is conducted on the fifth floor of the central wing. The fourth and fifth floors of the cross wing house the Chemistry Division.

On the second floor of the building, there are research rooms for the division of mechanical investigations, devoted to the studies of rockets, combustion, refrigeration, vibration, etc.

In addition to the main laboratory building, there are a number of others on the 180-acre tract. To the East is the Radiation Laboratory, in which a new type of accelerator known as the non-ferromagnetic synchrotron is installed. This apparatus, which is expected to yield 300,000,000-v x-rays is nearing completion. This building also houses an 80,000,000-v synchrotron, and x-ray equipment for one, two and ten-million volt radiation.

Early in the planning of the new laboratory it was necessary to decide whether a building with windows was desired or one without windows. A building without windows could be built cheaper than one with windows but a canvass of the technical employees indicated that many would not want to work continuously in a windowless building. Hence, a building with windows was built.

The exterior pilasters are made 6½ ft wide so as to allow three possible partitions, the preferred one at the center or if desired 3 ft either side of that point. This makes possible rooms having widths which are multiples of 3 ft. Room widths which are multiples of 12 ft are repetitive; the others can be arranged only in certain specific sequences.

Laboratory doors open outward from the rooms into the corridors for ease of egress. Each 4-ft wide doorway has a 1-ft-wide hinged panel which is normally bolted closed and a 3-ft-wide active leaf opening into a vestibule between service shafts. The arrangement is shown in Fig. 4. This door has a clear glass panel to provide visibility. Also, the door, when open, does not protrude into the corridor.

In general, two means of egress have been provided from each laboratory room in which hazardous work may be done. If the room is so small that it is not convenient to have two doors, escape hatches into an adjoining room have been provided at the end of the room far from the door.

For fire fighting, portable 3-, 5-, or 10-lb CO_2 hand extinguishers are provided, at least one in each room. In addition at each stairwell on each floor 50-lb CO_2 carts are located in cabinets off the corridor. The experience of the laboratory staff is that all but extremely unusual fires can be put out quickly with hand CO_2 extinguishers.

In standard research space thermostatic-type fire detectors have been installed on the ceilings with zoned drop-type indicators in the electrical control room where an operator will be stationed at all times. Basement and shop areas are protected with standard water sprinklers.

(3) All electrical and pipe services can be turned off in the shafts where they take off from the vertical feeders. Thus in the event of trouble in any room the services to the room can be turned off from the corridor without entering the room.

(4) For many years safety committees have been urging the use of solid protective grounds in addition to normal neutral wires on all electric systems. For example, single-phase lines would use three-prong plugs and sockets with the third or protective ground wire providing a means for connecting machine frames or equipment chassis solidly to ground independent of the electrical neutral or of the metal conduit whose continuity might be imperfect. Likewise, three-phase plugs without neutral would be four-prong so as to carry the protective ground wire. Furthermore, four-wire three-phase circuits in which the neutral is also carried through so that line-to-neutral voltage is available would require a fifth wire for the independent protective ground.

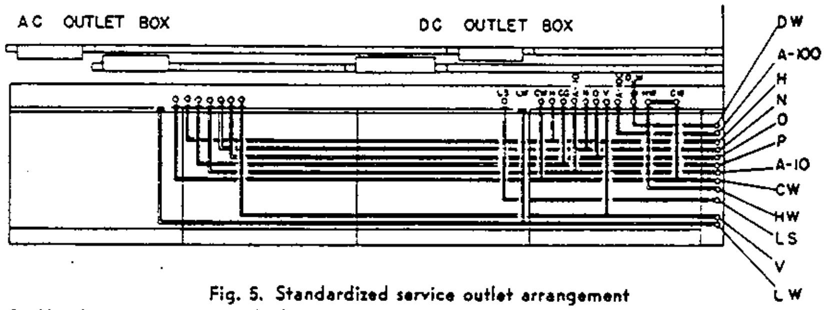

Fig. 5. Standardized service outlet arrangement

LS: Live Steam | H: Hydrogen | N: Nitrogen | A-100: Air at 100 lb
LW: Laboratory Waste | CG: City Gas | O: Oxygen | DW: Distilled Water
CW: Cold Water | A-10: Air at 10 lb | V: Vacuum | HW: Hot Water

Dedication

The dedication of this great new laboratory was attended by leaders in science and industry from all parts of the country and by some from other countries. Honored guests at the ceremonies included Dr. Willis R. Whitney, founder of the laboratory in October 1900, and its first director, and Dr. William D. Coolidge, x-ray pioneer and director emeritus. Now 82, an honorary vice president of General Electric, Dr. Whitney is still active in research.

Also in attendance were the members of the National Academy of Sciences, holding its autumn meeting at the laboratory. In the principal address, Charles E. Wilson, President of General Electric, reviewed the accomplishments of the laboratory in the past half century, and cited the necessity of industrial research to the nation's economy. Following his speech, Mr. Wilson formally dedicated the new home of the laboratory to the advancement of scientific knowledge and presented golden keys to Dr. C. G. Suits, G-E vice president and director of research.

In his acknowledgment, Dr. Suits paid tribute to Mr. Wilson's continued interest in the Research Laboratory and then unveiled a bronze plaque, at the entrance of the main building, which expresses the appreciation of the people of the Research Laboratory to the company president. Dr. Suits also unveiled two heroic glass portraits of Dr. Whitney and Dr. Coolidge. These are panels, each 33 by 57 in., set into the glass wall which forms the front of the entrance lobby to the main building. They were made by a new process developed by the Corning Glass Works in which the photographic image is formed through the glass itself.