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Rose Technic Staff
Rose-Hulman Institute of Technology

ROSE TECHNIC

OCTOBER, 1944

MEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED

Rose Polytechnic Institute proposes to offer refresher courses for all undergraduates and recent graduates when they return from military service. For the undergraduates, the refresher courses will serve as preparation for resuming the regular program; for the graduates who went directly into service, the courses will provide a review of college work before entering industrial employment.

ROSE POLYTECHNIC INSTITUTE

TERRE HAUTE, INDIANA

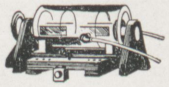
KEEPING UP WITH

Electricity

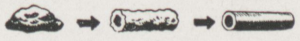
SYNTHETIC FIREFLIES... New Westinghouse fluorescent marker lamp rivals the firefly in economy of light generation. Tiny lamp, consuming only 1/10th watt, will prevent mishaps on dark stairsteps. Unlike lightning bug, it can be kept glowing continuously—at practically no cost.

1/50,000,000th OUNCE... That's the weight of a single layer of oxygen atoms the size of an air-mail stamp. Westinghouse research engineers have built a delicate balance that measures the weight of such a microscopic layer of oxide on metal—to determine resistance of special alloys to high temperatures.

POWERHOUSE ON WHEELS... The retreating enemy knows that the quickest way to paralyze a city is to destroy its powerhouse. Advancing Allies know that the quickest way to restore order is to restore power. A 5000 KW power train, built by Westinghouse, moves in on railroad tracks, hooks up to power lines, starts boiler and generator . . . then lights come on, order emerges.

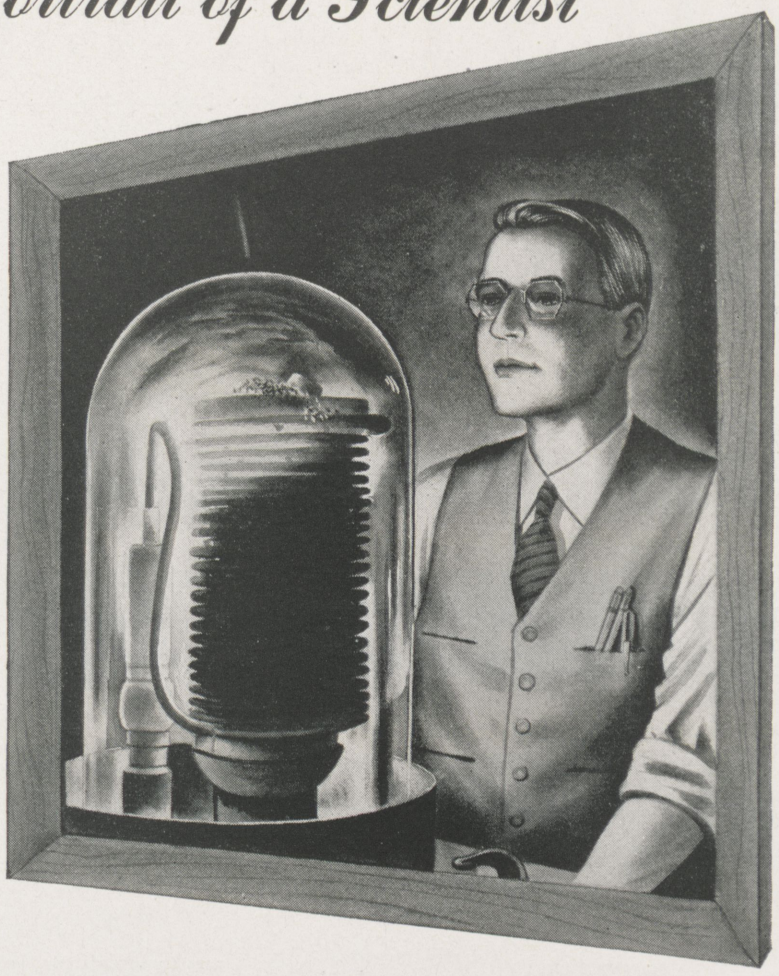


INSIDE STORY... Transparent Lucite bearings now permit research engineers to visualize performance of lubricating oil in bearings, subjected to varying operating speeds and pressures. Red pigment shows where oil goes and what it does.



PREFORMED PLASTICS... New Westinghouse process in plastics manufacture "beats" resins into cellulose fibre, then shapes mixture over perforated copper form. Plastic is peeled off and dried, then placed in heated mold and pressed into final shape. Saves time in making reinforced plastics of intricate shapes.

Portrait of a Scientist



creating a better yardstick for testing wartime metals

Spectrum analysis provides the *quickest* and *most* accurate method for checking the composition of metals used in making guns, planes, tanks and ships.

Iron has long been used as a *yardstick of comparison* in spectrography—because of the large number of lines in the iron spectrum.

Formerly, the best standard obtainable was *iron only 99.9 per cent pure*—containing impurities that produced confusing lines in spectrographic pictures.

Westinghouse research engineers tackled the difficult problem of producing a purer iron—a *better* yardstick for testing wartime metals.

They accomplished this by fusing the purest iron obtainable in a high-frequency induction furnace, surrounded by an atmosphere of hydrogen gas.

Result: iron 99.99 per cent pure—containing only 1 part metallic impurities in 10,000 parts of absolutely pure iron!

Today, this ultra-pure iron is "mass-produced" by Westinghouse at the rate of 1000 pounds per year—and is used in all parts of the anti-Axis world to improve the quality of war material.

A significant contribution, by Westinghouse, to industry at war and in the days of peace to come. *Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pa.*

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ROSE TECHNIC

VOLUME LV OCTOBER, 1944 NUMBER 3

STAFF

COVER—

Photograph taken in the welding department of the Rose shop.

—Photo by Wehle

FRONTISPIECE—

Resembling a giant starfish, this 27-ton mass of steel was machined at the East Pittsburgh Works of the Westinghouse Electrical and Manufacturing Company. It's the skeleton of a waterwheel generator for the Watt's Bar Project of the Tennessee Valley Authority, which will supply power to aluminum, aircraft and other war-busy industrial plants in that area. The starfish is 22 feet in diameter and will whirl around 95 times a minute inside the generator.

—Cut Courtesy Westinghouse.

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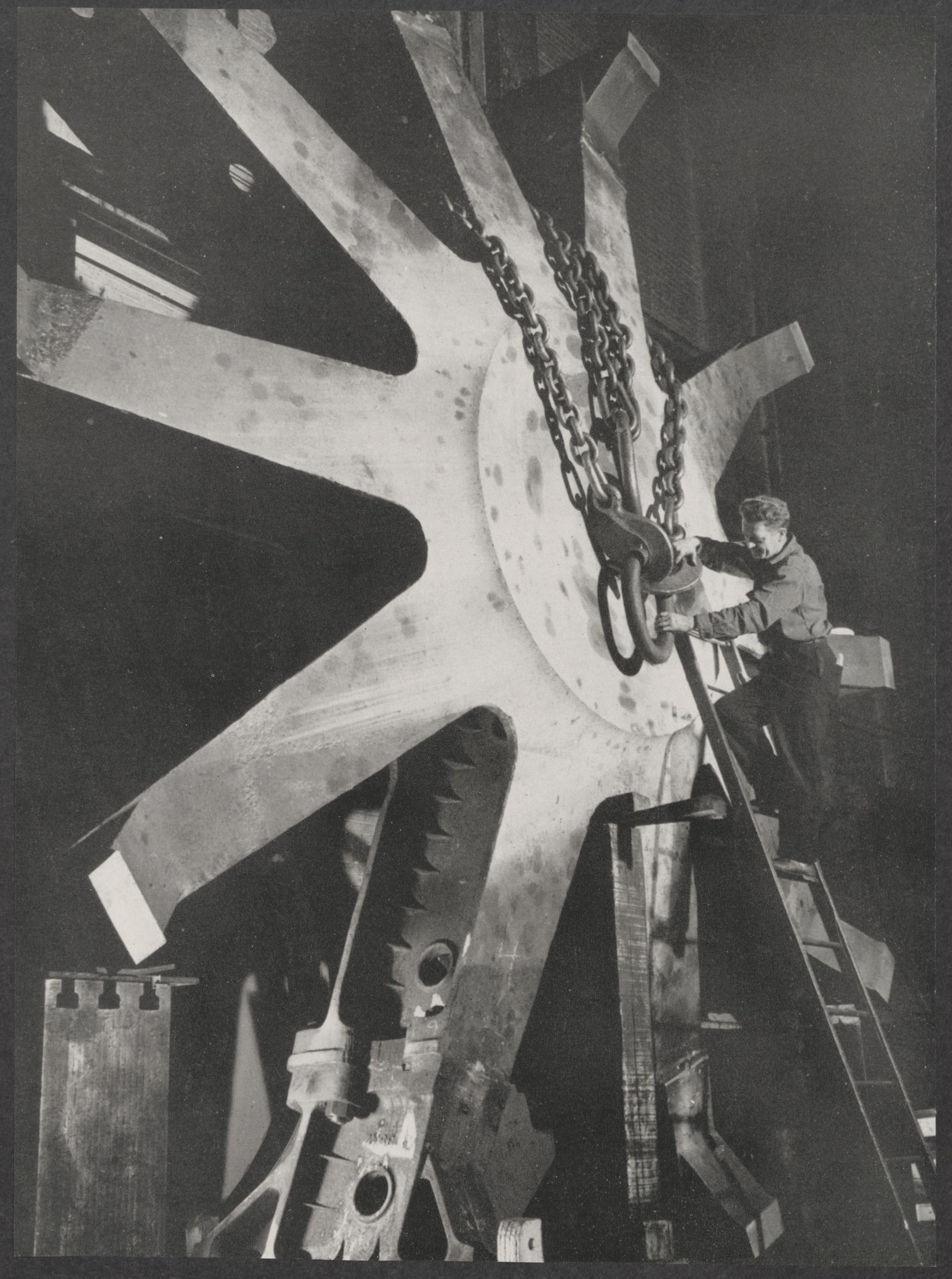
The Engineer

In the midst of our hurried wartime courses it is well to stop and consider what engineering consists of and what it stands for. Webster defines engineering as "the science by which the properties of matter and the sources of power in nature are made useful to man in structures, machines, and manufactured products." This definition clearly shows how wide-spread are the duties of the engineer toward mankind. His is the task of designing and operating the machines of science and industry. It is he who develops transportation, power, and communication. At present the engineer's task is an unpleasant one because the nations of the world have turned the fruits of his labor into the machinery of destruction.

Nothing is more ridiculous than to blame the engineer for the misuse of his work that is evidenced by this war. Destruction is not the goal toward which engineering training and development is directed. If, however, a nation is to preserve its very existence in times such as these it must mobilize all of its resources into preparation for self-defense; and engineering skill is one of its most valuable resources. Therefore, while we must direct all of our actions toward the conclusion of this world conflict, it is still advisable to prepare for that day when engineering can once again proceed, without the demands of war, to fill its normal place in the progress of the world.

The engineer, because of the great part he plays in our modern civilization and because the safety of a great part of humanity is placed in his hands, is usually considered a professional man. To achieve this standing he must attend and meet the requirements of an accredited engineering institution. The education he receives must be something wider and more diversified than the bare technical training in his field, for a successful engineer is a man of broad understanding, conscious of social needs and trends. This fact is indicated by the government's wartime training programs, which, while being essentially designed for technical training, even include courses in liberal arts, and the so-called humanities. Colleges are attempting to meet these requirements with extra-curricular programs designed to aid the student in acquiring a broad foundation for his engineering career.

Students now entering engineering colleges will be expected to carry on the standards and ideals which have always been maintained in these institutions. These classes will receive their training partly in war and partly, we sincerely hope, in peace; it is logical to expect, during this transfer from war to peace, the same momentary confusion and disorder experienced at the outset of the war. The ability of these men to weather the change without suffering a serious setback will be a measure of their future ability to meet the everyday problems faced by an engineer.



Refrigeration By Absorption

By JOHN PREWITT WEHLE, jr., e.e.

The possibility of producing refrigeration by an absorption-vaporization process has intrigued scientists since the earliest experiments of Michael Faraday, more than a hundred years ago. Success was finally attained by two Swedish students, who in 1926 patented the first practical unit operating on the principle of "ice from heat". Mr. Wehle discusses here the fundamental theory, history, and development of this method of refrigeration, which is becoming more and more popular for industrial and domestic applications.

The absorption system of refrigeration is one in which the energy necessary to change the conditions which complete the refrigeration cycle is supplied as heat instead of mechanical energy.

An absorption unit consists of four main parts: the heat element, the absorber, the condenser, and the evaporator or cooling coils. Chemicals found in the system include a a refrigerant, an absorbent, and a pressure gas.

As the refrigerant gas passes into the absorber it is taken up by the absorbent. The saturated absorbent is heated, and as the warm refrigerant gas is given up, it rises into the condenser. The pressure maintained by pressure gas and heat taken from the condenser coils by a cooling agent (circulating water or air) liquifies the refrigerant. The liquid refrigerant then passes into cooling coils where it takes the heat necessary for its vaporization from the surroundings of the coils. This leaves the coils and the space around them cold, thus producing refrigeration at the desired place. As the liquid refrigerant vaporizes, the cool vapors fall to the absorber where the cycle may begin again.

This process, while it is one of the oldest refrigeration systems, is not used in many models of domestic refrigerators. However, it has been quite successfully employed in the Servel "Electrolux" where moving parts have been completely eliminated. This model uses an ammonia refrigerant, water absorbent, with hydrogen as a pressure gas. Since air is used as the coil-cooling agent, no circulation pump is required in this model. The "Electrolux" was perfected by two Swedish students, Platen and Munters, and is the most popular of the absorption units using a liquid absorbent.

All refrigeration is accomplished by the changing of state (either solid to liquid or liquid to vapor) of some material known as the refrigerant. The heat required to change a block of ice into water must come from its surroundings, and this tendency to make a thermal equilibrium leaves the surroundings cold.

In a continuously operating refrigerator some system must be devised to liquify the gas refrigerant so that it may be used again to take external heat for vaporization. There are two principal methods for effecting this liquifaction: Compression and Absorption. This paper is concerned with the latter method. The difference in the two is explained by Tressler and Evers, who state: "The essential difference between absorption and compression is in the method of increasing the pressure between the evaporator and the condenser."

Except in these respects the two systems are very similar. They have similar condensing coils, receivers, and cooling coils. The compressor is merely replaced by the heating elements; and moving parts, especially in domestic models, are reduced to a minimum. There are two principal types of absorption refrigerators, the solid and the liquid. They are so named for the type of absorbent material used to collect the gas refrigerant. The liquid type generally uses a water absorbent and an ammonia refrigerant, while the chemicals used in the solid process vary. These two processes are to be explained further in the following pages.

Some of the earliest experiments of refrigeration were centered around absorption. Michael Faraday, in 1824, while performing experiments on liquifaction of "fixed gases", which were thought to exist only in the vapor state, worked with chlorine, oxygen, hydrogen, and ammonia. While working with ammonia he took a quantity of silver chloride, which will absorb great quantities of ammonia, and sealed the saturated compound in one end of an inverted V tube. Heat was applied to the powder, while the other end of the tube was cooled in a water bath. At the cool end of the tube a colorless condensation appeared which Faraday knew to be liquid ammonia. Having obtained a sufficient amount of the liquid, he removed the heat source and began to examine the condensation. While he watched, the liquid ammonia began to boil violently and as it vaporized it was again absorbed by the silver salt. When Faraday touched the end of the tube where the liquid was rapidly disappearing, he found it intensely cold, for the ammonia was taking heat from its glass surroundings in order to vaporize. This is an experiment which demonstrates the basic principle of absorption as it has been since developed for use in commercial refrigerators.

It was not until 1860 that a Frenchman named Frederick Carre made the first continuous operating absorption refrigerating machine. This embodied a water absorbent and an ammonia refrigerant in a two-cycle process and was the forerunner of the modern liquid absorber. Many of the models were used in breweries, distilleries, and other plants where there is an abundance of heat available and refrigeration is necessary.

In the 1890's Geppert, a German, began work on a more compact unit in which he planned to avoid clogged

valves and failing pumps by the elimination of moving parts. He too used the aqua-ammonia solution, but he introduced a third medium which was his greatest contribution to absorption refrigeration. This was a gas which was to allow the evaporation of the liquid ammonia without requiring a drop in total pressure. In 1899 he built a successful model, but throughout his career he was unable to attain his goal—complete elimination of the circulating pump.

By 1920 there was still no practical domestic absorption unit, but in 1922 two Swedish students from Stockholm attending the Royal Swedish Institute of Technology perfected a design for a workable, salable unit. These ingenious young men were Blatzer Carl von Platen and Carl George Munters. They worked independently of Geppert, but one by one they overcame all the pitfalls which had stopped him. They made use of the pressure gas for circulation and were thus able to realize Geppert's hopes, a refrigerator without moving parts. Rarely has an invention required less time to perfect.

This unit was patented in the United States on December 7, 1926, and soon the Servel Company paid Platen and Munters $5,000,000 for the patent rights in this country. Today the Servel "Electrolux" embodies this patent and with several refinements is the unit developed by Platen and Munters.

Solid Process Absorption

The solid absorbent system is often called the Faraday system, for it still works on the principles of his experiment mentioned previously. The refrigerant is allowed to be absorbed in a solid absorbent. When this is heated the warm gases rise into the condenser, are cooled at this pressure, and become liquid. In the chilling unit the liquid gas is again vaporized as heat is taken from the inside of the refrigerator. During this time when the liquid refrigerant is vaporizing the heat is discontinued. This allows the cooler gas to flow down to the absorber where it again saturates the absorbent. This system of intermittent heating breaks the process into two periods, known as the period of generation and the period of absorption. This intermittent operation makes the solid absorption unit rather inefficient. Sometimes two generators are installed so that one may be generating while the other is absorbing. Capacity is gained in some cases by the addition of a third generator.

While ammonia is generally used in conjunction with a calcium chloride absorbent, the solid absorption system is by no means confined to the use of these chemicals. Silica Gel, a form of silicon dioxide resembling quartz sand in its hard glossy appearance, is an excellent absorbent for a sulfur dioxide refrigerant. Other absorbents which are used with ammonia are chlorides of Barium and Strontium, as well as methyl and ethyl amine.

Several domestic models which embody the Solid Absorption system have been placed on the market. Among them is the "Superfex" made by the Perfection Stove Company of Cleveland, Ohio.

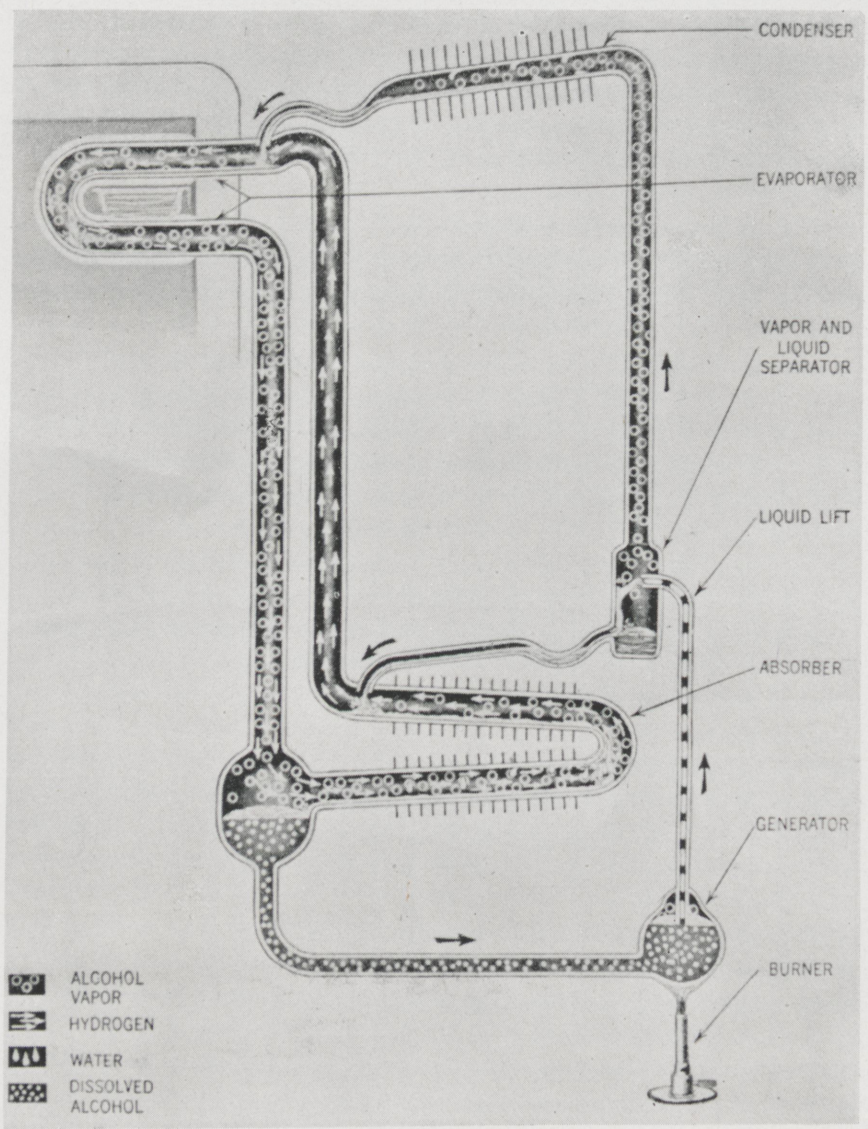


Photo Courtesy Servel, Inc.

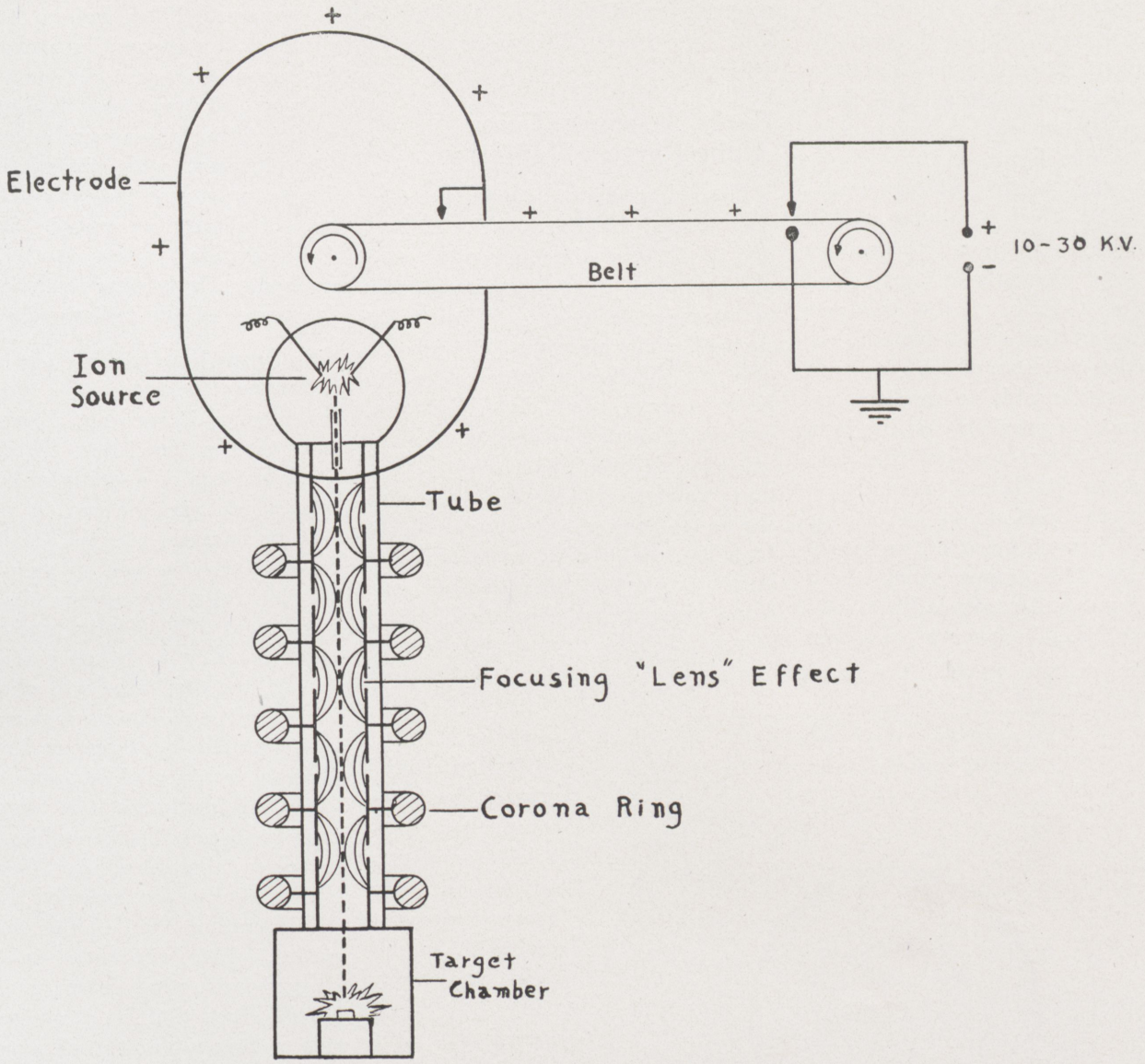
Electrolux Absorption Refrigeration Unit.

Liquid Process Absorption

This form of absorption refrigeration has reached its greatest perfection in the Platen and Munters

(*Continued on Page 22*)

model previously mentioned. Since this type manufactured by Servel, Incorporated, of Evansville, Indiana, is the most widespread of any absorption refrigerator, this model is discussed as representative of liquid



Sketch illustrating Van de Graff Generator.

Artificial Atomic Disintegration

By FRED MAIENSCHEIN, jr., ch.e., and CHARLES BASHE, jr., e.e.

Nearly everyone has heard or read something about "atom smashing", but most people have only a vague idea of the meaning of the term and the importance of this type of work. The following discussion presents some of the more important methods for producing atomic disintegrations and uses of the resulting radioactive materials.

The most important purpose of artificial atomic disintegration at the present time is its use in investigating the structure of the atom. Scientists have long had a fairly good idea of the external electronic structure of the atom, but the exploration of the nucleus has taken place largely in the past two decades. The method used consists of shooting high-velocity particles of extremely small size at the nucleus of an atom and observing the transformations that take place. The first particles used as "bullets" in these experiments were the alpha particles emitted by naturally radioactive substances. Other particles that have since come into use include the proton, the deuteron, the neutron, and the photon, of which the neutron is the most versatile and important. The particles are sometimes given the high velocities by means of an evacuated tube across which is impressed a high voltage. The particles, admitted at one end of the tube, speed to the other end, where they strike the target. Since the tube is evacuated, there are no air molecules to slow the particles down, and they attain enormous velocities. The difficult problem is the generation of sufficiently high voltages, and this paper has to do chiefly with the instruments which have been designed for this work.

Several important incidental results have been obtained from the experiments in atomic disintegration. One of the most interesting of these is transmutation of the elements, for centuries the dream of the alchemists. A wide variety of transmutations can be effected, but the goal of modern physicists is not to produce such rare elements as gold and platinum. Certain of the products of transmutation are unstable or radioactive isotopes, which may soon prove indispensable to medical science. Another possibility in the field of atomic disintegration that has been much publicized recently is that of the utilization of atomic power. Everyone has read such proposals as "The atomic energy in a glass of water, if converted into useful work, would power a passenger train around the world." The most concrete work done in this field is that concerning U^{235}, an isotope of Uranium.

Early Attempts Using Alpha-Particle Radiation

The study of atomic disintegration was opened by Becquerel's discovery in 1896 of the darkening of a photographic plate upon exposure to uranium-potassium sulfate. He showed that uranium compounds gave off a radiation which, like the X-rays discovered by Roentgen, were capable of discharging an electroscope. It was later shown that these gamma rays were only one of the three types of rays given off by so-called radioactive materials. The other two types of radiations are alpha rays, which consist of helium ions; and beta rays or streams of electrons.

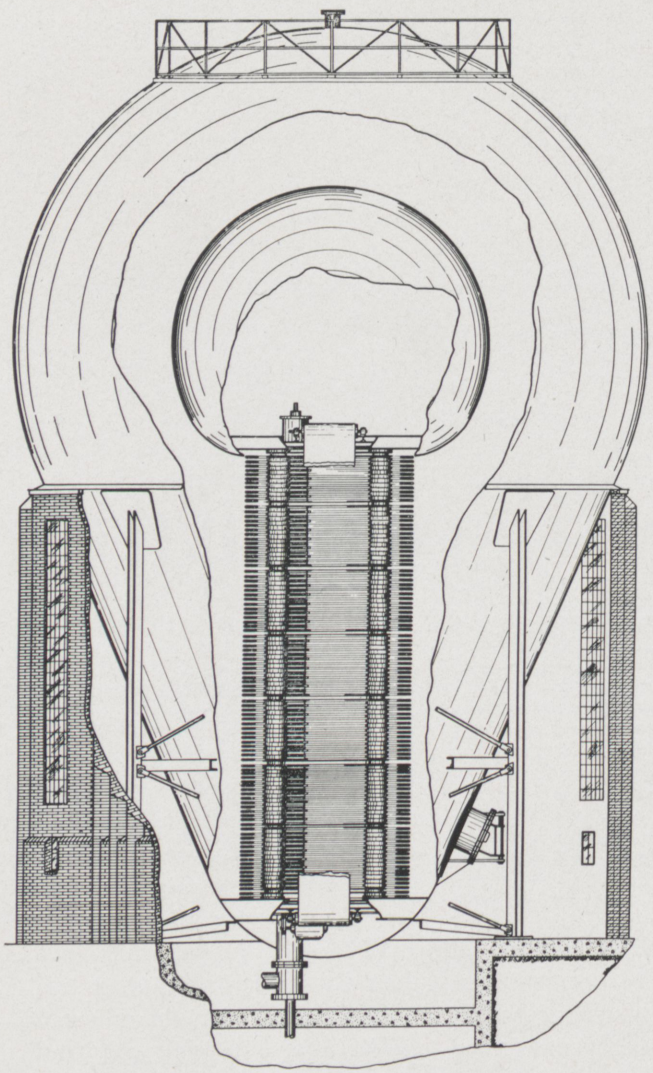


Photo Courtesy Carnegie Institution

Schematic diagram of the Atomic-Physico Observatory of the Dept. of Terrestrial Magnetism of the Carnegie Institution of Washington.

It was not, however, until 1919 that Rutherford first accomplished artificial atomic disintegration. He exposed nitrogen gas to the alpha radiation of radium C, and proved that protons were knocked from the nitrogen nuclei, and the atoms of the gas were disintegrated. The products of this disintegration are hydrogen and an isotope of oxygen, having an atomic weight of 17. This transmutation may be expressed as follows:

$$ {}_{7}N^{14} + {}_{2}He^{4} \rightarrow {}_{1}H^{1} + {}_{8}O^{17}. $$

From this atomic equation it is seen that when nitrogen (7 protons, 7 neutrons) is bombarded by helium ions (2 protons, 2 neutrons), there are left hydrogen (one proton) and isotopic oxygen (8 protons, 9 neutrons) nuclei. Other gases were substituted for nitrogen, with similar results. These early experiments can hardly be considered as purely artificial disintegration, since a naturally radioactive substance was used as the source of the radiations.

The Impulse Generator

The next device of this type, also invented by Brasch and Lange, was the impulse generator. This apparatus consists of a group of condensers which are charged in parallel and discharged in series. If ten condensers are charged in parallel at 100,000 volts, the series discharge will be at 1,000,000 volts. Since it takes some time to charge a condenser, the discharge will obviously be intermittent. The process is greatly facilitated by charging the condensers in parallel through water tubes. An insulating tube filled with water will not allow a sudden surge to pass; therefore the discharge must travel in the intended (series) circuit, rather than in the charging circuit. This apparatus is distinguished from other "atom smashers" by the fact that its impulse lasts only a few millionths of a second. The current during that time is over 1000 amperes, and the machine, made to discharge once each second, can deliver the equivalent of a continuous current of one milliampere. This apparatus, operating at voltages of one to ten million, is a very convenient source for the production of high-speed particles, and may again come into wide use in obtaining radioactive materials such as "tagged atoms", which will be discussed later. Some of the most important early work with the impulse generator was done by Cockcroft and Walton, at the University of Cambridge. Many of the first reports concerning the operation of the apparatus came from the Cambridge laboratory and was confirmed by Brasch and Lange.

The Vacuum-Tube Rectifier

Early experimenters, notably

Cockcroft and Walton, achieved considerable success in generating high d.c. potentials with an arrangement of vacuum-tube rectifiers, having their outputs connected in series. This high potential was then applied across the ends of an accelerating tube filled with positive ions. Potentials of over 700 KV and proton currents of ten microamperes were produced in this way. Particles with energies of one million electron volts (MEV) have been produced in this type of apparatus. In their original experiment Cockcroft and Walton used potentials of about 150,000 EV. Hydrogen ions, produced in an auxiliary tube, were passed into the main accelerating tube. After acceleration they emerged through a small window and struck a target of lithium. The lithium gave off alpha particles, which could be detected by an ionization chamber or by the scintillations produced on a fluorescent screen. The reaction is as follows:

$$_3Li^7 + {}_1H^1 \rightarrow 2 \cdot {}_2He^4$$

The alpha particles were ejected in pairs travelling in opposite directions along the same straight line. They were ejected with an initial kinetic energy of about 8.5 MV, which gave them a range in air of 9 cm. This energy is greater than that imparted to a single proton, but only about one proton in ten thousand produces a disintegration, so that the net effect is, as expected, a loss in energy.

The Van de Graaff Generator

The most successful device for developing the high voltages required in atom smashing has been the electrostatic generator developed by R. J. Van de Graaff. This machine, in its original form, consists essentially of two large hollow metal spheres which are charged at very high potentials, the one positive, and the other negative. An accelerating tube is placed between the two spheres, and charged particles introduced into the tube at one end are accelerated toward the other end, acquiring tremendous kinetic energies.

Each sphere is charged by means of an endless belt of some flexible, insulating material, driven by a motor and extending to the interior of the sphere through a hole in the shell. The belt is constantly receiving an electric charge and transferring it to the sphere. This transfer of charge is accomplished as follows in the case of the positive sphere: Two electrodes are so arranged that the belt passes between them on its journey toward the shell. One electrode, which consists of a fine wire or system of points almost touching the belt, is connected to the positive terminal of some such source of high voltage as a transformer-rectifier set. The other electrode, which is connected to the negative terminal, has a large, smooth surface and therefore strongly attracts charges of positive sign. Under these conditions a brush discharge can be maintained, positive electricity being sprayed onto the belt. In the simplest form of this machine, another pointed electrode inside the sphere would attract the charge from the belt and transfer it to the sphere. In actual construction, the sphere also contains a system whereby *negative* electricity is sprayed *onto* the belt and carried away. Obviously, this greatly increases the speed with which the sphere is charged. The negative sphere is charged in a similar manner and from the same primary source of voltage, but in this case the initial charge sprayed onto the belt is negative instead of positive.

When charged particles are accelerated from one electrode of this apparatus to the other, they constitute an electric current and hence deplete the charge on the spheres. Thus it is necessary to operate the belt at great speed if an appreciable

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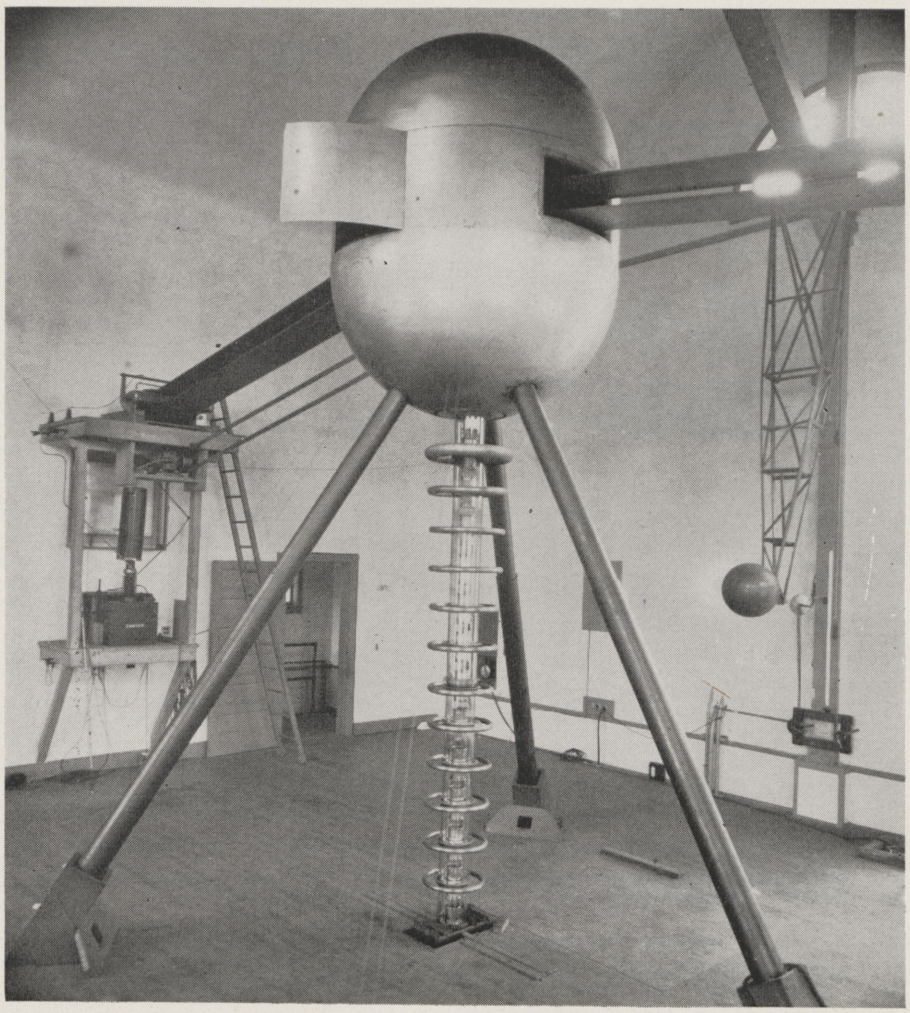


Photo Courtesy Carnegie Institution

1,200,000-volt electrostatic generator, Dept. of Terrestrial Magnetism, Carnegie Institution of Washington.

Dehumidification and

The removal of moisture from industrial gases is at times a very important problem. A great number of methods have been devised for removing this moisture under various conditions existing in industrial plants. Mr. Logsdon's article concerns the two principal processes by which water is generally collected in modern installations.

It often becomes necessary in industry to remove the moisture from the air or other gases, and this is usually accomplished by dehumidification or dehydration. The purpose of this report is to discuss the various methods of dehumidification and dehydration and the merits, characteristics, and advantages of each. Before going any farther, it is necessary that one have some of the basic definitions concerning this subject in mind.

To many there is little distinction between the terms dehumidification and dehydration, since both denote the loss of water. Dehumidification, however, usually means the condensing of water vapor at a temperature below the dewpoint from air or other gases by refrigeration. Dehydration, on the other hand, is usually associated with the removal of water vapor from air or other gases by adsorption or absorption with liquid or solid desiccants without cooling the gas below the dewpoint.

In talking about dehydration by the use of desiccants, one must distinguish between adsorption and absorption. Adsorption is the removal of water vapor from air or other gases by solid desiccants or adsorbents, while absorption is the removal of water vapor by liquid desiccants or absorbents.

Dehumidification

Dehumidification is probably the oldest of the two methods industrially. The conventional method of dehumidification is by compression; however one must not overlook the fact that this method may also be carried out by absorption. The first really important work on dehumidification was carried on around the close of the nineteenth century by James Gayley.

In both England and America a large amount of work had been done on the proposal that the water vapor be removed by calcium chloride; however all attempts had been proved impractical on account of the rapidly diminishing power of absorption possessed by calcium chloride. Gayley, observing a reduction of moisture in the air through a reduction of atmospheric temperature, concluded that the most obvious method of removing the moisture from the air was by a reduction of atmospheric temperature through mechanical refrigeration. It was on this basis that he began his first experiments in 1890.

Between 1890 and 1904, when the first dry air installation was installed at the Isabella Furnaces at Pittsburgh, Gayley and his assistant, Mr. Walker, carried on a large amount of research and investigated many methods of drying air by refrigeration. They finally decided upon removing the moisture from the air by passing the air through a chamber filled with pipes, which were cooled by brine. When this process was put into practice in 1904, a fuel economy of 15 per cent was obtained and with a 15 per cent increase in output. Within a very few years, this had become a standard process in the iron smelting industry; and for his outstanding work in metallurgical chemistry, Gayley was awarded the Perkins Medal in 1913.

The principles used by Gayley are the same ones used in the dehumidification industry today. Dehumidification is almost always used in the separation of condensable vapors from non-condensable gases. The best example of dehumidification is probably illustrated by the removal of water vapor from air. Air is either brought in contact with cooled surfaces or passed through an air washer in direct contact with cooled water. Cooled surfaces usually mean coils filled with brine or

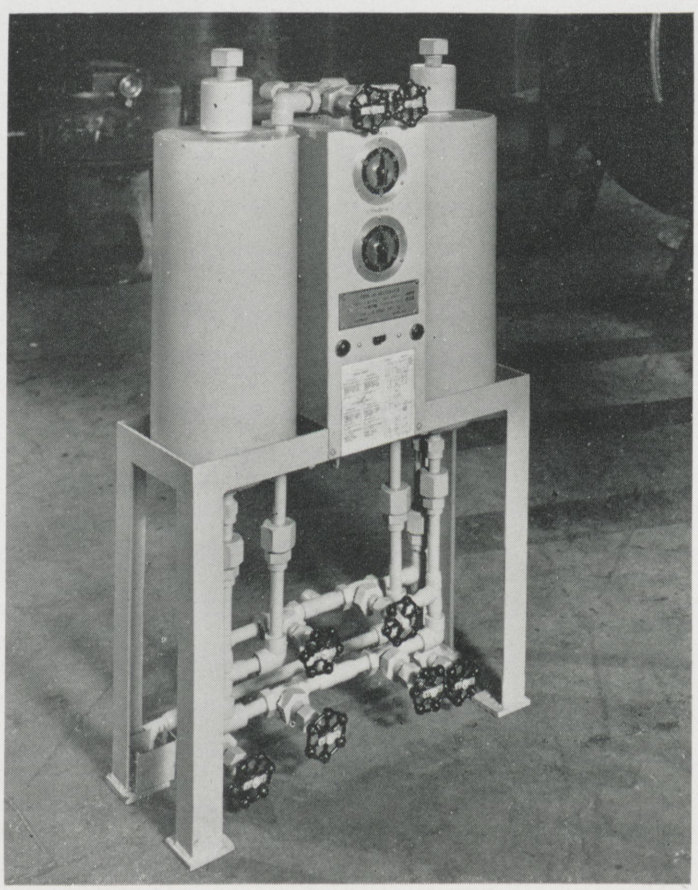


Photo Courtesy C. M. Kemp Co.

KSG dual tower Oxygen Dryer (Linds)

Dehydration of Gases

By ROBERT E. LOGSDON, jr., ch.e.

cooled water.

Since the compression method is the most widely used method of refrigeration in dehumidification, it is essential that one know the different types of compressor systems. These systems vary most in the type of power and refrigerant they use. The reciprocating compressor, usually driven by electric motors or gas engines, uses carbon dioxide or ammonia as the refrigerant on account of their small specific volume under operating conditions.

The centrifugal compressor, driven by electric motors and steam turbines, uses refrigerants of high specific volumes and low condensing pressures—for example, water and methylene chloride. Rotary compressors differ little from the reciprocating compressors, but the new steam jet vacuum type is rapidly gaining favor. One reason for this is that they use exhaust steam for power and may operate between 12-125 lb. per. sq. in. steam pressure.

Dehydration

Dehydration is rapidly emerging as the favorite method of removing water vapor from gases. The dehydration method is probably of greatest value where it is desirable to maintain humidity conditions without regard to dry bulb temperatures and where precise control of moisture content is required. The materials used to remove water vapor from gases are called desiccants, and the water is removed by adsorption or absorption.

Almost any solid has the ability of absorbing gases or vapors to a certain limited degree. The amount of gas or vapor that certain solids are capable of absorbing is practically negligible on account of their small surface area; therefore they have no value in the process of dehydration. Certain solids—silica gel, activated alumina, and activated carbon—have enormous surface areas and may be used as desiccants. These have a large absorptive capacity and do not change in chemical or physical characteristics when absorbing gases or vapors.

Whether a liquid is a suitable desiccant or not depends upon several factors—the water capacity of a solution, the chemical stability of a solution at high temperatures, the eutectic temperature, and many others. The absorbents each differ in the dryness of air that may be obtained. Many of the absorbents have only the ability to dehydrate gases to around 20 per cent relative humidity. In certain industrial processes where much drier gases are needed calcium or lithium chloride may be used, and for very dry gases sulfuric or phosphoric acids are more suitable absorbents.

Lithium Chloride

The hygroscopic salt most widely used for absorbing water vapor from air is lithium chloride on account of the relatively low dew points obtainable even at fairly high temperatures. Another important advantage of this chloride is that the concentrated solutions such as are used in dehydrating will not crystalize at temperatures encountered.

Lithium chloride is not a poison and is not readily flammable or volatile. This makes it very safe to handle, and since it is very stable, it may be used at high temperatures. Also after absorbing water vapor or gases it may be regenerated to its original concentration and used again.

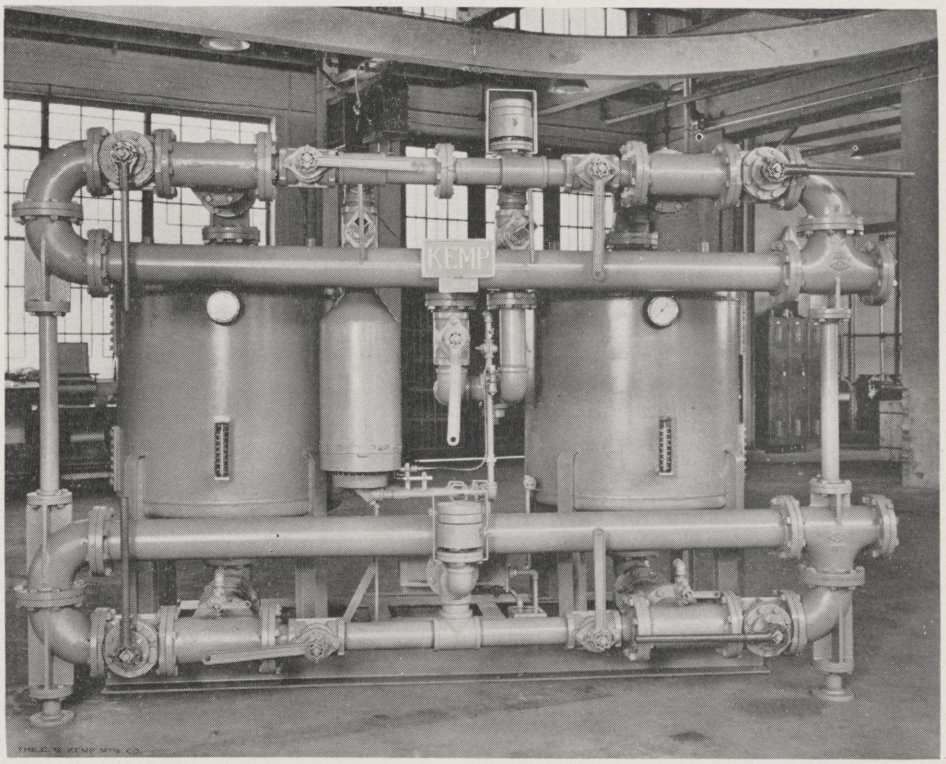


Photo Courtesy C. M. Kemp Co.

Dual tower Silica Gel process-air dehydrator.

Calcium Chloride

Calcium chloride, like lithium chloride, is used where a moderate degree of dryness is required. It is also one of the cheapest desiccants

(*Continued on Page* 26)

Research and Development

Edited by KEITH SUTTON, freshman

G-E Jet Propulsion Plant

General Electric's second largest wartime plant, built two years ago for the manufacture of war equipment which is no longer required by the allied forces, is being converted for the production of jet propulsion aircraft turbines.

Because of its more than 40 years experience in the manufacture of steam turbines, and since World War I of the turbo-supercharger, now used on practically all American bombing planes, General Electric was chosen by the War Department to head-up the production of this new type fighting weapon. Even though an entire plant of more than 600,000 square feet of floor space is being converted for this work, its output will not be sufficient to meet government's requirements, so General Electric has turned over the jet propulsion drawings and specifications, prepared by its engineers, to another large corporation formerly engaged in manufacture of airplane engines.

The jet propulsion airplane turbine, first conceived by Flight Commander Frank Whittle and built by the British Thomson-Houston Company, Ltd., was sent to this country for further development.

The basic principle which underlies jet propulsion is not new. It has been known for hundreds of years, since the days of Galileo and Isaac Newton. The new power plant is a successful and ingenious application of Newton's third law of motion—which states that to every action there is an equal and apposite reaction.

This principle is familiar to everyone. It is the backward "kick of the gases produced in a skyrocket that drives the rocket upward and forward. And there is a still more familiar example, the rotary dawn sprinkler. The jets of water go in one direction, and the reaction causes the frame that holds the nozzles to revolve in the opposite direction. You might say that the lawn sprinkler was whirled by jet propulsion.

An aspect of jet propulsion that puzzles many people is that in the substratosphere, where the air is very thin, an airplane propeller has a hard time. It has less and less air to bite into and pull the plane along. Actually up there, the propellerless jet turbine works better, because the air resistance on the plane is less, and the jet power plant doesn't have to have air to push against. It doesn't push against anything that it doesn't provide itself. The jet of gases moves in one direction; the inevitable reaction pushes the plane in the opposite direction. Theoretically, the jet propulsion principle would work just as well in a perfect vacuum—though, of course, some way would have to be found to support the plane and provide the air for the operation of the jet propulsion turbine.

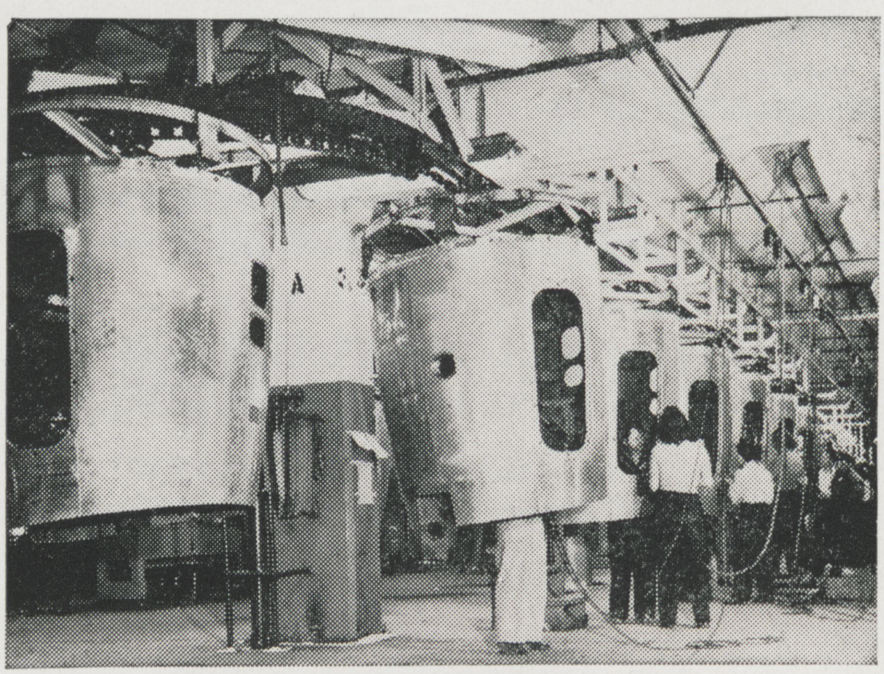
Conveyors Speed Production

Conveyorization, the rapid and efficient handling of industrial materials in volume, is prominent among several factors which have been combined to make an automotive company one of the world's largest producers of hydromatic aircraft propellers.

In another instance a former automobile body manufacturer has relied on new-type conveyors to forge ahead as a leading supplier of wingtips and engine nacelles for the Thunderbolt and Flying Fortress.

These accomplishments are the result of answers found for problems faced by many other companies in the industry when they were building up and expanding productive capacity in an effort to meet the tremendous goals set for them after Pearl Harbor.

Once war production got under way, the savings in time effected by the specialized conveyor system and other production techniques proved to be spectacular. Approximately



Mat Courtesy Automotive War Production

Conveyorization of aircraft nacelle production helps save 8,650 manhours a month.

4,680 man-hours a month are saved on the firewall, longeron and beam assembly of B-17 engine nacelles; some 12,620 man-hours are saved on the wing-tip framing line; and more than 3,740 man-hours are saved on the nose section final assembly line.

Flying Tanks Take Enemy Unawares

An Associated Press dispatch, with a date line from France, tells the story of a sensational new military weapon used in the invasion of Normandy—a huge tank-carrying glider called the Hamilcar.

"With a wingspread greater than that of a Lancaster four engined bomber, the Hamilcar must be towed by a heavy bomber, but can land in a small field. It can—and did—carry a light tank.

"One of the first of these tanks to be landed in France silenced within two minutes a German gunpost which had been causing heavy casualties among allied ground forces."

The gliderborne tanks have been credited with a share of the success of the inland fighting in Normandy. The Germans were stunned in the initial stages of the invasion by the unloading of these tanks which blasted them out of their positions.

Waiting to open fire on the expected landing of troops from the Hamilcar gliders, the Germans were shocked to see tanks come racing toward them.

The War Department has revealed that the tanks referred to are U. S. Army models built by the Marmon-Herrington Company in Indianapolis, Indiana. These tanks were designed to specifications furnished by the ordnance department, especially for airborne service.

The new tank has been unofficially named "The Locust" by the British. It has been rightly named too, for when the gliders land and their great doors open, the tanks swarm out to devastate the enemy ranks.

The idea of carrying tanks by air has, at times, been considered and such transportation of ordinary tanks has been tried with indifferent success. However, the idea of a tank especially designed to be airborne and a special glider to carry it was conceived shortly after Pearl Harbor. The tactical advantages of such a vehicle are many. The element of surprise in their first appearance on the battlefield obviously would be an important factor and accordingly the high command did not use this trump in any lesser operations, but saved it for the great invasion, where it had such telling effect.

Other advantages are the ability to reach places otherwise inaccessible to tanks, the possibility of effecting tank concentrations at distant and strategically important points on short notice and the opportunity to have the tanks arrive at the scene of combat with the vehicle in fresh mechanical condition and the crew rested and ready for battle.

The Marmon-Herrington plant at Indianapolis for more than two years has been a beehive of activity turning out these units and has been one of the most highly restricted armament building plants in the country. Even officers in uniform had difficulty in getting past the front door.

Now that this new weapon has met the enemy and played a stellar part in the invasion across the channel, its existence can be revealed. It is a compact, streamlined, all-welded tank with an extremely low silhouette and a low center of gravity, small enough to ride comfortably in the belly of the new giant Hamilcar glider and big enough to wreck havoc on the enemy.

This airborne tank is playing an important part in the invasion of France and Germany. It will, without doubt, be heard from again, in other theaters of action before this war is over.

Electrons Photograph Spark Flashes Going 5,000 Miles An Hour

A magic stream of electrons, driven in a pencil-thin beam, are photographing electrical sparks that flash in front of them at more than 5,000 miles an hour. Stopping the speeding spark flashes at one-tenth of a millionth of a second, the electronic beam is recording airplane engine ignition actions to help solve the problems encountered in producing faster and more powerful warplane motors, according to E. W. Beck, lightning arrester engineer for the Westinghouse Electric and Manufacturing Company.

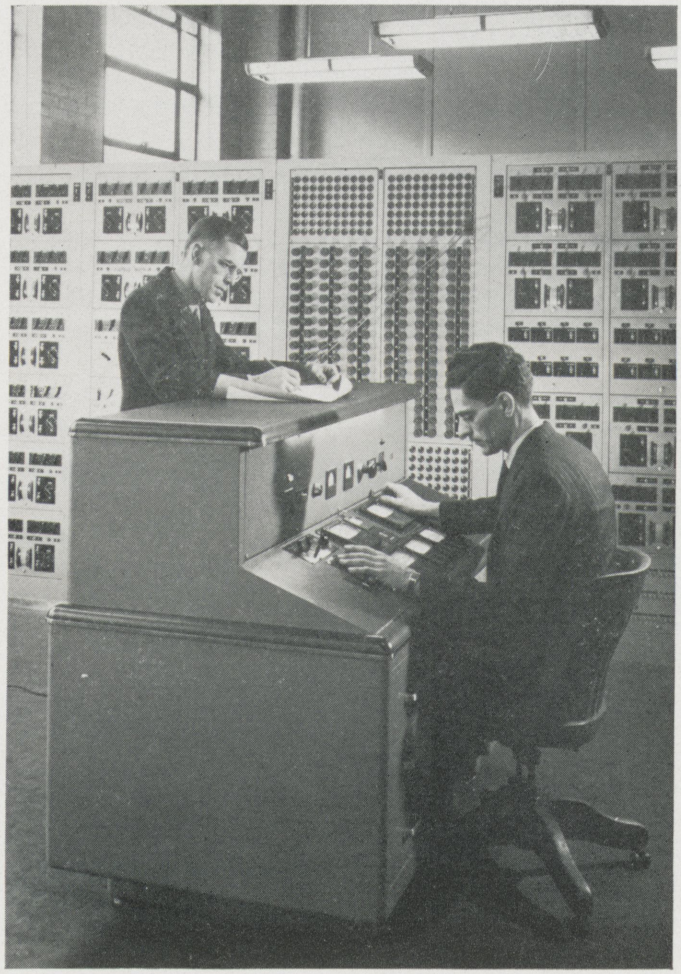
The electronic device which guides the electrons in their new task is the streamlined Westinghouse cathode ray oscillograph—once exclusively a laboratory tool—but now built on an assembly line basis for use on the production lines of the nation's war plants. Among war plants now using it are the Scintilla Division of Bendix and the Bosch Company.

The new electronic oscillograph is giving aircraft engine men more data about the ignition systems of high powered airplane engines than has ever existed before. The unit daily answers tough problems—solving them as would no other known device and with a rapidity and accuracy that has astounded veteran motor engineers. In fact, the electronic oscillograph has opened new fields in research.

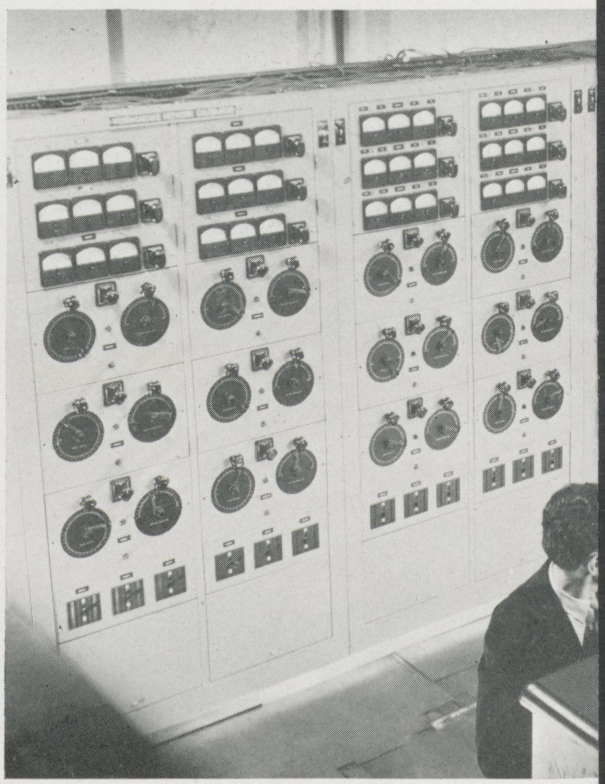
Mr. Beck gave this description of its operations:

"Functionally, it takes pictures on the household variety of camera film and makes its impressions in much the same manner as an x-ray. The beam of electrons, negative particles of electricity, is created by a high voltage rectifier. These electrons are guided into their narrow path by magnetic fields and by a series of plates which channel them downward. To prevent the beam from registering on the film before the ignition study is made, the device incorporates a beam trap that deflects the electrons out of the photographic channel.

"The electrical impulses which are to be studied are shot across the path of the electronic beam just above the film rack. The impulses force the electronic beam out of its straight path and cause it to 'write' on the strip of photographic film a record of the voltage. Simultaneously, the electron pencil records the time involved to give engineers a graphic record of electrical events that occur in periods as short as one hundred-millionth of a second.



This instrument indicates bus voltage, current distribution, associated power factor and watt or var distribution.



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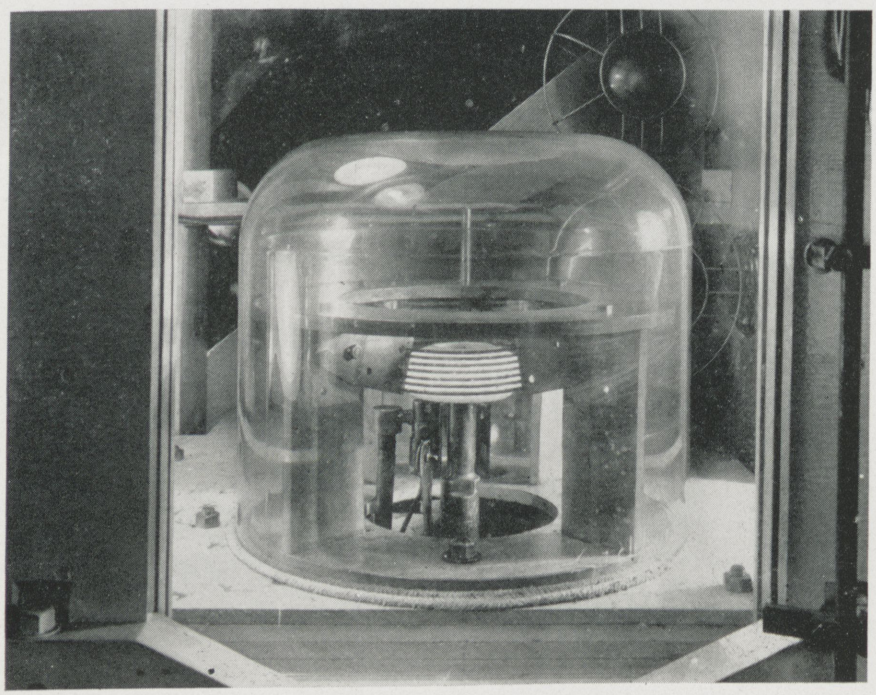
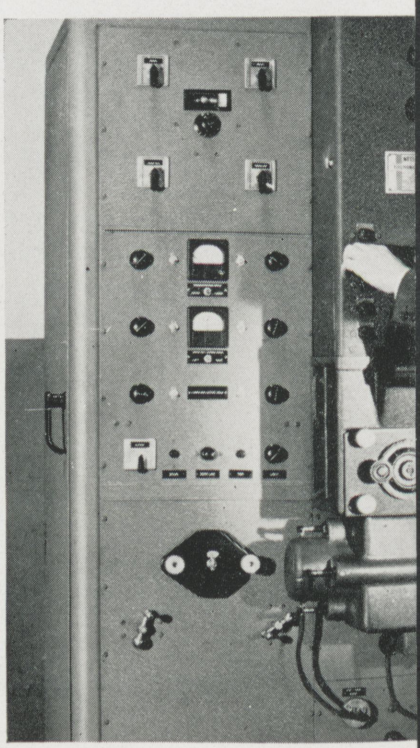


A rock bit being heated inductively for hardening.



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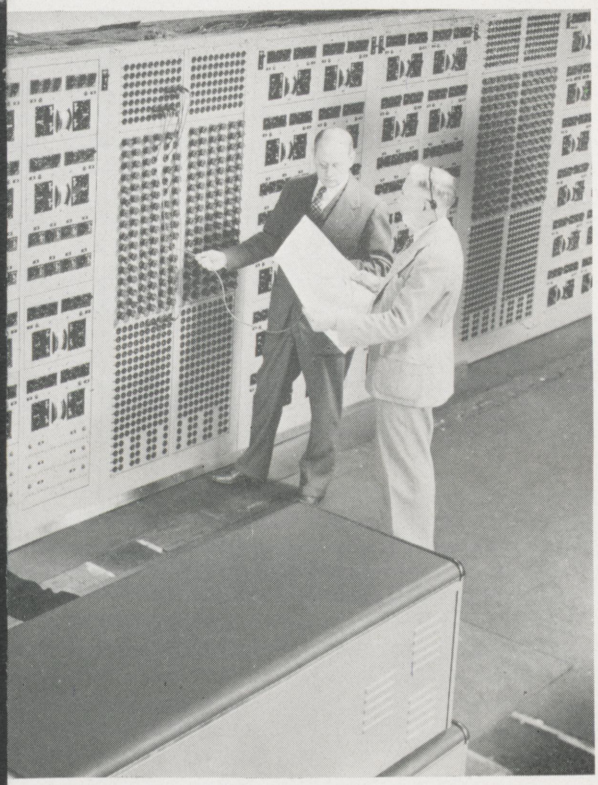

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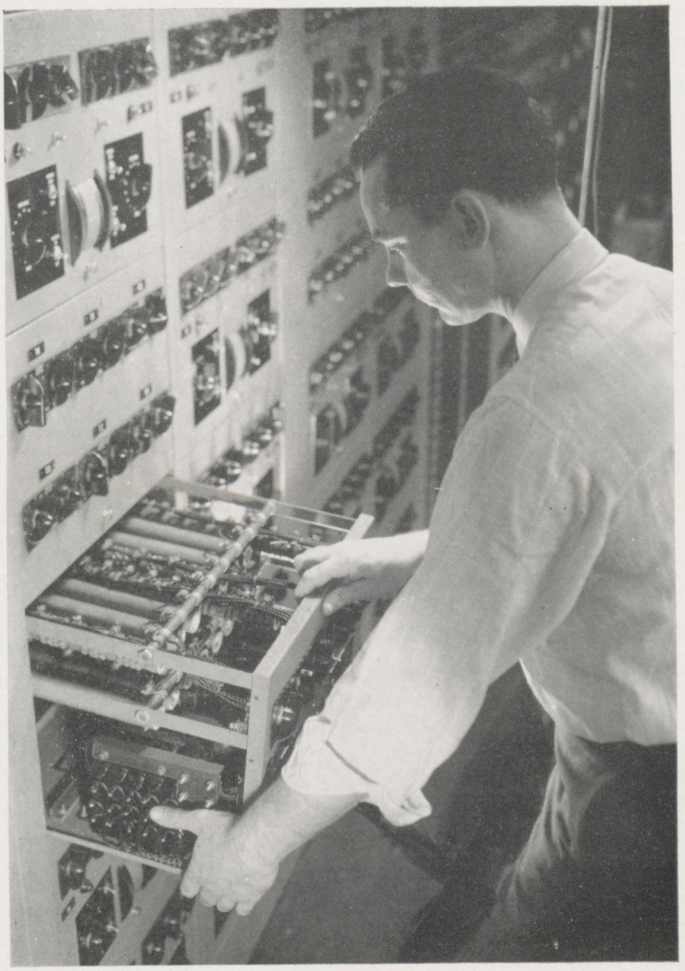
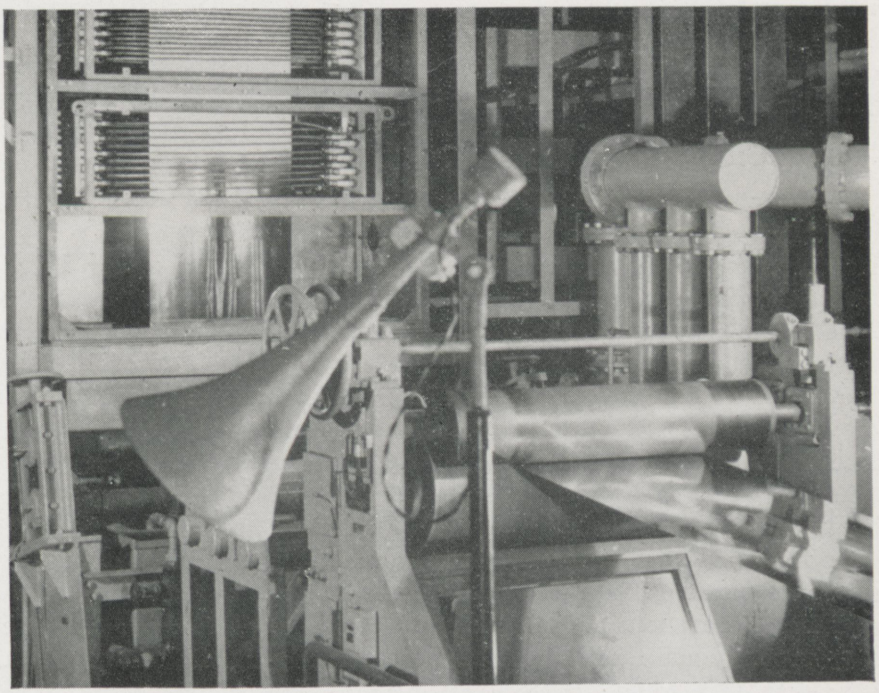
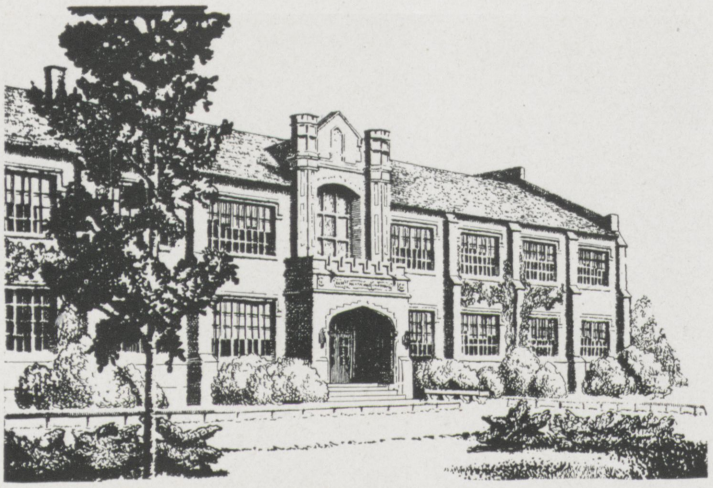


A resistor-reactor unit for a power system.

oscillograph.



Tin plate being heated as it speeds between induction coils.



Campus Survey

By C. GORDON HAYES, freshman

Debate Club

The Rose Poly Debate Club is now holding weekly meetings. At these meetings the members are discussing different topics. The topics which are chosen each week deal with current affairs, ideas, and the war. Many interesting discussions and ideas are presented to the club by the members each week.

Rifle Club

The Rose Poly Rifle Club had a meeting on Sept. 11, 1944. At this meeting it was decided to send in the papers for membership in the National Rifle Association. These papers have been sent in and the charter for the club should arrive in the near future. Several members of the club have been using the range and firing their rifles to get the sights lined up.

Camera Club

The Rose Poly Camera Club has been very busy lately. The members made several pictures of the C. & E. I. wreck which were posted on the Camera Club bulletin board. The members have been working very hard on the Technic covers and they now have those for the next two or three issues finished.

Freshmen

The freshmen have been busy the last week working on the annual bon-fire. Preparations were going along smoothly and the fire was beginning to take shape. The plans have been dropped for the time being because of finals. The bon-fire will be held at a later date.

The freshman class made an inspection trip to the Indiana Coke and Gas Plant on Sept. 14, 1944. This trip proved to be very interesting to the students. They were shown the complete process of converting the coal into coke and gas from the time that the coal enters the plant until it leaves in the form of coke and gas.

DISINTEGRATION

(*Continued from Page* 9)

current is to be drawn from the generator. The question might arise: "Why does electricity continue to flow from the belt to the sphere, regardless of how highly charged the latter may become?" The answer is best given in Faraday's reports of his ice-pail experiments, in which a charged metal ball, lowered into a metal pail by a silk thread, was shown to give up all of its charge to the outer surface of the pail upon contact with the pail. As Faraday stated it, "If the conductors are hollow, and contain air or any other dielectric, still no *charge* can appear upon that internal surface, because the dielectric there cannot assume the polarised state throughout in consequence of the opposing actions in different directions." In other words, the belt in the Van de Graaff generator is, upon entering the shell the only body inside the shell which is charged; and its charge is quite free to flow to the outer surface of the shell.

The exact form of the generator as described is no longer adhered to in actual installations. It is usually desirable to ground many parts of the apparatus, such as the target chamber at the end of the accelerating tube. For this reason only one electrode is commonly used in place of the two spheres. In one form of the generator this electrode has the form of a cylinder with hemispherical ends. The accelerating tube can then be placed in any convenient position, as long as one end is inside the electrode.

The only factor which limits the potential attainable with the Van de Graaff generator is the breakdown of the air around various parts of the machine. A great deal of success has been achieved recently by enclosing the apparatus in a steel tank and subjecting it to high pressures. In the summer of 1940, Dr. R. G. Herb of the University of Wisconsin announced that he had reached 4,500,000 volts with this type of generator. All generating equipment was enclosed in a tank 20 feet long and 5½ feet in diameter, under a pressure of 100 pounds per square inch.

A typical form of high pressure Van de Graaff generator has as its electrode a short cylinder concentric with the pressure tank. The charging belt extends from the electrode to one end of the tank, and the ion accelerating tube extends to a window at the opposite end. An ingenious method worked out by Dr.

(*Continued on Page* 20)

Testing Mica Sheets

Mica's special insulating qualities are mighty important in communications equipment. No equivalent exists, so war's huge demands caused a critical shortage.

Bell Telephone Laboratories' scientists were assigned the task of somehow finding more mica. They found it—in the very considerable amounts of raw mica which visual inspection had rejected. By developing electrical apparatus to test the two most important electrical properties, they increased the usable amount of mica by half and so stretched current supplies of mica to fill all military needs.

In many such ways the Bell System is serving the nation, constantly meeting the needs of our fighting forces for dependable communications.

BELL TELEPHONE SYSTEM

"Service to the Nation in Peace and War"

Alumni News

Edited By HOWARD FREERS, soph., m.e.

The Grads Advance

'06 Leon J. Willien, ch.e., has been appointed to the position of associate director of the Institute of Gas Technology at Illinois Institute of Technology. His appointment was announced by John Yellot, director of the Gas Institute.

A very widely known gas expert, Mr. Willien has been associated with the Public Utility Engineering and Service Corporation of Chicago, and he is now head consultant on manufactured gas for the War Production Board.

In his new post Mr. Willien will serve as consultant on water gas generation. He will have charge of research in gasification and related fields.

Mr. Willien has been the recipient of the American Gas Association's two highest awards. In 1927 he was awarded the Beal medal for the most valuable technical paper read before the association's technical section. Nine years later, in 1936, he was awarded the Charles A. Monroe award for hhis contributions to the manufacture, mixing, and transmission of gas.

Mr. Willien has ben elected an honorary life membership in the Pacific Coast Gas Association, for making the most valuable contribution to the gas industry on the Pacific Coast, in 1932. The contribution was the development of a process for the production of a high B.T.U. manufactured gas, with existing equipment.

He has presented and published more than a score of technical papers, during his career. He is author of a chapter on "Oil Gas" in The Science of Petroleum, published by the Oxford University Press, Oxford, England.

Commissioned a Major in the last war he served as commanding officer of the Offense department of the Development Division in Cleveland.

He graduated from Rose in 1906, got his masters in 1908, and received his chemical engineers degree in 1910.

William L. Marietta has received his wings from the Big Spring Bombardier School, Big Spring, Texas. He received his commission as second lieutenant.

'25 Everett C. Gosnell ch.e., has been made manager of the Chemical Division of the Lukens Steel Co. of New York.

'30 Maurice L. Piker, ch.e., has been promoted to the position of superintendent of the Clinton Engineering Works, Tennessee Eastman Co., Oak Ridge, Tennessee. He formerly was assistant supervisor of the Eastman Kodak Chemical Lab Plant, Rochester, New York.

'35 John A. Bradley, m.e., has accepted a position with the Imperial Diesel Engine Co., Chicago, Illinois. He was with Whiting Corporation in Harvey, Illinois, as head of the development department.

'43 (Oct.) Robert K. Drake, c.e., has been transferred from G. E. Pittsfield, Mass., plant to their Schenectady, N. Y. plant.

In The Service

'43 (Feb.) Ralph E. Brown, m.e., has been promoted to first lieutenant.

Robert E. Miller, e.e., has been transferred to Holabird Signal Depot, Baltimore, Md.

x-'44 (Dec.) Pfc. James Hurt has been transferred from Camp McCoy, Wisconsin, to Fort Belvoir, Va., where he is enrolled in the officer candidate school of the corps of engineers.

Seamen 1/c Rex Blood, Carl Wodicka, and Marshall Roesch have been sent to Texas A. & M. College for training as radio technicians. They have just completed a course at Wright Junior College, Chicago.

Marriage

Mr. Charles Omer Barbre, x-'30, was married recently to Miss Helen Gertrude Mattriski of Elmira, New York.

Death

Fred H. Hildreth, '94, c.e., died at Sea Cliff, New York where he had lived for five years. Mr. Hildreth began working for the Pennsylvania Railroad soon after his graduation from Rose.

Recent Visitors

'29 Fred O. Andrews, with honors, c.e.

'39 John Yaw, c.e.

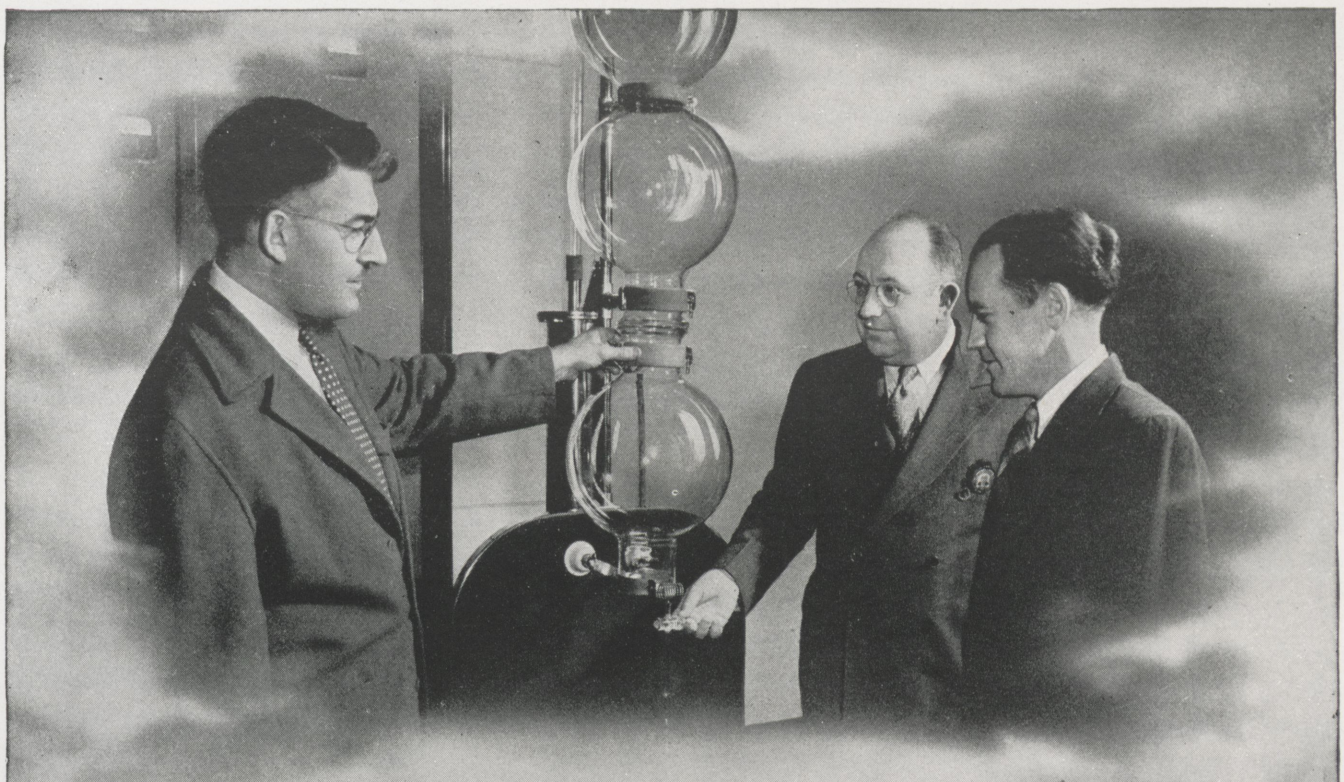
'43 (Feb.) Harmon E. Rose, c.e., Robert W. Mitchell, c.e.

'44 (July) Robert H. Dinkel, e.e., A. Jack Hief, m.e., Jay Kress, m.e., William S. Mitchell, m.e., L. Gene Landes, e.e., Robert G. Larkin, m.e.

x-'44 James Wade, Richard F. Rieman, Ralph E. Dinkel.

x'45 Benjamin A. Richardson, Robert E. Campbell.

A.S.T.P. Fessenden, Snyder, Selby, Kamody, Charles E. Piety of the faculty on leave of absence.



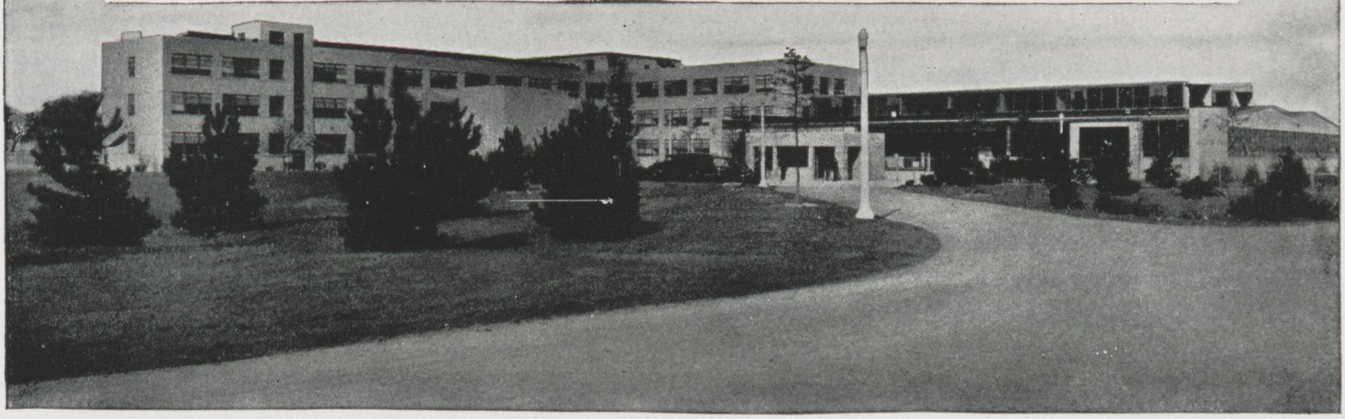
New RCA Penicillin Process Speeds Production!

TODAY, when the wonder-drug penicillin is so vitally needed on the fighting fronts and in the home-front sickrooms, the Radio Corporation of America reveals that a revolutionary method of production has been perfected in RCA Laboratories.

Tests at the Squibb Penicillin production center at New Brunswick, N. J., show that a single RCA electronic installation can concentrate two billion Oxford units of Penicillin in 24 hours—enough to administer 100,000 individual doses.

Besides streamlining the elaborate evaporation method, the new RCA Electronic system includes these important advantages: reduction of operation costs, lowered maintenance costs, less possibility of mechanical difficulties and production delays, great savings in floor space, and impressive reduction in initial equipment costs.

The new RCA electronic dehydrator of penicillin is shown here in regular operation at the plant of E. R. Squibb & Sons.



RADIO CORPORATION OF AMERICA
RCA LABORATORIES • PRINCETON • NEW JERSEY

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phonographs—records
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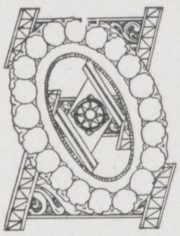
RCA

Listen to RCA's "The Music America Loves Best"—Sunday, 4:30 P.M., E.W.T., over the NBC Network ★ BUY WAR BONDS EVERY PAY DAY ★

Fraternity Notes

Theta Xi



The actives of Kappa chapter of Theta Xi returned to school this term after a much needed but, needless to say, short vacation. Brother Bob Penno unfortunately could not return this term because of illness which is confining him to the hospital. Here's wishing the best of luck and a quick recovery to you Bob. We'll miss your "Jeep."

During the vacation, Brothers Jack Joyce and Jim Hanes came back to the house for a visit. Brother Hanes had been doing research at the University of Illinois on the coking of coal until his recent induction into the navy. He is taking his boot training at Great Lakes. Brother Joyce is working at a war plant near Chicago. Word was received recently that Brother Robison is now in midshipmen's school working for a commission in the merchant marine. Also during the vacation Brother Hawkins came home on leave from a naval air cadet school.

The first meeting of the new term was held Tuesday evening, October 10, at which time the newly elected officers took over their new posts. These new officers are Stephen Liddle, president; J. P. Wehle, vice-president; Don Kersten, treasurer; Bill Dedert, assistant house manager; Joe Durra, corresponding secretary. The chapter is making plans for rush which is the 15th of October.

Alpha Tau Omega

Gamma Gamma of Alpha Tau Omega has returned to school with plans for another successful term. An extensive social program is being planned and rush plans are also being formulated.

Brother Fred Lundgren will return from the Navy for a furlough on October 19th. Fred has been in service since early in August and will be a welcome sight at the chapter house.

The chapter was honored with a visit from Lt. George Edwards, Oct. '43, on Monday, October 9th. George will soon go overseas and the best wishes of A.T.O. go with him.

At the end of last semester Brother Chad Williams journeyed to Sheboygan to put his pin on Miss Nita Rundstrom. This increases to five the number of Maltese Crosses adorning the fairer sex as gifts from Gamma Gamma's. Brother Bill Collessor has also given his pin to the fairer sex, however little else is known except that she comes from Indianapolis. During vacation the Mothers Club papered the fraternity for which the chapter is very grateful. May we now extend a formal thanks on behalf of the actives and alumni of Gamma Gamma.

DISINTEGRATION

(*Continued from Page* 16)

Herb for keeping the potential gradient uniform between the electrode and either end of the tank requires the use of a large number of aluminum hoops arranged concentrically along the outside of the belt and accelerating tube. Some kind of device (high resistances or corona discharge points) provides for a very small leakage current to the ends of the tank, which are grounded. This arrangement prevents sudden and violent breakdown at any point along the tube or belt.

A serious problem has been that of constructing a satisfactory accelerating tube. The ideal tube would be constructed of an extremely high-resistance material of perfectly regular potential gradient. Of course this kind of tube is a manufacturing impossibility; therefore a slight current must be allowed to flow along the tube to maintain the even gradient. The method of accomplishing this will be discussed later.

It is essential that the operator have control over the focus of the ion beam. For this reason all accelerating tubes contain metal cylinders arranged coaxially with the outer insulating tube. It is well known to physicists that the gap between two cylindrical sections at different potentials has a strong centralizing or focusing effect on a stream of charged particles. An ion beam which has traveled through say 50 "electron lenses" or gaps is usually found to be well focused.

(*Continued on Page* 24)

Some Suggestions About Your Future Career

Every young man with a job to do now—whether it is training for the services, or actually serving, as millions of you are—looks forward to the day when he can begin his career.

There are going to be many exciting things to do.

From what we see ahead for aluminum, may we venture a few suggestions?

You can learn a lot about the progressiveness of a future employer by finding out what he is doing about using aluminum in his business. For instance . . .

If you see a lot of aluminum on a new product, that's a good line for you to sell.

If you see a lot of aluminum used in the shop to make things light and easy to handle, that's a good company to be with.

If you see a chance to make anything, or sell anything, or work with anything made of aluminum, you're going to be way out in front.

This is how we see it at Alcoa . . . the first name in Aluminum.

A PARENTHETICAL ASIDE: FROM THE AUTOBIOGRAPHY OF

ALCOA ALUMINUM

• This message is printed by Aluminum Company of America to help people to understand *what we do* and *what sort of men* make aluminum grow in usefulness.

REFRIGERATION

(*Continued from Page 6*)

absorption. Servel has made the Electrolux available as a domestic refrigerator to large numbers, and it is the first absorption unit to become popular. Platen and Munters were able to perfect this model chiefly because of their use of the pressure gas as a circulating agent. Warm hydrogen rising from the absorber blows through the liquid ammonia, hastening evaporation in much the same manner as the cold sensation is produced when we blow upon alcohol on the back of the hand.

Let us consider the operation of the Electrolux by starting at the generator and going around the cycle made by the ammonia. In so doing, the cycles of the water absorbent and the hydrogen should also be noted, for each is complete in itself.

When the ammonia water is heated in the generator the ammonia is distilled off, and it rises as a vapor into the condenser. Water also rises through the tube leading up from the generator in much the same manner as water rises in a coffee percolator, spilling into the catch basin just above. Ammonia vapor, having been freed of the water, is collected in the condenser, where the cooling fins remove the excess heat, causing it to condense into droplets. These flow into the evaporating coils. At an intermediate point a liquid trap is inserted which keeps the hydrogen from entering the condenser. Two pipes run from the condenser into the evaporating coils, the upper one being for ammonia which doesn't condense below and rises into the upper section of the condenser.

As the liquid ammonia flows into the evaporating coils it encounters an upward counter-flow of hydrogen which has been pre-cooled by flowing through the vertical jacketed pipe. This hydrogen flow over the liquid ammonia has the effect of reducing the ammonia vapor pressure in the space above the refrigerant, thus hastening evaporation. As the ammonia vaporizes it must take the latent heat of vaporization from the refrigerator cooling coils and these surroundings. This produces the desired cold within the well-insulated refrigerator cabinet.

The cool, heavy mixture of hydrogen and ammonia vapor passes out of the top of the evaporator coils and down through the middle of the jacket pipe, thus pre-cooling the rising hydrogen in the jacket. The mixture of gases now passes into the absorber where the waste coming from the "percolator" tube above the generator dissolves the ammonia off the practically insoluble hydrogen and allows it to return to the jacket tube.

When the ammonia water flows from the absorber, it is collected and goes again to the generator for reuse. This completes the triple cycle in which nothing is expended but the small amount of natural gas necessary to maintain the generator flame. As it can be seen, this ingenious system works without a single moving part!

OWI Photo by Palmer, in an Allegheny Ludlum plant

Steel Man with a Mission

. . TO KEEP THE ELECTRIC FURNACES MELTING

ALL of us, men or women—on the job or off it—are people with a mission these days. The war makes common cause for every one and spares no one.

This maintenance man's job, atop an Allegheny Ludlum electric furnace, is no less essential than that of the crew who operate the furnace, nor than that of the men in the factories who use the stainless, tool, valve or electrical steel it produces. Total war requires maximum cooperation on the supply fronts as well as the fighting fronts, and it asks also that every last bit of manpower and materials be used to the maximum advantage.

Boiled down to a very few words that simply means: *no waste—everybody help.* It means, in terms of your everyday life, using everything wisely to secure the most wear; reducing expenditures to a minimum; saving materials; buying War Bonds and stamps to the limit.

It also points up a responsibility that falls upon you as one of the next generation of business men and technicians. War is the ultimate waster of men and materials, but it brings about enormous technical progress and development. That has been very true in the special steel fields. It will be yours to translate these advances into terms of better living.

AL

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Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

W&D A-9317

DISINTEGRATION

(*Continued from Page 20*)

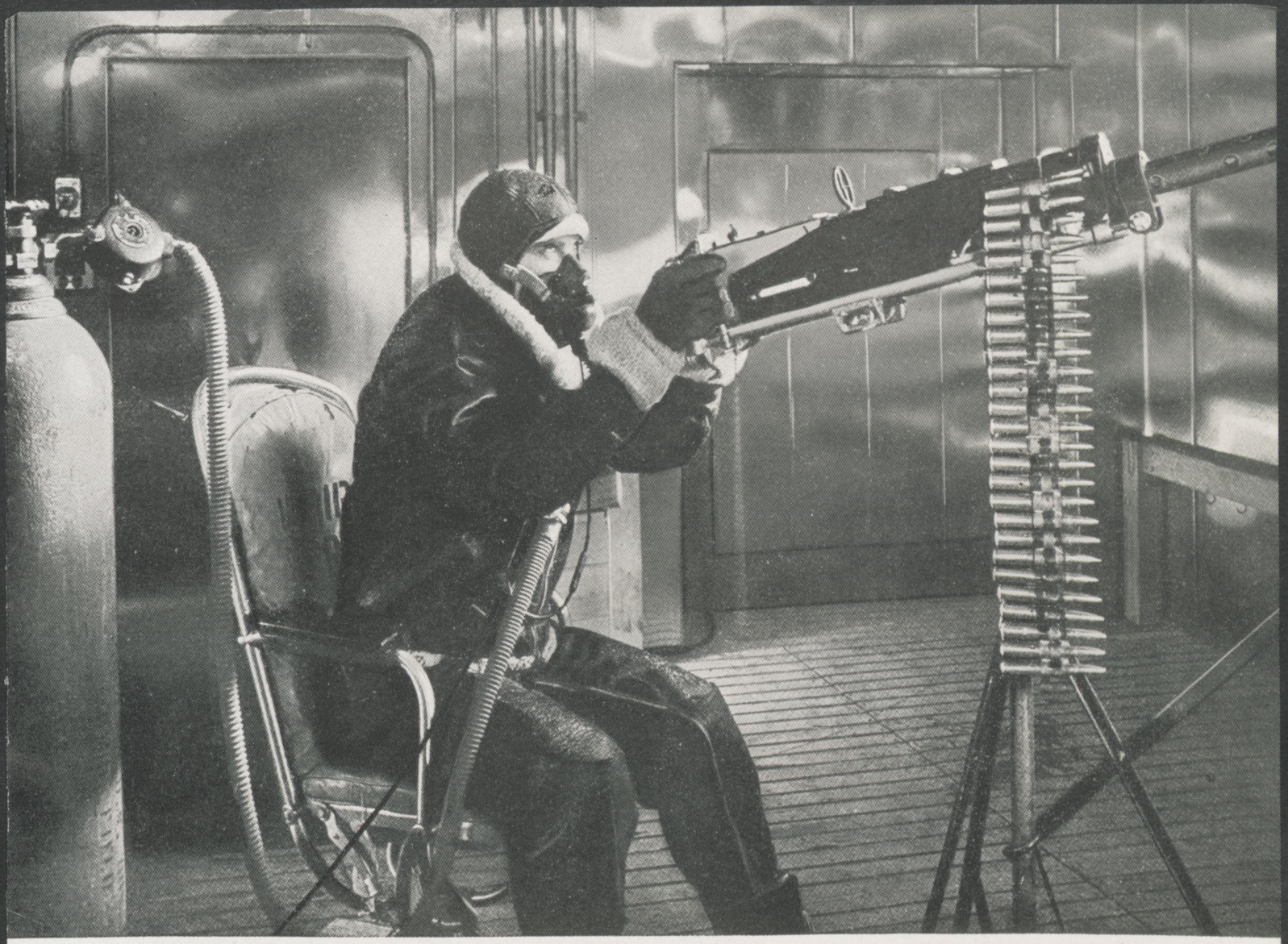
it a large metal flange, or plate, as shown in the sketch, to which are often connected corona points. The purpose of the discs and points is to maintain a slight leakage current and prevent sparkovers, which have caused a great deal of damage and annoyance in experiments with high voltages. The type of accelerating tube just described is essentially the one used for any of the high-voltage atom-bombarding apparatus which has been discussed.

Artificial Radioactivity

The bombardment of ordinary elements with high-energy particles generally results in the production of artificially radioactive substances (substances which continue to disintegrate for a time even after bombardment has ceased). It has been found that nearly all elements have radioactive isotopes. These differ from naturally radioactive substances in that they generally emit electrons rather than alpha particles. Certain products of disintegration, however, are known to give off alpha particles, positrons, and the X-radiations which accompany K electron capture. This latter process is one in which the nucleus of a bombarded atom attracts to it an electron from the inner, or K, orbit, causing the emission of rays of high energy.

Although the original aim of physicists in attempting to produce artificial disintegration of atoms was to determine the structure of the nucleus, some of the recently discovered applications of the resulting radioactive substances to medical and biological research promise to justify even more intensive efforts in the future. Biochemists are experimenting with "tagged atoms"—atoms, that is, of substances which have been made radioactive. These atoms can be fed to animals and plants in the form of food, and their distribution during metabolism observed by the aid of sensitive materials which respond to radioactive emanations. For example, it has been shown that the calcium enters the milk of a cow only a few minutes after consumption; that over 60% of the phosphorus consumed by animals becomes part of the bones or teeth within 5 days; and that light is not essential to absorbtion of carbon dioxide by plants. A more direct aid to medicine is the fact that certain elements are known to go predominantly to certain parts of the body. If some gland or tissue of the body can be cured by radioactive treatment, it is often possible to find a radioactive isotope of a

(*Continued on Page 26*)



Storms that SAVE Lives

STORMS OF HAIL AND OF SAND . . . storms of rain and sleet, and fog. Temperatures of 60 degrees below zero Fahrenheit and 150 degrees above. Such combat conditions and low pressures of high altitudes can be produced in the weather chamber which you see here being used for testing Army Air Force equipment—equipment upon which the fighting effectiveness and the lives of men depend.

Stainless steel—large-scale production of which was made possible by the development of low-carbon ferrochromium by ELECTRO METALLURGICAL COMPANY, a Unit of UCC—lines the interior of the weather chamber. *For stainless steel* has the necessary resistance to the tortures that beset this all-weather "test-tube" room for research in materiel.

Tough, durable, rustproof, stainless steels are also used in surgical instruments, operating tables, and other hospital equipment. And, because they are easy to keep clean and resist food acids, they are widely used in equipment necessary to the preparation, processing, and serving of foods. "After-the-war abundance" will make it possible for all of us in thousands of places in industry and the home to enjoy the luxury as well as the utility of stainless steels.

Units of UCC do not make steel of any kind, but they do make available to steelmakers many alloys which give new properties to and improve the quality of steel. The basic research of these Units means new, useful metallurgical information—and better metals for the needs of men.

▼ ▼

Executives, architects, designers, teachers, and other professional men are invited to send for the booklet P-10 "Stainless Steels and their Uses." There is no obligation.

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Plastics Division of Carbide and Carbon Chemicals Corporation

DISINTEGRATION

(*Continued from Page* 24)

Each metal section has fastened to substance which will eventually settle at that part of the body.

Certain of the nuclear reactions by which these radioactive medicines are formed are extremely interesting. For example, when the stable isotope of A1 is bombarded by alpha particles, radioactive P is produced and a free neutron is ejected. This reaction may be expressed as follows:

$$_{13}Al^{27} + {}_{2}He^{4} \rightarrow {}_{15}P^{30} + {}_{0}n^{1}$$

Several of the artificially produced radioactive elements result from the bombardment of Al.

A more recently developed method for producing disintegrations utilizes neutrons, which have no charge, as bombarding particles. The absence of charge on the neutron allows a relatively slow-velocity neutron to enter the highly-charged nucleus. These neutrons, however, are less easily controlled than charged particles; since they are not affected by electric or magnetic fields, they must be dealt with in an entirely mechanical fashion. They are obtained as products of the disintegration of substances by high-energy alpha particles, protons, or other ions. A great many more disintegrations have been produced by neutrons than by any other kind of particle. A typical reaction is the one in which magnesium is bombarded to form radioactive sodium as follows:

$$_{12}Mg^{24} + {}_{0}n^{1} \rightarrow {}_{11}Na^{24} + {}_{1}H^{1}$$

It should be mentioned that the half lives of artificially produced radioactive materials are very short, ranging from a few seconds to several days; this fact adds to convenience in using the substances for medical treatment, since they need not be recovered after they have served their purpose.

DEHUMIDIFICATION

(*Continued from Page* 11)

soda ash process. On account of its available as it is a by-product of the cheapness and availability, this absorbent has attracted much attention in the chemical world. It has many of the properties of lithium chloride and may be used at high temperatures.

In many cases where the cost of drying equipment is not justified, the air or gas is simply blown through lumps of calcium chloride; and this used chloride then thrown away. Calordide, a commercial product developed by C. R. Downs, is a mixture of concentrated calcium chloride (around 70 per cent) and activated carbon. In some cases mixtures of calcium and lithium chloride or calcium chloride and bromide are used as absorbents.

Solid Absorbents

The three principal solid absorbents are activated carbon, activated alumina, and silica gel. Activated carbon is more for taste and odor removal than for dehydration; therefore it does not compete with the other two. Solid desiccants are usually very stable and non corrosive. When a choice between liquid or solid type of dehydration is to be made, two factors are usually considered—the degree of dehydration to be obtained and the type of application.

Silicia gel was developed during the World War for use in gas masks but has found much wider use in the dehydration of air and gases. Being 99 per cent SiO_2, it is unaffected by most chemicals, and has a surface area of 50,000 sq. ft. per cu. in., which makes it a most excellent absorbent. It is unaffected by high pressures and may be used at 2,500 lbs. per sq. in. pressure. Dewpoints of -60° F. are obtainable with silica gel.

There are, of course, industrial applications where activated alumina is preferred. Of all the commercial absorbents, it produces the driest gas, and dewpoints of -76° F. may be obtained with it. The type of solid absorbent used in a process, however, usually depends upon the type of drying equipment used; and the selection of an absorbent is of secondary importance.

From ROCK *to* RUBBER

One of our country's large rubber plantations has its roots in limestone quarries. From this plentiful rock we produce carbide, then acetylene which is the basis of a widely used synthetic rubber.

Acetylene is one of the many chemicals available through the Airco family of companies for an infinite variety of uses, from cutting metal to preserving food. Today these chemicals are hastening victory—tomorrow a better world.

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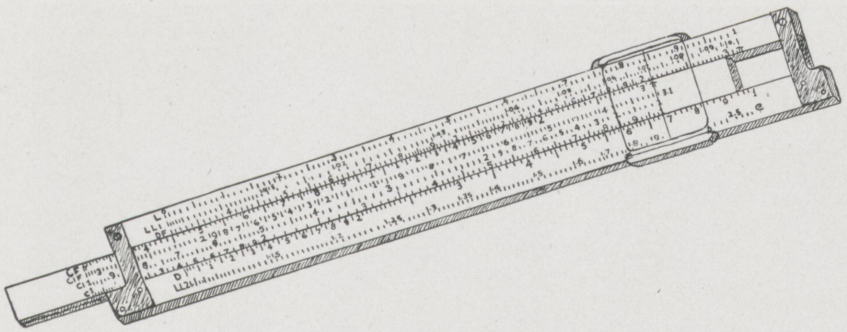


Sly Droolings

Edited by PETE LEE, jr., m.e.

A Skunk and her kittens were traveling West
When down drew night and she stopped to rest;
She found a place close by the town,
Where she fixed a bed and they all lay down.
As the Paper Mill odor filled the air,
Like rotted fish and burning hair,
She woke and crawled out of bed,
Took a sniff and hung her head.
She turned to the kittens seated there,
Saying, "Bow your heads, it's time for prayer,"
"Lord, you gave us a weapon for self-defense,
An awful odor, both potent and dense.
As the years passed and time rolled on,
We've sprayed the air and danger was gone.
For defensive purposes our smell will do,
And for all of this we are thankful to you.
But if this thing attacks us by day or night,
We will simply give up without a fight;
For the emergency measure we could take,
When compared to this, is simply a fake.
The peculiar part about the thing
Is the strange behavior it seems to bring;
For passing motorists always choose
To stop, get out and examine their shoes.
If a baby happens to be along,
They undress him to see what's wrong.
If the party consists of two or more,
They look at each other and open the door.
It takes the stomach out of a hound;
It keeps the pig's nose in the ground;
The victims of vultures miss their fate,
For it drives the buzzards out of the state.
There is something about it that opens my eyes;
I see why heaven was built so high;
And if people enjoy themselves in Hell,
You can remedy that with this awful smell.
I am a polecat of ripe old age,
A cat that no one wishes to cage;
But I can recognize defeat,
Compared with it, my smell is sweet.
The extent of the difference, I realize,
But I think it is really a matter of size.
So, Lord, I ask if it by Thy Will—
Make me as big as the Paper Mill."

Scene: Army barracks.
Characters: Two soldiers.
"Got a pen I can borrow?"
"Sure thing, Pal."
"Some paper, too?"
"Guess so."
"Going past the mail-box when you go out?"
"Uh-huh!"
"Wait till I finish this letter."
"O. K."
"Lend me a stamp."
"Yeh."
"What is your girl's address?"

Mandy Johnson, surrounded by her brood of 11 or 12 pickaninnies was talking to the old maid settlement worker. "Yas'm," she said, "birth control am all right for you all, but me, Ah's married an don' need it."

The lady of the house suspected that one of her two sons had been dating the maid. Anxious to find out which one, she said:

"Nora, if you had the opportunity of going to the movies with one of my sons, which one would you choose?"

"Oh, it's hard to say, ma'am. I've had grand times with both of them. But for a real rollicking spree, give me the master."

I'm done with all dames—they cheat and they lie;
They prey on us males till the day that we die;
They tease and torment us and drive us to sin—
Say, look at the blonde who has just come in!

Rose man arrested for speeding: "But, Your Honor, I am a college boy."

Judge: "Ignorance doesn't excuse anybody."

Georgia Lawyer to colored prisoner: "Well, Rastus, so you want me to defend you? Have you got any money?"

Rastus: "No, suh. I hain't got no money, but I got a 1928 Fo'd cah."

Lawyer: "Well, you can raise money on that. Now let's see—just what do they accuse you of stealing?"

Rastus: "A 1928 Fo'd cah."

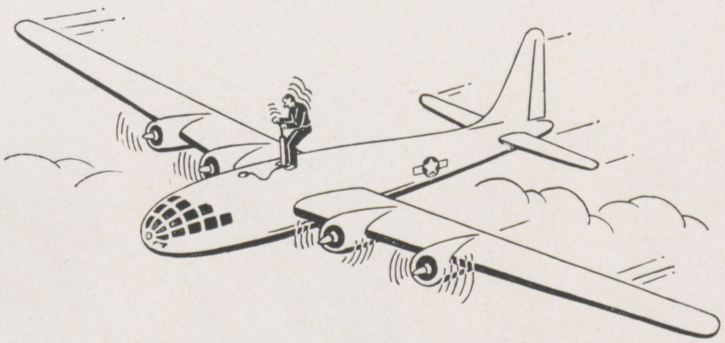
First Soldier: "Here's a letter from my wife saying that I'm the father of twins."

Second Soldier: "Well, I suppose congratulations are in order."

First Soldier: "No, but I think an investigation is."

G-E Campus News

RESEARCH AND ENGINEERING KEEP GENERAL ELECTRIC YEARS AHEAD

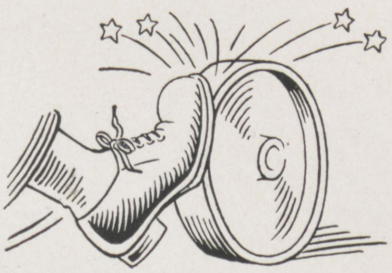


NEW PRESSURIZED CABINS

AN ALERT crew is needed to give any airplane the edge on the enemy. That's why the new B-29 Superfortresses have pressurized cabins that enable airmen to relax in relative comfort on unusually long flights between their base and the target.

G-E turbosuperchargers keep crew members warm and provide them with sufficient oxygen even at very high altitudes, eliminating the use of oxygen masks or electric flying suits except during the brief period of the actual bombing run. Consequently airmen feel better, react faster, when their objective is in sight and enemy opposition is the toughest.

The turbosuperchargers which maintain near normal atmospheric conditions in the cabin of the B-29 were originally developed by G.E. to provide compressed air for plane engines. On the B-29 there are two turbosuperchargers to supply each of the four engines. Two of the turbosuperchargers not only supply the engines, but also feed air at regulated temperatures to the sealed cabins.



FAST BRAKE

VERY often it's as important to stop a motor in a hurry as it is to get it going in the first place. One General Electric engineer has developed a brake that can stop a one-eighth-hp, 16,000-rpm motor in less than six turns. That's equivalent to stopping a mile-a-minute automobile in 2.73 feet.

Magnetism keeps the brake from the whirling rotor when the motor is running. When the power is turned off, a cork shoe brings the rotor to a standstill. The new brake has comparatively few parts. It was developed for use in the operation of equipment for the armed forces.

GROWING PLASTICS

SURROUNDED by foam, G.E. plastics laboratory men pronounce their newest product a huge success. A quart of molasses-like mixture which they have developed expands enough to fill a seven or eight gallon receptacle about ten minutes after it is prepared.

This foam has other advantages. Self-rising and self-curing, it is lighter than rock wool, glass, or cork; its heat conductivity is lower than that of any of the three. After the war it promises to have many applications, especially where insulation is required. *General Electric Company, Schenectady, N. Y.*

Hear the General Electric radio programs: "The G-E All-girl Orchestra" Sunday 10 p.m. EWT, NBC—"The World Today" news, every weekday 6:45 p.m. EWT, CBS.

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