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Merry Christmas

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Member Engineering College Magazines Associated

ROSE POLYTECHNIC INSTITUTE - - - TERRE HAUTE, INDIANA

MARKS-'35.

AND A HAPPY NEW YEAR

Surveying This Issue

CHEMICAL research enjoys an enviable position in modern industry. It is difficult to determine just one industry that is not dependent in some manner on or does not owe its existence to some form of chemical research. Mr. Reddie gives a general summary of the importance of chemical research in this month's lead article.

ACIDATION of oil wells is another method of increasing the rate of flow of low production wells. Mr. Altekruse explains why more crude oil flows after acid has been poured or pumped in a well.

WHAT is the modern conception of atomic structure? Why do the chemists' and the physicists' views on the question differ? In the conclusion of his paper on this subject, Mr. Giacoletto explains the modern theories and their shortcomings.

THE general procedure and the advantages of air conditioning are explained by Mr. Zinngrabe in his short article on this subject.

—*M. B. S.*

THE ROSE TECHNIC

DECEMBER 1937

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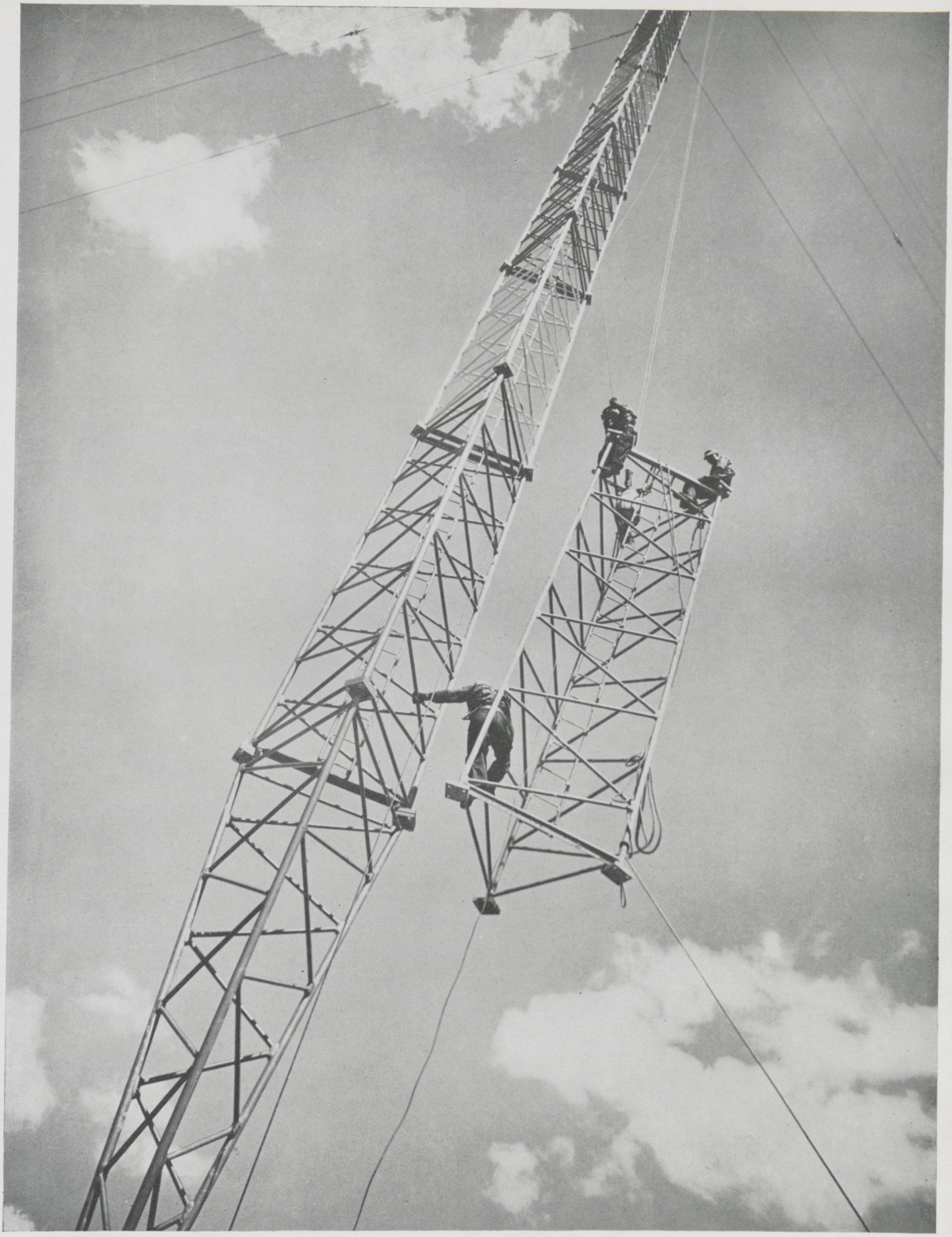

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THE ROSE TECHNIC

THE TECHNICAL JOURNAL OF THE ROSE POLYTECHNIC INSTITUTE

Volume XLVII DECEMBER, 1937 Number 3

The Value of Chemical Research

William A. Reddie, ch., '39

MAN has proved himself to be a born explorer. He has felt the spirit of adventure within him since time began. Ever since the beginning of history man has ever tried to extend the frontier line of his abode to determine what is across the river, within the forest, or beyond the mountain range. Sometimes this restlessness resulted from fear; sometimes this change of abode was to find more fertile soil and greener pastures; sometimes it was to seek precious metals and gems; and sometimes it was simply an attempt to find out that which he did not know and understand.

Now, since most of our world has been explored and mapped, he has engaged in other fields of interest. He is exploring the depths of the sea, finding and describing strange creatures that we never knew existed. He is continually building stronger equipment, safer balloons to further explore the stratosphere. Man's desire to know is so great that a feeling of fear does not exist. Instruments have been developed that increase a million times the power of the natural eye. Man can measure distances through space as accurately as he can locate points on the surface of the earth.

What is chemical research's role in industry? In what manner does chemical research affect modern production? Mr. Reddie gives the answers to these questions in this general discussion.

Rear Admiral Byrd's expedition to the Antarctic region was one of the greatest expeditions ever made. Such an expedition could not have been accomplished a half century ago. Every science contributed something toward his success.

All these different types of explorers are important enough, but there is another class of explorers which is equally important. They are the "wonder workers" of the research laboratory. At the present time there are 1,500 or more of these laboratories in the United States, not including the elaborately equipped laboratories of the large universities. Nor does this number include the many departments of government that deal with research work. The thousands who work in these laboratories are not only guiding industries but are establishing new policies and making new discoveries.

Discouraged by the depression, business feels confident that the modern achievements of chemistry will bring a new era of prosperity. The late Dr. A. D. Little, consulting chemist of Cambridge, Massachusetts, stated: "We may look with confidence to chemical industries for contributions which should go far toward supplying the stimulus essential to revival of our prosperity."

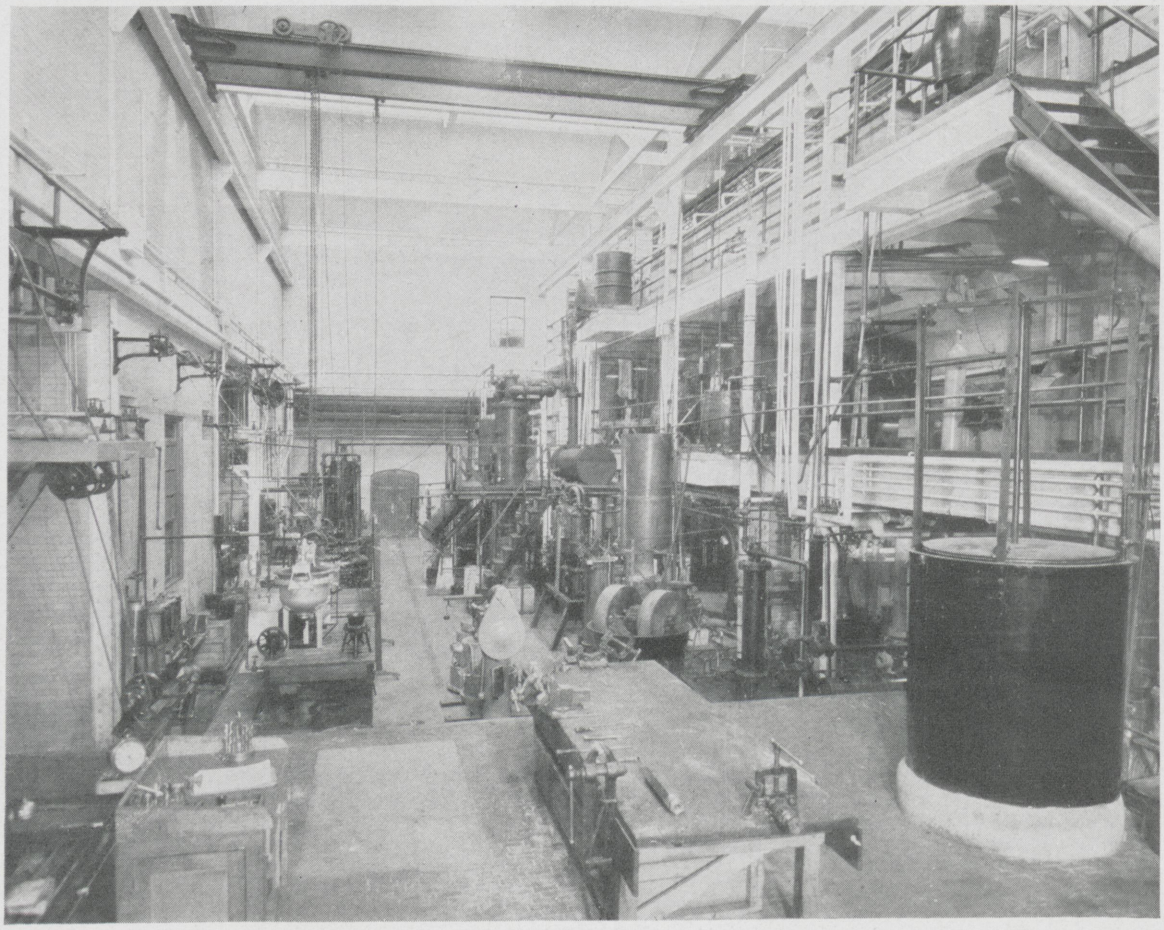
It is a well-known fact that advances in chemistry react on every industry, while, conversely, every progressive trend in other industries makes new demands on chemistry.

The approach to the Hall of Science of the Century of Progress was so arranged as to show the phenomenal development of the science of chemistry. By means of beautiful murals there was depicted the growth and the development of chemistry and its applications to industry, commerce, and medicine.

The chemist can claim without boasting that in his field the sciences find their common meeting ground. There is probably none other of the sciences which affects our lives as we live them today in as many ways as does chemistry. The chemist has done and is still doing his part to make our lives longer and more pleasant.

Scientific research has made possible the large-scale production of modern times. Such research

has been fostered by large industries, and great amounts of money have been spent for laboratory equipment for the purpose of increasing production. Every scientific advancement, whether it be of a chemical nature or not, results chemistry become more extensive, that they develop to a greater degree in order to solve the numerous new problems which call for large quantities of new materials with exactly designated properties increasing more and more in rigid eral vitamins, the biochemist has shown us the need for certain varieties of food. He also has shown the need for a variety of the proteins. Working together, the industrial chemist and the engineer have made it possible to preserve



Cuts Courtesy Industrial and Engineering Chemistry

Yale University Chemical Engineering Laboratory

in more efficient production of commodities and greater profit for business. The aims of modern industrial science are to conserve energy, eliminate waste, and utilize all the byproducts of industry for the purpose of achieving the maximum production at the minimum of cost. Big business has encouraged useful inventions and by means of large-scale production has brought to the masses comforts and luxuries never enjoyed before.

The necessity for chemical control in various industries has so increased that specialized departments of applied chemistry have been formed, with the chemist and his process in full control. This has required that the fields of specifications. Thus we have a new use of chemistry which is growing larger and larger and assuming more and more importance in the development and advance of our civilization.

The development of chemical operations in the industries to-day has reached the point where none of our factories can operate without chemicals. Take, for example, the case of agriculture which is dependent upon fertilizers and insecticides, and the textile industry which requires bleaching materials and dyes. These examples could be greatly extended, for all industries must have their essential chemical supplies.

With the discovery of the several kinds of food in all seasons. The common refrigerants, ice, ammonia, and sulfur dioxide, are being replaced by solid carbon dioxide, commonly known as dry ice. No one knows better than the ice dealer himself what the possibilities are in the extensive use of this almost new refrigerant.

Most of the credit due for improvements and economies in flour milling and blending, in bread and cracker manufacture, in the making of butter substitutes, in the maintenance of the quality of our food generally, can be justly given to the chemist.

In order to grow plants for food, food for plants must be present in the soil. Fertilizing was done orig-

inally by the use of barn-yard manure and other animal waste. But today the agriculturist knows his soil and fertilizers as well as the baker knows his flour and his baking powder.

The research department of du Pont has not by any means been idle during the depression. Sponsored by du Pont's millions, research chemists have introduced many new types of products, chief among which are synthetic resins and synthetic soaps.

Rayon was at one time referred to as artificial silk, but chemically it is the same as cotton. The demand and production of rayon are certainly increasing, and the quality is being steadily improved. So we may look for more and better silky fabrics.

The improvement made in dyes is also worthy of mention. At one time the United States was almost entirely dependent on Germany for its dye supply. Now, in this respect, we are independent of the rest of the world, and aside from the old standard colors, many new ones have been produced.

While the dye chemist has been improving the number and quality of his products, the rubber chemist has been very industrious. He has learned how to make tires and tubes and rubber goods which wear several times as long as similar articles did a few years ago. This advancement has come through improved methods of curing the rubber latex and of vulcanizing and applying the rubber.

Although American crude oil is now so cheap as to be causing acute economic distress in several oil fields, the supply is not inexhaustible, and chemists are already prepared to make gasoline and lubricating oil out of coal.

The improvements made in gasoline as well as the economies made in its production have been surprising. Crude petroleum as it comes from the wells contains about 20 per cent of light hydrocarbons which might be classed as gasoline. Yet by a process of cracking it is not uncommon to produce over 70 per cent of gasoline from the crude oil.

A research man will tell you that improvement is always possible in most manufactured products. Take glass, for instance. The very first characteristic of glass that occurs to one is its fragility. It has to be handled with care, but in a research laboratory recently a man tossed a glass lens into the air and let it fall on a concrete floor. Repeatedly the lens fell from a height of ten feet without even chipping. The adoption of this type of glass would revolutionize the glass industry. Glass suggests building materials, for glass brick, glass paneling, and glass columns are now on the market. Recently, a house made entirely of glass was constructed.

Due to the tremendous advances made in the metallurgy of aluminum, this white, light metal is now a strong competitor of steel in its variety of applications.

We might investigate other fields, and in every case we should find the chemist doing his part in the preparation, purification, protection, or improvement of practically everything with which we come in contact. There is no science which has more to do with our lives and habits of living than the science of chemistry.

By-Product Coking Plant

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Acidation of Oil Wells

Richard D. Altekruse, ch., '39

Constantly striving to increase oil production, the petroleum industry has been quick to seize and apply new methods. Acidation of oil wells is a method whereby the rates of production of old wells are increased.

ALTHOUGH the first patent covering the use of hydrochloric acid in oil wells was issued in 1896, it has only been since 1928 that acidation made its appearance in the mid-continent fields, and only since 1932 that experiments have seemed to justify the practice of acidizing wells.

The simple theory of acidizing oil wells is that the acid is introduced into the well to eat channels into the limestone through which the oil can flow to the pipe. The nitroglycerine shots which have formerly been used to form cavities and channels have a detrimental effect on the casing of the wells and necessitate an expensive job of cleaning the debris out of the wells. The products of acidation simply flow out or are pumped out of the wells.

Commercial hydrochloric acid is used for treatment of the well. The standard amount of acid used is 1000 gallons per well. Commercial hydrochloric acid contains about 30% acid and 70% water. This acid is diluted with an equal amount of water to form 15% hydrochloric acid. The dilute acid is more desirable because the spent acid has a lower viscosity and is more easily removed from the well and because the water retains the salts formed during the reaction in solution. If the salts are allowed to precipitate out of solution, the purpose of the acidation is defeated.

Acidation does not consist of putting acid into a newly drilled hole to facilitate the flow of oil, but is the operation of putting acid into an old well which has ceased to produce at a profitable rate. As a well produces, chunks of earth are carried into and deposited in the channels by the flowing oil. Reacidation clears these passages and may open new ones. Many wells have been acidized as many as four or five times. Increases in the rate of flow of reacidized wells have been noted as high as 100%. The specific gravity of the oil from these reacidized wells has been known to increase as much as four degrees A. P. I., indicating that the oil had not simply been thinned out and made to flow faster, but that new sources of oil had been tapped.

One objection which engineers have to the use of acid in oil wells is the fact that they can not tell whether it will be an advantage or actually a handicap. In some wells acidation has actually decreased the rate of flow. This is accounted for by the fact that each time such an action occurred the porosity of the limestone present was very low. The liquid would be drawn up into the capillary pores and held there by surface tension. When the liquid evaporated it left any salt dissolved in it to clog the pore. This difficulty has been overcome by the use of a new penetrating acid which has a lower viscosity and surface tension. The penetrating acid also has the property of being much more effective against oil covered substances than ordinary acid.

An interesting sideline has arisen in the acidation of comparatively hard beds of limestone which lie above layers of porous sand. If the acid is introduced as usual, all of the acid disappears into the sand. To keep the acid above the sand, a mixture of 3% organic matter and 97% water containing certain bacteria is introduced into the hole. This mixture solidifies into a jelly-like substance, sealing the acid away from the sand. After 24 hours the bacteria eat the organic matter leaving only the water. The upper limestone is thus acidized and the hole is not obstructed.

Acidation would be profitable if it only increased the rate of flow, thus decreasing the period of time of the investment. However, when one adds the possibility of actually getting more oil out of the well, it becomes highly desirable.

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The Evolution of Atomic Theories

Lawrence J. Giacoletto, e., '38

Note: This is the last of a series of two articles on atomic theory. In it Mr. Giacoletto traces the various theories of atomic structure from the beginning of the Twentieth Century to the present time.—Editor.

The Bohr Atom

In 1901 Planck, a German physicist, after having studied black body radiation, advanced the theory that radiation is not a continuous flow as it appears superficially but occurs in jerks or spurts. He explained that energy was radiated in separate bundles called quanta. A quantum of energy (e) is given by his equation:

$$(4) \quad e = hv$$

where h is a constant now universally known as Planck's constant

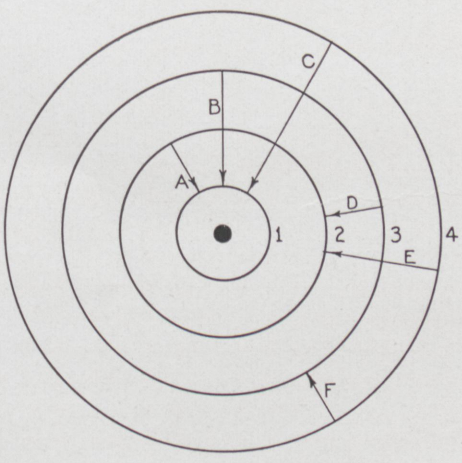

FIG. 3

equal to 6.55×10^{-27} erg-seconds and v is the frequency of the radiated energy.

Planck's equation was used by Bohr to explain the radiation characteristics of the atom. Bohr arrived at his conclusions by a study of spectra which are visual manifestations of energy radiated by the atom; energy which must come from the internal mechanism of the atom.

Bohr retained Rutherford's atomic model of rotating orbital electrons. However, the electrons were now endowed with another possible movement. That is, the electrons could jump from one orbit to another; in so doing some whole number multiple of the quantum of energy was either radiated or absorbed depending on whether the change was to an orbit of lower energy level or higher energy level. To better understand this let us consider the case of the hydrogen atom which is pictured in Figure 3. The four concentric circles represent four possible stable orbits for the single electron, while the radial lines denote the six possible ways the electron can change orbits. This change is not a change in position as we know it but an instantaneous change taking place without traversing the intermediate space. Mathematical investigation of the energy levels shows that if the energy of motion in the first orbit is represented by e, the energy of orbit 2 is $\frac{e}{4}$; of number 3, $\frac{e}{9}$; and of number 4, $\frac{e}{16}$. As an electron passes from the outer to an inner orbit (i.e. radiates energy), it loses energy of position and gains energy of motion. The total loss of energy is the energy radiated and may be shown to be equal to the gain in energy of motion. The energy radiated or absorbed can therefore be written as the difference between the energy of motion levels. Also from equation 4, each energy change must equal hv. Thus the energy change for each change of position as represented in Figure 3 is given by the equations:

$$(5) \quad \begin{cases} \text{for A} \quad e - \frac{e}{4} = \frac{3e}{4} = hv_1 \\ \text{for B} \quad e - \frac{e}{9} = \frac{8e}{9} = hv_2 \\ \text{for C} \quad e - \frac{e}{16} = \frac{15e}{16} = hv_3 \\ \text{for D} \quad \frac{e}{4} - \frac{e}{9} = \frac{5e}{36} = hv_4 \\ \text{for E} \quad \frac{e}{4} - \frac{e}{16} = \frac{12e}{64} = hv_5 \\ \text{for F} \quad \frac{e}{9} - \frac{e}{16} = \frac{7e}{144} = hv_6 \end{cases}$$

Solving for v (the frequency of the energy radiated) in each case gives:

$$(6) \quad \begin{cases} \text{for A} \quad v_1 = \frac{e}{h} \times \frac{3}{4} \\ \text{for B} \quad v_2 = \frac{e}{h} \times \frac{8}{9} \\ \text{for C} \quad v_3 = \frac{e}{h} \times \frac{15}{16} \\ \text{for D} \quad v_4 = \frac{e}{h} \times \frac{5}{36} \\ \text{for E} \quad v_5 = \frac{e}{h} \times \frac{12}{64} \\ \text{for F} \quad v_6 = \frac{e}{h} \times \frac{7}{144} \end{cases}$$

Therefore, if the constant, $\frac{e}{h}$, can be determined, the position of important spectral lines in hydrogen's spectrum can be fortold. The constant, $\frac{e}{h}$, is often denoted by R and is known as the Rydberg constant. Its evaluation by Bohr and Haas tied together the three fundamental atomic constants, namely: charge of the electron, mass of the electron, and Planck's constant. The value of the constant, R, is 3.291×10^{15} vibrations per second. It is therefore seen that the six important lines of hydrogen's spectrum bear whole number relationships to each other. The position of these lines can be measured by the use of a spectroscope.

The actual complete spectrum of hydrogen is a rather complicated affair. However, it becomes

quite simple when viewed from an energy level standpoint. Thus when the orbital electron changes from an outer orbit to the lowest energy level (orbit number 1), the resultant series of spectrum lines is known as the Lyman series. If the change is from an outer orbit to orbit number 2, the series is known as the Balmer series. The Paschen series is due to transitions down to the third orbit, and the Brackett series is due to transitions down to the fourth. It is readily seen that for each series a succession of differences can be written to correspond with each possible frequency in that series. Thus for the Balmer series which is a transition from some outer orbit to orbit number 2, the frequencies bear the following relationship to each other:

(7)

$$\left(\frac{1}{4}-\frac{1}{9}\right):\left(\frac{1}{4}-\frac{1}{16}\right):\left(\frac{1}{4}-\frac{1}{25}\right):\left(\frac{1}{4}-\frac{1}{36}\right):\text{etc.}$$

Thirty two lines have been observed in this series which means that a transition must have taken place from the thirty-fourth orbit, signifying that the diameter of the hydrogen atom increased by approximately 34 times its normal size (electron occupying orbit 1). This condition is only possible in an almost perfect vacuum (the spectrum was observed in a distant nebula).

Sommerfeld's Elliptical Orbits

Bohr orginally assumed that the orbital electrons moved in circular paths. This is not necessarily true, so that in 1915 Sommerfeld introduced elliptical orbits.

As the electron travels around its elliptical path, it speeds up as it approaches the nucleus. Now, from Einstein's theory of relativity, an increase in velocity means an increase in the inertial mass of the particle. As a result of this increase in velocity and mass, the orbit precesses about the nucleus as is shown in Figure 4. This precession introduces a slight frequency difference making the spectrum line a bit thicker than normal. As small as this difference is, instruments of highest resolving power have shown that it certainly exists, thereby giving a beautiful proof that Einstein's theory is applicable sub-microscopically as well as macroscopically (the precession of the planet, Mercury, about the sun was also explained on the same basis).

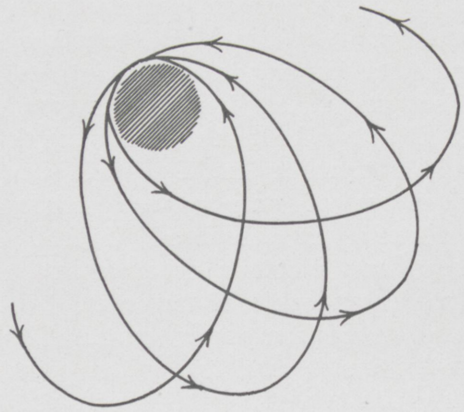

FIG. 4

The Lewis-Langmuir Cubical Atom

The chemists were not very friendly towards the physicist's conception of matter as composed of electrons rotating swiftly around a nucleus. The chemist viewed the formation of crystals as a wonderful example of the simple internal structure of the atom. Consequently two American chemists, Gilbert N. Lewis and Irving Langmuir, in 1916 developed a static atomic model known as the cubical atom. The orbital electrons were placed on shells of varied distances from the nucleus. As a change was made from one element to an element of next higher atomic number, one more orbital electron was placed on a shell, and the nucleus changed accordingly. However, there was a certain maximum number of orbital electrons that could be placed on one shell and after this another shell needed to be started. The three laws of shell formation can be stated thus:

(1) The maximum number of electrons possible on a shell is $2N^2$, where N is the number of the shell as numbered outward from the nucleus.

(2) The outermost shell can not take more than 8 electrons. The excess electrons must be placed on the next inner shell.

(3) The next to the outermost shell can not have more than 18 electrons. The excess electrons are placed either on an inner shell not filled to its maximum capacity or on the outermost shell to complete it, or, if neither of these are possible, a new shell must be started.

The cubical atom satisfactorily explained the octet grouping of the elements, accounted for variable valence, and to some degree explained the presence of the rare earth elements. Electrons were still permitted to jump from one shell to another; this being the basis for the explanation of variable valence.

In Figure 5 is shown the composition of the atom of the rare gas, argon. Since there are already 8 electrons on the outermost shell, there would not be any tendency for the atom to take away electrons from another element. Stated in other words then, it has a zero valence. The combination of lithium and fluorine is shown in Figure 6. It is easily seen that after this combination both shells are in a stable condition, and there exists an attractive force between them due to the opposite charges caused by the transfer of the orbital electron. Some elements, such as carbon, tend to form a chain of atoms, always having an unsatisfied bond to fill. This gives rise to the formation of crystals and crystal growth. The Lewis-Langmuir cubical atom has been very useful in pictorially representing certain chemical properties. However, what it gains in chemical clearness it loses in physical explication.

de Broglie's Wave Mechanics

Bohr's atomic model left the scientist in about the same position that Newton and the scientists of his time held. There arose the same controversy as to whether the atom

could be pictured as made up of discrete particles or was basically a wave structure. In the wave theory, the electrons of an atom traveling in their orbits are no longer completely governed by the laws of Newton, but the motion of these particles, if particles they are, is ruled by the patterns of their standing waves. Accordingly, Bohr's orbits, depending on the equilibrium between force of attraction and centrifugal force for stability, are replaced by orbits whose lengths are whole number multiples of the wave lengths. In other words the orbit of the electron would give the appearance of a standing wave. The product of the momentum by the length of the path must also be an integral multiple of the elementary quantum of action, h. By solving two equations simultaneously and substituting in the third, de Broglie computed the radius of the hydrogen atom in the normal state to be 5.3 x 10^{-9} cm., the velocity of revolution was 0.729 percent of the velocity of light, and the frequency of revolution was 6580 x 10^{-12} revolutions per sec.

Schrödinger further devolped de Broglie's wave mechanics. He added certain refinements and combined some properties of a particle to those of a pure wave. The wave theory was also aided by such men as Born, Jordan, and Diras. The wave theory very satisfactorily explained the reflections of electrons, which had been shown to exist by Davisson and Germer of the Bell Laboratories, and the diffraction of high speed electrons when passed through thin metal plates.

Heisenberg's Principle of Indeterminacy

In 1927, Heisenberg, in attempting to remove from atomic mechanics all quantities which are inaccessible to direct experimental measurement, came upon his principle of indeterminacy. Heisenberg stated that the more accurately the position of a particle was specified, the less accurately the velocity or momentum could be specified, and vice versa. Thus, if a is the uncertainty in the knowledge of position and b is the uncertainty in the knowledge of velocity, then the two were related by the equation:

$$(8) \quad ab = h$$

where h is again Planck's constant. From equation 8, it is seen that the quantities a and b have a see-saw relationship to each other. As one went up the other went down. An explanation of the principle may be given as follows. Suppose the properties of a particle such as the electron are to be specified. To determine the position, the particle must be seen either with our own eyes or, in this case, by the use of some type of photographic device. However, to see the particle, it must be illuminated with light, and if a picture of the particle is to be taken at any instant, a more intense or higher frequency light source must be used so that the time of exposure will be reduced. However, the higher the frequency of the light source that is cast on the particle, the more violently the particle is disturbed from its original path. Thus the particles can be pictured as being absolutely motionless in absolute darkness, and as light is admitted to locate the particle, it begins to move so that the position and velocity can not be determined simultaneously.

Heisenberg's principle of indeterminacy reserves for itself a very important position in modern physics.

Speculative Thought

A few years ago the atoms were pictured as composed of hard discrete particles each occupying its own definite position. The static structure was then replaced by a dynamic model. The atom now became a whirling mass of smaller particles, each of course following a definite law. Then removing the

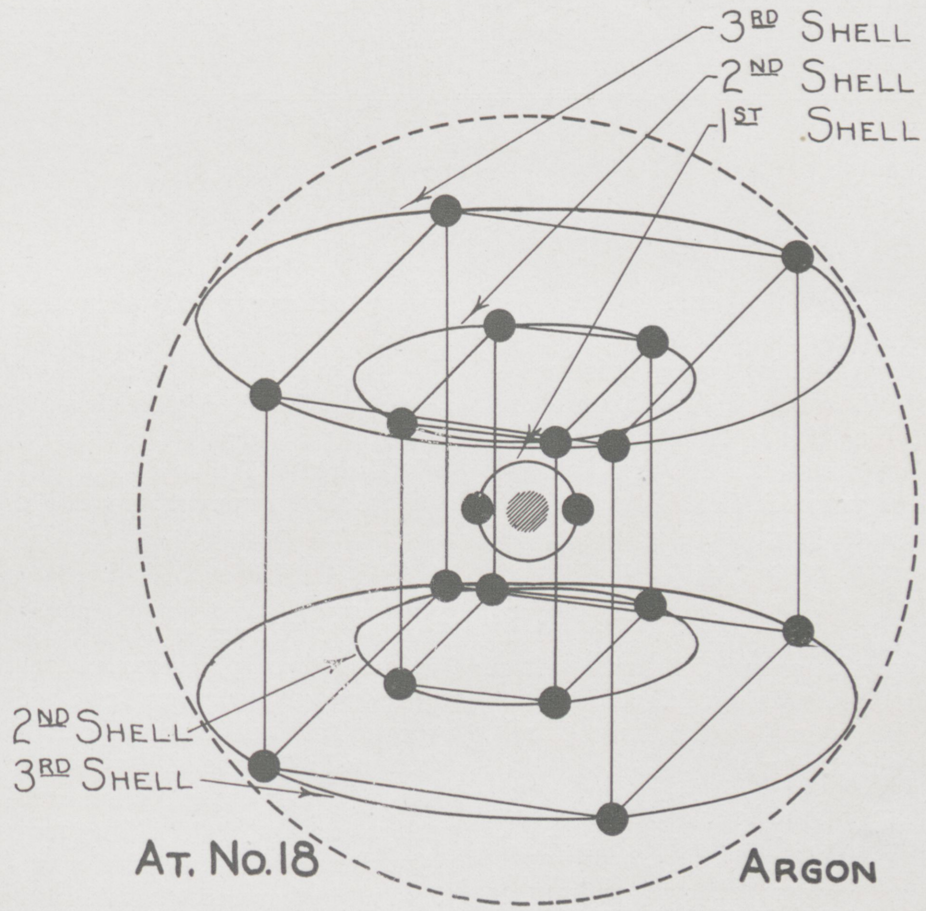

FIG. 5

atom further from the world of reality, it was pictured as composed of waves. Wherever the waves were more dense was to be found an atom or some smaller particle. However, a wave necessitates a medium for its transmission, in fact, for its existence, but Michelson and Morley's famous experiment in 1887 seemed to show that there was no such medium or ether present.

Newton and the scientists of his time had attempted to depict nature as a beautifully mechanized universe. They were seeking for the laws with which they could predict the future, having given the past. However, Heisenberg's principle of uncertainty stated that the ultimate laws of nature could only be written on a statistical basis. Newton's cosmos now crumbled, leaving only a chaos of uncertainty. No longer could man picture himself as the supreme ruler of his own destiny.

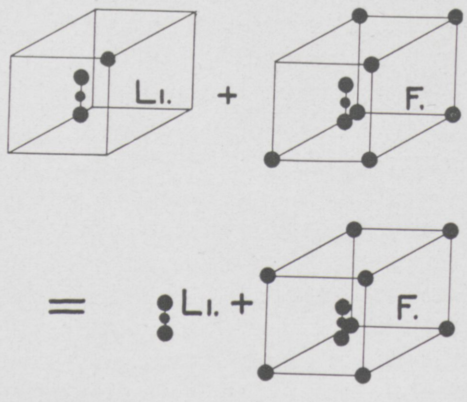

Fig. 6

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Air Conditioning

Claude L. Zinngrabe, m., '38

SINCE the beginning of time, air has been one of the predominating necessities for the existence of life. It alone is the absolute controlling factor in all animal life. People can live for days without food or water, but only a few minutes without air. Air, technically known as a gaseous mixture of mainly oxygen, nitrogen, carbon dioxide and water vapor, regulates to a large extent the span of life of the human being. It has a definite effect upon how he feels, thinks, works or plays.

The human body has always been subject to changes in atmospheric conditions. Excessive temperature and humidity quickly reduce his energy and efficiency. The change of seasons or climatic surroundings greatly affects his activity and health. Although he cannot regulate and control these conditions out-of-doors, he can and does control and regulate conditions indoors.

What is meant by the term air conditioning? It is the mechanical process of treating air to produce a clean, comfortable atmosphere. This process involves temperature and humidity regulation, in addition to active circulation and distribution of dust free air.

Since the human body maintains a constant temperature of 98.6 degrees Fahrenheit, and since a comfortable temperature ranges from 70 to 75 degrees Fahrenheit, heat must usually be removed from the body by the surrounding atmosphere. This heat removal can be accomplished in one of three ways: that is, either by radiation, convection, or evaporation. The most natural method is that of evaporation and is therefore that which is employed in air conditioning. To have a proper rate of evaporation there must be a proper moisture content in the air: thus the humidity must be controlled. If the humidity is too high, evaporation takes place very slowly, and, on the other hand if the humidity is too low, evaporation is rapid. Both cases cause considerable bodily discomfort. When air conditioning is employed this discomfort is eliminated by regulating the humidity to the proper degree by use of fans and cooling systems.

In order to insure the breathing of a pure, healthy air, an additional highly important factor, air conditioning provides for the cleaning of the vital mixture of gases. This cleaning is accomplished by passing the air through a series of filters. Thus all dust, soot, and smoke are removed; the resulting product being a comfortable, clean, healthy atmosphere.

Today air conditioning has become an accepted feature, and with its approval new, more economical, more comfortable, and more efficient homes, offices and factories are being erected.

Many new developments, coupled with the collateral advantages of air conditioning, are slowly changing man's life and living conditions from the old uncomfortable, irritating mode to a new, more efficient, comfortable, and enjoyable one.

THE ROSE TECHNIC

Member Engineering College Magazines Associated

Stormy Weather for C. I. O.

The C.I.O. has had some rough going for the past few months, and all indications point to the fact that the John L. Lewis steam roller is being stopped with some rather brutal treatment. The bitter labor disputes today are not between business and unions, but between one union and another. Warfare between the A.F. of L. and the C.I.O. has become ever hotter, and recently actual physical strife has broken out between the two. The C.I.O. is definitely on the defensive.

One of the worst blows suffered by Mr. Lewis and company was the loss of prestige, both with the public and at the White House. The recent elections were the strongest evidence that public support had collapsed. Loss of C.I.O. prestige at the White House is evidenced by the fact that William Green has supplanted John Lewis as the President's favorite caller.

In addition to external difficulties, internal strife in the C.I.O. has reached a point where six of Lewis's more influential lieutenants have openly defied their chief. These men knew that the cause of the C.I.O. had been hurt by violence and sit-down strikes, and they knew also that Lewis's blatant public claim that the administration owed him a political debt was bad psychology. When Harry Bridges, an alien and a communist, was appointed C.I.O. director on the Pacific Coast, and when several divisions of the C.I.O. openly criticized the New Deal labor policy, civil war flared.

The rebelling lieutenants were undoubtedly justified in their criticism. When Lewis alienated the Administration, he bit the hand that fed him. Any good labor leader must follow certain rigid specifications to be successful. He must remain in the Administration's favor, keep all bargains and treaties resulting from arbitration, and, above all, rigidly obey and see that his followers obey all laws of the United States, *including the Wagner Act.*

The A.F. of L. has capitalized on the C.I.O. mistakes. William Green has come out with a new six-point plan which is the first constructive labor program in many years. In this program, the A.F. of L. does, of course, propose a high wage maintenance, but also proposes means of aiding business expansion and stimulation.

If we are to have a centralized labor union, the American Federation of Labor deserves preference over the C.I.O. In the past several years the A.F. of L. has been very fair in its demands on business while the C.I.O. has taken a course of direct opposition. If the A.F. of L. continues in a peaceful and constructive manner, it will again be heartily endorsed by both labor and capital.

National Defense

The problem of national defense has come to be extremely important in this present war-mad world. Each new armed struggle brings the nations nearer to another world war.

The Reserve Officers Training Corps, in which college men are trained to lead troops in the event that we take part in a war, has been attacked many times by pacifists on the grounds that it was making militarists of our young men and morally ruining them. A survey of ten thousand graduates who have had R.O.T.C. training does not support the claims of the pacifists. Ninety-seven and one-tenth per cent stated that this training had a definite educational value of its own. That R.O.T.C. training does not tend to produce a militaristic attitude was the definite opinion of ninety-three and six-tenths per cent.

Do you agree or disagree with these editorials? The editor will be pleased at any time to hear your comments.

Our national defense would be materially weakened, if the enemies of R.O.T.C. succeed in driving it out of our schools. These courses provide the men who hold commissions in the Officers Reserve Corps, about which our war-time army will have to be built. It would be very expensive if we had to train the officers as well as the enlisted men in war-time, and much time would be wasted that could be used to bring the war to an early conclusion.

It is the duty of every good American citizen to do everything he can to aid in our national defense. One of the least expensive and least militaristic ways of providing security from invasion is to give the R.O.T.C. adequate support; first, as an instrument for discouraging aggression against us and second, as an essential means of defending ourselves and our country if others force war upon us.

The chief engineer of a large eastern manufacturing company recently remarked that some young graduates whom he had employed could neither read, write, draw nor do arithmetic. By this overstatement he was emphasizing the fact that college trained engineers sometimes are sadly lacking in fundamentals. However, the real drill in elementary subjects and the foundation of habits of careful thinking come before college years. Preparation for a successful engineering education begins in the grades and is especially important in high school.

If you have any problems in connection with your high school preparation, don't hesitate to write to the Registrar.

ROSE POLYTECHNIC INSTITUTE

TERRE HAUTE, INDIANA

Campus Activities

edited by
J. Edward Taylor,
ch., '40

The Rose Show Progresses

At assembly on Thursday, November 11, Professor Knipmeyer, chairman of the Rose Show Committee, urged the student body to spend much time in planning this worthy project in order to uphold the "constantly improving" reputation which the previous exhibitions have established. Professor Knipmeyer also announced that J. Allan Greenland, senior in mechanical engineering, had been chosen general chairman of the show by the planning committee and that each of the four technical departments, the physics department, and the military department will each have a senior, junior, sophomore, and freshman chairman to cooperate with Mr. Greenland.

The group chairmen elected by the groups they represent are: department of chemical engineering, Ralph White, senior; Richard Weldele, junior; Emil Christiansen, sophomore; and William Rustamier, freshman; department of electrical engineering, Clemens Lundgren, senior; Frank Doenges, junior; Earl Swickard, sophomore; and George Schull, freshman; department of mechanical engineering, Claude Zinngrabe, senior; Gene Petty, junior; John Quinn, sophomore; and Robert Phelps, freshman; department of civil engineering, Charles Fuller, senior; Richard Powell, junior; Vernon Whitehouse, sophomore; and Clare Harper, freshman; and the department of military science, George Neyhouse, senior; Randall Wise, junior; Ernest Palisin, sophomore; and John Lent, freshman. Chairmen for the physics department have not been elected as yet.

For convenience the files of old programs have been mounted and are displayed in the library for the students' leisurely perusal. It is expected that the better ideas may be re-displayed and that possibly new, more spectacular stunts be suggested.

Student Council

The Rose student council, consisting of the class presidents and the presidents of the recognized student organizations on the campus, met at the Sigma Nu house on Thursday, November 4, to elect officers according to the constitution. The officers elected for the year were Wendell E. Carroll, president; Edward H. Eckerman, vice president; and Frank M. Beeler, recording secretary.

The council then proceeded to hear reports on the investigation of the National Student Federation. The revision and extension of the existing honor point system was also considered.

President Prentice Speaks

President Donald B. Prentice addressed the Rose Tech Club of Dayton, Ohio, at a dinner meeting in the Biltmore Hotel in Dayton on Thursday, November 11. The Dayton club, like those in many of our larger cities, is composed of Rose graduates who are located in that area. These clubs furnish ample evidence that Rose alumni retain considerable interest in the Institute after graduation and that college life is responsible for many bonds of friendship which are especially valuable to men who are beginning work in a strange city.

President Prentice also appeared before the Dayton section of the American Society of Mechanical Engineers at the University Club of that city, where he discussed the operation of the local chapter at Rose.

Reserve Officers' Training Corps

The military band attached to the Rose unit of the R.O.T.C. under the direction of Mr. Malcolm C. Scott, Rose '22, is rapidly developing into an excellent musical aggregation. The band contains twenty-two instruments, and the members come from a rather widely distributed area: Robert Young, Indianapolis; Mark Anthony, Streator, Ill.; Milton Hosack, Bellevue, Pa.; Stanley Craig, West Union, Ill.; William Egloff, Brazil; Wayne Bennet, Terre Haute; Darwin Bare, Linton; Ivan Frakes, Indianapolis; Paul France, Brazil; Herbert Hall, Clinton; Kenneth Hambrock, Terre Haute; John Johnston, Bedford; William Kerns, Attica; John Kramer, Terre Haute; William Loman, Cutler; Lucien Nelson, Staunton; John Poole, Linton; Ross Pyle, Rockville; Maldon Titus

Marshall; LaRue Allen, Salem; Charles Zachritz, Rockport; and Edward Watson, New Goshen.

The band preceded the battalion in the Armistice Day parade in such a manner that Captain Frederic A. Henney personally congratulated the entire unit for the performance. The good showing was made possible by the fact that new uniforms for the junior officers arrived in time to allow the battalion to turn out one-hundred percent.

Football Luncheon

The football squad of Rose was honored along with squads of Indiana State Teachers College, and Wiley, Garfield, and Gerstmeyer high schools by the Service Clubs of Terre Haute at a luncheon given in the Mayflower Room of the Terre Haute House on Tuesday, November 30.

Major John Griffith, commissioner of athletics in the intercollegiate conference, was guest speaker for the occasion.

Positions Offered

The board of Industrial Relations of the United States Steel Corporation communicated with the Rose Placement Bureau recently, requesting that they set a date for representatives of this corporation and its subsidiaries to interview Rose seniors regarding prospective employment.

S. P. E. E.

Professor Stock, president of the executive committee of the Society for the Promotion of Engineering Education, opened the first meeting of the committee on Saturday, November 20. The date for the spring meeting of the Illinois-Indiana branch was tentatively set for May 7, 1938.

Other committee members who attended the meeting were R. E. Rich, Notre Dame; Stanton E. Winston, Armour Tech; L. H. Creek, Purdue; and Herman Moench, Rose.

A. A. U. P.

The Rose faculty branch of the Association of American University Professors met on Tuesday, November 23, in the rooms of the University Club. As officers for the ensuing year, Professor Edwin W. Mann was elected president, Professor Herman A. Moench, secretary; and Dr. Fred Genschmer, treasurer. Following the election Dr. Prentice submitted a paper on his research into the success of graduates of engineering schools as measured by the number of alumni listed in "Who's Who in Engineering."

Several Rose faculty members have signified their intention of visiting Purdue University on December 11 when a joint session of the A.A.U.P. chapters of the state is to be held.

Glee Club

The glee club has been practicing for several weeks, and, according to Mr. Chelsea Stockwell, director for the club this year, it is rounding out very nicely.

Mr. Stockwell brings a wealth of experience to the club since he has been studying voice for fourteen years, including several years under the late Clyde Bennett, director of many Rose glee clubs. He also directs the noted Methodist Temple choir and is active in the mid-west concert field.

In addition to the twenty-six men admitted to the club, the organization boasts a violin soloist, a soprano soloist, and a double quartette. Followers of the club will be glad to learn that Mrs. Edris Bennett is at her old post again this year as accompanist and advisor.

Radio Club

The Rose Tech Radio club was host to the Wabash Valley Amateur Radio Association on Friday, November 5. The meeting was held in the physics lecture room at Rose, and talks were given on directive antennas and ultra-high frequency apparatus.

Club members have been using the club amateur station, W9NAA, recently and were successful in contacting several graduates of Rose. Albert Mewhinney, Rose '36, who operates W8QHY at Dayton, Ohio; Mr. Theodore Hunter, formerly of the physics department, who operates W9NTI at Iowa City, Iowa; and Albert Lotze, Rose '37, who operates W9KDD at Indianapolis, Ind., were contacted within the last few weeks. Schedules have been arranged with other Rose men, and the club will be pleased to hear from any alumnus who has access to an amateur station.

A. I. Ch. E.

A majority of the student members of the Rose branch of the American Institute of Chemical Engineers visited St. Louis, Mo., on November 15 and 16 to attend the thirtieth annual meeting of the institute.

After registration on Monday morning at the Kingsway Hotel the group toured the pilot plant of the Monsanto Chemical Company. After dining at the hotel, toastmaster Dr. L. E. Stout presented the speakers for the evening, who were Dr. Harry A. Curtis, chief chemical engineer of TVA, and Joseph R. Mares of the patent department of Monsanto Chemical Company.

Tuesday's program included the inspection of the plant of Anheuser-Busch, Inc., and a speech by past president Albert E. Marshall on "How a Young Chemical Engineer Can Develop Professionally." Following the talk groups were organized for diversified round table discussions.

These yearly meetings attract nationwide attention and are of great value to the student engineer. They serve to inform him exactly as to the conditions he is likely to meet in his chosen profession, thus making it possible for him to orient himself in the preparation for his profession.

On Tuesday, November 23, the branch met to discuss the St. Louis

meeting for the benefit of those unable to attend. Ralph White, Joseph Dillahunt, Robert Dispennet, and President Norman Wittenbrock reviewed the student meeting. Professor Mann told of the trips to the Pevely Dairy and the Shell Refinery, and Dr. Strong gave a general summary of the professional branch meeting which was held during the following two days.

During the short business session it was decided that Friday afternoons would be more opportune times to hold the monthly meetings. The projected inspection trip to the plant of the Brazil Clay Company and the fact that Captain F. A. Henney, Corps of Engineers had been invited to speak to the group on December 10 were discussed.

A. I. E. E.

A business meeting of the Rose branch of the American Institute of Electrical Engineers was held at 8 o'clock, Tuesday evening, November 23. Lawrence Giacoletto gave a talk on his work this summer with the Collins Radio Company at Cedar Rapids, Iowa, and presented various sample charts and figures.

As a concession to safety, John Fessler spoke of electric shocks and the importance of artificial resuscitation in reviving shock victims.

After introductions all around the group adjourned to the physics laboratory where lemonade was manufactured on the spot, and a more informal meeting was conducted.

A. S. C. E.

The Rose Polytechnic branch of the American Society of Civil Engineers met at the University Club on Tuesday evening, November 8, in the Hotel Deming to hear Captain Hendrikx of the Ohio Paving Brick Manufacturers' Association. In addition to his talk on the materials and construction of brick pavements, Captain Hendrikx graphically illustrated his subject with numerous slides.

Mr. C. B. Carpenter, superintendent of sanitation at Bloomington, Ind., also addressed the group. Mr. Carpenter is the contact member appointed by the national society to act as student advisor for the Rose branch.

Rifle Club

Warrant Officer Kearns, coach of the rifle team, issued the schedule for indoor gallery rifle practice the first week in November. All freshmen were urged to begin practice early since they were to be given special attention and consideration during the first three weeks.

R.O.T.C. Promotions

The following appointments and promotions in the Engineer R.O.T.C. Battalion, Rose Polytechnic Institute, are herewith announced:

To be Cadet Sergeants—

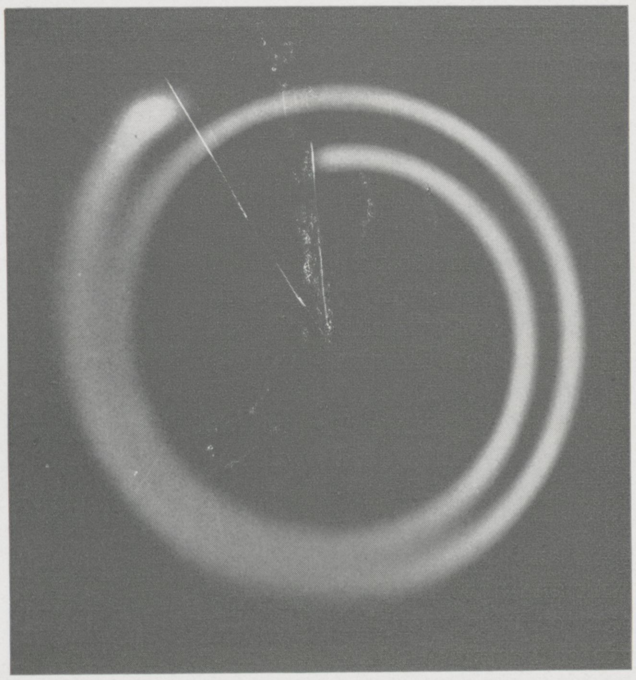
Richard D. Altekruse
Robert J. Burger
Franklin G. Doenges
Robert N. Ladson
William M. Noel
Victor W. Peterson
William A. Reddie
Joseph E. Ross
George W. Smith
Edward O. Spahr
Robert W. Underwood
Roy E. Warren
Richard G. Weldele
Randall A. Wise
John W. Yaw

To be Cadet Privates, 1st Class—

John G. Appel
William H. Bradley
Robert G. Brittenbach
Maurice W. Cannon
Raymond E. Chausse
Emil G. Christiansen
Robert H. Colwell
Stanley R. Craig
James E. Ducey
Otto E. Duenweg
Norman G. Eder
William C. Egloff
Maurice C. Fleming
Riley S. Halstead
John A. Hart
Karl J. Hessler
Milton M. Hosack
David M. Huggins
Maurice W. Johns
Avery C. Kelsall
Robert S. King
John F. Kowinski
James A. Lohr
Adrian R. MacFarland
Max L. Mitchell
Chancellor D. Montgomery
Ernest J. Palisin
Frank G. Pearce
David C. E. Reifenberg
Joseph S. Robinson

Research and Progress

edited by
Lawrence J. Giacoletto, e., '38



Cut Courtesy of The Cornell Engineer

385 microseconds as viewed on the cathode-ray tube. Each revolution is equal to 200 microseconds.

Measuring the Velocity of Light

Any measurement of velocity involves basically the measurement of distance and the time necessary to traverse that distance. For a continuous medium such as light, the time interval can not be measured unless a point in the beam is identified. In several past experiments the identification mark was obtained by rotating mirrors or cogwheels. However, due to the relatively low frequency at which the identifying pulses occur, it is necessary to use large distances for measuring the time interval.

Wilmer C. Anderson of the Physics Research Laboratory at Harvard University has markedly reduced the length of the base line required by employing high frequency modulation of the light beam. A modulated light beam is a beam whose intensity varies according to a predescribed manner. A Kerr cell is used to modulate the light beam. The cell consists of two parallel plates of metal immersed in a suitable liquid. In operation the plates or electrodes of the Kerr cell are initially biased to a given d.c. potential. Upon this d.c. bias potential there is superimposed a high frequency oscillatory potential. Due to the electro-optic effect of a Kerr cell, the oscillatory potential can be employed to vary the light intensity of a beam transmitted between the cell plates. The light beam transmitted through the Kerr cell is split into two beams by the use of a half-aluminized mirror. One of these beams is caused to travel a longer path than the other. Both beams are received at a photocell which changes the varying light intensities into correspondingly varying electric potentials. The varying electric potentials are detected by the use of a sensitive radio receiver containing a local oscillator for obtaining audio beat notes.

In general there will be a given phase relationship existing between the two light beams falling on the photocell. If the response in the radio receiver is minimized by varying the optical path differences, S, the two light beams will be 180 degrees out of phase, and the velocity of light, C, can be determined by the equation:

$$C=2FS/N$$

where F is the frequency of the high frequency oscillator and N is an integral odd number.

In the tests made, the radio frequency employed was 14 megacycles. The distances were measured with utmost accuracy. The data obtained showed consistent results within close limits. The mean result of 651 measurements gave as the speed of light in vacuum, 299,764±15 km./sec.

Cathode-Ray Timer

Trevor R. Cuykendall of Cornell University has recently described a new method of measuring very short time intervals. Essentially, the timer consists of a commercial cathode-ray tube and a circuit for swtching its beam on and off. If the two pairs of deflecting plates on the cathode-ray tube are connected to two sinusoidal alternating voltages of equal amplitudes but 90 degrees out of phase with each other, the pattern on the screen will be a circle whose radius and period of revolution will be determined by the magnitude and frequency, respectively, of the sweep voltages. If the cathode beam is only on during the time between two successive acts, the duration of the time interval can be determined from the length of the arc of a circle described by the beam and the frequency of the sweep voltage.

The electron beam is controlled by a grid of the cathode-ray tube. Initially the grid is biased negatively so that the beam is cut off. The beginning of an event is signified by a voltage wave traveling over two wires. These two wires are connected to the grids of two gas filled tubes known as thyra-

trons. The two tubes are initially non-conducting, but the arrival of the voltage wave "fires" one of the tubes causing an arc discharge. This discharge in turn makes the grid of the cathode-ray tube positive, thereby starting the electron beam. The cessation of the event is signified by a second voltage wave which "fires" the second thyratron tube which in turn stops the electron beam. Thus the beam is on the same length of time as the event which is to be measured. By suitably designing the sweep voltage circuit, the fluorescent pattern can be changed from a circle to a spiral to permit measurements of time intervals longer than that represented by a complete circle.

The cathode-ray timer has proved most valuable for measuring time intervals in the region of 50 to 1000 microseconds.

Hyper-Frequency Wave Transmission

The fact that ultra-high frequency electromagnetic waves could be "piped" through dielectric cylinders was first predicted mathematically by Lord Rayleigh in 1897. Recent investigations of this phenomenon by G. C. Southworth and W. L. Barrow, working independently, have brought to light several interesting aspects of this type of transmission.

The wave guide used can be either a solid dielectric cylinder or a hollow metallic tube where the air serves as the dielectric. For a particular guide, there is a critical frequency below which waves may not be propagated. This cut-off frequency as it is called is dependent on the diameter of the guide and on the dielectric constant of the medium. The guide therefore acts as a high pass filter.

Frequencies used in the investigations of G. C. Southworth ranged from 2000 to 6000 megacycles. The diameter of hollow tube guides for this frequency range varied from one inch to five inches. It was discovered that short lengths of wave guides would resonate electrically in much the same way as pipes resonate acoustically. Thus a generator for the waves consisted of a Barkhausen oscillator placed in the center of the tube with a movable piston in one end to permit adjustment for resonance. An adjustable iris was placed in the open end to permit control of the outgoing waves. The resonance frequency was also found to be dependent on the size of the iris opening.

A resonant chamber with adjustable piston was likewise used as the detecting element of the receiver. The receiver could be either connected in the end of the guide, acting as a sink and absorbing all the wave power; or loosely coupled by being mounted around the circumference of the guide, absorbing only a small part of the wave power. It was discovered that the presence of small bits of dielectric substances in the receiver chamber markedly affected the resonance point. This suggested the possibility of measuring dielectric properties of materials at ultra-high frequencies. In the past, such high frequency measurements had been extremely difficult to make. It is along this line of electrical measurements that the new investigations seem to be particularly applicable.

How Good Are Your Brakes?

Higher speeds of travel have placed added dependence on the braking mechanism of a car. Most states require that the brakes be tested periodically to determine whether they are in good working condition. However, the methods used in the past for testing the decelerating ability of a car's brakes have not been entirely satisfactory. One of the generally used methods consisted of painting lines, 25 feet apart, on a driveway. The car driver was instructed to drive at a rate of 20 miles per hour until he was alongside of the first painted line, then apply his brakes. The merits of his brakes were judged solely on his ability to stop within the prescribed 25 feet. The test as such was anything but accurate, relying greatly on the driver's ability to apply the brakes at the correct moment. The desirability of a compact, easily applicable instrument for making deceleration measurements is therefore quite evident. R. J. Alden, a pioneer in the designing of deceleration-measuring instruments, and vice-president of the Alden-Cowdrey Corporation, recently demonstrated such an instrument to a group of safety experts and motor vehicle officials.

The decelometer resembles in general appearance a common, tubular two cell flashlight. It has no moving parts. On its face are two small circular windows, one green, and the other red. A small bubble-level atop the outside of the case provides for the proper positioning of the instrument.

During the testing operation, the decelometer is placed on the floor of the car, directly in front of the inspector. A sharp set screw at the rear of the instrument holds it firmly in position. When the car

Cut Courtesy G.E.

The Decelometer

is suddenly decelerated, kinetic energy causes a column of mercury to move forward in a channeled grove. The motion of the mercury causes mercury switches to establish contact with either of two signal lights, operated by dry cells. If the deceleration is rapid enough, indicating proper braking, the mercury causes the green sig-

nal to be lighted; if not, the red signal is switched on.

The mathematical equations on which the operation of the Decelometer is based were worked out by scientists of the U. S. Bureau of Standards. Tests on the accuracy of the instrument indicate an error within seven-tenths of one percent as compared to ten percent which hitherto has been regarded as commercially acceptable for similar gauges. The instrument is calibrated to indicate a stopping distance within twenty-five feet at a speed of twenty miles per hour, the minimum requirement in many states. If desired, this setting may be changed to some other distance.

The Decelometer has received favorable attention from several sources because of the fact that it is simple to use and thus requires only a few moments for the complete test.

How's Your Suntan?

Each year many people become severely sunburned in attempting to obtain healthful benefits from the sun's rays. Now, however, it will no longer be necessary to guess the proper duration of the sunbath, for Dr. Matthew Luckiesh and A. H. Taylor of the General Electric lighting research laboratories have designed a meter which measures the amount of sunlight exposure.

Sunburn is caused by a narrow invisible band of rays in the sun's spectrum, known as ultra-violet rays. Due to the fact that the rays are invisible, it is difficult to determine duration of exposure without danger of over-exposure.

The new ultra-violet meter employs a photocell with a suitable set of filtering lenses so that the cell is only sensitive to that band of the sun's spectrum which causes sunburn. The photocell, when exposed to the sunlight, passes a small current which clocks a counting relay. The speed of counting is dependent on the intensity of the rays. The unit of sunburn has been named an e-viton which is that unit of ultra-violet light producing the minimum perceptible sunburn. The average untanned person can, without danger of burns, stand approximately 125 of these units.

Memory Machine

A machine with an electrical memory capable of photographically recording events after they have happened has been developed by D. E. Marshall and William E. Pakala, Westinghouse engineers. The memnoscope consists of a camera which is focused on a cathode ray screen and a system of condensers connected to the conducting bars of a rotating commutator. The condensers rotating with the commutator constitute the electrical mind which remembers what happened a short time before the camera shutter opens.

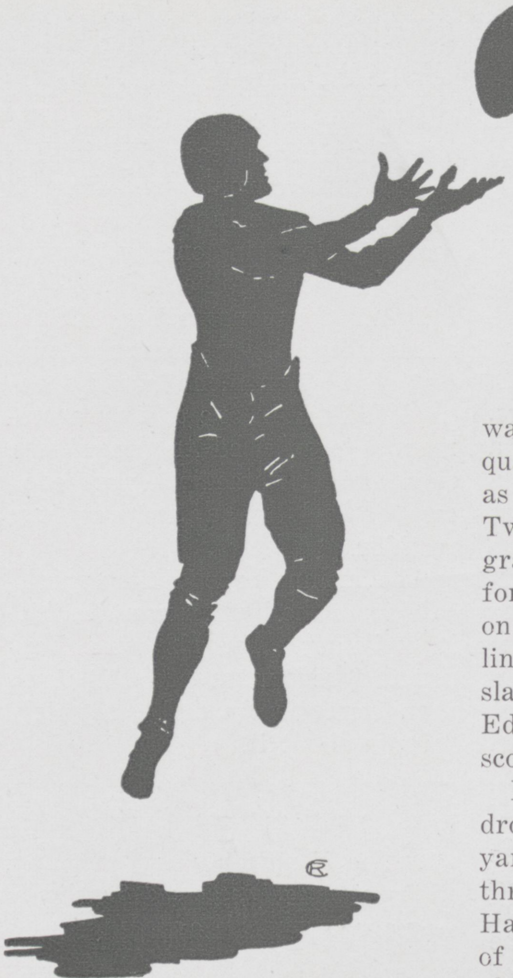
If the camera alone were used with the oscilloscope, a permanent record could be obtained only of events occurring after the action because of the unavoidable delay caused by the relays in opening the camera shutter. The addition of the rotating condenser system causes the indication of the oscilloscope to always correspond to events occurring 2 cycles previously. Thus when the relay system operates, the camera takes a picture which shows events occurring about 1½ cycles previously.

More specifically, the memnoscope consists of a commutator with 147 bars. To each bar is connected one terminal of a .01 microfarad condenser. The other terminal of each capacitor is connected to the shaft.

Any voltage on the input terminals will charge the capacitors to a value depending on the input voltage. If the input voltage varies, the charge on the capacitors will also vary from capacitor to capacitor. After a capacitor is charged by the input brush, it is carried around to the output brush where all or part of its charge can be recorded or used for some other purpose. The time of its use, however, is one revolution in time behind the input. One or two bars after a capacitor transfers its charge to the output circuit all of the charge remaining is in effect erased by a center brush. The capacitor is then ready for another charge. The output wave form is the same as the input wave form, and the loss in energy during transfer is negligible.

From the construction of the memnoscope, it is evident that only electrical phenomena can be recorded. Thus in one test the memnoscope was used to record the events which immediately preceded an arc-back in a mercury arc rectifier.

The memnoscope differs markedly from the human mind in that it unfailingly records what happened a revolution preceding and then immediately and completely forgets about it.



Sports

edited by
Robert N. Ladson, ch., '39

On October 30, Rose Poly's Engineers journeyed to Richmond, Indiana, and played the homecoming game with Earlham College. The team played by far the best game of the season but were lax on three occasions, and Earlham won 18-12. Peters, Earlham right halfback, was the chief cause of the Rose downfall. Earlham entered the game a heavy favorite because of its record of no defeats this season.

Earlham tallied its first touchdown on a surprise runback of the opening kickoff. Peters received the ball and behind deadly and precise blocking galloped seventy-five yards to score. On the try for point the over-anxious Rose team was offside three straight times and on the fourth try, the kick was wide. On these plays Eckerman, Rose left end who played an excellent game, blocked the kick each time.

The remainder of the first quarter was a real battle, and no one was able to score. In the second quarter Rose took to the air and as a result scored a touchdown. Two passes from McKee to Zinngrabe were good for a total of forty yards ending with the ball on the one yard line. After three line plays were stopped, Harper slashed over right tackle to score. Eder's place kick was wide. The score at the half was 6-6.

In the third quarter Earlham drove the ball to the twenty-four yard line and was stopped for three downs. On the fourth down Hardin went through the center of the line for a touchdown. The place kick was missed.

In this quarter Rose Poly also managed to score. Stanfield, Rose captain, punted out of bounds on the two yard line. Peters kicked out to Smith on the forty-five yard line. Smith, practically unaided by any blocking, carried it back to the eleven yard line. The Earlham team braced and took the ball on downs just five yards from the goal line. At this point Hogan, 240 lb. left tackle for Rose, broke through the line, blocked the punt, and fell on the ball on the one yard line.

On the third down Smith carried the ball over to tie the score for the second time in the game. Eder again missed the place kick. In the fourth quarter Rose Poly outplayed Earlham and drove the ball to the twenty yard line where Earlham stopped the attack. On the fourth down Harper attempted a field goal which was wide.

At this time Peters carried the ball off tackle. After crossing the line of scrimmage he cut back and ran the remaining distance to the goal unmolested with only one minute left to play. The place kick was wide.

Rose Plays McKendree

On November 6, Rose climaxed a very enjoyable journey to Lebanon, Illinois, by trouncing McKendree College 26-13. The game was played under nearly ideal conditions, for there was little wind and the field was in excellent condition.

Rose started fast, due in the most part, to the excellent ball carrying of Brittenbach, midget halfback. Twice in the first quarter "Brit" tucked the ball under his arm and galloped behind perfect interference to the McKendree secondary defense. Each time he then took the task upon himself to cut back and outrun the defensive safety man. It was a very fine demonstration of the spirit which habitually invades Rose elevens.

At this point in the game McKendree took it upon themselves to do some scoring also. In the second quarter the play was fast and furious, and much ragged defensive work on the part of both teams was in evidence. In this period McKendree scored one touchdown, and Harper scored for Rose. The score at the half was 19-6 by virtue of Norm Eder's one good place kick after the first Rose touchdown.

In the third quarter McKendree again scored after a long hard drive. The point after touchdown was good. In this quarter Rose had trouble getting started toward the goal line.

However, in the last quarter,

Brittenbach was again inserted, and he immediately ran for another touchdown. Eder again place kicked the extra point. In this quarter McKendree was held scoreless, and the game ended 26-13 in favor of Rose.

Oakland City

Rose Poly played Oakland City at Rose field on November 15, 1937. This may be called a dream game because Rose scored nine touchdowns and six extra points for a total of sixty-one points. Rose scored almost at will as the score indicates, and nearly every back that saw action was able to score at least once.

In the first quarter Rose scored twenty-one points, two touchdowns by Stanfield and one by Zinngrabe. Eder place kicked all three extra points.

In the second quarter things were practically the same. Harper scored two touchdowns and McKee scored the other. The half time score was Rose 42, Oakland City 0.

In the third quarter Oakland City's line bolstered and threw the Rose backs for many losses. In this period the "Oaks" showed a world of spirit despite the odds against them and allowed only one touchdown.

Brittenbach limbered up in the last quarter and scored two touchdowns through a tired Oakland City team. The Oakland City team was far outclassed in this contest, but it showed amazing spirit during the whole game. Although the team members' task was hopeless, they never gave up. Such spirit is to be highly commended.

Thanksgiving Day Game

Climaxing the best season in several years, the Rose Engineers played excellent football to down Shurtleff College 14-0. Fresh from winning the two previous games and with the chance of making a season record of four won and four lost, the team struggled through a dismal first half but came back strong in the second half.

The game was played at the Rose field at ten o'clock, Thanksgiving morning, before a fairly large crowd of cheering spectators. The weather was just right for football, and the game was interesting throughout. Robert Wadlow, the world's tallest man and water-boy for the Shurtleff eleven, was the main attraction during the halftime period.

In the first quarter, play was fairly even with Rose showing a little better offense than Shurtleff. The Engineers were plagued with many fumbles in this period, some of which stopped several potential goalward thrusts.

Late in the second period Rose started a determined offense featuring some good long gains and a pass from McKee to Brittenbach. However, the drive started too late to net a touchdown, for the gun sounded with the ball in Rose possession just twenty yards short of the goal line. The brilliant punting of Henderson, Shurtleff right half, kept the Shurtleff boys in the running during this half.

In the third quarter Rose really started its touchdown drive. After a few minutes of see-saw football Rose took the ball on a couple of long runs to the Shurtleff fifteen yard line where Stanfield tucked the ball under his arm and scored standing up. However, on this play a Rose man was offside and the play was called back.

On two steady drives the ball was advanced to the two yard line, whereupon Harper churned his way over the goal line. Eder, dependable guard and place kicker, booted the ball for the extra point.

A few minutes after the first touchdown Stanfield carried the ball to the Shurtleff thirty-five yard line. On the next play, a pass, Shurtleff intercepted and gained a momentary respite. However, Hogan blocked the punt, and Eckerman fell on the ball on the eight yard line. Stanfield carried the ball to the three yard line, and Harper crossed the goal line standing up. Eder again converted and the score was 14-0.

The final Rose threat started with Harper slashing nineteen yards off tackle to the Shurtleff forty-one. Stanfield picked up eleven yards on two attempts and Harper gained twenty to bring the ball to the ten yard line. At this point Rose fumbled and Shurtleff recovered. The final gun sounded a few seconds later.

Summary

This was the most successful season that the Rose Engineers have had for several years. The record was four won and four lost. The losses were to schools having much larger student bodies. In these schools, in most cases, physical education courses are offered, and this is some inducement to football players. Here at Rose football is, of scholastic necessity, a sideline in that the players are here primarily to become engineers and not football players. However, Coach Brown built up a fairly formidable team that always fought from start to finish. In points scored Rose was far ahead. The team amassed a total of 134 points while holding the opponents to 89.

Regarding next season the prospects look very good. Only four men will be lost by graduation. They are Capt. Stanfield, fullback; Eckerman and Zinngrabe, ends; and Wilson, guard. There were only three juniors on the team, McKee, Smith, and Ladson, all backs, so the next two years should be well taken care of. Rose Poly is regaining some of the prestige it held formerly in Indiana Conference football circles. This is a fine tribute to Coach Brown, who develops teams from the minimum of material.

The results of the season follow:

Rose	14	Evansville..	0
Rose	0	DePauw....	20
Rose	7	St. Josephs..	13
Rose	0	Wabash....	25
Rose	12	Earlham...	18
Rose	26	McKendree.	13
Rose	61	Oakland City	0
Rose	14	Shurtleff...	0

Alumni Notes

edited by

Robert S. King, m., '40

Edward H. Spalding

Mr. Edward H. Spalding, Rose '05, presented an article in the July issue of "The Torch", the magazine of the International Association of Torch Clubs. The article is titled "Our Cockeyed Thinking". He begins the article with, "Today our thinking as a nation is not only sluggish, careless and spiritless, but just plain cockeyed as well, and when we point out the guilty we are just as likely to put our finger on a doctor, a scientist or a lawyer as on a labor leader, a politician or a business man."

C. Chester Stock

Mr. C. Chester Stock, Rose '32, is co-author of an article in the November issue of the *Journal of Experimental Medicine* that is the result of a study of the bactericidal action of human serum on hemolytic streptococci. The study was made to determine the significance of hydrogen ion concentration (pH) and reducing agents in relation to the streptococcidal action of serum.

Obituary

Mr. Joseph A. Hepp died October 21, 1937. Mr. Hepp gradated from Rose in 1912; he was of late with the Union Electric Light and Power Company as Industrial Engineer.

Weddings

Announcement has been made of the approaching marriage of Miss Mary Eugenie Stitzer, of New York City, and Royer R. Blair, son of Mr. and Mrs. Robert Randolph Blair, of Terre Haute. Miss Stitzer, daughter of Mr. and Mrs. Ralph B. Stitzer, of Sheffield, Alabama, attended the University of Toledo and for some time has been residing in New York, where she is secretary to Gloria Swanson, movie actress. Mr. Blair received his degree from Rose in 1930. He is employed in New York and is doing graduate work at Columbia University.

Miss Shirley May Allen of Terre Haute was married to Mr. Hubert Wittenberg, formerly of Terre Haute, September 5. Mr. Wittenberg is a graduate of last year's class. He is now with the Radio Division of R.C.A. Manufacturing Company, Harrison, New Jersey. They now live in Bellville, New Jersey.

Births

Raymond P. Harris, '29, announced the arrival of a baby boy November 5, 1937, named Raymond Paul Jr.

Mr. Templeton, ex-'32, has announced the arrival of a son, Charles Merrill, on November 17.

Mr. and Mrs. Karl J. Mason have become the parents of a young engineer, born October 30 at St. Francis Hospital, Peoria, Illinois. The new comer has been named Donald Lee. Mr. Mason graduated from Rose in '35.

Dayton Alumni Meeting

A dinner meeting of the Rose alumni of Dayton was held at the Biltmore Hotel on Thursday, November 11. Those present were William J. Fogarty, '92; Harry G. Kittredge, '99; Edgar R. Weaver, ex-'14; Donald B. Weaver, '17; Harry C. Stickle, '28; Julius Hulman, '31; Albert Mewhinney, '36; and Dr. Prentice. Wert Klinger, '96, had assisted Mr. Fogarty in arranging the affair but was unable to attend. An informal discussion of recent activity on the Rose campus was adjourned early so that those present could attend a meeting of the Dayton Section, A.S.M.E., at which Dr. Prentice was the speaker.

Alumni Present at Homecoming

Although Homecoming was held several weeks ago, the complete lists of those alumni who returned to Rose has just been compiled. Those alumni present for the Homecoming celebration were: Robert L. McCormick, '91; William J. Fogarty, '92; P. Wert Klinger, '96; John A. Cushman, '03; Benjamin H. Pine, '03; John E. Bernhardt, '08; Orion L. Stock, '08; Arthur G. Butler, '10; Raymond S. Davis, '17; Henry C. Gray, '17; Sterling H. Pittman, '22; Wayne E. Watkins, '26; Robert H. Dowen, '29; Herman A. Moench, '29; Harold F. Schatz, '29; Clyde S. Marsh, '30; John W. Rockwood, '30; Harry E. Stock, '30; John W. Trueb, '30; Albert Ellis, '31; K. Richard Garmong, '31; Richard W. Johnson, '21; Harold Kehoe, '31; Robert S. Roach, '31; Charles E. White, '31; Hans M. Fischer, '32; Norman Hunt, '32; John H. Montgomery, '32; P. Arvard Smith, '32; John E. Tonetti, '32; Howard L. White, '32; Floyd E. Wilson, '32; Merrill L. Bradfield, '33; James W. Cantwell, '33; John M. Phelps, '33; W. Leon Sanford, '33; Noble C. Blair, '34; Brent C. Jacob, '34; Jack Newsom, '34; Arthur A. Tuemler, '34; Ronald W. Updike, '34; John A. Wilson, '34; John A. Bradley, '35; Gordon L. Burt, '35; Emmet J. Cody, '35; William C. Eyke, '35; John J. Fuller, '35; Ezekiel A. Hamilton, '35; Louis W. Heck, '35; John K. Loman, '35; Albert V. McEowen,

'35; Carl Nelson, '35; Bert L. Pearce, '35; Carl W. Price, '35; Harold J. Reintjes, '35; Francis H. Richardson, '35; Harry H. Richardson, '35; Virgil E. Shaw, '35; P. Byrne Terhorst, '35; Nelson B. Trusler, '35; Joseph B. Weaver, '35; Francis M. Blair, '36; James Campbell, '36; George E. Cavanaugh, '36; William R. Creal, '36; Edward B. Denehie, '36; Louis Duenweg, '36; Raymond J. Harrod, '36; Raymond R. Laughlin, '36; William G. Lindeman, '36; Paul G. McKee, '36; Albert B. Mewhinney, '36; C. Daniel Overholser, '36; Richard W. Spain, '36; Samuel Tait, '36; Joseph H. Walker, '36; John B. West, '36; Arthur F. Wood, '36; Alden Foley, '37; and Albert Lotze, '37.

Here and There With The Grads

'97 John H. Helweg, Jr. retired from Western Electric Company, Inc., October 31. His fortieth anniversary of service with that company was celebrated on September 14th, 1937. He will live in Pasadena, California with his daughter.

'04 William H. Hazard is president of Sta-Rite Products, Incorporated, of Delavan, Wisconsin.

'08 Charles H. Sievers is resident engineer inspector on the Tongue River Dam at Decker, Montana.

'09 Carl W. Piper is president of the Piper Engineering Company of Norwood, Ohio.

'10 Henry M. Shaw is now with the Parsons Engineering Corporation of New York City. He has the position of field engineer.

'13 L. W. Lewis is assistant chief quartermaster of the Panama Canal and is still at Balboa Heights.

'15 John C. Harger is sales engineer for the Stewart Warner Corporation of Chicago.

Richard D. Leitch was recently designated as a member of the Water Reserves Committee, National Resources Committee, to assist in the revision of reports requested by the president on current projects recommended for flood and soil erosion control, pollution prevention, and improvements to existing domestic water supplies, sewage disposal, and development of new sources of water supply.

'16 Robert A. Weinhardt has become second vice-president of the Decal Products Company, East Liverpool, Ohio.

'19 Arthur L. Ervin with the Air Reduction Sales Company has been transferred to Emeryville, California.

H. Winton Streeter is with the Wagner Malleable Iron Company, Decatur, Illinois.

'20 William C. Bryan is now fire insurance engineer for the National Union Fire Insurance Company at Louisville, Kentucky.

'21 Carl W. Schroeder is doing social service work at the Hannan Y. M. C. A., Detroit.

'22 Harry S. Fitzsimmons has become sales engineer with the du Pont Company at Newark, New Jersey.

'23 Richard W. Bledsoe, with the Graybar Electric Company, has been transferred to Grand Rapids, Michigan.

'24 William F. Lisman, with the Leland Electric Company, has been transferred to Dayton, Ohio, where he is sales manager.

'25 Richard P. Brettell is now district cable foreman with the Michigan Bell Telephone Company at Detroit.

Gustave H. Pfeiffer, with the Hercules Powder Company at Wilmington, Delaware, is now working in the patent division of the legal department.

ex'25 Earl Dawson has a successful shoe business in Owensboro, Kentucky.

'26 Paul E. Crane is buyer for the Sun Oil Company at Columbus, Ohio.

Clarence W. Ellis is product manager for the Raub Supply Company of Lancaster, Pennsylvania.

Harry E. Lewis, with General Electric, is to be transferred to Schenectady January 1. His work is in the Industrial Heating Department.

Ralph W. Tapy is assistant professor of Electrical Engineering, University of Detroit.

Joseph H. Utt is engineer with the Commonwealth and Southern Corporation of Jackson, Michigan.

'27 William L. Hillis, with the United States Engineer Corps, has been transferred to Pittsburgh, Pennsylvania.

Fred E. Mischler is the vice-president of the Nehf Hardware and Electrical Company, Terre Haute.

Colonel A. Swalls is president of Hein and Company, Incorporated, Coal Operators, Terre Haute.

Fred L. Trautman is the air conditioning engineer for Jardine and Knight Plumbing and Heating Company, Colorado Springs.

'28 Homer E. Holmes is now an employee of the Douglas Aircraft Company, Incorporated, Northrop Division.

Guy H. Stallard is with the Yellow Coach and Truck Corporation, Pontiac, Michigan.

'29 Henry T. Nancrede is sales engineer in Indianapolis for the Elgin Softener Corporation of Elgin, Illinois.

Abe Silverstein is now associate aeronautical engineer at Langley Field, Virginia.

'31 Robert S. Roach has been elected vice-president of the Alumni Association of Tau Beta Pi in Detroit.

'32 Myron J. Clark has taken a position with the Inland Container Corporation of Indianapolis.

Carl W. Kraemer has a position with the Velscol Corporation of Marshall, Illinois.

Floyd E. Wilson is electrical engineer for the Gary Heat, Light, and Water Company, Gary, Indiana.

'33 Thomas H. Batman is assistant publicity manager for the G. M. Basford Company, Industrial Marketing and Advertising, New York City.

Homer W. Fisher is working at drainage engineering under the Bureau of Agricultural Engineering at the CCC Camp at South Bend, Indiana.

James Gillian, with the Michigan Gas Transmission Corporation, has been transferred to Zionsville, Indiana.

'34 George F. Stark, in the United States Employment Service, has been transferred from Pittsburgh to Washington.

'37 Robert Averitt and John Sonnefield, with General Electric, have been transferred to Schenectady.

Stephen Koos has taken a position with Joseph E. Sergeant and Sons Company, Louisville, Kentucky.

PATENTS, GOOD WILL, etc. $1.00

Discovery of this item in a financial statement of General Electric Company prompts special reference to this most regular national advertiser in our magazine.

To us the *etc.* needs no interpretation for admittedly Men produced the patentable Products and Processes. Friendly Men have created Good Will and many friends for General Electric over a period of years.

Men have so developed and improved the products and processes of research that hardly anything is made today without some direct or indirect assistance of General Electric Men.

Advertising in this and other engineering college magazines represents a large investment for General Electric in good will--in making friends.

Tradition, background, products to meet the exacting needs of tomorrow's industry and the public--all these form an ideal foundation upon which General Electric may advertise today in this magazine to the important men of tomorrow.

Making friends of students in this community today by advertising is possible through the pages of this magazine. They are open to other far-sighted manufacturers of character who expect to stay in business and want to establish friendly relations with us now before we scatter in various jobs of many industries.

FRATERNITY NOTES

Theta Xi

Kappa chapter of the Theta Xi fraternity at Rose is enjoying an excellent year and is well represented in a majority of the school projects.

At the suggestion of the active members, the organization of the pledge class was perfected during the last meeting. Mr. Walter Zehnder was elected president, and Mr. Milton Hosack was named secretary-treasurer.

The fraternity has been making plans for social functions to be staged at a later date.

Theta Kappa Nu

Indiana Gamma chapter of Theta Kappa Nu presents a brief review of the activities of the chapter since this is the first chapter news that has appeared in the *Technic* for the current school year.

On Hallowe'en the entire chapter and their friends were the guests of John Whitesell for a party given at his home. The evening was spent dancing and playing ping-pong. The chapter wishes to thank Mr. Whitesell for a very enjoyable time.

On Sunday evening, November 21, the chapter met at the Roma Cafe for a dinner. The affair was purely an informal chapter get-to-gether.

Many alumni of Gamma chapter met at the house November 26 to effect an organization of an alumni association.

The Theta Kappa Nu Mother's Club has been active this year and has contributed many things to the chapter.

At present plans are progressing for the annual rabbit hunt which the chapter hopes to hold in the near future.

Alpha Tau Omega

On November 21, Gamma Gamma chapter of Alpha Tau Omega held its first initiation of the school year. Brothers Bill Bradley and Bob Colwell were formally initiated.

The regular monthly dinner meeting of the chapter was held on December 6 and again was a huge success, with thirty-eight actives and pledges in attendance. This was the second of such meetings, and both have been a great help in improving the spirit of the chapter. Professors C. C. Knipmeyer and H. A. Moench and Mr. J. J. Maehling were guests of the fraternity.

For several years the chapter has held a formal dance just before Christmas. This year the dance will be held on December 17 in the Mayflower Room of the Terre Haute House. Wayne MacIntyre, a former pledge, and his orchestra will furnish the music.

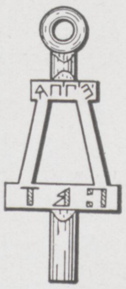
Several more Taus have been honored during the past month. The chapter wishes to congratulate Wendell Carroll for his election to the post of president of the student council, Ed Eckerman for his election as vice-president of the same organization, and George Smith, who will be the captain of the 1938 football team. The chapter also wishes Ed Eckerman, as captain of the basketball squad, a very successful season.

Sigma Nu

On November 7, Beta Upsilon observed the annual Memorial Day custom by attending the services at the Centenary Methodist Episcopal Church, the entire chapter attending in memory of the departed brethren. After the services the chapter remained for the christening of the daughter of Brother Wheeler, an alumnus of the chapter. Congratulations, Brother Wheeler.

Beta Upsilon of Sigma Nu continued its fall social program with an open house given on Friday, November 19, during which time dancing, bridge, and ping pong were enjoyed by all. The chapter was pleased to have Mr. and Mrs. Wheeler as guests for the evening.

Tau Beta Pi



The Indiana Beta chapter at Rose conducted an initiation ceremony in the rooms of the University Club at the Hotel Deming on Friday evening, November 12.

John H. Wilson, Ralph A. White, and Claude L. Zinngrabe, seniors; and William A. Reddie and Richard D. Altekruse, juniors, are the students who received this outstanding recognition. William S. Hanley, who graduated from Rose in 1905 with a bachelor of science degree and later gained his degree in civil engineering in 1928, also became a member at this time. Mr. Hanley is chief engineer of the St. Louis Southern Railway.

Dr. D. B. Prentice, president of Rose, acted in the capacity of toastmaster at an informal banquet given after the initiation. Dr. Prentice then introduced the guest speaker of the evening, Charles H. Spencer, president of the executive council of Tau Beta Pi and former road supervising engineer of the Interstate Commerce Commission. Mr. Spencer was very well acquainted with "Biscuits" Hanley and congratulated the chapter for offering the Tau Beta Pi bent to such a successful and well known engineer.

Blue Key

The members of Blue Key were very active in assisting to make the Thanksgiving Day football game a success. Realizing that this event would be a desirable tradition to begin at Rose, the Blue Key men worked heartily with Coach Brown to make the initial encounter successful.

Various posters and signs were erected over the campus to make the student body fully aware of the importance of supporting the team during this game.

During the game the entire chapter of Blue Key sat together and cheered heartily for the men of Rose who ended their season victoriously.

Tau Nu Tau

The annual Tau Nu Tau Banquet and Military Ball were held on December 4 at the Terre Haute House. The students and friends of Rose who attended the ball found the excellent music of Dick Jurgens and his orchestra very enjoyable. The ball was open to the public, but the banquet was open to only members of Tau Nu Tau and their guests.

The evening opened with the banquet, held at 7:00 o'clock in the Venitian Room. The ball began at 9:00 o'clock in the Mayflower Room. A delightful evening of dancing followed the grand march. The ball was strictly formal and upheld the reputation of being Terre Haute's most colorful social event.

The receiving line was composed of Mr. Kenneth L. Buis, president of Tau Nu Tau, Miss Jane Whitlock, Mr. and Mrs. Paul N. Bogart, Mrs. Donald B. Prentice, Captain F. A. Henney, Colonel and Mrs. Benjamin E. Wimer, Major and Mrs. C. C. Knipmeyer, Captain Roland E. Hutchins, and Captain and Mrs. Paul D. Harter.

Humor

edited by

James E. Ducey,
ch., '40

Well dressed man, cigar in hand, falling through the air from an airplane: "Gad! That wasn't the washroom after all."

Liza: "Waffo' yo' sharpenin' that razor, Rastus?"

Rastus: "Woman, they's a paih of gemmun's shoes undah yo' bed. If they ain't no niggah in dem shoes, Ah'm gonna shave."

"How did your tulip bulbs come up this spring?"

"With the assistance of the neighbor's Airdale."

Woman (telephoning to the desk clerk): "There's a rat in my room."

Hotel Clerk: "Well, make him come down and register."

"Oh, what a strange-looking cow!" exclaimed a sweet young thing from Detroit, "but why hasn't she any horns?"

"Well, you see," explained the farmer, "some cows is born without horns and never had any, and others shed theirs, and some breeds ain't supposed to have horns at all. There's a lot of good reasons why some cows ain't got horns, but the reason why that cow ain't got horns is because she ain't a cow—she's a horse."

Playboy: "Are you free for tonight?"

Digger: "No, that was only a sample."

Water is a certain blessing,
Good for washing ears and socks;
I'm just stating not confessing,
It's also good for ships and docks.
Of more uses I cannot think,
But of one thing I am sure—
It makes a helluva drink.

—*Drexerd.*

"Curse it, curse it," hissed the villian, snatching at the girl's waist.

"No it ain't either," she retored. "It's only a girdle."

"Well, son, what have you been doing this afternoon?"

"Shooting craps, mother."

"That must stop. Those little things have as much right to live as you have."

Buis says:
"In class, Greenland sat next to me.
From organs internal
Came noises infernal,
And everyone thought it was me."

The only time a fellow can ever be seen with a girl on one arm and a blanket on the other is at a football game.

—*Exchange.*

And then there was the absent-minded professor who sent his correspondence over to the golf club and went over to his secretary and played a round.

—*Missouri Shamrock.*

Dope: "What color is a belch?"

Dopier: "Burple."

Diner: "What's wrong with these eggs?"

Waitress: "Don't ask me. I only laid the table."

Lady in restaurant: "Waiter, why don't you shoo these flies?"

Waiter: "Well you see Madam, it's so hot to-day that I thought I would just let them run around bare-footed."

Words of advice

Ask a girl to talk—if she's talkative;
Ask a girl to walk—if she's walkative;
Ask a girl to dance—if it's permissible;
But never ask to kiss her—if she's kissable.

She thought he was pixilated, but he was only a squirmer.

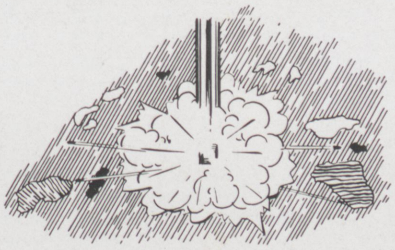
"Your husband is in no great danger, Mrs. Murphy, but I'm afraid we'll have to anaesthetize him."

"Well, if you must you must, but dear Mike did so want to have a boy."

G-E *Campus* News

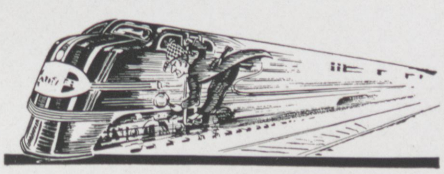
SHARPSHOOTING TWO MILES UNDERGROUND

SHOOTING HOLES through an oil-well casing at a depth of two miles underground is another problem successfully solved by electricity. The Lane-Wells Company Gun Perforator is an ingenious device used to pierce casings with steel bullets. When an oil pocket has been exhausted, the operators pierce the well casing at a different stratum, thus opening another pocket.



In order to know where to pierce the casing and how deep the gun is, G-E electric locating, weight, and depth instruments are mounted on a panel in a truck from which the shots are fired and the results recorded. Over two and one half miles of steel-sheathed cable is used to lower and fire the gun, the current for the charge being carried in the core of the cable. Accurate measurement of the depth at which the gun strikes or leaves the fluid level in the well is indicated to the operator by a weight indicator which utilizes two General Electric Selsyn motors.

In General Electric Company, numerous groups of engineers devote their entire time to the most efficient use of electricity in all types of industries. These men, former members of the Test Course, have solved many problems such as Sharpshooting Two Miles Underground.

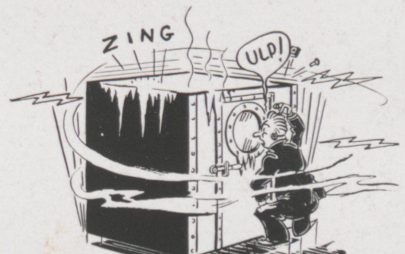


TRAIN-PERFORMANCE DETECTIVE

IN AN EFFORT to determine more accurately the performance of an electric locomotive and to calculate the most efficient motor for the train, T. F. Perkinson, R. P. I., '24, a former Test man now in the Erie Works of General Electric Company, invented a machine which performs these operations mechanically.

Computation by the step-by-step method of these calculations necessitates many hours of tedious slide-rule work; repeated adding and subtracting of time, speed, and distance increments; and reading of charts. The Transportation Calculator eliminates this work and solves the mathematics at least five times as quickly, depending upon the skill of the operator.

The Transportation Department of General Electric Company offers many opportunities to mechanical and electrical engineers in the design, construction, and production of electric locomotives, trolley cars, and trolley buses. The solutions of many interesting problems are found in this department, the Transportation Calculator being but one of them.



BOXING THE ELEMENTS

WIND, RAIN, SLEET, SNOW, arctic and tropical temperatures, six-mile altitudes, and power dives—all are found within the confines of two steel rooms in the radio-transmitter test department in the Schenectady Works of General Electric Company.

To assure perfect performance of aircraft transmitters, the equipment is placed in these two rooms where extremely severe weather conditions are simulated. Portholes of one-inch glass in the rooms permit the test men to observe the effects on the instruments without being subjected to the same strains placed upon the transmitters.

These complicated tests are made by college-trained men now on Test. The field of radio transmission from airplanes is, of course, new and progressive. The "flight rooms" provide radio engineers with a new and clearer conception of designs for radio equipment.

GENERAL ELECTRIC

90-16DH


Chesterfield Cigarettes
Chesterfield
Chesterfields
for Christmas