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Surveying This Issue

IN this month's lead article Ed Eckerman explains the advantages of variable pitch airplane propellers.

BILL REDDIE presents some theories as to the origin of petroleum.

HENRY C. GRAY, instructor in machine design, recounts some of his experiences of last summer.

"RESEARCH in Thermionic Vacuum Tubes" presents briefly the background of modern tubes.

C. R. W.

THE ROSE TECHNIC

JANUARY 1937

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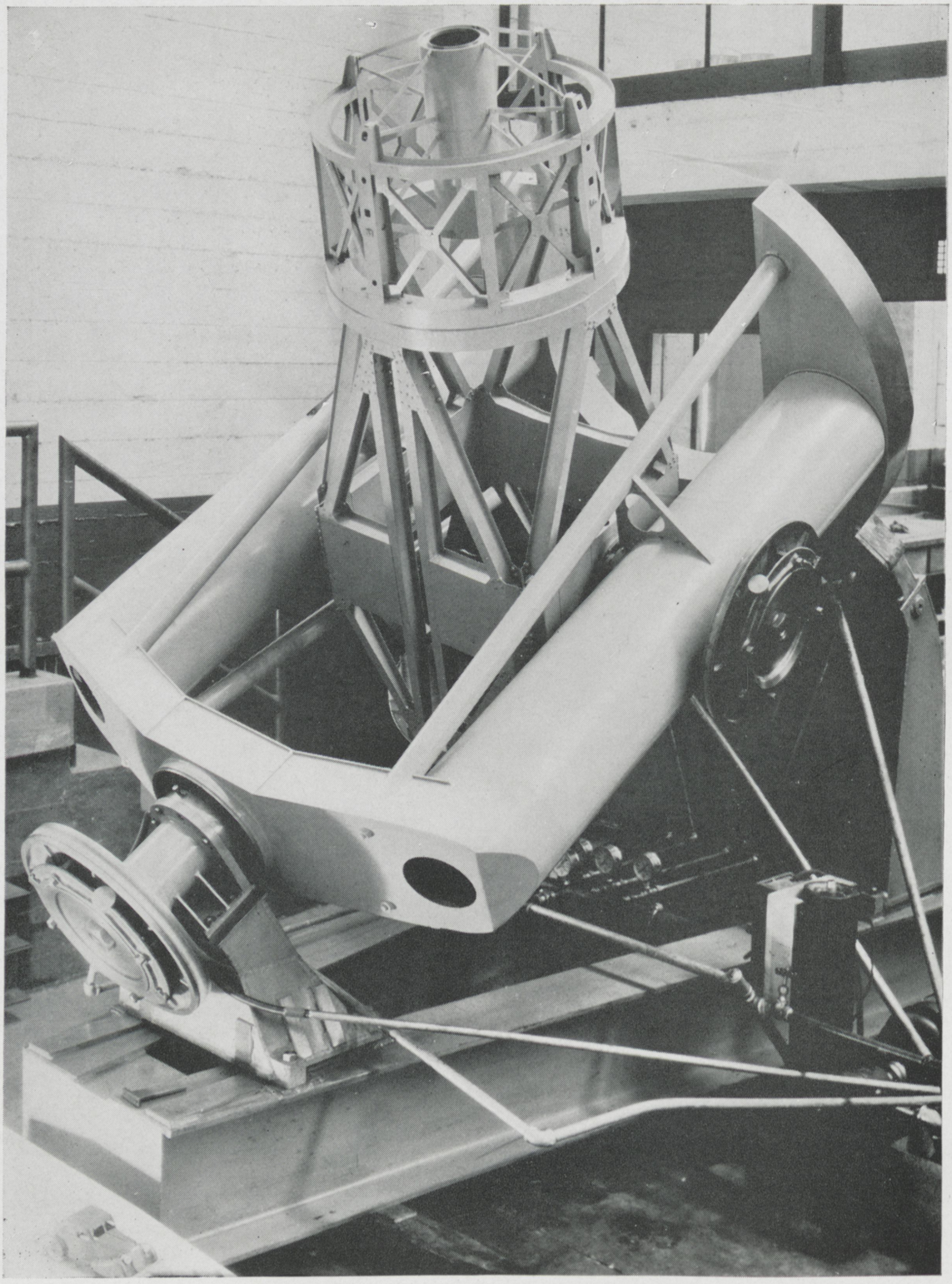

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THE ROSE TECHNIC

THE TECHNICAL JOURNAL OF THE ROSE POLYTECHNIC INSTITUTE

Volume XLVI JANUARY, 1937 Number 4

Variable Pitch Propellers

by

Edward H. Eckerman, m., '38

THERE is scarcely any transport plane in the world today that is not equipped with some form of variable pitch propeller, operated either mechanically, hydraulically, or electrically. The improvement in performance to be gained by varying the pitch has long been beyond dispute. The sole disadvantage of a manually operated variable pitch propeller is that it gives the pilot another mechanism to worry about. In military type airplanes it is desirable to have an automatically variable pitch propeller. A controllable propeller would be out of the question in the single-seat pursuit ships, because the pilot has more than enough to do, particularly in actual combat. Therefore, extensive development work has been going on, particularly in the United States, Germany, and France, on automatic pitch control methods. To understand the theory of variable pitch propellers it is necessary to delve into a few aerodynamic principles.

Theory of Operation

The thrust provided by a propeller is greatest at full throttle when the airplane is held stationary by chocks. If the angle of attack, or the pitch of the propeller, is large, the propeller powerfully resists the torque of the engine, and, when on the ground, the maximum number of revolutions per minute is not reached. Thus, a smaller angle of attack is needed when the plane is on the ground to allow the motor to speed up and increase the thrust.

In the climb after the take-off, the thrust is decreased, but is improved if the pitch is now made greater, because a greater pitch operates more efficiently with a higher air speed.

When the cruising speed is reached, the thrust is further diminished because of the reduction of input horse-power, due to the throttling down of the engine. The air speed is greater than on the climb; therefore, the angle of attack should be increased until it reaches its most efficient value.

It is a well-known fact that the brake horse-power delivered by a gasoline engine at full throttle is dependent upon the speed at which it is run and is nearly proportional to the number of revolutions per minute over the range of speeds at which these engines are used. Therefore, a loss of 10 per cent in revolutions per minute of the engine between the top speed and climbing speed will result in a loss of substantially 10 per cent in

power delivered by the engine to the propeller. By the use of a variable pitch propeller, the angle of attack can be reduced to allow the engine to turn at its maximum safe number of revolutions per minute during climb as well as at top speed. But a propeller is designed to operate under certain conditions, at a particular angle of attack. If the angle and conditions are changed, each element of the propeller would have to be changed by different amounts. This is structurally impossible, since the propeller is designed either to operate at cruising speed or to give the best compromise for the desired range of change of pitch ratio.

The design of a variable pitch hub mechanism has two problems to contend with: first, a means of retaining the blades in the hub structure, which must be capable of resisting the high centrifugal and bending forces produced and which will allow the blades to turn about their axis; second, a mechanism by which the blades can accomplish the desired rotation.

Means by which the first requirement may be satisfied include such supports as hydraulic cylinders, mercury float arrangements, paraffine-saturated fiber bearings, and specially designed ball and roller thrust bearings. Recent developments show that bearings of the last type will satisfactorily withstand the extremely large forces encountered.

In tests it has been found that the supports for the blades, with a 525 horse-power propeller, must withstand a force of 100,000 lbs. or more per blade. The centrifugal force on a hollow steel propeller blade, which is lighter than a corresponding one of aluminum alloy, has been calculated by a process of graphic integration. For this 9 ft. 5 in. propeller, the centrifugal force amounts to 70,300 lbs. at 2,500 revolutions per minute. This force increases as the square of the speed, which may reach 3,000 revolutions per minute, when the plane is in a power dive.

Curtis Controllable Propeller

This propeller is electrically controlled and receives its power through contacts on the propeller shaft. The pilot, adjusting the indicator on the instrument panel to the desired setting, actuates a small electric motor in the hub of the propeller. This rotates the blades to the indicated position. It has been found desirable to use a

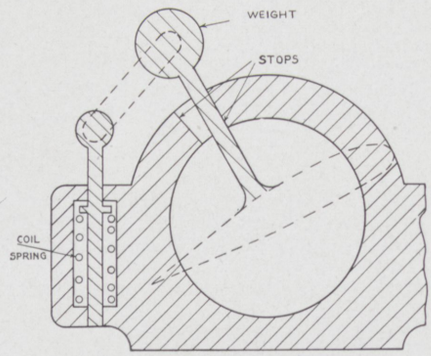

Figure 1

small high-speed electric motor geared to the blades by means of a high ratio speed reducing mechanism, as it is necessary to rotate the blades only two or three degrees at a time. As a source of supply, the storage battery, ordinarily used with the landing lights, is utilized. In the case of the supercharged engine, the power absorption of the propeller varies at different altitudes in a different ratio than the power delivered by the engine. Because of this fact it is necessary to adapt the pitch of the propeller to the power output of the supercharged engine. The power absorption of the propeller can be varied by changing the pitch of the propeller. Therefore, the exact pitch can be obtained to make the operation most efficient. Throttle stops can be eliminated, and maximum performance at different altitudes can be attained.

In this mechanism centrifugal and bending forces are controlled separately. One bearing is allowed to carry the centrifugal force, while an entirely different set of bearings carries the bending load.

Schwarz Automatic Propeller

In Germany, the Schwarz automatic variable pitch propeller has been successfully tested. It is exceedingly simple in principle and execution, as can be clearly seen in Figure 1.

The propeller is so mounted on its hub that it is free to rotate in its bearings between the two stops. Each of the propeller blades is controlled by two opposing moments: one is due to the force of the spring at the left; the other is due to the centrifugal force produced by the weight when the propeller is turning.

During the take-off and climbing, when the engine speed is relatively slow, the moment produced by the spring is greater than the moment produced by the centrifugal force of the weight. This causes the blade to be pushed over to the right stop, where the pitch is small, and to the position that is desirable for take-off and climb.

When the plane changes from climb to cruising speed and the engine speed is increased, the centrifugal force produced by the weight is greatest, consequently moving the blade over to the left stop. Here the propeller is at the most desirable angle for the greatest aerodynamic efficiency.

Hamilton Propeller

A propeller which removes the two pitch limitations and pilot control and automatically selects the desired position for each change of speed has been developed by the Hamilton Standard Propeller Company.

Called the "constant speed propeller", the new device consists essentially of a governor unit geared to the machine gun synchronizer shaft at the rear of the engine. Changes in engine speed are automatically transmitted to the propeller blade adjusting mechanism through the governor unit, which provides an infinite number of pitches and maintains the engine revolutions per minute at whatever value the pilot may select. Any tendency of the engine to increase or decrease its speed,

due to the change of air force on the blade, is immediately counteracted by the automatic change of pitch in the direction necessary to keep the speed of the engine constant. At the take-off the pilot sets the engine speed at the maximum allowable revolutions per minute, and the throttle is opened until the maximum manifold pressure is reached; then, regardless of any change in speed of the plane, the revolutions per minute are held nearly constant.

The pilot reduces the engine speed when the cruising speed is reached. If the altitude is changed, only one adjustment is required, that is, to change the throttle setting until the manifold pressure reaches the point required for the new altitude.

When landing, the throttle is nearly closed, but the engine continues to turn at almost the maximum speed because the blade angles have been reduced by the automatic control system. If necessary, full engine power is immediately available.

The control during ordinary cruising conditions is very precise and readily responds to changes in conditions, such as altitude or sudden opening or closing of the throttle.

Eclipse Propeller

With the Eclipse variable pitch propeller the thrust is the controlling element; that is, the pitch is small when the thrust is large, and pitch increases with a decrease of thrust.

The hub employs only three principal moving parts—the hub and two blades. Linkage systems connect blades with a back plate, which is attached to the propeller shaft. When the thrust is high, the hub slides along the shaft against the action of a group of springs in the hub cap. The pitch of the blades is decreased as the linkage straightens out, allowing the engine to speed up. In this particular propeller the angle of attack varies from 13 degrees at take-off to 23 degrees at cruising speed.

In testing this propeller a radial direct drive engine, rated at 210 horse-power at 2,000 revolutions per minute, was used. When on ground and equipped with a fixed propeller, the engine turned a maximum of 1,780 revolutions per minute. Using the automatic hub, in a comparable test, the engine turned at a maximum of 1,965 revolutions per minute.

With the fixed propeller at full throttle 1,825 revolutions per minute were obtained at the instant the plane left the ground, after being held by brakes and then suddenly released. Under the same conditions, but without brakes, the engine turned 1,835 revolutions per minute. Similar tests with the variable pitch propeller revealed in the first case 2,100 revolutions per minute and in the second case 1,975 revolutions per minute. Figure 2 illustrates the differences in performance of the two propellers.

In most cases there was a decrease of 30% in take-off distance,

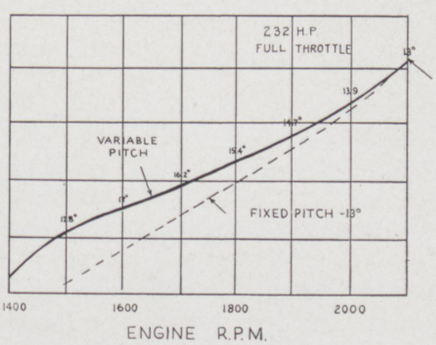

Figure 2

and the initial rate of the climb was found to be from 25% to 35% greater than that obtained with a fixed pitch propeller.

The maximum speed of the airplane, when using the automatic variable pitch propeller, is not affected because the speed is primarily a product of horsepower. In this case at maximum speed the propeller effects are the same, since the design, size, and angle of attach are identical.

Conclusion

With a manually controlled variable pitch propeller or with constant speed or automatic variable pitch propeller, a better coordination between plane speed and propeller pitch can be attained than when using the German made propeller, since more settings are available, but its simplicity of form and light weight give it claim to serious consideration.

The manually operated variable pitch propeller is not as desirable as the automatic variable pitch propeller. The facts that the pilot must continually change the pitch until the cruising speed is reached and that he cannot accurately select the pitch at which performance will be maximum under different conditions account for the greater use of the automatic propeller.

At the present time the thrust actuated automatic variable pitch propeller seems to be more desirable because of its simplicity and dependability.

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The Origin of Petroleum

by

Williman A. Reddie, ch., '39

PETROLEUM is composed principally of hydrocarbons—compounds of hydrogen and carbon. These two elements, by uniting in varying proportions with each other and with a number of other elements, form a multitude of compounds—solid, liquid, and gaseous—each having distinct properties. In petroleum itself is found a host of hydrocarbon compounds, and all petroleums are by no means identical in composition and properties. In commerce, petroleum is usually termed "crude oil". It is the raw material from which a great many products are made at petroleum refineries. It is sometimes thick like tar, sometimes oily and heavy like amber-colored cream, and sometimes light and volatile like the gasoline which it yields. In color it ranges from almost black, yellow, or brown, through shades of green, to colorless. Petroleum is commonly classified as a paraffine base or asphalt base, depending upon the residue after distillation. If it contains both paraffine and asphalt, it is known as a mixed-base.

Theories Concerning the Origin of Petroleum

For many years there have been two general theories regarding the origin of petroleum, known as the inorganic and the organic. There is a well defined gap between the advocates of the two theories, and their views are practically irreconcilable. Curiously enough, the believers in the inorganic origin are mostly chemists, while those who have held that the organic origin is the true one are mainly geologists. Let us see what these two classes of opinion are and what each has for or against it.

Inasmuch as it is possible to form hydrocarbons by certain reactions with metallic carbides, some investigators have thought that petroleum may have been formed in the earth by chemical reactions in connection with great volcanic disturbances which, accompanied by great heat, tore the earth asunder. This is known as the inorganic theory.

Almost all students of the subject (except the chemists) agree that in some manner plant and animal organisms—organic materials—similar to those found in shales and limestone were the origin of oil. It is believed that these minute organisms, buried in the seas by new muddy deposits and sealed from the air and protected from the ordinary processes of decay by the brine of the ocean itself, were subjected to slow decomposition and yielded, among other products, the petroleum of commerce. Science calls these organisms the "source materials" or "mother substances" of petroleum. This is the organic theory.

Geological Rocks and the Part They Play

The crust of the earth is made up of three types of rock—sedimentary, igneous, and metamorphic. Natural hydrocarbons like petroleum and natural gas are almost exclusively found in association with sedimentary rocks. Long and precise study of wells drilled for oil—of the formations penetrated by the drill—has determined this. Hence, science in its search for the origin of petroleum is particularly curious about sedimentary rocks—what they are, how they came to be, and their connection with the origin of petroleum. Sedimentary rocks consist mainly of shales, limestone, and sandstones. They take their name from "sediment". The sediment from which they were derived was laid down on the earth in the geological past by wind, water, and ice. Such sediment was later subjected to both pressure and heat and appears today in the form of sedimentary rocks. Sedimentary rocks are called the "source rocks" of petroleum.

Science has found buried in the rocks the "source material" from which petroleum may be produced under the proper conditions, but this does not mean that this organic material is necessarily or even commonly buried in the sediment in the form of oil. In other words, while all the world's petroleum is found in intimate association with sedimentary rocks, not all sedimentary rocks contain oil.

Principal Geological Structures Connected with Petroleum

There are many kinds of geological structures, but anticlines, faults, and lenses, with their numerous modifications, are the principal varieties in which we are now interested from the standpoint of petroleum.

Porous rock strata, such as sandstone and limestone, if overlain by impervious layers, may contain oil and gas where they have been bent in anticlines, where they have faulted, or where they wedge out in a direction up the slope (called the dip) of the beds. The arrangement of oil, gas, and water in a rock strata is always the same because of their respective specific gravities.

Migration of Oil

It is generally accepted that the liquid petroleum migrates from the source rock into the reservoir rock, where it accumulates. The chief agents which are thought to assist in the migration process are heat, gas pressure, and water, of which water and gas pressure are

by far the more logical and important. For this reason, they will be the only ones discussed here.

Water as a migration agent is capable of acting in three ways. One theory assumes that the oil has been carried by moving water from the source bed into the reservoir rock. However, such an assumption is probably incorrect. A second view, and one which seems to have much to recommend it, is based on the belief that migration of the oil is brought about by an interchange of the oil and water due to the physical properties of the two. The third way in which water may assist in the accumulation of oil is according to what is known as the hydraulic theory. This view holds that circulating waters moving through the reservoir rock might carry small particles of oil in currents until it reaches some rock. Here it remains protected, and other oil particles join it until a pool is formed.

Another possible explanation of the migration of oil into reservoir rock is gas pressure, for it is well known that gas is dissolved and absorbed to a great extent in petroleum. As this gas tends to exert an expansive force, it is quite possible that it may assist the movement of the oil through the pores of the rock. It is certainly responsible for the uprush of oil through the drill hole.

Conclusion

Petroleum has been found on every continent; it has been found in burning deserts, fever-ridden jungles, waste lands, cultivated lands, where derricks supplant orange groves, in the frozen steppes of the northland, and even below the ocean floor. Geologists say no stratified rock is too young nor too old to preclude the existence of petroleum.

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A Bit of Unfinished Business

by

Henry C. Gray

Rocky Mountain National Park lies about one hundred miles to the north and west of Denver. It is cut in a northwest to southeasterly direction by the Continental Divide and holds within its four hundred square miles of territory many peaks ranging from twelve to fourteen thousand feet in elevation. To the summer vacationist the park offers refuge from the heat of the lower altitudes, magnificent scenery, and a variety of educational activities to please everyone. Among the latter, hiking, mountain climbing, riding and fishing are popular. Then too, the National Park Service through its staff of ranger naturalists, conducts nature study hikes and gives illustrated lectures to acquaint those interested with the natural history of the region.

Long's Peak is the highest of all the peaks in the park. It is on the eastern boundary of the park, just off of the Divide. Since it rises to an elevation of 14,255 feet and is a mile above the surrounding valley floor, it offers one of the most strenuous climbs in the park.

The day dawned bright and clear. Despite this, however, storms come up quickly, and with little shelter available, we went prepared for the worst. The "we" refers to my fourteen year old son and myself.

With two trails available we chose the shorter and steeper, starting from Long's Peak Inn, winding up the side of Battle Mountain, along the crest of Mill's Moraine, around the summit of Mount Lady Washington to Boulder Field, which is about fifteen hundred feet below the peak.

The climb from the Inn to Boulder Field, about four thousand feet, is accomplished in a distance of six miles. The first part is easy, through a scattered growth of aspens and birch, with large patches of wild flowers, conspicuous among them in mid-July being the Mariposa lily.

Within a comparatively short distance the aspens and birch give way to a dense growth of pine, fir, and spruce, many of them with trunks eighteen to twenty inches in diameter. The odor of the evergreens is pleasant and cool and refreshing.

Continuing our climb the large trees give way to the dwarfed and twisted ones of Timberline. Through their fight with the elements, the trees at this elevation, with trunks six or seven inches in diameter, reach a height of scarcely that many feet. The trunks, as well as the individual branches, look as if they had been wrung out, as you would a wet rag.

Boulders of all sizes crop up, becoming more and more plentiful the higher one climbs. Patches of snow still lie in the more sheltered places, and all that grows is a thick grass.

Pausing for a moment to look around, the trail, now running around the edge of Mills Moraine, is leading toward the precipitous east face of Long's Peak, a sheer drop of 2500 feet, with Chasm Lake, not visible to us, at the bottom. To one side is Mount Meeker, and on the other Mount Lady Washington. A thousand feet below to our left is Chasm Gorge, floored with boulders, and with pine and spruce pushing through where they can. Twin Sisters Peak to the east is still above us, with its fire lookouts commanding a view of a large part of the park area. Beyond Twin Sisters the plains to the east fade away into the haze.

The trail forks, the left branch leading to Chasm Lake, the right following around the side of Lady Washington to Granite Pass. Little Coneys, the size of chipmunks, squeak at you from behind the rocks and a pair of marmots climb lazily out of reach.

From the pass, a large part of the park area is spread before you, the road to Bear Lake, the many small lakes with which the park is dotted, and the slopes covered with the fallen trees from the Great Burn of 1900. Below is a party on horseback, pausing for a brief rest, and higher up on the trail, three men on foot are making their way slowly. Water, from the snow melting above, covers the trail in places, and in others provides a refreshing drink.

Glacier Basin from Keyhole

At Boulder Field, the grass is gone, and the trail for the remaining half mile to the shelter cabin winds around among rocks of varying size. Horses can go no farther. The ascent to the top can be made only on foot.

Another half mile ahead and five hundred feet higher up is the "Keyhole" through which one of the two paths to the top leads. But what a half mile! There were rocks weighing from perhaps a ton to several hundred tons! Splotches of black paint, if you can follow them, mark the way.

Our climb ended with a pause at the "Keyhole". It was too late in the day to climb the remaining thousand feet. On the far side of the "Keyhole", the west side of the mountain slopes at a steep angle to Glacier Basin below. Across the basin is Chief's Head and further around to the right, the peaks lying along the Divide. Far to the northwest are Mounts Nimbus, Cumulus and Richtofen of the Never Summer Range, also on the Divide, and not so far in the same direction the Trail Ridge Road crosses the Divide at an elevation of 12110 feet.

Our climb had required five hours. In about two thirds that time we made the descent.

The register at the foot of the trail showed that a party of two men had made the top in the time it took us to make the Keyhole. I do not know that I can do that, but looking up the trail from the Keyhole made me feel that I must go back and finish that climb.

Research in Thermionic Vacuum Tubes

by

Stephen Koos, e., '37

"THE thermionic vacuum tube is a device which may be used to control the motion of charges in an electric circuit or system. In mechanical systems a device used to control motions is called a valve, and the thermionic vacuum tube might appropriately be called the thermionic valve. This is the name generally used in England. The three electrode thermionic vacuum tube or triode belongs to a class of valves in which the expenditure of a small amount of power on the control, or trigger, or power input element controls the flow of a large amount of power from a local source in the output element."[1]

When Edison discovered that a heated filament and a cold electrode inside a lamp would permit the passage of an electric current in one direction, we had the beginning of the present day vacuum

tube. This was in 1884. In the year 1896, Professor J. A. Fleming, after associating himself with Marconi, developed what was known as the "Fleming Valve". This invention has proved to be one of the most useful developments in the field of modern science. The function of the Fleming valve is that of a rectifier; its action is always such that the electrons flow into the plate (cold electrode) and out of the heated filament.

Shortly after the discovery made by Professor Fleming, Dr. Lee DeForest discovered the three-element tube, which he named the audion, which is the Fleming valve with a controlling grid structure placed between the plate and filament. This simple invention has made possible the remarkable advances in radio engineering, television, and numerous other fields which employ the vacuum tube.

The more common vacuum tube, such as those used in radios, has three different functions or characteristics. First, it may be used as a detector. Of the complete electric wave spectrum, radio waves cover only a very small portion and at frequencies much too high to be detected by the human ear. So the vacuum tube was put to the task of changing those high frequency oscillations to frequencies which we can hear, the audio frequencies.

The second use of the tubes, designed for the purpose, is amplification. One can readily realize what wonders a vacuum tube can do when sound waves of speech, the energy of which is comparable to that of a fly climbing up the stand of a microphone, enter the microphone and are amplified by only a few vacuum tubes, and then issue from the speaker unit with deafening blasts.

A problem in the early days of radio was the source of constant high frequency oscillations which were capable of being modulated for speech and music. The discovery that the vacuum tube could be made to generate the desired type of waves fixes the third use of the vacuum tube.

Scientists and engineers, however, were not satisfied with such simple tubes and designed multigrid tubes for various uses, thus greatly improving radio operation and reception. Even today this progress has shown no signs of retardation. Intense search is being made on available material which promises to be superior to those used now. New designs are in progress.

Mr. McMaster writes on "Tube Metal Processing":

"In a comparatively short period, Seva metal has been widely adopted as an ideal material for use in electronic devices where gas-free metal is essential. In this country, eight of the more important tube manufacturers have adopted this material, as well as makers of electronic devices in Canada, Europe, South America, Asia, and Australia.

"While largely used in radio receiving tubes, it is readily adapted to use in power rectifiers, transmitting tubes, cathode ray tubes, photocells, X-ray tubes, and lamps."[2]

Efforts have been made to get perfect vacuua in electronic tubes and have failed because metals used were not completely gas-free, although the elements were heated to white heat by induction furnaces during the process of evacuation.

At the present time radical designs in radio vacuum tubes are taking place. Instead of the customary glass envelope, a metal encasement is provided. The metal container takes the place not only of the familiar glass form but also takes the place of the shielding "cans" for glass tubes by connecting it to an appropriate prong on the base of the tube.

When one thinks of the vacuum tube, he invariably links it with radio. Upon inquiry, however, numerous applications of the great variety of present-day vacuum tubes confront the reader. A vacuum tube is an electric valve, and in possessing that capacity, it is a controlling device. Industry, today, depends very much on electronic tubes. It may seem surprising that the sound picture industry heads the list, as shown in the following tabulation, which shows the annual expenditures for vacuum tubes of several of the industries requiring them.

Industries Depending on Electronic Tubes[3]

Industry	Annual Expenditure
Sound Pictures	$750,000,000
Long-distance Telephony	$250,000,000
Broadcast Receivers	$200,000,000
Radio and Electronics	$ 75,000,000
Broadcasting Stations	$ 73,000,000
Medical and Industrial	$ 20,000,000
Radio Communication	$ 8,000,000
Recordings	$ 3,500,000
Total	$1,379,500,000

The field of electronics and the application of vacuum tubes to industry have shown remarkable advances to this day, and will continue, due to their numerous advantages. There are yet many undeveloped and undiscovered fields in which "electronics" can be applied.

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Midterm Examinations

During this past semester, the subject of midterm examinations has been a source of much discussion and controversy. For the past several years, the practice of the institute has been to set aside a whole week in the middle of each term, devoted completely to four-hour examinations. This year a new method of examination, which substitutes one-hour quizzes held each six-weeks' period for the midterm examinations, has been introduced.

Naturally, this departure from a well-established custom is not without reason. Presumably, the method of many short quizzes provides added incentive to the student to study his subjects regularly, day by day, instead of resorting to "cramming" immediately before the more important midterms. If the student has studied his subject matter regularly, there is no necessity for requiring him to take a long examination during the middle of the semester. The present system also abolishes the devotion of an entire week to midterm examinations, thus allowing additional subject matter to be studied during the semester.

One may ask if this system is entirely satisfactory, if its merits are of sufficient magnitude to warrant deviation from past standards. The opinion of many students and of several members of the faculty is that it is not, that, while no examination or grading system is without error, the present system introduces more disagreeable factors than did midterms. The foremost reasons for forming these opinions are the following:

As long as examinations are deemed necessary to undergraduate work, they should be made as fair and as comprehensive as possible. In order for a short one-hour quiz to be both fair and comprehensive, it must necessarily consist of several questions or problems with brief solutions. A majority of the subjects in the Rose curriculum deal with the solution of typical engineering problems, making this type of quiz impossible. Thus, these one-hour quizzes must consist of a very few problems or questions, dealing with only a small part of the subject matter studied during the six-weeks' period. An average student taking such a quiz may have the subject fairly well in hand, but may not fully understand a small part upon which one of the quiz questions is based. By missing one out of a very few questions, the student's grade is lowered considerably more than it should be. This is, of course, unfair; yet a satisfactory solution is impossible with one-hour quizzes.

Several professors, realizing the deficiencies of one-hour quizzes, arrange with each other to give longer examinations. In other words, recitation hours are traded back and forth in order that two- and three-hour examinations may be given, resulting in the fact that students miss nearly as many recitations as if a midterm week were held.

Many advantages that cannot be offered by the present system are outstanding with four-hour midterms. Such examinations can be and are made comprehensive, yet they do not rush the student to the extent that he loses his sense of logical reasoning. Midterms also afford an excellent review of the first half-term's work and aid much in preparation for finals.

Thoughtful consideration of the advantages and disadvantages of both systems certainly leads one to conclude that longer examinations are to be desired.

Our Drawing Rooms

To all outward appearances, our drawing rooms are well suited for the use to which they are put. Certainly there are no space limitations. Well-constructed desks answer every drawing need. Yet it may be said that our drawing rooms are definitely inadequate, for the simple reason that suitable illumination is not provided.

Stated so mildly, this fact is hardly appalling, yet its consequences are of a serious nature. Often students spend six to seven hours a day in poorly lighted drawing rooms. Because of this, eye strain and resultant headaches are by no means uncommon among students and faculty members alike. Graphical accuracy is practically unobtainable because of shadows made by T-squares and triangles. Similar difficulties are also encountered in laboratories and classrooms.

With the facilities at hand that Rose does have, the expense of installation of an adequate illumination system would certainly not be so great as to be prohibitive.

Even bare feet will never feel it!

OCCASIONALLY a telephone wire must be run under a rug or carpet. The twisted wire formerly used made an unsightly ridge.

So Western Electric—manufacturing, distributing and purchasing unit of the Bell System—produces a flat cord only one-eighth inch thick, seven-eighths of an inch wide. (Like this ). Within this tiny space are four conductors of insulated wire. Under the rug or carpet this cord is not seen, not even felt with bare feet.

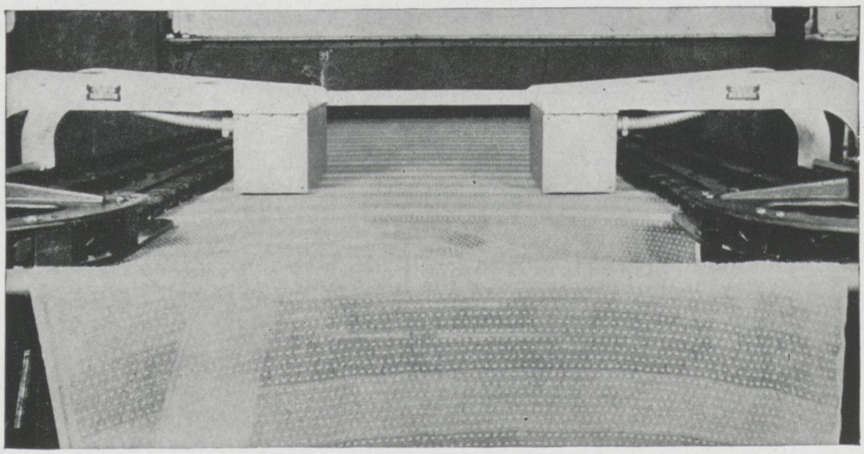
Even to the smallest detail, the Bell System is constantly on the lookout for the better way to make telephone service more satisfactory to the customer.

BELL TELEPHONE SYSTEM

College men and women find after 7 P. M. a convenient time for long distance calling. Moreover, most rates are lowest then.

Research and Progress

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



Cut Courtesy General Electric

Correcting Cloth Skew

In the manufacture of cotton cloth the two strands of cotton, which are known as the warp and weft, must everywhere be exactly perpendicular. One method used to accomplish this is to have an operator watch the cloth and manually control a motor which corrects misalignment of the weave. This method is not very satisfactory, as the operator can not possibly detect small cloth skews at cloth speeds more than 40 yards a minute. As modern practice calls for speeds as high as 100 to 150 yards a minute, a different method of inspection must be used.

A photoelectric control device is used for this purpose. The correcting motor is still used, but now manual control of the motor has been replaced by electrical control. The device depends upon the frequency of interruptions caused by the threads as the cloth passes between two scanning lights and phototubes. The system is synchronized by Selsyn control. Cloth speeds may vary from 20 to 140 yards per minute, and the number of threads or weft count may vary from 20 to an inch in open weaves to 100 to an inch in close weaves. Therefore, the device must operate over a frequency range of 280 to 8,400 cycles per second.

Improvement in 1937 Radio Receivers

Engineering skill has made possible many interesting and useful improvements in radio receiver design. Everything possible has been done to insure the best of reception.

One interesting feature on some of the newer radio sets is the design of the acoustic chamber. In old receivers the actual position of the set with reference to the walls had much to do with quality of the sound produced since the rear of the set was open. Also at certain low frequencies the room and speaker chamber broke into resonance and caused an undesirable booming of the voice. Different methods have been used by the various manufacturing companies to minimize these defects. The Zenith radio sets have a cover which closes the speaker chamber. This cover consists of an inner and outer shell. The inner shell can be moved a total of 3 inches toward the speaker. This dampens the lower frequencies, thus reducing the boom effect. The Stromberg Carlson sets accomplish the same results by causing the sound waves to travel through a labyrinthic chamber. The RCA-Victor sets have a set of resonant pipes through which the sound waves must pass. These pipes act as acoustic filters, causing a reversal of phase of sound waves from the rear. Thus the latter appear in the room in phase with the waves produced from the front of the speaker.

The upper frequency response has been increased from the usual 4000 cycles to 6000 cycles and beyond. This, of course, gives a better reproduction of music for the critical ear. For those who are not so critical, it is possible by varying the coupling between the windings of the intermediate-frequency transformers to attenuate frequencies higher than 4000 cycles.

Another very interesting feature of the new radio sets is the method used in tuning. Several companies employ the automatic frequency control; only the rough tuning is done by hand, the finer tuning is accomplished automatically. This type of automatic control employs the "drag in" effect of oscillators. By this method a 3000 cycle error in tuning is reduced to less than 60 cycles. Some companies use the automatic tuning in connection with a telephone dial. The finger is inserted in the dial hole labeled with the call letters of the station desired. When the dial is turned the automatic frequency control does the rest. Of course, wide use is still being made of the cathode ray "eye" as an indication of tuning. On the General Electric sets the maximum signal strength is designated by the green color of the dial, while off tuning causes red to predominate. These lights are controlled through a saturated reactor, whose reactance changes as current flows through an independent coil on the core. This coil is in the plate circuit of a special tube. When the set is tuned properly the plate current is maximum, and, therefore, the reactance of the coil the greatest. Under these

circumstances the green light is most prominent. As the plate current decreases, the red light begins to come on, so that the color varies from green through white and into pure red to show no signal.

It is interesting to note that a few of the sets have been built to cover the lower wave lengths, such as 10 meters and even 5 meters. For this all wave reception the RCA engineers have designed what they call the spider web antenna. The antenna, which resembles a spider web, is composed of several individual antennas each designed so as to resonate at a particular band of frequencies. Thus the entire band can be covered with maximum efficiency.

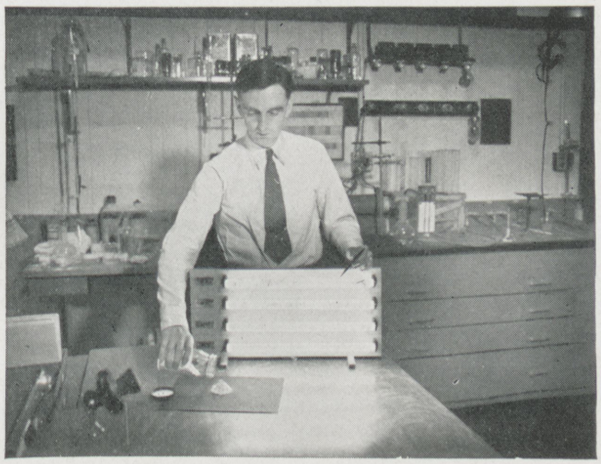
Disintegration of the Atom

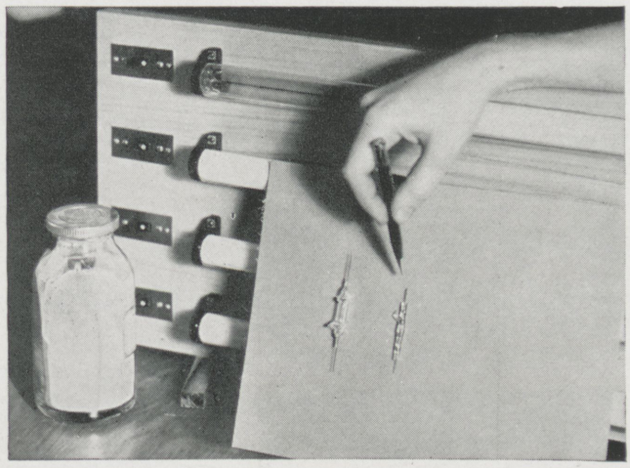
The Westinghouse Electric and Manufacturing Company recently commenced the construction of a hugh electrostatic generator. The generator, which is being built at the Research Laboratories in East Pittsburgh, is designed to attain a d-c potential of five million volts above ground.

The large generator is a modern version of the Van de Graff electrostatic machine. A large high-pressure vessel of a shape similar to an incandescent light bulb will be mounted on the roof of a two story laboratory building. The vessel will be 47 feet in height and will have a 30-foot hemisphere for the top portion. Within the vessel a 15-foot spherical electrode will be mounted on four large micarata insulating columns. The spherical electrode itself will be in the center of the hemispherical vessel. By maintaining an air pressure of 120 lbs. per square inch, the 5 million volts potential will be made possible. This potential will be collected by charged rubber belts.

The spherical high voltage electrode will be connected to the lower ground end by means of a segmented porcelain vacuum tube. This vacuum tube contains lens electrodes which will focus the nuclear projectiles onto a suitable target. The nuclear projectiles are protons, deuterons, and alpha particles which are created at the high potential electrode. These nuclear projectiles represent the enormous energy necessary to disintegrate the atom. It will, therefore, be of interest and importance to notice the effect these projectiles have on different target materials.

By rough calculation, engineers have estimated that within a 100 mile area of radio station WGY, in Schenectady, eight hundred billion radio receiving sets all tuned to WGY's signal would probably absorb the energy output of the station. However, there are approximately only a billion people in the world, so there seems no danger of this ever happening.





Cuts Courtesy General Electric

New Light Sources

Development work has brought out two new types of mercury vapor lamps. One type of mercury vapor lamp is the fluorescent lamp, which is capable of producing a wide range of remarkable colored lighting effects. For the same electrical energy used, this lamp will give from 50 to 200 times as much colored light of a quality far superior to that given by colored incandescent lamps. Another new type is the capillary lamp, which was originally developed in Eindhoven, Holland. The capillary lamp is also a type of mercury lamp, and, although small, it produces an intrinsic brilliance exceeding that of the sun. It also emits a wealth of photochemical rays useful in commercial, industrial, and therapeutic installations. The capillary lamp derives its name from the small tube or bore in each lamp. This bore is no larger than a common pin and is expressly made that size to provide the high pressures required for the operation of the lamp. Like other mercury lamps, these lamps require special equipment for starting and operating. The capillary tube requires several minutes to arrive at full brilliance. Both lamps are highly efficient and will probably be used extensively.

Correcting Spherical Mirrors

In general, there are two types of telescopes. One type uses a lens to focus the light to a single point. In this case, since the light rays must travel through the lens, there is quite a loss due to absorption in the lens. The lens telescope also introduces diffraction difficulties so that the second type, the reflecting telescope, is now most generally used. In this case the light rays are focused to a point by reflection from the surface of a mirror. It is to this class that the new 200-inch telescope belongs.

In order to focus the parallel rays from the distant stars to a point, the surface of the mirror must be that of a paraboloid of revolution. However, although a spherical optical surface can be produced with comparative ease, the transition from a spherical to a parabolic surface is not an easy task.

Recently Messrs. John Strong and E. Gaviola of the California Institute of Technology announced an entirely new method of parabolizing a spherical mirror. Their method utilizes the recently developed evaporation process of coating mirrors and consists essentially of controlling the depth of this deposit to yield the desired surface. The method in which this is done is quite unique and interesting. To understand this method the evaporation process of aluminizing mirrors must be reviewed briefly.

For some time the reflecting surface on mirrors was obtained by silver plating the surface. This method was not very successful because the coefficient of reflection for the silvered surface was not very high, and also the silver surface tarnished, with the result that the plating had to be redone occasionally. It was discovered that by placing the mirror in a vacuum and evaporating aluminum in the vacuum, an atomic depth of aluminum could be deposited on the mirror. Such an aluminum surface has excellent optical properties. If a screen having a definite geometrical design is interposed between the mirror and the aluminum source, the depth of the aluminum can be controlled to give any desired surface to the mirror. It is necessary in this case to rotate either the mirror or screen at a velocity of one or two revolutions per second.

The mirror is placed in an inverted position in a brass shell. This shell is supported on roller bearings so that it can be rotated easily. This is then placed within a large aluminum bell jar. Just above and outside of the bell jar is placed a strong electromagnet. By rotating the electromagnet the mirror inside is caused to rotate at the desired velocity. At the base of the jar are placed the tungsten electrodes, which are loaded with the proper amount of aluminum. Just below the surface of the mirror is placed the screen whose design has been carefully computed. This design usually takes the shape of a spiral shaped opening punched in a metal diaphragm. The bell jar is then sealed and evacuated to a pressure of 10^{-4} or 10^{-5} millimeters of mercury, and, after the mirror is rotating at the proper speed, the tungsten electrodes are heated electrically. It was found that the position of the electrodes or aluminum sources seriously affected the depth of aluminum deposit so that further corrections were necessary.

This method is used either to parabolize or hyperbolize spherical mirrors. The method is also used to accomplish a feat which from an optical point of view is very difficult—the production of a parabolic mirror whose axis is other than the geometrical axis of the mirror itself.

The final use of the controlled deposition method is that of correcting parabolic mirrors. To do this, a quantitative knowledge of the existing shape of the mirror is necessary. There are possibilities that this method will be used to parabolize the 200-inch mirror now being ground spherical.

SPORTS

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

This year there will be no intramural basketball competition as has been the case in past years. Due to the availability of only one gymnasium for competition, the basketball prowess of Rose students can not be divided, but must be concentrated into one effort. That effort is now varsity competition.

Those students who are extremely interested can make and are making a definite effort to produce a good varsity team. Those students who take only a meager interest in the sport can possibly find enough to do to come to home games and cheer for dear old Rose. Also it has become a tradition in so short a time as two years that the reserves from the varsity squad play a curtain raiser before each home game with the football squad transferred to the basketball floor. These games are amusing as well as interesting, and the football men keep in shape for spring practice. Thus it is possible by means of a varsity squad and a reserve game to furnish an outlet for the basketball enthusiasm of every student desiring to compete. Also some talk is frequently heard that at the end of the regular playing season, a few weeks of intramural basketball will be held.

On November 24, thirty candidates reported for basketball practice. Such a large turnout was hardly to be expected, but before the week was out that number had dropped to twenty, where it has stayed until the present time. The captain this year is Ed Wodicka, the only senior on the team and also co-captain of football this year. The other lettermen are Ed Eckerman, junior; George Smith and Bob Ladson, sophomores. The freshman candidates that look good in early practice sessions are Stanley Dusza, guard; Robert Colwell, center and forward; Otto Duenweg, center; John Appel, forward; and Bill Egloff, guard. Ralph White, a junior, and Stout, a new sophomore show a thorough knowledge of the game.

There is plenty of height on this squad, and the team should consistently tower above any of its opponents. Colwell and Duenweg received their early experience at Wiley; Brittenbach, speedy forward, is from Broad Ripple of Indianapolis; Appel hails from Garfield; Dusza comes from Bloomfield, New Jersey.

Suffering a bad case of the jitters and a bit of stage fright, the Rose cagers journeyed to Greencastle, Indiana, on Dec. 4 and played DePauw in the season opener. DePauw had played earlier this season and used this experience to win 41-17.

Beginning the game fast, the DePauw cagers dumped in six points before Rose was able to score. Colwell of Rose then followed one in for two points and the team took on a new life. Due to some long distance sniping the Rose team was able to tie the score at 8-8. From that time on DePauw, using a fast break to good advantage, took the lead and were never seriously threatened.

With the exception of once in the early part of the game, the Rose offense did not function consistently. Inexperience showed itself every time Rose took the ball. On defense Rose Poly often got tangled up in the tricky DePauw blocks permitting many open shots. In the second half the Engineers stopped the DePauw offense for several minutes, but a new, fresh team began to find the range and to raise the score. At the half the score was 23-9.

Nothing can be said concerning personal performance in this game, as it was a typical early season game, and no particular individual stood out. Never during the whole game did Rose quit fighting, and it was all a matter of inexperience in playing together.

The St. Joseph game originally scheduled for Saturday, December 19 was postponed. Due to heavy snow storms in Terre Haute and farther north, it was deemed inadvisable to make the trip. The game will be played at a later date.

On December 22, Rose Poly met the net team of Lawrence Institute of Technology from Detroit. It was the first home game of the season, and the Rose Engineers fought hard to win, but were beaten in the last forty seconds by a lucky long shot. The final score was 29-27. The game was played in the Rose

gymnasium before a meager crowd of loyal fans.

Lawrence got the first field goal of the game on a long shot by Horowitz, but Colwell and Egloff scored and Rose Poly took the lead. Rose then ran the score to a five point lead 11-6, but Lawrence came back and were leading at the half 16-13. Coming back fighting in the second half, Colwell led his mates to another five point lead 26-21 with only three minutes to go. At this time Lawrence made their most determined drive of the game and scored four field goals in a row while Rose was collecting a foul shot.

The game was the eighth for Lawrence, and they have won seven of the eight. Rose Poly was playing its second game of the season and still showed signs of inexperience. The team was further handicapped by illness, injury, and the vacation period. Two boys were home for the vacation, and two had missed several practice sessions. However, the Rose offense sparkled at times, and the defense was particularly good. All of the Lawrence scoring was done from out on the floor.

The game was a free fouling, rough affair, and twelve fouls were called on each team. Rose was hurt worst by these because Smith, stellar guard, went out on fouls before the first half was over. Egloff, the other guard, was injured temporarily in the first half, and this enabled Lawrence to take the lead at the half.

Rose Poly was a considerably improved team over the team that took the floor for the previous game. Colwell was the star for Rose and scored twelve points on six field goals.

Several teams from Indiana boast long trips for their basketball teams. Both Purdue and Indiana University have played in Madison Square Garden in New York, but all their efforts have been confined to the United States. Now Rose Poly comes out with an international contest. The touring Rose cagers play a game with the University of Western Ontario. This may not have any grave influence on international affairs, but will be a start toward friendlier athletic relations between the two countries. While on this trip the team will stop off at Detroit to renew the rivalry between Lawrence Institute and Rose. Another side trip on the journey will be made to Hillsdale, Michigan, to play Hillsdale College.

Campus Activities

edited by

William A. Reddie
ch., '39

Assemblies

On Thursday, December 10, Mr. J. Norvin Compton, Rose class of 1915 and chief chemical engineer of the Carbide and Carbon Chemicals Corporation, spoke before a general student assembly. Mr. Compton reviewed the chemistry situation in Europe and told of some of the activities of the World Congress of Chemical Engineers held in London last June. He said that the hospitality and friendliness shown at the Congress was excellent and that not a dull moment existed while he was there. He also described the superb beauty and lavishness of the social affairs connected with the meeting. One of the outstanding statements made by Mr. Comptom was that Germany has no special chemical engineering courses, but secures her chemical engineers from other branches of engineering. He also stated that England is patterning her chemical education system somewhat after the system used in the United States.

Dr. R. K. Strong, head of the chemical engineering department at Rose, met Mr. Compton, who was then on his way to London, in New York. After hearing that he was going to attend the Congress, Dr. Strong induced him to come to Rose to address the students here.

On Monday, December 14, a very interesting assembly was held, of which Mr. Maxwell T. Maxwell of the Yale-Towne Corp. was the speaker. Mr. Maxwell's subject was "Loxology". In his talk he presented, in well-organized form, the evolution of the modern-day lock. He illustrated his talk with large colored posters and actual working models of certain types of locks. One unique model which proved to be very interesting was the original bar-and-bolt type of lock used in ancient times on the Temple of the Holy Sepulchre. Mr. Maxwell said that the origin of locks is not definitely known, but that mention of them is made in the earliest literature, although nothing is told of the mechanical nature of such locks.

Stating that the basic principle of the key locks of today differs but little from the principle used in the locks of ancient times, he proved his point by actual comparison of models. He stressed the fact that all cheap locks were nothing but junk and that the public should be willing to pay a little more for good locks if security is desired. He also said that any key lock can be picked, although it might require some time and effort to do so. Mr. Maxwell stated that the Yale lock was the first lock which allowed interchangeable-part manufacture and mass production. In conclusion he stressed the need, especially in the case of banks, for improved locks which would insure greater security.

A. I. E. E.

Recently the Rose student branch of the A.I.E.E. held a meeting in the physics lecture room. Two reels of moving pictures were shown: one dealing with the manufacture of insulated copper wire, the other with the application of electric ovens for heating purposes. Talks were given by Albert Lotze and John Fox, both senior electricals, on the jobs they held last summer. Mr. Moench, instructor in electrical engineering, is said to have recited a humorous poem dealing with ohms, amperes, volts, and henries. Also Prof. C. C. Knipmeyer, head of the electrical engineering department, read from his little book containing certain "brainchilds" of the student in the form of ridiculous answers to examination questions. He collected these boners several years ago while an instructor at the Massachusetts Institute of Technology.

Following the aforementioned part of the meeting, the group adjourned to the physics laboratory and enjoyed refreshments in the form of hot dogs and buns.

E.C.P.D.

Recently Dr. Prentice, a member of the accrediting committee of the Engineers' Council for Professional Development was in Chicago for a few days, during which time he visited, with the committee, Armour Institute of Technology, the engineering school at Northwestern University, and Marquette University at Milwaukee. Dr. Alonzo J. Hammond, Rose class of 1889, a prominent consulting engineer in Chicago, is also a member of the committee.

Military Ball

On Saturday evening, December 12, in the Mayflower Room of the Terre Haute House, the annual ball of the Tau Nu Tau military fraternity of Rose, which is always one of the outstanding social events of the Christmas holiday season, was held. The dance was preceded by a banquet which was held at seven o'clock in the junior ballroom.

The decorations, which were very elaborate indeed, were the engineer insignia and the school standards of rose and white. The effectiveness of the decorations was further strengthened by the changing lighting system of the room.

Emil Velasco, one of America's outstanding pipe organists, and his twelve piece orchestra furnished the music for the occasion. This was the first appearance of this orchestra in Terre Haute. Featured with the orchestra was Helene Gray, a delightful singer, who enjoys the honorable distinction of being a Paul Whiteman audition winner. Another vocal artist with the orchestra was Earl Bartain, rhythm singer, from New Orleans.

There were a large number of special as well as honor guests who were in the receiving line and also in the grand march which opened the ball.

In the receiving line were Dr. Donald B. Prentice, president of Rose, and Mrs. Prentice; Dr. Paul N. Bogart, president of the board of the school, and Mrs. Bogart; Clyde E. Cromwell, president of Tau Nu Tau, and his guest, Miss Helen Kivits; Col. Thomas L. Sherburne of Indianapolis, chief of staff of the Indiana National Guard, and Mrs. Sherburne; Lieut. Col. Benjamin E. Wimer, and Mrs. Wimer; Maj. and Mrs. J. W. Bulger of Vincennes, Ind.; Maj. Clarence C. Knipmeyer, reserve officer, and Mrs. Knipmeyer; Capt. Joseph H. Stevenson, professor of military science and tactics at Rose, and Miss Helen Mahley; Capt. Roland E. Hutchins, reserve officer, and Mrs. Hutchins; Lieut. Donald C. Hawkins, assistant professor of military science and tactics at Rose, and Mrs. Hawkins; Warrant Officer and Mrs. Sylvester Kearns; John Stineman, vice president of Tau Nu Tau, and guest; Paul Giffel, secretary of Tau Nu Tau, and guest; and Walter Snedeker, treasurer of Tau Nu Tau, and guest.

The committee in charge of the ball, which was an unusually successful affair, included Clyde E. Cromwell, general chairman; John Stineman and Jonathan E. Sonnefield, orchestra; Walter R. Snedeker, financial chairman; Robert Averitt and James Hughes, tickets and programs; Alden B. Foley and Harry Halberstadt, banquet; and Paul E. Giffel, publicity.

S. P. E. E. Meeting

On Saturday, November 28, there was held a meeting of the officers and executive council of the Indiana-Illinois branch of the Society for the Promotion of Engineering Education which Orion L. Stock, professor of drawing and descriptive geometry at Rose, attended. Prof. Stock is a member of the executive council. Other schools besides Rose that were represented at the meeting included the University of Illinois, Purdue University, and Armour Institute of Technology, all institutional members of S. P. E. E.

The purpose of the meeting was to plan a program for the annual spring meeting of the society that will be held April 3 at the Univer-

sity of Illinois. It was decided to divide the spring meeting into two sessions. The morning session will be a general session with a discussion on the Engineering Council for Professional Development, stressing quality rather than quantity in students. The afternoon session will be divided into various educational groups. Mr. R. P. Hoelscher is president of the Indiana-Illinois branch of S.P.E.E.

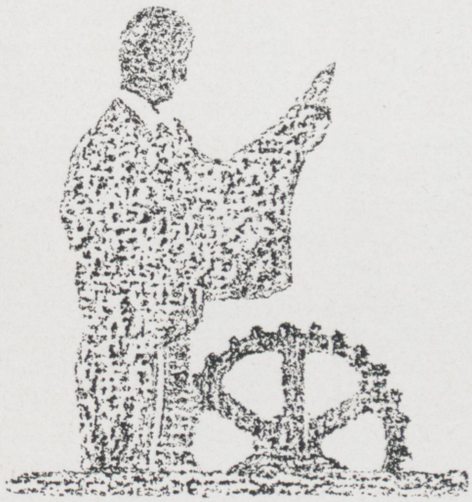
Inspection Trips

On Friday, December 11, both the juniors and seniors in chemical engineering made an inspection tour of the local plant of the Owens-Illinois Glass Co. The group was greatly impressed by the modern-day methods of making glass and various products from it, also by the surprising efficiency of the operations necessary in the manufacture of flawless glass. The group found the main product of the factory at the present time to be various kinds of bottles for alcoholic beverages. At the plant the group met Theron Detrick, Rose class of '33, who is now connected with the company.

On Wednesday, December 16, the senior and junior chemicals made a trip to Indianapolis. The entire day was spent in the inspection of two chemical concerns there. In the morning the group visited the Reilly Tar and Chemical Co., creosoters and producers of coal tar products of various kinds. Their plant was more or less an out-door concern, resembling to a great extent our local coke and gas plant. In the afternoon the group visited the factory and research laboratories of the Eli Lilly and Co., manufacturers of pharmaceutical chemicals and supplies of all kinds. Here the group was impressed by the utmost cleanliness evident both in the factory buildings and in the laboratories.

The chemicals have also taken a trip to our local water works. Here they observed how water purification was accomplished on a large scale and in a most sanitary manner.

Dr. R. K. Strong, head of the department of chemical engineering at Rose, recently talked in Indianapolis at a noon luncheon of the American Chemical Society. His subject, which was an interesting one, was "Bringing the Public to Science."



ALUMNI NOTES

edited by Norman G. Wittenbrock, ch., '38

Doctor Prentice Visits Rose Tech Clubs

A dinner meeting of the Rose Tech Club of New York was held at the Advertising Club on Thursday evening, December 3. E. J. Hegarty, '15, President of the club, was toastmaster. The annual election of officers resulted in the choice of E. J. Hegarty as President, Vice-President, Secretary, Treasurer, and as any other officer which, in his opinion, the club required. The popularity of the perennial chairman was attested by the applause with which his speech of acceptance was received. A report on affairs at the college was presented by President Prentice, together with a discussion of some trends in engineering education. Regrets from about fifteen alumni were read and the roll call of those present included: Andrick, '07; Beecham, '12; Blair, '30; Boem, '91; Bruning, '21; F. B. Butler, '32; E. S. Butler, '06; Cash, '28; Craver, '95; Dunning, '25; Ellis, '26; Fairchild, '12; Ferrell, '21; W. B. Ferris, '27; E. B. Ferris, ex-'31; Hegarty, '15; Hickman, '08; Holding, '89; Hulbert, '91; Isenberg, '09; Kelsall, '06; Loehninger, '13; D. L. Mewhinney, '23; Omar Mewhinney, '91; Reinking, '27; Ross, '04; Schweers, '10; Shaw, '10; West, '27; Willison, '08; Wilson, '22.

The Rose Tech Club of Schenectady met at the Mohawk Club for dinner on Friday, December 4. Paul F. Stokes, '10, President of the club, presided. A short business meeting with reports from the Secretary-Treasurer, Chester W. Falls, '18, was followed by the election of officers. George H. Pfeif, '05, is the new President and Allen G. Stimson, '31, assumes the responsibilities of Secretary-Treasurer. Mr. Pfeif discussed some aspects of the present industrial situation, particularly in regard to labor relations. Dr. Prentice then reported the latest news from the campus, and there was a general discussion of educational problems, which did not exclude some references to the political situation.

Through the kindness of Mr. Falls, a company car had been provided for the afternon before the meeting and Messrs. Stokes and Stimson accompanied Mr. Prentice on an inspection trip through the plant of the General Electric Company.

In spite of the icy streets which made driving dangerous, the following alumni attended the dinner: Brown, '34; Davis, '92; Falls, '18; Gilbert, '89; Henry, '14; Long, '36; Pfeif, '05; Sage, '07; Stimson, '31; Stokes, '10; Waters, '88; Whitecotton, '07.

The Cleveland Rose Tech Club held a luncheon meeting at the Cleveland Club on Saturday, December 5, with John Richardson, '31, President of the club, in the chair. An interim election of officers was required to fill the vacancies caused by the fact that Harry Richardson, '35, and Brent Jacob, '34, had transferred to the jurisdiction of the Detroit and New York clubs, respectively. Harold Johnson, '23, and Jay Hall, '35, were elected to serve the unexpired terms. Fred Fishback, '02, received congratulations on his election to the presidency of the National Electrical Manufacturers Association.

Doctor Prentice reviewed the events of the past year at Rose and suggested, as he had at Schenectady and New York, that alumni could be of real help in enlarging and strengthening the college library by contributing technical books or standard library and historical works from their own collections. It is proposed that a book plate bearing the donor's name will be placed in each volume as it is added to the library. General discussion on various matters connected with engineering continued until nearly five o'clock.

The Case-Western Reserve football game was scheduled for Saturday afternoon but in spite of this competition there was a fine attendance at the Rose meeting. In addition to Spalding, '05, from Akron, the following Cleveland alumni were present: Burt, '26; Charman, '18; Cook, '05; Fishback, '02; Froeb, '32; Gray, '25; Griffith, '22; Hall, '35; Holloway, '17; Johnson, '23; Kessler, '20; Kunz, '27; Landrum, '04, Vice-President of the Alumni Association; Leisey, '23; Richardson, '00; Richardson, '31; Schaack, '32; Schwartz, '01; Stone, '24; Tilley, '17; Waite, '93; Woody, '14.

Pittsburgh Rose Tech Club Meets

The Pittsburgh Rose Tech Club met at the University Club on November 13. A. W. Worthington, '06, President of the club, acted as chairman. Holding's proposed amendments to the constitution and by-laws of the Alumni Association were discussed by the club. Carl Wischmeyer, '06, was present at the meeting as a representative of the Institute and brought news of recent activities in Terre Haute.

The roll call of the men present included: Frisz, '09; Holding, '94; Leathers, '14; Maehling, '24; Overpeck, '16; Ransford, '14; Reed, '05; Staggs, '27; Stark, '34; Stoltz, '16; Wells, '31; Wiley, '98; Woody, '09; Worthington, '06.

W. H. Junker

Mr. W. H. Junker, '21, has been elected to serve on the board of directors of the Engineers' Club of Cincinnati. At the same time he was appointed Chairman of the House Committee.

Mr. Junker graduated from the mechanical engineering course at Rose in 1921. He was instructor of physics at Du Pont High School in Louisville for two years. After this he was with H. G. Brownell, consulting engineer. For eight years he was with Harry Hake, architect, designing the mechanical equipment for many notable buildings and industrial plants erected during this period. During the past three years Mr. Junker has been serving as chief engineer with Thos. Emery's Sons, Inc., and Emery Industries, Inc. He received his M.E. degree in 1927.

Engagement

The engagement of Mr. John H. Welsh, who graduated from Rose in 1935, to Miss Juanita Caufield of Louisville, Kentucky, has been announced.

Marriages

Mr. Herbert E. Matson, of the class of 1926, was married in Louisville, Kentucky, on December 14 to Miss Mary M. Cooprider of Terre Haute, Indiana.

Mr. Harold P. Kehoe, who graduated from Rose in 1931, was married to Miss Dorothea Sovern of Terre Haute. The wedding was held at Indianapolis on Sunday, October 11. Mr. Kehoe is stationed at Petersburg, Ind., with the Indiana state highway commission.

Here and There With The Grads

'02 Fred R. Fishback of Cleveland has been elected to the presidency of the National Electrical Manufacturers Association.

'05 George H. Pfeif has been made assistant to the vice-president in charge of manufacturing of the General Electric Company.

'12 John H. Becque formerly a Captain in the Chemical Warfare Service has been promoted to the grade of Major. He has been in Rio de Janeiro for more than a year as a member of the American Military Mission.

'15 Henry L. Coles has been appointed to the faculty of the University of Colorado at Boulder.

'30 George L. Kessler, with the American Telephone and Telegraph Co., has been transferred to Cleveland.

'31 Clarence W. Hoff, with TVA, has been transferred to Knoxville as Assistant Engineering Aide.

'35 John J. Hager has taken a position with the United States Gypsum Company in Texas.

Fred W. Wiles has taken a position with the B. F. Goodrich Co. at Akron, Ohio.

FRATERNITY NOTES

MARKS.

Alpha Tau Omega

With basketball holding the spotlight at this season of the year, Bob Ladson, George Smith, and Ed Eckerman, all previous lettermen, are again proving themselves a credit to both Rose Poly and A. T. O. The season is yet young, but hope seems to be running high, in spite of our tough schedule.

The Gamma Gamma chapter was well represented at a state conclave held at the chapter house at Indiana University on December 6. Among other things, plans were discussed for the annual state dance to be held in Indianapolis early in March.

The Christmas formal, held December 18 at the Edgewood Cabin, was thoroughly enjoyed by the active chapter, members of other Indiana chapters, alumni, and faculty members. Music for the occasion was furnished by Wayne McIntyre and his orchestra. The chaperones were Mr. and Mrs. Henry C. Gray, and Dr. and Mrs. William D. Crozier. Capt. Joseph H. Stevenson and Miss Helen Mahley were guests of the chapter.

Blue Key

Following a banquet at the Elks' club Wednesday evening, December 16, eight students of Rose were initiated into Blue Key, national honor fraternity. Carl Wischmeyer, president of the organization, was in charge of the event, which was attended by Dr. B. A. Howlett, head of the physics department at Rose, and John Phelps, Rose field representative.

The seniors initiated were Paul E. Giffel and Clyde E. Cromwell, both of Terre Haute, and Alden B. Foley of Decatur, Illinois. The juniors were Merton B. Scharenberg, Kenneth L. Buis, and J. Allan Greenland, all of Terre Haute, Max L. Stanfield of Martinsville, Illinois, and John R. Hayes, of Indianapolis.

Robert A. Averitt was named official Rose delegate to the national convention of Blue Key to be held December 29 to 31 in New Orleans. Thomas N. Wells, of Martinsville, Illinois, was elected alternate.

Edward J. Wodicka, a senior, and Wayne E. Alexander, a junior, elected to membership in Blue Key, were unable to attend the initiation ceremonies. Special exercises will be held for them later.

Sigma Nu

On Saturday evening, December 5, Beta Upsilon held an open house. Entertainment for the evening consisted of dancing, cards, and ping pong. The chaperons were Professor and Mrs. McCormick and Professor and Mrs. Bloxsome.

Initiation services were held on Sunday, December 13, for Donald McCullough and Frank E. Blount. The members of Sigma Nu extend their heartiest congratulations to the newly initiated men.

The election of officers for the coming year was held at the beginning of the month. The men who were elected are: Wayne E. Alexander, Charles G. Fuller, Lawrence Carroll, William J. Butler, Charles B. Drieke, and Louis M. Eyerman.

There is a great deal of popular misunderstanding today about courses such as Diesel engineering, aeronautical engineering, radio engineering and air-conditioning. These subjects are divisions of the major fields of mechanical and electrical engineering. The demands of industry and the opinions of experts coincide in favoring broad training in fundamentals rather than specialization. At Rose these specialties are taught as parts of the more important curricula. The Registrar will be glad to discuss these subjects with high school students who are interested.

ROSE POLYTECHNIC INSTITUTE

TERRE HAUTE, INDIANA

HUMOR

edited by

George W. Smith IV

m., '39

SLIGHT-OF-HAM

A big buck Indian had just ordered a ham sandwich at a drug counter and was peering between the slices of bread when he turned and said to the waiter—"Ugh, you slice 'em ham?"

The waiter replied, "Yes, I sliced the ham."

"Ugh," grunted the Indian. "You damn near miss 'em."

—Nebraska Awgwan

The nurse entered Professor Bloxsome's room and said softly, "It's a boy, sir."

The professor looked up from his desk. "Well," he said, "what does he want?"

She: "No, we mustn't. Didn't you know that the Deans have decided to stop necking?"

He: "Aw heck. The first thing you know they'll be wantin' the students to stop, too."

—Carnegie Tech Puppet

The confident young man stopped in the apartment house hallway to call through the telephone. "Hello, baby," he said, "This is Gideon."

"There's so much noise on the line, I can scarcely hear you," came the voice of a gal on the other end of the line. "Who did you say it was?"

"Gideon, honey. G for gin, I for ice, D for drinking, E for excitement, O for orey-eyed and N for necking. Got that, honey?"

"Well," answered the gal, "not all of it, but come on up, anyhow."

—Northwestern Purple Parrot

"How kind of you," said Helen, "to bring me these lovely flowers. They're so beautiful and fresh. I believe there's some dew on them."

"Yes," stammered Clyde in great embarrassment, "but I am going to pay it off tomorrow."

ENGINEER'S WHISKEY TEST

Connect 20,000 volts across a pint. If the current jumps it, the product is poor.

If the current causes a precipitation of lye, tin, arsenic, iron slag, and alum, the whiskey is fair.

If the liquor chases the current back to the generator you've got good whiskey.

—Pelican

"I tell you I won't have this room," protested the old lady to the bell-boy who was conducting her. "I ain't going to pay my good money for a closet with a measly little folding bed in it. If you think that just because I'm from the country—"

Profoundly disgusted, the boy cut her short. "Get in, mum, get in. This ain't your room. This is the elevator."

—Excavating Engineer

A little boy and his mother were walking down 5th Avenue in New York.

The little boy was looking at the skyscrapers. Turning to his mother, he said, "Mother, are there skyscrapers in heaven?"

His mother gravely replied, "No, son, engineers build skyscrapers."

A patient in a hospital woke after an operation and found the blinds of the room drawn.

"Why are those blinds down, Doctor?" he asked.

"Well," said the doctor, "there's a fire across the street and I didn't want you to wake up and think the operation had been a failure."

Excavating Engineer.

THE TRAGEDY OF HUMOR

The day was warm, the hour was late,
But the editor's work all had to wait,
With nervous steps he paced the floor
And looked askance at the card he bore . . .
Then suddenly, quickly—a timorous rap!
With puzzled expression he answered the tap,
It was a frosh, with face scared and wet;
"I—sent you a joke—did you get it yet?"
The editor groaned, as he looked at the card. . . .
"Not yet," he shrieked . . . "but I'm trying hard!"

—N. Y. U. Varieties

"That's a swell rooting section they have at that college. What makes it so good?"

"Oh, they give all the rooters a cheering drink."

"Of what?"

"Don't be dumb. Root Beer, of course."

—Penn Punch Bowl

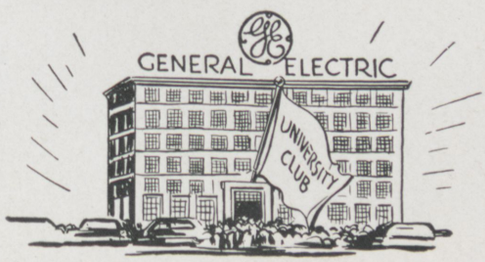
G-E *Campus News*

LIGHTNING STRIKES TWICE

LIGHTNING may strike not only twice but a dozen times in the same place over the same path within one second's time. This is one of the unusual facts that Karl B. McEachron, Research Engineer of General Electric's High-voltage Laboratory, has found out about lightning.

Even more unusual is the new theory that the brilliant lightning flash one observes during a storm is not a bolt from the sky, but a union of a cloud streamer with a similar one from the earth. The action of the air currents and of the falling drops of water separates the charges in the cloud. When the voltage in the cloud reaches a certain value, a streamer starts toward the earth, traveling in jumps at about one-tenth the speed of light. When this streamer is a few hundred feet away, streamers from four to eight feet long begin to form on the surface of the earth. When the streamer from the clouds unites with one from the earth, the flash of lightning occurs. The pressure generated during the passage of current makes the thunder.

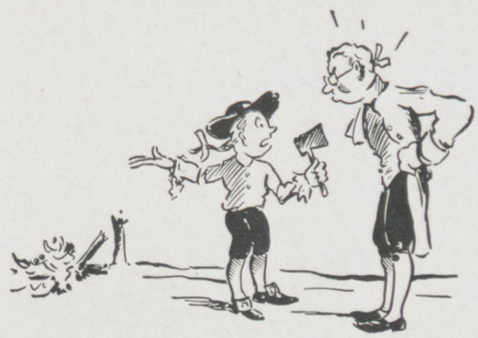
General Electric conducts research in lightning so that its engineers can design transmission lines and protective equipment which will insure better continuity of service.



UNIVERSITY CLUB

DAVE PACKARD of Stanford and Otto Schwartz of Columbia played against each other in the Rose Bowl game of 1934, but now they are working side by side in the Schenectady Works of the General Electric Company. This seems unusual until it is pointed out that in the General Electric organization is one of the largest and most cosmopolitan university clubs in the world. Approximately 4500 college graduates, representing 237 American universities, colleges, and technical schools, are employed by the Company. In addition, there are 198 graduates from universities in 22 foreign countries.

Ten educational institutions have contributed more than 100 graduates each to the General Electric family. They are: Cornell, Iowa State, M.I.T., Penn. State, Pratt Institute, Purdue, Union College, U. of Colorado, U. of Michigan, and Yale. Fifteen other schools have provided more than 50 graduates each. They are: Case School, Georgia Tech., Kansas State, U. of Maine, U. of Minnesota, Ohio State, R.P.I., Syracuse, U. of California, U. of Illinois, U. of Kansas, U. of Nebraska, U. of Wisconsin, V.P.I., and Worcester Polytechnic.



DETECTING LIES

PAPA WASHINGTON needed no lie detector; George told the truth. But as a check on less truthful persons, Northwestern University's crime-detection laboratory has developed a lie detector. It makes simultaneous measurements of respiration, blood pressure, and perspiration. Emotional disturbances are reflected in these body functions. And since extremely sensitive recording instruments are needed to record changes in perspiration, the delicate photoelectric recorder developed by General Electric engineers is put to work.

For many years General Electric has made instruments for exacting applications. This same photoelectric recorder is used to obtain a continuous record of temperature in a wire-enameling oven. Electric gauging of ball-bearing diameters, of wire diameters, and of strip thickness is accomplished in rolling mills. These operations and hundreds of others are recorded by this instrument, and with a power consumption of only one thousandth of a microwatt.

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