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Rose Technic Staff
Rose-Hulman Institute of Technology

ROSE TECHNIC

JULY 1942

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The amazing transformation and expansion of American industries to produce the materiel of war at a rate never approached in history are striking examples of the initiative and skill of engineers. If you are interested in studying for this profession at a college which has produced more than its share of leaders write to the Registrar.

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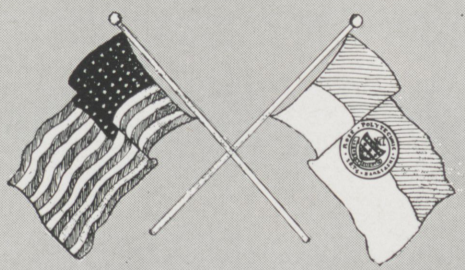
ROSE TECHNIC

VOLUME LII JULY, 1942 NUMBER 1



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A 190,000 lb. ingot ready to be forged into the world's largest turbo-generator rotor. —*Courtesy of Allis-Chalmers Electrical Review*

THE COVER

Summer time at the Rose dormitory. —*Photo by Davis*

STAFF

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ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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Colorado Engineer
Cornell Engineer
Drexel Technical Journal
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Rose Technic
Tech Engineering News
Villanova Engineer
Wayne Engineer
Wisconsin Engineer

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Pressure Effects In Physics and Chemistry

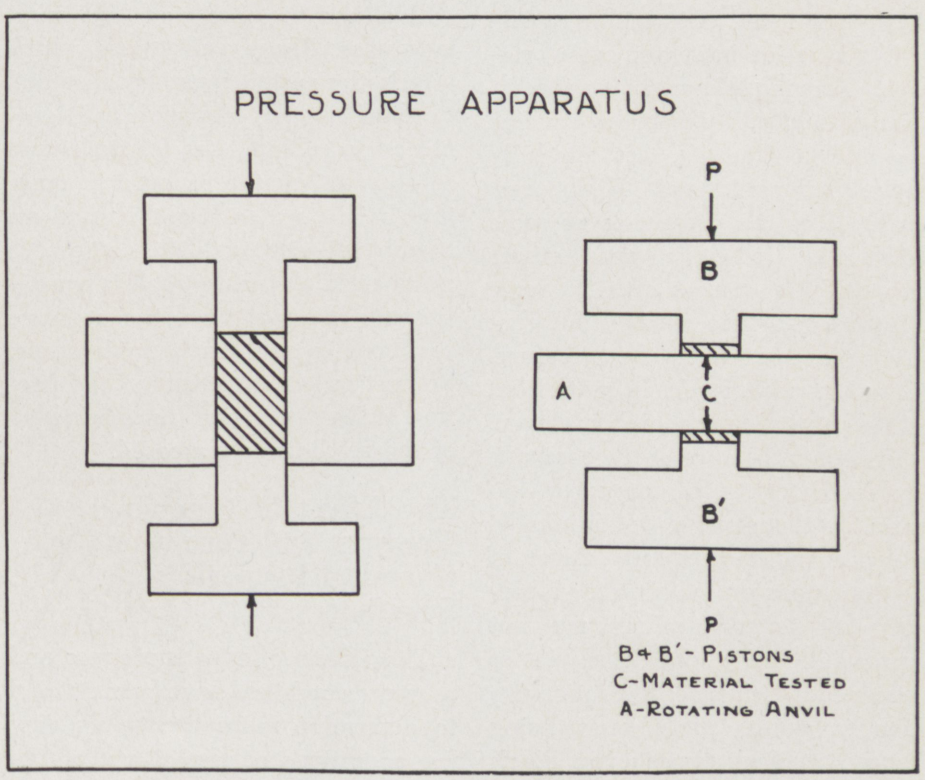
By HARRY D. FRYE, junior, m.e.

Combinations of high pressure and torque cause some substances to undergo radical transformation. This article summarizes the effects of high pressures on various liquids and solids, and describes some of the methods employed in performing high pressure experiments. Mr. Frye also explains some of the limitations encountered in such experiments.

HIGH pressures seem remote, but many of the most common things we use were formed with the aid of high pressures; the coal we burn, the petroleum we use in our automobiles and the rocks which are all around us. The investigation of high pressures was undertaken to learn more about the conditions near the center of the earth. Scientists have not as yet been able to produce pressures comparable to those of more than a few miles below the surface, but they have learned many things concerning the behavior of matter under high pressures.

Changes in Volume Produced by Pressure

Volume changes differ greatly as to the state of the matter; gases are highly compressible, liquids less so, and solids still less so. Not many years ago liquids and solids were considered incompressible but as science advanced and more powerful instruments were devised the compressibility of liquids and solids was proven. To measure the compressibility of solids such as iron, which is one hundred times less compressible than water, pressures of many hundreds of atmospheres are necessary. Under a pressure of 50,000 atmospheres a liquid may lose 30 to 40 per cent of its volume. Caesium, the most compressible metal, may be reduced to one-half its volume by a pressure of 50,000 atmospheres. The compression of matter takes place in two stages, the first of which is the reducing of the distances between atoms, the second is more complex and its explanation is beyond the scope of this paper. Accurate measurement of volume change is difficult because the apparatus and measuring devices are affected by the pressure. Dr. T. W. Richards has done much work in this field. He devised an accurate method of determining the compressibility of liquids and solids. Although this apparatus was very accurate its pressure range was limited. The principle of the method was to compare the compressibility of the liquid or solid with some standard liquid. Two forms of apparatus were necessary—one for liquid and one for solids. The first was simply a short, wide test tube into which a tightly fitted hollow stopper with a downward pointing needle fitted. This glass jacket was placed in a Cailletet compression apparatus and successive weighed portions of mercury were added noting the amount of pressure necessary to break the electrical contact. A mercury compressibility curve was then plotted. If a substance were then introduced below the surface of the mercury and a similar procedure followed and a graph plotted the difference between the two curves would be the difference between the compressibility of the substance and mercury. The compressibility of liquids was found by using a U-tube apparatus. The apparatus was filled with mercury and a mercury curve determined. Part of the mercury was then removed leaving just enough to fill the U-tube. The liquid to be determined was placed in the tube and its compressibility curve determined. With the two compressibility curves, the compressibility of the liquid was found.



Effect of High Pressure on the Boiling and Freezing Point of Substances

The change of melting temperature with pressure has been one of the most interesting effects studied. James Thomson said that the melting temperature of a substance would be raised by pressure if it contracts on freezing and that the melting temperature would be lowered if it expands on freezing. Lord Kelvin proved his brother's theory. With the pressures then available it was difficult to change the melting temperature more than a fraction of a degree. With the pressures available today mercury may be made to freeze solid at 100 centigrade. Any liquid will freeze at any temperature if the pressure is high enough. No critical temperature enters into the effects of pressure between liquid to solid phase as it does between vapor to liquid phase.

Tamman applied 3000 atmospheres to water and the results spectacularly proved Thomson's theory to hold true at high pressures. Tamman found that if a pressure of 2200 atmospheres was applied to ice at -22 C. the ice suddenly collapsed with a 20 percent decrease in volume. This new ice has an entirely different crystalline form. The melting point of this new ice increased with pressure, proving Thomson's theory. bismuth and gallium, both of which expand on freezing, act similarly under high pressure. High pressures affect the properties of some substances radically and others are affected very little. Some substances have many different forms varying with the pressure. Water has seven forms, bismuth four, gallium three, and camphor eleven.

We cannot be sure of the composition of the center of the earth, because of the strange conditions of pressure and temperature. Most of the transitions produced in the laboratory by pressure alone are not permanent. Only one example of permanence caused by pressure alone is white phosphorus being changed to black phosphorus. Black phosphorus looks much like graphite, does not spontaneously ignite on exposure to air, and is a conductor of electricity. It is now thought that pressure alone will not produce many permanent changes but that a combination of pressure with shear stress or high temperature is necessary.

The methods used in producing high pressures are worth mentioning, because the field is limited by the range of pressure. The limiting factors of the apparatus are the ability of the cylinder and pistons to withstand the pressure and chemical action of the substances. The best steel cylinders will stand only 40,000 kg/cm.; however, if external pressure is increased to equal the internal pressure the cylinder will not rupture. This is done by making the pressure vessel in multiple units. The pressure on the outside units just equaling that on the inside ones. In practice this is done by making the inside unit conical and forcing it like a stopper into an external sleeve. Steel pistons will not withstand a pressure of 50,000 kg/sq. cm. but a cemented carbide of tungsten and cobalt, "carboly", has a higher compression strength than the hardest steel. Another factor that must be considered is that many substances will attack the piston at high temperatures. Those substances which attack the piston must be sheathed in some material like copper or lead. Mercury, sodium, tin, bismuth, and sulphur attack the piston and cause it to rupture at a few thousand atmospheres. Although this apparatus produces high pressures, it is not extremely accurate since the pressure produced is not truely hydrostatic. When two pistons are used the friction is decreased and the sharpness of the readings is increased.

The Effect of Combined Pressure and Torque on the Chemical Properties of Substances

The effects of shearing stress and pressure combined have been studied to determine more accurately how the conditions at the center of the earth affect matter. The principle of the method used to produce shearing stress and pressure together was to place a thin disk of the material to be studied and apply pressure and torque at the same time. Mechanical limitations, however, make it necessary to use a modified apparatus in which an anvil is placed between two pistons and the material to be studied is placed between the anvil and the piston. The anvil is rotated. The mean pressure exerted was 50,000 kg/sq. cm. and the shear stress was 25,000 kg/sq. cm. The substances studied were not chosen at random but with an eye to the similarity of structure of other substances which had given good results. For example, sulphur was chosen because of its similarity to phosphorus. The theory that permanent transitions could be produced by pressure plus torque is based on the reasoning that the molecules or atoms might slide into new positions which uniform hydrostatic pressure would not cause. This reasoning must be true since most of the transitions produced are permanent. The following table contains the results of combined pressure and torque on certain substances:

The Effect of Pressure and Torque Combined on the Chemical Properties of Substances

Material — *Changes effected*

Rubber—Hard, translucent, horn-like material.

Paper—Hard, translucent, horn-like material.

Wood—Hard, translucent, horn-like material.

Linen Cloth — Hard, translucent, horn-like material.

Celluloid—Violent detonation.

Ammonium Nitrate NH_4NO_3—No change.

Red Phosphorous—Black Phosphorous.

Thymol Blue—Becomes less soluble.

Rosanilin—No change.

Lead Dioxide $Pb0_2$—Violent detonation, residue of metallic lead.

Lead Oxide Pb0—Metallic lead.

(*Continued on Page* 22)

Courtesy Roads and Streets

Two Lane Highway before improvement.

Life Lines

By KENNETH R. ALLISON,
junior, c.e.

Few people realize the tremendous importance of good highways to the efficient operation of the nation's armed forces. The general condition of American roads, the characteristics desired, and some of the problems encountered are discussed in this article by Mr. Allison. The value of the Pan-American and Alaska Highways and the extreme difficulties met in such constructions are also revealed.

THE all-out effort of the United States to restore peace and freedom to the world has of necessity wrought many changes in the way in which we live. Our great automobile industry has been transformed into arsenals and bomber plants within a few short months; certain food stuffs have been rationed because of limited shipping and the loss of vital producing areas to the enemy; and other shortages prod us with the seriousness of the conflict we are in. It is the wish of every American to help his country to a speedy victory; yet in the minds of most people a question arises of what can be done for the war program which will be of use and help to us in the restoration of the peace time mode of living. The most probable answer is our system of American highways.

Highways are the bonds of our democracy which have become the arteries that carry the vital industrial traffic and the maneuvers of the fighting forces. Adolf Hitler fully realized that before his great war machine could function properly it must have good roads on which to operate. Thus he had his "Autobahen" built and completed before he pushed the world into open conflict. The average person will say if it takes miles of good highways to win the war it is all over since the United States has long been recognized as having more miles of improved high-type roads than any other country in the world. That is quite true, but how adaptable are these highways for military use? This question has long been a source of doubt and of investigation of our military leaders. They have found that the location and the nature of the highways leave much to be desired; therefore they have conducted experiments to find in what way the old roads can be corrected and how to build the new highways.

Conferences of construction chiefs, of the design engineers, and the military leaders have shown us what is needed in our highway system. Highways in the past have been built in proportion to the population of the area. That method of determining the location of our roads is good peacetime economy, but as a result our highways on the east and west coasts are routed through congested areas. Along our north and south borders the roads are very few due to the scattered settlements. In order to fully defend our shores, offensive roads must be built on which our forces can speed to repel invasion if it should ever come. The highways of the middle-west are some-

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Courtesy Roads and Streets

Same Highway after faults have been corrected.

Electrodeposition of Metals

By WILLIAM R. KNIPTASH, junior, ch.e.

In the past several years, the electrodeposition of metals has assumed a greater significance because of the application of scientific methods to the process. Mr. Kniptash discusses in his paper the methods and requirements necessary for the electroplating of metals such as copper, silver, and lead.

THE quality of electrodeposited metal greatly depends upon the base metal. The base metal must be thoroughly cleaned before the article is ready for plating.

There are several things about which the plater must have a knowledge before he can plate an object to specifications. He must know the amount of current for a specified plating time. This of course necessitates a knowledge of the throwing power and plating ability of the solution.

Before deposition of a certain metal may be carried out, the electrochemist must prepare the materials. His most important work is the preparation of the plating solution. The plating solutions in this report are given with the realization that other solutions possess the same ability and usefulness.

For many years electroplating was conducted as an empirical art, with processes that were often considered secret. For the past several years, however, there has been a definite application of science to the process. Through establishment of electroplaters' societies and through courses instituted specifically for training electroplaters, there is now widespread knowledge of the subject. Today electroplating is no more an empirical art than is the practice of medicine or any other recognized profession.

The scope of electroplating has expanded rapidly in recent years for science has discovered many and varied uses for the electroplater's product. It is conceded, however, that electroplating, as a business, is in its infancy, and that more and greater developments may be expected in years to come.

Preparation of articles for plating is as important as the plating itself for the production of high-quality coatings. The article to be plated must be thoroughly cleaned. Foreign materials likely to be on the surfaces to be plated are of two kinds: oxides and grease. Where both are present, the grease must be removed first in order that the oxide may be reached. Greases are mainly of two kinds: animal and vegetable fats, and mineral oils. The grease of the first type may be removed by means of an alkaline solution which decomposes or converts the grease to a soap. The second type of grease may be removed by means of solvents such as benzene, gasoline, carbontetrachloride, and trichlorethylene.

Pickling baths are often used for the removal of oxides and as a brightener. One of the recently developed cleaning solutions which has proved successful is Anodex. To further protect against foreign materials remaining on the surface, it is often necessary to clean the article with pumice and a brush. All cleansing operations are followed by a thorough rinsing in water.

The current measuring devices are the basis for the method of computing plating time. The time and current required are computed as a certain number of amperes per square foot of plating surface for a certain number of minutes. Standards have been established by which current time and density can be calculated with a minimum error. As an example, it is known that with a given tin plating solution, a current of 30 amperes per square foot of plating area for 0.3 minutes will produce a deposit of .0001 of an inch. It remains to multiply this conversion unit by the thickness of deposit desired to get the required amount of time. The proper number of amperes may be determined by multiplying the area of the plating surface by 30. Similar conversion constants may be set up for other plating solutions. The accuracy of the various standards depends on the continual efficiency of the cathodes involved.

One of the very important factors to be considered in electroplating is throwing power. Throwing power is the term applied to that property of a solution which enables it to cover evenly and completely all parts of the object to be plated.

Without the effects of polarization, the current density would increase at the point on the cathode nearest the anode, and since the quality of metal deposited is in direct proportion to the current density, this point would receive a heavier deposit than the remainder of the article. A study of polarization curves (graphs plotted to show the action of the current under the influence of polarization) shows that this tendency defeats itself. The higher current density causes a higher polarization voltage which, in effect, increases the resistance and prevents the current density from increasing to the full extent indicated by the difference in length of current paths.

Considering a given plating bath and specified operating conditions, the relation between the primary current distribution and the actual metal distribution represents the throwing power. The difference in metal distribution and primary current distribution, expressed in percent of the primary current distribution, is a numerical evaluation of throwing power that may be used for comparing different baths, electrodes, etc. In using this evaluation factor, a "plus" throwing power represents a better metal distribu-

tion than primary current distribution. A "minus" throwing power represents a poorer metal distribution than primary current distribution. This latter condition (minus throwing power) exists in almost all chromium plating solutions and in some nickel plating baths.

Electrodeposited metals all show crystalline structure upon x-ray examination. A number of factors affect the characteristics of plated deposits, such as current density, concentration and agitation of the solution, temperature, conductivity of the solution, metal ion concentration, hydrogen ion concentration, the use of addition agents, the structure of the base metal, and the throwing power of the solution.

Plating baths must be operated within definite current density ranges or poor deposits will result. Plating baths having low ionic metal concentration are used for the production of fine grained deposits which are readily polishable. It must be borne in mind that the best of care in plating is of little value if the foundation is improperly prepared, insofar as crystal formation is concerned. Electroplating, unlike painting, does not cover such defects as scratches and dents in the surface of the base metal. The various factors which generally improve the quality of the deposit may be summarized as follows: (1) use of addition agents such as glue and gelatin; (2) low metal ion concentration; (3) increasing current density; (4) decreasing the temperature where this does not adversely affect the solubility, conductivity, etc.

Copper

Copper was one of the first metals to be deposited from a plating solution. In earlier years the chief reasons for the deposition of copper were to provide decorative and protective effects. Recently, copper has been discovered to possess properties which aid in the deposition of other metals.

Solutions

The two principal baths used in industry are the acid sulphate and the alkaline cyanide solutions. The former, although simple and easily operated, cannot be used for direct deposition of copper on metals which would displace copper from solution. The cyanide copper bath, therefore, is extensively used in plating iron. For production of thick deposits of copper on metals such as iron, the initial coating of copper is put on in the cyanide bath, and the major part of the coating deposited in an acid sulphate bath.

The following are constituents of the acid sulphate bath:

Copper sulphate (bluestone)	1½ lbs./gal.
Sulphuric acid	4-6 oz./gal.
Water	as required

The function of the copper sulphate is obvious. That of the acid is at least two-fold. The acid mostly adds conductance and, in addition, prevents the formation of rough deposits, giving a finer type of crystal. It is found that in neutral copper sulphate there is a tendency toward the formation of basic salts, with the production of rough spongy deposits. The presence of acid prevents this and, in addition, adds to the throwing power by the reduction of the number of free copper ions in the solution.

The composition of the alkaline cyanide bath is as follows:

(1)

sodium cyanide	7 oz./gal.
single copper cyanide	5½ oz./gal.
sodium bisulphite	3 oz./gal.
sodium carbonate	3 oz./gal.
water	as required

or

(2)

sodium cyanide	7 oz./gal.
copper carbonate (58%)	6.7 oz./gal.
sodium sulphite	3 oz./gal.
water	as required

The chief difference between the two solutions above lies in the interactions which take place when the various constituents of each solution are combined to form the bath.

Strikes

Strike baths are often used in connection with copper plating. These baths are used to produce a coating of copper rapidly which serves as a good base for the more gradual deposition of the regular plating bath. The strike plays a major part in the prevention of spongy deposits. A higher amperage is usually used for copper striking than is used for the more gradual plating of the major coating.

Anodes used in copper plating provide little difficulty in that they are almost one hundred percent efficient. Electrolytic anodes are the most commonly used. To avoid the trouble of handling the scraps of anodes which inevitably are left, it is better to use as anodes, copper deposited on perforated lead plates. The copper can then be used down to the last.

In the cyanide baths, a current density of 25 to 30 amperes per square foot of material is used. When rapid deposition is desired and a smooth surface is not necessary, the density can be greatly increased, especially with the application of some sort of agitation—although figures for current density go up as high as 300 amperes per square foot, these are exceptional.

The conditions under which the various solutions are used vary considerably. Generally, however, lower current densities are required with the higher degrees of temperature of the solution and usually finer grained deposits are produced. Temperatures ranging from 75° to 120° F. are about normal in these baths.

Silver

This type of metal plating is one of the oldest kinds known. The fine appearance and corrosion-resistant properties of even a very thin deposit of silver have won it a high place among plating metals.

The cyanide solution is the one most used in silver plating. It is compounded of the following constituents:

silver	2 oz. Troy/gal.
sodium or potassium cyanide	4 oz./gal.
sodium or potassium	

(*Continued on Page* 30)

A Young Man's Fancy Turns To——

By WILLIAM H. PLENGE, sophomore, c. e.

The young high school graduates and college students find themselves in a strange predicament because of the nation's all-out war preparations. Here, Mr. Plenge discusses the problems encountered and reviews a few of the schemes—some in operation, some mere suggestions—submitted to relieve the situation.

THE problems now confronting the average college student are not easy ones to answer. Foremost, perhaps, is the decision whether to stay in school or whether to enlist. This decision cannot be made by referring to a general formula or pattern of behavior because each and every student has a different problem.

Last year when the administration and military authorities asked Congress to lower the draft age to eighteen, there were howls of disapproval from earnest citizens because they felt that there was a huge reservoir of manpower still undrafted in the twenty-one to thirty-six year range. Probably the compromise at twenty years was due to the reluctance of the Congressmen to consider an eighteen-year-old fit for military service. This is hardly the fact for all Army men agree that an eighteen-year-old is more readily trained because he has fewer responsibilities and his reflexes are at the peak. The Navy enlists boys at seventeen and the Army at eighteen if the boys have their parents consent. The Army Air Corps, in order to meet the increased demands for personnel, has lowered its age limit to eighteen and in addition, removed the two year college education requirement.

With all this confusion, the late teen-age man of the country is somewhat bewildered. His college deans and advisers tell him to remain in school until the Selective Service calls while enlistment posters and the tempo of the times advise him to enlist immediately.

Those boys not in college face a two or three year period until they are drafted. What to do in this period is their biggest problem. It is not easy to decide whether it is best to attempt to start a college education and hope that being upperclassmen will exempt them long enough to graduate or whether to get jobs in war production in order to make enough money to get their education after the war is over.

What the teen-age boy wants is an assurance of certainty and this is one thing he will not get. Nobody knows just exactly what is going to happen and any one who is unwilling to gamble is certainly out of place in these times. With the eighteen to twenty age group restricted from the draft, the Air Corps, Navy, Marines, and Coast Guard have tried to tap the pool of 2,000,000 men.

One cannot blame the Air Corps and the Navy for trying to enlist the teen-age boys since both these services depend entirely upon voluntary enlistment. The Air Corps further justifies its attitude because the training it offers to cadets is equivalent to a two year college course. Veteran army men agree that the average draftee is smarter and more easily trained than the peace-time volunteer because the better element in the American public is reached, but the Army would be better off if it didn't have to wait two years to induct the cream of the crop.

The competition between the Services has certainly helped the average college man, however, for he can sign up early in his college life for reserve commissions with a pretty good assurance that he will not be called for at least two years and probably not until he has received his degree. Close to the college freshmen and sophomore is the Navy's plan to sign up eighty thousand men between eighteen and twenty.

Such arrangements and others proposed by the Air Corps, Marines, and Coast Guards, will be hard on the mass army because each candidate is exempt from the draft. The Army has tried to stem the rush to the other services by publicizing the fact that four-fifths of the men now training for commissions came from the selectee ranks; but the attitude of college administrators as well as the boys has done much to aid the other services.

With the help of college officials, students remain free until the draft threatens and then try to get a reserve commission in the Navy or Air Corps. As it is, with the army planning to induct millions before Christmas, even jobs in the defense factories will not be safe from the draft and neither will men with dependents.

Those in the safest positions are the boys now enrolled in technical schools for the administration urges the college to keep the enterprising engineer, doctor or dentist in school long enough to receive his degree. The school authorities, however, will help only those who show promise of making the most of their opportunities. Authorities note that the better students show little improvement while those just getting by are beginning to go to work.

Probably the most vital question to college students whose summer vacations have been eliminated is the Office of Education's plan to loan money to needy technical students. The colleges favor the plan for they

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Editorials

Idiotorial

A wise and intellectual illiterate once precociously paraphrased, "It ain't the heat it's the humanity." Rose students, however, are inclined to consider this very definitely a moot statement. After brief contact with the rays of "Old Sol" that come pounding through the sky-lights of our imposing edifice, they hastily and unanimously conclude that it is the heat. In other words, as the students so concisely phrase it, omitting the usual generous sprinkling of their quaint expletives, "It's hot."

Yes, it's hot, but the spontaneous spirit of Rose will never wither in the face of a little heat wave. It is granted that the towering temperatures are not conducive to the highest type of productive concentration, however, the heat must not be allowed to interfere with studies. You fortunate fellows graced with the privilege of attending school during the summer must continue your preparations to be able to accept positions in industry or the armed forces of the nation.

So, embryo engineers, equip yourselves with shorts, shoes, and slide rules for defense against Sol's pyrotechnics, and assume a comfortable position atop the well known spheroid.

J. E. M.

Times Haven't Changed

This is the first issue of Volume LII of the *Technic* which makes it just 50 years ago that the staff first underwent the change necessitated by graduation. The editorial written by the succeeding staff for that occasion applies very admirably to our present situation and is well worth reprinting.

"In presenting this first number of Volume II of *The Technic* the new management salutes its readers. Some of us have labored in the ranks before, but with a single exception each member of the board of editors assumes new duties for the coming year. A feeling of strangeness pervades, which we trust will soon pass away, that with more experience in the work, a journal worthy of R. P. I. and its supporters may continue to be published. By the graduation of Messrs. Layman, Rose and Fogarty, *The Technic* lost those who did most to place it in the front ranks of college papers. Men of ability, experience and push, they were eminently fitted for the positions they held, and by their departure leave vacancies hard to be filled. That *The Technic* succeed this year as it did the past will require the hearty cooperation of the entire Institute. The board of editors do not stand upon the ground of sole contributors to its pages amongst the student body, but as one of a trinity composed of faculty, alumni and editorial staff. Each student already has his time very nearly filled with the round of his regular work, and this should point the lesson that an editorial board can only serve as agent, not principal, in the putting forth of a college journal. *The Technic's* pages are yours and at all times contributions of any sort, consistent with the standard of the paper are welcomed, are solicited. The members of the faculty will continue among our distinguished contributors; the alumni are most cordially invited to send in articles bearing on their several lines of work and all other items of interest; the board of editors bespeak the support of all."

This year the Technic lost Jack Kennedy, John Mehagan, Gene McConnell, Hulit Madinger, Earl Michaels, R. King Chalfant, Leon O'Dell, William Leedy, and George Kesler. All of these men were important cogs in the organization that made possible the quality of last year's Technic.

The present staff is proud of these men and pledges itself to carry on their good work. It asks that the students, faculty, and alumni continue to give their generous support.

The Editor

Changes

The war-time schedule is causing quite a few changes on the campus. Many traditions will have to go and other things substituted in their place. Recreation is as necessary in war as in peace but the war will impose certain limitations.

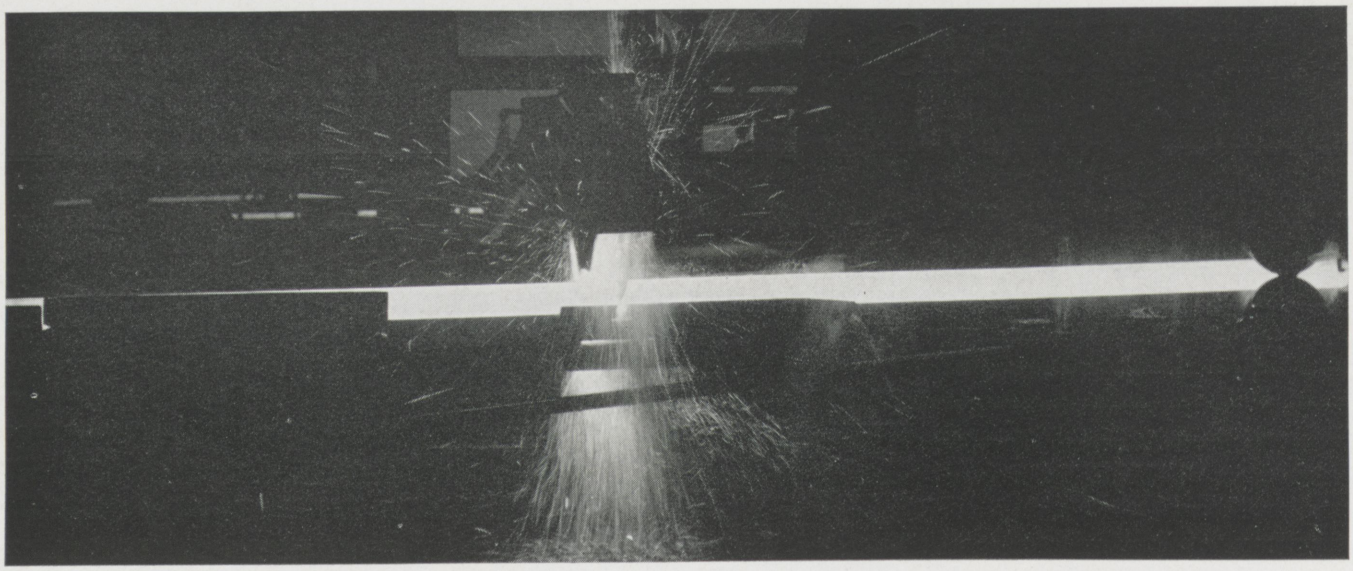
Starting school without football makes it hard to get into the spirit of things. Rosie's absence is keenly felt by all. The freshmen will lack that unity which comes only by gathering wood and guarding it the first six weeks of the year. It's much easier to get acquainted working together than by going to class together. Freshmen, remember you can go to Rose without being a Rose man. You have to have that spirit. Freshmen, get that spirit. The war will change many things, rightly so, but we must not let it change our school spirit.

The seniors are a pretty sad lot these days. After three years of toil for the traditional honor of wearing cords its too hot. A close second are the sophomores who don't know whether to educate the freshmen or dig up their own hats and garters. The juniors don't have much to worry about—just school.

St. Pat will frown on us for allowing the freshmen to cast aside their hats and garters before the day but it is hardly fair to expect them to be both freshmen and sophomores at the same time.

There are solutions to all of these problems and they will be worked out.

H. D. F.



Courtesy Engineering Progress

Red-hot Pipe being Cut into Accurate Lengths.

Research and Development

Edited by ROBERT W. HODGERS, senior, e.e.

Cutting Red-Hot Pipe While Moving

The problem of cutting red-hot pipe accurately as it comes out of the mill at approximately seven feet per second is exceedingly difficult since the speed of the pipe through the furnace may change to maintain the correct temperature.

This problem has been solved by means of a new "hot saw", as it is called. The saw continuously rotates at high speed, the carriage moves parallel to the pipe with a reciprocating motion and at the proper instant when the saw carriage has caught up with the pipe and is running with it at the same speed, it tilts forward into the pipe. The difficulty is, of course, to coordinate this motion with that of the pipe, regardless of how the speed of the pipe may vary. The saw carriage is driven by a cam and any speed can be obtained by changing the position of the carriage-driving link on the cam. The older methods of coordinating these complex motions employed mechanical aids such as flag switches and clutches, but the coordination is now obtained by electrical controls. The timing is done automatically and so accurately that cuts are made within two inches of the desired length even though the pipe is moving close to 450 feet per minute.

New "Dual Rotation" Propeller

American aviation engineers are experimenting with a "dual rotation" propeller which they claim will be a great improvement over the conventional airplane propeller. Dr. Everett W. Thatcher of Schenectady, coordinator of civilian pilot training at Union College made this statement in a General Electric Science Forum address given in cooperation with the U. S. Army Air Force.

"The dual rotation propeller is a propeller in two parts, each revolving a different way, one-half of the propeller turning clockwise and the other half counterclockwise," Dr. Thatcher said.

"The front half of the propeller sets up swirls that make the 'bite' of the other propeller more efficient," he explained. "The Army Air Force is working on this new development right now."

"The dual rotation propeller will not cause complications in airplane design, but instead is a great improvement," the speaker continued. "For one thing, in addition to giving the propeller blades a more efficient 'bite', it creates an air stream that flows back straight over the plane instead of swirling back like a wildcat whirlpool."

"Ordinary propellers, which churn the air in one direction only, create a spiral current of air on the plane's surfaces. This revolving air stream naturally causes resistance that would be reduced with the dual rotation propeller. Another factor is that the dual rotation propeller would simplify mounting the engine to resist strain."

"In other words," Dr. Thatcher pointed out, "with a twisting motion in both directions there won't be a force tending to turn the airplane over in a single direction."

"Translated into performance, it means more speed, greater range, better performance, and a better reliable, all-round fighting aircraft," he said.

"Once again, the U. S. Army Air

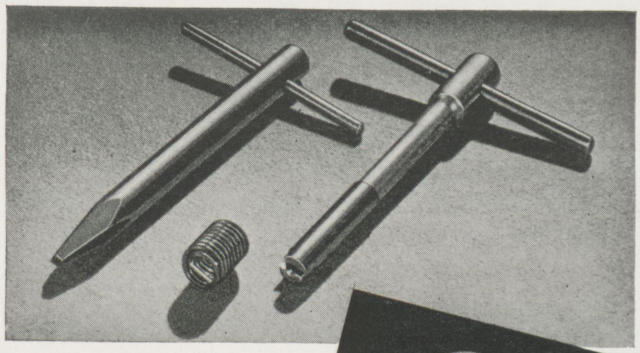
Force set the pace for the world in new developments, scientific research, and finer performance," he concluded.

Spinning Rotors at 1000 RPS

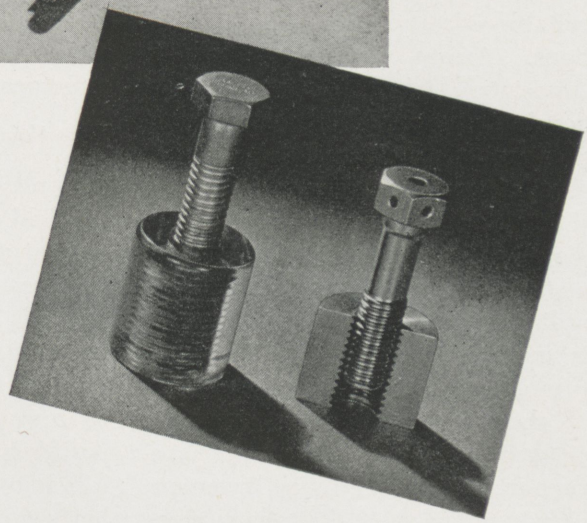
By spinning rotors in a vacuum "bottle", scientists at General Electric Research Laboratory have been able to obtain speeds of 1000 rps, thus making a pound mass exert a pull, by centrifugal force, of over 100 tons. The rotors weighing as much as 20 pounds literally explode as these extreme speeds are reached.

The vacuum "bottle" in which tests are made is two feet in diameter and one-half foot high. The rotor is suspended on a vertical shaft through the top. The "bottle" is exhausted to 1/10,000 atmospheric pressure. The vacuum chamber has massive steel walls since the fragments have terrific energy after rupture occurs.

The speed is measured with an electric eye, or photocell. At the top of the air turbine shaft is a two-faced mirror, on which shines a light beam. It is reflected upward to the photocell twice every revolution. The resulting electrical impulse operates a frequency meter, indicating the revolutions per minute on a dial.



Courtesy Bakelite Review

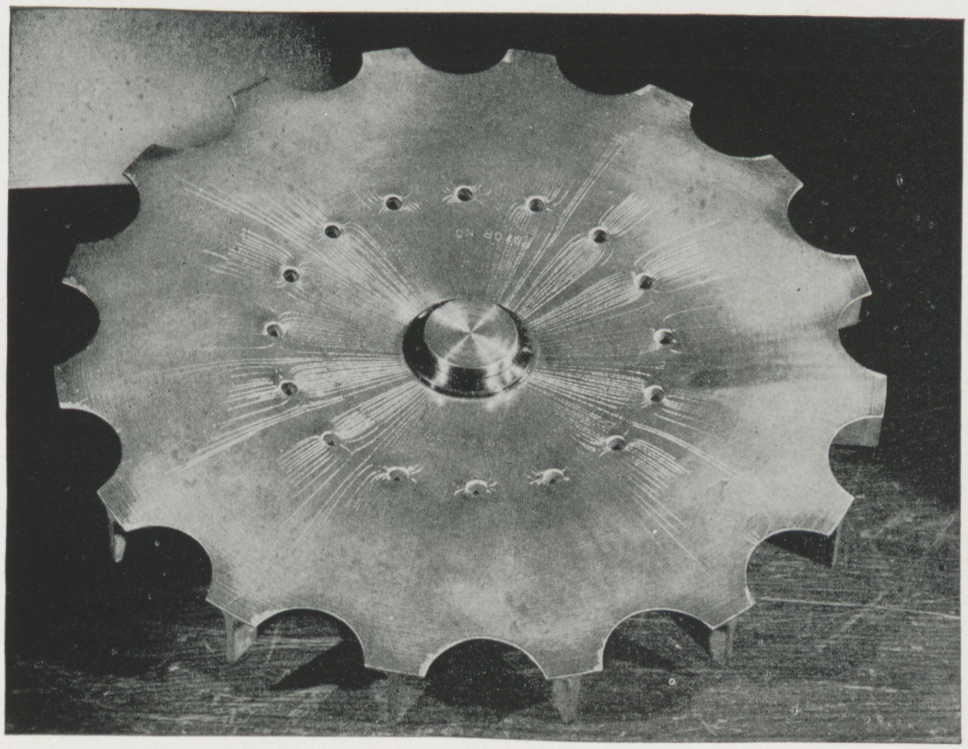


Steel Inserts for Screw Threads in Plastics.

Top: Tools used for inserting liners.

Right: Plastic with inserts screwed in place.

Another advantage of the use of a vacuum is that the rotors may be coated with a special varnish that records, in fine cracks, the stresses the wheels encounter at speeds below rupture. These cracks form at right angles to the stress and the number is proportional to the magnitude of the stress, thus a definite stress pattern is formed showing the direction and comparative magnitude of the stress at every point on the test piece. This stress-coat analysis is possible at such high speeds only in a vacuum chamber since in air, the varnish would be warmed by air friction and would not be brittle enough for the cracks to form.



Courtesy General Electric

Stress Pattern on a Supercharger Rotor.

Screw Fastenings for Plastics

A new type of screw fastening for plastics has been developed by the Aircraft Screw Products Company. It is used in conjunction with a hard spring wire thread insert which is first screwed into the tapped hole. The design of the insert is such that when it is in place, it expands against the threaded grooves to form a hard, metal thread lining that cannot be removed or displaced by the engaging screw member.

The use of a shallow, round bottom thread groove on the mating screw is permitted by the smooth, polished metal thread surface. This results in greatly increased strength. The risk of wearing out the tapped hole by removal and re-assembling is eliminated. Although this type of fastening was developed originally for aircraft construction, it is adapt-

able to many other types of equipment.

Wooden Emergency Pipe

Although it is still possible to get corrugated metal pipe for important locations on defense projects where no suitable substitutes can be found, there was a definite need for finding suitable substitutes for all other locations. Armco Drainage Products Association solved this problem by developing a completely new design of a wood structure, being 100 per cent of non-critical material. Steel sheets and bands, wire-mesh, nails, metal reinforcing and other critical materials are not needed. Unlike the ordinary box-type of structure which is quite rigid, the opening of the emergency pipe is made up of series of short stout segments, given an octagonal or other polygonal shape, connected together in an ingenious way to utilize the full strength of the material. The unique design of this pipe permits the using of short random lengths of wood thus saving the larger and better grade timbers for other war uses. These segments are fabricated into lengths of about 12 feet, which in turn are simply joined together in the field to make a single structure. This makes it possible to use unskilled labor in the assembly of the pipe thereby reducing costs. Increased durability is obtained by treating the wood with a non-critical material. It is intended to outlast the 5 to 10 year period for which most of the present army camps and cantonments are being built. On more permanent installations, replacement can readily be made either by threading corrugated metal through it or by jacking a metal pipe around it and removing the old structure.

Plastics in Surgery

A new application of plastics in the field of surgery may prove to be a great aid in the prevention of infections. Modern surgical aseptic methods involve very careful preoperative preparation of the skin to prevent contamination of the wound by germs on or in the skin. The importance of this is understood when it is known that normal skin usually harbors about 10,000 germs to the square centimeter.

In a search for better means of control, Dr. Michael De Bakey and his associates in the Department of Surgery in the School of Medicine of Tulane University, New Orleans, set out to find a material that in addition to being easy to apply, had the following properties: (1) impermeability to bacteria (2) bactericidal action (3) nonirritancy (4) transparency (5) adhesiveness to skin (6) elasticity and (7) easy incisibility. Finally their search was rewarded and the result was a material having the following formula:

VINYLITE polyvinyl acetate —grade AYAF	25 Grams
Acetone	100 C. C.
Nitrocellulose	1.32 Grams
Phenol	0.80 Grams

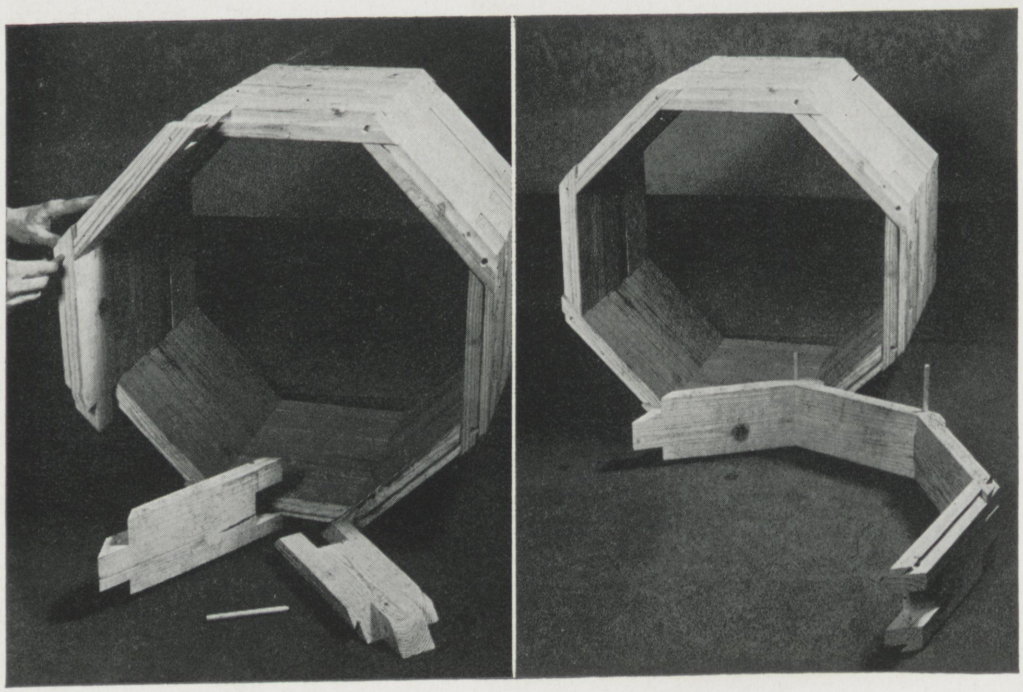
The liquid is painted on the skin and dries in about five minutes forming a very satisfactory film for pre-operative use.

The value of this film is shown by the fact that whereas, after the usually accepted methods of skin preparation bacterial growth was found in some 36 per cent of the cases and in some studies an increase of 23 per cent by the end of the operation had been noted, but when the resin film was removed in some 30 trial cases, bacterial growth was noted in less than 11 per cent of the cases. This leads to the conclusion that the use of this method may definitely reduce the hazard of infection of operative wounds from skin contamination.

"Plexiglas" Bomber Noses

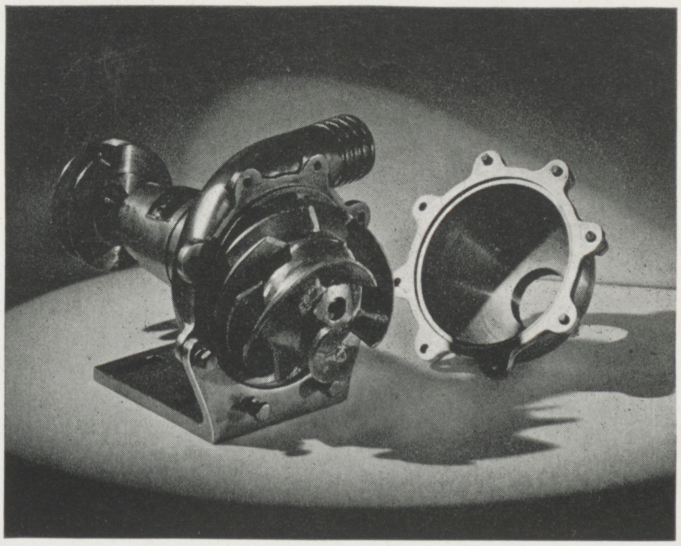
The chemist has given the plane builder, for the shape of the nose of modern military aircraft, a material which can be fashioned as easily as moulder's clay. The material is a plastic known in the laboratory as acrylic resin and to industry as "Plexiglas". It is used for cockpit enclosures, windshields, gun turrets, landing light covers, illuminated dials and other transparent parts.

Its plasticity in forming operations allows it to be fashioned with ease at temperatures between 220° F. and 250° F. and it is more transparent than a good plate glass. Plexiglas will transmit about 92% of a given light whereas the latter transmits only about 88%. Its resistance to discoloration by outside exposure, its toughness, and its light weight are of vital importance in aircraft



Courtesy Armco

Steps in Assembly of All-Wood Pipe.



Courtesy Inco

Twenty Pound Pump Handles 200 gals./min.

applications. Its cubic density is less than that of magnesium and about half that of aluminum.

Palm-Sized Pump

Weighing only twenty pounds and actually little bigger than an average man's fist, the new turbine pump designed and manufactured by Higgins Industries, Inc. of New Orleans, La., has a capacity of two hundred gallons of water every minute. Designed especially for salt water and other corrosive services, the pump is all-bronze, equipped with a V-belt pulley, sealed ball bearings and a shaft of heat-treated "K" Monel. An outstanding advantage of the unit is its compactness; it can move more water than pumps three to four times its size. Another advantage is the unique design permitted because of the galvanic neutrality between "K" Monel and the bronze impeller. This characteristic guarantees contact without danger of electrolysis.

The following table is taken from Volume 18, No. 2 of *Inco*:

Table of Capacities at Various Representative Heads and Horsepower

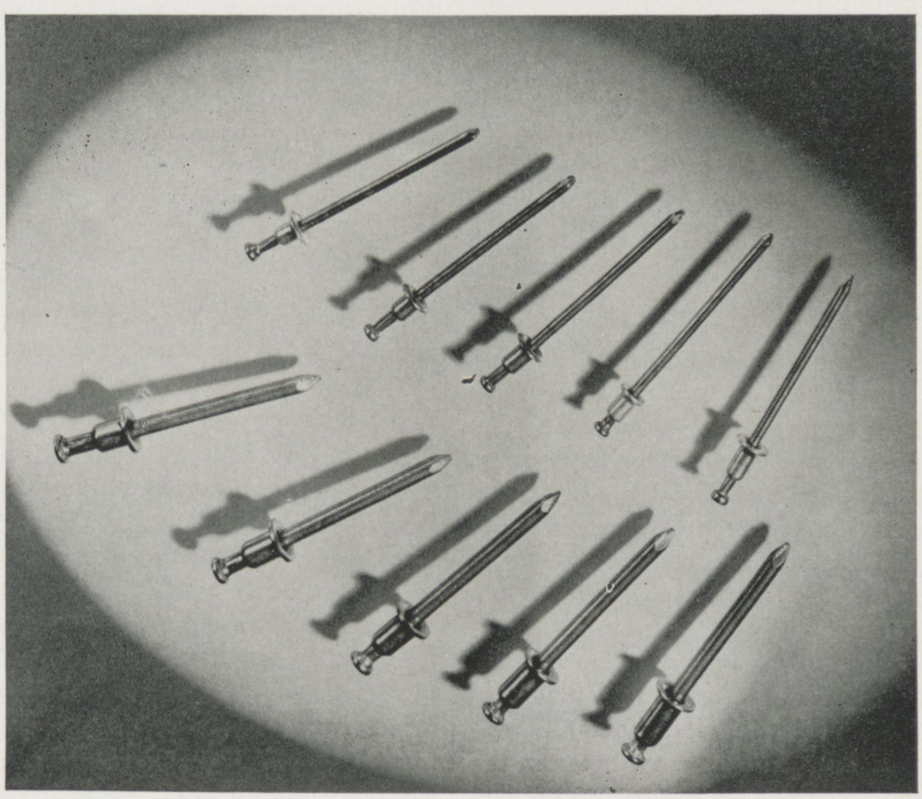
Horsepower	Gallons per min.	Head in feet	Revolutions per min.
1/8	30	4′	1000
1	195	15′	2550
1½	145	4′	2900
2	160	4′	3150
3	185	4′	3600
3	120	45′	3700
4	75	75′	4300
5	210	4′	4250
6	222	4′	4550
6	170	60′	4550

New Hollow Rivets

Though the idea of a tubular rivet to replace those of solid metal is not new, their use in the past has been somewhat restricted. With the cooperation of the United-Carr Fastener Co. of Canada, Limited, a new type of rivet and revolutionary method of application has been developed at the Fort Hilliam, Ontario, plant of Canadian Car and Foundry. The rivet is stamped out of strip stock in an automatic eyelet machine at the rate of 110 a minute.

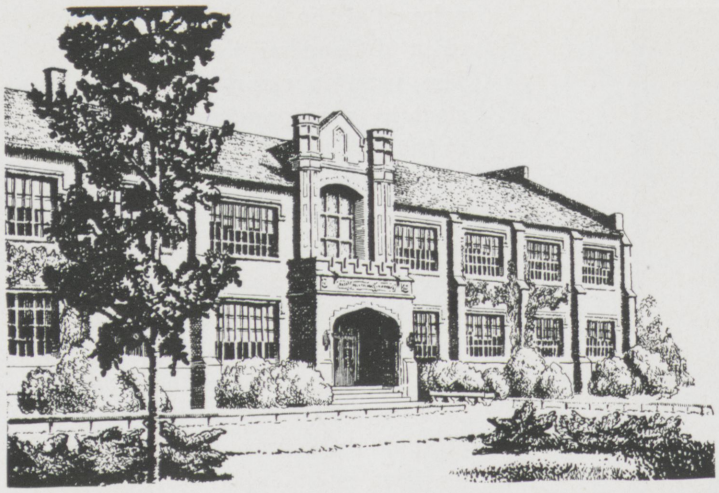
It is slipped on a commercial nail of plain carbon steel necked down under the head. The shank of the nail is used as a mandril. In fastening, the nail with its attached rivet blank is slipped into the rivet hole from the front side of the section to be fastened. A pneumatic squeezer of standard commercial design with its jaws re-equipped with a chuck and claw is used for fastening operations. The necked down nail, or mandril, is so designed that it will break when the expansion has reached a point sufficient to provide maximum holding power. The head falls off inside and the shank is pulled outside and the fastening is as firm as a solid rivet.

Primarily the rivet is used for "blind sections" of the frames, wings, and fuselage where riveters find it difficult or impossible to work with a holding "dolly" or bar. These hollow rivets can be driven from 5 to 6 times as fast as the conventional solid rivet in these blind spots.



Courtesy Inco

Hollow Rivets speed "Blind Section" Assembly.



Campus Survey

Edited by CHARLES W. NEWLIN, sophomore, c.e.

New Blood

The first class to enter Rose under the new accelerated study program arrived at Rose as scheduled, June 15. This group, 90 in number, hailed from all parts of the country. Most of these students stepped directly from high school into Rose since the summer vacation was omitted this year in order to graduate Rose engineers one year earlier. They were formally introduced to Rose and its activities at a smoker given by the Blue Key honorary fraternity at Deming Hall, June 15. The presidents of the various clubs, societies, and honorary fraternities were present to explain the purpose and activities of their particular organizations. Following these speeches refreshments were served. This get-together not only helped the freshman class become better acquainted with Rose but also brought the two together so they could meet the other members of their class.

Under the able leadership of the sophomore class the freshmen have donned their garters and green skull caps and lighted more than one cigarette for an inquiring sophomore. Also they have finished work on a raft which was put in the lake to make it possible for the students to swim there this summer. A "swimming party" was given by the sophomores for the freshmen the evening of June 18. A wonderful time was had by all (the sophomores).

Since ill-feeling arose between the freshman and sophomore classes and many students were late to their classes because of a skirmish occuring during a noon hour, a general assembly was called, June 21, with the purpose of regulating freshman-sophomore activities in the future. At this time Dr. Prentice discussed changes with the student body relative to the activities occurring during the past few years, several of which were somewhat out of line with the normal rules and traditions at Rose. It was decided that both classes should adhere only to the traditional activities and discard any tactics which might contribute to ill-feeling between the classes at Rose. With co-operation on the part of all students in observance of these rules it is felt that the real purpose of this friendly rivalry will be met and that every man will hold a higher respect for his fellow students.

New Organization

In response to the interest which advanced course military students have shown in the Society of American Military Engineers, a student post of this society has been organized at Rose.

Since men taking the advanced course are prospective officers for the Engineer Corps, it is believed that membership in the organization will prove very beneficial to them because newly developed ideas and tactics in the military and engineering line can be transmitted to them through the society. Also the society furnishes an instrument for directing constructive patriotism to a useful end and prepares its members for wartime service in the United States Army or in the civilian army which backs the fighting men at the front.

The first meeting of the chapter was held Monday, June 29, with advanced course military students present. The following officers were elected for the ensuing year: Ralph Brown, president; Richard Ellsworth, vice-president; Darrel Criss, secretary; and William Weinhardt, treasurer. It was decided at this meeting that sophomores taking military would also be eligible for student membership.

Membership in the S.A.M.E. also carries with it a subscription to the society's magazine "The Military Engineer", which is rated highly in technical value.

V-1

Lieutenant Stone of the United States Navy visited Rose June 24, and met with those students who might be interested in entering the navy after their graduation. He explained the different phases of the new navy program and the qualifications to be met in order that a man should be accepted.

Lieutenant Stone stated that the navy will need 40,000 officers a year. The requirements have been somewhat lowered from those in peacetime in order to provide officers for our rapidly expanding navy. The navy plans to have every position ready to be filled before a vessel is launched to take advantage of every moment of time. The V1 program will furnish a method of predicting

the number of officers to be available.

Because of the ROTC training given at Rose only a small number of students could sign up for this program, but much interest was shown by the students. A group who are taking the advanced military course and who will graduate as Second Lieutenants in the army attended this meeting.

Armament

When the order came to the military department at Rose that the rifles used in training the basic ROTC students would be needed to equip the soldiers of our fighting forces it was at first feared that the manual of arms would be omitted from future drills. But before the precious Springfields were crated and sent away, Colonel Noyes had a wooden rifle made with the same general features of a Springfield. With wood donated by the Kiwanis Club of Terre Haute and using this wooden rifle as a model enough other rifles were made by the students to equip the Rose battalion. Each basic student was given a two inch pine board roughly cut to resemble an army rifle. He then proceeded to file and sandpaper it until it met the required specifications. A six-digit number was stamped on each rifle to take the place of the number found on all army rifles. Stain to give the rifles the proper color was contributed by the Edw. S. Lammers Paint and Glass Co.

A Garand is now used in the classroom to instruct freshman military students in the construction and operation of army rifles.

An order is an order—we all know
it's for the best,
Yet we can't escape the feelin'
that we too should travel West,
For a car without its tires is as
naught—a tiny trifle
To a soldier who must stay at
home, and only send his rifle.
Clean 'em well and oil 'em quickly,
don't neglect a single screw,
'Cause the guys who're gonna use
'em got an urgent job t'do,
Though we can't go over with 'em,
we can see they're sent off right,
Who knows but what someone
may see ol' Hitler thru that
sight?
Place 'em gently in their cases, block
'em well, they're off to war,
An' may have to travel farther
than they did that time before,
See the red, white and blue stripes
that adorn that o. d. case?
They tell of Yanks who fought and
won in another far-off place.
Bayonets and slings, Sir—counted,
tallied with the sheet,
They're ready to be shipped, Sir,
to speed the foe's defeat.
Sure we're gonna miss 'em, but
there's plenty to be done
To train ourselves for duty when
there's Victory to be won.
Lot's of things we'll need to know at
some not distant date
Can be learned in time if only we
really concentrate.
It takes more to make a soldier than
a snappy rifle drill—
We know our course, let's follow it,
because we've got the will.

From the Army and Navy Register

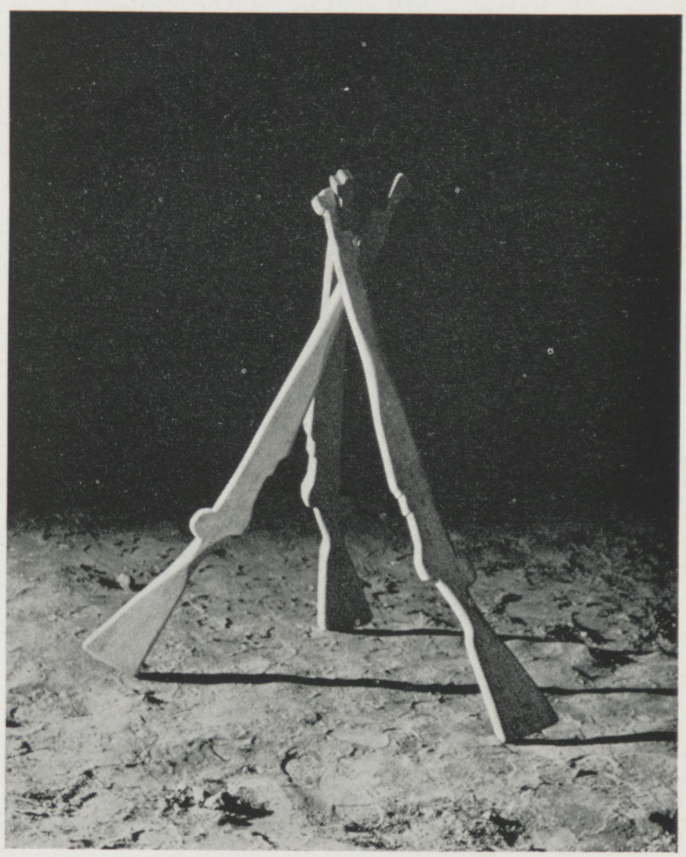
Year Book

The 1942 Modulus arrived registration day, June 15, immediately following the announcement of the staff which will produce the year book for next graduating class. The year book for future classes will be produced for each graduating class rather than once a year since now classes graduate every eight months.

This years' publication, which arrived a few weeks later than usual, included several changes from the general policies of annuals of past years. The photographs of the students were arranged according to their department rather than with the class with which they are to graduate. This bronze colored annual, edited by Harris Murchison and having Harold Bowsher as business manager, has proved a great success. The various changes have brought about much favorable criticism from the student body.

It was announced that the following men were selected to serve on the staff of the 1943 Modulus:

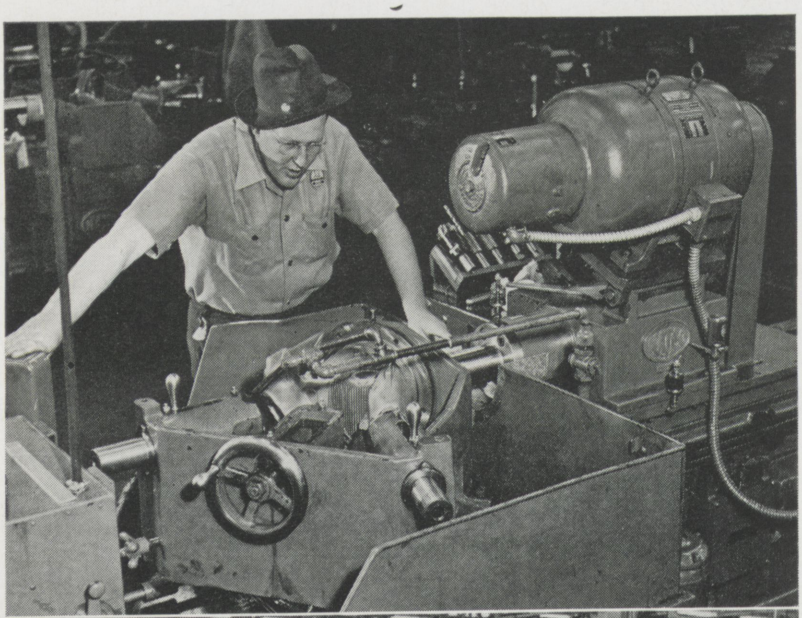
Editor-in-Chief	R. O. Driskell
Business Manager	J. J. O'Connell
Assistant Editor	Wm. Haley
Assistant Editor	D. Snider
Asst. Bus. Manager	R. Kopan
Campus Editor	R. E. Miller
Asst. Campus Editor	A. E. Smith
Sports Editor	W. Shanks
Humor Editor	D. Price
Art Editor	J. Neerman
Advertising Manager	C. N. Miller
Asst. Adv. Manager	R. Calvert
Asst. Adv. Manager	G. Weibel
Asst. Adv. Manager	E. Carpenter
Photo Editor	H. Rose
Asst. Photo Editor	W. Soudriette

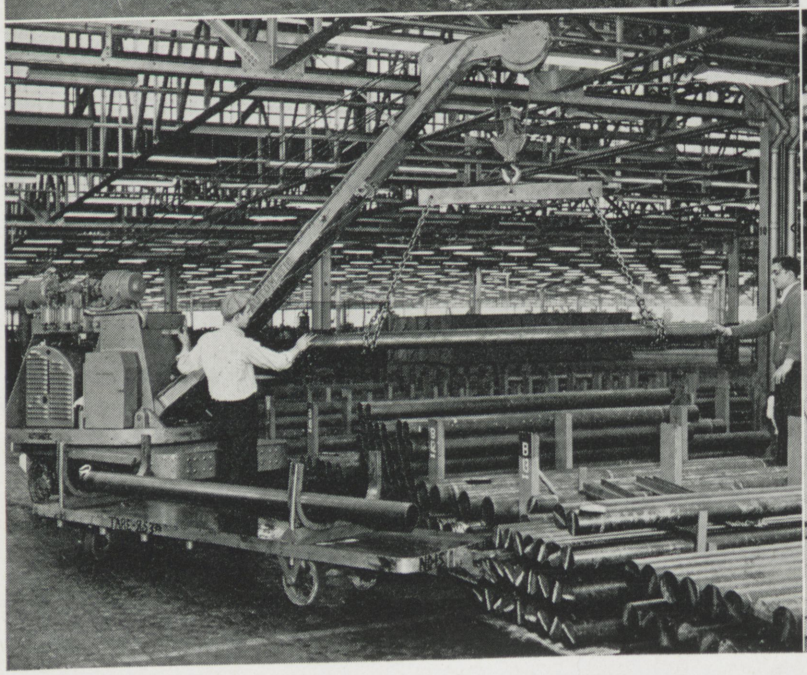


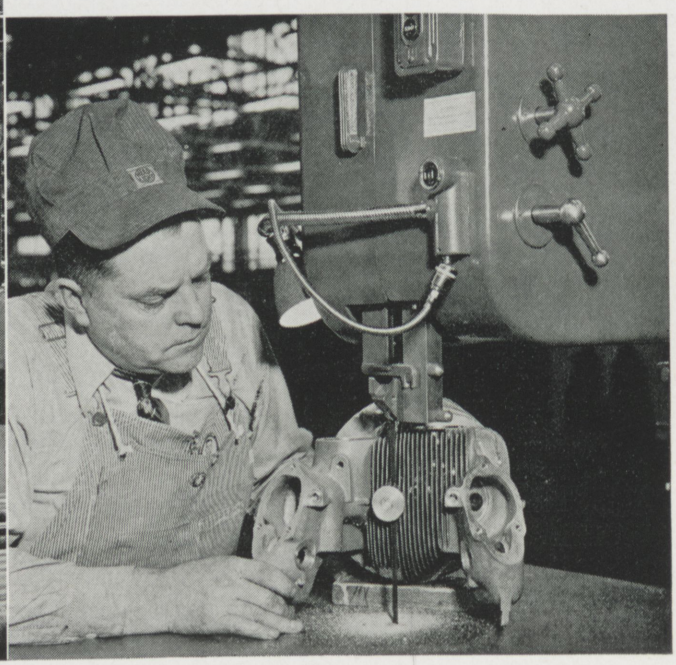
Wooden Rifles.

PRODU

Modern machine tool equipm warplane engine plant ill large scale productic







(Top, left) A special horizontal boring machine with a two-position indexing fixture for boring operations is used on cylinder heads, valve guide holes, and valve seats.

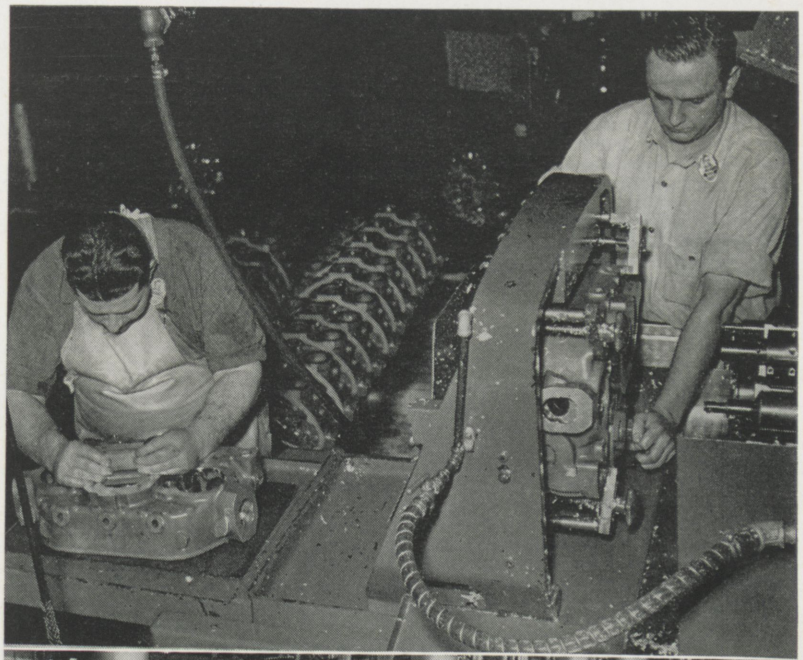
(Center, left) Among the many filing, polishing, and burring benches is this one in the crank case department. It is provided with electric and pneumatic portable tools for filing and burring.

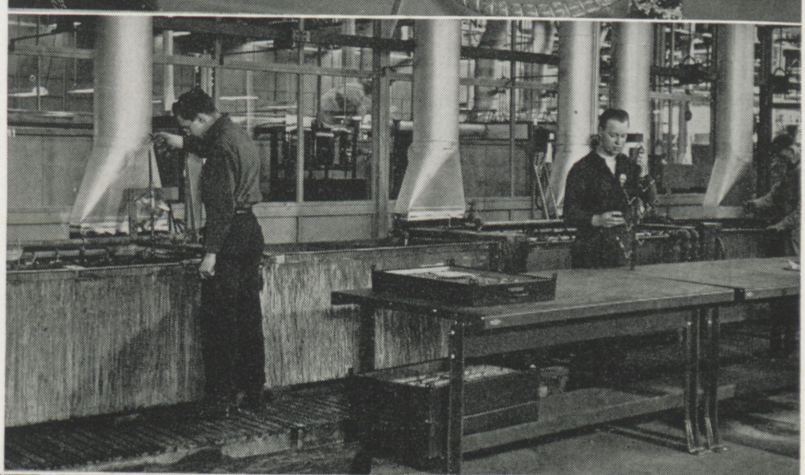
(Bottom, left) This automatic truck is a single crane unit of 3000-lb. capacity used for heavy lifting and spotting. It has push button remote control for operation of boom and hoist units.

(Bottom) After initial machining, this sawing machine is used for cutting off the work-lug on cylinder head castings.

CTION

ent in the new Buick
ustrates the latest
n techniques.





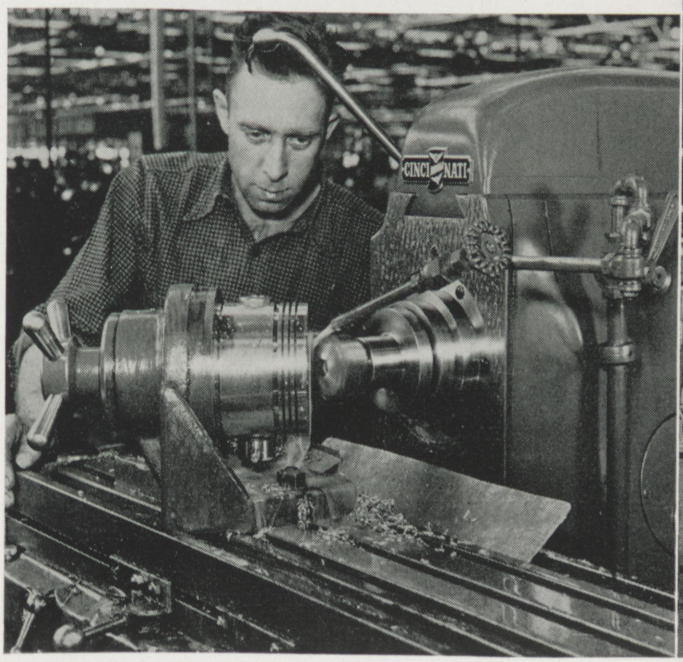
(Top, right) The rough boring and facing of four holes in the rear section of the crankcase is accomplished by this machine.

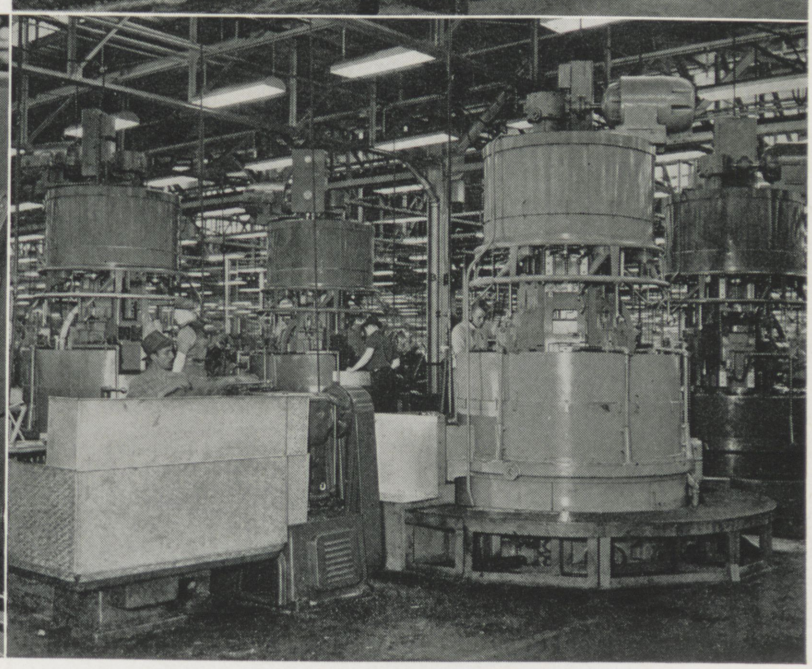
(Center, right) Gears are chemically cleaned before heat treatment by the newest descaling units.

(Bottom, right) A group of automatic machines perform the initial operations on cylinder heads and barrels.

(Bottom) Valve clearance in piston head is obtained through the use of an accurate milling machine.

Cuts Courtesy of
Automotive and Aviation Industries





Cross Section

This feature is the first of a series of articles planned to better acquaint the students, faculty, and other readers with a few of the interesting men now attending Rose. In this article some of the experiences and travels of Bill Rumbley and Tony Bogran are related.

Bogran

Antonio Bogran, h; San Pedro Sula, Honduras—Tony is a senior mechanical and is the newly elected chairman of the student A.S.M.E. Chapter.

Tony was born March 15th, 1919, at Tela, Honduras, which is on the Atlantic coast. In the twenty-three years of his life he has received an exceedingly broad education. He attended grade school and high school in San Pedro Sula. In his country the high schools are specialized just as are our colleges of the United States and Tony attended a five year liberal arts school.

While in high school he was active in literary work, being president of the Ateneo Literario (Literary circle) and editor of the semi-monthly school magazine, Crisalida, (crysalis). Tony had an article written about the great South American national notable, Bolivar, published in a text book. Tony played soccer and also represented his high school many times at public meetings.

After being graduated from high school in 1938, Bogran came to the United States and attended Louisiana State University for one year.

In 1939 Tony came to Rose and here he has taken mechanical engineering with a few extra courses in French and military.

He speaks English and Spanish, and is one of the most interesting conversationalists at Rose. Tony's life outside of school has been even more interesting. Honduras is a country less technically advanced than our own and he has had every opportunity to lead an outdoor life. In 1931 Tony with a few class-mates went to Chicquimula, Guatemala which is the religious Mecca of the Central American Indians of that region. The tour required six days and was made over the mountains on

(*Continued on Page* 30)

TONY BOGRAN

BILL RUMBLEY

Rumbley

William F. Rumbley; Fresno, California—"Big Bill" or "Beachcomber" as he is known to the fellows here at school is a senior mechanical, all 6′-6″ of him. Bill is a member of Blue Key, a letterman in track and basketball, and captain of the football team.

Bill was born March 22, 1919 at Los Angeles, just one week and a few thousand miles from Tony. He attended grade and junior high school in Los Angeles and then moved to Fresno, California to finish high school. In high school, Rumbley was a member of the California Scholarship Federation and he also was a letterman in basketball, track and swimming.

In 1937 Bill went to Stanford University to study pre-legal work and economics for two and one half years. While at Stanford he was a member of Beta Theta Pi fraternity and a member of the freshman basketball and track squads.

Bill decided to change from pre-legal work to engineering and came to Rose in 1940. Here at Rose he has somehow managed to be active in every sport and still make his grades.

Bill's summer vacations have proved very interesting and have been highly varied. In 1930 Bill went to Washington Bay, Alaska. He visited a fish-meal plant at that small isolated settlement which is in the wilderness south of Juneau. Bill spent the summer of 1932 on a cattle ranch in California but he regrets that it cost him the chance to see the Olympics. In later vacations while Rumbley was in high school he attended a Y. M. C. A. camp in the San Bernadino mountains and also worked in a fruit packing house. During the vacations while Bill has been in college he has driven a truck transporting gasoline from a refinery

(*Continued on Page* 30)

Alumni News

Edited by W. ALAN WINSLOW, junior, ch.e.

The Grads Advance

Frank Allen Whitten, class of '98, has been acting as co-director of the Civilian Technical Corps in the state of Michigan, and recently received a letter from Lord Halifax thanking him for what he has done. The work was sponsored by President Roosevelt, Wendell Wilkie, and Mayor LaGuardia and had to do with the recruiting of non-combatant technicians to operate radio locators overseas. The British government agreed to return the men to this country when we need them, and their experience gained with the Civilian Technical Corps will be very valuable to our armed forces. Mr. Whitten is an investment counselor with the firm of Campbell, McCarthy & Company, Detroit, but has been giving his services in organizing the C. T. C. as a contribution to the Allied war effort.

George T. Christopher has advanced to the position of president of Packard Motor Company following the meeting of the board of directors of the company. Formerly, Mr. Christopher had been vice-president of this same company. He was graduated from Rose in 1911 with a degree in electrical engineering.

Christopher was employed with the Westinghouse Electric and Manufacturing Company immediately after leaving Rose. He subsequently entered the automobile manufacturing business and was associated with Delco-Remy, Oldsmobile, Pontiac and Buick. He joined the Packard organization in 1934.

Joseph H. Carter, Pittsburgh, Pa., has been named president of the Pittsburgh Steel Co. following a career of engineering associations since his graduation from Rose in 1916. Carter made an enviable record at Rose where he won letters in four sports and was prominent in football. Immediately after his graduation he joined the Sharon Steel Hook Co. of Youngstown, Ohio, where he remained until 1935. He left the Youngstown concern to become a director and vice-president in charge of operations at the Pittsburgh Steel plant, a position he has held until his present advancement to the presidency of the corporation.

Luther S. Rose, '92, has received his second degree, this time in law from the University of Cincinnati. He began a railroad career in 1882. He stopped long enough to receive his degree from Rose in 1892 and then steadily advanced until he became general manager of the Peoria and Eastern in 1923. He retired in 1938 and moved to Cincinnati.

Frank T. Green, class of '96, reports he has an electro-plating business in San Diego, California.

A. Wayne Dicks was graduated as an electrical engineer in 1929. He has been with the Michigan Bell Telephone Co. in Midland, Michigan but has now been transferred to Saginaw, Michigan.

Elvin L. Everett, '34, with the T. V. A. has been transferred to Fountain City, Tenn. from Chattanooga, Tenn.

Carroll R. Merriman, '36, with the Pennsylvania Railroad has been transferred from Steubenville, Ohio to Pittsburgh, Pennsylvania.

Robert W. Dispennett, '38, formerly inspector and assistant chemist, Quaker Maid Co., Terre Haute, is now technical supervisor at the Massena, New York plant of the Aluminum Co. of America.

C. Roger Howle, '41, is assistant plant metallurgist with the American Magnesium Corporation at Cleveland, Ohio.

John J. Hager, '35, is the chief chemist at the government's new shell loading plant at Texarkana, Texas. After his graduation from Rose, he was employed in the technical department of the B. F. Goodrich Co., in Akron, Ohio, and later at the Picatinny Arsenal, Dover, New Jersey.

In the Service

George F. Nicholson, '06, Commander U. S. N. R. has been transferred to the James River shipyards in Richmond, Virginia.

Captain Frederick L. Matteson, '25, 388th Engineer Battalion has been transferred from Fort Belvoir, Virginia to Camp Claiborne, La.

Robert H. Dowen, '29, formerly lighting sales engineer of the Detroit Edison Co., is now in the 122nd signal radio intelligence company at Fort Sam Houston, San Antonio, Texas.

Lieut. John R. Motz, '34, formerly assistant highway engineer, Knoxville, Tenn., is assistant P. M. S. and T. at Alabama Polytechnic Institute.

H. Loren Thompson, '34, is in Spokane, Wash., designing the sewage disposal plant for the naval training station to be located at Bayview, Idaho.

Burrill F. McIntyre, was ordered to Fort Belvoir, Virginia, May 11. He was graduated from Rose in 1935 as an electrical engineer and has been employed by the Northern Indiana Public Service Co.

Lt. Harry H. Richardson, '35, has been transferred from Fort Leonard Wood, Missouri, to the 713th Engineer Battalion, Clovis, New Mexico.

Raymond J. Harrod, '36, formerly engineer of the Pennsylvania Railroad is now with the 22nd Armored Engineer Battalion at Camp Cooke, California.

Capt. J. H. Walker, '36, is the executive officer at the Chickasaw Ordnance Works in Millington, Tenn.

Clemens W. Lundgren, '38, has been promoted from second to first Lieutenant in the Army Ordnance

Dept., at Natier Field, Dothan, Alabama.

Lt. Joseph W. Dreher, '41, formerly student engineer, General Electric Co., is now stationed at Norfolk, Virginia.

C. Lewis McWilliams, '41, formerly with the Vincennes Bridge Co., is now a junior naval architect in the Bureau of Ships, Washington, D. C.

Lts. J. K. Kennedy and Frederick Nahm, have been transferred to Ft. Knox from Ft. Leonard Wood.

Lt. C. E. Roberts, '42, is in the Signal Corps School at Ft. Monmouth, N. J.

Newlyweds

Mr. and Mrs. Merrill Robert Rhodes announce the marriage of their daughter, Geraldine, to Mr. Gene F. McConnell, Rose, '42, on June 7th in Washington, D. C.

Mr. and Mrs. Herman Page of West Terre Haute announce the engagement and approaching marriage of their daughter, Alma, to Irvin Keeler, '42.

Mr. and Mrs. William R. Delgar announce the marriage of their daughter, Mary Jane, to Lieutenant John G. Appel, '41, at Aberdeen, Md.

Mr. and Mrs. Phillip Franckschock announce the marriage of their daughter, Louise, to Ensign Robert S. Kahn, U. S. N. R. the fifth of April in Bremerton, Wash.

New Arrivals

Capt. and Mrs. Joseph H. Walker of Memphis, Tenn., announce the birth of a son, Thomas David Walker. Capt. Walker was graduated from Rose in 1936 and is now executive assistant at the Chickasaw Ordnance Works near Memphis.

Death

Edgar L. Shaneberger of Terre Haute died recently at his home. For the past thirty years Mr. Shaneberger was engaged in the gravel business and he was the owner and operator of the Montezuma Gravel Co. Previousy he owned and operated the Macksville Gravel Co., and prior to that time he was a civil engineer for the Pennsylvania Railroad. He was graduated from Rose in 1895.

Graduates in the Service

The following list comprises all of the Rose men in the service who have reported their present station. The *Technic* intends to keep this list up to date and therefore asks that all men report their transfers as soon as possible.

A

'40—Lt. J. William Adair, U. S. Air Corps, Maxwell Field, Alabama.

'28—Major J. Rex Adams, C. W. S., Edgewood Arsenal, Maryland.

'32—Lt. Albert L. Ahlers, Asst. Area Engineer at the Hoosier Ordnance Plant, Charlestown, Indiana.

'28—Robert F. Alexander, Asst. Chief of Safety Section Office Q. M. G., Arlington, Va.

'41—Lt. John G. Appel, Co. B, 1st C. W. S. Trg. Bn. Edgewood Arsenal, Md.

'35—Lt. Robert B. Asbury, Basic Flying School, Lemoore, Calif.

B

'29—Capt. Ralph C. Bailey, Hg. 5th Engr. Bn., E. R. T. C., Ft. Belvoir, Va.

'41—Lt. John E. Bartmess, 819th Engr. Bn. (Avn), Pendleton, Oregon.

'12—Major John H. Becque, Hg. Hawaiian Dept., Ft. Shafter, Honolulu, Hawaii.

'36—Capt. Paul D. Bennett, Asst. P. M. S. & T., Rose Polytechnic, Terre Haute, Ind.

'34—Lt. Willis S. Biggs, 108th Engrs. (C), Camp Forrest, Tenn.

'42—Lt. Harold E. Bowsher, U. S. Army, West Point Refresher Course, Engr. School, Ft. Belvoir, Va.

'42—Lt. James R. Brown, Hg. 30th E. T. Bn., Ft. Leonard Wood, Mo.

'31—Richard E. Biller, Assoc. Mech. Engr., Office G. M. G., Washington, D. C.

'36—Lt. Francis Blair, U. S. Flying School, Bakersfield, Calif.

'32—Capt. Frederich J. Bogardus, Engr. Board, Ft. Belvoir, Va.

'41—Lt. H. Rolland Buell, 378th Engr. Bn., Camp Shelby, Miss.

'39—Lt. Robert J. Burger, 60th Ordnance Co., Camp Livingston, La.

'35—Lt. Earl B. Butler, Asst. Project Engr., Airport Construction, Tyndall Field, Panama City, Fla.

C

'36—Lt. James Campbell, 341st Engrs., Ft. Ord, Calif.

'37—Lt. Lawrence B. Carroll, Co. F, 102nd Engrs., San Francisco, Calif.

'32—Myron Clark, 467th Engrs. Shop Co., A. P. O. 813, New York, N. Y.

'40—Lt. Robert H. Colwell, 77th Engr. Co., Camp Blanding, Fla.

'41—Lt. John L. Combs, H. & S. Co., 30th Engrs., Ft. Belvoir, Va.

'41—B. Franklin Cook, U. S. Naval Reserve, Cadet Barracks, Jacksonville, Fla.

'35—Deforest Colburn, Jamaica Base Contractors, A. P. O., 804, Kingston, Jamaica.

'36—Lt. William R. Creal, 24th Engr. Bn., Pine Camp, New York, N. Y.

'42—Lt. R. King Chalfant, Hq. 30th E. T. Bn., Ft. Leonard Wood, Mo.

'37—Lt. Clyde E. Cromwell, N. Y. Port of Embarkation, Brooklyn, N. Y.

D

'33—Capt. John C. Dalrymple, 24th Engr. Bn. (A), Pine Camp, New York, N. Y.

'34—Rufus Danner, Air Corps, Patterson Field, Fairfield, Ohio.

'30—Capt. J. Harold Dicks, Asst. Engr., Hq. Armored Forces Engineer Office, Ft. Knox, Kentucky.

'39—Lt. Franklin D. Doenges, Co. C, 29th E. T. B., Group 6, E. R. T. C. Ft. Leonard Wood, Mo.

'34—Lt. Henry H. Douglas, Hq. Co., 107th Engr. Bn., A. P. O. 813, New York, N. Y.

'29—Robert H. Dowen, 122nd Signal Radio Intel. Co., Ft. Sam Houston, Texas.

'41—Lt. Joseph W. Dreher, Norfolk, Va.

'36—Capt. Louis Duenweg, Adjt. Gen's. Dept., G. H. Q. Army War College, Washington, D. C.

'42—Francis M. Drury, Turner Field, Albany, Ga.

E

'25—Capt. Ernest A. Ewers, O. C., Sig. O., Washington, D. C.

F

'40—Lt. Maurice C. Fleming, Injured June, 1941, in maneuvers, 2539 Washington Ave., Terre Haute, Ind.

'37—Lt. Alden B. Foley, Q. M. C., Camp Claiborne, La.

'42—Lt. Marion B. Foley, Co. C, Bakers and Cooks School, Ft. Riley, Kansas.

'27—John A. Fairhurst, Inspector Eng'r'g. Material, U. S. Navy, Dayton, Ohio.

G

'38—Lawrence J. Giacoletto, Signal Corps Laboratory, Ft. Monmouth, N. J.

'30—Lt. John R. Gibbens, Ft. Belvoir, Va.

'38—Capt. James E. Goddard, Army War College, Washington, D. C.

'38—Lt. Charles E. Grogan, 50th Pursuit Group, Key Field, Meridian, Miss.

'24—Richard I. Graul, Proj. Engrg. Draftsman, U. S. Navy Yard, Brooklyn, N. Y.

'33—Lt. James F. Guymon, 36th Engrs. (C), Plattsburgh Barracks, N. Y.

'28—Capt. Morris Guggenheim, C. W. S., Ft. Leonard Wood, Mo.

H

'37—Capt. Harry J. Halberstadt, B. O. Q., Shaw Field, Sumter, S. C.

'89—Alonzo J. Hammond, Construction Advisory Committee, War Dept., Washington, D. C.

'35—Lt. Jay F. Hall, U. S. Q. M. C., Washington, D. C.

'41—Lt. William M. Hales, Co. C, 31st Bn., Ft. Leonard Wood, Mo.

'37—Lt. James A. Hughes, Co. B, 86th Engr. Bn. (Heavy Ponton), Camp J. T. Robinson, Arkansas.

'36—Raymond J. Harrod, Co. B, 22nd Engr. Bn., (A) Camp Cooke, Calif.

'42—Lt. William M. Hochstetler, Off. Replacement Pool, Gadsden, Ala.

'32—Lt. Charles E. Howard, Co. A, 107th Engrs., A. P. O. 8b, New York.

'41—Lt. Charles A. Howlett, Co. B, 820th Engr. Bn. (Avn.), A. P. O., Care Postmaster, New York, N. Y.

'38—Lt. John R. Hayes, Refresher Course, Ft. Belvoir, Va.

'32—Lt. Joseph L. Hunter, Ft. McIntosh, Texas.

'40—Ensign Milton M. Hosack, Induction Training, U. S. N. R.

J

'35—Albert L. Janes, C. W. S., Mass. Inst. Tech., Cambridge, Mass.

'41—Lt. Quenton R. Jeffries, 1st C. W. S. Training Bn., Edgewood Arsenal, Md.

'40—Lt. Morris Johns, Ft. Belvoir, Va.

'32—Lt. James T. Jones, Ft. Belvoir, Va.

K

'27—Major Richard C. Kadel, Missing since May, 1942.

'36—Lt. William E. Kasameyer, 61st Material Sq. A. P. O. 925, San Francisco, Calif.

'39—Ensign Robert S. Kahn, A-V, Naval Air Station, Anacostica, D. C.

'32—Lt. Lee C. Kelsey, Post of San Juan, San Juan, Puerto Rico.

'37—Stephen Koos, C. A. R. T. C., Ft. Eustis, Va.

'42—Lt. Robert S. King, Fort Meade, Md.

'42—Lt. Jack K. Kennedy, 53rd Engr. Bn., Ft. Knox, Ky.

L

'39—Lt. Robert N. Ladson, Co. B, 2nd (Sep) Cml. Bn., Ft. Bragg, N. C.

'33—Lt. Norman W. Liston, Signal Corps School, Ft. Monmouth, N. J.

'18—Lt. Cmdr. Robert P. Long, U. S. N. R., Washington, D. C.

'31—Lt. Harry J. Loving, Camp J. T. Robinson, Arkansas.

'38—Lt. Clemens Lundgren, Ordnance Dept., Napier Field, Dothan, Ala.

'42—Lt. Donald D. Logsdon, 468th Engr. Shop Co., Ft. Ord, Calif.

'37—Albert Lotze, Radio Dir., Naval Research Lab., Anacostia Station, Washington, D. C.

'40—Ensign William V. Louthen, Tech. Asst. to Chief Aerologist, U. S. Navy, Washington, D. C.

Mc

'34—Lt. Harry L. McGurk, E. R. T. C., Ft. Leonard Wood, Md.

'35—Burril F. McIntyre, Fort Belvoir, Va.

M

'28—Capt. George J. Mason, Asst. Construction Quartermaster, Camp Lee, Petersburg, Va.

'34—Capt. James I. Mason, 307th Engrs., Camp Claiborne, La.

'25—Capt. Frederich L. Matteson, 388th Engineer Battalion, Camp Claiborne, La.

'28—Capt. Guy S. Mahan, Q. M. C., Holabird Depot, Baltimore, Md.

'39—Sgt. Francis A. Marasco, U. S. Signal Corps Instructor on detached service, R. A. F. Radio School, Clinton, Ontario, Canada.

'34—Lt. John R. Motz, Asst P. M. S. & T. at Alabama Polytechnic Institute.

'40—Pvt. Richard A. Mullins, 4th Platoon, Co. K, 3rd C. W. S. Tr. Bn., Edgewood Arsenal, Md.

N

'06—Commander George F. Nicholson, U. S. N. R., James River Shipyards, Richmond, Virginia.

'40—Lt. William M. Noel, Keesler Field, Biloxi, Miss.

'28—Capt. Andrew J. Nehf, Water Supply Eng., Eng. Section Hq. 2nd Army, Memphis, Tenn.

'43—Lt. Fredrich Nahm, 53rd Eng. Bn., Ft. Knox, Ky.

O

'42—Lt. Leon L. O'Dell, Off. Replacement Pool, Gadsden, Ala.

'36—Lt. C. Daniel Overholser, 86th Engr. Bn., Camp Gordon, Georgia.

P

'40—Lt. Frank G. Pearce, M. I. T., Cambridge, Mass.

'41—Lt. Robert D. Phelps, Pan-American Ferries, 36th St. Airport, Miami, Fla.

'32—Capt. Wayne Plimmer, Road Construction, Alaska.

'42—Capt. Clifton A. Pratt, E. R. T. C., Ft. Leonard Wood, Mo.

'35—Lt. William S. Pratt, 46th Engr. Regt., Camp Bowie, Texas.

'38—Robert D. Prewett, Material Div., Army Air Corps, Chicago, Ill.

'43—Jack Price, U. S. Army Air Corps, Maxwell Field, Ala.

R

'41—Lt. Col. Alvin C. Rasmussen, Ordnance Reserve, Cincinnati, Ohio.

'35—Lt. Harold Reintjes, Camp Forrest, Tenn.

'39—Lt. Ewing Ross, Edgewood Arsenal, Md.

'42—Lt. C. E. Roberts, Signal Corps School, Ft. Monmouth, N. J.

'41—Lt. John R. Roberts, Territory of Alaska.

'35—Lt. Francis H. Richardson, Langley Field, Va.

'35—Lt. Harry H. Richardson, 713th Engineer Battalion, Clovis, New Mexico.

'38—Ensign Adam H. Romeiser, U. S. N. R.

'05—Claude E. Robertson, U. S. N. R., Engrg. Materials Div., Chicago, Ill.

'35—Lt. Harry H. Richardson, Co. C, 32nd Bn., Ft. Leonard Wood, Mo.

'39—Pvt. L. Irvin Rose, Co. I, 150th Inf. (R), Rio Hato, Canal Zone.

'42—Lt. Clifford Roberts, Signal Corps Laboratories, Ft. Monmouth, N. J.

S

'40—Lt. Earl O. Swickard, Hq. 31st E. T. Bn., Ft. Leonard Wood, Mo.

'09—Lt. Colonel Richard L. Smith, C. E., Hq. 5th Corps Area, Ft. Hayes, Columbus, Ohio.

'12—Lt. Com. Jerry H. Service, U. S. N. R., Instructor of Navigation, N. R. Midshipman's School, Northwestern Univ., Chicago, Ill.

'37—Lt. Walter R. Snedeker, 16th Engr. Bn., Ft. Knox, Ky.

'07—James R. Stalker, Social Security Bldg., Washington Industrial Specialist, O. P. M.

'41—Lt. James E. Shake, 30th Engr., Ft. Belvoir, Va.

'33—Lt. James C. Skinner, Air Corps Technical School, Chanute Field, Rantoul, Ill.

'39—Lt. George W. Smith, Pine Bluff Aviation School, Pine Bluff, Ark.

'37—Lt. Jonathan E. Sonnefield, 20th Engrs. (C), Ft. Benning, Ga.

'39—Malcolm A. Steele, Army Air Corps (Materiel), Dearborn, Mich.

'33—Alan Sebree, 58th Engr., Camp Shelby, Miss.

'30—Gilbert L. Shew, 77th Engr., (Lt. Pon.), Ft. Custer, Mich.

'39—Lt. Edward O. Spahr, Aviation Bn., Key Field, Miss.

'34—Lt. George F. Stark, Armored Force School, Ft. Knox, Ky.

'42—Lt. Benjamin K. Sollars, 469th Shop Co., Camp Claiborne, La.

T

'40—Lt. J. Edward Taylor, C. W. S., Edgewood Arsenal, Md.

'34—Lt. John Tracy, E. R. T. C., Ft. Leonard Wood, Mo.

U

'39—Lt. Robert W. Underwood, Erie Proving Ground, Locarne, Ohio.

V

'44—Joseph Van Meter, Naval Air Station, Cuddahy Field, T. S. 12 A, Corpus Christi, Texas.

W

'36—Capt. J. H. Walker, Executive Officer, Chickasaw Ordnance Works, Millington, Tenn.

'39—Lt. Ray E. Warren, 82nd Engr., Ft. Leonard Wood, Mo.

'37—Thomas N. Wells, Air Corps, Kessler Field, Biloxi, Miss.

'35—John H. Welsh, Ft. Belvoir, Va.

'40—Lt. Vernon E. Whitehouse, 35th Engrs. (C), Camp J. T. Robinson, Ark.

'33—Capt. Edwin J. Withers, Staff and Faculty, Engr. School, Ft. Belvoir, Va.

'41—Lt. Fred Wehle, Jr., 3rd Engr. Bn., Schofield Barracks, T. H.

'38—William Wolf, Ft. Leonard Wood, Mo.

'38—Lt. Norman Wittenbrock, E. R. T. C., Ft. Leonard Wood, Mo.

'31—Lt. Bruce C. Wells, E. R. T. C., Ft. Belvoir, Va.

'32—John A. Wells, Ft. Leonard Wood, Mo.

'27—Baird F. West, Munitions Bldg., Washington, D. C.

'40—Lt. Allen T. Wilson, Aberdeen Proving Ground, Md.

'31—Lt. Herndon L. Witt, Ft. Belvoir, Va.

'39—Lt. Randall H. Wise, Ordnance Office, Washington, D. C.

'38—John H. Wilson, U. S. N. R., Washington, D. C.

Y

'39—Luther L. Yaeger, 113th Engrs. (Med. Detach.), Ft. Leonard Wood, Mo.

'43—Pvt. Robert Young, Headquarters Battery, 150th F. A., Training Div., Camp Shelby, Miss.

Z

'34—Gene Zwerner, Engineer, War Production Board, Washington, D. C.

PRESSURE EFFECTS

(*Continued from Page 4*)

If pressure and torque will decompose some substances then it may make others combine. The following syntheses were tried by Dr. Bridgman:

Attempted Syntheses by Pressure and Torque

Substances	*Result*
Copper and Sulfur	Copper Sulfide.
Thermite	
Potassium Chromate	
Fe_2O_3+Al	Metallic Iron.
and Aluminum	No change.
Silica and Magnesium	No change.
Silicion and	
Magnesium Oxide	No change.

The field of synthesis by pressure and torque is new but is a very vital part of the study of pressure of effects.

High Pressure in Solutions

One of the more common pressure effects is pressure in solutions. Pressures in solutions can be explained by a simple experiment. If you dissolve a salt in water the total volume will be less than the sum of the volumes of the salt and water. What causes this loss of volume? It is generally accepted that the addition of a solute to a solvent alters the solvent just the same as external pressure. This external pressure can be calculated if you know the pressure necessary to change the volume

(*Continued on Page 27*)

Campus Sports

Edited by RAYMOND KOPAN, junior, e.e.

Engineers Score Victory In Three Way Meet

Rose Tech's track and field team walked off with the top track honors on Indiana Central's track when they placed first with a total of 84½ points in a triangular meet with Indiana Central and St. Joseph track squads. St. Joe's team pushed into second place with 49½ points, while the host, Indiana Central, trailed with a total of 29 points.

Speedy Ed McGovern streaked to three first place positions in taking the 220-yard dash, the broad jump and the 100-yard dash events for top honors of the meet. St. Joe's Yaganski, with firsts in the javelin throw and blue ribbon honors in the discus throw, pulled up as a close second place star.

Rose was strong in almost all departments, including the dash and field events. The Engineers' only weakness appeared in the two-mile run and the mile run.

Summaries:

880-yard run—Butts (R), Adams (IC), Bitter (St. Joe). Time—2:10.

220-yard run—McGovern (R), Hillenbrand (R), Ford (St. Joe), Wisniewski (St. Joe). Time—23.6.

Two-mile—Miller (IC), Cavey (St. Joe), Reiman (R), Shields (St. Joe). Time—11:17.

220 low hurdles — Hillenbrand (R), Cundiff (R), Bladell (St. Joe), Windig (St. Joe). Time—27 seconds.

Pole vault—Johnson and Buchanan (R), tied; Smith (R) and Hiatt (IC), tied. Height—11½ feet.

Shotput—Crowe (IC) Yaganski (St. Joe), Shrabrug (St. Joe), Pasey (IC). Distance—41 feet, 9½ inches.

Discus throw—Yaganski (St. Joe), Smith (R), Keeler (R), Crowe (IC). Distance—111 feet.

Javelin — Yaganski (St. Joe), Meurer (R), Keeler (R), Crowe (IC). Distance—150 feet.

Broad jump — McGovern (R), Shaw (St. Joe), Hillenbrand (R), Bissey (IC). Dist.—20 feet, ½ inch.

100-yard dash—McGovern (R), Cundiff (R), Shaw (St. Joe), Ford (St. Joe). Time—10.3.

Mile run—Adams (IC), Shields (St. Joe), Casey (St. Joe), Potts (IC). Time—5:02.

440-yard run—Johnson (R), Wisniewski (St. Joe), Rienmann (St. Joe), Steck (R). Time 53 seconds.

High jump—Keeler (R), Bladell (St. Joe) and Hiatt (IC), tied Hillenbrand and Buchanan (R), tied 6′2″.

120 high hurdles—Cundiff (R), Garrett (R), Bladell (St. Joe), Windig (St. Joe). Time—17:05.

Mile relay—Rose, St. Joe, I.C. Time—3:43.5.

Rose Takes Second in Triangular Meet

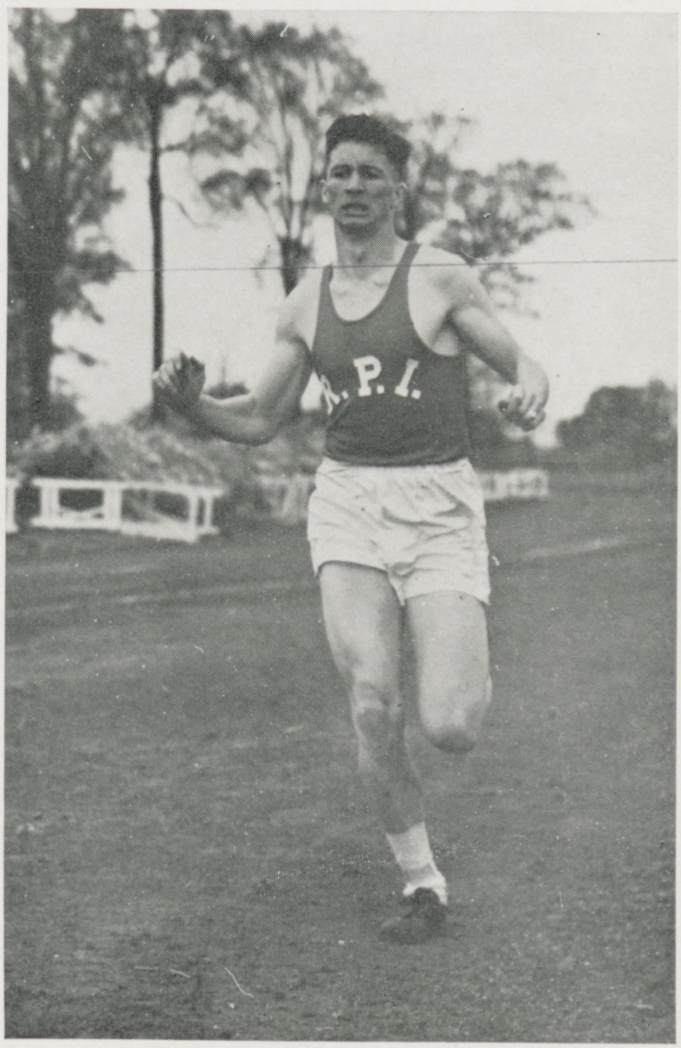
The Engineer's track team entered in its second three-way meet of the season at Ball State on May 9 but the outcome was not so bright as at Indiana Central. The weather was rainy but the track was fast and excellent showings were made in the contest, and when the last event was run the standings showed the Engineers to have taken second place, Ball State first, and Taylor third.

Cundiff and Johnson were outstanding in their events, each taking two firsts and participating in the victorious mile relay team. Cundiff won first place in both the high and low hurdles, and Johnson did likewise in the quarter mile and pole vault. Keeler and Rumbley tied for first place in the high jump. The final results were Ball State, 72; Rose Tech, 58; and Taylor, 20.

Track Men Enter in State Meets

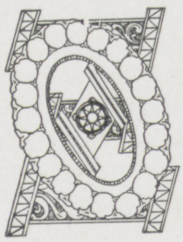
The Little State meet, held at DePauw May 16, offered the last opportunity for the squad to compete this season, and the men put forth every effort to make a good showing. In spite of the absence of Johnson

(*Continued on Page* 26)



Fraternity Notes

Theta Xi



The Kappa Chapter of Theta Xi has responded nearly 100 per cent to the new school program. Each member is arming himself against the summer months with determination, an electric fan, and a glass of ice water.

Four Kappa men have entered the advance R. O. T. C. training course. They are Harry Frye, Dean Albon, Dick Garrett, and Kenneth Allison. The opening of spring football practice finds T. X.'s Price, Suiter, and Allison listening to the moans of Coach Brown.

The season is working its effect among the members with tennis matches, swimming parties, and baseball being part of the daily dozen. Even the moody fishermen have come to life wearing their battered hats covered with flies. On Saturday evening of June 27 the chapter enjoyed a hayride which wound about the countryside and ended with dancing at the Old Mill. The amiable chaperons were Captain and Mrs. Bennett and Dr. and Mrs. Knight.

Ernest Curtis found time during the short two week vacation to take the final vows.

Alpha Tau Omega

At the start of the semester Gamma Gamma chapter acquired two new members in the fraternity. Bob Jensen, has transferred to Rose after completing a year and a half at Purdue and is continuing his active membership at this chapter. The other new member is Bernard Vonderschmidt of Jasper, Indiana, who was pledged at a formal pledging ceremony on June 22.

July 12 is the date set for another initiation and so far six pledges have indicated their intention to become active members of the fraternity on this date.

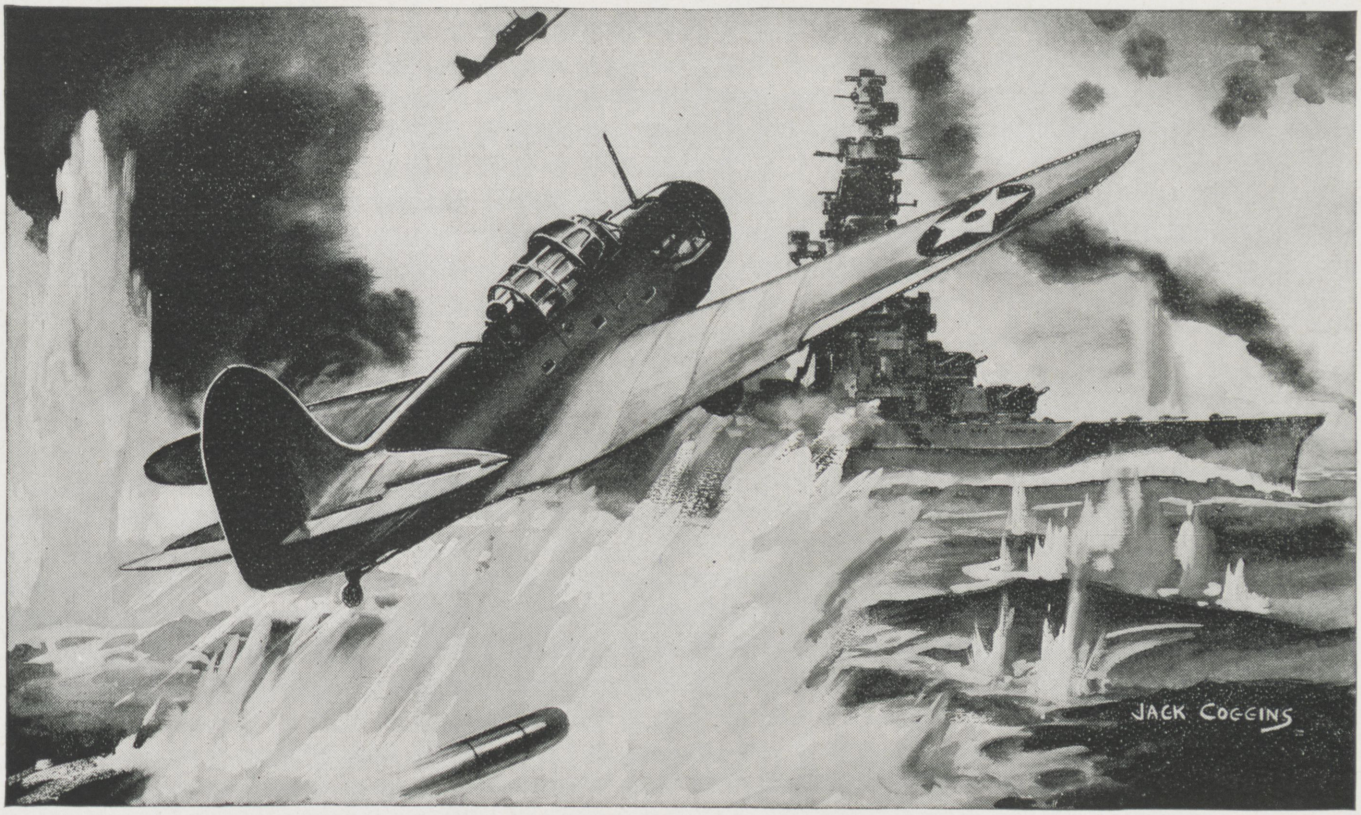
Outdoor meetings and picnics are on the summer's calendar. The first picnic has been planned for July 19 when the members and their dates will travel to Shakamac State Park for a day of sport. An outdoor meeting featuring a picnic lunch is being planned for the very near future.

Two installations have been completed in the house to provide some degree of comfort from the summer heat. A large exhaust fan was purchased to blow out the hot air from the attic dormitory and the furnace was converted to circulate cool air from the basement to the upstairs through the heating conduits. These fans will make the house more suitable for study purposes.

Lambda Chi Alpha

The members of Lambda Chi Alpha spent the last month in preparation for the incoming of the newer members. The yard has been beautified, the house well cleaned, and new chairs, beds, and desks have been purchased and placed within the house. By the time vacation was here, four new members were ready to move in the house.

The fraternity regrets that its treasurer, Ralph Mitchell, found it necessary to leave Rose at the end of the semester. We all hope that he will again be with us next February.



Bombers from the Bottom of the Deep Blue Sea

THERE'S a fabulous amount of magnesium in every cubic mile of sea water.

Enough magnesium for more than *four million* Flying Fortresses. Enough to lay a continuous ceiling of bombers . . . a hundred miles wide and stretching all the way from London to Berlin!

Now magnesium can't be dredged out of the ocean . . . for every ounce of this rare metal must be produced by electrolysis. This necessitates the conversion of vast amounts of alternating current to direct current, at the very water's edge.

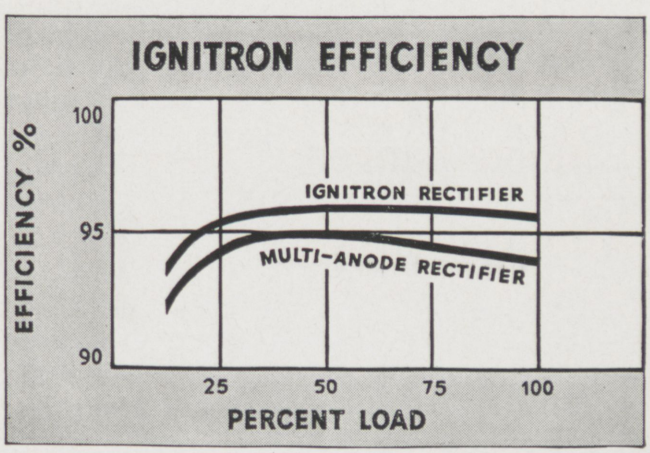
The best means of converting power is the mercury arc rectifier. As long as ten years ago, Westinghouse Research Engineers began experimental work on a *new type* of mercury arc rectifier which would be more efficient . . . more economical . . . less costly to install and maintain than existing types.

These Westinghouse scientists realized that new untapped fields in metallurgy would be opened by the perfection of an improved mercury arc rectifier. In 1937, they brought forth the *Westinghouse Ignitron.*

The Ignitron operates on the radically new principle of *starting* and *stopping* the mercury arc with each cycle. This means that electrodes can be placed much closer together . . . grids and shields reduced . . . arc drop voltage decreased . . . voltage control simplified . . . arc-back practically eliminated. And all of this assures higher efficiency and greater reliability.

More than 1,000,000 kw of Ignitrons are now at work in magnesium, aluminum and chlorine plants, in electric railway systems, in mines, in many war industries.

And so, the germ of an idea . . . born ten years ago in the Westinghouse Electronics Laboratories . . . is now contributing its important share in winning the war today.



Westinghouse

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, PITTSBURGH, PENNSYLVANIA

Sigma Nu

Beta Upsilon chapter of the Sigma Nu fraternity began its 48th year on the Rose campus with bright prospects for another successful year. The house, contrary to previous years, was opened for the summer because of the war and the resulting summer school at Rose.

The brief vacation proved an adequate interlude for romance—Brother Bob Mitchell placed his pin upon Jeane Greer of St. Mary's, and Brother Bob Leathers placed his pin upon Jean Miller of Indiana State. The chapter extends congratulations to these two brothers and awaits with anxious expectancy for the forthcoming cigars.

This year the chapter house acted as host for brothers now in the armed services. An average of two men a week have stayed overnight at the house in going to-or-from their assigned military posts. Recently Brother Celland of Gamma Tau—Minnesota, dropped in on his way to Waco, Texas where he was assigned to an air division. He revealed new aspects of the value of the fraternity to the individual when he described the closer relationships existing among fraternity men in service.

SPORTS

(*Continued from Page* 23)

and Cundiff, two of the most consistent point makers, the team finished fourth in the meet. The first four were Butler (first), DePauw (second), Ball State (third), and Rose Tech (fourth). Rumbley took first in the high jump with a leap of six feet, two inches, while Keeler tied for second. Hillenbrand took second in the low hurdles, and McGovern took third in both the 100 and 220 yard dashes to help the Engineers cause. The mile relay team took third in its event with McGovern, Steck, Butts, and Keeler doing the work.

The Big State meet found Big Bill Rumbley as the only entry from Rose, but he made a good showing by beating all competitors in the high jump with a jump of six feet one and a half inches.

There were nine men who met the requirements for track letters. Their names and points made are listed below.

Winston Cundiff, Co-Capt.	53¾
Irvin Keeler, Co-Capt.	55
Arthur Johnson	51¼
William Rumbley	27
Edward McGovern	70¾
Burt Butts	17¾
Francis Hillenbrand	26½
Charles Meurer	30½
Robert Steck	9

(placed in the Little State)

Rieman and Garrett earned 11 points respectively to earn minor awards. Other point makers were Willis Rose (3), Buchanan (8½), and A. E. Smith (6½).

Harmon Rose was recognized as

senior manager of the track squad this year.

Wabash Loses to Rose Net Team

The Wabash College tennis team suffered a stunning defeat from the rackets of the Rose players on the latter's courts. Rose won four singles and two doubles matches to win by a 6 to 0 score. The Crawfordsville boys offered little opposition to the victorious Rose men who had previously won four out of five scheduled matches.

Wayne Shanks, Bruce Powell, Gene Coltrin and Bill Kniptash turned in winning match scores in the singles division. Powell and Kniptash won one of the doubles matches and Shanks and Coltrin followed to make a perfect day for the home team.

Rose Men Play in State Net Finals

To climax the season's tennis matches three men of Rose Tech's net team traveled to Richmond to participate in the state intercollegiate tennis tournament against the finest players from Indiana's colleges. The Rose men were able to obtain only four points which were made by the Shanks-Powell doubles team when they defeated the Huntington pair.

Despite winning a love set Shanks was defeated by Schumaker of Butler by a 6-2, 0-6, 6-3 score. Wiebel lost his match to Stinson of Earlham and Powell followed suit by faltering before Izack of Indiana. The Shanks-Powell combination was eliminated in the second round by Parks and Doutel of Notre Dame.

Notre Dame won the tournament with the support of Olen Parks who finished on the winning side in all his singles matches. The champion doubles team was Gulick and Winchler from DePauw University.

PRESSURE EFFECTS

(*Continued from Page 22*)

of a pure solvent a given amount. The author preformed an experiment to demonstrate this effect.

Ten milliliters of sodium chloride were dissolved in 90 milliliters of water. The resulting volume was 97.5 milliliters.

Volume of water.....90 milliliters
Volume of NaCl.....10 milliliters
Volume of solution..97.5 milliliters

The pressure required to compress 100 milliliters of water 2.5 milliliters at 20 C. was found to be 646 atmospheres. Therefore the pressure exerted by the sodium chloride when it dissolves in water is 646 atmospheres.

Compressibility of Water
Volume at 0°C and 1 ATM.
Pressure taken as Unity.

P,atm	−10°C	+10°C	40°C	80°C
1	1.0017	1.0001	1.0076	1.0287
2000	.9223	.9277	.9386	.9568
4000	.8751	.8818	.8931	.9097
8000			.8330	.8483
12000			.7931	.8080

FACTS ABOUT NAVY V-1 at ROSE

The Navy's V-1 Plan under which Freshmen and Sophomores from 17 through 19 years of age can continue their courses and prepare to become officers in the Naval Reserve has been accepted by our school. Hundreds of colleges and universities are backing the Navy's V-1 program, and thousands of students in other schools have already enlisted under this plan.

Only 80,000 men will be accepted annually for this training, but the Navy wants these men to be fully acquainted with all V-1 details before enlistment. Many questions have been asked. In this column we will answer those most frequently asked and in addition carry informative articles covering all phases of V-1 activities. Some questions asked are:

Q. I am a sophomore and will be 20 years old next month. Can I enlist in V-1?

A. Yes. If you have not yet reached 20 and you are otherwise qualified, you're eligible.

☆ ☆ ☆

Q. When the war ends, do I stay in the Service?

A. Under V-1, you enlist in the Naval Reserve. As an enlisted man or as an officer, you may be released from active duty as soon as possible after the war is over.

☆ ☆ ☆

Q. Will the Navy pay my tuition and other expenses while I am still in college under the V-1 plan?

A. No. Navy pay does not start until you are assigned to active duty.

☆ ☆ ☆

Q. What is the citizenship requirement for acceptance for V-1?

A. Applicants for V-1 must have been citizens for at least 10 years before the date of application.

LIFE LINES

(*Continued from Page* 5)

what better than the coastal roads; yet little thought was given to location suitable for transformation into a military highway.

What are the requirements of a good military road? A highway should have wide flat sloping shoulders. The width would of course be governed by the nature of the terrain, but shoulders should be 12 to 15 feet wide where possible. Wide shoulders would give the road proper drainage and would afford more than two lanes of traffic in emergencies. Europe's armies were slowed immeasurably in their tactical movements by the congestion of refugees on the narrow highways. Wide shoulders would carry movements without endangering the vital military line on the surfaced road. A highway should have a high type surface in order to carry traffic in all weather and at a high rate of speed. This surface must shed water and be of a type that will require a minimum of maintenance. The bridges along all highways must be inspected for strength and for possibilities of a supplementary structure being built, for even though the highway could carry increased lanes of traffic, narrow bridges would soon bog the line into a hopeless condition. In strategic locations treated piling should be driven in preparation for the time when bridges will need to be widened.

One of the most important points of a highway is its junctions with other important lines. Unless highways are woven into a network, they are of no use. Together the arteries carry the life blood of men; together the highways carry our vital commerce. The intersections of important highways in metropolitan areas have bottle-necked the flow of traffic. In recent years this fault has been overcome by grade separation and "clover leaf" intersections. The value of grade separation is illustrated by the comparison of the Sunrise Highway and the Grand Central Parkway in New York City. Each is a four lane road and carries traffic to the saturation point. A traffic census was taken over a period of one year for the two roads. It was found that the Sunrise Highway carried 8,000,000 cars in the year while the Grand Central Parkway carried 15,000,000 cars during the same year. The Sunrise Highway is intersected by 13 cross roads, all at grade; the Grand Central Parkway is intersected by 15 cross roads, all separated at grade. The results were so striking that plans were made for the separation of grade at the crossings on the Sunrise Highway.

A new program providing for areas suitable for the landing and the take-off of aircraft adjacent to highways was authorized by Congress under the Defense Highway Act of 1941. These areas are called flight-strips. The ideal flight-strip area would be 1,800 feet wide and 8,000 feet long and laid out in the direction of the prevailing winds. This use of the highways would be of unlimited value in time of attack when the air fields were unsafe. Plans for these flight-strips are prepared in the Public Roads Administration district office; however, the

(*Continued on Page* 30)

A YOUNG MAN'S FANCY

(*Continued from Page* 8)

realize the importance of technical courses, and that such a plan will keep alive the hundred or so engineering colleges during the war. At the present time, however, any plans are very indefinite and it will be several months before anything is done about the problem.

The R. O. T. C. will not be expanded in this war because the Army simply cannot spare the officers or material. Carleton College in Minnesota is a very good example of an institution going all-out to get behind the war effort. At Carleton two-thirds of the male students are enrolled in a flying corps under reserve commissions of the Army, Navy, and Marines. Harvard and Dartmouth have a Volunteer Land Corps which trains under-age or draft-deferred students as farm hands to help the New Hampshire and Vermont farmers at a minimum wage of twenty-one dollars per month. High school and county authorities in the middlewest are anxious to start the same plan.

The Stevens Institute of Technology at Hoboken, New Jersey, has also taken great steps and affected drastic reforms in the interest of the war effort. Stevens has gone on the three semester a year basis; each semester being seventeen weeks long. This plan so shortens the course that a student can graduate in three years of two semesters per year. The third year he goes to work in a war plant at full pay.

This plan has been called the Antioch College system and is aimed at giving the student a practical as well as theoretical knowledge of his life work. The plan enables the student to gain valuable experience and helps to shorten the adjustment period between graduation and actual work in addition to giving the student an opportunity to finance his education. There is, however, a great disadvantage to the plan in that it tends to kill the faculty. It has been suggested that the smartest juniors and seniors teach as student instructors during their work semester. Also it has been urged that the Antioch College system destroys the general education aspect of college. Even so, enrollment at Stevens looks as if it will increase by a third.

The formation of a War Man Power Commission to allocate manpower among agriculture and industry had done much to remove the questionable elements from the Selective Service Act. The Commission will probably restrict voluntary enlistment and lower the draft age to eighteen. Probably the greatest argument against this action would come because it eliminates the options from all age groups. The Navy and the Marines will also probably protest because they are strong for the volunteer recruiting method of calling men to the colors. On the whole, however, the individual will be better off because even though the initiative is taken out of his hands it will definitely set the time and method by which he will serve in the armed forces.

ELECTRODEPOSITION

(*Continued from Page* 7)

carbonate .....7 oz./gal.

The function of the silver and the cyanide is obvious. There has been much discussion as to the advisability of the addition of either sodium or potassium carbonate. Whether added or not, they invariably form by the decomposition of the continually added cyanide, and the solutions are known to work better for their presence. Carbonate increases the inductance, yields more finely crystalline deposits, and increases the throwing power.

Pure silver should be used and the anodes should be annealed to permit easy solubility.

Strikes

With silver, as with copper, it is often necessary to give the base metal a preliminary coating before immersing it in the regular plating solution. This is to prevent plating by immersion and subsequent formation of porous and spongy deposits. This preliminary coating often consists of a thin coating of copper.

It has long been known that the addition of a small amount of carbon disulphide to the silver solution changes the deposit from dull to bright. It is also known that sodium thiosulphate, barium thiosulphate, and ammonium thiosulphate when added to the plating solutions in certain amounts also aid in bright plating.

Troubles in the Silver Bath

Although little emphasis has been put on the difficulties encountered in the silver bath, it must nevertheless be understood that some are met with at times. The usual precautions which apply to the conditions of the base metal in other types of plating apply to silver plating. Trouble is often encountered in the metal content of the solution failing because of the formation of a film on the anode. This can be averted largely with a little foresight by the use of proper addition agents.

An almost endless variety of uses suggest themselves to silver plating. Because of its corrosion resistant property, fine appearance, and its value as an ornamental metal, it has a very wide application.

Future

Much research is being made in the field of electroplating. The increasing value of the process to industry is being recognized, and the subject is being dealt with as a science in itself. In step with specialization everywhere, electroplating has its own specialists. These men are devoting their lives to the development and improvement of the various processes. Progress is continually being made along the lines of improvements in processes, wider application, and new solutions. It may be logically expected that the value of electroplating will advance even more rapidly in the future than it has in the past.

BOGRAN

(*Continued from Page* 18)

horseback. On later summer vacations he went hunting in the interior for tapir, tigers, deer, and small game. On one occasion he and a few companions ran out of food and were forced to kill a monkey to keep from starving. Tony said the meat was tough and does not recommend it. In the summer of 1940 Tony went back to Honduras to prospect for gold. He has been very interested in mining and has considered very seriously the possibilities of mining gold in Central America.

Tony's hobbies are hunting and flying. In 1941 he received one of two Central American flying scholarships that were offered by the United States government. He received his training at the Terre Haute airport.

After graduation Tony plans to work in Central or South America.

RUMBLEY

(*Continued from Page* 18)

and also has spent some time in the California oil fields.

Rumbley's hobbies include wood carving, building model airplanes, the study of astronomy, and sports. He especially likes skiing, sailing, and swimming. Bill says the job he wants most must deal with people, afford a chance to travel, and most important must enable him to live in sunny California.

LIFE LINES

(*Continued from Page* 28)

actual construction of these flightstrips is carried out by the state highway departments.

The Pan-American Highway and the Alaska Highway are two arteries of defense and commerce which have been on the tongue of every American. The supreme importance of the Pan-American Highway for moving armies and military equipment is apparent to everyone. The common question concerning this highway is how near completion is it? The Pan-American Highway is completed nearly to Panama, and construction beyond Panama is being finished at a fast rate. It must be realized, however, that the surface between the United States and Panama is not all of a high type. All the small Central American countries with aid from the Import-Export Bank are improving their section of the highway. When completed this highway will be of value, not only as a military road, but also for peace time trade relations. The Alaska Highway has been rerouted from the original plans in order to connect air fields on the route to Alaska and to remove it from range of an easy air attack. Alaska is one of our greatest military bases and an important producer of raw materials, rendering a highway to this territory one of utmost importance. Construction is being rushed by army engineers.

Highways are vital for our defense in this mechanized world war, but the same principles which make a better military road make a safer and better highway on which to drive. Improved highways are something we need now which will be of use when peace is restored.

MOUNTING POWER FOR ALLIED WAR BIRDS

THIS engine mount destined for overseas service on an American made fighter plane is being fabricated by the best known method of joining metal — that is, by welding. For welding makes equipment a homogeneous, permanent unit, light yet exceptionally strong. This versatile process utilizes the Airco oxy-acetylene flame to make design problems vanish. It is applied rapidly and economically even under difficult shop and field conditions. The apparatus employed is simple, portable, easy to operate. » » So versatile is the oxy-acetylene flame, so varied are its useful applications in the metal working field, that it has long since been drafted into service to speed defense by swiftly cutting metal to close tolerances, by hardening metal surfaces for longer wear, by cleaning them for faster, longer-lasting paint jobs, and by gouging metal with amazing speed and accuracy.

The interesting booklet "Airco in the News" shows pictorially many ways in which Airco products and processes are being used to help industry speed up production. Write for a copy.

AIR REDUCTION

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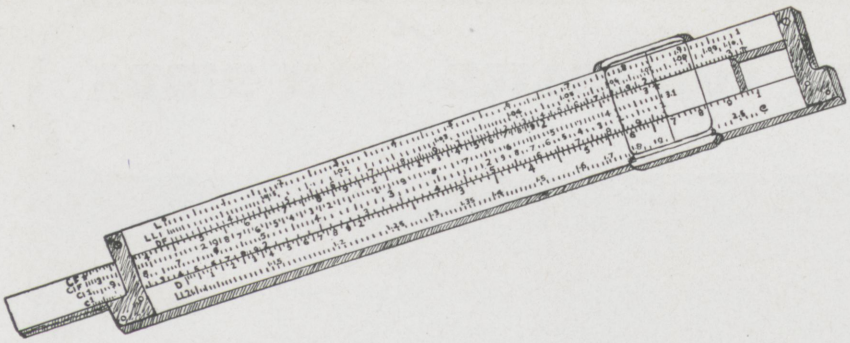
Magnolia-Airco Gas Products Co.
DISTRICT OFFICES IN PRINCIPAL CITIES

ANYTHING AND EVERYTHING FOR GAS WELDING OR CUTTING AND ARC WELDING



Sly Droolings

Edited by HAROLD E. CAMPBELL, m.e., sophomore,

Doctor: "What you need, my dear young lady, is a little sun and air."

Patient: "Why doctor, how dare you! Why, I'm not even married."

"Pop, I got in trouble today in school and it's all your fault."

"How's that, son?"

"Remember when I asked you how much a million dollars was? Well, 'Helluva lot', isn't the right answer."

Definition of a friend: A person who has the same enemies you have.

It's a dopey lover who starts stealing for home even before he's gotten to first base.

If there be anyone in the congregation who likes sin, stand up—What's this, Sister Eliza, you likes sin?"

"Oh, pardon me," replied the shy young lady, "I thought you said gin."

The Japanese want to buy all our glass bottom boats at Catalina so they can review their fleet.

Her figure was harder to ignore than a ringing telephone.

"Is my face dirty or is it my imagination?"

"Well, your face is clean, but I don't know much about your imagination."

Girl Customer: "Does this lipstick come off easily?"

Cosmetics Clerk: "Not if you put up a good fight!"

The small boy of a wealthy contractor was asked by his father what he would like for Christmas.

"A baby sister," replied the boy.

"But it is only two weeks until Christmas and that doesn't leave much time," answered his father.

"I know," replied the boy, "but can't you put more men on the job?"

He: "Since I met you I can't eat, I can't sleep, I can't drink."

She (coyly): "Why not?"

He: "I'm broke!"

Train Passenger: "Porter, get me another glass of ice water."

Porter: "Sorry suh, but if I takes any more ice, dat corpse in the baggage car ain't goin' to keep."

Definition of a Bachelor: A man with no children to speak of.

Young Girl (peering out of her berth on a sleeper spying a young man down the aisle): "Sir, have you the time?"

"Young Man: "No, madam, nor the inclination either."

Anyone can play bridge, but it takes a cannibal to throw up a hand.

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.

Judge (hearing traffic case): "Had you complete command of yourself at the time of the accident?"

Rose: "Er—no, sir; my wife was with me."

Three slightly deaf old maids were motoring to London in an old noisy car and hearing was difficult. As they neared the city one asked, "Is this Wembly?"

"No," replied the second, "this is Thursday."

"So am I," put in the third, "lets stop and have one."

Senior girl to Freshman after being asked for a date: "No, I couldn't go out with a baby."

Freshman: "Oops, sorry, I didn't know."

And when a girl is as fit as a fiddle, every man in town wants to be her beau.

A tommyhawk is what when you go to sleep suddenly and wake without hair, there is an Indian with.

A pretty young school teacher was explaining the difference between "concrete" and "abstract".

"Concrete means something you can see," she said, "while abstract is something you can't. Now, who'll give me an illustration?"

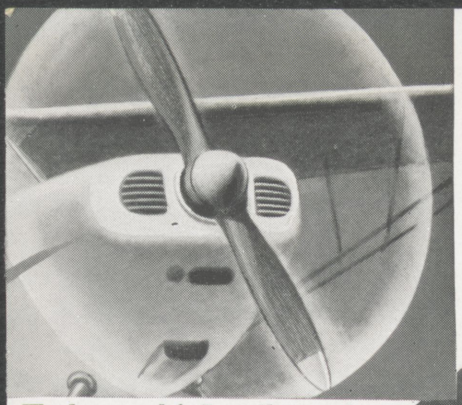
A small boy in the front row shyly raised his hand. "My pants are concrete," he replied, "yours are abstract."

Jimmie: "Wot's de best way to teach a girl to swim?"

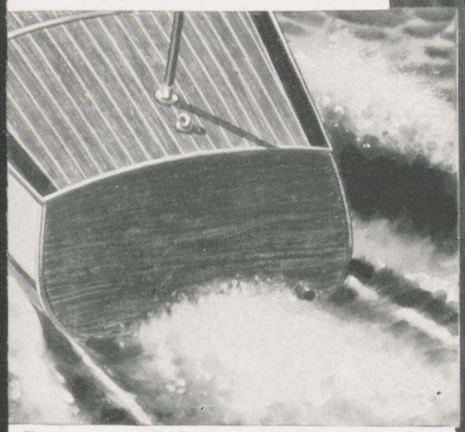
Johnny: "Well, yer want ter take her gently down to de water, put your arm 'round her waist, and—"

Jimmie: "Oh cut it out. It's me sister."

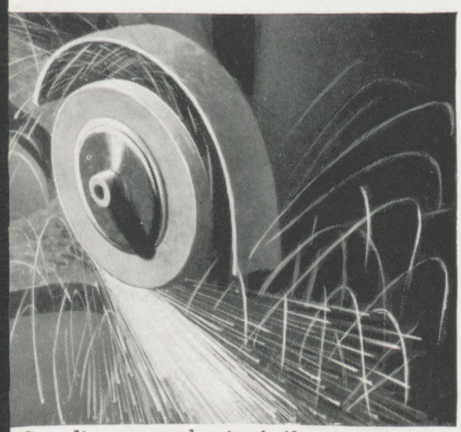
Johnny: "Oh, push her off de dock."



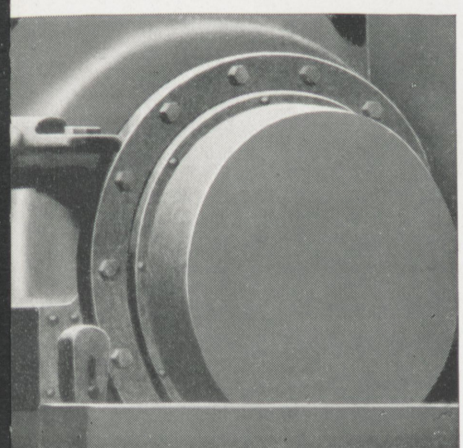
Wonder woods! Propellers and many aircraft parts are produced with "Bakelite" resin-bonded molded plywoods.



Born seaworthy! Plywoods bonded with "Bakelite" resins are ideal for boat construction. No need to worry about getting them wet. They won't de-laminate!



Speeding up production! Abrasive particles in vital high-speed grinding wheels are bonded with "Bakelite" resins.



Even the rollers that roll steel, roll on bearings made of "Bakelite" resin-bonded materials!

UNITED THEY STAND

. . . *most anything!*

By what strange alchemy do thin, frail sheets of wood become so tough and strong . . . so resistant to wear and tear, to water, chemicals and decay . . . that builders of aircraft, boats, homes, and other structures hail these transformed woods as *marvel materials?*

The answer is found in "Bakelite" resins. These synthetic, man-made materials, which paved the way for many developments in molded, laminated, and cast *plastics* in common use everywhere, have gained an even broader and more basic role.

Through research . . . in helping to solve the problems posed by manufacturers in many fields . . ."Bakelite" resins have become increasingly important as *impregnating, coating,* and *bonding* agents. They hold materials together . . . and they give greater strength, greater durability, and longer life to common substances that man has used for ages. "Bakelite" resins also permit the creation of *many new materials* . . . materials never seen before . . . with possibilities that make one want to do things with them.

Developments in bonding, stabilizing and densifying plywoods with "Bakelite" resins are one phase of this story. "Bakelite" resins have also solved many problems in the fabrication of metals, carbon, abrasives, cloth, leather, paper, glass . . . in countless ways . . . in varied forms. Certain types of "Bakelite" resins have helped to establish new standards of durability for paints and varnishes.

And this is *only the beginning.* As new problems are presented . . . to be solved by research . . . a host of new uses may be expected of these efficient, versatile, problem-solving materials.

• • •

The ever-broadening diversification of materials offered by Bakelite Corporation is now supplemented by the "Vinylite" plastics developed and produced by Carbide and Carbon Chemicals Corporation. The manufacture and application of these products have been greatly facilitated by the plastics-fabricating research of National Carbon Company, Inc., by the metallurgical experience of Electro Metallurgical Company and Haynes Stellite Company, and by the metal-fabricating knowledge of The Linde Air Products Company. All of these companies are Units of Union Carbide and Carbon Corporation.

BAKELITE CORPORATION

Unit of Union Carbide and Carbon Corporation

30 EAST 42ND STREET UCC NEW YORK, N. Y.

G-E Campus News

IDEA MARKET

"A PENNY for your thoughts" is dirt cheap! Last year the General Electric Company paid $95,203 to its employees for some 12,453 suggestions for more efficient ways of doing things; in the past 20 years General Electric employees have converted thoughts into $1,100,000 worth of suggestions.

Many of last year's suggestions were ideas for speeding up war production. For example, one young man's idea for a better method of manufacturing radio equipment brought him $800; another employee received an award for his ingenious device which cuts in half the time required for a vital step in building propulsion equipment for warships.

Some of the Company's most economical methods of operation have evolved from this practice of "buying ideas."

A CHANGE OF HEART

DR. UHLIG, a scientist in the G-E Research Laboratory, can make a piece of stainless steel change its mind in truly feminine fashion.

The metal Dr. Uhlig uses pays no attention whatever at first when it is placed close to a powerful alnico magnet. Then, like a woman who has a sudden change of heart, it suddenly flies to the arms of the waiting magnet.

The scientific explanation is that a delayed change takes place in the steel's atomic arrangement. Dr. Uhlig heats a strip of the metal to 1100 F, at which temperature it is nonmagnetic, and then suddenly cools it. The atoms start rearranging themselves when the metal is cooled, but it takes about a minute and a half before the majority are shifted and at least a day before they all reach a state of equilibrium.

COME AND GET IT....

AND when the boys come and get it today, they find "Iron Rations" safeguarded by electronics, a science now used to inspect much of the steel going into tin cans that produce many a "mess." (Actually these *tin* cans are made of sheet steel, with a thin coating of tin.)

Sheet steel races from processing machines at speeds up to 1000 feet a minute, and the human eye can not detect tiny pin holes that may cause spoilage. Two electronic devices, however, do the job: one discovers holes as tiny as 1/100 of an inch in diameter; the other marks the flaw for removal before the sheet becomes a container.

Just before the strip of steel enters the leveller rolls, it passes through a slotted scanner head. Light projected downward pierces through any pin holes and operates photoelectric tubes in the bottom half of the head. These tubes, through an amplifier, operate a mechanism which diverts faulty sections from the production line.

Thus the science of electronics is helping to look after that stomach on which an army is supposed to travel.

GENERAL ELECTRIC

953-41-211