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Rose Technic Staff
Rose-Hulman Institute of Technology

ROSE TECHNIC

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WARREN S. SENTMAN

APRIL, 1934

Vol. XLIII » « » « Number 7

Member Engineering College Magazines Associated

ROSE POLYTECHNIC INSTITUTE, TERRE HAUTE, INDIANA

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Surveying This Issue

THIS issue marks the final work of the 1933-34 Technic Staff. To all who made possible these issues the editor wishes to thank for their help and cooperation. To those who will publish the next eight issues the editor wishes to extend best wishes for success.

IN the lead article entitled "Monolithic Tier Building," Mr. McEowen describes a unique adaptation of concrete structures as beer storage tanks. This is one of the engineering developments which followed the advent of beer.

IF you have been reading current engineering news lately you will probably have read about the steam turbine designed by the Detroit Edison Company for the use of 1000° F. steam. Mr. Mason describes some of the problems involved in operating such a turbine.

WHAT will the highways of the future be like? In a very interesting article Mr. Hess describes some of the new highways which are to be built in the future.

THOSE who attended the recent Rose Show were probably attracted by a wind tunnel designed for the testing of airplanes under conditions resembling those of actual flying conditions. Mr. Sentman shows how a tunnel designed for the use of full scale airplanes operates.

J. J. H.

THE ROSE TECHNIC

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Mr. Robley Winfrey, Chairman, Engineering Hall, Ames, Iowa.

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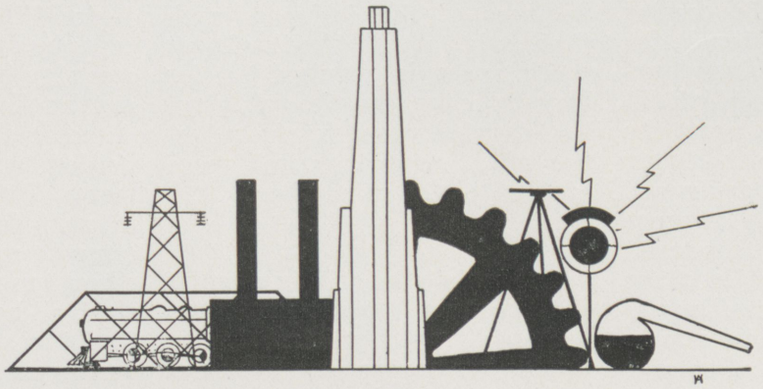
EDUCATION does not mean teaching people to know what they do not know. It means teaching them to behave as they do not behave. It is not teaching the youth the shapes of letters and the tricks of numbers, and then leaving them to turn their arithmetic to roguery, and their literature to lust. It is, on the contrary, training them into the perfect exercise and kingly continence of their bodies and souls. It is a painful, continual, and difficult work, to be done by kindness, by watching, by warning, by precept, and by praise, but, above all, by example.

JOHN RUSKIN 1819-1900



THE ROSE TECHNIC

THE TECHNICAL JOURNAL OF THE ROSE POLYTECHNIC INSTITUTE

Volume XLIII APRIL, 1934 Number 7

Monolithic Tier Building

Albert V. McEowen, c., '35

With the recent advent of legal beer the various manufacturers have gone to great pains to adapt recent engineering discoveries to the improvement of their product. The use of the monolithic storage vat is one of the notable results.

THIS article, while dealing with a topic of engineering interest, also refers to another subject quite welcome to many engineers and should consequently attract more than passing interest. A monolithic tier building is a solution to many engineering problems, but when used as a stockhouse in a brewery it gives the brewer an economical, space-saving answer to his demands for fermentation and storage tanks.

A word of explanation will aid one in understanding the uses and special requirements of a stockhouse. The brewery operations are divided into two main sections that require two definite layouts which can be conveniently handled in the brew house and the previously mentioned stockhouse. In the first or brewing operation the ingredients are brought together in their proper proportions and the wort is prepared. This wort is cooled and passed to the second unit where tanks are provided for the fermentation, aging, and storing of the beer as it approaches its final form. These latter operations make it necessary to provide a stockhouse that will accommodate large quantities of the liquid. In previous years this action took place in tubs and casks which were stored in huge vaults and refrigerated by melting ice.

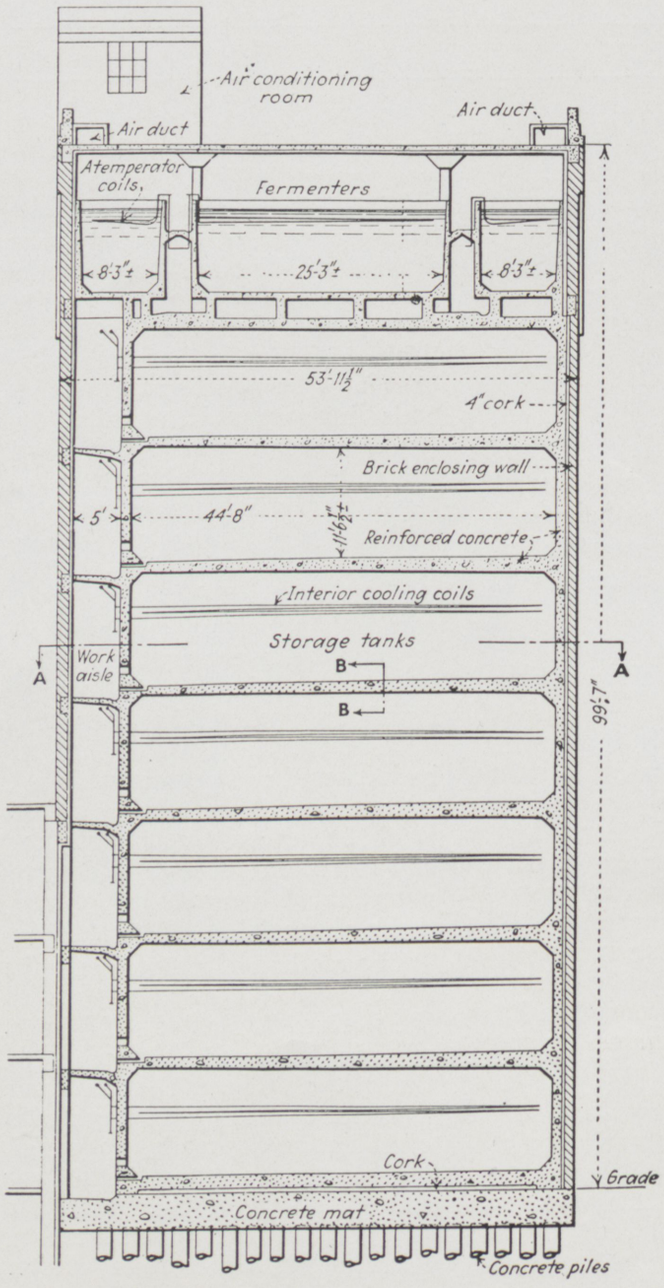
As the time passed and newer and more efficient insulating materials and refrigerating machinery were brought forward the vaults were supplanted by tall buildings that took up less ground space and provided the required storage for casks and tubs, or later glass lined tanks. The introduction of reinforced concrete brought a new material to the designer, and its application was studied in view of certain problems which came to light. The beer had a deteriorating effect upon the concrete that had to be prevented by some sort of lining. This lining was also limited by the fact that it had to withstand the results of changing temperatures near the freezing point without giving any undesirable taste or odor to the beer. The tanks had to withstand a pressure of from three and one-half to five pounds per square inch in addition to the weight of the liquid and when the beer was withdrawn the pressure had to be increased to twelve pounds per square inch. Even minute cracks would be serious in such instances and to obtain the results desired necessitated very thorough design and careful erection methods.

The method of lining the tanks finally evolved was largely due to the work of R. Rostock of Vienna who did much experimenting on the subject. Paraffin is the basic material used in the lining and a combination is made up which withstands the action of the beer and gives it no troublesome taste or odor. The tank surfaces are covered with a porous plaster coat, and the whole unit is dried by steam coils, warm air, or other

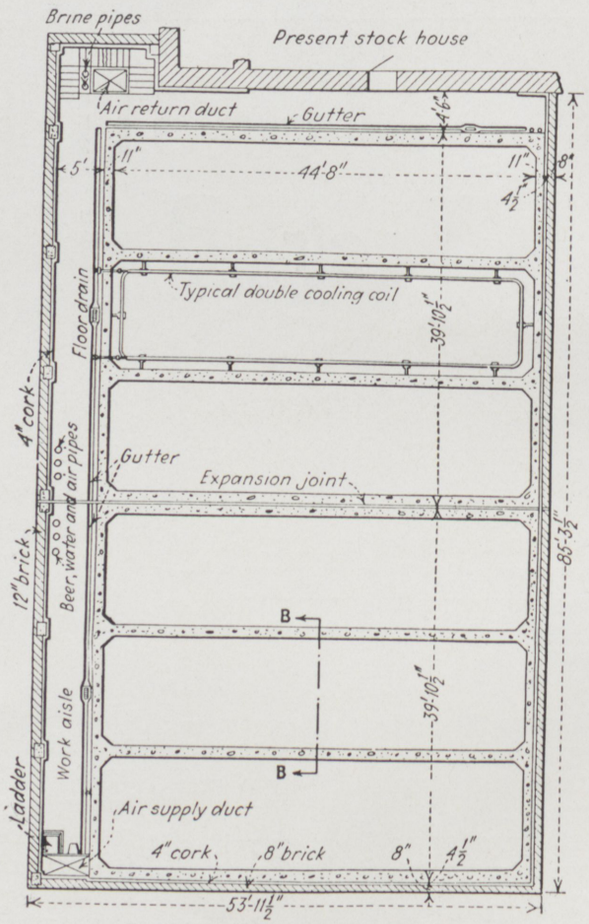
methods. A hot paraffin coating is then applied with a brush, the applications being continued until a smooth, glossy finish is built up. After its development the method was applied to the lining of concrete replicas of tanks and barrels, but as economy of space became more important the tanks were made rectangular in shape and placed one upon another until the stockhouse became a mere shell surrounding tiers of storage containers. A brick veneer exterior and a cork insulating layer was supported by the tanks themselves and a material saving was made in building costs. The compactness of the design is such that only about two-thirds as much space is required as for barrel storage, and the refrigeration cost is lowered by the reduction of the amount of wall space exposed to the atmosphere.

Design of Tanks

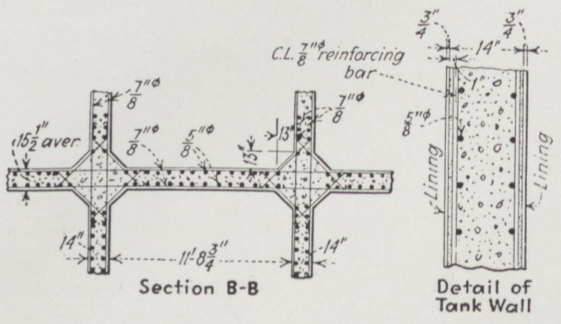
The tanks used at this stage of the brewing operations must withstand as high as twelve pounds per square inch pressure, not to mention the weight of the liquid. The gas tightness required is the most difficult requirement to satisfy, since a small crack will cause serious damage to the contents of the tank through loss of pressure. Since tensile stresses are of prime importance in this construction, it is necessary to do more than use the materials needed to satisfy code requirements. Extra care must be taken in such design work; the water cement ratio, the amount of cement used, and the quantity of steel, all have to be considered so that the stresses will be limited even more than is usual for stability. In tank construction of this kind, experience has shown that an extra amount of reinforcing steel is desirable, two to three per cent being common as com-



Cross Section of Building



Plan A-A of Storage Tank Tier



Section B-B

Detail of Tank Wall

pared with about one percent as used in ordinary concrete structures. To help in preventing cracks it was found necessary to place the steel as near as possible to the surface of the concrete. Usually about one-half inch covering is allowable in stockhouse tanks since the additional plaster and paraffin covering adds another three-quarters of an inch protection and the fire hazard which is in evidence in most buildings is practically non-existent in a case like this. By properly placing a sufficient amount of reinforcing steel the cracks due to loading are taken care of, leaving shrinkage, temperature, and settlement stresses to be provided for by additional precautions. By restricting the tank dimensions to a maximum of fifty feet on a side the designers find that the danger of cracking is reduced to a minimum. This division of the structure into several blocks which can expand and settle independently gives a final unit which efficiently resists the many and varied stresses encountered.

An Application

One of the latest applications of this type of design is to be found in the new stockhouse for the F. & M. Schaefer Brewing Company, the building being fifty-five by eighty-five feet in plan and one hundred feet high. It has a capacity of sixty-five thousand barrels in the fermenter and storage tanks. The building consists of seven tiers of storage tanks, each tier being made up of six 1400-barrel tanks which have dimensions of forty-four by eleven by eleven feet. Above these there is the fermenter floor which has a total capacity of six thousand barrels. The building is supported on a four foot concrete mat and a pile foundation requiring 653 concrete piles to handle the total loaded weight of 19,500 tons. An expansion joint is provided which divides the building into two blocks that can act separately as suggested in the design treatment. To provide insulation, two two-inch cork layers are applied, and the outer shell of the building is comprised of a twelve inch brick wall. On each floor a work aisle is provided so that access may be gained to any tank to facilitate cleaning and repairing. These aisles are most efficient if constructed through the center of the building but in this case they had to be placed around the outside. They serve not only as passageways but also as ducts for the movement of cooled air to aid in the refrigeration. Additional cooling is provided by interior coils containing an alcohol-water cooling solution.

This stockhouse is the first of its type to be constructed in the United States, but the same design has been in use in Europe since the war and has given efficient service. The countries across the sea have at present completed structures of this type totaling two million barrels capacity, an indication of the breadth of one field which has been opened by the legalization of beer in this country. There is no denying the fact that this type of building is the most economical in use at present and is greatly superior to other barrel and tank storehouses. As the breweries of the United States enlarge and tend to become more efficient the economy of this method will be more and more appreciated. The engineer should note here one application of his training that might normally pass without notice, but which required much study to bring it successfully to completion.

Reference: Engineering News-Record, November, 1933.

Steam Turbines of The Future

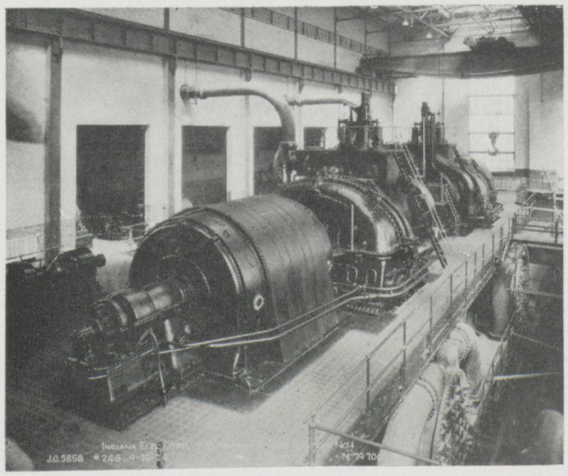
James I. Mason, m., '34

IN building the first steam engine, James Watt sought only to build a machine that would run, mechanical perfection and efficiency being given but little thought. But after building a few engines that would run, mechanical perfection was sought; and afterwards efficiency became of importance. At the present time, efficiency is the thought uppermost in the minds of steam engine designers.

Superheated steam, cylinder jacketing, compounding, Corliss steam valves, and the uniflow principle have done their part toward increasing the efficiency of reciprocating steam engines. But steam turbines have been found to operate much more efficiently than any steam engine. Turbines can also be built in much larger units than reciprocating steam engines, and for this and other reasons have superceded the reciprocating steam engine to a very great extent. But the steam turbine designer is now faced with the demand for increased turbine efficiency.

The latest development in improved efficiency of steam turbines is the use of 1000° F. steam. The principal advantages which such steam at entrance to a turbine has over low temperature steam at the same pressure and used without reheating are as follows: (1) More energy is available for transformation into work, (2) a larger portion of this energy can be utilized, and (3) less erosion of the blades in the low-pressure stages of the turbine is produced. The use of such steam, however, has several inherent drawbacks, which will be presented in the discussion of a 1000° F. steam turbine installation which follows.

When the advantages accompanying the use of steam at temperatures of 1000° and higher first became apparent, there was in existence no metal which had the necessary physical properties at the high temperatures. A per-



iod of metallurgical research produced an austenitic 18 per cent chromium, 8 per cent nickel alloy which would stand up under the temperature and stress to which it would be subjected in a 1000° F. turbine. The cost of the alloy not being prohibitive, a superheater capable of producing 1000° steam at a pressure of 400 lbs. per sq. in. was designed and constructed of this metal. The superheater was installed in the Trenton Channel Power House of the Detroit Edison Company in 1929 for the purpose of obtaining design information for use in designing a contemplated 10,000 kw, 1000° turbo-generator unit.

The superheater was tested for more than 20,000 hours at temperatures between 1000° and 1100° F. The 18-8 alloy was replaced in the cooler portions of the superheater by other alloys which had better fabricating qualities and lower costs and which could stand up under the lower temperatures satisfactorily. Difficulties were encountered in the use of the original pipe joints and valves which were not made of the 18-8 alloy. The creep resistance and other high temperature properties of most of the other parts proved satisfactory and adequate.

With the information obtained from the tests of the Trenton Channel superheater, a 10,000-kw turbo-generator, piping system, and superheater have been designed, constructed, and installed in the Delray Power House No. 3 of the Detroit Edison Company. The installation has been designed for the use of 1000°, 400 lbs. per sq. in. steam. The turbine runs at 3600 rpm., is supplied with steam at the throttle of 390 lbs. per sq. in. pressure, has three regenerative feedwater heaters, and has an exhaust pressure of 1″ Hg. Using 1000° steam, the installation has been tested for a period of nearly 8000 hours, about 5 per cent of the total steam used being sealing steam about the high-pressure packing glands. To avoid setting up too high thermal stresses in the turbine, 700° F. steam was used in starting and shutting down the installation.

While making the 1000° test, comparative tests were run using 900°, 800°, and 700° steam. The results of these tests showed a decrease in energy consumption of 920 btu per kw-hr., or 7.9 per cent reduction, in going from 700° steam to 1000° steam.

The radiation and convection losses as determined from the tests were quite small—namely, 0.6 per cent of the available energy, but the loss due to the leakage of the sealing steam was 4.4 per cent of the available energy. It is believed, however, that this loss can be reduced by making the proper changes in the construction of the packing glands and in the handling of the steam used about the glands.

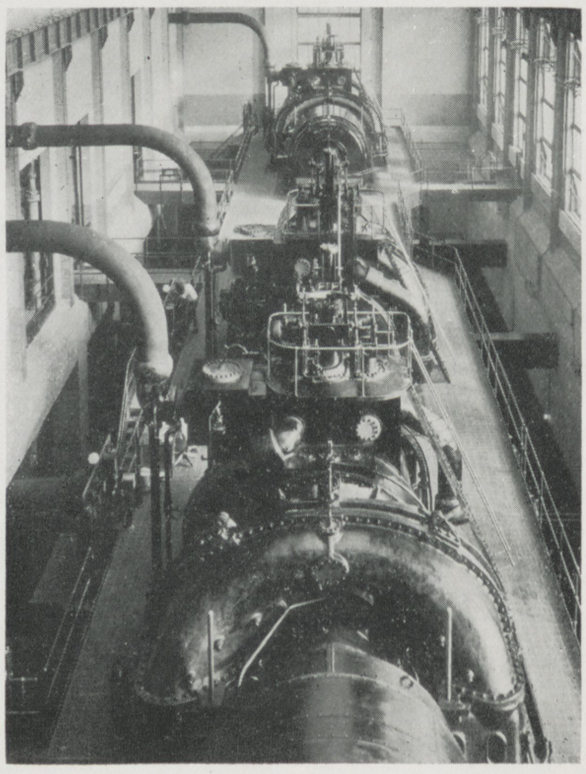
The engine efficiency of the complete unit was 76 per cent, the thermal efficiency of the turbine being 31.8 per cent. These are efficiencies believed to be impossible of attainment in a steam engine a few years ago.

In comparing the performance of the Delray, 1000° F. steam installation installations, it must be remembered that the Delray unit is not as yet fully developed and that its chief deficiencies are mechanical and not thermal, as is the case with most other units. It is also the firm belief of the designers and experimenters that the turbine is much too small to to produce the maximum efficiency obtainable with 1000° steam. It is their contention that turbines of 30,000 kw and higher would have efficiencies somewhat higher than the smaller Delray turbine.

The design and construction of a 1000° F. steam turbine of 30,000 kw output will entail the expenditure of a great deal of research, work, and capital, but the results of the tests on the Delray turbine point to so many possibilities and advantages in the use of 1000° F. steam in large installations that a concerted effort to build such a unit is sure to be exerted.

With the foregoing discussion as a basis for our expectations, we may reasonably expect to have such engines in successful operation within the next few years.

EDITOR'S NOTE: *This article on steam turbines and probable use was submitted by Mr. Mason as part of his Tau Beta Pi work. The tests carried out seem to indicate that turbines designed for high temperature steam are much more efficient than was thought possible a few years ago.*



Superhighways

Arthur W. Hess, c., '35

FOR many years the manufacturers of automobiles have been stepping up the speed of their cars about five miles per hour annually. Recently it was thought that they were approaching the maximum speed possible without incurring unreasonable operating costs. However, the advent of the principles of streamlining stems to indicate that the past trend of speed will be maintained. At the present time one of the large manufacturers is experimenting with the fickle public to see if it approves of the radical appearance of the new streamlined car. If the public shows its approval, it will doubtless be but a short time until cruising speeds of one hundred miles per hour will be the rule.

Are the highways of the nation ready for such speeds? It seems obvious that they are not. With the present number of accidents and consequent loss of life occurring at speeds up to seventy miles an hour, the present highways would be death traps at speeds of one hundred miles per hour.

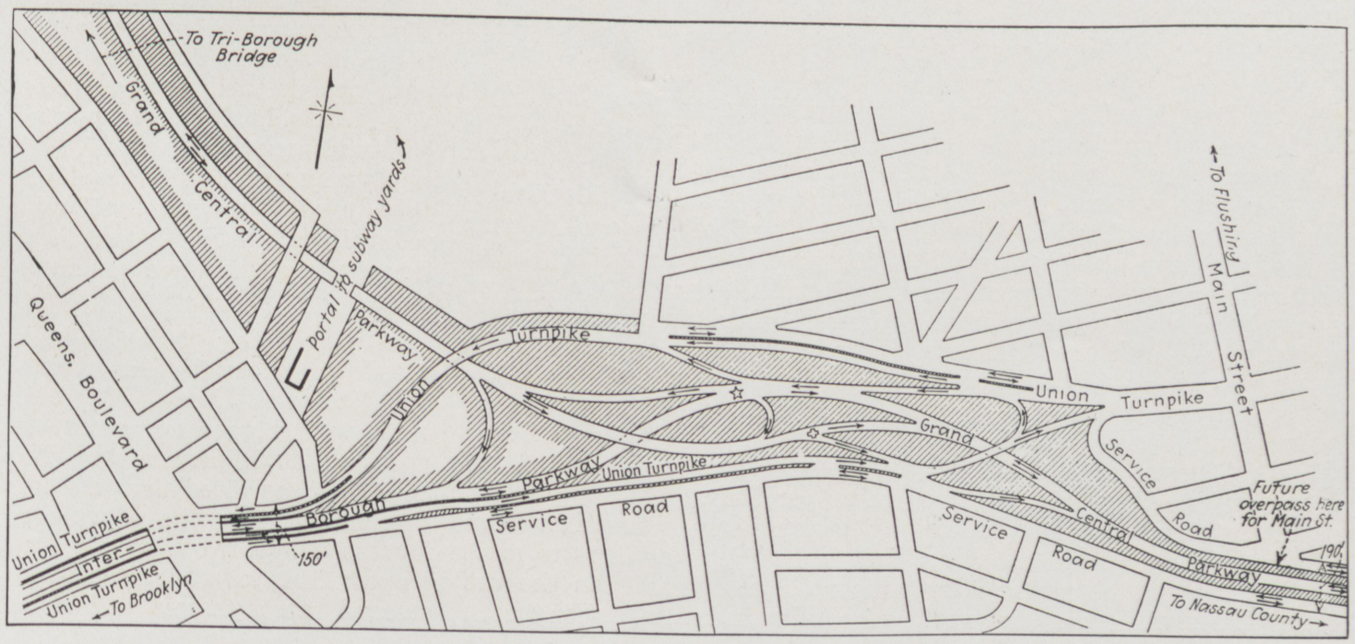
In order to do away with these accidents it will first be necessary to determine their causes. There are two major causes of highway mishaps, of which the first is the intersection of two or more lanes of traffic. This includes traffic making left and right turns as well as intersecting traffic. The second cause is passing traffic which means vehicles moving in the same direction passing one another. Of course there are other causes of accidents, such as poor alignment of roads, sharp curves, excessive grades, and the like, but these are recognized as dangerous at present and are being removed by the highway officials. These hazards are considered as such usually because they increase the danger of the first two named—intersections and vehicle passing.

In order that the future highway, which is dubbed "the superhighway" to distinguish it from the present system, be safe at the high speeds, it must provide for the safe and speedy conveyance of intersecting traffic and for the conveyance of traffic of different speeds. If these two requirements are satisfied, the future roads will be safe.

Engineers have devised the various forms of grade separation to provide for the first, and the multi-lane road with center passing lanes to fulfil the second requirement.

Grade separation is carried out by simply carrying one highway over another by means of a bridge or taking it under by means of a subway. There are many applications of this method of which the so-called "clover-leaf" is the best known. It provides not only for the safety of intersecting traffic but also for left and right turn traffic. Grade separation has long been used by the railroads to reduce their liabilities due to accidents. The same type of intersections could be and are being used to some extent for the safe conduction of intersecting highway traffic.

Every one is more or less familiar with the multi-lane highway. It has been used to some



extent as a test sample in various sections of the country. However, to be effective, a road of this type must be practically the same width throughout its length and must be used in the proper manner. The outside lane should be used only by right turn traffic and slow traffic, while speedier traffic should use the inner lanes reserving the center lanes for passing.

There are many things which impair the efficiency of a highway of which the most important are cities and towns and the so-called "bottle neck effect." In order to speed traffic through urban districts, many highways follow two paths, one through the district and the other around it. In the larger cities where this scheme is impossible an elevated, high-speed highway over the local street has been suggested and tested. It is very successful, but quite expensive. This elevated road would have no intersections but would have ramps at intervals to allow traffic to return to the level of the street.

A great source of difficulty in the improvement of highways is the "bottle neck" effect. Widening a road necessitates widening upon sound, engineering facts. bridges, culverts, etc. This is sometimes neglected. No more traffic can use the road than can use the poorest section of the road or, in other words, as far as capacity is concerned a road is no better than its poorest part. Consequently, although a road which has been partially widened may be somewhat safer, it is no more efficient than its narrowest portion.

Another problem is that of maintaining a speedy flow of traffic across and through the various important highway bridges and tunnels where several trunk highways merge. This is accomplished by the use of different levels of approach. A striking example of such a method is the New Jersey approach to the Washington bridge.

What, then, will be the appearance of the superhighway? How will it feel to ride down this highway? These are the questions now asked by the person more interested in what will happen than in how or why will it happen. Of course, such a prediction is more or less imaginary, but it is based

The superhighway will have many lanes with a possible park lot in the center for expansion. It will be a surface route in rural districts and all intersections will be of the grade separation type, "clover-leaf" or otherwise, at intervals of two miles or more. It would not be necessary for every farmer to have a lane intersecting this highway nor would it be necessary for every cow-path to cross it.

Entering the suburban district the crossings may be closer together, probably an interval of half a mile being about correct. When the traffic becomes quite congested, through traffic will then take the elevated section of the road and proceed through the congested district at high speed and so on to the rural highway again.

When will we have such highways? Only as soon as public demand is great enough to insist on their erection and to obligate public office holders to build them. The engineer is ready and waiting with a host of data and ideas for the erection of a hundred mile an hour superhighway.

High Speed Wind Tunnel

Warren S. Sentman, m., '36

SPEED with safety in the air! Speed with economy of operation! Speed with comfort for air travelers! For the past few years these speed demands have been insistently made by the users of airplanes and especially by the airline companies whose existence depends on the swift, safe, dependable, and economical transportation of passengers, mail, and express.

The builders of commercial airplanes are meeting this demand so successfully that air-transport lines find their ships do not wear out, but have to be replaced by faster planes while they are still in excellent condition.

Within the past year the speed at which transport planes can fly most economically with the best paying load has increased from 150 miles per hour to 200 miles per hour. Every day we read of planes being built which will carry large paying loads both swiftly and economically, and it is not an uncommon thing to read of planes carrying loads of over a ton at a constant speed of 180 miles per hour.

One of the important factors in helping airplane builders to meet these demands has been the use of wind tunnels. It has long been known that wind resistance cuts down the speed of airplanes, automobiles, and all moving bodies; it has been known that over a quarter of the power developed by an automobile engine is used to overcome the resistance set up by air as the auto moved forward. By means of wind tunnels in which blasts of air may be blown past models, and now even full size models, engineers have studied wind resistance and methods of decreasing it. The results of these studies are very noticeable today in the field of transportation, especially in the aeronautical branch.

In developing today's high-speed commercial planes, the manufacturers have not built ships with bigger engines to be operated at higher costs. Nor have they sacrificed airworthiness or comfort. They have achieved increased speed by turning out planes of improved design and increased aerodynamic efficiency.

Here again wind tunnels have played an important part in helping airplane builders achieve these results. Builders have followed the trail blazed by the air scientists who work for the advancement of aviation in the marvelously equipped Langley Memorial Aeronautical Laboratory of the National Advisory Committee for Aeronautics. The job of this group of men is the scientific study of the problems of flight for the benefit of all American aviation, commercial as well as military.

Because aircraft operate in the air, the air scientist realized one of the first things he would have to learn was how to control, surely, and accurately for experimental purposes, the most elusive of the elements. Of course, much could be learned from actual flight. Ingenious and highly accurate instruments were developed to measure and record speeds, pressures, and the positions of control surfaces while an airplane is flying. However, flight test could not solve all the problems of aviation, so small wind tunnels were built. A wind tunnel is simply a large tube through which air is either drawn or forced at a constant speed. At a certain place in the tube, particularly where it is smaller, the air is moving more smoothly and at a more constant velocity than anywhere else and it is here that the model which is to be tested is placed. In these small wind tunnels small-scale airplane models, full-size small parts of planes can be mounted on delicate scales and balances and subjected to a blast of air that simulates the conditions of actual flight and the pressures and strains measured.

Later much improved wind tunnels were built, and today there are all types. Vertical wind tunnels in which is studied just what happens when an airplane is in a tailspin; variable density wind tunnels in which models are tested in air that is compressed in inverse proportion to the model's scale, a one-twentieth-size model being tested under twenty times normal air pressure. In a refrigerated tunnel are studied the formation of ice on airplanes and its prevention. In a twenty-foot tunnel, with an air speed of 110 miles per hour, are tested full size propellors, and other parts of the plane including body, engine, landing gear, and tail surfaces.

The huge building which houses this gigantic apparatus looks as if it was built inside out, the structural steel frame is outside the cement-asbestos sheets which form its walls. The building is 434 feet long and 222 feet wide, and has been designed to withstand the hurricane blasts which rush through the inside of it.

Inside the building is a smoothly planked elliptical cone sixty feet wide and thirty feet high, the entrance cone. Directly opposite it, and fifty-six feet away, is a similiar cone, the exit cone, split by a fairing, or smooth wall, into two circular passages. In each of these passages is mounted a four-blade, cast-aluminum-alloy propellor, thirty-five and a half feet in diameter, driven by an electric motor which develops 4,000 horsepower. These propellors create an air blast of 120 miles per hour. Beyond the propellers the circular passages gradually change their shape and size, until at the end of the building they are forty-six feet square. At their ends series of wind vanes, which have all the appearances of airplane wings set on end, are adjusted carefully to turn the airstreams smoothly into the fifty-foot-wide return passages that run the length of the building. At the other end of these return passages more vanes turn the airstreams again, so that they join in the 110 by 72-foot entrance cone that narrows gradually to sixty by thirty feet at its mouth.

Located between the entrance cone and the exit cone is the test chamber. In the test chamber between and beneath the gaping mouths of the wind tunnel is located the glassed-in control room, the roof of which is about level with the lower edge of the cones. Protruding from the roof of the control room are streamlined struts upon which is placed the plane to be tested. Inside the control room, and protected from wind currents, is the balance that measures the air forces to which the plane under test is subjected. The balance is large enough to weigh a big airplane, and yet delicate enough to serve as a post office scale.

The struts on which the axle of the landing gear is mounted and the triangular frame to which the tail is attached are secured inside the control room to a turntable which is in turn attached to a floating frame that rests on four struts which transmit the light forces, those forces which act straight up, to four scales. A linkage attached to the floating frame and acting against a counterweight transmits the drag forces, the forces which act parallel to the airstream, to another scale. Two other linkages, attached to the frame at its front and back and also working against counter weights transmit the cross-wind force, the force which acts at right angles to, but in the same plane as the airstream, to two other scales. The turntable allows the airplane to be yawed, or turned about a vertical axis, from twenty degrees to the right to twenty degrees to the left, and frame on which the tail rests can be raised or lowered, thus adjusting the angle of the wings to the airstream. Other forces which are measured are those which tend to cause rolling, a movement about an axis through the center of the nose of the airplane; the forces which create pitch, a movement about an axis perpendicular to the side of the body of the plane and passing through the body at a point about which the airplane will balance. In all, six forces are measured, and the readings automatically recorded.

Above this man-made hurricane is mounted a movable bridge, from which is suspended a delicate instrument to measure the airflow around the plane. Much of value has been learned from the study of the air after it leaves the back edge of the wings, and airflow around the tail surfaces.

Not all the many problems of aerodynamics and flight can be solved by full scale wind-tunnel research but many problems have been solved by this high speed wind tunnel, especially those relating to high speed flying.

THE ROSE TECHNIC

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And So Goodby

With this issue of the Rose Technic, the present staff has finished its assigned work. Part of the staff succeeds itself and so forms a sort of connecting link. For many of us, however, this marks the end of our journalistic experience. For some of us this experience has been gathered during practically all the time we have been at Rose, for while a maximum of three years is the limit of service, yet this may begin in the freshman year and continue into the senior year.

Getting out a publication of this sort is not an easy task. If the magazine does contain a few errors, just remember that the editors had just as many calculus problems to solve, just as many laboratory experiments to write, and just as many examinations to take as you have had. The job of getting the Technic out on time in a creditable fashion is simply that much extra work.

It has been a great pleasure to us to see the Technic grow. We have had many goals, some of which were in a measure reached. There are many problems yet to be solved; many difficulties to be overcome; many improvements yet to be made. The newly elected staff must meet these problems. They are sure to be successful if you will cooperate with them. Remember this is your magazine. Your articles and comments are needed to make it a complete success. We are asking you to help the new staff carry on from where we leave the work. And so goodbye!

A Center of Attractions

Because of the activities of Rose students and the organizations on the campus, Rose has become the center of many attractions this year. The Rose Show brought many people from other states to visit us. In some instances this was the first visit to the school. The success of this exposition is now so well known that further mention of it is unnecessary.

On April 14 the electrical engineering students of Illinois University, Purdue University, and Rose Polytechnic Institute met at Rose for the annual A. I. E. E. meeting. In addition to the students present at this meeting there were a number of professional men.

Following the close of school in June, the Rose chapter of Alpha Chi Sigma together with the other Indiana chapters will entertain representatives from the leading colleges and universities giving courses in chemistry and from the principal chemical centers of the United States at the biennial conclave of that fraternity. Although the convention will be held on the campus of Indiana University, it being a larger and more suitable place, the activity of the Rose men will bring much honor and recognition to the school which they are representing.

The E. C. M. A. has chosen Rose Polytechnic Institute as the place of its annual convention to be held next fall. Delegates from many of the leading engineering colleges will visit Rose for this occasion and it gives the Technic a great deal of pleasure to be permitted to act as host for this occasion.

The record of the debating teams has helped to add prestige to Rose. The Glee Club by its many performances in and around Terre Haute has also contributed to the good name of the college.

All of this in addition to the fine record already set for excellence of education and graduate attainments is certainly going a long way to keep Rose in a highly respected place among the institutions of higher learning in the United States.

An Engineering Curriculum

Ever so often a professional group will undertake a study of a curriculum for students interested in their particular line.

These curricula are always designed for the average student, that is, for the man who has very little idea of what particular portion of the field he wishes to make his life work. In the case of engineering, the result is to give the student a wide, but relatively thorough knowledge of one subject and a glimpse into the fundamentals of the remainder of the courses taught. Although this type of education occasionally irks a student who has rather definite ideas on what he should take and what he wants to take, it does have the advantage of giving the engineering student about the most thorough education of all college trained men.

Since the whole idea of American education is to prepare the average person for a useful life, it also has the distinct advantage

of bringing the student into contact with a number of fields so that he may better pick the one most suited to him.

It is very unfortunate, however, that in order to get all of these fundamentals, the student is deprived of taking some of the courses he would like to take, such as for example cultural subjects. It seems very likely to the writer that eventually preparation for the engineering profession will require more than four years of college work. Indeed many institutions offer a fifth year in administration principles or something similar leading to a master's degree in the student's chosen course or a bachelor's degree in business training.

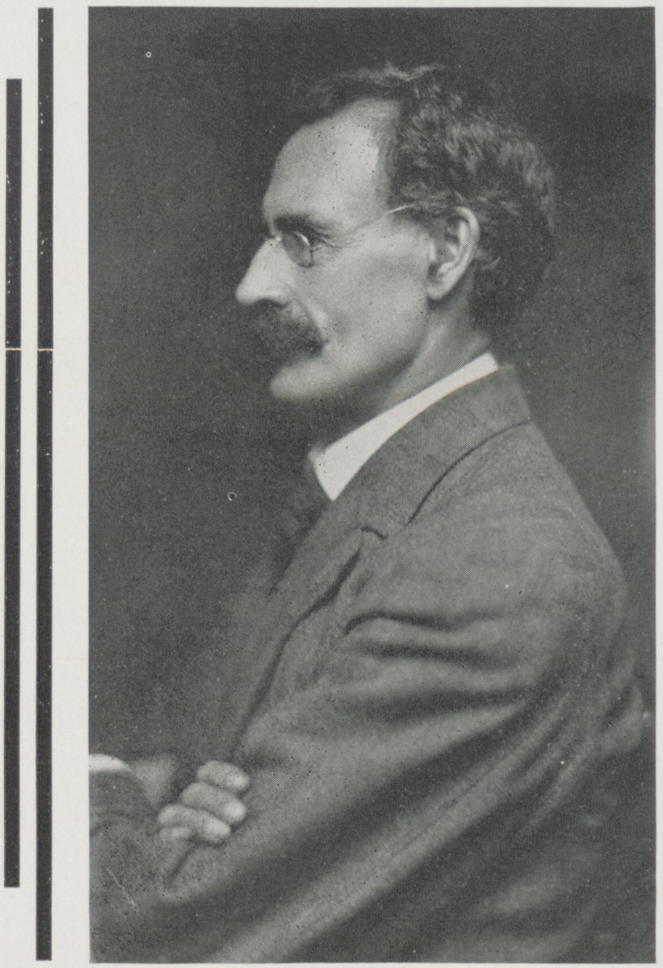
The present engineering curriculum is not adequate, but it is about the best that can be adopted for a four year course. When extra time is required then the curriculum can be greatly improved by the addition of specialized courses and more cultural subjects.

THE EDITOR'S LETTER BOX

Editor:

What are the advantages of the new highly praised grading system? When I entered Rose I found an answer to the question of how to make a compensating grading system. Under the old system if a man received a "C" instead of a "B" which he thought he deserved, it would affect his credit points but not his numerical average to any great extent. On the other hand, if a man took extra work, he could build up his credit points, but not his numerical average. In other words, the numerical average tended in any case to correct any mistakes or points of natural unfairness in the simpler system used in connection with it. After all, the difficulty in grading is the border men, and here is a suggestion for improving the new system; instead of having a heavy subject marked like this: Calculus, 4C, let it be thus Calculus, C, C, C, C, or thus, D, C, C, C, or thus, C, C, B, B, etc.

Yours,
Raymond Harrod.



ARTHUR STAFFORD HATHAWAY

Arthur Stafford Hathaway was born September 15, 1855 in Michigan, the son of Aaron S. and Alizina (Robinson) Hathaway. His people were Quakers and he was reared in the simple faith of that sect. His early education was received in the public schools and a nearby business college where he learned stenography, which enabled him to enter Cornell University in 1875 and at the same time assume the duties of private secretary to President Andrew D. White. After his graduation in 1879 he taught mathematics for two years in the Friends High School in Baltimore. There he became acquainted with Professor Sylvester of Johns Hopkins University who secured for him a fellowship in the department of mathematics.

In 1885 Professor Hathaway returned to Cornell as instructor in mathematics and in 1889 was promoted to assistant professor, a position which he held until 1891 when he was called to Rose as professor of mathematics, succeeding Professor Clarence A. Waldo. He retired on a Carnegie pension in 1920 and soon afterwards removed to Boerne, Texas, where he died March 11, 1934.

Professor Hathaway was married twice. His first wife was Miss Susan Hoxie, whom he married in 1878 and who died in 1880; his second wife was Miss Ada Jackson who also preceded him in death. Three children survive him, Professor Arthur S. Hathaway, Jr. (Rose '08), now in Northwestern University, Hazel (Mrs. Lee Brinton) and Hilda.

Professor Hathaway reported and edited the lectures of Sir William Thompson, First Baron, Lord Kelvin, delivered in Baltimore in 1884. He was also the editor of the proceedings of the U. S. Electrical Congress held in Philadelphia. He was the author of a textbook on Quaternions, a Primer of Calculus and various papers contributed to mathematical and

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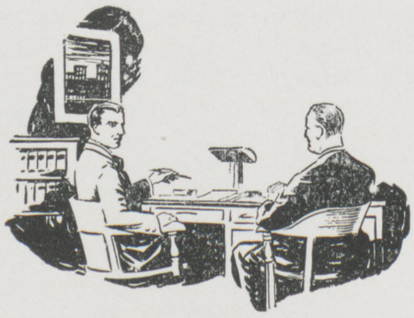
Alumni

Edited by Jay F. Hall, e. '35



Here ane There With The Grads

'00 Jesse H. Loofbourow, is a civil engineer with the Modesto Irrigation District at Modesto, California.

'14 Arthur N. Nehf, formerly a star pitcher for the New York Giants has been visiting in Terre Haute for the past few weeks.

'15 J. Robert Wisely is with the Robbins Conveying Belt Company in Chicago.

'22 Joseph A. Engelhard, who has been lost for some time, is assistant secretary and treasurer of the Glenmore Distilleries Company of Louisville, Kentucky.

'23 Harry J. McDargh, Jr., who is with the Portland Cement Association has been transferred back to Indianapolis where the office is to be reopened.

'23 Richard W. Hager is now located in Terre Haute, Indiana. He is the authorized dealer for General Electric Company. Prior to his coming to Terre Haute Mr. Hager was located in the Philippines where he was the sales agent of the General Electric Company.

'25 Zachary X. Bennett is now selling insurance for the Metropolitan Life, at Evansville, Indiana.

'27 William Hammerling, who is with the Kelvinator Electric Refrigeration Company is, at the present time somewhere in Africa. In a recent letter to Miss Gilbert he stated that he had been in East Africa until February 1, when he went to Bombay to stay for a month. While in India his itinerary included Lahore, Delhi, Agra to see the Taj Mahal, Calcutta, Rangoon, Singapore, Colombo in Ceylon, Madras, Haiderabad, and then returning to Bombay and South and East Africa. Mr. Hammerling's address is, c/o American Consulate, Johannesburg, Transvaal, South Africa.

'28 Hubert W. Swartz has been transferred to Wilmington, Delaware, and his address is 1331 Washington Blvd.

'29 David L. Thompson, with the Northern Indiana Public Service Company has been transferred to Goshen.

'31 Clarence W. Hoff is with the United States Geological Survey at Porter, Indiana.

'33 Charles Grogan has a position with the National Malleable and Steel Castings Company at Indianapolis,

Marriages

'29 Henry Nancrede, was married February 10, to Margaret Steppe of Effingham, Illinois. He is with the L. A. Snider Engineering Company, Inc., in Indianapolis, and he and his wife are living at present at 111 East Sixteenth Street, in Indianapolis.

'17 W. Charles Wente was married to Miss Beulah Mildred Amy March 16, 1934 in New Orleans. They are living at 4537 Canal Street, New Orleans, Louisiana.

Births

'27 William A. Harris is the proud father of a baby son, born February 19. Mr. Harris is now with the R. C. A. Radiotron Company, Inc., of Harrison, New Jersey, but lives 25 Oak St., Belleville, N. J.

'29 Jack Derry and his wife were very happy and proud to announce the birth of their daughter Josephine, at Philadelphia last December. Mr. Derry is now Chief Substation Inspector on the electrification work of the Pennsylvania Railroad between Baltimore and Washington. His address is 3319 Liberty Heights Ave., Baltimore, Maryland.

We Add to Our Roll of Honor Eddy David Frohman

Eddy David Frohman was born in Cincinnati, August 12, 1873,

son of Lewis and Fanny (Friday) Frohman. He entered Rose in 1890, graduating in the chemical course in 1894. During the year 1894-95 he did post graduate work in Massachusetts Institute of Technology. From 1895 to 1898 he worked in the Pittsburgh Testing Laboratories. The following two years he was in the employ of O. Hommel and Company, Pittsburgh. In 1900 he accepted a position with The S. Obermayer Company as assistant chemist, later becoming successively, secretary, treasurer, vice-

He is chairman of the executive committee of the Pittsburgh Boys' club; member of Engineers Society of Western Pennsylvania, of American Foundrymen's Association, of the Pittsburgh Foundrymen's Association, of the Bibliophile Society of Boston, of the Rotary Club and various other social clubs. He is a 32nd degree mason and a shriner.

His hobby is rare books and editions.

He is unmarried.

Professor Hathaway

(Continued from page 11)

scientific publications.

Professor Hathaway, familiarly known as "Hath" was loved and esteemed by all who knew him. He was gentle and unassuming, kind and considerate, a trustworthy friend, and a teacher who knew his subject thoroughly. With the students he was popular. One of his outstanding characteristics was his love of clean sport and he was a familiar figure upon the athletic field and a champion tennis player.

For twenty-nine years every student at Rose took "math under Hath" and thus came to know him personally. At the alumni meetings he met the early graduates, so that it is safe to say that practically every graduate previous to 1924 knew him. The Faculty joins this great body of the boys in mourning the loss of a beloved associate, adviser, friend and teacher.

Campus Activities

Edited by

Daniel Overholser,

ch, e., '36

R. O. T. C.

The military department is again preparing for the annual inspection which is to be held on May 9. Unfortunately, the unit has had to drill inside of the gym and on the runway most of this semester because of rain and snow. Last year the morning sessions of the inspection were held inside the school because of rain; therefore, this practice in drilling inside might be of great advantage in case inclement weather prevails during the inspection this year. It is hoped that the unit will again receive an excellent rating as it has for several years past.

Community Play Night

Several Rose students have been attending the Terre Haute Community Play-Night programs which are conducted each Saturday evening from seven to eleven o'clock at the Y. W. C. A. These free programs are being sponsored by the Terre Haute Park Board Recreational Council. Swimming, dancing, bridge, ping-pong, dramatics, and all sorts of games are presented for your entertainment. The tickets may be obtained from Frank Mansur or Russel Kerr or by calling at the Y. W. C. A.

Crash!

Crash! What was that? That is what students were wondering on the morning of March 13 as they sat in classes on the upper hall. Could the bookcase have fallen over in the office.

No, it was not that. Brent Jacob, who had been cruising about in the attic, had made a misstep and had fallen partially through the metal-plated ceiling. Sam Tait, who was walking through the hall, heard the crash and looked up to see a pair of legs dangling through a hole in the ceiling. Although Brent was not hurt, he seems to have no desire to attempt any more acrobatic stunts.

Rose Show Attendance

There were 4,243 paid admissions to the Rose Show this year, in spite of most unfavorable weather conditions. No one can doubt that the public is interested in Rose and what its students are capable of doing.

St. Pat's Dance

The forty-fifth annual St. Pat's Dance was held at the Terre Haute House on March 17. Slim Lamar and his orchestra played to an attendance which could hardly be accommodated with the ballroom, the promenade, the dining room, and the lobby all being used for dancing. Tables were reserved for almost everyone. Great masses of green and white baloons hung from the ceiling. The Spectator was right when it announced that Terre Haute wants more Rose Tech dances, for they are always highly successful.

F. E. R. A.

Under the regulations of the Federal Emergency Relief Act a nice piece of work is being done on the athletic field. A concrete curb is being laid around the track. This curbing runs along the straight-away from the creek and entirely surrounds the football field. Rose Polytechnic loans its track to the high schools of Terre Haute for their track meets; therefore, the track is considered as one of public service. With this understanding the institute has obtained the government's permission to carry on this project. The track will be not only greatly improved in appearance, but its surface will be laid absolutely level. The work, which was begun in March, should be completed by June.

Each month twenty-one students are employed, each one of the students being allowed to work thirty hours during the month. Perhaps this work under the F. E. R. A. will be followed by some under the R. P. I. which will pipe water to the football field and will tile and level off the field. The work is being done under the supervision of Coach Brown.

Woman's Department Club Visits Rose

The following article is taken from the Woman's Department Club Bulletin of April 2:

On Monday afternoon, March 26, about twenty members of the Club visited Rose Polytechnic Institute under the auspices of the Social Science Section.

Although the trip began inauspiciously, due to the rain and the accident which blocked the National Road, necessitating a muddy detour, whatever gloom had

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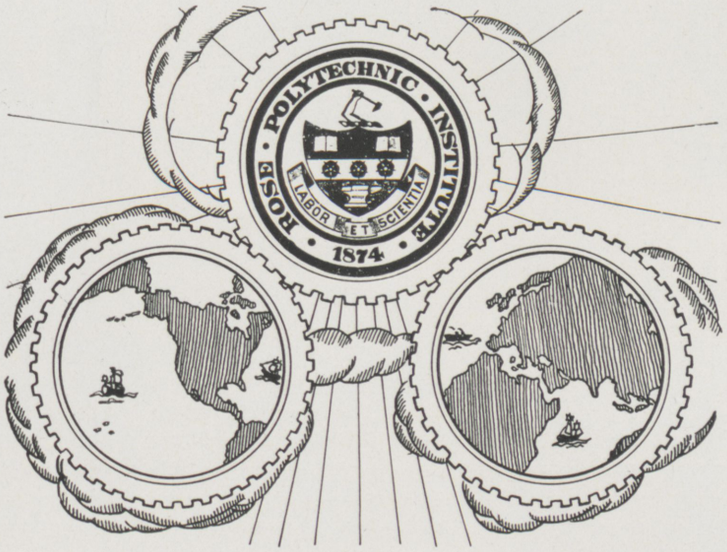


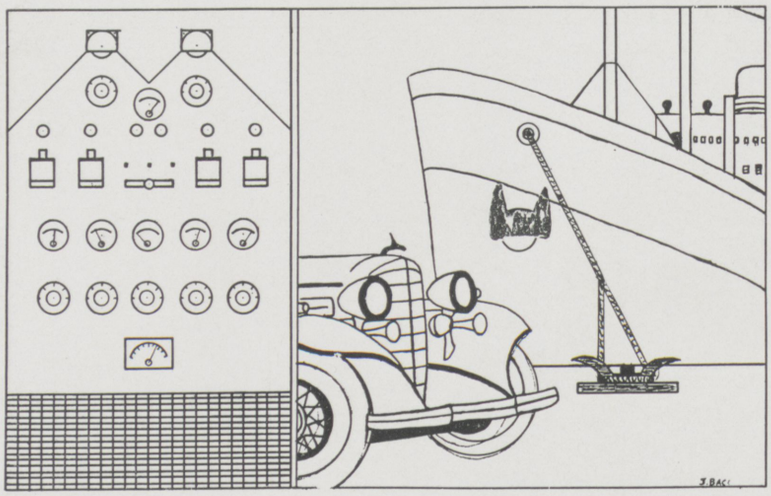
WILL YOU BE READY?

Industry is awakening. Already it is demanding technically trained men, men with engineering educations. Will you be called? Will you be ready?

Since 1874 Rose Polytechnic Institute has trained men for Industrial leadership. Well planned courses in Civil, Chemical, Electrical and Mechanical Engineering are offered. For complete information, write to the registrar.

ROSE POLYTECHNIC INSTITUTE

Terre Haute, Indiana



Research and Progress

Edited by
John A. Ritter, m., '34

Cooling Concrete

The mass concrete being placed in the Boulder dam which is now under construction is being artificially cooled during its setting or hardening period. This is an important innovation in the art of mass concrete construction and is necessary because of the unprecedented dimensions and other conditions involved.

The chemical reactions which accompany the setting of Portland cement in concrete release considerable quantites of heat which in the case in question may be expected to raise the temperature of the concrete mass an average of 40 dgrees F. above the temperature at which it is cast. Although the concrete begins to harden and lose its plasticity within an hour or so, the setting process is not completed for a long period of months. Fortunately the generation of heat becomes negligible after a few weeks.

Concrete expands and contracts with changes in temperature and therefore has a greater volume when it has a high temperature due to the setting heat of the concrete than when this excess heat is dissipated and the concrete assumes the temperature of its surroundings. As the concrete shrinks it opens up construction joints which must be filled with grout under pressure to render the structure monolithic.

The cooling process must be complete when the joints are grouted or harm may result from the adjustment between different parts of the dam. It is therefore the purpose of the cooling system to bring the shrinkage to completion before the dam is made into a structural unit by the grouting process. The cooling will also make the grouting more effective since wider openings will be obtained at the construction joints. A good job of grouting is essential if even distribution of the stresses throughout the dam and a proper distribution of the loads upon the abutments are to be obtained.

The amount of excess temperature at the end of the construction period depends somewhat upon the rapidity with which the construction is carried on, but more directly upon the dimensions of the dam. A study of the laws of cooling reveals that the time required for such a structure to lose a given proportion of its excess heat by natural process is, if other things are equal, proportional to the square of the thickness. Thus while a concrete wall five feet thick would lose about 90 per cent of any excess temperature it might have above that of its surroundings in less than a week, a wall fifty feet thick would require about a year and a half and a structure 500 feet thick would require a century and a half to lose the same proportion of its heat. The thickness of the Boulder dam will vary from 45 feet at the top to 660 feet at the base. It is sufficiently large that some means of cooling artificially must be employed to accelerate the return of the concrete to normal temperatures if it is to be brought to a stable condition at the end of the construction period.

The excess heat in this massive structure is being removed in a short period of time by circulating cold water through one inch pipes laid horizontally, spaced about five feet apart from center to center as the concrete is placed. A large refrigerating plant and cooling tower combined are necessary to provide this cooling water. Ammonia compressors for the plant have been installed on air compressors used previously in the work of driving the tunnels and they have a capacity of 600 tons of ice per day. The cooling tower is designed to cool 6000 gallons of water per minute. Part of this is used to carry away the heat from the refrigerating plant and the rest is circulated through the dam. About half the heat will be extracted by the water from the cooling tower, the rest by means of the refrigerating plant. Approximately one foot of imbedded pipe is necessary for each cubic yard of concrete to be cooled. These pipes will act as reinforcing rods in the finished concrete structure.

Propellor Sound

In order to determine how much noise an airplane propellor makes, and at what speed it makes the most noise, a motor and propellor have been set up for acoustic analysis at Langley Field. The 200 horsepower motor has a maximum speed of 3600 R.P.M. but can be reduced to 1000 R.P.M. The motor rests on a heavy supporting column which is swiveled so it can be turned through a complete circle. The propellor is mounted

directly to the motor shaft and the nature of the sounds at different speeds determined by the analyzing equipment. It is hoped that the result of these experiments will help in the design of better propellors.

Rehabilitation

From an engineering point of view the rehabilitation or remodeling of an old power plant is usually of greater interest than the construction of an entirely new plant. Greater resourcefulness is required to adapt the existing equipment to new conditions and also keep it in service while changes are being made than to start from scratch and build up. A small plant of Virginia Public Service Co. underwent such a change not long ago.

This plant had 19,500 K. W. turbine capacity in five units with a total of 4210 boiler horsepower of 200 pounds 125 degree superheat, stoker-fired boilers in seven units. It was found that the boiler room capacity did not match that of the turbines. In order to increase the plant capacity and to give certain economies three 640 hp. boilers were changed to pulverized coal. Although the boiler room was small the plan adopted did not necessitate change of building roof or walls.

Problems presented in the redesign of the plant which had to be met by the engineers are as follows:

The boilers installed were sufficient but the capacity developed from them was not enough to take care of the increasing load.

The plant needed higher boiler room efficiencies and elimination of cinder nuisance which was causing complaint in the residential district.

It was necessary to accomplish these things with the least expenditure of capital that would be justified in the resulting savings.

First, the three boilers were reset and turned around to facilitate firing by pulverized coal. Furnace liberation was kept to maximum of 16,000 Btu. The air was preheated to 300 degrees which was sufficient to take care of moisture content of the coal. The furnaces operate on a pressure of .1 to .5 in. less than atmosphere, thus avoiding any filtration outward into the boiler room. The walls being air cooled, this arrangement tends to prevent damage to them by flame.

The pulverizers were enclosed in a stationary sound-proof jacket which makes their operation noticeably quiet. The furnaces are equipped with open type burners which permit easy view of flame distribution.

The dust is removed from gas

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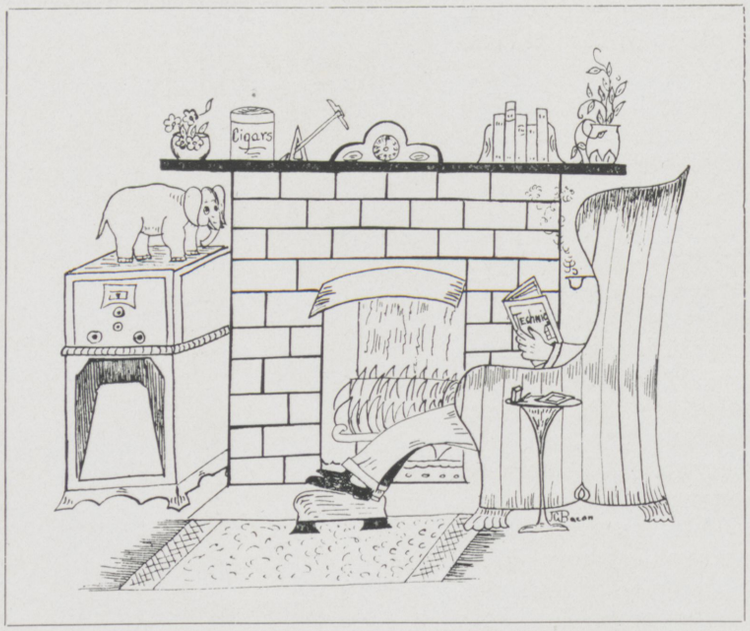

Fraternity Notes

Tau Nu Tau

On the afternoon of March 12 a short meeting of the members of Tau Nu Tau was held. The Annual Inspection Dance was discussed, but no definite plans were made about it. A motion was carried unanimously to ask Captain Stevenson to give another of his travel talks at a later meeting of the chapter.

Captain Stevenson talked about his travels in the Philippine Islands at a meeting of the chapter on the evening of April 11.

Alpha Chi Sigma

Iota's part in the 1934 Rose Show was well received. The last day of the show the chapter was host to about twenty-five Alpha Chi Sigma members from Epsilon at Indiana University and the Indianapolis professional chapter. During the morning nearly one hundred made a trip through the Commercial Solvents plant.

Two events are scheduled for April. The initiation will be held at the college on April 20. A professional meeting will also be held during the latter part of this month. Dr. Wiedemann will present the program and the date will be set for his convenience.

A large percentage of the junior and senior members of the chapter plan to be present at the American Chemical Society's student meeting April 13 and 14 at Indianapolis and the Alpha Chi Sigma meeting and dinner to be held in conjunction with it.

At the business meeting held during March, George Cavanaugh was elected the official delegate to the 1934 Conclave for which Iota is one of the host chapters.

Sigma Nu

Beta Upsilon of Sigma Nu is proud to announce the formal initiation of Carl Nelson, John Fox, Stanley Cox, Rol Donie, Rhiman Rotz, and Burt Raynes at a formal initiation held at the chapter house on Sunday, March 25. We believe that these men, five of whom are freshman, will keep up the high standard of Sigma Nu during the coming years.

The annual state convention of Sigma Nu was held in Indianapolis on April 14. A majority of the members of all of the five Indiana chapters were present. One of the discussions centered around the possibilities of a state dance which was decided to be held in the near future.

Plans are also being made for our annual spring formal which is one of the high lights of the season.

Theta Kappa Nu

Indiana Gamma had the honor of playing host to delegates from Iota Chapters at the Annual Province convention during Saturday and Sunday, April 14th and 15th. All Chapters of Iota Province were represented by delegations and after a short informal meeting on Saturday afternoon a banquet was held. A dance in honor of the visiting delegates was given on Saturday evening and greatly enjoyed by everyone. A buffet lunch was served after the dance.

On Sunday, April 15th, an informal meeting was held with Dr. Donald B. Prentice of the Institute as guest speaker. Dr. Prentice was introduced by Professor Stock and gave an enjoyable and interesting address based upon the activities and amusements of his fraternity during his college days at Yale. Following Dr. Prentice's address, short talks upon various subjects pertaining to fraternity life were given by A. B. Musick, National Executive Secretary, and Dave Easton, Province Arakon. The meeting over, the convention was officially terminated by dinner at Mother Eaton's.

Indiana Gamma will hold rough week on April 20th, 21st and 22nd, and an interesting program for the new pledges is being planned.

Theta Xi

With the first days of spring upon us the boys have diverted their attentions from ping pong to the rustic and ancient sport termed horseshoes. A tournament with the Alumni Club is contemplated as soon as they are once more in trim.

As a result of the recent election the following men have been chosen as officers for the present semester: Trusler, Mayrose, Mueller, Bard, Lyon, Marks.

An "Open House" was held on the evening of March 2nd at the chapter house. Faculty guests for the evening were: Warrant Officer and Mrs. Kearns, and Mr. and Mrs. Henry C. Gray. As usual the affair was well attended by alumni.

Plans are now underway for an Alumni Dance which is to be held on April 7th. From all indications this dance will assume the aspect of the traditional Bowery Ball held at many other chapters of Theta Xi.

Alpha Tau Omega

Fred W. Wiles was elected Worthy Master of Gamma Gamma chapter on Monday, April 9th., succeeding Harry McGurk to this office. Ernest Welsh, William Kasameyer and John Hager were elected to the positions of Chaplain, Keeper of the Exchequer, and Scribe, respectively. Other officers chosen were: Virgil Shaw, John Cushman, John Bradley and Gordon Burt.

Eleven pledges were initiated into the fraternity at a formel ceremony held on Sunday afternoon, April 8th. Prof. C. R. Wischmeyer presented pins to the folowing men: Gordon Burt, Norman Cromwell, Wilmot Moore, Dan Overholzer, Warren Sentman,, Robert Averitt, Paul Giffel, Robert Sears, John Stineman, Warren Tappan and Carl Wischmeyer.

Last Saturday, April 14th, the annual state banquet and dance was held in Indianapolis at the Lincoln Hotel. Music was furnished by Joe McCartney and his "Masters of Melody."

SPORTS

Edited by
Harry H. Richardson,
m., '35

Spring Practice

ROSE is now in the midst of its annual spring football practice which started on Monday, April 9. Spring practice is usually held earlier in the year, but due to the interruption caused by the biennial Rose Show and the ever pleasant mid-term examinations, Coach Brown was forced to postpone it until a later date.

Spring football at Rose differs slightly from that in other colleges and universities, both in length and character. It is much shorter because of the limited amount of time available and is usually terminated at the end of two or three weeks in contrast to the usual six weeks in the larger schools. It differs in character in that it is not as serious a practice as that held in other schools. This does not imply that the coach and the football candidates are not serious in their individual actions or type of play, because that would not be true, but merely that spring practice is mainly a period during which the coach tries to get a line on numerous new plays and formations that he has been formulating in his mind over the winter. Therefore more stress is placed upon eliminating those plays and formations that are out of the question as far as their use to Rose is concerned than upon such things as blocking, both team and individual, and tackling. If more time was available these other features would be taken up in great detail, but in order to have a team on the field in time for the first game of the year, it is necessary to know the type of play that is to be used. The best time to decide this last point is in the spring because of the experimental time available. However, on the other hand, a team that has any number of formations and plays is not worth anything if it does not know the fundamentals of the game. Therefore the first week's time is spent upon fundamentals entirely, while the remainder of the time is to be used up in football experimentation. At the end of the practice, it is Coach Brown's plan to have a regulation game with shortened periods in order to determine just what the newcomers can do under fire.

Because of the small size of the Rose squad, both in number and physical aspects, Rose will have to be dependent upon strategy in order to get very far in the 1934 football season. With that purpose in mind Coach Brown has a multitude of hidden ball plays, spinner plays, and new formations and shifts which will tend to confuse the defensive linemen. It is during this second or so of confusion that Rose will have to get by the opposing line and well into their backfield as we do not have enough power or speed to accomplish the same thing in any other manner.

According to spring practice dope a number of men will be performing in unfamiliar positions during the next season. Rose will again be handicapped at the end position this coming year by old man experience. Wodicka and Laughlin, both ends on last year's squad, but who have had little actual playing experience, are sure to be out for their old positions. Colburn, who played everything in the line last year until he ended up playing a good game of guard, will probably be shifted to end because of his aggressiveness and tackling ability. Presnell may also be shifted to end to team with West, an end from last year.

The tackle position has always been a great question of discussion, indecision, and inexperience; and this year is no exception to the general rule. Tait, who finished strong last year at a tackle position, is being counted upon heavily. Jacobson, a guard last year, may be shifted to tackle if guards become plentiful. Raynes and McKee, neither of whom have had any football experience to speak of, let alone experience playing tackle, which is one of the toughest jobs on the field, are in the field of competition.

There is quite a number of guard candidates. Cavanaugh, a tackle last year, is sure to be shifted to guard. Eyke, who played both tackle and guard last year will probably be used at guard most of the time this year. George Landenberger and Hatcher, both of whom are freshmen, are expected to give a good account of themselves. Leever and Cartwright, both newcomers to Rose football, may make themselves felt along the line of guard competition, although Cartwright may be shifted to a backfield spot.

Tucker, who was the able understudy to Captain Landenberger last season, will most likely be the leading candidate for the center position. However, Fox, a fullback last season, will be shifted up into the line because of his weight and line experience and will probably drift into the competition for the center position.

The Rose backfield will offer the least trouble as far as finding material is concerned as only one man graduated from the entire backfield squad of last season.

At quarterback, Bard and Hufford, both with a year's experience as quarterbacks behind them, will lead in the race for the first-string position. Hufford has had two year's experience in a Rose uniform, but Bard makes up for that with his gridiron strategy, and a lively race is to be looked for.

Forte is the leading candidate for the fullback position as he is the only member of the present backfield squad that has had any experience at the position, Cauley having graduated and Fox having been moved up into the line. However, any one of the other backfield men may be moved to fullback.

Quite a number of halfback candidates will decorate the landscape. Captain-elect Richardson and Campbell, running mates of last year, are sure to be put to some use during the coming season. Sentman, who saw quite a lot of service last season, will probably get into the swing along with Newman who was also out last year. Laughlin and Cartwright may also be in the backfield before the season is over.

This summary of spring assignments is by no means final as far as the lineups next fall will read. It is more than probable that the lineup for the opening next fall will contain names not even mentioned in this article.

New Rules

As usual, football players all over the country will have to learn some new rules for this fall's competition. The National Football Rules Committee promulgated three new rules to take effect this fall, two of which pertain to passes. All three of the rules tend to give a bigger advantage to the attacking team.

The first rule abolishes the penalty connected with incompleted passes. Under the old ruling, two incompleted passes in a series of four downs drew a five yard penalty to the offending team. The new rule allows the attacking team to throw three incomplete passes in a series of four downs without drawing any penalty. The team may throw as many as they wish without any penalty, but a kick usually comes on fourth down except when deep in the opponents territory.

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Campus News

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gathered was effectively dispelled by the cordial and gracious greeting of Miss Mary Gilbert, registrar of the Institute.

Miss Gilbert conducted the visitors through the various departments of the school, showing them the motors, machines, and other equipment necessary for gaining a technical education. To one who has no technical background, the vast amount of machinery and apparatus is surprising. It is with great pride that we realize that we have in our community one of the finest technical schools in the Middle West.

When all departments of the school had been visited, the group went to the Dormitory, where tea was served in the lounge. Mrs. F. H. Hopkins, who with her husband, is in charge of the Dormitory, was a charming hostess, and introduced the visitors to Mrs. D. B. Prentice, the wife of the president of the Institute.

Mrs. Hopkins was assisted by Mrs. Prentice, who poured, Mrs. Carl Wischmeyer, and Mrs. P. T. Baker. The tea table was attractively decorated with a centerpiece of pink sweet peas, surrounded by candles.

The success of this delightful tea and instructive trip was due largely to Mrs. Wischmeyer, who was chairman of the tour, to Mrs. P. T. Baker, who assisted her, and to Mrs. Charles Zimmerman, chairman of the Section. Those who enjoyed the occasion will long remember the charming and gracious hospitality of Miss Gilbert and Mrs. Hopkins.

Glee Club

On March 15 the Glee Club and its guest soloist, Miss Dorothy McCullough, presented a program at the assembly period of the Woodrow Wilson Junior High School in Terre Haute. Following the program all the members of the club, Mr. Bennett, the director, Mrs. Bennett, the accompanist, and Miss McCullough were the guests of the school at a delightful luncheon served at the school.

On March 18 the club sang a number at the Lenten Vesper service of the Washington Avenue Presbyterian Church.

The Annual Home Concert of the Rose Polytechnic Glee Club was presented at the Centenary Methodist Episcopal Church in Terre Haute on March 25 at 7:30 o'clock in the evening. The club sang three groups, and Miss McCullough sang two groups.

The club is now preparing to sing at the commencement exercises of the Fayette Township High School on April 19.

The Wreck

An interurban-truck crash on U. S. Highway 40 occurred in front of Rose Polytechnic shortly before eleven o'clock on Monday morning, March 26. Mr. Charles Savoy, Newton, Illinois, a passenger in a truck loaded with brick, died a few hours later in the St. Anthony's Hospital in Terre Haute. The driver of the truck lost control of it when he attempted to avoid a collision with another machine and went off the pavement onto the interurban tracks where it was struck by the east bound interurban. After striking the truck at a point about three hundred yards west of the Institute gates, the interurban car left the rails and ran for a distance of more than two hundred feet down the right-of-way before it finally lurched onto the highway and came to a stop. A truck, which was passing at the time of the accident, was forced to take to the ditch on the south side of the pavement in order to avoid being struck by the interurban.

As the interurban car blocked almost two-thirds of the highway, it was more than seven hours after the accident that normal traffic past this point was resumed. The state police joined with the Rose students and the sheriff's force in getting the traffic started and in caring for the injured. A letter has been received from the State Highway Commission expressing its appreciation to the Rose students for their cooperation in helping to restore through traffic following the accident.

Sports

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The second rule, which also has to do with passing, states that passes thrown incomplete into the end zone are not counted as touchbacks except upon the fourth down. In other years many a touchdown has been lost by an incomplete pass into the end zone from the neighborhood of the five yard line on the first, second, or third downs which counted as a touchback, automatically giving the ball to the other team upon their own twenty yard line.

The third ruling pertains to kicking by the offensive team. The new rule allows any number of men to handle the ball between the time that it is passed from center until it is finally kicked. This will tend to give a new angle to the fake kick and the quick kick. This new rule will not affect a great many teams in my opinion, as any use to which it is put must be perfect in execution which, in turn, involves a good deal of practice and time. The main use to which it will be put will be in the field of the kick. This is accomplished by having one member of the backfield hold the ball while another one kicks it. This will hasten the time for the play by about a full second or two, which means a great deal, but it takes a lot of practice to grab a ball on a pass from center and hold it out with one hand so that a teammate can kick it any distance.

An event which did not occur last year, but which is of interest to every live alumnus, is going to become a reality during the course of the coming football season, That event is Homecoming. Due to the fact that more than half of the games were played out of town last year, a Homecoming was not agreed upon. However this year things are different and a Homecoming goes along with the new deal. At the present time the last game of the season, which is with Oakland City, is under consideration as the date of Homecoming. The fact that Oakland City has never been our opponents on a Homecoming occasion has had a lot to do with

deciding so far. Oakland City, a team that up until last year would have never even been thought of as a Homecoming opponent, now has a fine team that walloped Rose last season to the surprise of everybody. In fact, they were the surprise of the year, not only to Rose, but to every team that they played. A Homecoming game with Oakland City as our opponents will be a game for you alumni to see. Let us hear from you alumni that have any choice or suggestions as to when Homecoming should be held and who our opponents should be.

Tentative Schedule (1934)

Sept. 29—Franklin at Franklin
Oct. 6—St. Joseph at Collegeville
Oct. 13—I. S. T. C. (Normal) Memorial Stadium
Oct. 20—Wabash at Crawfordsville
Oct. 27—Evansville Rose Bowl
Nov. 3—Earlham Rose Bowl
Nov. 10—Oakland City (Homecoming?) Rose Bowl

Research and Progress

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by the Cottrell electric precipitation system and it has been found that a large amount of the suspended ash is removed before the gases escape through the stack to the atmosphere. This installation has resulted in entirely eliminating any complaints from ash deposits. The precipitated ashes are mixed with water and taken away by conveyors to cars. This in itself was quite a problem but after experimenting, the proper mixing conveyor was installed and the results have been satisfactory.

It is possible now to get 400% ratings from these boilers as compared with the 250% to 275% heretofore obtainable.

"Super Clipper"

The public has just been given a first glimpse of the giant fly boat, the first to be completed of the three under construction for the Pan-American Airways in the Sikorsky factory. These boats are twice the size of the Navy planes which made the San Francisco-Hawaii flight and have a gross weight of about 19 tons. The power plant consists of a battery of four Hornet engines driving three-bladed controllable pitch propellers through reduction gears and has a total of 3,000 Hp. With 32 passengers it will have a cruising speed of 150 miles per hour over a non-stop range of 1,200 miles.

The wings are carried rather high above the hull and the engine nacelles have been streamlined into the leading edge of the wing. The wing-bracing system has been simplified, the center section which contains the four power plants is supported by a completely streamlined structure arising from the center line of the hull, and a pair of inclined struts on each side tying into the center section outboard from the engine mounts. The center section is rectangular in planform, but the wing-tips which are full-cantilevered, are strongly tapered. Ailerons extend practically the entire length of the tip sections.

Pontoons are suspended independently and no provision has been made to carry fuel in the wing floats as has been done in previous clipper ships. The rearrangement of the power plants and the elimination of much of the exterior wing bracing of previous models may be expected to result in improvement in performance.

The wing is metal structure throughout with a covering of fabric and the hull is made up of duralumin sections covered with smooth Alclad.

Power Losses

Edited by Nelson B. Trusler, e., '35

Another Rose Show has passed with all its pleasure and its work, but wasn't it rather hard to know just how you ought to take it when that sweet young thing came up and innocently asked you if you were one of the professors at the Institute? Maybe you know just how one of the faculty members felt at the show four years ago when he was asked if he were a student here.

Did you ever see a dream dancing—in the lobby of the Terre Haute House with four persons per square foot of area—no? Then you weren't at St. Pats.

Now they have to go and spoil a perfectly good week end by sprinkling exams all around it. But cheer up you'll get off for May 30th just in time to study for finals.

This line is devoted to Philip Space.

(Editor's note). The pun is said to be the lowest form of humor by critics, so if you liked that one look where it puts you.

They laughed when I walked over to the piano,—but they were right: I couldn't lift it.

"Bull" (Hairy) Richardson caused much embarrassment to members of the Junior Military class the other day when he suggested how surprised you might be if you tried to milk a cow which had been eating dynamite. Quite an experience we'd say. Why not try it for thesis? If nothing happens you can pick another thesis, if something does happen, well, you won't have to pick another.

Now here is something of note. Dr. Sousley dismissed one of his 3:30 classes at 3:30 the other day.

Three Ways to End a Dinner Conversation

1. Ask the lady on your right if she's married. Should she say "Yes," ask her if she has any children. If she says "No," ask her how she does it.
2. Ask the lady on your left if she is married. If she says "No," ask her if she has any children.
3. Ask the lady across from you if she has any children. If she says "Yes," ask her if she's married.

—Pennsylvania Punch Bowl.

She: "So you're going to France. Do you know how to speak their language? Suppose you want to say 'egg,' what do you say?"

He: "You just say 'off'."

She: "But suppose you want two eggs?"

He: "You say 'twa off' and the silly old maid gives you three. Then you give her one back. Man, its an awfully easy language."

Some freshmen thought that back slapping ended with rush week, but now they know it doesn't. It just moves further down.

I got a purpose which is high,
I shuns the flowing bowl,
I hits my books while youse guys dance.
I'm pure, I got a soul.

I got a noble duty here,
I got a urge to know,
I got ambition, and besides,
Cheez, guy, I got no dough.

—Nebraska Blue Print.

Overheard at the Fraternity Dinner Table

Student (who has been served tea): "What do you call this stuff, anyway—tea or coffee?"

Waiter: "What does it taste like?"

Student: "Paraffin."

Waiter: "Then it must be tea—the coffee tastes like gasoline."

—Michigan Technic.

Lover's Lament

If oo don't love me tay tow, and don't teep me tandin' here on these told teps tause I'm tired and teepy, but if oo do love me tay tow an' tiss me tause I ture like that tave man tuff.

Prof.: "What is the spinal column?"

Student (after a short period of scrutiny and thought): "It's a long string of bones. The head sits on top and you sit on the bottom."

All we need now is some new chairs for the new smoking room.

Did you hear about Brent Jacob trying to make an aerial attack on Doc Sousley's classroom? He missed his mark a little and crashed through the ceiling in the hall. Wahoo!!

About the most successful method of preserving bodies known to the undertakers today is that used in the teaching profession. For all practical purposes, some of the specimens treated by this method have been dead twenty years and yet appear to be in a remarkable state of preservation!

—The Iowa Engineer.

Conductor: "Madam, you will have to pay full fare for this boy."

Madam: "But he is only 10."

Conductor: "Well, our rule is long pants full fare, short pants half fare."

Colored Mammy (in rear of car): "Lawsee, next time I'se gwine ride for nothin'."

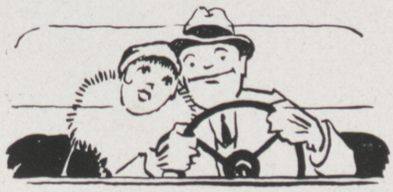
—The Armour Engineer.

G-E *Campus News*

A NEW MOVIE STAR

Lightning, commonly considered a "bad actor," plays the leading role in a sound-motion picture just released. Contrary to expectations, he gives a good performance; in fact, some critics say he "electrifies" the audiences. The picture, "A Modern Zeus," was made to illustrate how the terrific force of lightning has been reproduced in the General Electric high-voltage laboratory in order that its effects may be studied and means devised to safeguard life and property against its attacks.

The film traces the common fear of vast electric discharges, from its earliest manifestations in mythology, down through the "lightning-rod era," and pictures the ravages wrought by freakish bolts. The studio, or laboratory, scenes show the discoveries of Edison and of Steinmetz, and the laboratory at the General Electric Works at Pittsfield, Massachusetts, where artificial lightning discharges of up to 10,000,000 volts have been made. The charges leap across space, shattering blocks of wood and model buildings, and fusing sand into glass. The effects of lightning's striking models of the Chrysler and Empire State buildings in New York add to the spectacular nature of the picture. The laboratory where the actor was trained is directed by K. B. McEachron, Ohio Northern U., '13, M. S., Purdue, '20, and the picture was made by General Electric's cinematographer, John Gilmour, Union College, '27.



FREER WHEELING

For a stretch of 30 intersections along Michigan Avenue, Chicago, traffic speed has averaged only 13 mph. Chicago traffic engineers made a thorough 5-year study of the situation and designed a system of traffic control, based on the recommendations of several other nationally-known traffic experts, that is the most modern in the world. Here are some of its features: It is a progressive system that will practically double the present average speed of travel. Northbound traffic at certain intersections will be managed independently of southbound traffic. Flashing green signals will tell a driver whether he is going too fast or too slow to make a nonstop passage. A special controller will cut in to operate the lights at the Chicago River immediately after the bridge has closed, to allow waiting vehicles to clear. Even the previously neglected pedestrian will have a blue-white signal to guide him.

When the three Chicago municipal government bodies involved decided, last year, to install the system, it was found that General Electric traffic-control apparatus would meet all the unusual and complicated conditions. General Electric obtained the order, and the system is now being installed.

Ralph Reid, M.I.T., '24, was responsible for the design of the equipment, and C. H. Rex, Illinois, '26, G-E traffic-control specialist in Chicago, aided in the preparation of final plans.

ANTARCTIC AIR MAIL

In Schenectady, N. Y., there is a mailman who has, without a doubt, the longest route in the world. Every two weeks he delivers letters and postcards to eager recipients about 10,000 miles away—yet every one arrives on time. These letters go by air mail in the truest sense of the word, because they are broadcast by the General Electric short-wave station, W2XAF. Their destination is the camp of the Byrd Antarctic Expedition in Little America. Mailman K. G. Patrick, U. of Michigan, '29, of the Company's Publicity Department, occasionally gets some unusual requests. Once, a youthful balloonist wanted to send an aërial picture of himself to Admiral Byrd, but the mailman had to compromise by describing it. Letters come from all over the world, and about half of them wind up with a request for a penguin.

This air mail goes through regularly and quite clearly, thanks to a special directive antenna designed by Dr. E. F. W. Alexanderson, Kungliga Tekniska Hogskolan, Stockholm, Sweden, 1900, a G-E consulting engineer. For the benefit of short-wave radio enthusiasts: this antenna is of the horizontal checkerboard type, especially adapted to sending horizontally polarized radiations. The effectiveness and carrying power of these radiations were discovered by Dr. Alexanderson in 1924. Incidentally, W2XAF operates on a wave-length of 31.48 meters, or 9,530 kilocycles, and these programs are broadcast every other Sunday night, starting at 11 o'clock, E.S.T.

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GENERAL ELECTRIC