The Minnesota

October

No. 1

ENGINEERING COLLEGE

SAME THEME . . . SAME PLOT

but the technique has changed

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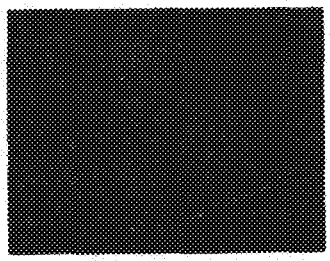

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The Editor Says:

Howdy folks, we are back again—new students—new staff—new cover—new magazine. Our aim is to please you, so your constructive suggestions will help us.

The frontispiece may keep some of you, who are not civils, guessing. The strange looking contraption called a triangulation tower is really quite a scientific structure. The large outer tower is of fairly large logs and is rigid enough to sustain the weight of two men, the instrument man and the recorder. This tower also supports the signal flag, the mast of which must be plumbed exactly above a point on the ground. It is this signal which is sighted upon from a distant station.

The inner tower supports only the instrument, and it is in no way attached to the outer tower. The reason for this construction is to prevent the inner tower from being moved due to the weight of the men.

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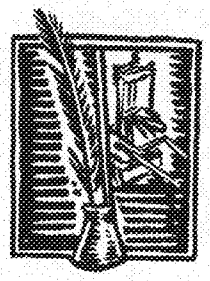

Minnesota Techno-Log

37 ELECTRICAL BUILDING U of M

RALPH MONSON
Managing Editor
GORDON ROSHOLT
Business Manager

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This Month

A TRIANGULATION TOWE

By RAY WEIDLICH

surveying the

1933 Civil Engineering Camp

at Cass Lake

By RALPH E. MONSON, C. E. '34

FIVE forty-five A. M.—the crisp clear tones of the saw resound over the peaceful surface of Cass Lake, abruptly terminating the pleasant dreams of the fifty senior civils attending camp. Suddenly from down the long line of white tents come signs of activity. Here and there white smoke curls up the smokestacks, the morning is really cool. But wait—what is this? From the lake comes a man carrying a cot. Can it be—well, if it isn't Harry! "Why in the world do you take your cot with you to your morning dips, Harry?"

"Morning dips, h——! I sleep out there to keep away from those rats in the tent." We always thought some of the things Harry told us were a bit fishy anyway. Now we know why.

The fun soon "blows over," and within a few minutes the entire camp is assembled in the mess hall ready for breakfast—pardon, roll call. Do they eat!! It's just too bad for anyone who comes late or is a slow eater. Albert surely does dish up the meals, and fifty hungry lumberjacks couldn't have better appetites. But breakfast is soon over and seven o'clock rolls around.

Since we are primarily interested in a general cross section of camp, let us follow several parties into the field. Here is one which looks interesting. That little windmill affair is a current meter with which the members of the party will attempt to measure the discharge of the Mississippi. Sounds like quite a job, but let's follow them and see. First they rate the meter in a still pool near the dam. They take no chances on using yesterday's rating as that may be changed by the conditions today. Here we are at the Mississippi. What! This? Yes, that little creek is the Mississippi river. See, it doesn't even come up to Ogrosky's knees (I mean ankles). They learn how to operate the meter and calculate the discharge, and that is just as valuable to them as though the stream were twice as large as it is.

Let's drop in on this base line party—it's almost noon so they ought to be pretty well along. Well of all things, if this isn't the most ridiculous we have seen yet. There are five boys, two at each end of a 200 foot tape and one in the middle. Suddenly they jump to their feet, hoist the tape to their shoulders, and begin running down the track as though they were being pursued by a Soo Line section crew. Suddenly they stop. One man at each end drops to his knees and begins examining the ties with a reading glass. No, on closer observation we see that the forward man is setting a pin in the tie. Why the reading glass, you ask. Well, this pin must be set with greater accuracy than can be seen by the naked eye. Do you know that on these base line measurements the boys get closures of from one in 200,000 to one in 300,000? Taking an average of these values, that means that these boys could measure a line better than four miles long, and feel sure that they were within an inch of the correct length. What's that they're saying? a new record? Sure enough, they have broken the base line derby record of 22 minutes 10.5 seconds, by measuring the 3400 odd feet in 21 minutes flat. What a record! what a record.

Let's explore this lunch basket Albert gave us and then be on our way. I make the nickle this noon. My sandwich has eleven strawberries in it and the next high has only nine. Oh well, that doesn't begin to make up for the four days that I lost by counts of four to ten and worse. Now to get back to the field. There is Segal's crossover party. You don't see them? Well, look down there on the shore of Pike Bay just between those two clumps of bushes. Yes, that's Sam himself sound asleep. We better go down and awaken him before one of the profs comes along. Sam always did seem to get things turned around. Here he thought he was supposed to have two hours off at noon instead of one-half hour.

THERE goes a group across the bay in one of the boats. That party is running in swamp shorelines on Pike Bay. No, I didn't say they were running in the swamp. Let me explain. They will go over along that swampy shore, where it would be impossible to set up an instrument, and stop their boat. With a sextant they read the angles between three points on the opposite shore whose positions are plotted on

[*Please Turn to Page 22*]

Philip Kilpatrick, Bruce Wallace, and transit number 18 (to say nothing of Wallace's pipe) ford Middle twin lake while taking stadia topography in some rough country.

upper mississippi

Nine Foot Channel

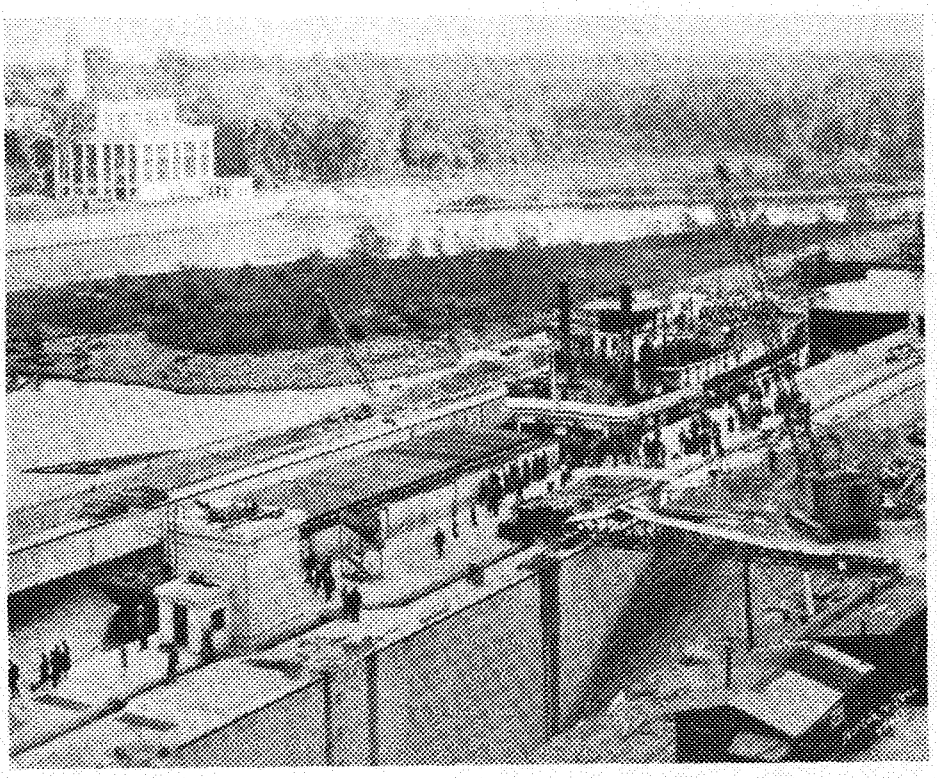
is now under way

By F. T. SCHAEFER, C. E. '34

A DREAM of the Northwest is about to be realized—the completion of the nine foot channel of the Mississippi River from Minneapolis to New Orleans. The project has been under discussion for many years, and has been a popular subject for legislative debate and campaign speeches. However, through the new federal public works program the necessary funds will be provided, and within a few years the channel will be completed. Just how much of a saving to the Northwest shipper this project will represent remains to be seen. The steadily increasing yearly tonnage indicates that the plan may meet a very pressing need of the farmer and manufacturer of this area.

The purpose of the extensive Upper Mississippi River Development now in progress is the relief of the mid-western inland area from the high rail freight rates now in existence. For example, it is cheaper to ship commodities from Moline, Illinois, by boat down the Mississippi River to the Gulf of Mexico and then through the Panama Canal to the Pacific Coast than it is to ship the same commodities directly by rail to the same destination. The same conditions apply on shipments to the Atlantic Coast.

In order to provide cheap transportation by water for the inland area adjacent to our navigable streams the Inland Waterways Corporation has been established. This Corporation operates on the Illinois River, the Mississippi River, the Mobile River, the Alabama River, The Tombigbee River and the Warrior River. It is composed of three divisions, the Upper Mississippi River Division, the Lower Mississippi River Division, and the Warrior River Division. The Upper Mississippi River Division operates between St. Louis and Minneapolis.



The S. S. Thorpe brings a cargo barge through the Twin City lock. In coming from Grafton, Illinois, to Minneapolis, under the proposed system, these barges will have to pass through 26 such locks, a total of 325 feet.

MANY products are transported by the barge lines, some of the more important are coffee, sugar, canned goods, corn, fertilizers, sisal, coke, pipe and fittings, sheet and structural steel, soap, cordage, and automobile parts. During the calendar year 1932 the total tonnage handled at St. Paul, was 24,102 while the tonnage handled at Minneapolis for the same period was 42,383, a total of 66,485 tons for the Twin Cities as compared to a total of 3,145,738 tons for the three divisions.

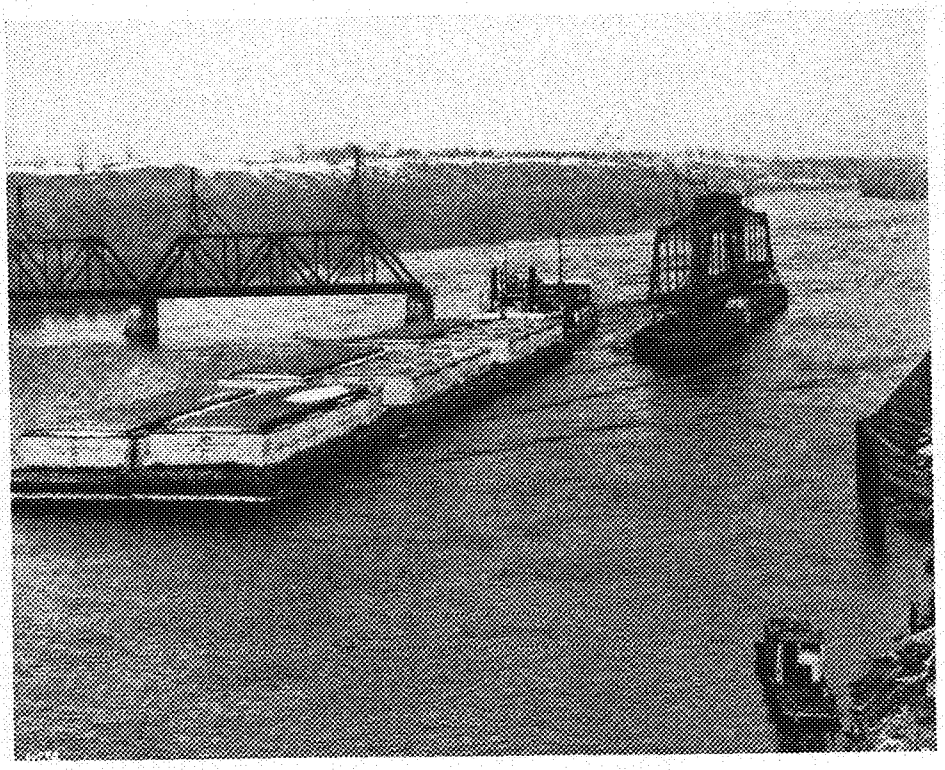
Approximately 300 cargo barges are available to traffic on the Federal Barge Routes. These cargo barges vary in size, the smallest being 126 feet in length and having a capacity of 300 tons while the larger barges may be as much as 300 feet in length and have capacities up to 2500 tons. Fifty-four cargo barges are regular equipment on the Upper Mississippi Division. Besides these standard cargo barges there are various other barges such as wharf, track, storage, shop, oil and derrick barges. The draft of a fully loaded barge may be as much as eight feet whereas the draft of the same barge may be reduced to four and one-half feet by reducing the load. In order to negotiate channels where the depth of water is insufficient the barges must be only partially loaded. This not only materially reduces the tonnage that it is possible to handle normally, but also tends to increase operating time, resulting in increased operating costs to both the Waterways Corporation and to the shippers. The schedule time from Minneapolis to St. Louis is six days down river and eight days coming up the river. This schedule is maintained exactly under normal conditions.

In spite of existing economic conditions and the low stage of water this year, which is the lowest on record, the tonnage handled by the Upper Mississippi River Division has been steadily increasing. During the season of 1932

an increase of 28% in tonnage handled was noted on the Upper Mississippi Division, a figure which shows clearly the demand for water transportation in this area.

Navigation is suspended during the winter months from November 15 to March 15 because of ice on the upper Mississippi. This leaves only eight months of the year during which water transportation is available; and if low water difficulties are encountered this operating time is materially reduced.

To eliminate difficulties due to low water a nine foot channel is to be constructed from Minneapolis to the Gulf of Mexico. This is to be accomplished by an extensive canalization of the entire Mississippi River. In the district which is above the junction of the Mississippi and the Missouri Rivers, a section about 650 miles in length, a series of 27 locks and dams is to be constructed to maintain the desired channel.



A pivoted railway bridge swings open to let the S. S. Thorpe and her tow of six barges pass. The hillsides partly covered with snow indicate that it is very early in the season. These boats invariably have to break ice on their first trips north.

THE elevation of the tail water below Dam No. 26 which is five miles below Grafton, Illinois, is 400 feet while the elevation of the pool above the Twin City Lock and Dam is 725 feet. Therefore, a total lift of 325 feet will be required. The average lift at each lock will be approximately ten feet. Four of the locks will have lifts varying from twenty feet to forty feet. The lift at the Twin City lock and dam (Ford Dam) is 36 feet and the maximum lift will be 38 feet at Keokuk, Iowa. All lifts and elevations are given on the accompanying profile. Elevations given are elevations above mean sea level.

The Twin City lock and dam and the Hastings lock and dam are now complete and the channel between the two Dams is of the desired depth. Dams No. 4, 5, 15 and 20 are now under construction. Dam No. 15 at Rock Island is practically complete at the present time. The cost of this Dam alone amounted to $7,000,000. Dam No. 20 at Canton, Missouri, will be completed in 1935.

Contracts for work on various Dams between Dam No. 5 above Winona, Minnesota, and Dam No. 26 below Grafton, Illinois, are being let at the present time. It is expected that all contracts will be let by December of this year. These contracts involve Dams No. 5, 5A, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, and 26. Locations of the dams are also given on the profile. Work is to be started on these dams immediately and will be in full swing by the summer of 1934. The completion of the work noted above will require the expenditure of $75,000,000 in addition to funds available at the present time. The cost of construction on Dams No. 5, 5A, 6 and 7 alone amounts to $20,000,000.

The locks should be completed within 18 months of the start of the work. All locks being constructed now will be of the standard Ohio River size—600 by 110 feet, being larger than the locks now in existence on the Upper Mississippi River. The largest lock now in service on the river is the lock at the Hastings Dam. It is 500 by 110 feet. The lock at Keokuk, Iowa, is 400 by 110 feet and the next largest is at Le Claire, Iowa, which is 370 by 80 feet. The two other locks are the locks

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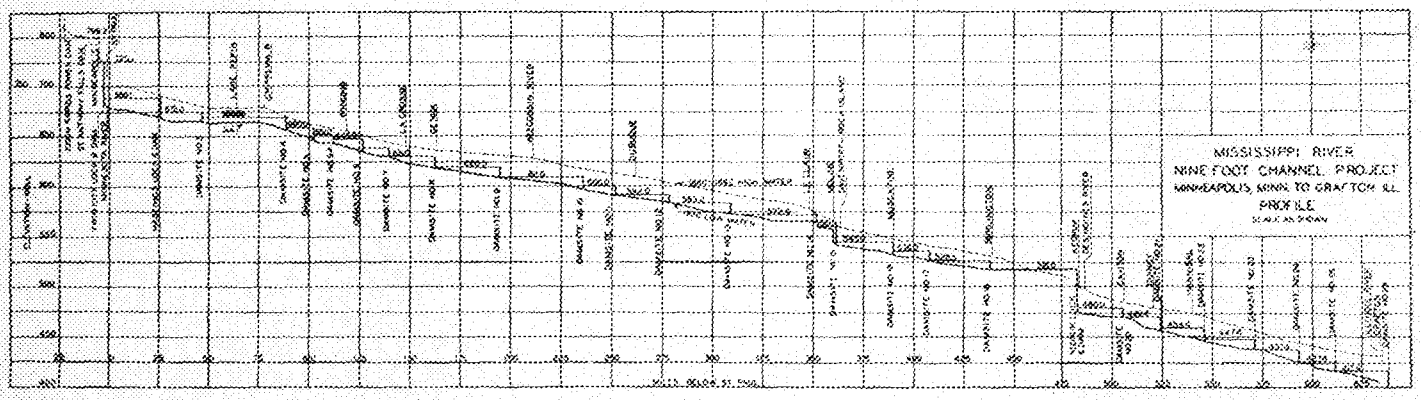
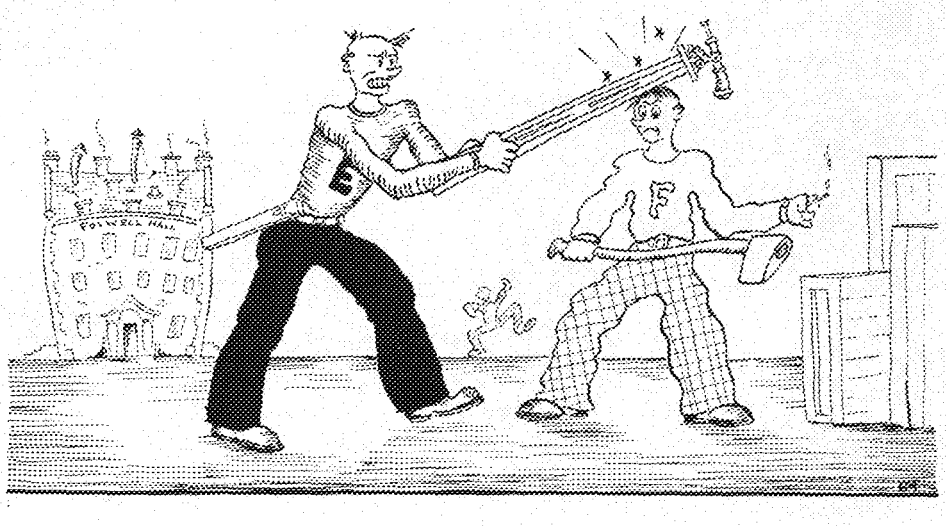


This chart shows the approximate location of all of the locks and dams which are to be built to complete the nine-foot channel, and also the drop at each dam. The figures give the elevation of each pool above mean sea level.



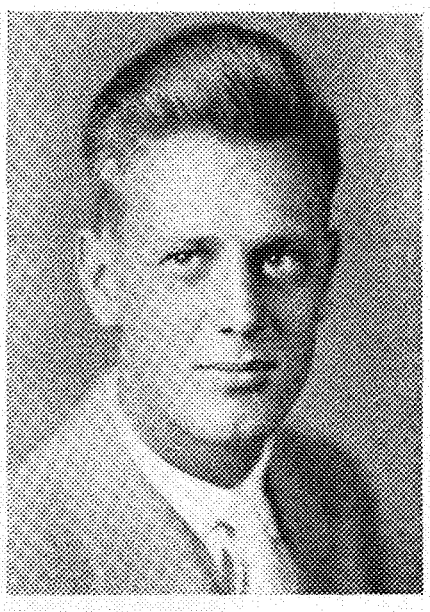
Artist's conception of the fight between the foresters and the engineers which is scheduled to be a regular part of the homecoming celebration this year.

engineers and foresters

Will Battle for the Right

to light bonfire

THE advocates of St. Pat and Paul Bunyan have crossed axe and transit again, the subject of their dispute being the annual homecoming pepfest bonfire. The foresters haven't been allowed to forget the beating given them by the St. Pats, and so under the banner of Paul Bunyan they have taken up the torch and plan to be ahead of the engineers when the bonfire construction is started. The engineers, however, have a different idea about the matter and have expressed their opinions to the homecoming chairman, Earl Larson, for his appointment of Dick Poucher as bonfire chairman.



Earl Larson, Homecoming Chairman

Threatening letters have been received from both organizations, and trouble is expected between the two camps, each having threatened to destroy the other's accomplishments.

The executive committee has received several menacing notes from the foresters to the effect that there will be no pepfest fire if the engineers are allowed to participate in the construction. Chairman Earl Larson has called the committee for a meeting to decide what will have to be done to assure that intervention by either of the two factions will not detract from the success of the fire.

The chairman of the bonfire committee has assured the homecoming group that all possible precautions will be taken to prevent any interference with the homecoming plans by the foresters. However, Perkins, Liss and Wattson of the committee are a little skeptical of the strength of the engineering group to cope with that of the Bunyan force.

Odds are being given that the miners will join forces with the foresters as they have never been forgiven by the engineers for their participation in the paint splashing episode on the steps of the experimental engineering building, and the question of their affiliation with one of the two construction "gangs" is a subject of much discussion. The miners, however, are taking an active part in the homecoming celebration this year as they are producing a show for the benefit of the alumni and friends of the University in the Homecoming Open House program on the night of the pepfest, October 27.

There may be some doubt as to who will build the fire, but there will be no discussion or dispute when the effigy of "Old Main," the Business school to you, is burned immediately following the pepfest fire. The burning of the Business school miniature will be a part of the plan of the Minnesota Jubilee committee to impress upon the alumni and friends of the University, the necessity for a new business building. A petition will be circulated throughout the crowd, immediately following this, to urge the construction of a new building.

a few suggestions

To the October Freshmen

By RODERICK Wm. SILER
Assistant Professor of Mathematics

WELL, we're back, with the weather as fine as only October weather can be, the football prospects looking good, and the College of Engineering entertaining a promising class of freshmen. This is all to the good. There is another side to the picture, however. It lies in the fact that several hundred other institutions throughout the country, where higher learning and technical knowledge are dispensed, are experiencing stimulating weather, high class football squads, and ambitious freshman classes. This means competition, in college and afterwards. It would not be a bad idea for every man entering school this fall to paste this fact of keen and inevitable competition in his hat.

I doubt if ever in the history of this country have any two years seen as great a difference between the conditions surrounding two entering classes as 1929 and 1933. Believe it or not, boys, but in 1929 we all had money. That is, compared with 1933, we had money. Which means, in substance, that if a student in 1929 found himself temporarily short of cash he could go out and get a job, and in comparatively short order correct the embarrassing situation. This simply reflected conditions existing in the world outside the colleges. The market for engineering graduates was then still good. A depression was in sight at that time, but almost everyone thought it would be only temporary, and never as severe as it has proved to be. Freshmen of 1929 came in joyously, quite certain of four pleasant years followed by a nice and immediate job in June, 1933. In the interim, September 15-October 1, 1929, the roads were cluttered up with collegiate cars, traveling towards the campus, ancient cars as a rule, but nevertheless vehicles described and licensed as automobiles. In 1933 it is very different.

It seems to me that these present conditions should be of vital significance to a man entering college this fall. No doubt every freshman must have some idea of the tough going everywhere, but probably few completely appreciate the bitterness of the economic struggle today, and the universally tragic consequences of it. These conditions are going to last for some time to come. Despite all bear stories, there is a definite improvement in affairs in this country, and the improvement should continue. But it will be slow, and there is no very evident reason to think that in 1937 the slogan will be, as in 1929, "No college man complete without a second-hand Ford." There is no particular reason, as I see it, why a man, if he is young and hairy chested, or even if he is only young, should become despondent over facts as I have given them. It simply means greater effort to meet greater competition than graduates of from five to fifteen years ago encountered. And it should not be forgotten that a man entering college today is having, to begin with, a break of luck in being allowed to prepare for that struggle which it is impossible to escape.

IF A freshman will keep his eye on the great object of going to college, which is not simply to be collegiate nor even to get a diploma, but to prepare himself for later life, he will be able to face with a good deal more equanimity certain things which are bound to bother him more or less between now and Christmas. I imagine that what troubles a freshman as much as anything is the impersonal character of the University, the apparently appalling indifference of everyone as to whether a freshman is in existence or not. After all, this indifference is more apparent than real. Sensitiveness to it is due chiefly to the natural shock which an individual but recently a senior in high school experiences when he finds himself suddenly tumbled from that eminence into the position of a humble freshman in a university with thousands of students. It is nothing to become permanently discouraged over. College seniors get the same surprising bump when they take their first job after graduation. I suppose that a college freshman's peculiarly lowly status has been developed in the past with the intention of bringing forth in him that quality known as modesty.

Possibly the work at the University will seem to a freshman vastly harder than what he found in high school. It may seem at times that instructors are trying to load him up in a couple of weeks with all the knowledge it has taken mankind some thousands of years to accumulate. If such is the case the chances are that the student is simply seeing things. For as a matter of fact the university courses have been planned, not for a race of mental giants, but for high school graduates of average ability, industry, and health. In fact it is probable that a student can be a bit shy in any one of these three directions and by putting on extra steam elsewhere get along. So that if a man in his first year finds himself falling behind it might be well for him to ask himself if he isn't simply folding up at this his first taste

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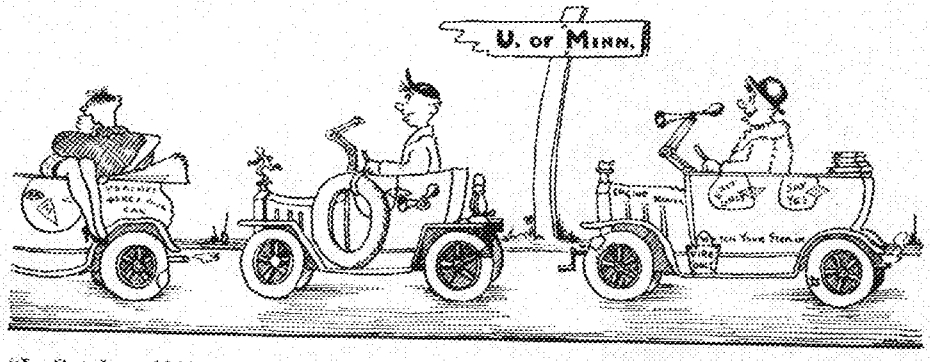

"In October, 1929, the roads were cluttered up with collegiate cars traveling toward the campus . . . . . vehicles described and licensed as automobiles."

the manufacture of BEER - - -

a lesson in cleanliness

By RALPH E. MONSON, C. E. '34

To satisfy many inquiries and questions regarding the processes included in the manufacture of beer, the Techno-Log submits this article in which an attempt has been made to clearly outline the general steps in the industry. For the information used in writing this article, the author is deeply indebted to Mr. Charles Kiewel, vice president and general manager of the Minneapolis Brewing Company, and to that company for the loan of engravings used herein.

IN THE minds of many, the manufacture of beer brings pictures of the basement home brew plant or the back yard moonshine still where dirt is the prevailing factor and the product is only secondary. A far cry from this is the modern brewery where cleanliness and purity of product are prime factors. No kitchen is more carefully cleaned and sterilized than is the brewery, and no meal is prepared under more sanitary conditions than is the present 3.2 beer.

The entire interior of the buildings which house the brewery and offices resembles that of a fine home. Clean, polished floors and woodwork, beautiful stairways, interior architecture, carried out to the same extremes as a home, are all features common to the present brewery. Every effort is made to keep the product clean and pure, and to keep the building and equipment in first class order.

Before going into the process, however, let us examine a few statistics regarding the brewing industry. Assuming a brewery of 500,000 barrels per year capacity which was in good condition at the time prohibition came into effect, it would require between $300,000 and $400,000 to put that plant back in operation in 1933. This amount represents repairs to buildings and machinery, cleaning and overhauling of tanks and other equipment, and other miscellaneous items, most of which are labor. That goes to explain why the return of beer and the reopening of the breweries gave employment to so much labor. After this brewery is put in operating condition, between 1000 and 1500 men are required to keep it in operation. When the many thousands in the distributing organization are taken into consideration, the tremendous relief of unemployment can be readily appreciated.

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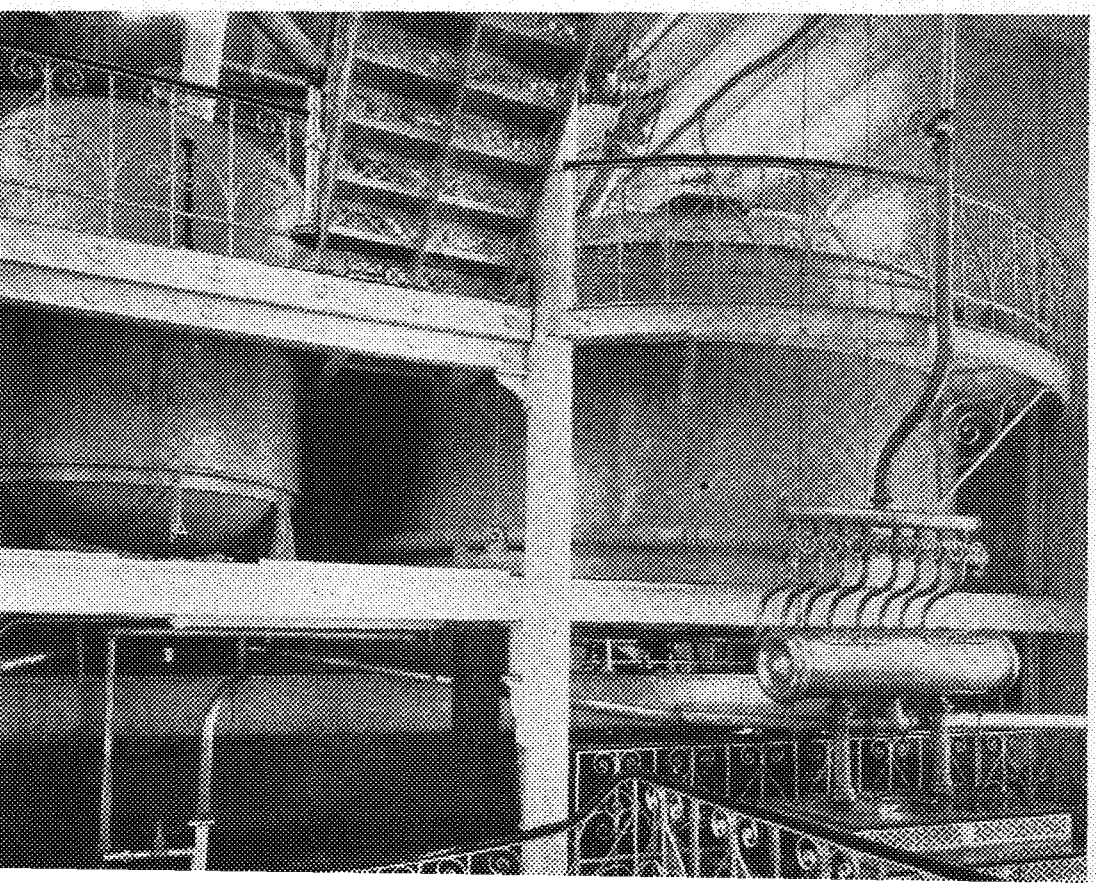
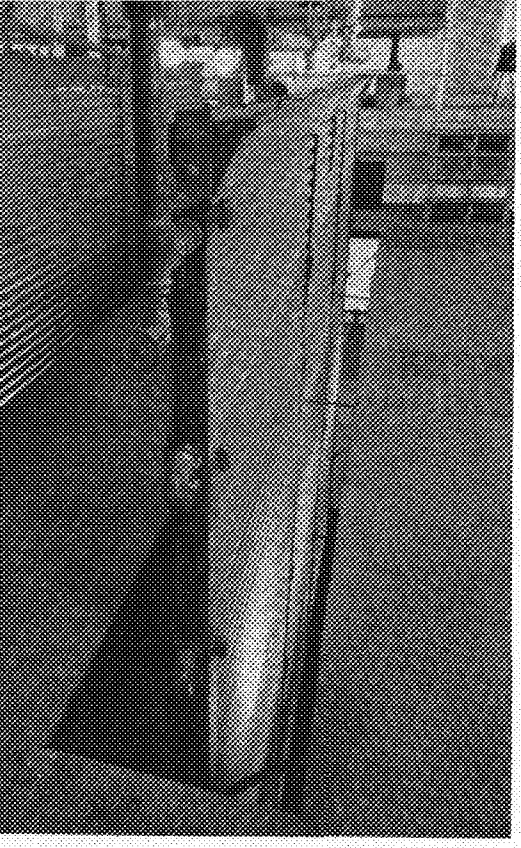
This interior view of the Minneapolis Brewing company's brewery shows two of the huge mash tuns in which the malt and water are mixed to form the mash. This view is a typical example of the character of interior architecture employed in the building. Walls, floors, ceilings, and equipment are all kept spotlessly clean.



OF PARTICULAR interest to us, however, is the process of making the beverage, and the equipment employed. The process, first of all, is a natural and not a mechanical one. For this reason there can be very little improvement made in the methods or products used over those employed in the same industry for many years. The brewery provides the proper conditions for the natural processes which combine to produce beer, but it is really nature itself which does the work. This is evidenced from the first step of the industry through to the last.

The transformation of barley from the grain form to malt is the first step. This is usually carried out as a separate industry, although in some large breweries in this country and in many of the breweries in Europe, the malting process is carried on at the same brewery where the beverage is made. The essential of malting is to change the starches in the grain to sugars, since sugar is the base of all beer. This is accomplished in the following manner. The barley is first soaked in water for about 40 hours. It is then placed in the proper temperature conditions to cause it to germinate. The process is similar to the sprouting of the seed in the ground. When the sprout approximately one-quarter of an inch long has formed,



The beer in passing through these huge coolers is cooled from near the boiling point to a temperature of 47.5 degrees Fahrenheit, at which temperature fermentation takes place. The coolers are operated by large refrigerating machines.

●

the moisture is removed, and the barley is brought back to a dry condition in kilns. It is this series of actions which changes the starches of the grain into sugars. The final step in the making of malt is to grind or crush these grains into a fine state. The product is then ready to go into the mash.

THERE are two essential elements to the mash. The first is the malt, and the second is the water. A generous supply of cold pure water is essential to the production of good beer. Most plants have their own wells and treat the water they obtain to remove undesirable impurities. A moderate amount of calcium sulphate (Gypsum) is desirable, but iron in the water is harmful. The supply must be free from bacteria and organic material or the natural processes cannot be carried on properly, and the batch will be spoiled.

Malt is placed in the mash tun, a large copper tank with a fine copper screen in the bottom. Hot water is then added to the malt, and allowed to percolate down through it. The mash, however, is not raised to a boiling temperature. The procedure is very similar to that of steeping tea. After the water has been given time to percolate through the mash thoroughly, the liquid is drawn off through the fine copper screen in the bottom. The screen retains the malt which is sold as dairy feed. The liquid which has now been drawn off contains a definite amount of malt sugar. By properly regulating the quantities of malt and water added to the mash, a constant gravity of the liquid is maintained. For 3.2 per cent beer, the sugar content is maintained at from 11.5 to 12 per cent. The liquid which is drawn off, then, contains none of the barley malt from the mash.

The liquid is next run into huge steam jacketed kettles where it is held at the boiling temperature for four hours. At this point the hops are added, and the mixture is removed to another tank known as the hop jack. Here the hop flavor is absorbed by the liquid. (It is interesting to note that the hops add nothing to the alcoholic content or base of the beer, and are a flavoring medium only.) In the bottom of the hop jack is another fine copper screen through which the liquid is drawn off leaving the hops. This by-product is of no use except as a fertilizer. The liquid thus obtained is known as the wort.

Next the wort is pumped to a storage tank in the top of the building from which it is allowed to run slowly down over the coolers. These coolers, shown at the upper left, reduce the temperature of the wort from the almost boiling temperature of the hop jack down to a temperature of 47.5 degrees Fahrenheit, this being the fermenting temperature. The wort then goes to the settling tanks where the yeast is added. It is allowed to remain here for 12 to 16 hours after which it goes to the fermenters.

Fermentation is carried on at a temperature of about 40 degrees Fahrenheit and continues for eight days. During this time there is a great deal of carbon dioxide gas given off which is collected and stored for later use in carbonation. The effervescence of this gas causes considerable agitation of the liquid, but at the end of the eight days, this agitation dies down. After the yeast has settled to the bottom of the tank, the liquid is drawn off leaving the yeast in the bottom. An interesting note in this connection is that the yeast is not used up, but continues to multiply. Once supplied, the brewery has a continuous supply of yeast which can be used over and over as long as it is kept clean.

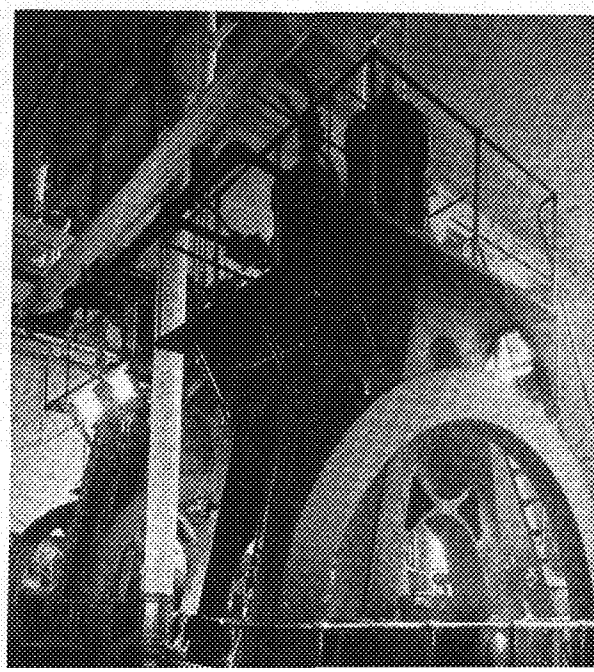
The beer then goes to storage for aging. There are two common types of storage tanks. One is a steel tank lined with glass, and the other is a wooden tank lined with a paraphin-like varnish. In the first type, the glass serves to keep the beer from coming in contact with the steel where contamination might result. In the second type, the varnish keeps the beer from coming in direct contact with the wood which might cause it to change flavor. Here, as throughout the rest of the process, the huge tanks are kept completely covered and protected from impurities of the air as well as from contamination through contact with the containers. In the storage tanks there is no action, and the process is simply a natural process of aging and mellowing. Since the return of beer last April, there has been much propaganda, and many experiments were conducted on short periods of mellowing or aging. The huge demand which so far exceeded the supply has forced many brewers to put their product on the market before it was properly aged. The best beers should be aged in storage for five months, and no doubt, after the breweries catch up with their orders, the aging period will be increased to that amount.

One month before the beer is to go to market, it is placed in a container which will carry pressure. To the aged beer in these containers is added 10 per cent of beer out of the fermenters. The fermentation of this percentage forms the

[*Please Turn to Page 17*]

●

These two huge refrigerating units or ice machines are located in the engine room of the Minneapolis Brewing Company plant. Their purpose is to cool the beer to the proper temperature for the fermenting process, and to keep it at that temperature throughout the operation. Note how clean and orderly the equipment is maintained.



THE MINNESOTA
TECHNO-LOG
UNIVERSITY OF MINNESOTA

RALPH MONSON
Managing Editor

GORDON ROSHOLT
Business Manager

Other staff members will be announced in the November issue of the Techno-Log.

RAMBLING REMINISCENCE

WELCOME is one of an editor's first thoughts when the subject of editorials for the first issue is brought up. Although "welcome editorials" are old, they are not useless nor is the idea worn out. When we meet a friend whom we have not seen for some time, we greet him—shake his hand, inquire as to his health and business, ask about his family, and if time permits we may even reminisce a bit.

So with the Techno-Log. In bringing this, our first issue for the year, into the hands and before the eyes of our readers, we feel that we are greeting an old friend, or perhaps many old friends. Let us reminisce just a bit. This is the first issue of the fourteenth volume of Techno-Log. For thirteen years, then, the magazine has been familiar to engineering students.

During these thirteen years, some changes have taken place in the magazine. Glancing through an issue of 1920, we find this first article, "Service, the Soul of Business" which begins as follows, "Mr. Chairman and Gentlemen: I am always very happy to meet with you engineering students . . . . ." Following this article is a water wheel turbine test, covering three pages and containing seven graphs and one apparatus chart. With all due respect to the staff of 1920-21, no one can deny that the issues of the past few years have been more attractive to the eye as well as more interesting to read.

It is not our purpose to brag, we are merely reminiscing. Few if any of the members of the present student body were on the campus at that time. So it may be 13 years from now. The editor of that day may pick up a 1933 or 1934 issue of Techno-Log and find it just as much different from his magazine as the 1920 issue is from ours. But, so the world goes on, and so things change. We must change with them, and therefore we must be willing and ready to accept suggestions and change our thoughts and actions from time to time to meet the suggestions.

Well, this is just a rambling reminiscence, but it leads us to a thought. Techno-Log, not unlike all other organizations and all individuals, must be and is ready to accept changes which will cause a more complete fulfillment of its purpose. Therefore, tell us what you like and do not like about this issue. Drop a line, or come in and talk it over; your criticisms are always welcomed.

—*R. E. M.*

HUMOR PAGE

WHEN you think of an engineer, you do not think of a stately, serene gentleman with a tuxedo and winged collar sitting in a deeply cushioned chair and looking for all the world as though the fate of the universe rested upon his mind. Neither do you think of a delicate "sissified" creature who flits along as though he were doing a dance, and who never sits still long enough to seriously consider any problem. Neither of these two typifies the engineer, although they perhaps represent two opposite extremes.

In contrast, you will commonly picture the engineer as a plain, simple man, but one who can sit down and work through a problem of any sort with cool deliberation and mathematical precision. He is not a man who allows everyone else's business to bother him, nor is he inclined to be excessively frivolous. He enjoys plain living and plain entertainment and does not like to have his serious thoughts interrupted with frivolity.

So, in planning this issue for a group of men who are soon to be practicing their profession, the editor has decided to try something a bit different from what has been practiced for the past several years. That, as many of you have doubtlessly noticed, is to omit the so-called "Humor Page." In so many cases, this page has brought distress to the staff and in so few cases has it really been worthwhile that we have decided to omit it for one issue and then await the reactions. The staff is open-minded, and hopes only to please and satisfy the student body for whom the magazine is published. We will be glad to publish any open letters on the subject, and welcome any suggestions which may be offered.

PUBLIC SPEAKING

EVERY engineering student has been repeatedly told that when he gets out into the world, "He will have to sell himself." Not only must he have amassed a certain amount of knowledge, but he must be able to apportion desired bits of that knowledge to his clients in a delectable and digestible manner. Very few engineers have developed the ability to speak easily and intelligently in public. Engineers are usually so highly specialized educationally, that they just do not speak the language of the people. A commissioner of public works has stated that "the village wag with his fluent tongue can

impress the public better than the engineer with his authentic but awkwardly presented technical verbage."

The only way to overcome any type of shyness, is to become more familiar with its cause. One can conquer his shyness of speaking before the public only by doing much public speaking. At the university this opportunity is presented in the many interesting and profitable seminar courses offered and in the regular classes in public speaking and elocution.

—*M. C.*

LOOK AHEAD

THE present economic depression has presented another problem to the graduating engineer. Assuming that the probability of employment will be greater this coming June, the newly graduated engineer will nevertheless find the way blocked to what few jobs there will be. As was to be expected, a very large percentage of last year's Senior class have returned for graduate work. Next Cap and Gown Day will find not only too many Bachelors of Engineering marching in that parade, but also a surprisingly large number of Masters of Science. Competition for jobs will therefore be between Masters, with the Bachelor not even given a show; for who will employ men with four years training when men with five years training are available at no extra price.

This means only one thing. The prerequisite for a job is now advanced education. Engineering has involuntarily become a five year course, with merely two diplomas at the end, instead of one. The far seeing student, realizing this, will plan accordingly. A highly specialized branch of engineering should be followed, taking all prerequisite courses required for graduate work in that field. Sophomores and Juniors have every opportunity to follow such a course, and it will pay them to look ahead.

—*M. C.*

MANUFACTURE A "PULL"

MANY engineering students at Minnesota have hopes of obtaining positions with local engineering firms after graduation. Usually, if they apply for positions via the employment offices of each company after they have graduated, their hopes are soon crushed, for they have not that mysterious thing known as "pull." With so many older engineers among the unemployed, young engineering graduates are finding it extremely hard to obtain real engineering positions by merely applying for them.

Many firms want men with some specialized training, but have not the desire or the means to train the men themselves. Refrigeration, air conditioning and humidity control, diesel engine operation, electronics, television, electricity in medicine, aerial surveying—these are only a few of the fields which offer special promise to the engineer of the future, if he will secure training in them today.

Pick out the company you want to work for—find some excuse to visit the place, even if you just go over to borrow some equipment or material for a seminar lecture demonstration. Write articles on this company's products and manufacturing methods for your college magazine, give seminar talks on different phases of the company's practices, get to know as many people as possible in the company, show your interest in the company in every possible way, and you may find a position waiting for you when you receive your diploma.

—*L. J. M.*

Dean Leland's Pen

A Word to the Freshmen

YOU have entered the University and your respective courses on faith. You have confidence in the University, its objects, its plans, its administration, and its staff. You have come here at considerable expense and, in many cases, sacrifice on the part of your parents in order that you may take advantage of the opportunities offered by the University and the State of Minnesota. You believe that these opportunities are worthwhile or you would not begin a four- or five-year course of study, which involves a valuable period of your lives and heavy expense, not to mention serious hardships and difficulties to be overcome by many of you in order to come to college.

Your purpose in coming to the University is to obtain instruction, training, and a certain amount of practical experience, in preparation for life work in specific fields of engineering, architecture, and chemistry. You know that the courses which you are undertaking have been planned by men who have had experience in these fields and who have made the training of young men and women for these professions their principal occupation and interest for many years. You do not know why certain subjects are included in your courses. You may not understand why certain requirements have been established which may not seem at all necessary. Still, you have faith in the University and your college and faculty so that you do not waste time and energy in trying to avoid the regular courses and requirements, but keeping in mind the final goal of graduation, realize that the college course consists of a large number of steps, each of which must be surmounted if the objective is to be successfully reached.

THE technical professions are made up of a succession of problems. In the college course, you receive training in attacking and solving problems of wide variety and increasing difficulty and scope. This practice in the solution of problems during the years in college is preparation for the solution of the larger problems of professional practice after graduation. Therefore, it is essential that problems be attacked and successfully solved rather than avoided. Each difficulty should be treated as a problem and surmounted, in order that the necessary strength and growth be developed through this exercise.

The fact that you have been admitted to these courses testifies to your successful completion of your high school preparation with a sufficiently high record to justify the expectation that you have the ability to complete the college courses you have undertaken. The best possible indication of this ability lies in a satisfactory high school record. You may be certain that if you devote yourselves to your studies industriously and continuously, you have a favorable prospect of success.

—*O. M. Leland.*

where do Minnesota Graduates find their jobs?

By LADDY MARKUS

In this, the first of a series of articles telling what Minnesota men are doing in our local engineering firms, we briefly sketch the work done at the plant of the Minneapolis Honeywell Heat Regulator Company.

WANDERING through the factory and offices of the Minneapolis Honeywell Regulator Company, we ran across a surprisingly large number of Minnesota men—every one of them busy. This firm is now working at peak production, with hundreds of orders piled up waiting to be filled, and many more coming in each day. The pessimists of the company look doleful and say it's only a seasonal rush, but here are the facts: more people are being employed now than in the peak days of 1929—more orders are being received than ever before in the history of the company—and two and even three shifts of workers are used in almost every department of the factory.

Honeywell has redesigned most of its products during the last two years, and now punch press work is being used wherever possible to speed up production and cut down manufacturing costs. Old heat control circuits have been improved—new circuits and new equipment are being added to their line. The Thermochron, a new thermostatic control which smooths out the peaks and valleys of the temperature curve obtained in a room controlled by an ordinary thermostat, is taking the country by storm. A new humidity control using a human hair as the humidity-sensitive element, and operating on changes of two per cent in relative humidity, is now in production.

The mercury switch department of the company was moved here from Elkhart, Indiana, early this year. Automatic tube machines similar to those used in making radio tubes are used in making the more common switches, others are made by expert glass blowers. Some of the more recently designed switches have four and even more electrodes sealed in a glass tube, with a small amount of mercury moving from one set of electrodes to the others as the tube is tilted. Some are capable of handling up to ten amperes at 110 volts, and some are so sensitive that they will open and close circuits if tilted one half degree.

The company elected to come under the Scientific Instrument Makers code soon after the NRA drive began. This meant shorter hours for almost every worker, with the same salary as before plus a 5 per cent increase. Now everyone is working forty hours a week again, and the weekly pay checks are bigger than they have been for some time.

University graduates who begin work at Honeywell are usually given testing or inspection work to start with, but soon are promoted to more responsible positions throughout the factory. You can see what a wide variety of positions our men are holding now, from the short notes given below for those Minnesota grads whom we could locate at the plant.

PROFESSOR S. CARL SHIPLEY, head of the engineering department at Honeywell, has been so closely connected with the development of our Mechanical Engineering department, as instructor in 1907, assistant professor from 1908 to 1917, associate professor in charge of training auto mechanics for the army in 1918 and 1919, professor in 1921, and in 1923 as head of the mechanical engineering department, that we place him first in the list of Minnesota men at Honeywell, although he received his ME degree from the University of Cincinnati. His duties are many and varied, and he's always busy coordinating the efforts of the various production departments with the drafting, design, and developmental departments over which he has charge.

'10 ME—GEORGE DU TOIT is a Mechanical who's made good at Honeywell—he has been Vice President in charge of production for some time. George has complete charge of the production lines of the plant, and he determines whether 100 or 10,000 of a certain apparatus will be made.

'13 EE—RUTCHER SKAGERBERG joined up with Honeywell some two months ago, and is in charge of air conditioning and temperature control sales for large buildings. You'll find him up on the sixth floor, with an office all for himself. He expects to be busier and busier each month, for air conditioning of homes and business establishments is perhaps the most rapidly growing field in engineering today.

'28 EE—CARL SWANSON, business manager of the Techno-Log in the good old days, has a fine test bench all for himself in the relay inspection department of Honeywell. Carl started work here this summer, just in time to get the benefit of the pay raises of the NRA code.

'29 EE—WILLIS GILLE is visiting the Century of Progress Exposition during his vacation this month, and we're all praying for the safety of all poor cats and dogs that may live somewhere on the road from here to Chicago. Willis has been listening to reports of the Fair all summer, and has gathered almost a library of literature of the exhibits. Still we doubt whether he'll see everything worth seeing in the one short week he has.

Willis has had a busy summer as Development Engineer at Minneapolis Honeywell Regulator company and is slowly but surely learning to cuss. It's his job to give advice in the design of new heat regulating equipment, to help build working models, to chase around from milling machines to punch presses to screw machines in getting the product into production, and then to show the factory how they've made every part wrong, all because they wouldn't listen to him in the first place. It's a busy and interesting life, with something new every day to keep his brains working and his feet off the desk.

Willis is married—no children as yet—known to play golf at times—and is seldom seen in the noon-hour poker games at work.

'29 EE—JACK GINNATY, editor of the Techno-Log way back when national advertising just about paid for the magazine, joined the gang at Honeywell this summer, and is now inspecting and adjusting relays and temperature controls. Jack still likes to celebrate after the day's work is done, and has honored more parties than he can remember with his presence this summer.

'29 EE—JOHN KRIECHBAUM, after completing the Westinghouse Test course at Fort Wayne, Indiana, in 1929, came to Minneapolis, and is now smoking out the engineering department with his famous but ancient briar pipe. John's duties are rather varied—he straightens out production difficulties, watches the quality of parts being produced, handles the orders from foreign countries for special voltage and frequency equipment, assists in the design of new apparatus—always busy, and always doing something different. He's been married since 1929, and has one little girl to his credit. You can't get in touch with him after seven each night at 4910 Emerson, Minneapolis, for he asserts with a sober face that he spends his evenings sleeping.

'29 ME—MELVIN FEDDERS has a desk right next to John's in the engineering depart-

ment of Honeywell, and is doing just about the same type of work, a little of everything. Mel manages to get rid of his pennies at the noon hour poker games each day. He trades them for nickels and dimes. He's been married for some time and pretty nearly owns his own home.

'29 EE—John Perotti came to the company immediately after his graduation in 1929, and is now in the Time Study department. Jack was married this summer, but we don't know the details as yet.

'28 EE—Frank Sweeney has been at Honeywell for four years now, and began his work in the production department. Frank is now in the Time Study department with Hub Sparrow and Jack Perotti, where he studies the operations made by each worker in manufacturing or assembling different parts, times the operations with a stop watch, and then gets out the slip-stick to compute the piece work rate for that operation. These boys have to know a bit of human nature, too, for some of the young ladies at Honeywell become very, very tired when they are being timed for piece work rates.

'30 EE—Hubert Sparrow was clerk in the drafting room for about one year, and in the Time Study department after that. Hub is coming up to the engineering department as assistant to Mr. Gille sometime this month—and here he'll be kept busy doing the thousand and one odd tasks which can only be done in the engineering laboratory.

Hub, together with Frank Sweeney, Willis Gille, John Kriechbaum, Bill Martenis, and Laddy Markus, will be taking a course in Electronics taught by Dr. Hartig in the Extension Division here, and they expect to get all the latest dope on Thyratrons, photocells, and all the other new commercial tubes that are slowly being adopted by industry.

'31 ME—William Martenis, handsome son of our illustrious Mechanisms prof, still enjoys his poker during the noon hour at Minneapolis Honeywell, but won't admit just how much he's in the hole. Bill is in the testing department, and craftily manages to get life tests of temperature controls assigned to him—an ideal maneuver, for once the test apparatus is set up, he can let the automatic temperature recorder do the rest of the work. Bill and his father assisted Mr. Shipley, head of the engineering department, in dishing out the hamburgers and potato salad at the annual picnic supper given by Mr. Shipley this summer for the members of the engineering department.

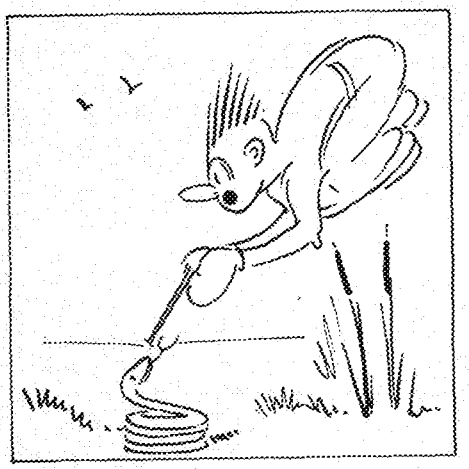
'33 Arch E—Charles Herbert Starkey has deserted his drawing board, and is now testing relays and temperature controls at Honeywell.

'33 EE—Laddy Markus has been working in the engineering department of the company during the summer, doing test work, experimental work with vacuum tubes, and constructing a Cathode Ray Oscillograph.

Laddy visited the Century of Progress just after graduation, driving down with M. O. C. Johnson, '30 E.E., and Oscar Norgorden, '31 E.E. They stayed in Chicago for three days, visiting the Fair twice, and spending the third seeing Chicago from the elevated, and visiting a few of Chicago's parks. One flat tire and one almost flat dog helped drive off the monotony of the trip home. They're still trying to figure out how one tiny dog can make so much noise.

Laddy plans on keeping a watchful eye on the Techno-Log this year, so you should find him rather often in Room 37 Electrical building after 4:30 in the afternoon. He still spends his evenings on the farm, but hasn't hit any more bridge center piers with his Ford for almost a year. Come Station. R. R. 3, St. Paul, is the address.

'33 ME—Chester Sines has had three jobs since graduation—as assistant to Professor Algren in the Experimental Engineering building, as machinist for American Can company of St. Paul, and now as machinist



'28 James B. Ringwood is on topography along the river and inland from Winona. He writes that the rattlesnakes are pretty thick, and will send us the rattlers as soon as he gets a big one.

in the engineering department of Honeywell. Chet is now doing preliminary production work on a line of Modutrol motors which have recently been completely redesigned and are now almost ready for production in large quantities.

While working for Mr. Algren this summer he and Clarence Lund, '33 ME, received a special degree in pipe fitting, under the able instructions of Doc Doty.

The future engineer of the family is now almost three years old, and is rapidly becoming a nuisance, according to Chet. No more peaceful naps for him after dinner each night—he spends his evenings keeping the kid out of mischief, and answering the thousand questions of an inquisitive mind.

'33CE—John Hubbard spends his days in the "cold" room at Minneapolis Honeywell Regulator Company—a room where it is always seventy degrees hot or cold. John's official duties include the inspection and adjustment of room thermostats. It's a real thrill to walk through the factory with John and watch the smiles the young ladies have for him. We must remember that St. Pat's have always been popular with the ladies here at Minnesota.

General Alumni Notes

Architecture

'31—James S. Dovolis—If you run across a highway with the curves banked the wrong way it might be the fault of the Architectural Engineer named Dovolis. Jim is planning roads for the State Highway Department. Marvin L. Kline, Architecture '29 is also working in the department.

Chemical Engineering

'29—Leonard P. Moore is now employed as a research fellow for the Frazer Pulp and Paper Company at Montreal, Canada. Leonard received the degree of Doctor of Philosophy last May at McGill University.

Civil Engineering

'33—Charles Britzius, captain of the 1933 Minnesota tennis team, spent the summer gathering more honors in tennis. He won the northwest doubles championship in tennis this summer, and the National Park Board Championship in the matches at New York, with Billy Schommer, a member of the freshman tennis team, as his partner.

Electrical Engineering

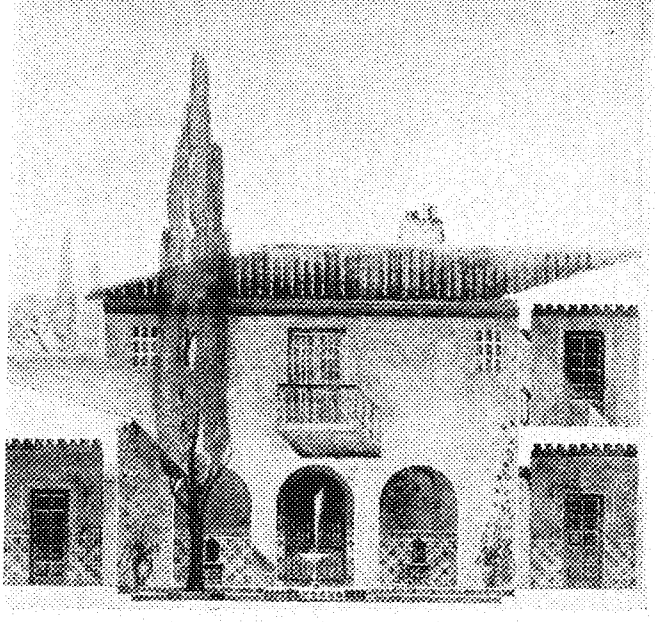
'27—John H. DuBois took the vows of marriage this past summer. He is employed in the refrigeration department of the General Electric Company's office in Chicago. Luckily for him he gets a chance to cool off at his work as his bride is quite the hot little number, we are told.

'33—Paul Erickson tells us he is working at Swift's packing plant in South St. Paul. Paul always said he would start bringing home the bacon as soon as he finished school.

Mechanical Engineering

'33—Millard Borgeson, who kept his marriage a dark secret all through his senior year, now proudly announces the birth of a baby girl. His classmates suspected something, for an application for a license did appear in a Minneapolis paper under his name some time back, but he allayed their suspicions with a statement that someone was playing a joke on him.

'33—Roman Arnoldy is working for the Standard Oil Company in Minneapolis, and is applying his knowledge of Mechanical Engineering to the science of greasing anything on four wheels. Roman, who was manager of the Band last year, met some Socony executives while on the band tour last spring, and this job is the result.



The Architects' Corner

By THOMAS TUDOR

A Patio

THIS problem, a patio, is the work of E. R. Young. The program explains this problem thus, "In countries favored with mild climates it is a practice to plan residences with an inner court or patio where cooler temperatures can be found in summer and warmer in winter." The specific problem deals with a patio of a residence in California. The area open to the sky is thirty feet square, and it is surrounded by a covered portico nine feet wide. The choice of materials for the patio was left to the discretion of the designers, and a fountain, shrubbery, and flowers completed the design.

Prizes Are Awarded

THE Architectural Society is still formulating a program for the coming year. One meeting has been held. Loren Abbott, president, has invited prominent local architects to give a series of talks in the Engineering auditorium. Dates and speakers will be announced soon. The society sponsored a freshmen mixer which was given Friday evening, October 6.

At this mixer prizes and awards were announced by Prof. F. M. Mann, head of the department. Russell Williams and Austin Fraser received the book prizes given by the faculty for scholarship in their junior year. Williams was first with an average of 1.92. Edward V. Lofstrom did even better with an average of 1.98 to win the sophomore prize. Robert Auvinen and Leonard Currie tied for the second place. Several prizes have been withdrawn by their donors, while many will be awarded during the coming year.

The Year Begins

THE innovation of the five year course in architecture has resulted in a change in the scheme of teaching architectural design, principal subject in the architectural curriculum, with the result that for a few days this fall, many architects didn't quite know how they were classified.

Those students who were registered in the five year course last October are commencing architectural design. Their first problem was a motor-bus terminal, a particularly feasible type of building. The new architects learned the foremost principles of good design by deciding on solutions for arrangement of units and circulation and by striving for beauty in the elevations.

Mr. Robertson, after a leave of absence of one year, is back as instructor for the group known as "new" grade two. This class of second year students had for their beginning work an outlay for a tourist park. It was designated as a special sketch, and was due in three days. The "old" grade two problem, a therapeutic institute, tended to cultivate many a junior's vocabulary. Bewildered by such medical terms as radiotherapy, electrotherapy, and mechanotherapy, the students emigrated hopefully to the University hospital for information. Several were taken on brief tours of the therapy departments and were especially interested in the radium and X-ray apparatus.

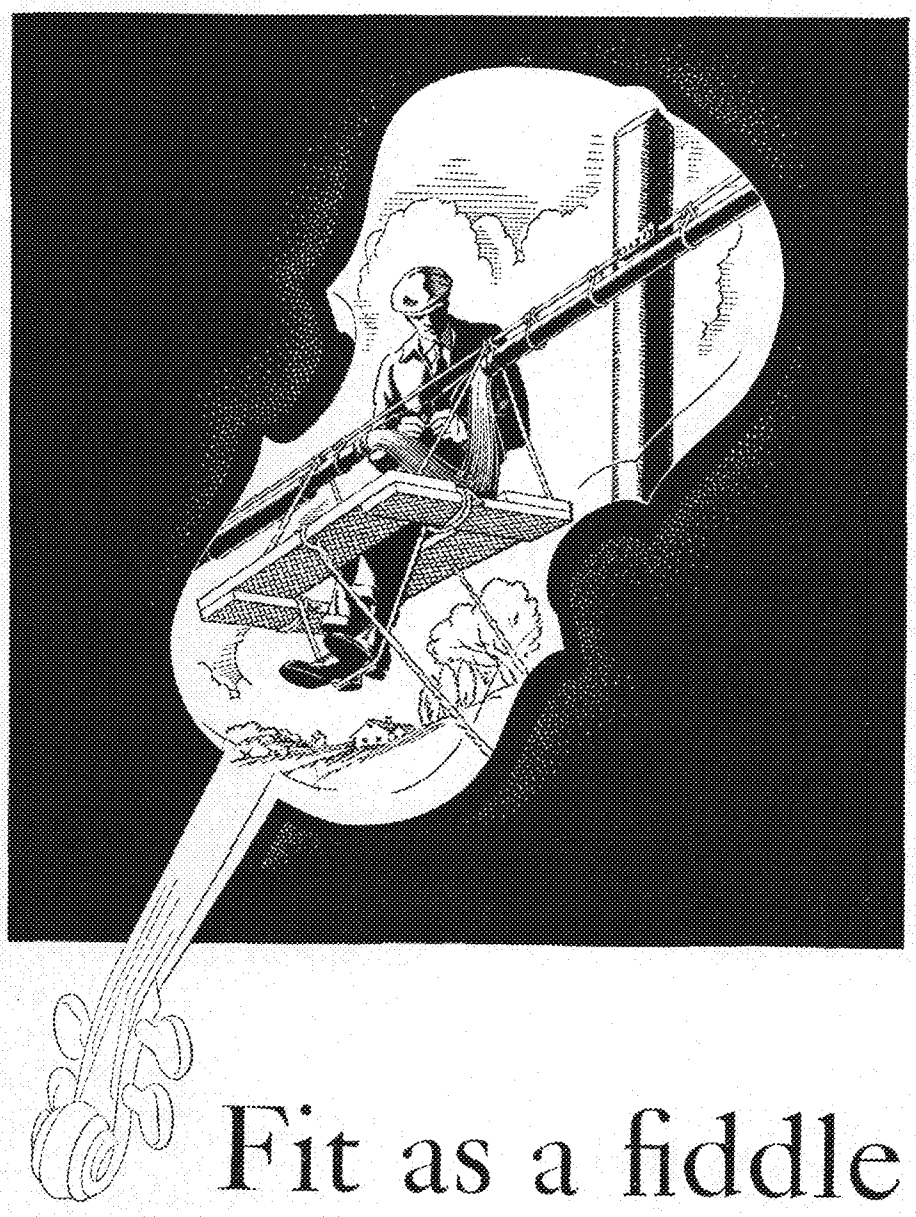
With the design for a formal and monumental treatment for a small island, grade three architects began their last year. According to the problem, a three day sketch, the island lies in the middle of a river on one bank of which is a large city. It is proposed that a bridge be built from the city to the opposite shore and to have the bridge rest at some point on the island. The problem is to develop the island with retaining walls, stairs leading from the bridge to the island, a place where concerts and open air plays could be given, fountains, pools, walks, etc.

The Cover

The cover this year is a modernistic interpretation of progress and was designed by Raymond Weidlick, senior in architecture. Weidlick is the winner of a contest conducted during the first week of school. The technic used in the rendition is truly interesting. Weidlick covered his surface of "scratch board" with India ink and then scraped out the design with a knife. Appropriately inspired by the theme of the World's Fair, the cover portrays the progress from the days of Fort Dearborn to the modern sky-scraper city.

Selection of this year's cover was the result of the cover design contest conducted by the Techno-Log. Designs were submitted by several students, and the winner was selected by a committee consisting of Professor Leon Arnal of the School of Architecture, Ralph Mooson and Gordon Rosholt, editor and business manager, respectively, of the Techno-Log. First, second, and third prizes were awarded, the first prize design to be used as the Techno-Log cover throughout the year.

An adjustable-head T-square, donated by the Engineers' Bookstore, was the first prize and was won by Weidlick. The second prize was a pen and pencil set, won by R. A. Penney, the prize being donated by the Acme Printing and Stationery company. The third award was given to Berthand Getsog. It consisted of a notebook and filler, and was donated by the Acme Company. The design selected has tremendous possibilities for color combination, several of which you will see displayed during the next nine months.



Fit as a fiddle

Telephone service must be kept fit as a fiddle 365 days a year. Thanks to a continuous program of maintenance and replacement, Bell System plant is today more efficient than ever. Constantly improved operating methods provide the swiftest, surest service on record. Plans devised by telephone men fit the service more and more exactly to subscribers' needs.

The result of all this is: the telephone gives you a lot for a little money.

BELL SYSTEM

SAY "HELLO" TO MOTHER AND DAD
—RATES ARE LOWER AFTER 8:30 P. M.

coast artillery

Takes Life Easy

at illinois camp

This article, which is reprinted from the Kansas State Engineer, gives us not only a picture of the R. O. T. C. camp life, but also a slight bit of Kansas opinion regarding the Minnesotans.

By EUGENE BARTLETTE, E. '34

CHAMPAIGN and Urbana are Illinois towns that will never forget the summer of 1933, because 500 boys from Minnesota, Missouri, Illinois, Kansas, and West Virginia, congregated there last summer to have their annual R. O. T. C. camp. Only those who attended camp will understand the full significance of the townspeople's memories.

The boys on arriving at the designated locality were surprised to find in place of the expected rows of tents, only a University campus on which to spend their camp life. The only indication of a military atmosphere on the campus was the presence of a huge armory.

On entering this building, our army life began. Our first taste of it was the processing. "Let me see your travel orders," shouts a sergeant. "Take your clothes off," shouts another. "Put 'em in this bag." "Fall in that line for physical examination!" After the officers had assured themselves of our physical fitness, they sent us to the commissary to draw uniforms.

Our barracks were not the usual tents, but instead, a modern dormitory. In contrast to dirt floors, army cots, tin plates and board tables, we had terrazo floors, Simmons beds, china dishes, and regular tables. In addition we had easy chairs, desks, lavatories, hot and cold water, and electric lights.

The day following our arrival, the routine army life began. At 5:15 reveille, 5:25 formation, 5:30 calisthenics, 6:00 mess, 6:30 clean barracks, 7:00 drill, 10:00 lectures; 11:30 noon mess, 12:30 gun drill, 5:00 evening mess; 10:00 taps, immediately followed by bed check.

Battery C consisted of the men from K. U. and eighty-seven Swedes from Minnesota. The Coast Artillery has two different types of defense; the antiaircraft and seacoast. To practice our antiaircraft defense, we were provided with three-inch antiaircraft guns, search-lights, R. A. corrector, surveying equipment, range finders, telephone equipment and trucks. Most of this antiaircraft drill was done during the day; however, two nights were spent at this drill in order that we might learn the use of the search-light.

To practice our seacoast defense we were provided with a 155 mm. gun, 155 mm. howitzer, tractors and plotting room and observation station equipment. One piece of seacoast artillery equipment that the boys got the most fun out of operating was driving the ten ton caterpillar tractor over rough ground.

Two days were spent on the range learning to fire the 45 Colt automatic pistol. After one day of instruction and practice fire, we were given a chance to qualify for medals.

During the afternoons, we listened to lectures given by the regular army officers in charge. Some were given in the lecture room, but those concerning gun locations were given in the field at the probable gun locations. In the lecture room we were shown moving pictures and given lectures. The lectures consisted of talks on personal hygiene, military policies, map reading, function of officers, defense against an imaginary invasion, and other military subjects.

One of our special duties was to take guard detail. This duty was not received with favor among the fellows because the guards had to report those coming in after bed check if he saw them. Another disagreeable part of this job was to walk post when the other fellows were off duty.

Regular routine was not followed on Saturdays. On Saturday we had a rigid inspection of men and quarters. On Tuesday and Thursday afternoons we displayed the results of our morning drill periods by going on parade and review. At these parades and reviews all the corps represented at the camp participated.

Saturday noon marked the end of the week's army life. The barracks are a mad burst of shouting, singing and rushing for the showers. Some are going to Chicago, some to a show, some to see a girl friend and some to "Pren's." Everyone is headed for the place he best likes to spend his recreation time.

This was the weekly procedure for the four-week period that we spent in camp. Then we were dismissed on July 13, we ceased being soldiers and returned to our normal civil life, taking with us pleasant camp memories to keep with us forever.

Another Letter from Eric

Editor's Note:

Again we are favored with a letter from our friend Eric. Those who recall Eric's letters of last year will remember how, in his simple fashion, he explains the complex working organization of the University. This time we get an enlightened picture of the functioning of the Students Work Committee, whose actions are familiar to most of us, but whose purpose may seem more remote.

DEER mr. deen,

Now vunce more ay ban rite you again. Last year ay rite all about examination now ay rite about stewdent verk commit.

Ay tell you last time ay get latter from mr. vest. Also latter from mr. trench. He say you bane on drop list & you much come see stewdent verk commit if you vant came back to skule. Corse ay vant to came back mr. deen & get edicated to be Engineer. So mr. french he say in latter come saturday & meat stewdent verk commit so ay rite ay werrymuch please to except your invite.

Vell ay go & find bunch other fellers also asked to come & meat stewdent verk commit. Vell ay go in & stewdent behind desk give me number just like in barbershop & ay say vat dis for & he say you take your turn & ay say ay got no turn vat you do vit it & he say ven ay call number on your ticket you get up & go see stewdent verk commit.

Vell sir, dis dont like no good to me but ay say to myself ay sit here anyvay ay see vat ban happen so ay sit in chair long time & he call plenty numbers & stewdents get up & go in office. Some come out & some dont so ay begin to tank. So ay ask feller behind desk vy didnt they came out? Are they the fellers stewdent verk commit drop & he say he dont no. Ay say ven stewdent is dropped vere is he dropped & he say out of college. By golly ay vas glad ve bane on first floar.

Vell after long time feller he call my number & say "your necks" so ay open doar and hop rite in. Vell in middle of room vas big round table & lots of profs without werry much hair sitting around smoking & looking out vinder & talking & vun prof vit shiny bald head looking thru lots papers. Vell pretty soon vun feller he say sit down so ay sit down. Feller vit papers he bane keep rite on turning over & over & over. Other fellas they sit & tell fish stories & by yumpin yimminy ay never heerd such big vuns about fish. No sir ay almost couldnt believe some, ay couldnt.

Vell pretty soon vun feller turn quick to me & say vat your story? By golly ay didnt no ay had to tell a story but mr. deen ay tank fast so ay tell about uncle Sven ven he ketch luterfisk. Vell big feller takes out pipe & say by golly that a whopper but little feller vit pipe he say madlike vat you mean come here & vaste our time vit story? Ay pretty near tell him vat ay tank about his story but prof vit papers he say vat your name & ay tell him & he start turning over papers some more & pretty soon he stop & say o yes you are on drop list.

Big feller vit pipe he say anyvun who can tell story like that aught to make dam good Engineer but little feller he say nope ay vouldnt have him in my department ven he tell such stories & nother feller he say vell hed have to go some to beat you & nother feller he say can you match this & he tell biggest vun yet. By yimminy ay never bane heerd vun like it before no sir!

Vell, prof vit papers pounds table & he say vot you do vit dis case? But dey keep rite on telling stories & pretty soon dey stop & vun feller say vot case? So feller vit papers tell all about me vanting to came back to skule. So big feller he say ay move it be granted & dey all say at vun time ay second it. Vell if everybody say ay second it ay vont be left out no sir so ay say ay second it too & everybody laff. Ay dont no vat vas so werry funny & ay didnt see big feller move like he said he vould so ay tink whole bunch crazy in head. Den feller vit papers rite slip & say o. k. you can come back. By golly that sortinly sounded good to me yes sir.

So mr. deen ay bane come back to coolage again.

Goodby,

Eric the Engineer.

• • •

BEER

[*Continued from Page 9*]

gas which puts the "head" on the finished beer. Beer finished in this manner is known as "kruisen beer." There is another process by which the same results can be obtained. That is the method known as carbonization. Some of the carbon dioxide gas which is obtained from the fermenters during the process of fermentation is sprayed back into the beer to give it "head." Finally the finished product is filtered through huge paper pulp filters to remove the last traces of solid matter after which it is placed in bottles or kegs for distribution.

Not once during this entire process has there been any possible chance for the entrance of impurities into the batch, nor a chance for contamination through contact with containers or air. However, regardless of how much might be said here, the true cleanliness of the brewery can only be appreciated by a personal inspection.

Annual Financial Report of the Engineers' Bookstore

Profit and Loss Statement for the Year Ended May, 31, 1933

Sales		$45,540.36
Inventory		
June 1, 1932	11,373.21	
Purchases	32,733.65	
Freight Charges	997.43	
	45,104.29	
1932 Inventory	10,772.52	
	34,331.77	
Gross Profit on Sales	11,208.59	
Operating Expenses	7,750.83	
Operating Income		3,457.76
Additions to Income		
Cash Discounts	140.17	
Interest on U. S. Bonds	389.65	
Other Interest	84.18	
Profit on Sale of Bonds	5.42	
Check Exchange	2.91	
Bank Exchange Operation	96.52	
Total Income		4,376.61
Deductions from Income		
Bad Debts and Losses	57.25	
Net Income		4,119.36
Reserves and Surplus June 1, 1932		11,512.44
1926 Dividends Cancelled		285.00
		15,836.80
Plus Adjustments of Bonds to Market		533.45
		16,370.25
1932 Dividend		4,749.54
Reserves and Surplus May 31, 1932		11,620.71

Balance Sheet as of May 31, 1933

Current Assets		
Cash on hand in bank	$	261.58
Certificates of Deposit		2,000.00
Accounts Receivable		930.82
Inventory		10,772.52
Accrued Interest		194.86
Total Current Assets		13,759.78
Investments, U. S. Bonds, and Notes		14,307.50
Fixed Assets		
Store and Office Equipment		336.00
Cap and Gowns (for Rental)		348.00
Total Assets		28,752.28
Liabilities		
Bank Overdraft		135.65
Vouchers Payable		309.53
Deposits on Orders		67.10
Dividends Payable		5,988.90
		6,501.18
Membership, Reserves and Surplus		
Membership		9,405.00
Cap and Gown Replacement Reserve		1,350.00
Reserves and Surplus		11,496.10
Total Liabilities		28,752.28

student investments in

Engineer's Bookstore

yield $4749 dividends

THE Engineers' Bookstore has for the thirteen years of its existence, been a profitable and successful student corporation. Before the conception of the bookstore, the Engineering Student Council, recognizing a need of the college, attempted the purchase of books and other supplies through the University Purchasing Department. This proved to be too cumbersome a process, and the plan of having a 15% discount at the Minnesota Co-op company was tried. The supply was inadequate, however, and there was so much delay that many purchased elsewhere to avoid the red tape found in the operation.

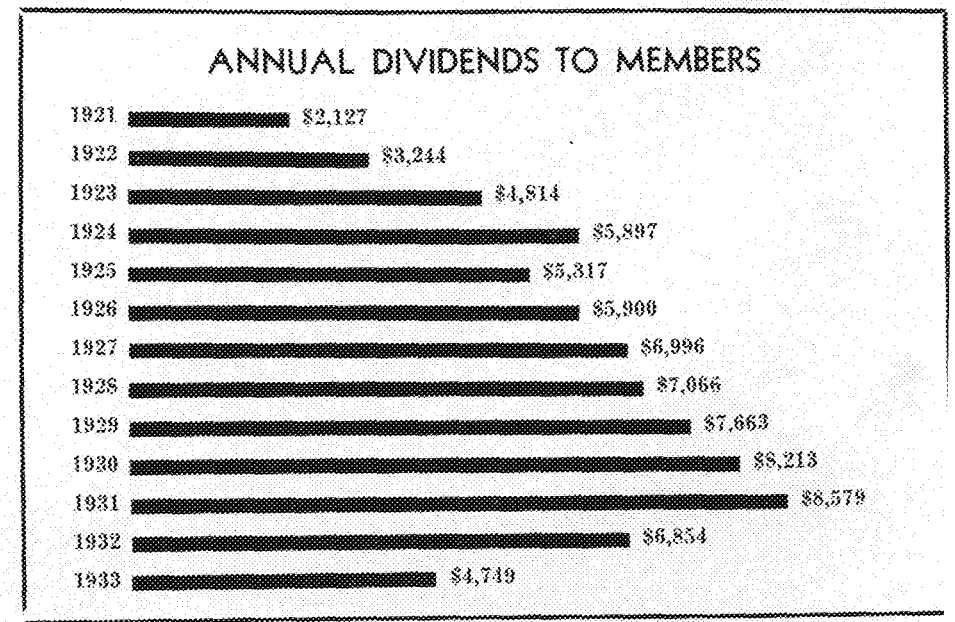
In May, 1920, the Board of Directors of the Engineers' Bookstore was elected. After a year of successful operation a dividend of $2,127.98 was declared. The success of the Engineers' Bookstore encouraged the board to establish a branch in the Business School. In 1925 the branch store was found to be unsuccessful and closed. During the succeeding years the declared dividend amounted to a high of $8,579.28 in 1931.

Any student in the University is eligible to membership in the Bookstore, but only students registered in the College of Engineering and Architecture and the School of Chemistry have a voice in the government of it. The only requirement for membership is a deposit of $5.00 with the store. When the student leaves school, his deposit is returned to him. The $5.00 is used as a working capital.

Every fall, except the first one of the Bookstore's existence, members have received a dividend of 16% based upon the total purchases made by each member and the operating profit. The Board of Directors, who determine the financial policies and operation of the store, is composed of one elected representative from each college in the technical school, three faculty members, and the manager. The directors are:

Professor W. H. Kirchner, head of drawing department; Professor C. A. Mann, School of Chemistry; Professor O. S. Zelner, surveying department; Elmer Ekroot, Architecture; Fred Haverland, Civil; Robert Marshall, Electrical; William Kaiser, Chemistry, and Allen Burnett, Mechanical.

With the idea of supplying its members with the utmost in service and the greatest in economy, the Bookstore has since 1925, under the management of Harold Smith grown to a business of enviable size and reputation. Many innovations have been made in its service, and a quality of merchandise has been maintained that will give the greatest amount of satisfaction to the members.



Around and About the Campus

Minnesota Flying Club Wins Competitive Prize

The University of Minnesota Flying club has successfully completed its first year of operation. The club won second place in the annual Loening intercollegiate flying competition, and was awarded a cash prize of $150. First prize in the competition was awarded to the William and Mary Flight club and third prize to the Harvard Flying Club.

Flight instruction is given to the club members by the Northland Aviation school at World-Chamberlain field. Twenty-eight students have received eight hours of flying both dual and solo. Four students have continued their flying and received their private pilots license, and two students have received their limited commercial license. In addition three faculty members have also received flight training.

At the conclusion of his flight training the student is presented with a bronze pin. This year the flying club is planning to hold a number of activities such as dances and picnics, and all students and faculty members interested in the club are urged to inquire at the Aeronautical Engineering office.

M. S. A. E.

The Minnesota Society of Aeronautical Engineers was organized for the purpose of providing the aeronautical engineering students with extra-curricular activity and to arouse interest in aeronautical developments. Speakers are brought in by the society so that students may keep in touch with current doings in the field of aeronautical engineering. To encourage the student in personal endeavor the society recognizes individual achievements. Social functions are held as a means of furnishing the members with recreation.

To increase public interest in aviation the society acts in an advisory capacity to model-making clubs in the lower schools. Last year a model-making contest was held in which the subscriptions to aeronautical magazines were given as prizes.

The present officers of the society are, President, Loyal Downing; Vice-President, Reynold Coleen; Secretary, John Wells, and Treasurer, R. L. Thompson.

A. I. Ch. E.

A bigger and better year is being planned by the local student chapter of the American Institute of Chemical Engineers. The new officers are, Robert E. Conary, president; Eugene H. Eyster, vice-president; Roger C. Bossen, corresponding secretary; Harry H. Cottingham, recording secretary, and W. E. Lundquist, treasurer.

With attention focused on a gigantic Chemical Show in the spring, some very interesting meetings are being planned for this year. Meetings will be held every two weeks, with an outside speaker alternating for each meeting with a local member, who will present a report on some subject of technical interest. Films and trips to nearby chemical plants are also included in the vigorous program. A big smoker, planned for the immediate future, will start things off.

A. S. C. E.

This year the Minnesota student chapter of the American Society of Civil Engineers are developing an extremely interesting program. This week an extensive membership drive is being carried through in which the sophomores, especially, are urged to join the society. A special effort is being made to avail the underclassmen of the opportunity to hear the interesting experiences of the various speakers.

The officers are: Lewis F. Martin, president; Richard E. Schuett, vice-president; Goodwin Kolstad, secretary, and Harry Baker, treasurer. Prof. A. S. Cutler, Al Nowicki, and Ted Jensen are assisting with the programs and membership drive.

Civils Win Basketball Trophy from Cass Lake

Civil engineers during their annual summer camp at Cass Lake won the basketball tournament from the local high school basketball team for the first time since the competition was started. The civil engineers won two out of three games, winning the final game by the narrow margin of one point. The trophy awarded is a miniature triangulation tower made of birch twigs, and is on display in the surveying office.

A. S. M. E.

At the last meeting of the local student chapter of the American Society of Mechanical Engineers a program was decided upon for the coming year. A membership committee was appointed with Bertram Getsup as chairman. Other members of the committee are Dave Diamond, Harold Shaw, and Fred Warner.

Trips to industrial plants in and about the city are planned, along with joint meetings with the senior chapters in Minneapolis and Saint Paul. Regular meetings for technical discussions and entertainment are also in the program.

Professor Robertson was re-elected faculty adviser. The officers of the society are Norbert Sternal, president; A. B. Carlson, vice-president; Peter Riede, secretary, and Richard Poucher, treasurer.

American Chemical Society

The Minnesota section of the American Chemical society will have a very distinguished speaker for their first meeting, October 25. Dr. Thomas A Boyd of the General Motors Research Laboratory will give an address on

Chemical and Physical Researches in Engine Combustion. Dr. Boyd is very prominent in this field, being a co-discoverer of the anti-knock properties of tetra-ethyl lead. The meeting, to be held in the Chemistry Auditorium at 8 p. m., is open to all, and should be of special interest to mechanical engineers and car-owners.

The local society's new officers are: R. E. Montonna, chairman; W. M. Sandstrom, vice-chairman; P. D. Bartlett, secretary; C. F. Koelsch, treasurer; C. H. Bailey, C. B. Gnadinger, and S. C. Lind, counselors.

Techno-Log Judged Best Magazine at E.C.M.A. Meet

The annual convention of Engineering College Magazines Associated, the national association of engineering college magazines of which Techno-Log is a member, was held in Milwaukee October 16 and 17. Ralph Monson, Managing Editor, and Gordon Rosholt, Business Manager of the Techno-Log, attended, representing Minnesota. The convention assemblies were held in the new dentistry auditorium of Marquette University.

The various problems of the editorial and business staffs were discussed in round table discussions, men from the various colleges taking advantage of the opportunity to compare their problems.

The Minnesota Techno-Log was judged the outstanding magazine in the association by the executive committee. In connection with the awards for excellency during the past year, the Minnesota magazine placed first for having had the best illustrations, and third for the quality of its alumni sections. The article entitled "Surveying Through Mountainous Norway," by Harald Flaata and Ralph Monson, which appeared in the April-May issue of the Techno-Log, won the distinction of being the third best individual article in the 153 issues published by the members of the association last year.

A. I. E. E.

The yearly program of the student chapter of the American Institute of Electrical Engineers opened last week with a membership drive. The highlight of the week was a get-together and smoker for the purpose of acquainting electrical engineering students with the organization. This meeting was held Friday, October 13, in the engineering auditorium. In spite of the inauspicious date, the meeting was a big success. The guests were greeted by the president and other officers of the society. Miller and Mills provided hilarious entertainment with motion pictures of the vintage of 1890.

Indications point toward a very good year. Several speeches by prominent engineers are contemplated and visits will be made to points of electrical engineering interest in the Twin Cities. The highbridge station and at least one mill will probably be included in the itinerary. Plans are rapidly being completed and the society may well look forward to a very interesting and instructive year.

Faculty Men Take Interesting Trips

Many engineering faculty scattered far and wide over the country in search of recreation last summer. The following is a brief account of the summer's experiences of a small proportion of that group. Included among those who toured during the summer are several members of the English department: Messers. Richardson and Guthrie.

Professor Richardson motored to California via the northern route, and returned by way of the southern, traveling rather leisurely so as to be able to take in all the places of interest along the way. Some of the sights he delights in describing are the Montana rodeos; Logan Pass in Glacier National Park, where this summer they were removing with a steam shovel forty feet of snow from a road which natives say cost $100,000 a mile to build; Crater Lake, a huge body of pure water in the top of an extinct volcano; Los Angeles harbor, where prosperity is said to have returned long ago; the geysers in Yellowstone; and Carlsbad Caverns, in New Mexico, which are so large that one room is capable of holding the Foshay Tower. Bats make their home in the caverns, and every evening thousands of them leave on their nightly flight in quest of food. The bats have a cruising radius of about a hundred miles, and are estimated to consume eleven tons of insects daily — a fact which proves them invaluable to the farmers of the territory.

* * *

Mr. Guthrie, too, had many thrilling experiences on his two-month trip from Steamboat Springs, Colorado, traveling through steep, dangerous mountain passes, witnessing roundups and the breaking of horses, and driving through flooded regions of Nebraska.

October Freshmen

[*Continued from Page 7*]

of real competition. For there is an element of competition in becoming an engineer or, indeed, a member of any other profession. If for no other reason than that there is a limit to the number of men the professions can absorb, it must be perfectly evident that everyone cannot blossom out as an engineer, or as a doctor, lawyer, teacher or preacher. The result is that only those proving themselves best fitted in preparing for the professions can manage to get into them. Thus the professional colleges become, not only places where men are taught, but places where men are weeded out. And that is why freshmen in technical schools, facing harder work than they have had to do previously, are simply being given a taste of that competition which they must meet in even greater degree when they later practice their profession. They should welcome both the preparation and the elimination of the least fitted which result.

So the thing for any freshman entering the Engineering College this October is to get into his new life with a bang. There are university and college activities outside of the classroom, and these he should take a whirl at, occasionally, at least. For there is as much to be learned there as anywhere else. When once he is in school he should realize that he is part of the best college, the best university, and the best state in the country. If he doesn't agree with this opinion it is to his interest to do what he can to make the opinion a correct one. He should not, however, try to raise a moustache before next June. Because in the Engineering College is it always assumed that moustachios identify upper classmen. Colleges have their traditions, you know.

1933 Civil Engineering Camp

[*Continued from Page 3*]

the map they carry. Then, by means of the three arm protractor they plot the location of the point they are at. Thus they are enabled to plot the general outline of the shoreline which would otherwise be inaccessible. Interesting? Yes, all points on the opposite shore whose positions are plotted on the things we do here are interesting, and they teach a fellow to rely on himself and to carry a job through to a successful conclusion.

Speaking of following a job through, let us go out south of town and see what is being done on the railroad lines. This is one job which is completely carried out during the camp period, but only a small part of which is done by any single party. First of all, there were three preliminary lines run over about three miles of that rough cutover country you see. That is, parties start at points on the present railroad and go off across country selecting a route for a new piece of road. At each 100 foot point they drive a stake, and each time they change direction they measure the angles with the previous lines. When they have finished, another party comes along and runs levels to determine the ground line profile. Succeeding this party is a two man party who get a contoured map of the area on both sides of the line using a little instrument known as the hand level. The map thus secured is studied, and a location line selected. This line is measured, its profile determined, and slope stakes are set for the earthwork. All curves are calculated and run in, and finally the road is ready for the construction crew to begin work. That's the kind of job which brings right before our eyes the things Mr. Boon and Mr. Cutler lectured about last winter.

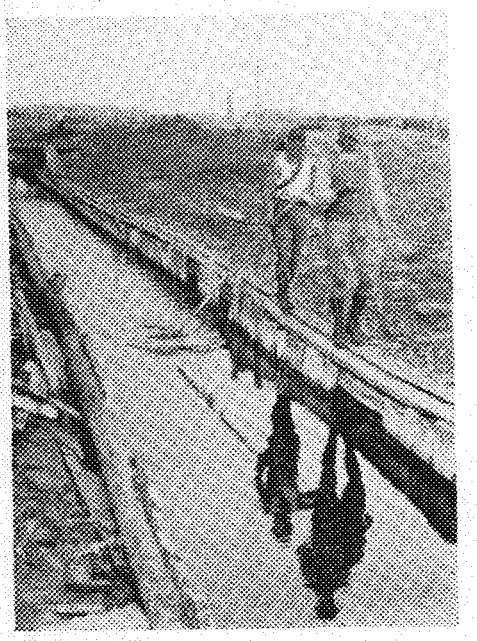
We have not yet visited anywhere near all of the field parties but let us return to camp and see what goes on there during the day. The first person we see upon returning to camp is the K. P., or Camp Assistant by his proper title. To hear him, one might think he was sawing wood, but not so. He is sound asleep atop a drawing table in front of the computing tent. What a job! What a job! In all due respect we might add that the camp assistant does carry several barrels of water and numerous armfuls of wood for the cook in addition to doing half of Charlie's work. In vain, we roll said K. P. off the table onto the ground, for it disturbs his slumbers not in the least. Oh well, let the poor fellow sleep; he was probably in Bemidji last night.

Out on the lake we see a party taking soundings. That looks interesting; let's go out and see. The man on the deck of that boat looks like he is playing cowboy. Oh no, he is casting out the sounding weight which is attached to a long rope. As fast as he can work, he throws out the weight, taps the bottom, and hauls it back in again. It's no snap repeating that entire process twice a minute when the water is over fifty feet deep. Whew—that was a close call; he had the rope looped around his leg and almost got thrown in the lake. Now he's getting excited. Whoops! There goes the whole rope. He forgot to hang on to the end and threw the whole thing overboard. Some quick work with the oar catches the line and rescues that apparatus from a watery grave. That map they are making gives one quite a picture of the bottom of the lake. It ought to be useful to the fishermen anyway.

Now back to camp to visit the computers and plotters. Here is a party computing a quadrilateral. They certainly learn how to use the seven place logs if they don't do anything else. The party at this table is trying to compute and close a stadia traverse. Their traverse has about 75 sides and covers almost five miles of territory. They certainly are having a time. They failed to close by several hundred feet, and after working a week, are still unable to find any errors. Looks like someone's diary may read like this.

August 26—Started stadia traverse.

August 30—Continuing stadia traverse.



September 8—Still on stadia traverse.
September 27—Through with stadia traverse. (Camp over.)

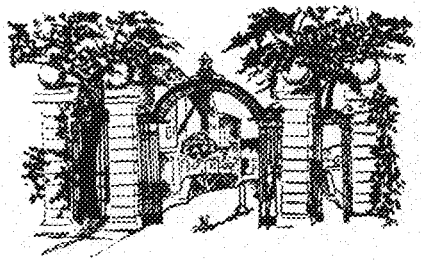
Let's take a look at the map they are turning out. There are Lakes Bina and Armstrong (two dirty little mud-holes). Here is B. M. Gaebe, B. M. E. L. K., B. M. Riphagen, B. M. Flaatberg, etc., etc. No one can say that the members of the class of '34 did not leave their names inscribed in the north woods.

Well, perhaps we've seen a rough cross section of a day's work. Of course we have not seen everything, but to do that would take more than one day, so we shall let this suffice. Toward 4:30 the parties come trickling back to camp, laughing, joking, jolly. They have put in a hard day's work, but they don't let that bother them. The foremost thing on their mind is, "What are we going to do tonight?" The last party to come in are the firefighters. They have been drafted by the state foresters to help fight a brush and peat fire which is burning nearby. Are they dirty? And, do they like their job! (Oh yeah!) This experience should teach them to be very careful with fires in the woods.

Tonight is the night of the big snipe hunt. The boys have seen many snipe in the woods around the south end of Pike Bay about eight or nine miles from camp. They have a supply of sacks and lanters all set. Off we go. As we near the hunting grounds, the hunters are dropped off one by one, each with his sack and lantern. Joe Koropov is to be given the final and best position. Well, happy dreams Joe; the rest of us must get our beauty sleep. Morning—and the hunting stories are flying thick and fast. None, however can even parallel Joe's tale of almost getting a rabbit. "I didn't see any snipes," se says, "but I darn near got a rabbit that jumped up in front of me." That's his story and he sticks to it.

Speaking of stories reminds us of an interesting true story about one of our members whose initials are S. M. G. It seems that S. M. went to Bemidji one night to fulfill a prearranged date. However, much to his embarrassment, he was "broke." Recalling his Scotch ancestry, and Boy Scout preparedness, he decided to make the most of the evening—which he did to the extent of two dollars. (Further details of this "get rich quick scheme" may be obtained by sending $500 in stamps and a self addressed envelope to S. M. G., Room 227, Main Engineering.)

In addition to all of the fun and adventure of six weeks of camp life, there is a world of knowledge and experience to be gained at camp. It is six solid weeks of practical worthwhile experience which gives every graduating civil the experience and confidence in himself which will make him really worthwhile to his employer.



9 Foot Channel

[*Continued from Page 5*]

at Moline, Illinois, and at the Twin City Dam. They are 350 by 80 feet and 350 by 56 feet in size, respectively.

The Land Acquisition department of the U. S. Engineers Office must acquire all rights to approximately 60,000 acres of land, most of which will be flooded when the water is backed up behind the various dams to maintain the nine foot channel.

Many Minnesota graduates will doubtless find employment on this River Development project in the next few years as this work will be going on for a number of years. Employment, for engineers, is obtained through the Civil Service System, so engineers from all over the country are in competition for positions. Following is a list of Minnesota men who are employed on the Upper Mississippi River Development at the present time. This list is probably not complete, but it indicates the various activities in connection with this project very clearly:

J. Ackerman, '25, assistant in construction department; L. M. Boor, '22, in charge of the survey of the Mississippi Valley from Hastings to the Wisconsin River; E. Brownell, '26, in charge of office work on all surveys; G. O. Guesmer, '24, charge of reports and studies of the project; H. M. Hill, '23, charge of all construction, surveys, and land acquisition on the project; R. Johnson, '23, charge of all drafting; J. R. Johnson, '26, in charge of operations; R. E. Johnston, '17, in charge of concrete control for construction; C. J. Kocian, '30, draftsman; H. W. Lieske, '30, chief of party on survey; H. J. Manger, '23, assistant in land acquisition department; H. Marcus, '29, draftsman; W. S. Mitchell, '15, Chief Engineer for Merrick, Chaplin and Whitney Company of Cleveland, Contractors for Dam No. 5; V. Nelson, '29, chief of party on survey; W. W. Ralph, '30, chief of party on survey; J. A. Wielde, '28, chief of party on survey. These men are all graduate civil engineers from the University of Minnesota.

FOR STUDENTS

. . Who need a change

. . . Who like good fun

. . . Who enjoy good theatre

THE
UNIVERSITY THEATRE

University of Minnesota

SUGGESTS:

Alison's House, Drama - - - - November 7-11
by Susan Glaspell
Pulitzer Prize Play 1931-32

The Taming of the Shrew - - - - December 5-9
by William Shakespeare
Modern staging, effects and costumes

God, by Proxy, Drama - - - - - February 6-10
by Alice Prendergast
World Premiere

The Devil Passes, Comedy - - - - March 6-10
by Benn W. Levy
New York Season 1931-32

Joan of Arkansaw, High Comedy - April 17-21
by William Fuson Davidson
World Premiere

●

SEASON TICKETS NOW ON SALE—5 Productions $2.50, at The University Theatre Office, Room 18 Music Building and The Techno-Log Office

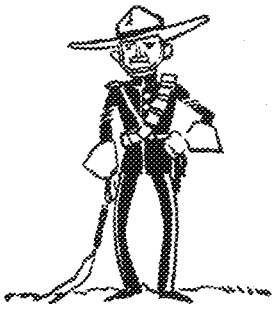
G-E Campus News

BEMOTORED BEHEMOTHS

The same sun which never sets on an unshaved Englishman's chin likewise never finishes its daily round without seeing electric motors put to some new use.

In the Sinclair Refining Company's exhibit at "A Century of Progress," you can see five prehistoric monsters. Largest is a Brontosaurus, 70 ft. long and 22 ft. high, with a steel skeleton and welded joints, posing on a mountain. Little motors operate his eyelids, head, neck, mouth, breathing apparatus, and tail. A motorized Tyrannosaurus rocks back and forth, blinking and running out his tongue. A 30-foot Triceratops lunges forward; a Stegosaurus waves his fins; and a Duck-billed Dinosaur sits in a lake and churns water with his tail.

Interviewed recently, and speaking for the group, Brontosaurus shrewdly winked an eye and recommended G-E motors, on the basis of his 80 million years of experience.



WATCHDOG

Like Malone of the Mounted, old PM-13 always gets its man.

When the storm king rides roughshod along transmission lines, this new G-E automatic oscillograph waits to see the whites of his eyes. Then it starts recording within a half cycle (of a 60-cycle wave), a speed made possible by a special little mirror with a movement all its own. On a single roll of the sensitized paper, PM-13 can handle as many as a hundred oscillograms of chance transients and surges, and they can tread right on one another's heels or follow months apart.

When power surges sign their names, it's no forgery. The signature shows true wave shapes and phase relations. And, best of all, the PM-13 is permanently connected in the circuit and runs by itself.

Incidentally, Claude Hathaway, a U. of Colorado graduate in 1927, is largely responsible for this new development.

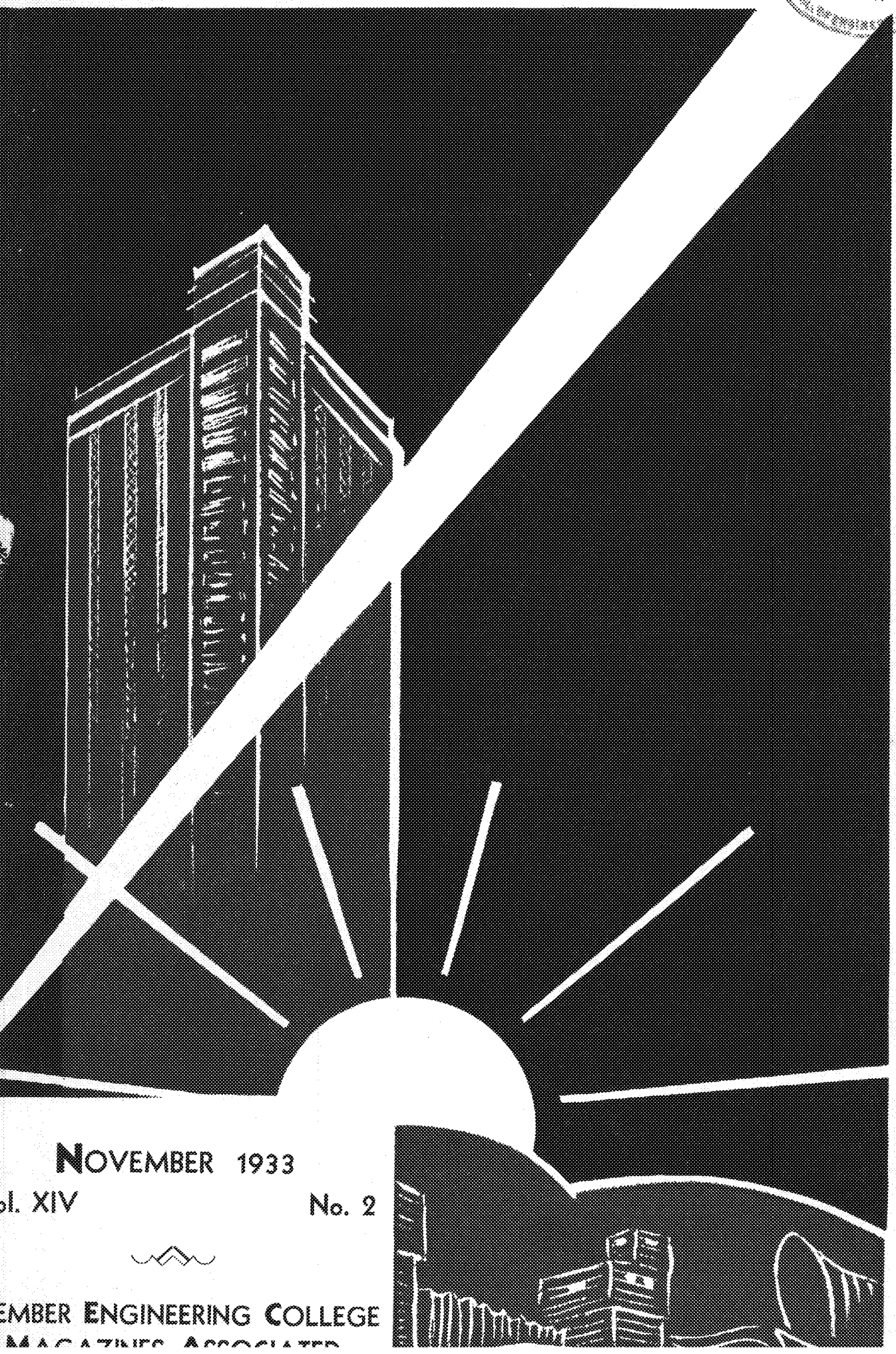
THERMOCOUPLE TAVERN

We take you now to our new indoor weather laboratory.

General Electric has "commandeered" this ten-room house in Schenectady and dedicated it to improving the air we breathe. Two G-E engineers —Elliott Harrington, Beloit College, '16, and Leon Mears, U. of Minnesota, '30, live there and conduct tests. Air conditioning (temperature control, humidity regulation, air cleansing, air circulation) flourishes. There is automatic oil heating; there are extensive air ducts in the walls, in the floors; room coolers; combination units to deliver air either heated or cooled; filtering, humidifying, and circulating devices. Air currents can be produced—vertical or horizontal. To help summer cooling, a ventilator exhausts air from the attic. With thermocouples located in nearly a hundred places, temperature readings are taken at one point by means of a telephone-relay system.

This residence was one of the proving grounds for the G-E oil furnace. Now it develops design principles for air-conditioning equipment.

The Minnesota Techno-Log

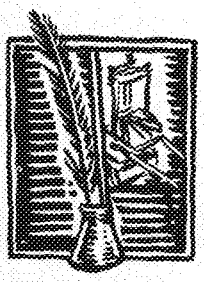


NOVEMBER 1933

ol. XIV No. 2

EMBER ENGINEERING COLLEGE

MAGAZINES ASSOCIATED



The Editor Says:

I was going to start out, "Here it is November and we've still got a dollar," but since that statement is not strictly true I might as well just review this issue briefly.

The frontispiece is interesting not only from the architectural viewpoint, but also from the aspect of its development. Ray's first sketches were no larger than a postage stamp and were made with very soft pencil. He made and studied a number of these to secure the proper composition, after which he developed several larger sketches in charcoal. The final drawing is done in lithographic crayon. While he was rambling around the post office site, Ray also picked up some interesting facts about the construction of the building which are incorporated in the first article.

Mr. Siler's article is on as many and varied subjects as its title suggests. We (Mr. Siler and I) welcome any suggestions pertaining to this article or any other of Mr. Siler's series. This issue introduces a new series, a group of articles explaining briefly the various engineering fields. Chemical Engineering got the break this time, and the others will be taken in their turn. The article on electricity in medicine, although not exactly along the same line, does give a picture of what one engineer is doing after graduation.

Probably the most radical thing about the issue is the reinstatement of our humor section again introducing Oscar O. Fegas. What Oscar doesn't see through that keyhole just simply doesn't exist. However, we'll just let Oscar and his pages speak for themselves.

Well, this is my issue and I'll stick to it, not saying I won't be very glad to accept any comments or suggestions for the next issue which will come to you on December 15.

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Minnesota Techno-Log

37 ELECTRICAL BUILDING U of M

NOVEMBER 1933
Volume XIV Number 2

Ralph Monson
MANAGING EDITOR

Gordon Roshalt
BUSINESS MANAGER

Published monthly from October to June inclusive, by the students of the College of Engineering and Architecture, the School of Chemistry of the University of Minnesota

This Month

MEMBERS OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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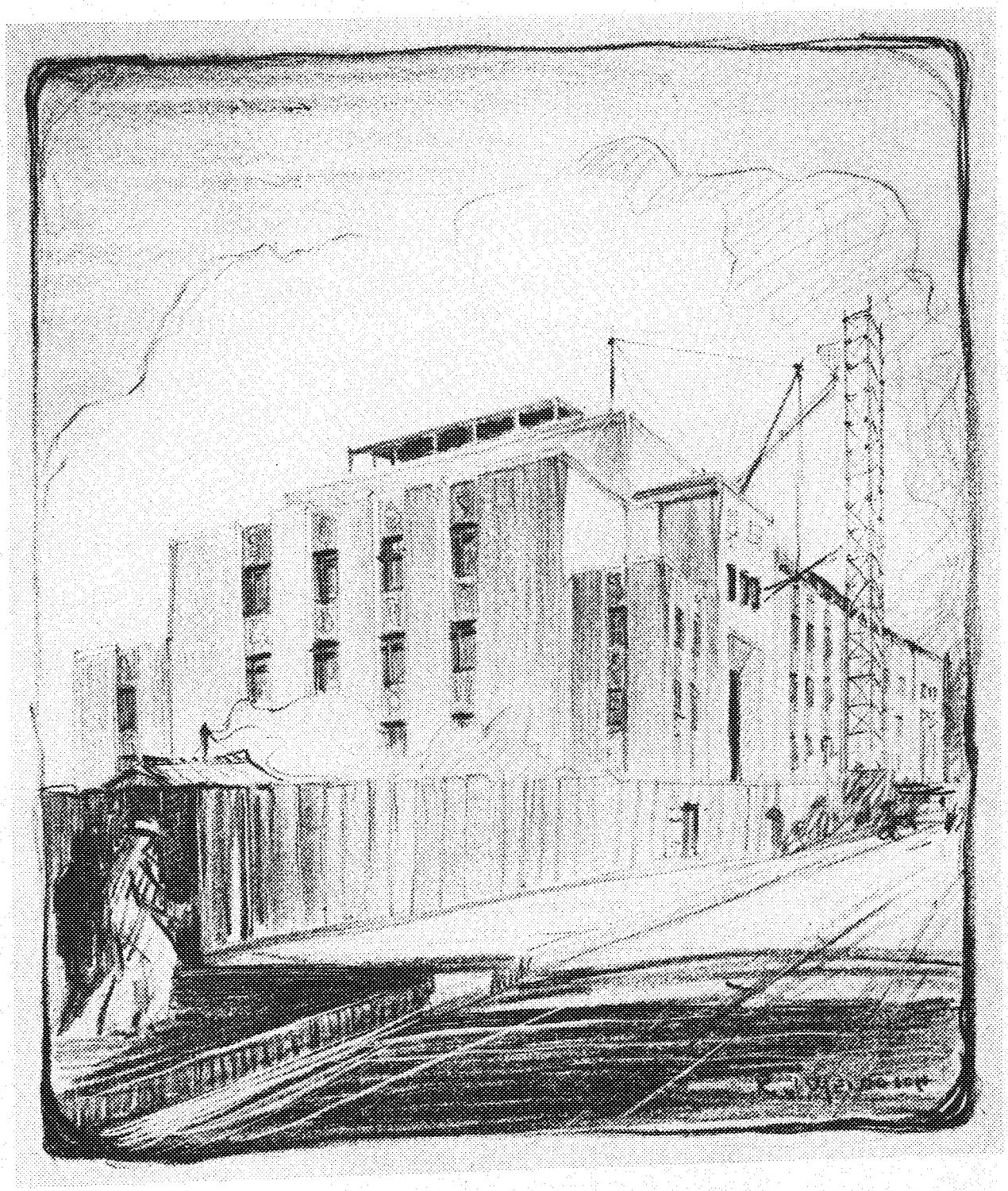
Kansas Engineer	Ohio State Engineer	Tech Engineering News
Kansas State Engineer	Oregon State Technical Record	Wisconsin Engineer



THE NEW MINNEAPOLIS POST OFFICE

Drawing by Raymond Weidlich

Postoffice is model of architectural Efficiency

By RAYMOND WEIDLICH, Arch. '35

DEMANDING respect and admiration, the most modern postoffice in the United States, the new Minneapolis Postoffice, stands on a bluff overlooking the Mississippi river. This structure, which embodies the latest developments in engineering and architecture, is the newest addition to the Minneapolis loop. From a small two story frame structure in 1854 and costing probably only a few thousand dollars to an imposing $4,150,000 steel, brick, and stone edifice, embodying the latest motifs of modern architecture—is in brief, the story of Minneapolis postoffice buildings in the past seventy-seven years. This is also the history of the plot of ground at Second avenue south and High street, where the first Minneapolis postoffice building was erected long ago, and on which the new structure is now well on its way toward completion.

The first postoffice established in the limits of Minneapolis was at St. Anthony falls. Shifting about from place to place, it was moved to the old Stevens store at Main and Pine streets, and then to the Winslow Hotel, which was later demolished to make way for the old exposition building. The early start in the construction of the new postoffice was pushed on by the President. A request for an appropriation of $4,150,000 for the building was presented to Congress by President Hoover in a supplemental estimate for the public building program of the federal government. Congress acted speedily in authorizing construction and as a result, the structure is now well under way.

Covers Three Blocks

EXTENDING over an area of 82720 square feet, the structure is excellently proportioned to fit a most perfect site. It is 540 feet long and 153 feet deep, fronting on First street. The building is located in the center of the three-block site, extending from Nicollet to Third avenue south, flanked on the Nicollet avenue side by the Gateway park, and on the Third avenue side by a separate garage, repair, and storage and heating plant. The structure stands eighty feet high from the street level and contains four stories, the first of which is three feet above grade.

The site is exceptionally fitted for its purpose. The requirements in plan for a large number of departments adjoining each other on one floor makes it necessary to have the first floor of a long rectangular shape with a loading platform on one long side. The site made this possible with the loading platform on the river side. This gives perfect access to the trains and dispatch room.

A number of old brick structures were razed before the excavation could be started, and much debris had to be cleared away before the steam shovels could be put to work. This task was accomplished in record time for the old brick buildings were only one story in height and presented no problem in removing old footings. As soon as the debris was cleared away, a fleet of steam shovels were put into action to clear an excavation for the basement.

Test drillings had to be sunk at different locations of the site to determine the nature of the soil. The accuracy in this operation is of utmost importance. If an error had been made as to the nature of the soil, the engineer's calculations as to the bearing power of that soil would be inaccurate, and the finished structure might fail. Samples of the soil at different depths of the drilling are bottled as soon as they come to the surface. This preserves the drill dust in its natural state and gives accurate information as to the moisture content at different depths. The drill test revealed a sandstone bed, one of the familiar beds which are found along the Mississippi river.

Next, the footing excavations were sunk to the sandstone bed and filled with reinforced concrete. Sandstone is a very desirable rock for footings because it is of a very compact nature and if in a thick bed, it will carry an enormous load.

A Minneapolis architectural firm, Magney & Tusler, Inc., was selected to do all of the architectural and engineering work. That they have been highly successful is evidenced in the fact that only minor changes have been made in the plans as originally drawn, while the design of the building has won widespread favorable comment in architectural circles. One of the changes was the omitting of the mezzanine floor. This floor contained two swing rooms and two toilets. An inspector's lookout surrounded the entire layout and divided the floor into two parts, one for carriers and one for clerks. The inspectors' lookouts were placed on the second and the fourth floors.

State Stone Used

THE question of whether or not Minnesota stone was to be used was soon settled by testing some samples of state stone, for durability. The base of the structure is composed of an unbroken line of dark gray granite quarried at St. Cloud and the superstructure of Minnesota dolomite, generally called Kasota stone. Dolomite is a brittle calcium magnesium carbonate of a rather porous nature and a cadmium yellow in color. A light colored marble veneer will be applied to the interior, which at present is still in the rough structural concrete.

The cornerstone is of grey St. Cloud granite. The stone is inscribed with the names of William H. Wooding, Secretary of the Treasury; James A. Farley, Postmaster General; Lawrence W. Robert, Jr., Assistant Secretary of the Treasury; James A. Wetmore, Acting Supervisory Architect; and Magney & Tusler, Inc., Architects and Engineers.

The monumental architecture usually found in federal buildings was abandoned, and a modern architecture with classical lines has taken its place. The facade is unbroken by horizontal lines. The fourth floor is set back slightly on each side. At the ground level, a space of twelve feet provides for shrubs between the sidewalk line and the building at the front, and a forty-eight foot space at the rear of the structure to accommodate mail trucks for loading and unloading. The garage and heating plant is 236 feet long and has a siderrack for receiving coal, oil, gasoline, and other supplies purchased in carload lots.

The concrete is now being poured for this structure from the roof of the postoffice. This makes it possible to use the steel construction tower to elevate the loads thus eliminating the building of another elevator. The concrete is hauled in small cars along steel tracks to a dump trough. From here the concrete runs, under force of gravity to the forms surrounding the steel skeleton of the garage and heating plant. As soon as the concrete has set, and the forms have been removed, a veneering of Minnesota Dolomite will be applied.

Expert Construction

VERTICAL window columns run unbroken through the first three stories on the facade. The bronze panels covering the floor levels are decorated with a chrom-nickel decoration. The window frames are of a steel structure to which are bolted the bronze fittings and sashes. All joints of the sashes are machined to minute detail. The windows are more ornamental than utilitarian as far as ventilation is concerned. The ventilation at all times of the year will be entirely independent of outdoor conditions. Four huge air conditioning plants will change the air every twenty minutes and the humidity will be controlled scientifically. The structure will be zoned for temperature purposes. Quarters in which physical labor is being done will be maintained at slightly lower temperatures than the offices in order to secure a maximum working efficiency for all.

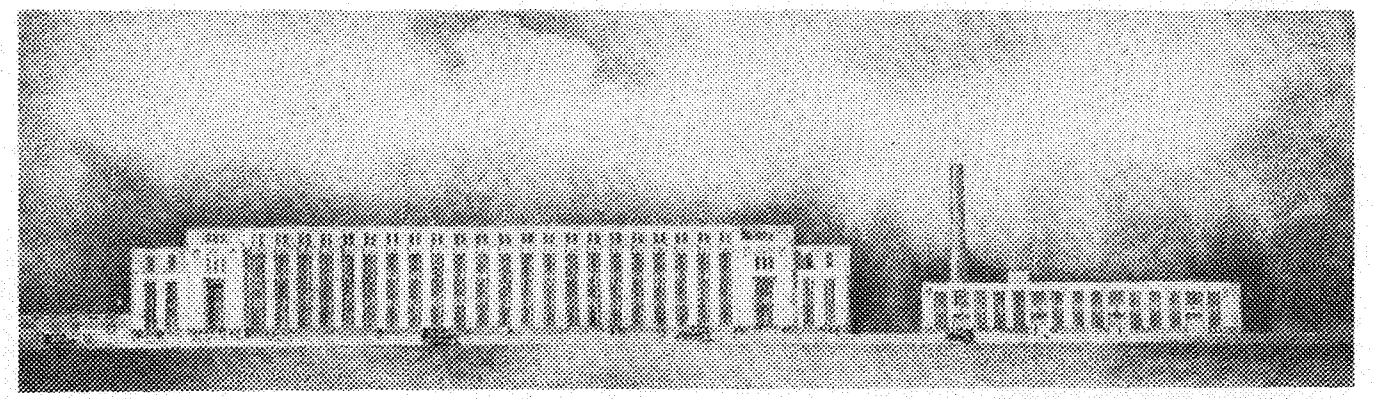
The structure is of concrete with a skeleton core of steel. The concrete was poured up to the second floor before work was started on the exterior granite base. The curtain walls are built up entirely of yellow brick and are veneered with Minnesota dolomite. The brick courses are anchored to the concrete skeleton by means of steel rods which were set into the concrete during the process of pouring. The parapet on the roof of the fourth floor is anchored to a solid slab of concrete which forms the roof. Reinforcing rods, of three-eighths inch diameter, project vertically a distance of eighteen inches along the extreme edge of the roof. A brick parapet was then laid so that the reinforcing rods anchor it at intervals of three feet. A crown stone, tapered to shed the water, is cemented and anchored into place on top of the brick parapet. The exterior of the brick is faced with a veneer of dolomite. The heavy crown stones are handled by means of small portable winches after they have been carried to the roof on the steel construction towers. Flat cars, running on a network of steel rails enable the workmen to move the heavy stones about with ease.

Unique Conveying System

THE method by which the modern automobile manufacturer is able to make five thousand automobiles daily will be utilized in handling mail at the parcel post station of this structure. In the plant of the former, automobiles are built up as they move continuously on a conveying system from workman to workman. Similarly, incoming and outgoing mail at the new parcel post station will be distributed by clerks as it passes by them on belts. This method will reduce the number of men required by fully fifty per cent and enable the office to take care of eighty thousand pieces of mail per day or twice its present needs.

The incoming and outgoing mail will be taken at once to the first and fourth floors respectively. The outgoing mail conveyor system has not been fully decided upon, but it will probably be similar to that used in the Quincy street station in Chicago. The parcels will be dumped onto a wide belt and carried to a primary distributing center where they will be removed by clerks and placed, according to their geographical destination, on one of ten belts. The packages are then divided geographically on secondary belts and placed on moving belts to carry them to the mailing tables. The conveying system is terminated by the mailing tables where the parcels are finally sacked.

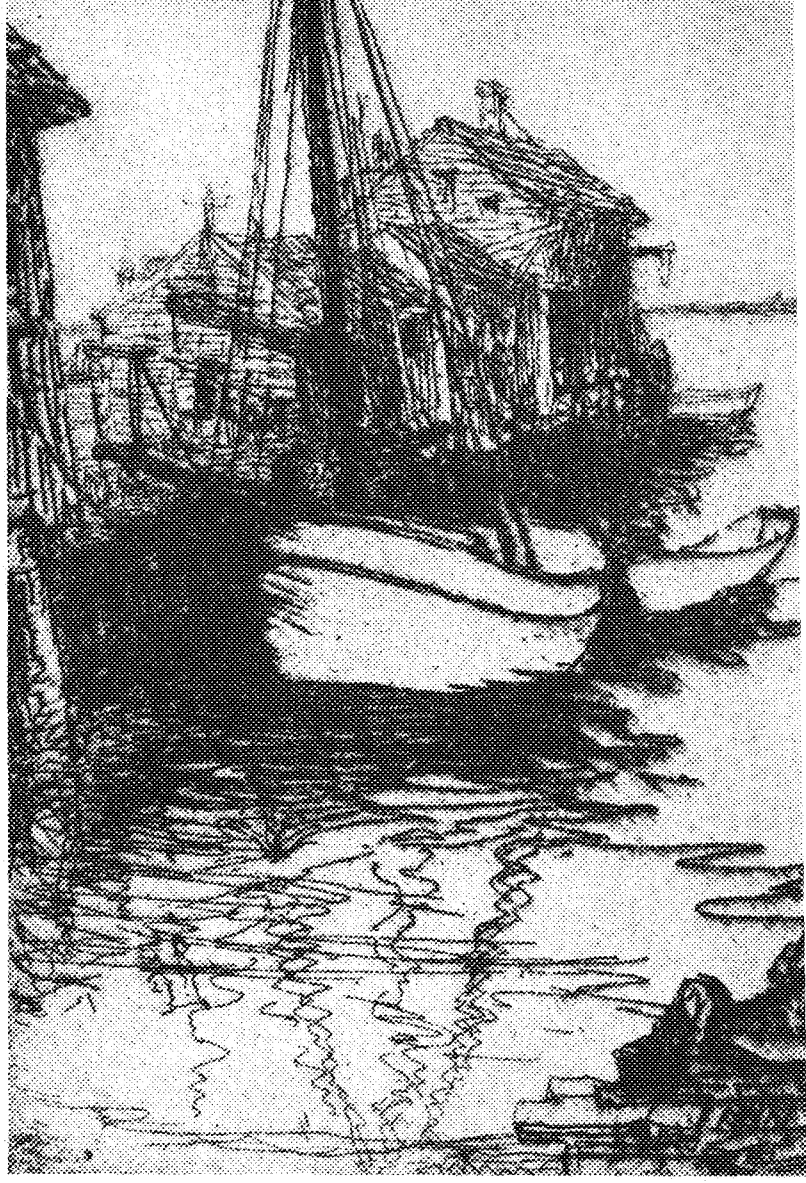
Incoming mail is received on the first floor. The loading platform and dispatch room cover one entire side of this floor. A drive will permit the mail trucks to make exchanges of mail at this platform. The entire second floor is assigned to the parcel post with the exception of a small area which is covered with the Civil Service Department and the cafeteria. The third floor is in close connection with the second and is devoted entirely to parcel post. City deliveries require most of the fourth floor with the exception of office space and rest rooms. A bridge from this floor will connect the present mail and express building at High street and Nicollet avenue. Two conveyors will operate over this, carrying the mail to and from the trains.



The architect's conception of how the completed structure will appear looking north on the First street side. The garage and heating plant are shown at the right of the Postoffice proper on this view.

Hogs - - Canals - - and Albicore

By RODERICK Wm. SILER
Assistant Professor of Mathematics



IF PROOF is wanted that American farmers of a century ago were a determined breed of men it can be found in the fact that some of them were known to drive herds of hogs all the way from west of Pittsburgh to the markets in Philadelphia, New York and Baltimore. It is certainly proof enough for me. Anyone who has ever tried to overcome the preferences of even a single hog must realize what a thorough test of iron will this of keeping several hundred hogs united and contented on their way to become pork must have been. As a matter of fact even the hardy old timers were not overly fond of the chase across the Allegheny Mountains and down the Atlantic seaboard. I imagine that possibly a young fellow who was not fully acquainted with the peculiarities of swine in transit, might have started his first trip with some enthusiasm. But once was plenty. After that he was an ardent advocate of better methods of transportation for farm products. He became one reason why in this country there was during the last century such a building of roads, canals and railroads as never was seen on earth in the same length of time before.

Of roads built there were a great many macadam, after the invention in 1816 of the Scotch engineer, John McAdam. But more interesting today, because they have probably gone beyond recall, are the plank roads of the 1840's and 50's. The first of these roads seems to have been laid down in 1837, in the neighborhood of Syracuse, New York. In an old manual of road making I find a description of their construction:

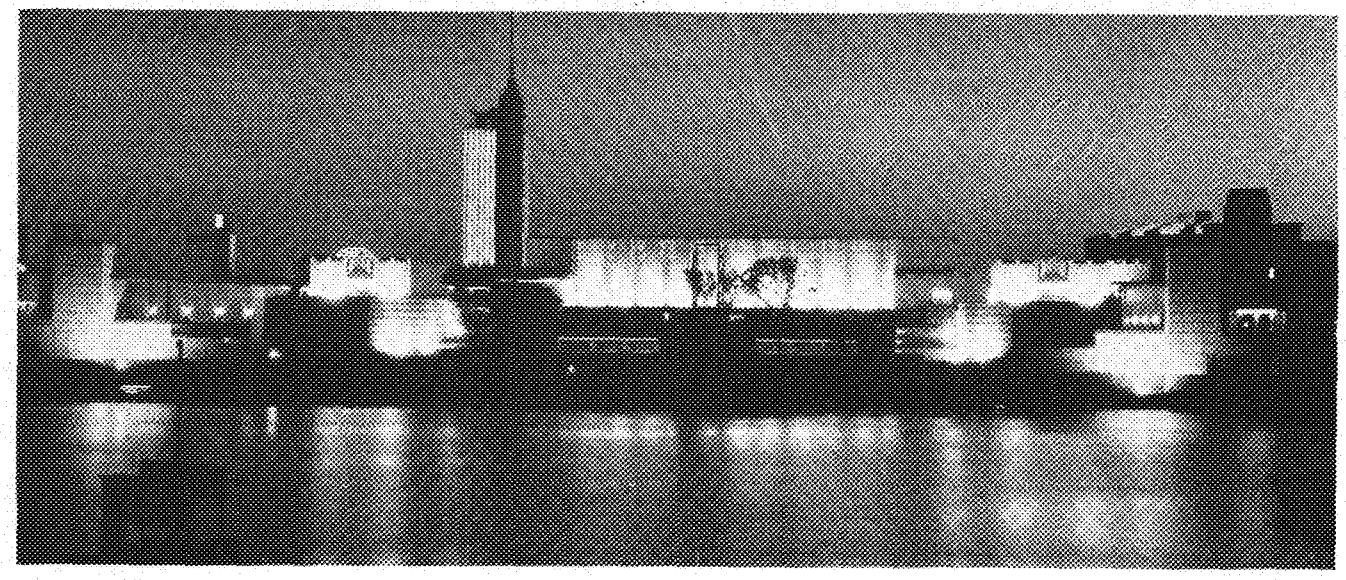
> "In the most generally approved system two parallel rows of small sticks of timber are embedded in the road, 3 or 4 feet apart. Planks, 8 feet long and 3 or 4 inches thick, are laid upon these sticks, across them at right angles to their direction. A side track of earth, to turn out upon, is carefully graded. Deep ditches are dug at each side, to ensure perfect drainage; and thus is formed a plank road."

It looks as if one of these roads, for anyone who could read the formula and had a couple of Saturdays off, must have been easy to make. I can't see much mention here of engineers, and conclude it must have been they who cut down the trees, lugged them to a sawmill, and turned out the planks. 2,000 miles of plank road are said to have been built in New York up to 1855, and the habit spread from there to the new country of the West; to Michigan, Indiana, Illinois and Wisconsin, where lumber was plentiful and roads were not. Chicago became quite a center for roads of this construction, which not only radiated out into the surrounding country but spread into the city, itself. Almost up to the Civil War period, Madison and State streets, and Blue Island avenue—all present day thoroughfares—were planked. Plank roads did not hold their popularity long, possibly because the people building them usually lined them with toll gates.

PLANK roads came and went, but there was another type of transportation, that by canal, which, long preceding plank roads in this world, is still in existence. Canals were used by the ancients, and there is some reason to believe that when it is realized in this country that there is no particular virtue in giving such things as coal, grain and lumber a ride of sixty miles an hour to market, canals will come back. In 1830 there were 1,200 miles of canals in the United States. And less than 100 miles of roalroad. In 1840 the respective figures were 3,300 and 2,800; in 1850, 3,700 and 9,000. Since then, in the mania for speed, the railroads have so outstripped the canals that there is many a person who hardly realizes there ever was such a thing as a canal in the country.

From all accounts there was much of interest and the picturesque about the old canals. In the beginning—that is, prior to the great increase in railroads after 1845—the canals

[*Please turn to page 48*]



Night Life

is most spectacular feature

At World's Fair

- - A rambling account of a few of the interesting features seen last summer at the Century of Progress exposition

By HERBERT JENSEN, Ch. E.

FIFTY years ago a beam of light left the star Arcturus to set in motion with its feeble light the world's most gigantic industrial spectacle, A Century of Progress. Almost apace with the speed of this beam has been the rapid rate of our growth in both industry and population until now we are the most powerful nation in the world. Fifty years ago few people in this country had even thought of attending the 1933 World's Fair, yet as the ray of light from Arcturus kept speeding through space, making perhaps its sister beams somewhat jealous, a World's Fair was planned and organized. When, on May 27, 1933, at 8:25 P. M. the stage was set, the easternmost of the four observatories to assist in this unique ceremony, picked up the light from Arcturus at dusk. The ray, wending its way through the telescope, greeted the silvered inside of a photoelectric cell, its first worldly contact was made, and at that point the ray was changed to an electric impulse and intensified. At Chicago an imposing audience of dignitaries and near dignitaries wait in silence. Soon a light appears opposite the name of the first observatory and in the amplifiers on the ground a low whining hum is heard.

Some minutes later there is a change in the pitch of the tone from the amplifiers. It grows higher and louder and becomes more clear as the second light appears on the panel opposite the name of the second observatory, indicating that the ray from Arcturus has been picked up by that station. The crowd waits, the sun dips, further and further into the blue haze, the whine becomes higher and louder, and yet another light appears on the stage. Darkness now gradually envelops all in its soft velvet tentacles and providing atmosphere for man's more romantic ideas. The whine again—higher—almost a roar—the fourth and last light on the panel appears, indicating that now all four of the observatories have their telescopes trained on Arcturus. Finally sufficient light has been intercepted to provide the necessary current and the Century of Progress is about to burst forth in all its splendor. High above the earth there is the sharp report of an aerial bomb, and the crowd is startled. Slowly a giant searchlight sends its finger of light across the island front in an effort to drive darkness and its silence from the earth. A photocell grabs at the beam and one building blazes forth in a maze of color and light. Further down the island the beam travels, touching each building and transforming it from a cold dark mass into a pleasing and colorful spectacle. In this most unusual, yet typically American, manner is introduced a night at the Fair—the searchlight beam continuing until it has spread the entire fair out as though opening a fan.

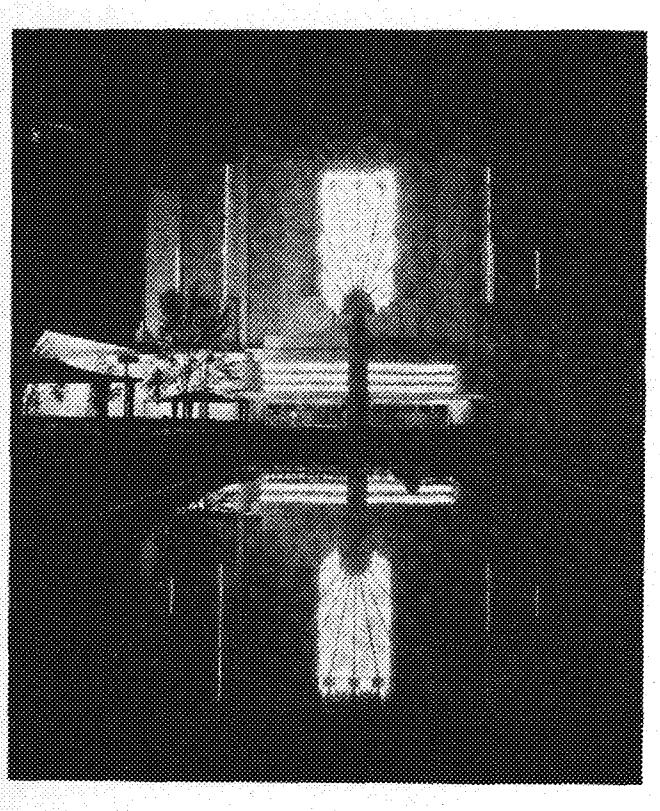
This spectacle has been viewed from the grounds adjoining the Hall of Science. Let us now make a hurried trip around the Fair to see what things are really outstanding to our semi-scientific minds. In the Hall of Science itself we find many things of interest. However, many of these are so complicated that we are unable to fully comprehend their significance. A thing that does interest us especially is to see many of the demonstrations we have seen attempted by various lecturers in their classrooms actually being successfully carried on. Not only that, but they are being done mechanically and without the aid of human hands. Certainly the most marvelous part of these exhibits is that which is behind

the scenes, the controlling equipment. However, there are plenty of things in that one building to occupy any engineer as much of the time as he might have at his disposal.

Attracted by the lights of the Electrical group, we make our way to the island to see some of the rapid strides of electricity during this "century of progress." Electricity, electricity everywhere—purely scientific electrical devices, industrial electric equipment, home and office equipment—everything from huge motors and generators down to tiny curling irons and midget radio sets. To the General Electric House of Magic we offer our silver plated congratulations for showing what we thought was the most entertaining exhibit of the Fair. It is a great idea, this House of Magic, for it seems equally interesting to the layman and the scientist. You leave it feeling that you have been entertained royally and that you really have seen something worthwhile—a feeling akin to that you get after seeing a season's best play. One thing, however, was not quite clear to us. To our surprise and apprehension we found that Westinghouse and General Electric had presented several identical developments in their respective exhibits as products of their independent research.

From the electrical group we hurry to the Hall of States where the states of the nation are on parade, and what a parade. As in all things, too big a selection is just as hard to choose from as too small a selection, and here it would have taken a Solomon to pick out the best state group. We are still haunted by the "oh-so-warm" attention paid us by those girls from California. One in particular, a beautiful blonde, so captured us that before we got away we had asked her for every bit of information she had regarding her state from how to protect apple trees from worms, to the Golden Gate bridge project. The mailman still delivers folders and pamphlets on California.

The Golden Temple of Jehol was the most beautiful non-commercial exhibit of the Fair. On the walks before the entrances were Chinese girls vending incense, the odors from

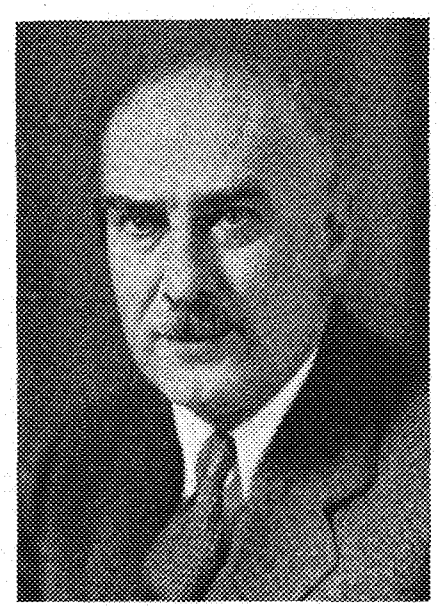


their trays bringing you quickly into the atmosphere of the place. It wasn't hard after that to imagine yourself in a Far Eastern city walking in narrow streets lit with small blinking lamps which shone dimly through the thin haze from the harbor and lent a wierd Oriental touch to this street in Chicago. The first step inside the door took you nearer the East and as you gazed upon the tapestries and busts of Buddha, you were no longer in America but attending worship in the land of Confucius and Lao Tze. Gongs tolled the hours. Small gongs whose voices were like the tinkling of fine glass. Large gongs whose clang would make the dead turn in their sleep. Tremendous gongs whose hoarse bellowing reverberations would fairly waken the dead. The lecturer begins his lecture and narrates the history of the curiosities we see about. Time flies. Once again we find the show is over and we must go our way. It strikes us here that we in America have no rich spiritual heritage like the Orientals. It is too bad. America with all its production, efficiency, and the numerous other accomplishments she is known for, will lack an effectual trust fund of things to live by. We travel fast and do not see the road we travel.

But now it is ten o'clock and the exhibits are closing, so let us be on our way toward the Midway. The trip to the Midway is made in a blaze of light. Man, in this continuous effort to find a new way of advertising something, has utilized light to its utmost. Multi-colored searchlights flood the grounds. Ultra-modern lamp post design adds eerieness to the place and we marvel at this flashy fellow, Light, in his desire to be seen.

The Belgian village gets us next and no sooner in the gate than what do we find on our arm but a peasant girl. Her touch gives us a distinct feeling of buoyancy. Man once again feels important as this shy, pretty little girl waif pretends she needs protection and companionship. In our heart we swear no wrong shall come to her. But no sooner does she completely gain our heart than she pins a rosebud on our lapel and says "Ten cents. Please, mister, it's the only one I have left." What can we do? Another look into her innocent face and again we are completely helpless. Inwardly we feel as if she had asked for ten times as much, it would have been hers. Yes, the rosebud still hangs on that lapel.

Such are a few of our fleeting recollections of the 1933 Fair. Of course, in one evening we cannot begin to see everything — — in fact we haven't even seen a fan dancer yet — — not even to mention the Travel and Transport exhibits, foreign country exhibits, etc., etc., etc. However, the Fair opens again next spring, and we'll go back then and complete our visit.



Dr. Charles A. Mann

Chemical Engineering

fulfills a growing need

In Modern Industry

By RICHARD R. PEDERSEN, Ch. E. '35

(Cuts courtesy Chemical and Metallurgical Engineering)

AFTER the usual discussions of the current topics of the day, the embryo chemical engineer at home or among the home town acquaintances is often asked, "What course are you taking at the university?" Without further ado he is likely to answer, "Well, I'm taking a fling at Chemical Engineering." Thereupon some listener may remark, "Gosh, that must be pretty tough stuff. Just what is meant by chemical engineering, anyway? To which the embarrassed chemical engineer may reply with awkward gestures of the arms, "Aw, it isn't so bad as long as you really get down and study the junk. It's all about putting chemical processes on an industrial scale and stuff like that." He then proceeds to dismiss the matter in a rather disinterested manner by stating jokingly that after all chemistry's greatest gift to humanity was probably blondes, and so on.

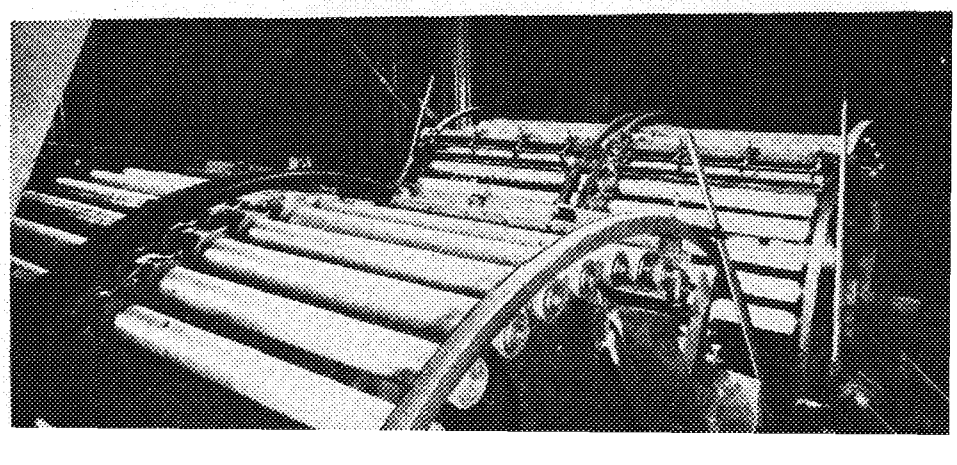
To hear such an explanation given to a layman would in all probability tend to make an experienced chemical engineer become extremely lachrymose and lugubrious. The average chemical engineering student spends his first two years in college becoming well versed in the basic sciences of physics, chemistry, and mathematics. His introduction to actual chemical engineering does not come until his junior year, and he is therefore hardly to be blamed for giving such trite definitions of the subject to his admiring non-professional uncles, second cousins, and grandmothers.

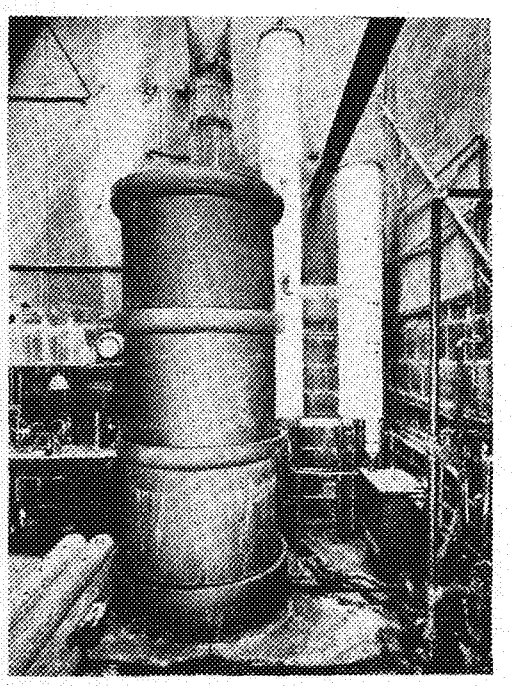
Almost everyone has fairly acceptable notions about the older, well-established civil, electrical, mechanical, and mining engineering professions. It was about at the turn of the century when chemical engineering began to be established on a definite basis in this country. The American Institute of Chemical Engineers was organized in 1908, but it was not until the advent of the World War that the utility of a chemical engineer began to be realized and appreciated by industry in general. Since that time the prestige and achievements of the profession have increased by leaps and bounds. This year, the profession is celebrating its twenty-fifth anniversary and it can rightly point with a proud finger to its progress during the past quarter of a century in the United States.

DR. CHARLES A. MANN, Chief of the Division of Chemical Engineering at the University of Minnesota, defines a chemical engineer as follows: "A chemical engineer is a professional man so thoroughly trained in the branches of chemistry as to be able to determine the chemical and physical conditions involved in a process depending on chemistry, and who has the proper mechanical, electrical, and chemical engineering training to enable him to design, construct, and operate the equipment and plants necessary to make such a process commercially successful." This seems to be a rather large order for one man to undertake alone, but, upon further analysis, it is found that all industrial chemical processes are based on certain definite *unit operations*, no matter what process it may be. The more important of these so-called unit operations or unit processes are crushing and grinding, mixing, evaporation, filtration, drying, distillation, heat transfer, fluid flow, and crystallization. We also have what are called the unit organic operations. The more important of these are reduction, nitration, sulfonation, oxidation, hydroxylation, amidation, alkylation, esterification, and halogenation. These lengthy terms may seem somewhat puzzling to the average person, but they are not really as bad as they sound. They are the very basis, or the life blood, so to speak, of the chemical engineer's profession, and it is his duty to become well-versed in their basic physico-chemical aspects. He must not only know the underlying theories of these unit processes, but he must be able to make them commercially possible; that is to say, he must be able to make money for the tycoons of industry, and consequently a little for himself. He applies science to industry and helps to administer its benefits to humanity. Therefore we can say that a chemical engineer is a true engineer. He is not a chemist, but he uses chemistry as one of his main tools. The chemical engineer is primarily a producer and he makes potassium permanganate and alpha-nitroso-beta-naphthol by the ton, not by the gram.

The most important work of the chemical engineer is the translation of the work of the laboratory into practice. In studying a new process he may work in the plant, if it is possible to interrupt

The modern rotary filter in the picture below is one of the latest applications of an important chemical engineering unit operation of industry.





In the picture above is an experimental gas-washing plant. This is a good example of the so-called "semi-works" process, an experimental set-up half way between the laboratory stage and the production stage.

●

production, but more likely he will have a semi-works or pilot plant in which to work. Here he follows a fairly definite procedure. First, he must put the plant into operation; then, he must accumulate masses of operational data and from the data determine the variables upon which depend the commercial value of the process. Finally he must design the full-sized apparatus necessary for production, specifying sizes and materials.

It can be seen that the education of a chemical engineer is an extremely important factor. He must be taught how to think and how to analyze problems very carefully. He must develop his personality and he must be an honest and responsible person. If he has initiative, and if he is willing to work and study, the chemical engineer can attain high executive positions in industry.

The fact that the Division of Chemical Engineering at the University of Minnesota was on the first list of schools to be formally approved by the American Institute of Chemical Engineers, and that it now holds an honored place among the nineteen accredited institutions in the United States, speaks for itself. The division functions as an independent unit in the School of Chemistry under the leadership of Professor Charles A. Mann (genially known as "Doc" to his students and associates). If the day ever comes when one of the multimillionaire chemical engineering graduates of this institution shall see fit to donate the money (all contributions will be gladly accepted—the line forms either to the left or to the right!), a chemical engineering building will be erected next to the School of Chemistry on Washington Avenue.

The division, as it now functions was organized by Doctor Mann when he came here in 1919. Besides Dr. Mann, the following are members of the staff of chemical engineering: Dr. George H. Montillon, professor; Dr. Ralph E. Montonna, associate professor; Dr. Arthur E. Stoppel, assistant professor; and Drs. Elliott L. McMillen and Burrell F. Ruth, instructors. John L. Beal, Kenneth C. Johnson, Edward E. Litkenhous, Oscar J. Swenson, and Charles C. Winding are graduate assistants. This year there are twenty-five graduate students working on research problems in chemical engineering. The efficiency of the instructorial staff can be illustrated by the fact that nearly all of the graduates of the school hold good positions and that twelve men were placed this last summer alone.

The equipment in a chemical engineering department is an extremely important adjunct in the education of the student. At Minnesota there are six chemical engineering laboratories in addition to the regular chemistry laboratories. These are the chemical manufacture laboratory, the control laboratory, the crushing, grinding, and mixing laboratory, the applied electro-chemistry laboratory, the electric furnace laboratory, and the drawing and design room. In addition to these there are several research laboratories. These laboratories are equipped with the necessary apparatus to enable the student to become well-grounded in the practical application of the unit operations. A reference library of chemistry and chemical engineering is also available to the student.

Now you may ask, "After the chemical engineer has received his training, just what does he do." It is true that nowadays one may find chemical engineering graduates running elevators, playing professional football, hunting (for jobs, mostly), acting as gigolos, or taking a doctorate in dishwashing. These glaring contrasts in employment are true of all professional school graduates, however.

When a chemical engineer starts out in a plant, he may do all sorts of work, from that of a common laborer to a laboratory analyst, in order to become well acquainted with the inner workings of the special industry. But, he comes there thoroughly trained in the fundamentals, and his advancement should be rapid. He can become a maintenance, development, or supervising engineer. Many chemical engineers are in the technical writing field and others are connected with the government and research foundations in various capacities. Teaching is a field that holds great interest and a teaching-consulting practice has ideal possibilities. The classes of 1920-29, inclusive, were distributed as follows in 1930: 23 percent were in graduate study, teaching, governmental and institutional research, consulting practice and law; 5 percent outside of engineering; and 72 percent in 21 industries.

Thus it can be seen that the scope of the profession is almost limitless and that it covers a wide range. It would be an almost futile task to attempt to enumerate all of the possible positions that a chemical engineer could fill with his broad training, but suffice it to re-emphasize the fact that the field is large, and it is not overcrowded, comparatively speaking.

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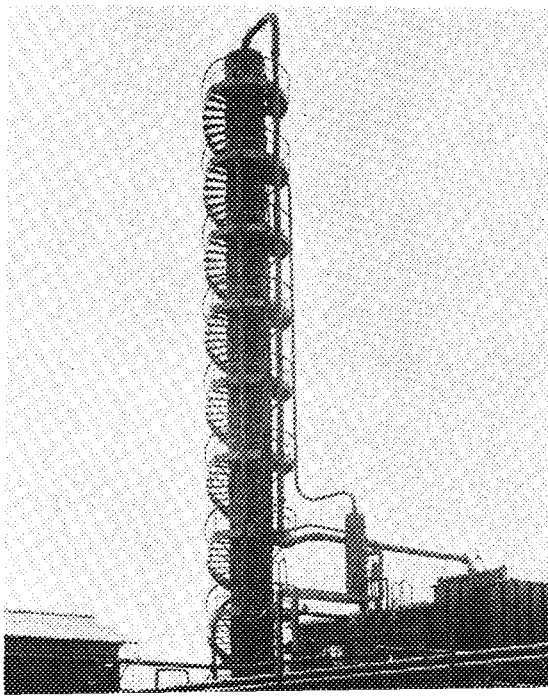
Below is shown a huge distilling tower such as is used in an oil refinery, a typical chemical engineering development.



Electric

diathermy performs wonders in

Medicine

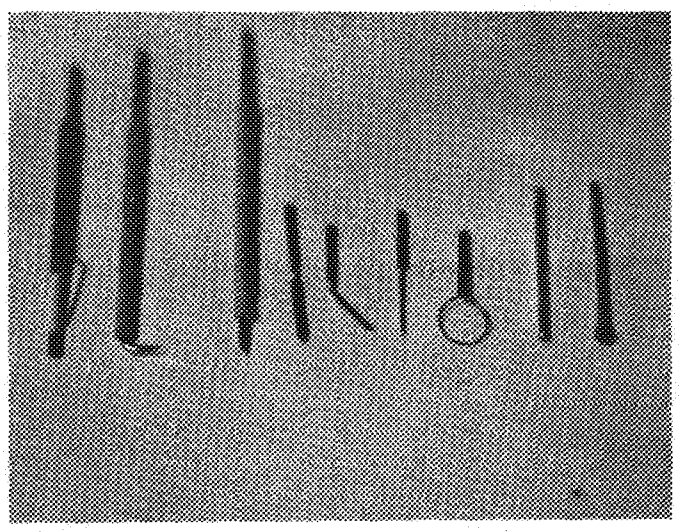
By ISADORE CHALEK, E. E. '30

Bloodless surgery! Think of it. Surgery without bloodshed. How many of us realize that this phenomenon belongs to the present, and is not some fantastic dream of the future? Even the removal of tonsils, which is in reality one of the most bloody of operations, is now accomplished without the least danger of hemorrhage. Marvelous, yes. But this is only one of a number of improvements in medicine which have been wrought by the use of diathermy. Mr. Chalek presents in this article a bird's-eye view of the features of diathermy. The author, who received his B. E. E. in '30, is now employed at the University hospital, while pursuing a course in medicine.

EARLY beginnings were made along the line of diathermy when in 1891 Nicola Tesla observed the heating effect of high frequency currents upon insulated bodies. Experimental work was carried on by others, who applied this principle to the production of artificial fever in animals, and finally in 1904 to human beings. During the last ten to fifteen years great advancement has been made in diathermy —the technique and application of these principles to therapy and surgery. Today diathermy is used universally and with much success in the treatment of such human ills—to name only a few—as rheumatism, primary pneumonia, and some forms of venereal disease. In surgery it is used for the removal of tumors, cancerous tissues, and facial blemishes.

The diathermy machine is an electrical oscillator whose output frequency is about that of a modern radio broadcasting station. Of the two kinds of diathermy machine, the spark gap and the vacuum tube types, the former is used more extensively, and will therefore be described in detail.

The machine operates from the power of an ordinary lighting supply. The circuit in its bare essential consists of a power transformer, a variable spark gap, a condenser, and an output transformer provided with several taps for different voltages. Upon closing the switch the condenser becomes charged up to a voltage dependent upon the setting of the spark gap. The longer the spark gap the higher will be the voltage to which the condenser is charged. When the critical voltage is reached the spark gap breaks down and the energy stored in the condenser sets up a high frequency current oscillation which dies down to zero within a few cycles; this is called a damped wave train. As soon as the oscillations of the wave train die out the condenser again charges up and discharges to give another high frequency damped wave train. This process continues as long as the machine is connected to the power supply.



The electrodes shown above are used in the various techniques of surgical diathermy.

There are several ways of varying the output. Some methods vary the number of wave trains per second, while others vary the peak voltage of the wave train. It is apparent that the same effective voltage can be obtained by using a small number of wave trains per second with a high peak voltage, as by using a larger number of wave trains with a lower voltage. It is more desirable, however, to use a lower peak voltage as there is less danger of burns and shock to the patient. Under ordinary conditions 8,000 to 10,000 wave trains per second are used.

The application of high frequency currents is divided into two major fields: medical diathermy and surgical diathermy. In the former a relatively large amount of heat is produced in the tissue without causing its destruction. In the latter the tissue is actually destroyed at the point where the current enters. Medical diathermy is designated simply as diathermy. In both forms the high frequency current is actually passed through the body.

How high frequency currents of large magnitude (3.5 to 4.0 amperes, in general diathermy treatments) can be passed through the human body without harmful effect is a matter of wonder to the person unfamiliar with the physiological action of electric currents on tissue. Direct or low frequency currents of the same magnitude would be fatal, whereas the passage of high frequency currents gives no sensation except a gradual increase of temperature. The harmful effects encountered in the use of low frequency or direct currents are due to electrochemical reactions which destroy the cell content of the tissue and the neuromuscular reactions. The rapid change in polarity when using high frequency currents prevents any of these harmful reactions from taking place. The only function of the high frequency current is to produce heat in the tissue.

There was an old theory that the human body acts like a metallic conductor which displays "skin effect" at high fre-

Treatment of ankle showing salt solution being used as special electrode.

quencies. This means that the current is forced from the center of the conductor and travels on its outer surface. That theory has been definitely disproved. In a diathermy treatment the current passes through the body from one electrode to the other, its distribution in the body depending upon the relative resistance of the various tissues between the electrodes. The current seeks the path of least resistance in passing through the body. The only limit to the magnitude of current that may be used is determined by the size of the electrode and the smallest cross-section of tissue through which the entire current must pass. The maximum current density that can be safely used is 100 milliamperes per square inch of electrode. A higher current density results in a skin burn before any appreciable heating of the underlying tissue is obtained. The following table gives an idea of the relative resistance to high frequency currents of the various tissues of the body:

Muscle	1.0	Bone	20.0
Skin	3.0	Internal organs	1.0 - 3.0
Fat	20.0		

The electrode is a suitable conductor through which the current is led into the patient. In diathermy treatments of the body and its extremities where heating effects are desired, malleable tin plates, or cotton pads backed with copper gauze are used. These pads are soaked in a concentrated sodium chloride solution.

In surgival diathermy three techniques are used: electrodesication, electrocoagulation, and cutting. In the first, a needle point electrode is held either at a short sparking distance or in contact with the part to be treated. The shrinking and drying which follows is due to evaporation of the moisture content of the cells. There is but a small amount of fibrous (scar) tissue produced, which fact makes diathermy practical in the removal of moles and other small growths. While the voltage used in this procedure is high, the current is low.

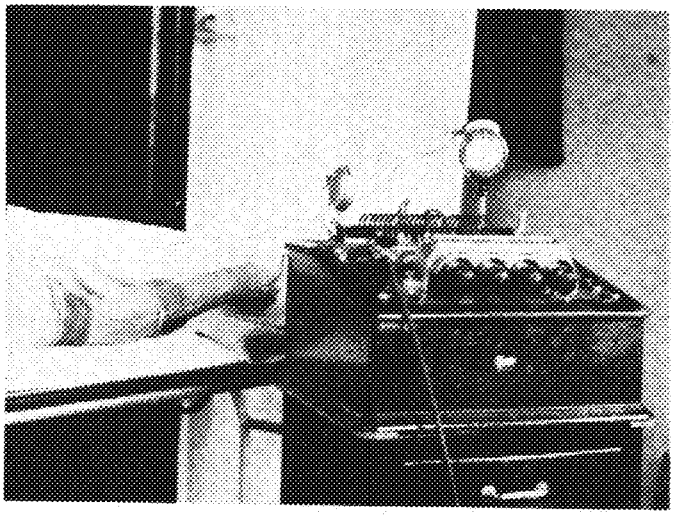
In the second technique, electrocoagulation, the active electrode is usually a needle, one tipped with a small ball or plate being used for superficial coagulation. A large dispersive electrode is placed usually on the back. The depth of coagulation is controlled by varying the current. This technique produces a greater destruction of tissue than electrodesication, and is therefore responsible for a greater quantity of scar tissue.

In the third technique, where actual cutting is desired, a needle, blade, or loop of fine wire is used as the active electrode, depending on the kind of work to be done. The loop is used for the removal of tonsils. As the rate of cutting is decreased, the amount of accompanying coagulation increases. This coagulation is sufficient to close the small blood vessels. The larger blood vessels are pinched with a forceps where they are cut and then are sealed by touching the forceps with the coagulating needle for about one second. Bacteria and malignant (cancer) cells are destroyed by the heat of the sparks, thus producing a sterile field and reducing the chances for the spreading of these undesirable organisms and cells. Cancer surgery has adopted this means for the removal of tumors and cancer tissues wherever its use is possible.

It has been previously mentioned that the function of the current used in general diathermy is to heat the body tissues. A number of physiological effects accompany this heating. Blood circulation and metabolism are increased. Bacteria of many kinds are affected in such a way that they may be more easily destroyed by the white blood corpuscles. In the case of nervous disorders, there is a marked sedative effect coupled with relief from pain.

The effects noted above make diathermy especially useful in the treatment of arthritis, neuritis, pneumonia in its primary stage, internal organs of secretion, venereal diseases, and inflammation in general. Experimental work is now being carried on in connection with tuberculosis. General diathermy treatments are given in which the entire body is given an artificial fever sometimes reaching 106 degrees Fahrenheit. Diathermy is used also in the treatment of general paresis, which is the third stage of syphilis.

It is reasonable to expect that considerable progress will be made in the field of diathermy in the near future, along both surgical and therapeutical lines. Inasmuch as favorable results are being achieved in the treatment of early stages of cancer and tuberculosis, diathermy holds an important position in the advancement of medical science.



Longitudinal treatment of elbow joint showing diathermy machine used at the University hospital.

THE MINNESOTA
TECHNO-LOG
UNIVERSITY OF MINNESOTA

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A Faculty Work Committee

FROM time to time, in fact at very frequent intervals, groups of students may be found discussing among themselves the relative merits of various faculty members. In most instances the discussions are centered about some particular faculty member who is generally disliked. Having absolutely no official or recognized means of voicing a criticism of a faculty member or of suggesting any changes in methods or teaching procedure, these students can only work up feeling among themselves and then carry grudges against the various instructors who are for any reason disliked.

Furthermore, there is at present in the University of Minnesota no organized means by which the various instructors are enabled to get representative constructive criticisms from their students. No matter how well versed the teacher may be in his particular field, he cannot always "put the thing across." Some important detail which may be perfectly obvious to him is touched so lightly that the student who is entirely new to the subject fails to grasp it. The student thus gains either a hazy conception or an absolute misconception of the principle, and when he finds himself lacking an essential element in the solution of a problem of a quiz, he naturally blames the professor, probably adding that "the old fossil doesn't know what he is talking about anyway." Some such criticism is, beyond a doubt, sound. But, much of it is groundless and could be avoided if there were a proper coordination of student opinions.

There is no doubt that some reason can be scared up to account for the hiring of every member of the teaching staff. The man may be a good instructor, he may be an authority in the field, he may have a broad general knowledge, he may have at one time in his life done something which gained him the position, or he may simply "have a pull." Whatever that reason might be, the University authorities would uphold it strongly enough to overcome any argument that an individual student might bring up. However, if the efforts of a group of students were united toward the accomplishment of the common goal, a much more satisfactory goal might be reached.

We suggest, therefore, the organization of a Faculty Work Committee, the purpose of which would be to entertain written grievances against any faculty member of the institution offered by students, to consider fully and seriously these grievances, and to report their conclusions and recommendations to the proper University officials. Through such an organization, and only by that means, will a better understanding between students and faculty be accomplished.

Scientific Laboratories

ENGINEERING students of any university are in an advantageous position in that they have access to some of the best engineering, physics, and chemistry laboratories in the country. Most students carry out their laboratory experiments perfunctorily, rushing through without knowing what they are doing, leaving as soon as they have finished. It is only after leaving school and working for an engineering firm which has limited research facilities that they really appreciate the many measuring instruments and test equipment which were at their disposal.

There are many engineering firms which have certain experimental work that can only be done in the University laboratories, but which are unable to pay the charges made by the University for outside work. Of course engineering students are not allowed to do this work with University equipment if it is strictly a commercial proposition. In many cases, however, the work is of such a nature that it fits in with the regular experiments and class work.

There are many ways for engineering students to find commercial experiments which they can do as a part of their class work. In one instance, a student answered an advertisement in a commercial magazine, asking for technical information on recently developed electrical equipment. By return mail he was offered a complete set-up of the equipment advertised, if he would make a few measurements on it in the electrical laboratory.

If students who desire to do extra work will explain the nature of the work to their instructors, often they will be given permission to go ahead. Although little, if any, remuneration can be expected from the smaller companies from work of this nature, the practical experience gained and the contacts made with engineering firms will prove invaluable when a student seeks a position upon graduating.

Do You Know?

HAVE you ever asked yourself what you are going to do after you finish school? An easy question to answer but one that is hard to answer properly. Of course, you are going to be a civil, or electrical, or mechanical engineer or some other such thing. But do you really have a clear picture of what your particular branch of engineering is going to demand of you? You will have amassed a great deal of theoretical knowledge during four years' stay at the University, but have you any idea of the problems you will meet in practice; or what the organization of which you will become a part will be like?

We are nearly all in the same boat with the two chemical engineers, one a junior, the other a senior, who were arguing in the office the other day. They were unable to agree on what chemical engineering was. Because there is this lack of knowledge about the actual work of the engineer, the Techno-Log is beginning, with this issue, a series of articles on the various branches of engineering.

Some of the articles will be student written, as is the one in this issue, others may be written by faculty or alumni. In any case, the facts of the articles will be authoritative, since all statements are either checked by professional men in the field or are compared with authoritative information on the subject such as that contained in the pamphlet entitled "Engineering, A Career, A Culture."

On page thirty-two there is an article entitled "Chemical Engineering Fills a Growing Need in Industry." Read it. Read the ones to come. Then see if they do not help you to answer the questions asked above.

Reviving the Arabs

AT THE beginning of every year, some talk arises on reviving the Arabs, engineering dramatic organization. The Arabs were a well known group, giving high class dramatic productions in which the entire cast was composed only of engineers. The men wrote the plays themselves and took parts of both male and female characters. Their last production was in 1931, when because of financial difficulties, the organization disbanded. Last year some effort was made to revive the Arabs and this year the subject has again arisen.

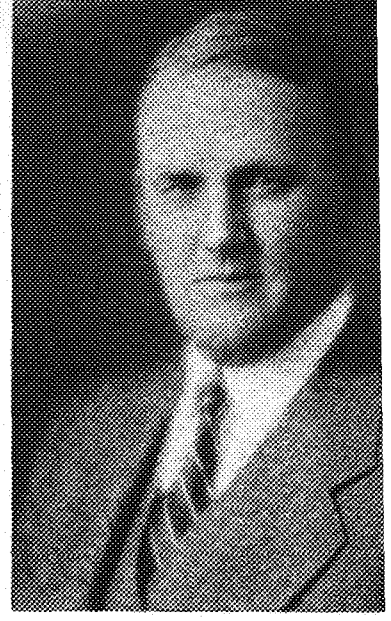
A dramatic society among engineers is highly desirable. Acting is a form of activity having beneficial and interesting qualities not obtainable in any other way. The Arabs should be revived, but mere talk will not do this. Immediate action is necessary, and the few members of the original organization are the ones who can best bring about a reorganization. Let's have some action on this right way. Either the Arabs must be reorganized before the end of this quarter, or the question may as well be dropped until next year. The Techno-Log will do its part by continuing to publish articles and editorials concerning the Arabs, as well as any open letters on the subject which we may receive.

* * *

"A good thing to remember and a better thing to do
Is to work with the construction gang not with the wrecking crew."

—*O. M. Leland.*

Dean Leland's Pen



Abolish Academic Degrees

EVERY time that some test or requirement in connection with a college curriculum is abandoned and the course made less exacting, an immediate response occurs in the college press with spasms of delight or dignified scholastic approbation. If all such evidences of student desire for a life of ease as far as studies are concerned were to be collected, a logical inference might be that the ideal course from the student's standpoint would be one which made no demands whatever upon him and which he would be entirely free to take or leave, in part or in whole, as he saw fit, according to other demands upon his time. Similarly, expressions from members of the faculties of some colleges deplore the scarcity of students, presumably of a former vintage, who study merely for the sake of studying and without any idea of a useful application of their college scholastic activities.

It would seem logical, therefore, to ask why it would not be a good plan in an arts college to abandon the Bachelor's degree entirely, together with all tests, examinations, attendance requirements, etc., in order that students might pursue their studies untrammeled by dreads and fears and without interference by any rules. Such students might study for the love of it and, according to opinions in the student press, would obtain the ideal college education with the least possible loss of time and energy in the overhead requirements.

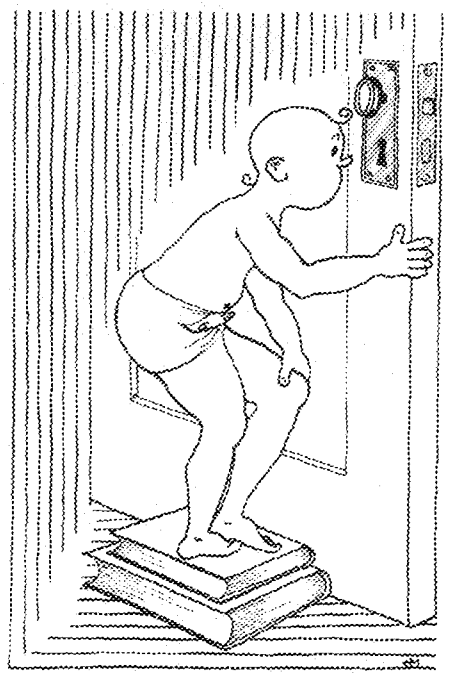
PROBABLY the majority of students graduating from an arts college do not take graduate work and may not have any professional use for the Bachelor's degree. In the professional schools, on the other hand, a degree is a tangible and valid certification of the completion of a definite curriculum and this certification is recognized by legal licensing and registration bodies or boards which determine to a great extent the professional status of the graduate. Therefore, the degrees from professional schools could not be abandoned as some of those from arts colleges might be.

Instead of going to the extreme, perhaps, of abandoning all Bachelor's degrees from the arts colleges, it might be desirable to separate the students into two classes: first, those working towards a degree; and second, those who might be regarded as unclassed students, not working towards a degree. In the former group, students might be subjected to the usual tests, required attendance, examinations, etc., in preparation for the certification of the degree. The second group would be essentially auditors, although they might be permitted to participate in the activities of the classes they attended, insofar as such participation did not interfere with the work of the regular students.

If such unclassed students were encouraged to regard themselves as a select group, free from objectionable and routine restrictions, the plan might become popular.

—*O. M. Leland.*

ENGINEERING



our new frat of the month

iota go nude

Beginning in this issue, we will publish lists of honorary members elected to Iota Go Nude. Selections of prospective members will be made upon nomination by the stewdents. Nominations must be filled with the editor, and shall be judged by "we." Selections made by the judges are final, and no entries will be returned. This contest is open to all except the Techno-Log employees and their families. Come come, girls, let us hear about you. Subject requirements for I.G.N. nominations:

A. Profs.
1. Cracking stale jokes.
2. Monotonous comical repetitions.
3. Habitual tardiness.
4. Scandal.
5. Any conscientious objections.

B. Stewdents. (The dents who go out and get stewd.)
1. Scandal.
2. Prominence in a bad way.

charter members

1a. A particular prof. in structural engineering, who can't allow such a little thing as time for class to disturb his sleep, yet never lets a class go at the "20 after" bell.

2b. A junior E.E., who pledged Pi Ep Pi Sig., and who was seen running around halls of E.E. without his pants.

Names will be published next issue unless a hush fee of $5.00 is paid to the editor.

* * *

According to our local world's greatest newspaper, Richard (Karl Marx) Scammon enjoys yelling SCArAB at the village workingmen. We think Richard is a SCArAB. (afterthot) Even if he is Pnyx.

igbay adbay olfway

Idday ouyay everhay earhay de sturrey emfray de Igbay Agbay Olfway? Ellway eevegay a istenlay nday I illway ellay ouyay. Anymay onglay earsyay goway, Little Red Riding Habit entway ootay erhgy angray ather'smay ootay eeplslay. In de iddlemay of de ightnayeshay eardhay a oisenay. Ookinglay underlay de edbay, oohay ouldshay eesay utbay de igbay adbay olfway. So atwhay ouldeay eshay ooday utbay ellyay. "O-oh! Mamma! There a big bad woof under my bed." So de euxious grenmaw, tinking to please Leetle Rad Riding Hebit, turned de wooluf into a men. De men came out from under de bed end introducted himself to Leetle Rad Riding Hebit, end dey lived aver heppily efter.

* * *

ode to pillsbury

With contemptuous pleasure, we note the size of Skum, as October issue. They seem to think over in Pillsbury that Skum can usurp our time-proven position as the campus' humor magazine. We say this because we know they'll read this while trying to cop a new idea. Ooyay, ouhay, Ansypays

what? no spokes

Karl Ziegler, senior E.E., was quite at loss the other day as to why the big wheel in the cut on the bottom of page nine, last issue, had no spokes. "What holds the d(arnd) wheel up?" quoth Karl ithway uchmay concern. (To the rest of Engineering-at-large, the wheel is revolving at high speed.) Karl was in a fog, as it were. Tee Hee.

* * *

mee-ow-w-wer-rr

Hurray for Harold Butler, the Tiger Man from Mars. It seems that Harold grew a mustache on his chin last summer just to thrill the girls. Ah, me, we were once a cave man myselve.

* * *

digest of skum

We don't like Skum's masthead cut. Baring Gold isn't old enough to have whiskers. What we did like, tho, was the picture of Miss Jayne Foote. Hats off to you, Jayne. P.S: May we c'mup sumtime? Huh?

Furthermore, why does, Barold-Ging have to pick on innocent shy young things for his d - - - jokes. Now say, were it Mrs. Skinner, or Blitz. . . . .

---

pome

Who is the man designs our pumps with judgment, skill, and care?
Who is the man who builds 'em and who keeps them in repair?
Who has to shut them down because the valve-seats disappear?
The bearing-wearing, gearing-tearing Mechanical Engineer.

Who buys his juice for half a cent and wants to charge a dime?
Who when we've signed a contract, can't deliver half the time?
Who thinks a loss of twenty-six per cent is nothing queer?
The volt-inducing, load-reducing Electrical Engineer.

Who is it takes a transit out to find a sewer to tap?
Who then with care extreme locates the junction on the map?
Who is it goes to dig it up and finds it nowhere near?
The mud bespattered, torn and tattered Civil Engineer.

Who thinks without his products we would all be in the lurch?
Who has a heathen idol he designates "research?"
Who tints the creeks, perfumes the air, and makes the landscape drear?
The stink-evolving, grass-dissolving Chemical Engineer.

Who takes the pleasure out of life, and makes existence hell?
Who'll fire a real good lookin' one because she cannot spell?
Who substitutes a dictaphone for coral tinted ear?
The penny chasing, dollar wasting Efficiency Engineer.

end of pome

Through a Keyhole

By

OSCAR Q. (WINCHELL) FEGAS, C. O. D. '11

paging

All youse Engineers: We have offered a bounty of 23c per head on stewds from S.L.A., Mines, & Forestry. We offer two bits a piece for the heads of Wm. S. (Baring-gold) & T. Arthur Rogers.

✓ ✓ ✓

We had a most confidential chat with Prof. French some weeks back. Will say right here that Sam Stein and a bunch of other muggs are all rong. I think Mr. French is a suwell guy, wot I mean.

✓ ✓ ✓

Betty Lou, my Cio Cio San,
Neck with me, for I'm your man.
"Boima Shuve."

✓ ✓ ✓

I.N. Cidentally, my very good friend, has promised me a treatise on necking for the next issue.

✓ ✓ ✓

in a fog

We wonder whether or not the military dept. believes in hazing at their big event. When the ball is over (Rah! Rah! Team! Team! Team!), many of the money patriots will be in a many such severe hazes, blue blazes!

li'l liza lou

or

why girls stay home

I surely like your chassis
Li'l Liza Lou.
The boys all say you're classy.
Now I know it too.

Good Gosh! you're custom built, I see—
Li'l Liza Lou.
With four-wheel brakes, and spare tires three,—
Why, you're as good as new.

Your frame seems slight, yet well-streamlined
Li'l Liza Lou.
For things like that, I'll change my mind—
That, I'm sure I'll do.

And now with automatic clutch,
Li'l Liza Lou.
You can drive like one with finished touch.
That's the way with you.

You're up to date with floating pow'r—
Li'l Liza Lou.
Your stock's come up within the hour,
Now my money's due.

Cushion-balanced engine-mounting
Li'l Liza Lou.
Tells you when your engine's pounding—
Without more ado.

Your cylinders are not in line,
Li'l Liza Lou.
You'll have to get them tuned to mine,
Or I'll not go with you

Yet I know improved free wheeling,
Li'l Liza Lou.
Has added to the joyful feeling
When I ride with you.

With valve-in-head, you're coming fine,
Li'l Liza Lou.
Your red war-paint and body shine
Look nicer than the blue.

With silent-second and synero-mesh,
Li'l Liza Lou.
You're a sport model in the flesh,
With one spare tire, not two.

Double-drop frames are surely nice,
Li'l Liza Lou.
I guess they make you worth your price—
That's why I go with you.

We'll heat our home with Tropic-Aire,
Li'l Liza Lou.
I know we'll make a lovely pair.
Don't you think so too?

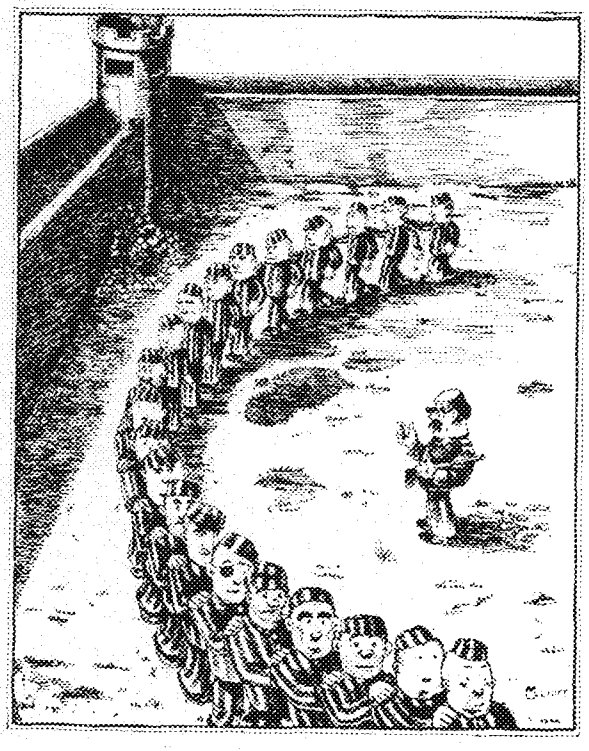
You have essential qualities—
Li'l Liza Lou.
I'll marry you for all of these;
My Li'l Liza Lou.

✓ ✓ ✓

And DON'T FORGET Iota Go Nude.

WHAT coed selling homecoming buttons, spent a whole morning in room 36, E. E. with Engineers?
AND—why did Steinmetz buy one?
why did Sgt. Strider buy one?

●



And there is a question of what Mahatma Gandhi would have done if he were in Sir Walter's shoes at the rescue of Queen Elizabeth from the mud puddle.

✓ ✓ ✓

Last year four men by name of Ziegler attended the University. Three of them were named Karl.

●

GIVE 'EM TIME

And now we begin to wonder: Why in the hell don't the money patriots (advanced drill stewds.) try to get in the stone tent at Stillwater? They'd get two bitz a day, over there (instead of 17c).

Minnesota Grads find employment in local Gas Manufacture

This is the second of a series of articles in which the Techno-Log is attempting to give its readers a picture of some of the local industries which employ Minnesota graduates and of what the respective graduates are doing.

By L. J. ECK, M. S., Ch. E. '24
Superintendent of Manufacture
Minneapolis Gas Light Company.

A VERY efficient and concentrated form of a fuel is the gaseous. Manufactured gas contains the energy of coal and oil stripped of all impurities and waste products. That is why it may be burned in an open jet without causing smoke or ash. The superiority of gas as a heating agent for domestic purposes has long been established and its industrial uses are ever increasing.

Artificial gases used in the United States are carbureted water gas, coal gas, and oil gas. Often gas furnished to users is a combination of these, and in some instances it contains natural gas also. At present a large percentage of manufactured gas is carbureted water gas. That furnished the city of Minneapolis is 100 per cent carbureted water gas.

Water gas was introduced in England about 1890 and its production has continuously increased. The modern water gas plant operates on the principle discovered by Lavoisier in 1793 that when steam is passed over incandescent carbon, the carbon is oxidized forming carbon monoxide and hydrogen. The carbon is present in the form of coke or coal which contains about 90 per cent carbon.

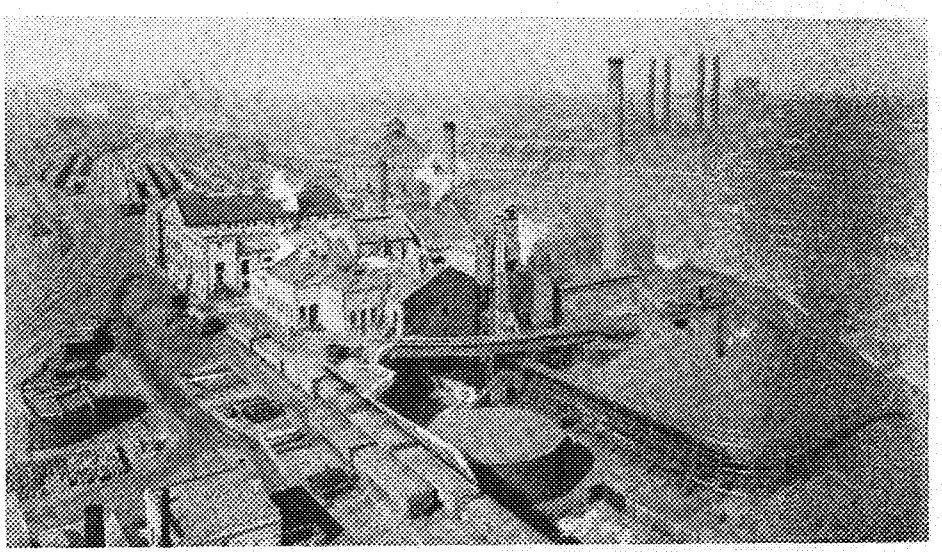
A water gas machine consists of a generator which holds the fuel, a carburetor in which the oil is cracked, and a superheater which completes the cracking of the oil. A turbine driven blower furnishes air which is blasted through the fuel bed for one third of a four minute cycle. In the fuel bed the air forms some producer gas which is used to heat the checker brick in the carburetor and superheater. During the balance of the cycle steam is passed through the fuel bed and oil is sprayed on the red hot brick in the carburetor. At the end of the cycle the fuel bed and brick are cooled and ready for the heating period of the next cycle.

Each machine is capable of producing three million cubic feet of gas per day. The gas leaving the machine passes through condensers which cool it and remove the excess steam and tar. From there it passes into a relief holder, from which it is pumped through a cottrell tar precipitator and the purifiers which remove the sulphur. Before passing to the storage holder all the gas is metered through large station meters. From the storage holder the gas is pumped at 4 to 12 pounds pressure, depending upon the demand, through feeder mains. Pressure governors placed in pits at various points over the city release the gas into the low pressure mains which supply the consumer at a pressure of 3 to 5 ounces per square inch.

The materials required to produce one thousand cubic feet of carbureted water gas are 26 to 30 pounds of bituminous lump coal, 3 to 3.4 gallons of gas oil, and 10 to 13 pounds of steam coal.

Minnesota Graduates

The Minneapolis Gas Light company employs several graduates of the technical schools of the University of Minnesota in addition to Mr. Eck. N. O. Mitleen, '30 Chem. E., and George Johnson, '33 Chem. E., are employed as Chemical Engineers in the Production department. Arthur Sebo, '24 Chem. E. is a Testing Engineer for the Production department. P. L. Covell, '24 Chem. E., is also in the same department. S. S. Alwin, '09 C. E., is in the Engineering department. M. C. Eck, '29 C. E., and T. G. Noble, '30 Arch. E., are with the House Heating service. Donald Bayers, '30 E. E., is in the Industrial service of the company. Andres Neilson, '27 E. E., A. Nelson, '29 M. E., and George Brimball, '33 E. E., are all working in the meter shop.



An airplane view of the plant of the Minneapolis Gas Light company which produces the gaseous fuel to supply the entire city of Minneapolis.

General Alumni Notes

Architecture

'33—J. Boyd Tyrrell. The most unusual letter on record was received by the English Department from this boy Tyrrell recently. He says he actually takes pride in the themes he wrote in his freshman course and wants them sent to him. Boyd cancelled out of school to fill a position in Pittsburgh.

'32—Harvey S. Dailey. Harvey is located now in Kansas City working for the United States Gypsum Company. He's straining his mental powers now to learn the stock in the company warehouse. Harvey is still single and is living with his family who have moved with him to Kansas City.

'32—Robert G. Cerny. After graduation from Minnesota, Bob took his masters degree at Harvard with a fine record. He was almost immediately appointed an architect on President Roosevelt's Tennessee Valley project where he is a member of Land Planning and Housing Division. The job of this group is to plan a model city of five hundred homes which will be habitated by the workers on the Norris dam site. Bob is working on the development of the public buildings for this city and writes that laying out this municipality from the very bottom is the fulfillment of an architect's dream.

Chemical Engineering

'29—Allyn M. Ramsden announces that he is married to Gertrude Synsbey, also a Minnesota graduate. No doubt many a girl wishes her husband had Allyn's job. He is foreman of the Foods, Spices, and Face Powder department of the J. R. Watkins Medical Co. of Winona, Minnesota.

'28—Edward M. Van Duzee is doing research on the catalytic hydrogenation of organic compounds under high temperature and pressure at the University of Wisconsin. He expects to receive his Ph. D. next June.

'23—Helen Webster Porham. It seemed as though there was a big future for girls in Chemistry when we first looked at a post card received from a former graduate. She wrote that she was President of the Motor City Testing Laboratory, President of the Minneapolis Testing Laboratory and President of the Lady Helen Cosmetics of Minneapolis. But after looking in the telephone book and finding none of the above companies mentioned we wonder —— ——

Civil Engineering

'32—Wilfred Darling, our St. Pat king of 1932, is following up the military career which he began in such a big way while in the Advanced Corps of the Coast Artillery. Darling took all the correspondence work in the Organized Reserves up to and including that which makes him eligible for an appointment as captain. In this work he got the highest marks of any cadet in the United States. As a reward for his hard work, the government gave him a position with the finest C. C. C. camp in California. Now Darling is directing the boys in their work under the redwood trees.

'32—Maurice Norton, '32 Forton Christopher. These two boys are taking graduate work in the School of Business Administration at Harvard. Norton is keeping his fee statements paid up by "slingin' grub" in the dining hall of a Harvard dormitory. Christopher is there on a scholarship.

'32—Scott Linsley sends congratulations to Ralph and Gordy, saying "I still think the Techno-Log is maintaining the distinctive characteristics of a progressive magazine." Scott asks for more and more news of our alumni. He is Junior Engineer for the United States Department of Agriculture, directing erosition control construction at C. C. Camp No. 1751, Caledonia, Minnesota, with labor furnished by the Civilian Conservation Corps.

Some of the Scott's work includes calculation of run off, discharge, time of discharge, size of pipes to empty reservoirs in 24 hours, and the figuring of gravity sections of reservoirs and earth dams. He ran the original location survey and helped design the largest erosion control dam constructed in Minnesota this summer.

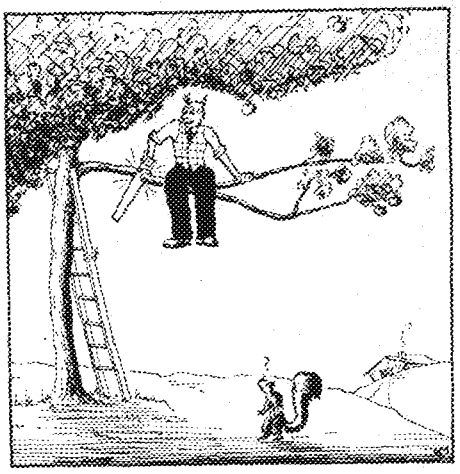
Nine erosion control camps have been located in southeastern Minnesota throughout the past summer. The majority of the work of these camps consisted of the building of brush and masonry check dams, soil saving dams, and some tree and brush planting. Most of the camps will be moved to new locations for the winter, but as much work as possible will be carried on through the winter months.

'27—Frank R. Lundsten is a Junior Engineer for the Federal government doing office work on river surveys in the winter months at the Milwaukee office and inspecting and superintending harbor construction during the summer. Frank apparently is well satisfied with his position. Another graduate, Wilho Kallio, '30 E. E., who is a Junior Signal Engineer for the Bureau of Valuation, Interstate Commerce Commission, says that government positions are O. K. in times like these but there is no assurance of promotion or even a definite assurance of permanence.

Electrical Engineering

'33—Joseph Getsoo is back in school again this year, working for a Master's Degree in electrical engineering. Now that Joe has his B. S. tucked away, why not ask him what relation there is between a loud noise made by the tongue, a liquid air demonstration, and a certain heat professor?

'33—J. Oswald Hanson is in the service department of the Northern States Power Company at Chippewa Falls, Wisconsin. Would welcome a line, he says.



'32.—Richard Bonney of Saint Paul broke his right hand in five places when he fell while sawing a limb off an apple tree this past summer. It was necessary for him to remain in the hospital four days and carry his hand in a cast several weeks. The accident prevented him from attending the Fort Sheridan summer camp.

● ● ●

'19—Donald E. Marshall. Donald has worked himself up to a very high standing with the Proctor and Gamble Company whom he has been with since his graduation. He has managed plants in Kansas City, Cincinnati, and Stanton Island and is now superintendent of one of the company's largest plants at Long Beach, California. Professor Richardson reports a very pleasant stay with Donald and his family while on the west coast this summer.

Mechanical Engineering

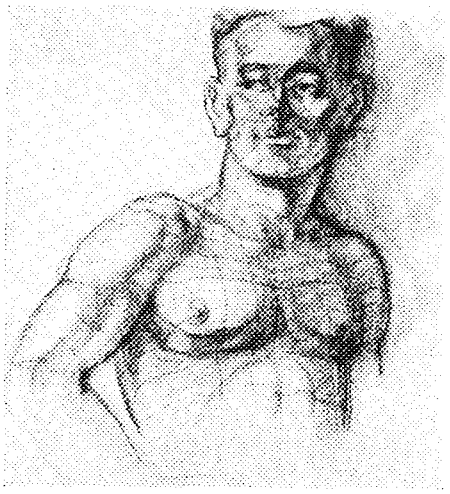
'33—John de Graff has motored to Miami in search of a position. He believes conditions will be better down there—at least the companies shouldn't complain about frozen assets.

'33—Gayle Priester was awarded a scholarship at Harvard for this year. Gayle will work for his Master's Degree, majoring in heating and ventilating, with mathematics as a minor.

'33—Emmet Field is specializing in motor design work at the International Harvester company's plant in Minneapolis. He has been seen rather often in company with a sweet young lady of South Minneapolis—more news later.

'33—Irving Pratt is back again, working for his Master's Degree in heating and ventilating during the mornings, and dishing out gasoline and oil at a filling station during the afternoons and evenings. Irv has been married for some time, for his daughter is now four years old.

'33—Frank Ventora is an inspector at the American Can Company of St. Paul. Frank has hopes of very soon becoming an executive of the company, and already has a solid mahogany desk picked out.



The Architects' Corner

By THOMAS TUDOR

The Intangible Something

THE study of architecture differs from that of less artistic professions. To like a certain kind of work often seems the principal pre-requisite for pursuing a course. We say it is tragic if the man discovers too late that he has been educated for a profession he can never like. From the opposite viewpoint it is tragic when the student realizes that he cannot be taught architecture. To like and to appreciate architecture isn't enough, for ability to create is foremost.

Some people unfortunately enter the architectural course without the slightest semblance of an artistic imagination. It is truly a debatable question, however, whether or not they should try to go on. Of course, it is the proverbial "something that each student must decide for himself."

Early in his course the architectural student receives the first tests of his artistic abilities. In this crucial period of commencing the study for his life work he should not over-emphasize the importance of the first judgments. Many men have had no previous training in art. They have registered for the course for various reasons, plausible or foolish. Before the first marks become a measure of their worth, the novices must learn to use the tools and tricks of the profession.

As in all lines of endeavor, real work and concentration are necessary. If the student possesses the creative gift, he can be taught how better to express it.

Too frequently to the groping underclassman comes the "X", notation of complete failure, and the heartlessly sympathetic judgment, "It doesn't quite arrive." The elaborated criticism or opinion often does not suffice in explanation for the baffled student. Because there is no right or wrong in design, those qualified to judge have difficulty in making the blind see. Philosophically, the beginner must absorb his learning gradually, taking his defeats as a spur to start him up the line to the "mention" class. (Oh, the irony of it all!)

If the student is to progress, he must have the indefinable quality of a good designer. He will become able to tell whether or not a work is good. Truly, there is an intangible separation of the successful and the unsuccessful students. The best requisite is to possess that unexplainable "something" that governs the interpretation of ideas.

Fine Arts

THE fine arts department is truly an integral attribute of the architectural school. The engineer (if he does consider it) may have little conception of the importance of freehand drawing in the architectural course. By learning to use various media in sketching, drawing, and painting, the student develops a freedom and confidence necessary for the rendering of an architectural problem. He achieves fine expression in his drawing by the use of masterful technique in presentation. An ease in draftsmanship with a minimum use of the straight edge is striven for, and freehand drawing is valuable as an aid.

During the first year of freehand drawing, students make pencil, charcoal, and wash drawings from geometric solids and architectural details. In the spring they receive their first experience with river-bank sketching. The same old house-boats have been drawn by successive classes for many years.

The second year the young artists get the "feel" of the brush in learning how to do still life and out-of-doors sketching in water color. Much thought is given to composition, which is continually stressed by the instructors in freehand.

Drawing and painting from life makes up the program for the third year. The study of life drawing is particularly applicable for the architectural student. Besides the obvious use in ornament and sculpture, a familiarity with the proportions of the human figure is valuable in defining the scale of a design.

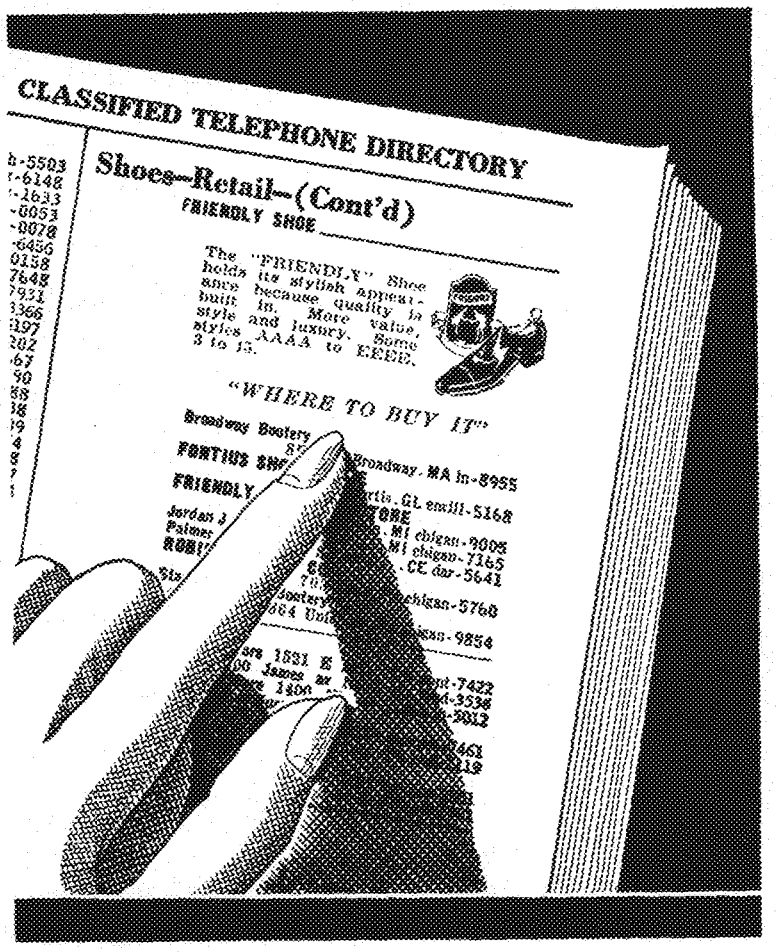
The above drawing is a sketch made with a lithograph crayon. The reader will perceive that the method of drawing can be termed analytic. The figure was built up in sections, the intermediary lines being similar to the altitude lines in a topographical map. This sketch was probably drawn in fifteen minutes, and is but one of many exercises which are rendered during a quarter.

Interior Designing

NEW to the interior architecture course is the introduction of an additional year of interior designing. The revised curriculum which offers two years of interior problems gives the students more practice in their specialty. The change has long been desired by faculty and students.

Until recently, first year design has been more academic and less creative in scope. Now the elementary course has become the first step in a four-year progression in designing, and it is believed that it suffices for the needs of an interior architect. The new course has been substituted for the second year design which was formerly taken with the architectural students.

At the present time, Esther Shapiro is the only person registered in senior interior design. She is one of seventeen who began the interior course at the same time.



A strategic point *in the battle for sales*

Today's intense competition calls for new and more effective merchandising methods. Several plans pioneered by Bell System men are proving helpful.

For example: the "Where to Buy It" section of the telephone book. Here local dealers are listed beneath the trade marks of advertised products —such as Plymouth, Greyhound Lines, Exide, RCA Victor. This service helps manufacturers to reduce substitution, helps dealers to increase sales, helps *you* to locate the brand you want.

BELL SYSTEM

TAKE A TRIP HOME BY TELEPHONE —TONIGHT AT HALF-PAST EIGHT!

Around and About the Campus

Architectural Society

ACTIVE functioning of the Architectural Society was given a sound foundation in a meeting held Thursday, November 2, when a new constitution was drawn up under the 1933-34 officers: Loren Abbett, president; Paul Grosz, vice-president; Edith Reed, secretary, and Robert Hansen, treasurer. During the course of the meeting an executive committee of three was appointed, the purpose of which is to cooperate with the administrative officers. This committee is composed of Collis Hardenbergh, Kermit Johnson, and Victor Gilbertson. The evident manifestation of enthusiasm of the Society coupled with the equally evident sincerity on the part of the administrative officers points strongly to one thing, namely, that during the year 1933-34 the Architectural Society is going to function as an integral part of student life in the Architectural Department.

S.P.E.E.

The Society for the Promotion of Engineering Education held its fall meeting Monday, November 13. Dr. E. G. Williamson, director of the University Testing Bureau, spoke upon the work of his department in obtaining information on student aptitude by means of objective tests.

This year's officers are Professor E. W. Johnson, president; Professor L. G. Straub, secretary and treasurer, and Professor R. E. Montonna, chairman of the program committee. Meetings are held about once a quarter with special speakers providing the entertainment.

A.S.H. & V.E.

A lecture, technical and illustrated, on the decalorator, a device for steam vacuum refrigeration, was given November 7, in the Minnesota union. The speaker was J. W. Spencer of the American Blower Corporation, and the meeting was sponsored by the American Society of Heating and Ventilating Engineers. It was open to all interested in the subject of air conditioning. Prof. A. B. Algren of the University and Carl E. Gausman of Ellerbe & Co., St Paul, made arrangements.

Minnesota Flying Club

At a meeting last month new officers of the University Flying Club were selected. They are the following: Thurman Erickson, re-elected president; Leonard Proebstle, vice-president; Jean Barnhill, secretary; Harold Anderson, treasurer.

Thurman Erickson recently returned by airplane from Washington, D. C., where he received the prize of $150 awarded for second place in the annual Loening intercollegiate flying competition. While in Washington, Thurman conferred with representatives of the various flying clubs and department of commerce officials on the proposed plan for a national organization of college flying clubs.

Officers of the Flying Club believe there may be a misunderstanding in regard to requirements for membership. Any student in the University who has had any flying experience or is planning to take flying lessons is eligible to join the club.

A. S. M. E.

All students registered in mechanical engineering were invited to a smoker given by the student chapter of the American Society of Mechanical Engineers on November 14. The affair was given in the Minnesota Union. Talking pictures were shown, and refreshments were served.

M.S.A.E.

A talking film, "Wings of Tomorrow," which described the autogyro, and several travel pictures were shown at the Minnesota Society of Aeronautical Engineers meeting on November 3. Loyal Downing, president, announced a reduction in the membership dues.

* * *

Outside the School of Architecture there are but two girls registered in the College of Engineering. One girl, a senior, is in mechanical engineering, while the other, a junior, is registered in aeronautical.

A.I.E.E.

On Wednesday, November 1, a meeting of the American Society of Electrical Engineers was held in the engineering auditorium. Football coach Bernie Bierman was guest speaker. Despite his characterization of himself as a poor speaker, he delivered an excellent address on the purpose of football as an activity. Coach Bierman emphasized the fact that the sport demands quick decisions of the men and stated that it offers good training for any kind of work.

He also stressed the effects football has in building character and in the promotion of sportsmanship. Drawing from his own experiences as a coach, Mr. Bierman illustrated his points with colorful stories. After the talk moving pictures which depicted the development of the University were shown, followed by a reel of interesting shots of the Pittsburgh and Iowa games. The evening was concluded with the usual refreshments of doughnuts and cider.

Iota Sigma Pi

A very unique tea was given Tuesday, November 7, by Iota Sigma Pi, chemical sorority. Invitations were written on filter paper in green ink, and tea was siphoned from large Erlenmeyer flasks into Pyrex beakers, with watch glass saucers and glass stirring rods completing the ensemble. Ordinary utensils were "taboo" as the fair chemists demonstrated their domestic ability with laboratory equipment. The decorations were in white, green, and gold, the society's colors.

This is a national honorary organization for women who have majored in some branch of chemistry. It is comprised mainly of graduates and seniors, though jurors are eligible.

Library Wants Copy

The files of the Cleveland Public Library being incomplete, they have asked the Techno-Log to supply them with the November, 1930 issue of the Techno-Log. Unfortunately, we have no extra copies for that month. If you have a copy available please bring it to the Techno-Log office, room 37, Electrical Engineering building.

A Letter from Eric

Eric the Engineer comes through with the article he promised us on registration. All of us have gone through one or more "registrations," so we readily sympathize with our friend in this matter.

To editor of tecklog:
Deer mr. tecklog editor:

AY TANK ay got to rite nother latter. Ay all set up about regstration.

Mr vest he rite me print latter about pay fee & he send me paper folded up so tree sides all the same printing on top & say same ting.

Vell print latter he say you must pay money vat say on tree slips before 12M saturday december 30 or university charge you to dollar. Ay dont like rase of price the 1st of year. So ay say to myself ay go see mr. deen about this.

Vell next morning ay go to mr. deen's office & say ay vant to see mr. deen. So black bare girl, ay tank her name bane Rathskeller, she say to me vat for you vant to see mr. deen? Ay tank she alful inquisitive but ay say ay vant to find out vy price of regstration is rased yannary 1st.

She say you have to see prof herrig about all regstration matters. So ay say does he no & she say ay don't no but you better see him anyvay.

So ay go see prof herrig & ay say vy do stewdents have to pay to dollar if he don't pay regstration before 12M sat. ven skule don't start til yannary 9?

Vell he smile & say have chair & then he tell me long story about senit & deens & regents sitting round trying to run the univ so stewdents can get edicared & they got to no before the qurter begins if they have got money enuf to give all corses so stewdent has to pay early so mr. centerstreem, ay tank that his name, hes the feller vat controls the univ, can tell mr. president if he can pay his celery & all the prof & all the oder bills for next quarter.

Dear Eric:

Thanks a lot for the letter and thanks for adopting the style we originated in the last issue. It was necessary to rewrite the first letter, but the second was O.K. We hope the next to be still better. (The deadline is December 5, by the way.) And, for the love of Ole, please double-space your typing!

Yours for a straight "A",

THE EDITOR.

P. S. When you mean "think," please use "tank," and not "tink."

By golly ay neber thot about that. Ay thot state pay all the bill. Ay yust thot stewdent pay only the tecklog & mens union & drill.

Vell ay shure vant to get edicated so ay go to bank & get lots of money & go to pay fee & feller he take money & folded paper & put it into machine & punch lot of buttons & ring bell & than he hand back paper but ay find ay only get von part instead of tree. This not look rite to me, no sir.

Vell ay feel glad after ay pay that president & prof can get celery & ay get edicated for nother qurter.

Vell ay get little book from mr. vest about regstration & it say ay come saturday yannary 6 to regster. Vell ay dont like saturday so ay go see prof herrig & say can ay regster monday & he say yes if you vant to pay tree dollars. Ay say how come, yust like that, & he say house of representatives or senit say so. So ay say ay vont pay no tree dollar ay come saturday.

Vell ay go saturday & ay find lot of oder fellers vant to get edicated to. Ay go to big room vit lots of drawing deskes round edge & big sines vat say different kinds of engineering. Ay see down end of room my kind so ay go down & find lot of fallers standing round & ay say vat matter & von faller he say no prof here to regster us. Ay look round & see prof by every sine but the von ay belong to.

Ay ask faller vy aint our prof here & he say von to busy vorking down town & oder von probally forgot to come rund.

Vell ve wait long time & no prof come & fellers get mad because prof dont come. After a while von feller say lets see if we cant get prof to get us regsteed. So we all go see prof herrig & he say vat can ay do for you fellers? So von faller he say ve have no prof to regster us. By golly he dont even ask vhere ve come from but grabs phone & calls head of department & tell him lots of stuff about his prof not being on yob. Ven he gets thru he say to us fallers ay sorry but there vill be some von there shortly.

Vell ve go back & pretty soon feller who forgot to come round come out faller busy down town dont come.

Vell we sine lots of times on blank & then prof he sine blank to & he say now go up stares & get name on class list. So ay go up vit oder fallers & go to nother big room vit drawing desk all round room & lot of prof by each sine.

Ay have to meet lots of prof & each von rite my name on card & make funn lines on my blank. Von feller he say they nitials but ay couldnt reed any.

Vell after ay see all prof on my blan ay hand it to girl at door & she tar off peece & give it to me & say you ar redy to go to class now. Ay vonder vy she meen cause class dont begin t monday.

Vell anyvay ay get regster for nothe qurter, & aisle stick to, you bet you!

goodby,

Eric the Engineer

Minnesota Professor is Consulting Engineer

On a leave of absence of one year, Professor J. L. Parcel of the civil engineering department is at work on a large engineering project in Kansas City, Kansas. As an affiliate of the firm of Sverdrup and Parcel, Mr. Parcel is a consulting engineer for the new Seventh Street Trafficway in Kansas City. This extensive improvement, a $4,000,000 job, provides a bypass around Kansas City, Mo. The work includes bridges over the Missouri and Kansas Rivers and large viaducts across the industrial districts. Mr. Parcel's office is in St. Louis. During Professor Parcel's absence, R. C. Brinker and T. B. Jensen are assisting in the department.

Personals

Although Richard Scott got tired of school before he graduated he was well known and liked in the Engineering College. He managed the Engineers bookstore about 1923 and tried a few quarters in the business school before he left. The Great Northern Railroad hired Dick at Glacier Park and he has been working there each summer for about nine years. He now boasts the title of Manager of Transportation and if you ever take a trip through Glacier Park, Dick will plan it for you. He says he doesn't care so much for the hotel work, however, and is studying up on railroad traffic in hopes of getting work along that line.

They Also Served

The success of any magazine depends, to a large extent, on a group of people whose names do not appear on the editorial page. The Techno-Log is no exception. This month we have some whose writing should be familiar and some who are new to the Techno-Log pages. Fred Segerstrom was with us last year and now begins his second year, reporting Architectural Society doings. Nathan Budish is another of the old guard who is keeping up the good work this year. Ed Marshall wrote up Iota Sigma Pi and then unearthed a society even Techno-Log had never reported before, the Society for the Promotion of Engineering Education. F. P. Warner covered the A. S. M. E. in fine style.

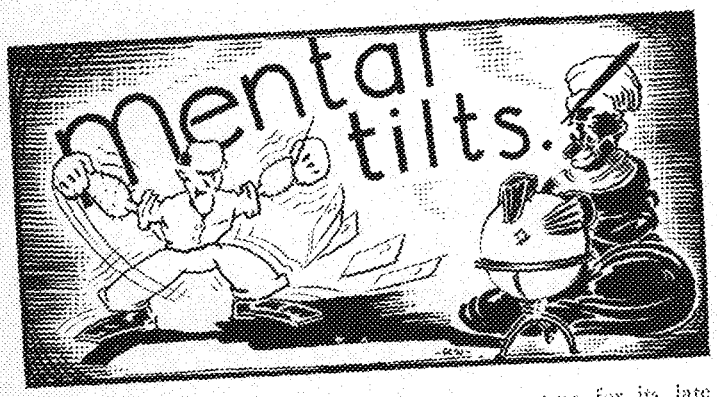
The alumni page owes a lot to Charles Sweatt, who scared up all kinds of alumni notes. Robert Gilruth didn't mind giving up a Sunday afternoon and evening to assist with the copy reading. Bill Bannister, a new man on the Business end of the game, is showing good stuff in advertising. The initials you have seen at the bottom of the cartoons this year are those of Harlow May who thus adds his bit of spice to many articles. Morris Cohen did his bit for the editorial page. A new addition to the staff this year is the staff photographer which position is filled by Karl Ziegler. Karl took the pictures which are in the article on electricity in medicine. The staff's thanks go to all of them.

Engineers Club Gives Pamphlets to College

Through a gift of funds from the Engineers Club of Minneapolis, five hundred pamphlets entitled "Engineering, A Career, A Culture," and dealing with the fields of engineering, have been obtained by the College of Engineering and Architecture for distribution. The pamphlet discusses briefly but thoroughly the general requirements and opportunities in civil, electrical, mechanical, chemical, and mining and metallurgical engineering. It is addressed to young men, their parents, and teachers, and is to provide information to aid the high school graduate in deciding whether engineering is the profession in which he can best realize his ambitions. It also will help him in deciding which branch of engineering will most closely fulfill his ideals. The books have been sent to high schools, and are available upon request for the use of parents and prospective students. In this connection students may be interested in the fact that a comprehensive collection of books and pamphlets containing vocational information is available in the Engineering Library.

Phi Lambda Upsilon

A lively smoker, given Tuesday, November 7, for the benefit of freshmen chemists, started off Phi Lambda Upsilon's program. The smoker is given annually to acquaint the newcomers with some of the faculty and advanced chemists, and to aid them in making friends and enjoying themselves. Phi Lambda Upsilon is an honorary fraternity, open only to seniors of high standing who have majored in pure or applied chemistry. A series of interesting lectures are being planned for the near future.



THE Mental Tilts department offers as an excuse for its late start, the difficulty of promoting funds from the Business Manager. The appropriation was finally made, but with the stipulation that the boys work for the money. The Department is therefore pleased to offer to some ambitious disciple of St. Pat the sum of one dollar cash for the first set of correct solutions to these problems turned into the Techno-Log office. Up an' at 'em!

The Two Bottles

ONE of our chemical engineers doing a bit of homework in his cellar runs up against a perplexing situation. Wishing to deliver a bit of Thanksgiving cheer to a friend, he finds he can spare only 4 pints, which he must pour into a 5-pint jug. The only other exact measuring utensil available is a 3-pint bottle. He is not satisfied with approximations, but with true engineering persistence, he proceeds to dope out an exact method, and succeeds. And furthermore, he finds another way so that he can check his work. With the means at his disposal, how did he succeed?

The Chimney-sweep's Dilemma

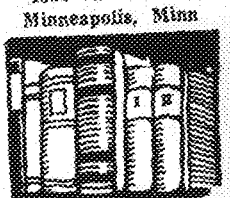
A CHIMNEY-SWEEP finds it necessary to clean a stack from beneath, as the top is inaccessible. The bottom of the stack, which is circular and 1.5 feet in diameter, opens into the ceiling of a room 10 feet high. He attaches his brush to a long pole, but finds to his dismay that the pole is too long to fit around the corner of the ceiling and the chimney. Using the cut-and-try method, he whittles the stick down until he is able to reach up into the stack with it. How long is the stick after having been shortened?

A Hunting Problem

A RABBIT and a dog are 100 feet apart. The rabbit runs in a line at right angles to the original line between the dog and rabbit at a rate of 30 ft./sec. The dog runs after the rabbit, always running directly towards it, at a rate of 50 ft./sec. How far does the dog run before catching the rabbit?

Navigation for Duck Hunters

A HUNTER on the bank of a river 100 feet wide observes a duck (Mr. Duck, to you) swimming towards Mrs. Duck at a point directly opposite the hunter. The velocity of the duck in still water is one mile per hour, while the velocity of the river varies as the square of the distance from the nearer shore; from zero at the shore to a maximum of 11 miles per hour in the middle. If Mr. Duck started where the hunter now stands, and swims so as to face Mrs. Duck continually, write the equation of the path of Mr. D.



Hogs, Canals and Albicore

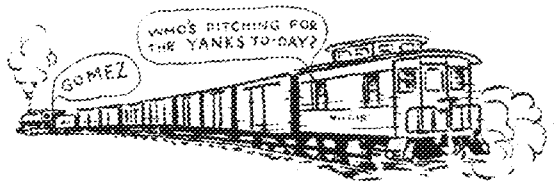
[*Continued from page 29*]

carried much passenger as well as freight traffic, and to accomodate the former there were special boats, known as packets, which were given the right of way over freight, and could bowl along at five or six miles an hour, a hundred miles or more a day. History seems to be pretty well agreed that the old canal men were a rather hard lot. They had to be. When for instance, a fleet of boats was waiting to get through a crowded lock, as often happened on such a canal as the Erie, there was always an inclination to pass the most pugnacious crew through first. However, the arguments over precedence seem generally to have been of a manly sort, the canal men usually being content with Nature's weapons, fists, bricks and bottles, and seldom descending to such artificialities as knives and pistols. There must have been a streak of the poetical in the boys, too, for a reading of the lists of the old canal boat names discloses some very pretty sentiment. Sometimes a name suggests the ladies, as The Hattie and Mattie; sometimes natural history, as The Fly and Flea; sometimes human history, as Napoleon; sometimes other things: as, for instance. Flying Cloud, Yankee Spy, Sabbath Rest, Blooming (not Flaming) Youth; all bona fide names in canal history, and all very appropriate for canal boats.

Of the once long array of thriving canals the Erie of New York state is about the only one left in operation. But in driving over the country, especially in the East, I have more than once come across reminders of what once was: a decaying boat, high and dry in a field; an old ditch, minus the water; the remains of an aqueduct by which the canal was carried over some stream; or even a stretch of canal, itself, the towpath overgrown with weeds, the channel now stagnant water. The course of the Chesapeake and Ohio, a canal which gave up the ghost in 1924, is still easy to follow as it runs from Washington, D. C. to Cumberland, Maryland. This is beautiful country, offering many glimpses of the Potomac and views of the mountains. Traveling on a canal boat in the old days via the C. and O. could not have been half bad. The traveler could spend many a pleasant hour sitting on deck and watching Maryland slip by. The deck of a canal boat must have been a wonderful place for a quiet smoke. Or to fish from. I know of no other form of inland transportation where a passenger can both smoke and fish.

Which reminds me that I was located for several weeks this summer on a bay on the Nova Scotian coast which is said to be unsurpassed as a fishing grounds for professional fishermen. This bay, which is perhaps ten miles deep and enclosed with headlands at its entrance five miles apart, is continually hung with fishermen's nets, great lengths of them covering acres of ground—or water—and so contrived that a fish once straying in seldom strays out. The catch is usually cod, haddock, mackerel, medium sized creatures and good eating, but not affording any very great excitement when they are hauled in. The excitement in this fishing, as in all occupations, is furnished by the unexpected, or at least by the uncertain. Into the nets, looking for food, occasionally wander what are called on this coast albicore. When I first saw some of these monsters hanging up at the dock I thought whales were invading the bay. The albicore vary from 200 to 600 pounds in weight, and when the fishermen in the morning find them floundering in the nets they are pulled abroad and beaten to death with heavy mallets. It is a bloody, mussy business, and no place for an amateur fisherman. For sport these fish may also be caught with hook and line, but it takes special equipment and, I imagine, an especially good man. One of the natives of the coast, who fished for albicore only in the professional way, namely, by knocking them on the head with a hammer, told me that even that system wasn't entirely fool proof with such giants. The fish, it seems, sometimes come to, after apparently being defunct, and proceed to thrash about in the boat with hammer blows of their own. He had met the experience and been knocked overboard, and from what I could make out, he had risen clear to the masthead before finally settling back on the water. If this yarn had been spun by an amateur fisherman I might have been dubious, for amateur fishermen are notoriously unreliable when giving the length, avoirdupois and antics of fish. But professional fishing up on the North Atlantic coast is such a hard occupation that to be kicked over a masthead and then dropped to the ocean floor before being rescued is all in a day's work. I might add that though higher education is not absolutely necessary in the pursuit of albicore it did seem to me that two or three weeks, say in September, wrestling with these fish would be fine preliminary training for a football team. Any football candidate who could keep a not entirely unconscious albicore on the bottom of a boat for thirty seconds, without using a maul or without being hoisted overboard, ought to be able to push any eleven human beings over any field.

G-E *Campus News*

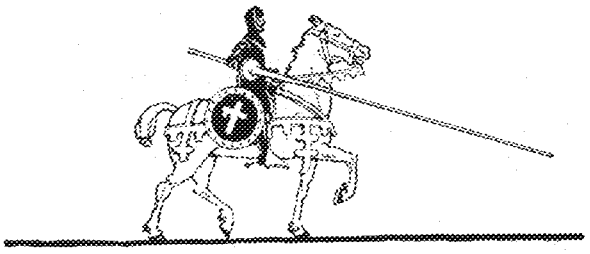


TALK FOR TRAINS

On a track near Schenectady, a few weeks ago, several visiting trade-journalists sat in a test car. From a loudspeaker in this car came a running stream of information. The voice was that of a G-E engineer in a "station" a half-mile down the track. Sample remarks:

"Believing that we could help railroads to speed the movement of freight trains, G.E. has now produced this device — a new system of communication. It's not radio, but, in principle, direct telephony. It's a distant cousin of the carrier-current communication that power companies use. They talk over the power lines; we use the rails, plus any wire line along the track. Now, the man in the caboose can talk with the man in the cab. It also works between trains up to 5 miles apart, and between trains and stations. Loudspeaker reception overcomes the train noises. Can you hear me all right?" They could.

Dr. Ernst Alexanderson, a G-E Consulting Engineer, is responsible for this development. He is a 1900 graduate of the Kungliga Tekniska Högskolan, Stockholm, Sweden. Incidentally, a partial indication of his versatility in engineering design will be found in the U.S. Patent Office, through which he has been granted more than 200 patents.

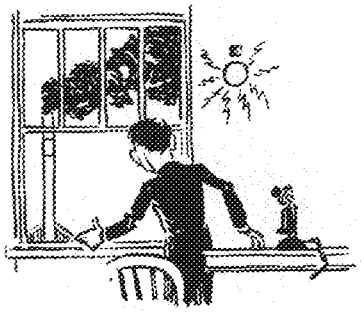


A RÖNTGEN WARRIOR

For the doctors who are waging continuous warfare against the dread, lurking specter of cancer, G-E research men believe they have provided another shining sword. Again they have produced the most powerful x-ray tube ever built—this time, for continuous operation in practical cancer therapy at the Mercy Hospital, Chicago. Dr. E. E. Charlton, Grinnell College, '13, is the man who directed the production of this tube.

The giant tube (brother under the glass to those in your radio) measures more than 14 feet in length, is rated 800,000 volts, will treat patients in a fraction of the time required by the last "most powerful" one, has x-ray radiation equivalent to $75,000,000 worth of radium (if there is that much!) and needs 20 gallons of Lake Michigan's coldest water every minute to keep cool.

It's a pleasure to make good motors and good lamps. It's a greater pleasure to help alleviate human ills—all in the line of duty! More tubes are on the way.



SMOKE IN THE EYE

An eye in the stack is worth two on the ground. So thought G-E engineers as they finished mulling over the smoke-nuisance problem of power and heating plants.

A light source and a photoelectric-relay unit were installed in stacks in Chicago and New Jersey. They are so arranged that when the stack is clear, light falls on the phototube; a meter or recording instrument registers zero smoke density. As the density increases, the phototube receives less light and indicates an increase in density. An adjustable electric contact is provided to operate an alarm. (A running record of the amount of smoke passed up the stack could be obtained by adding a recorder.) Thus, the "electric-eye," which is not affected by cinders and is never closed in sleep, has found another way to be of service.

Two G-E engineers, W. R. King and Pieter Juchter, developed this new smoke-density indicator. King is a '28 graduate of the U. of Kentucky, and Juchter a '24 graduate of the Eidgenössische Technische Hochschule, Zürich, Switzerland.

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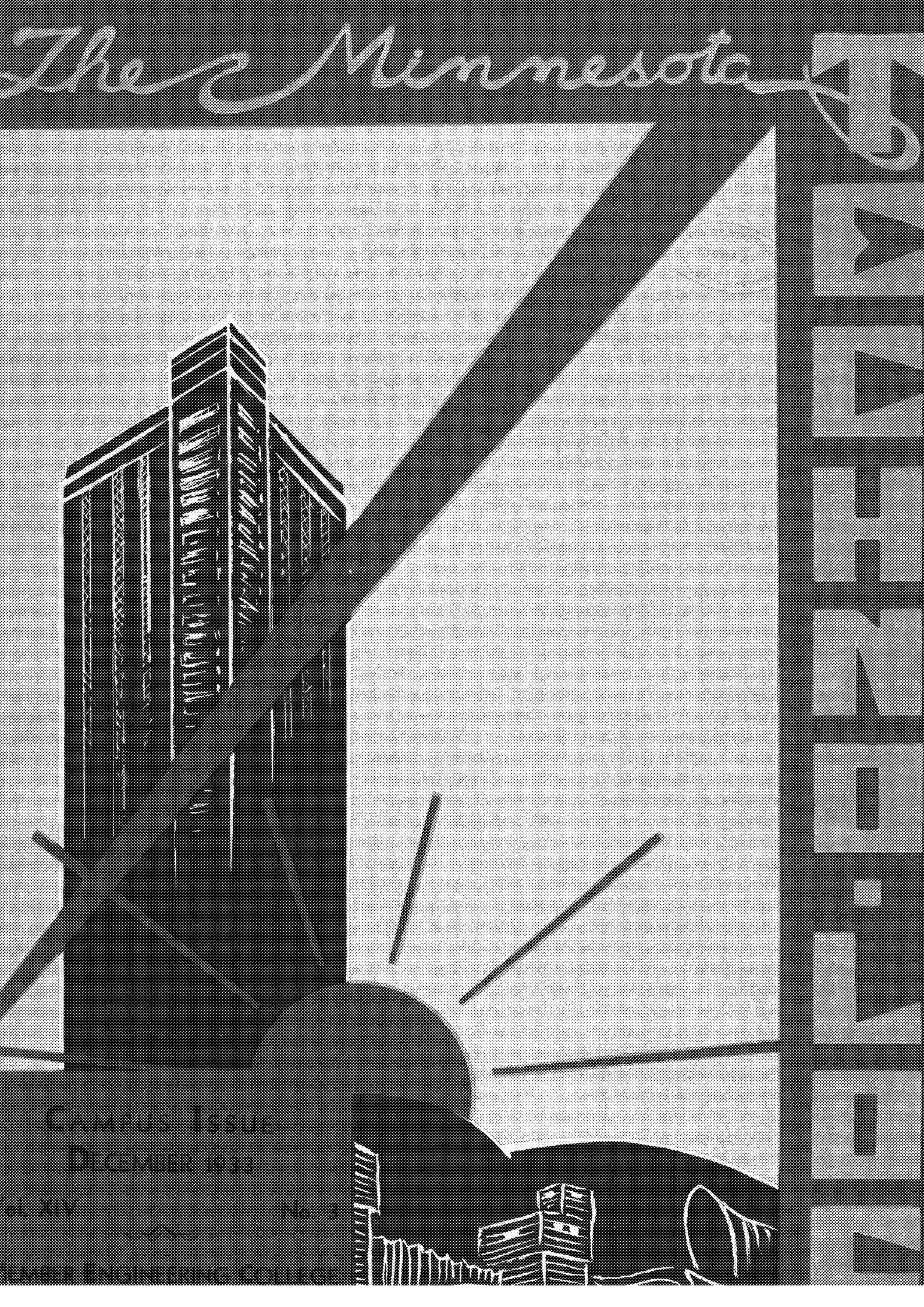
GENERAL ELECTRIC

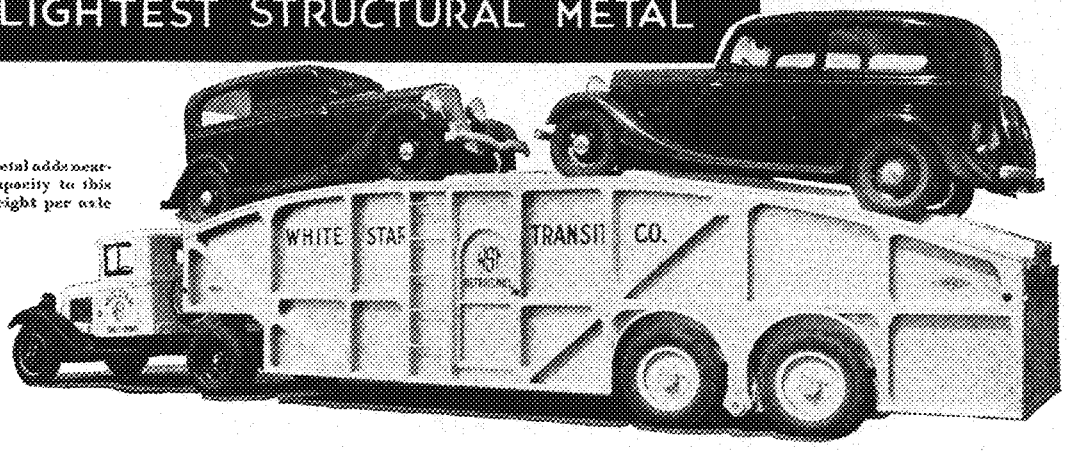
The Minnesota Engineer



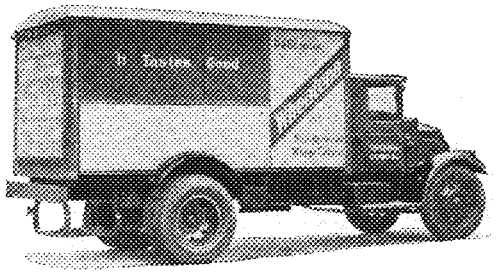
Centennial Issue
December 1951

Reduce TRANSPORTATION COSTS *with* DOWMETAL

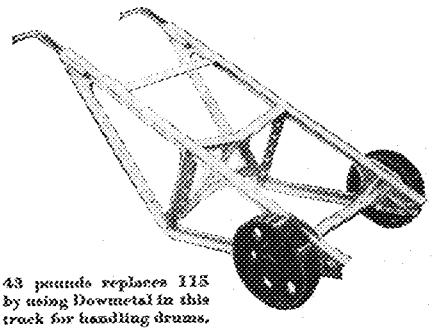
WORLD'S LIGHTEST STRUCTURAL METAL



Lightest weight Dowmetal adds nearly two tons payload capacity to this vehicle within the weight per axle limit.



Dowmetal, less than one-fourth the weight of steel, saves 3200 lbs. in the body of this Wheaton unit.



43 pounds replaces 115 by using Dowmetal in this truck for handling drums.

THE chassisless semi-trailer illustrated above is a striking example of how transportation costs can be reduced by the use of Dowmetal. This vehicle weighs but 4300 pounds, yet will carry 4 automobiles, two inside and two on top, with a return load capacity of eight tons of bulky freight.

The 14-foot Wheatena body weighs but 1300 pounds for a payload of 10 tons. This is a ratio of fifteen to one for payload to body weight. It replaces a weight obsoleted body of 4500 pounds. Light-weight Dowmetal transforms nearly two tons of previous dead weight into live payloads, loads on which freight rates are paid, loads carried and delivered, instead of just being hauled back and forth for no pay.

These transportation units not only show what can be done with Dowmetal to reduce transportation costs, but also the practicability of fabricating in large structural forms. Dowmetal serves the same purpose of reducing burdens in portable tools, machinery, and countless other products.

This world's lightest structural metal can be sand cast, die cast, rolled, extruded, forged, welded, and machined by processes common in industry. It is the easiest of all metals to machine.

Send for the Dowmetal Data Book. Tell us your problem. Consider Dowmetal for every job to improve or redesign, whether it be pattern, product, machine, or structure.

Dowmetal Division

THE DOW CHEMICAL COMPANY · Midland, Michigan

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DOWMETAL

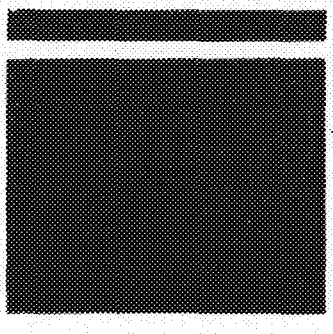
MAGNESIUM ALLOYS

MERRY CHRISTMAS

and

A HAPPY NEW YEAR

ENGINEERS' BOOKSTORE



THIS DAY and AGE

In these days of hustle and bustle and in a land accustomed to the translation of visions and dreams in terms of steel, concrete and marvelous machinery, a brief survey of the art of transferring ideas by means of printed words or symbols will be found profoundly interesting. Printing ranks high in the list of technical industries of the world. To prepare and produce the magazine you are now holding involves technical skill and the use of intricate machinery. An endeavor to give even a smattering of the intricacies in this limited space would be impossible. In lieu of an attempted dissertation herein, we invite all who may be interested to visit our plant and get first-hand information about the intricacies of printing by watching the operation from the making of type to the final inspection of the finished product.

THE JENSEN PRINTING COMPANY

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The Editor Says:

Merry Christmas and a happy holiday season to all. May you fret in peace after completing (or not completing) this quarter's work.

If the last few weeks of this quarter have been tough for you—if you have stayed up late, studied nights when you would rather have been doing something else—crammed until your head ached—etc. then sympathize with ye editor who has been doing just about that all quarter.

But, here we have our December issue and a special Campus Issue at that. When we sat down some short while ago and began to talk over what we knew about our own college and campus, we found that actually our education in this respect was sadly lacking. So, thinking that many of our readers may be in similar circumstances we are presenting this Campus Issue featuring the history of the College of Engineering and Architecture "From Long Ago to Now."

Our genial rambling columnist, Professor R. W. Siler, put on his thinking cap and recalled some of the experiences of his own school days—perhaps just a bit different view of the "good old days" than we are accustomed to hearing.

Several of our staff members greased up their hiking boots and sallied forth over the campus in search of interesting bits with the result that they disclosed some unusual facts about engineering research projects and about some of the interesting characters in the faculty. In fact they dug up so much material, that ye editor was literally swamped and had to file much of it with the complaint department for possible use in future issues.

Not to be outdone, the alumni department began an all-inclusive campaign which netted so many interesting personalities among the faculty and graduate students that for a time, we were considering making this a campus supplement to the alumni directory.

However, after sorting over and cutting down the several volumes of material which came in, we finally present for your approval the Campus Issue.

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Minnesota Techno-Log
37 ELECTRICAL BUILDING ••• U of M

DECEMBER 1933
Volume XIV Number 3

Ralph Monson
MANAGING EDITOR

Gordon Rosholt
BUSINESS MANAGER

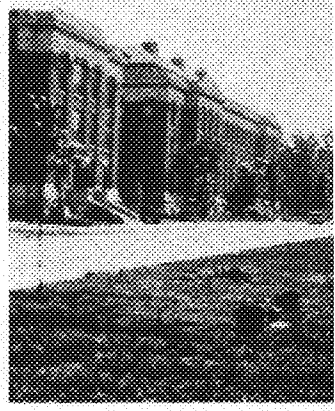
Published monthly from October to June inclusive, by the students of the College of Engineering and Architecture, the School of Chemistry of the University of Minnesota

This Month

Aerial View of the Campus

From Long Ago to Now

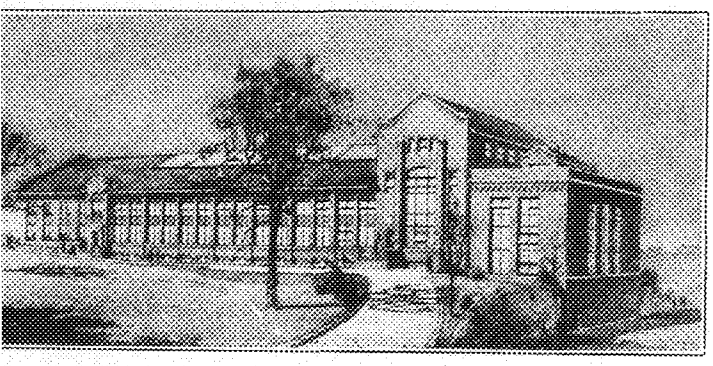
a brief sketch of the development of the college



By RICHARD R. PEDERSON, Ch. E. '35

The author wishes to thank Dean Ora Miner Leland and the Minnesota Alumni Weekly for their kind co-operation and assistance in preparing this article

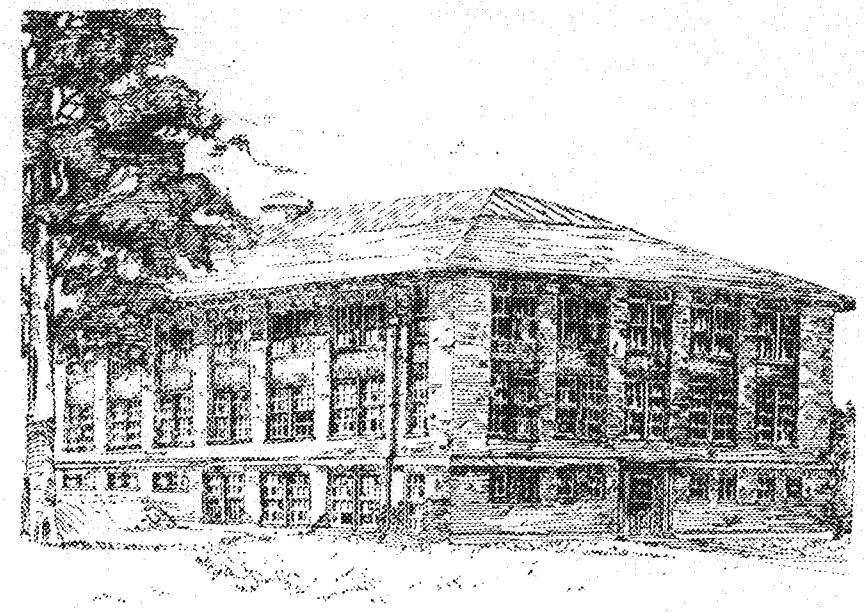
In these supposedly post-depression days of 1933, we walk about the engineering campus with an air of comparative ignorance about the historical aspects of our college and university. A little over eighty-two years ago, on November 26th, 1851, to be exact, the University of Minnesota, with an enrollment of about twenty students, first opened. Various preparatory subjects were taught by a single instructor, a Professor E. W. Merrill. Such were the meager beginnings of our present large institution. The University led a rather interrupted and questionable career until it was formally reorganized in 1868 and started on its way under the able administration of President William Watts Folwell. The first building on the present site of the campus was called the Old Main and was constructed in 1858. At one time during the Civil War a legislative committee visited the structure, which was apparently vacant. They discovered a family living in the building, ostensibly as caretakers, with turkeys kept in one room and hay stored in another. Again, in 1866, when the state was hard pressed for a building to care for the insane, it was only by the most vigorous efforts of the regents that the University was kept from becoming an insane asylum. The years from 1851 to 1868 were very trying times, however, and the fact that a university even existed was a credit to the foresight and intelligence of the people in the state.



The College of Engineering as an independent unit did not exist prior to 1872. Although the legislature of Minnesota authorized Mechanic Arts in 1868 when the University was entirely reorganized, engineering was a part of the College of Agriculture and Mechanic Arts until July, 1871, when an independent College of Mechanic Arts with its own faculty and course of study was organized. Professor Arthur Beardsley first taught courses in civil and mechanical engineering in the year 1871. Actually, the college was very closely associated with the College of Science, Literature, and the Arts until 1885, at which time it first offered an independent four-year engineering curriculum. Previous to that time, the first two years of work were taken along with the academic students, and specialization did not begin until the junior year. Courses in civil and mechanical engineering and architecture were provided. In 1882-83, special courses in shop work and drawing were offered.

These courses were organized the following year into what was called the "Artisan's Training School," wherein special provision was made for practical work in drawing and shop work for those not prepared to take up the work of the regular college courses. This school was continued until 1892, when it was dropped. In the fall of 1880, Professor William A. Pike, a graduate of the Massachusetts Institute of Technology, was made full professor of engineering. He was appointed director of the college in 1886, and it was this year that the Mechanic Arts building was constructed (now the School of Business Administration). The paper organization of the College of Engineering had now grown into an actuality. Prior to 1886, seventeen degrees in mechanical and civil engineering had been granted. The first class was graduated in 1875, and consisted of three men who were made bachelors of civil engineering. The men were Henry Clay Leonard and J. Clark Stewart, both of whom ultimately became surgeons, and Samuel Addison Rank, who became a mining engineer. The first degree of bachelor of architecture was conferred upon Walter Stone Pardee in 1877.

In 1885, John H. Barr was appointed instructor in mechanical engineering and William R. Hoag instructor in civil engineering. In 1887, the course in electrical engineering was organized in charge of Frederick S. Jones, professor of physics. George D. Shepardson was appointed instructor in electrical engineering in 1891. In that year the first degrees in electrical engineering were conferred.



Artist's sketch of the south end of the Experimental Engineering building where much of the engineering research is carried on

View showing the new Physics building under construction

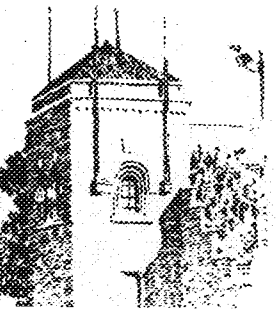
All the engineering courses were conducted in the old Mechanic Arts building until 1900-01 when the old Mechanical and Electrical Engineering buildings were built. Prior to 1900 none of the graduating classes were larger than twenty in number, but after that date the classes increased rapidly. The following figures show the growth of the college in enrollment:

Year	Enrollment	Year	Enrollment
1900-01	265	1920-21	1084
1912-13	393	1930-31	1735
1933-34	1033		

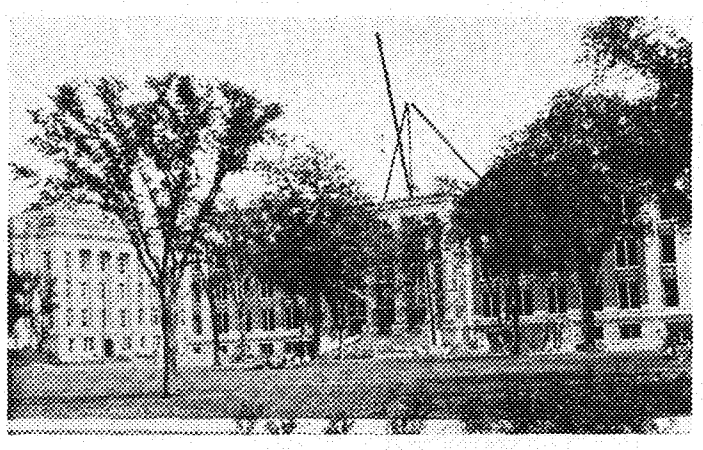
More rigid entrance requirements account for the decrease in enrollment this year.

The School of Mines was instituted and incorporated into the College of Engineering in 1891 and was headed by Prof. William R. Appleby. Since the year 1896, however, it has functioned as a separate unit. Dean Pike resigned in 1892 to go into private practice, but retained a lectureship in the college. He was succeeded as dean by Prof. Christopher W. Hall who held position until 1897, when he resigned to resume the more studious life of professor of mineralogy. President Northrup was elected acting dean by the Board of Regents, until the appointment in 1902 of Frederick S. Jones, professor of physics, as dean. Prof. W. H. Kirchner came to the University in 1894 to take charge of work in drawing department and he has been with us ever since that time.

The construction of the Mechanical and Electrical Engineering buildings in 1900-01 relieved much of the congestion in the engineering school. Previous to this time, Professor Shepardson's classes in electrical engineering were scattered in four or five different buildings, a small room in the Armory serving as the department office.

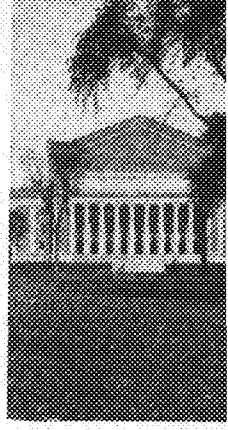


The legislature of 1907 foresaw the growth of the Engineering College and appropriated $250,000 to erect an engineering building and also made an appropriation of $450,000 for extending the campus. Dean Frederick S. Jones won a place for the engineering college on the new campus and our present Main and Experimental Engineering buildings were erected in 1911-12. In 1909, Dean Jones resigned, and was replaced by Francis C. Shenehon, a member of the civil engineering class of 1895, who was dean until 1917.



Professor Frederick M. Mann, C. E. '90, organized the department of architecture at Minnesota in 1913. The first class numbered nearly fifty students, which was a surprising response to the announcement of the department's organization. The department of architecture is now located on the third and fourth floors of the Main Engineering building. Degrees are offered in architecture, architectural engineering, and interior architecture.

The present course in chemical engineering was organized in 1919 by Dr. Charles A. Mann, and aeronautical engineering was established at Minnesota in 1928. The construction of the new Electrical Engineering building in 1923 relieved a great deal of the congestion which was becoming apparent in the electrical department. The College of Engineering and Architecture as it is now known was formally named as such in 1916. During the war period, there was a rapid change of deans in the College of Engineering. Dean Shenehon resigned in 1917 and was succeeded by John R. Allen who was dean for two years. In 1919 Dean Lauder W. Jones succeeded him, and in 1920 our present Dean Ora Miner Leland succeeded him in office. The engineering col-



lege has had seven deans in its history. They have all worked hard and guided its destinies well. The amazing progress and the excellent reputation which our college has enjoyed amply supports such a statement.

In May, 1917, the War Times Standard was adopted by the students and faculty of the College of Engineering and Architecture. The inscription entitled "Making the World Safe for Democracy" now hangs in the hall of the Main Engineering building, and reads as follows:

"First—We stand ready to respond to the call of the country in ready and willing service.

"Second—We undertake to maintain our part of the war free from hatred, brutality, and graft, true to American purposes and ideals.

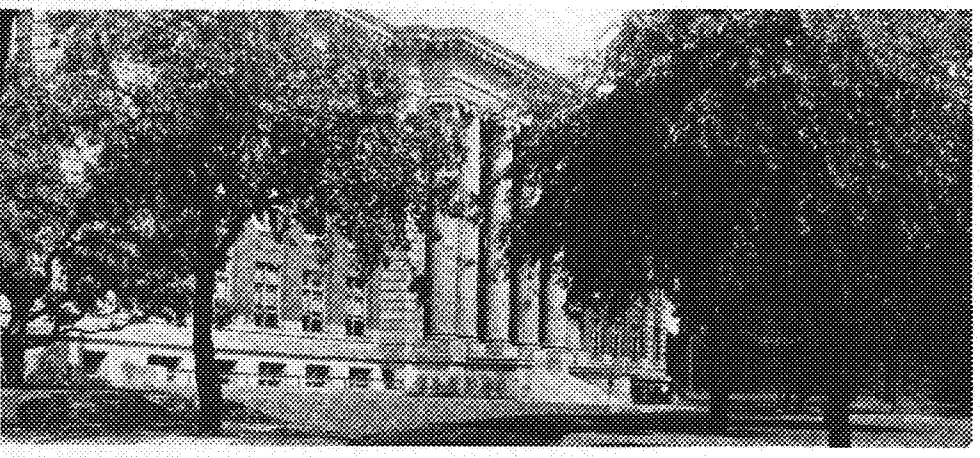
"Third—Aware of the temptations incident to camp life and to the moral and social wreckage involved, we covenant together as college men to lead the clean life and to seek to establish the American uniform as a symbol and guarantee of real manhood."

The Minnesota Techno-Log was formally organized in 1920. Twenty-seven years before that time, however, the foundations of the present Techno-Log were laid down, when, in 1893, the first edition of the "Yearbook of the Society of Engineers" was published. The Society of Engineers had long been an active organization in what was then the College of Engineering, Metallurgy, and the Mechanic Arts, when in 1893 it was decided to publish a year book, which would be essentially technical in scope. The annual was published for fifteen years thereafter, and it contained many technical and scientific contributions from students, alumni, and faculty. In 1908, however, a yearly publication became inadequate for its needs, and a quarterly was published under the title of "The Minnesota Engineer." A regular staff was appointed with a faculty advisory board. The publication of "The Minnesota Engineer" was suspended in December, 1915, and for six years thereafter no publication appeared on the technical campus.

In November, 1920, the Association of Engineering Students, a reorganization of the old Society of Engineers, established "The Minnesota Techno-Log," a monthly publication. A small room on the fourth floor of the Main Engineering building served as an office. In April, 1922, the Techno-Log became a member of Engineering College Magazines Associated. In 1924, the Techno-Log moved into its present office in the Electrical Engineering building. The adoption of the blanket subscription plan in 1928 took a great load from the shoulders of the already over-worked staff members. Today, the Techno-Log is recognized as one of the country's leading engineering college magazines.

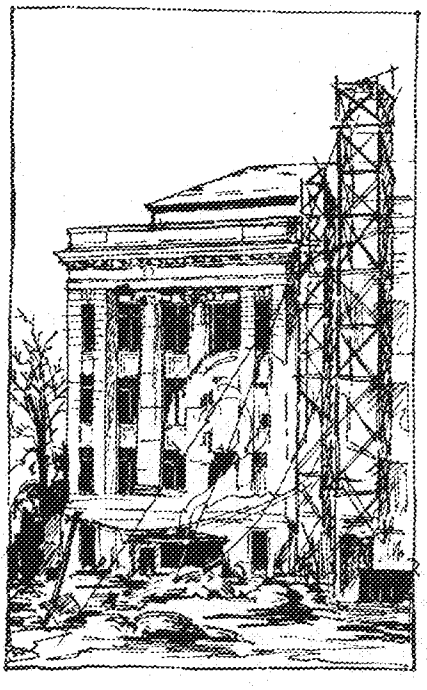
In 1914, the Student Council began making up in advance lists of books wanted by the students, and buying them on a co-operative basis. This practice continued until 1920 when the Association of Engineering Students organized the Engineers' Bookstore with H. C. Jacobson, C. E. '21, as manager. Its policies were controlled by a board composed of elected students and three faculty members appointed by the dean. Harold D. Smith, E. E. '25, succeeded Mr. Jacobson as manager in 1925. The bookstore has prospered down the years and earnings have been turned back to the students in the form of dividends. Engineering students can now be assured of having their textbooks and supplies available when desired.

[*Please turn to page 72*]



A campus beauty spot—the School of Chemistry

Construction sketch of one of the more recent campus buildings, the Students' Health Service division of the University Hospital



Between Friends

a dissertation on freshman english--- casually overheard

By LEON ARCHIBALD

●

Mr. Archibald is well remembered by many as a member of the Engineering Drawing staff for many years. At frequent intervals he has favored the Techno-Log with articles relating his personal experiences as an engineer in the field. In this article Mr. Archibald recalls a conversation which he might have overheard any December afternoon while sitting in his office

At 1:15 p. m. two embryo and embattled engineers known to their intimates as Pete and Andy went into a huddle in room 1E. Together with sundry other subjects that are liable to get a first year man down they were repeating freshman English. At 1:30 p. m. the class in English 6f was scheduled to convene and from each and every member of the section was expected a 500 word theme on Technocracy.

Pete's dissertation was finished. Not, however, in the sense that it was a polished masterpiece. It simply consisted of a hemorrhage of five hundred words, none over two cylinders in caliber, most of them misspelled and a headache in every sentence.

Andy's essay was yet to be composed. But he had fifteen minutes together with a pal who was ready to step into the breach. He unlimbered several soiled and crumpled sheets of theme paper, borrowed his friend's fountain pen and encompassing it with a ham that would quicken the pulse of a packer he set to work.

"How do you spell the title, Pete?"

"T-e-c-k-"

"Wait a minute, t-e-c-k, okay, go ahead."

"N-o-c-k."

"Sure it's another k, Pete?"

"That's what I got."

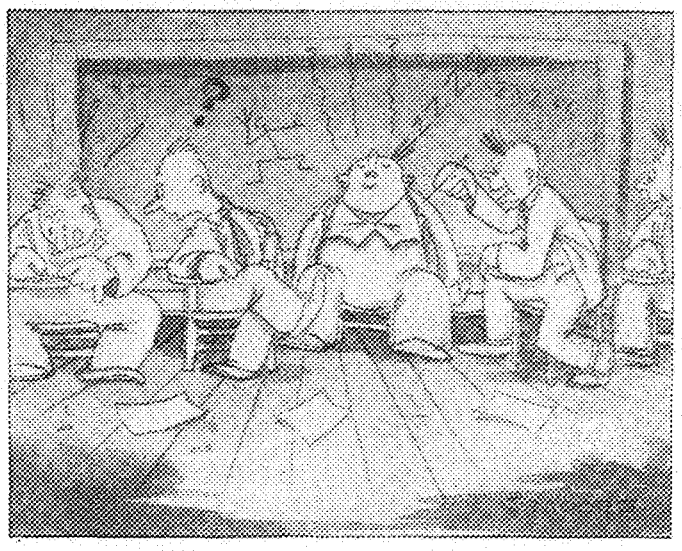
"Okay."

"R-a-s-, maybe that would be a c, and the last one's a y."

Andy made it a c and then subjected his title to a searching, squint-eyed scrutiny. "Well," he said, "what's next?"

Pete read his first sentence: "Technochracy is a science that was invented at Columbia University. Now, just change that around a little like: The science of Technochracy was discovered by some scientists at Columbia University."

Andy wrote laboriously, stopping frequently for assistance in spelling. "Countin' the title," he said, as his face lighted with an approving grin, "that makes thirteen words. Come on, boy, let's get hot!"



Our friends Pete and Andy are caught by the staff cartoonist in the act of writing a quiz

●

"Say," inquired Pete, apropos of a folded slip of paper that came out with his packet of cigarettes, "how'd you make out in mid-quarters?"

"Took another beatin'," Andy replied with a sigh that was just next door to a sob. "How'd you do?"

"You an' me, too, big boy."

"Yeah," the big, good natured Swede continued as his teeth proceeded with the demolition of Pete's pen cap. "Me an' that what's her name on the bottom of Havana harbor is just the same. Are we ever *sunk*?"

"Maybe you ain't been hittin' the books enough," Pete ventured.

"*Books?*" Andy said. "I ain't seen one for two yeeks."

"How come?"

"Lost the key of my locker again an' they're all in there. So's my overcoat."

"That's tough," Pete consoled.

"When I went home at Thanksgiving," Andy went on, "I ast the ol' man could I transfer. He ast me what was I takin' and I said engineerin', an' he said, well, ain't that all right? An' I said they's too much math an' English an' stuff in it, an' then he said, listen, boy, you stay in there an' pitch if it takes ten years. An' geez, kid, this whole smear is just on account of pickin' the wrong street car."

"How come?" Pete inquired.

"Well," Andy explained, "it was like this. I come to town on the Milwaukee an' I asts a copper outside the deepo how did I get to the University? An' he said take one of them cars with Saint Paul up that swings aroun' that corner down there an' get off at Washington and Church. So I did an' when I got off I seen this dump an' here I am. An' all the time they was them Harriet cars goin' up Fourth right next to Folwell an' I didn't know it. Geez, boy, did that copper ever cross me up?"

"How'd you ever happen to clean up on analyt las' spring, Andy?" Pete asked with a suspicious show of interest.

"Oh, I dunno." Andy said, evasively.

[*Please turn to page 64*]

Hydraulic Research

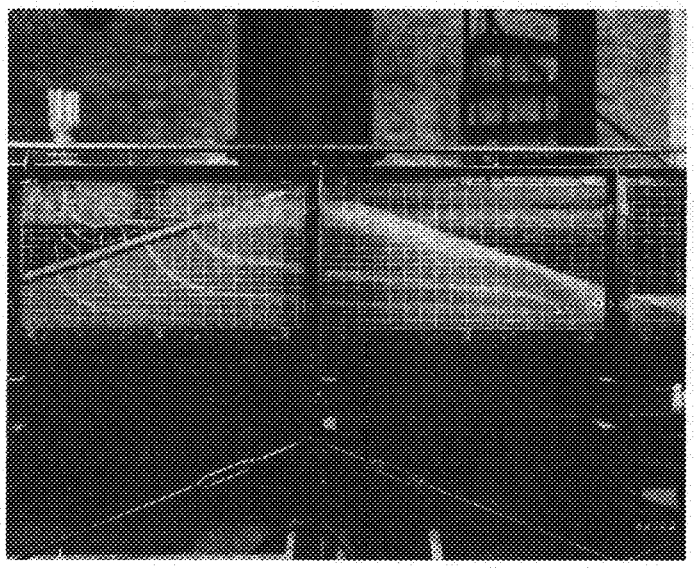
earth dam construction and erosion of soil are principal projects

By THOMAS TUDOR

Research based on principles of hydraulics is an important part of the activity in the experimental engineering building. At present many projects of a practical and feasible nature are being undertaken. The researchs are carried on by several graduates and assistants under the direction of Dr L. G. Straub.

The United States engineering department is furnishing aid for several experimental projects. These have many practical applications and are related principally to river channels and dams. Models of dams for the proposed Mississippi River development are being studied. The miniature dams are constructed in specially designed glass-sided channels. These dams are built on a small scale to correspond with the proposed structures. The water levels on the two sides are varied in accordance with the conditions likely to occur in nature. Observations are made to determine the nature of the potential conditions of failure, this frequently occurring by "piping" on the down stream slope. Piping is the condition occurring when the velocity of percolation through the sand dam becomes great enough to carry sand particles from the structure. In order to determine the direction of flow through the model dam, dye lines are formed through the dam near the glass face of the flume by allowing coloring matter to enter at various points on the up-stream face of the model.

The study of flow through granular materials is another major piece of work being undertaken this year. The experiments are of value in such cases as the study of flow through filters in water plants. The data determined can also be used in planning for the stability of structures built on water bearing sands and in calculating the permeability of dams.



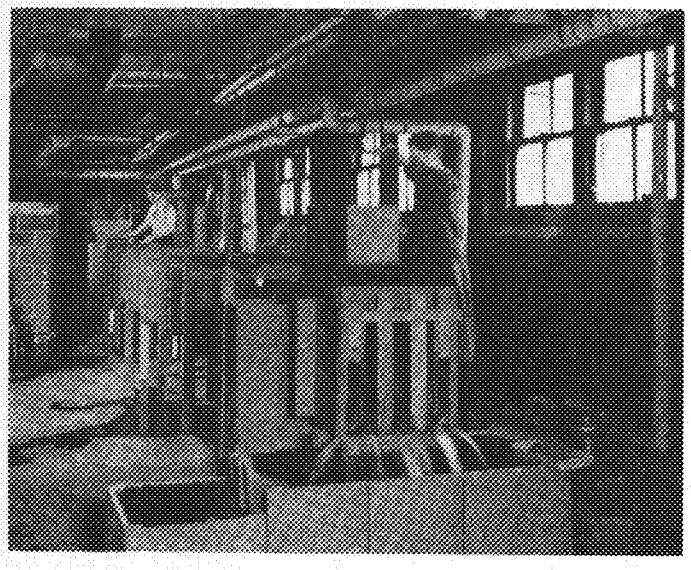
A glass channel being used to study the seepage of water through a sand dam

In another investigation the conditions of sedimentation and erosion in river channels are determined. Water in wooden channels is allowed to flow over sand at various velocities. During the establishment of different kinds of flow the rates of erosion are noted.

Another project in the study for the river development pertains to the effect of channel contraction works. Model contraction works corresponding to "wing" dams in rivers are built and the conditions of equilibrium are observed with a view of determining the amount of contraction of the river channel which will provide the depth of water required for navigation. This research is especially applicable to river projects throughout the country.

The problem of erosion and sedimentation in rivers and canals is one of the most baffling with which the hydraulic engineer has to deal. The river maintains itself in a delicate condition of equilibrium, varying rates of flow causing differences in erosion. In connection with providing a navigable river channel, careful studies must be made of the "bed-load" so that bars will not form to hinder navigation. Studies in the laboratory are made of the transportation characteristics of sand taken from the river under consideration for improvement.

An aid to modern industries is the research in regard to the flow of viscous fluids through pipe lines. Using long glass tubes the investigators note the change in flow conditions for different velocities of the liquids. The principles observed can be used for all types of fluids. It is possible for example to make experiments on one type of fluid such as water and predict what will occur in a very different type of fluid such as sulpheric acid or viscous oil. The data are applicable to flow through the trans-continental oil lines and similar pipe lines particularly those in which fluids flow at relatively low velocities.



Equipment used in soil erosion and stream flow tests

minnesota professors

Determine Velocity of Fluids

by auditory methods

By EUGENE PRICE, E. E. '35

During the past two summers two professors in the College of Engineering and Architecture, Dr. H. E. Hartig and Professor H. B. Wilcox, have been conducting experiments on an auditory method of determining the velocity of fluids. The research is being carried on under the auspices of the Research Committee of the American Society of Mechanical Engineers. It is also listed as a project of the Engineering Experiment Station of which Dean O. M. Leland is a director. Funds were supplied by the Engineering Foundation.

The basic theory of the research depends upon the effect of motion of air on the velocity of propagation of a sound wave through the air. Two methods have been investigated for comparing the velocities of sound in air at rest, and in air in motion. These might be called the nodal method and the interference method.

The first of these methods depends upon the fact that sound waves in air are of the longitudinal type, that is, the wave forms a series of compressions and rarefactions which move outward from the source of the sound. If another such wave of the same frequency be introduced at another point so that between the two points the sound waves are traveling in opposite directions, antinodal planes will be formed at which there is no variation in pressure. These antinodal planes are stationary and lie at right angles to a line between the two points. If a velocity is given to the medium in which the sound travels these antinodes will shift in the direction of the motion. The magnitude of the shift depends upon the distance between the two sound sources, the velocity of the sound, and the velocity of the medium. Then knowing the magnitude of the shift, and the velocity of sound in air, the velocity of the air flow can be determined.

The apparatus for this method consists essentially of two sound sources placed a known distance apart in a pipe with a sound probe placed between them. The sources are ordinary telephone receivers with tubing leading into the pipe. The sound probe is a similar tube leading to a microphone. Sound is furnished by an oscillator. The sound probe leads through an amplifier to a headset. By moving the sound probe the amount of shift of the nodes can be measured and from that the velocity calculated.

During the last summer the two men again worked on the research and evolved a simpler method. In their second method the sound probe is placed at one end of the pipe and led to a Y-tube to which is also attached a receiver connected through an attenuator and phase shifter to the oscillator. A microphone at the mouth of the Y-tube picks up the sounds from the two sources and passes them to an amplifier and headphones as before. The system is first calibrated by passing a sound through the pipe while the air is still. The phase shifter is then adjusted so that the two sound waves, one passing through the pipe and the other originating at the Y-tube, just cause destructive interference and no sound is heard in the phones. Air is then passed through the tube from a gasometer. The shift in the nodes of the sound waves brings different parts of the two waves together with the result that a sound is heard in the phones. The phase shifter is then again adjusted until no sound is heard. By using the difference in the phase setting the difference in the velocities can be calculated. The difference depends on the velocity of the medium.

Sensitivity of the apparatus as a detector of air flow is very great. Some idea of the sensitivity may be shown by the following comparison. In one second sound travels a distance of 1130 feet. The length of the pipe used was approximately 20 feet. The time of travel of the sound in the pipe was then somewhere around .02 second. The velocity of the air in the pipe was made as low as 0.5 foot per second. Using this low velocity the difference in the phase could be read with an error of not greater than ten per cent. The difference in phase represents a difference in velocity of 0.5 foot per second. The time of travel of the sound wave in the pipe when there was no motion of the medium was equal to 20/1130. When the air is moving through the pipe the time becomes 20/1130.5. The difference in time is equal to about eight millionths of a second. The phase angle and, therefore, the change in time, can be determined with an error of not more than ten per cent at the outside. This gives the instrument a sensitivity to a change in time of less than one millionth of a second. The assumption of ten per cent error is a very generous allowance.

Dr. H. E. Hartig

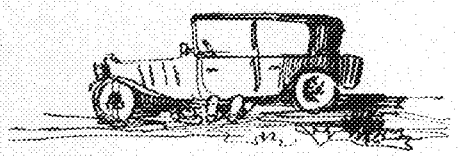
Prof. B. B. Wilcox

The Campus That Was

By RODERICK WILLIAM SILER
Assistant Professor of Mathematics

I take it that it wouldn't be a bad idea for me, in this particular issue of the Techno-Log, to grow reminiscent about old college days. I realize that when a graybeard begins to wind up in this way the natural thing is for all hearers to move out of the vicinity. However, your Techno-Log is now paid for, so that you might as well hear this out. It won't take long. The editor has begged me to get these sweet old memories off my chest within the limits of a thousand words.

Those were great days, boys, those old college days, when the campus was not what it is at present. While of course there was the necessity of getting passing grades, always a deterrent to the complete enjoyment of college life, we were free from many of the worries which at present make college such a trial to you. Take the one matter of transportation. We never thought of it. In those days the world was not full of automobiles, aeroplanes and helicopters. The result was that unless a man had broken a leg or lost his shoes he walked from one spot to another. Now observe the simplification of life that resulted. In the first place, our transportation service being of an elementary sort, required very little attention or cost of upkeep. All a man had to do was keep his shoes half soled. Then, at the same time that we were being transported we were being exercised. Result: no need of bothering to go to gym. Again, our health was, because of this ceaseless tramping, well nigh perfect. Result: no doctors' bills, no visits to the Health Service. And last, but far from being least, we had such first class appetites that we could eat anything and digest it. We were not finicky about our food. All we asked was plenty of it.



Yes, the more I think of those old college days the better I realize the truth of the fact that men are molded and made by their transportation facilities. In the old college days, while a man walked he could think. And he did think, even if not always profoundly, because thinking is an accompaniment of walking; that is, of walking under the right conditions. A man footing it half a mile to the University in the old days could consider and prepare a recitation, without being knocked cold by a brother scholar in an automobile hurrying to find a parking space. If he was with another man he could argue, and without danger, except possibly from the person he was arguing with. In other words, college life of the past, like the life in the world without, moved more slowly and sedately than at present.

As I remember it, students seem to have had more leisure then. Some will say that that was bad, since an idle student is the devil's own pasture and a menace to law and order. I am not so sure of that, because leisure does not necessarily mean idleness. While it is true that facts are necessary in a college course, and particularly to engineers, it is also true that a man who departs from college lacking in opinions, and therefore in judgment and balance and breadth, has definitely missed the thing he should have come to college to get. A man stuffed with facts and nothing else is no more educated than is a stuffed Christmas turkey—and far less interesting.

Facts and opinions. In combining and adjusting them lies the eternal problem and struggle of life. Facts no more determine opinions than opinions do facts. There is no such thing as a fact standing alone in this world. It exists and is defined by its relationship to other facts. Here is where enter opinions, and this is what has led some people to conclude that there are no facts, but only opinions. The old timers, handicapped as they were by horses and whiskers and bustles, saw this interplay of fact and opinion more clearly than is done today, I believe. Whether that is true or not, it should be evident to anyone who stops a moment to consider, that there is a reason for going to college other than to be pumped up to the chin—or perhaps I had better say, down to the chin—full of facts. An equally important reason is to develop opinions of the facts as related to the life and profession a man intends to follow. There is not a fact taught in a college course that is not debatable: not necessarily as to the mere wording of the fact, but as to its value and relationship to other things. This phase of a college course can hardly be handled by the man teaching it, for he is, as a rule, pushed to get his facts over in the time allotted him. Thus there is nothing left but for students to discuss these things among themselves. On the old campus they were more inclined to do that, it seems to me. Of course, as I have indicated, their opportunities were greater. I will admit that I know of no place in the neighborhood of the Engineering College where a man can wrangle earnestly without being destroyed by the traffic. Unless it is possibly down among the lockers of the basement floor of the Main Engineering Building.

Well, it is for you students of the present to decide whether the old college campus had any features worth emulating by the new, and whether such features should be brought back. When everything is said and done, it is all a matter of opinion, anyway. Isn't that a fact?

THE MINNESOTA
TECHNO-LOG
UNIVERSITY OF MINNESOTA

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A Breathing Spell

Fall quarter 1933 is almost a thing of the past. For many it is first college experience, for a somewhat smaller number, this quarter is almost the last. But for all, freshman to senior and all others, the termination of the quarter is anticipated with some thankfulness, much anxiety, and no small number of sighs of relief. Eleven weeks of study and hard work have been completed, and the week of final reckoning is upon us. Do we get an A for the quarter's work, or will we be repeating the same course next quarter?

It's a more or less nerve wrecking experience, this business of going to school—especially for those of us who are not the most excellent in our studies and who put a great deal of our time into outside activities. The value of these extra curricular undertakings is not the point of this discussion. The fact remains, however, that a quarter of work in the engineering college is strenuous enough so that a short vacation will be highly appreciated by every student.

The two weeks of vacation following this quarter are more than simply an opportunity to rest up after twelve weeks of work. It is an opportunity to do a few of the million odd things you have thought of during the quarter that you didn't have the time to do then—that much neglected correspondence with rich uncle Ed—that radio you were going to repair a month ago—reading over those last few Techno-Logs—getting those notes gathered together and filed away where they are available for future reference—there are many things to do which, while recreation, are really helpful. Make your breathing spell worthwhile.

Our Magazine File

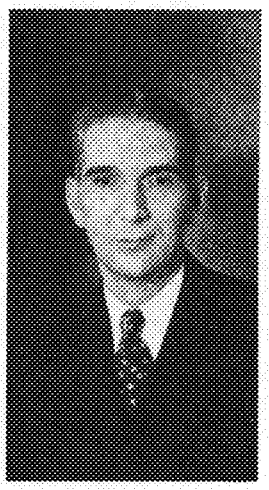
The Techno-Log announces that its magazine files are now open to the general student body. These files are quite complete and have some magazines not available in the engineering library. Publications of Engineering colleges from all over the country, even from Mexico, are on hand. The files also contain major engineering publications on highway engineering, explosives engineering, lightning arresters, glass manufacturing, wire engineering, hydraulics, welding, and other general engineering subjects.

General Electric, Westinghouse, and Edison publications, copies of all campus publications, and all society and fraternity magazines are on file. There are many non-technical magazines on fine and applied arts journalistic publications, pictorial magazines on Minnesota and the Northwest, complete files of the "Century of Progress" magazine, the "Scientific American," and of course a complete "Techno-Log" file.

The student body is invited to take advantage of the completeness of the Techno-Log files and use them for reference in the Techno-Log office.

Faculty Sketch

Ledru O. Guthrie



Ledru Octave Guthrie (L. O. to all), a member of our Engineering English Department, was born on John Milton's birthday, December 8, but some time later, 1897, in Brooklyn, New York. He still has cousins with "poisonality," wearing "shoits," and referring to "New Joisey." To prove his date of birth, Mr. Guthrie maintains that there is a silver spoon inscribed, "Baby Guthrie '97"; he staunchly adds, however, that it was "absolutely *not*" in his mouth when he was born.

When he was "too young to resist," Mr. Guthrie was taken to Grand Forks, North Dakota, but "fortunately" he does not remember this journey. When he was a few years older, he took his father and mother with him to Oklahoma City. There he learned "to ride, shoot, and do school work." He won prizes in scholarship, but Mr. Guthrie modestly adds, he received no laurels in riding or shooting.

Mr. Guthrie attended Iowa State College in 1916-17 where he majored in electrical engineering. After war was declared, he transferred to the College of Engineering in the University of Michigan. It was here that he was in the Students' Army Training Corps "while it lasted," during which time he "learned to distinguish mess call from any

distance." In 1919 Mr. Guthrie changed from an electrical engineering to an arts course, which he continued until 1922. He spent two years writing editorials on the Grand Rapids (Michigan) *Herald* until he decided to go East and join a big paper in 1924. He taught the fifth, sixth, seventh, and eighth grades in Telford, Pennsylvania, in 1924 and 1925. In 1925 Mr. Guthrie received his Bachelor of Arts degree at the University of Michigan; he received his Master's degree in English the next year at the same university. He taught journalism at Dearborn (Michigan) High school in 1925-26, English at Haddon Heights (New Jersey) High in 1926-27-28 and has been at the University of Minnesota since 1928.

He was married in 1921 and has one daughter who, he says, is "not old enough to be of interest."

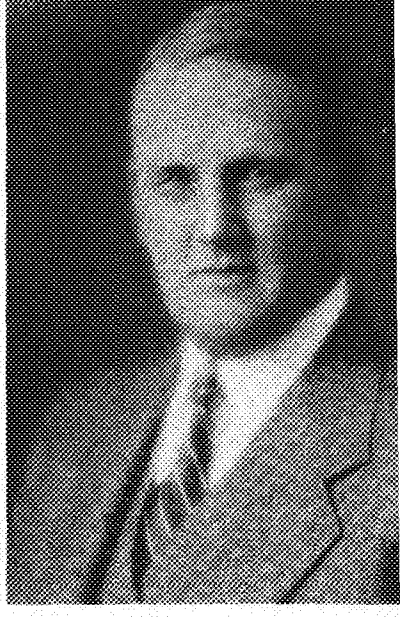
Mr. Guthrie is a member of the honorary fraternities, Phi Beta Kappa and Phi Delta Kappa. He is a member of the National Council of Teachers of English in which he served on the Committee on College Reading. In connection with this work, he was editor of the section, "Modern Philosophy," in the *Students' Guide to Good Reading*. Mr. Guthrie is a contributor to the *English Journal*. He is a co-author with Messrs. Richardson, Beckland, and Haga of *Practical Forms in Exposition* known at the present time to local freshmen, but to be published as a real book next spring by the Macmillan Company.

Although Mr. Guthrie does not commit himself as to his favorite author, he admits that the first Sir Walter Raleigh stands high in his esteem. This memorable scholar, soldier, and adventurer especially appeals to Mr. Guthrie in the courageous letter that he wrote to his wife the evening before he was supposed to be executed.

When asked whom he admires most in the field of poetry, Mr. Guthrie declares that his taste runs quite generally along the approved lines of good poetry; however, he feels that the modern poet, Nicholas Vachel Lindsay, the writer of *Congo*, is not receiving the credit due him.

Mr. Guthrie has very definite ideas on the place of English in the engineer's training. He is convinced that present college curricula have slighted this very essential part of the technical student's education. Six semester hours of English training are required of University of Minnesota engineering students; the average amount of time required of similar students in other universities of the United States is eight semester hours. Mr. Guthrie is certain that at least twelve semester hours are necessary to the student to allow him to fulfill the common conception of a college graduate. This extended course would include the present composition training, world literature, scientific literature, advanced technical writing, and public speaking.

Although Mr. Guthrie realizes that many of the old authors have accomplished things that have never been equalled, he recommends modern literature as being well worth reading. According to Mr. Guthrie there has never been a second "Billy" Shakespeare, Dumas, or Poe, but modern authors such as Thomas Mann, Barrie, Huxley, Galsworthy, and Hardy have already won their places in the literary hall of fame. Rolvaag, author of *Giants in the Earth*, is distinguished as being an important modern writer of novels that picture the pioneer life of the Northwest.



Dean Leland's Pen

Suggestions From Students

In an editorial in the last issue the suggestion was made that there should be some procedure by which students could bring their "grievances" regarding matters of instruction to the attention of their teachers. It was assumed that the individual student could not get consideration and therefore concerted action would be necessary in order to bring pressure to bear.

In general, this assumption is unsound. Any student can obtain from any teacher fair consideration if he deserves it. If, however, he has neglected his work, accused the instructor of unfairness and partiality, and assumed an attitude of critical disrespect and antagonism (and a few students have been known to do this), he can hardly expect unlimited patience on the part of the teacher. The great majority of students on the other hand, are actuated by a conscientious desire to obtain the greatest benefit from their college courses and are willing to co-operate with their instructors to secure this result. For such students the way is open at all times for sympathetic consideration of their questions and suggestions.

Some of the methods of instruction which students discuss when comparing courses, departments, and instructors, are these: the frequency of written quizzes; daily written problems or quizzes of short duration; daily recitation and discussion with or without grading by the teacher; frequent assignment of home-work problems to be handed in on time and returned with errors marked; examinations too long for completion by the average student in the allotted time; too few questions in examinations and quizzes; difficulty in hearing lectures or explanations by the teacher when his back is towards the class and his voice is weak; etc.

I am certain that every teacher would be glad to receive constructive suggestions from his students regarding such questions and to discuss them with his classes. It should be understood, of course, that the attitude underlying such suggestions must be constructive and helpful, if results are to be satisfactory. The teacher is responsible for the conduct of his classes and from his experience has definite ideas about many of these questions; still, he is vitally interested in the success of his instruction. It must be assumed, also, that lessons have been conscientiously prepared by the students before the class periods. The student who does not show any interest in his work cannot expect much personal help from his teachers. A mutual understanding contributes greatly to achievement by the student and successful instruction by the teacher. Thoughtful questions and suggestions from the student may aid in bringing this about.

—*O. M. Leland.*

many faculty men

Are Minnesota Graduates

- - - survey shows

In accordance with the theme of the issue, the Alumni Department is devoting its columns to graduates that are on the Campus at the present time. Besides the numerous graduate students, there are many members of the faculty who received their degrees at Minnesota. This month, the Department of Mathematics and Mechanics and the Department of Mechanical Engineering are covered; other departments will be discussed in future issues.

Axel B. Algren

The busiest man in Experimental Engineering—that's Axel B. Algren, Assistant Director of the Experimental Laboratory. After graduation from High School, Axel worked with a railroad until he got into the Army in 1919. He came to the University when the scrap was over, and graduated in 1925 with a Bachelor's degree in Mechanical Engineering. For two years, he was Superintendent of the A. T. Rydell Sash and Door company, and says that contrary to what one might imagine at first thought, training in Mechanical Engineering fits very well into the woodworking field. Coming back to the Engineering College in 1928 as a research engineer, Mr. Algren worked up to his present position. He is particularly interested in heating and ventilating, and is now the chairman of the Twin City Chapter of the A. S. H. & V. E. Experimental work which he is now doing includes some very interesting research on air filters. Building a filter that will catch the pollen which causes hay fever is an especially fascinating problem as these pollen particles are very small, and there are only a few of them in each cubic yard of ordinary air.

Thomas P. Hughes

The job first, and then the degrees, was the way T. P. Hughes, Instructor in Mechanical Engineering, tackled things. Mr. Hughes obtained a position in the Mechanical Engineering Department in 1923 and started his undergraduate work at the same time. In 1930, he got his Bachelor's letters and three years later, his Master's. Being especially interested in welding, he has conducted much research in that field and was recently made a member of the Fundamental Research Committee of the American Bureau of Welding. This committee is conducting over fifty research problems on welding in various schools and colleges throughout the country. Mr. Hughes has charge of the two problems being done on our Campus. One of them he is conducting himself, and the other is being written up as a thesis by a graduate of Iowa State. Another interesting project on which he is working is the construction of a polaroscope. This is an instrument of lights and mirrors used to examine celluloid models of welded joints. The transparent models are put in the machine and made subject to stresses similar to those under actual conditions. Interference bands caused by the refraction of light in passing through the specimen show the distribution of internal stresses and betray the points of stress concentration. This leads to much valuable data on the most efficient type of weld to use on a certain job. Another project being carried out by the students is the building of a drop testing machine to determine the forgability of a metallic specimen. Fundamentally, a weight is dropped on the heated piece, and the amount of deformation is used as a measure of the forgability.

Carl A. Herrick

A man of interesting practical engineering experiences is Carl A. Herrick, Assistant Professor of Mathematics and Mechanics. Starting soon after his graduation in 1902, Professor Herrick was associated with the excavating machinery field during most of the time which he spent as a practicing engineer. With the Bucyrus Company for some time, his work was the designing of dredging machinery, and special problems seemed to be continually coming up. At one time the company was called upon to build two large dredges that could be transported by camel-back three hundred miles into the interior of India before being erected. The difficulty of designing these machines so that none of the parts would exceed in weight the carrying capacity of a camel can well be imagined. At another time, they were required to build a special mining shovel that could be lowered to the working level of the mine in parts that would go down a shaft four feet square. Mr. Herrick also worked with the American Hoist and Derrick Company where he did designing and estimating. He tells of one discouraging experience which the designing office went through in the building of a derrick for the Navy yards. The Navy was looking for bidders and had issued specifications for a certain type of guyed derrick. Anxious to get the job, the draftsmen and designers

worked day and night, finishing the plans twenty minutes before the last train left that would get the bid to Washington in time. Their price was the most satisfactory and the job was given them. However, when a representative looked at the site, he found that some of the anchor locations for the guy wires were out in the ocean and that an entirely different type of derrick would have to be used. The Navy immediately called for bids on this new type, and the designers worked feverishly to prepare new plans. Because of the lack of time, the results could not be adequately checked, and some insignificant error got through and was discovered in Washington. Although their price was again the lowest, the Navy refused to award them the contract on account of the inaccuracy of a detail, and many hundreds of dollars and lots of hard work has been spent for nothing.

On another occasion, the Panama Commission asked for bids on a large machine to be used on the Panama Canal. Times were hard and competition was keen, so the Chief Engineer was told to scale the price down to the lowest possible figure. After the plans were completed, eight thousand dollars was arbitrarily knocked off the price in order to assure the contract. The company was awarded the job, and informed that theirs was the only bid turned in.

Burton J. Robertson

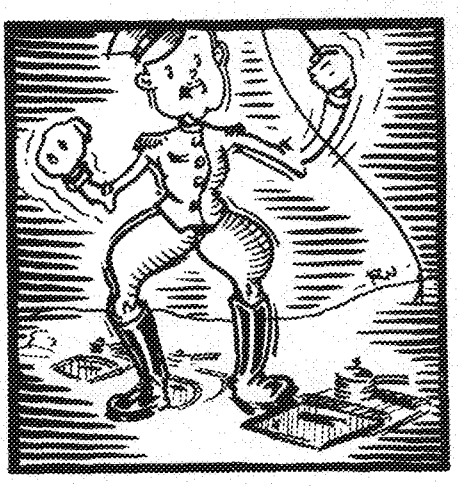
One of the best liked men in the College of Engineering is Burton J. ("Dad") Robertson, Professor of Mechanical Engineering. Except for a few years in which he designed machinery used in the manufacture of road signs, Professor Robertson has been with the University since he received his degree of Electrical Engineer in 1915. His first teaching job was instructing enlisted soldiers of the Students Army Training Corps during the war. From there, he went to research work under Professor Rowley, and when the Internal Combustion Division was established he was made head of it. The latest experimental accomplishment of this division is a method of measuring the gas pressure from the combustion chamber of an engine which gets behind the piston rings and forces them against the cylinder walls. This apparatus is believed to be the only one of its kind in the country, and important data has been obtained with it, some of which is at variance with well established theories. Much work is also being done on commercial lubricating oils to determine the merits of different makes as compared with their prices.

Charles T. Boehnlein

A "Jack of Two Trades" is Professor Charles T. Boehnlein who divides his time between Mathematics and Aeronautics. Receiving his Bachelor's degree in Engineering in June, 1917, he immediately obtained a position with the Minneapolis Steel & Machinery Company, boasting the title of Testing Engineer. Deciding, however, that he had to wear overalls too much of the time, Mr. Boehnlein resigned after a month or so to become an Aeronautical Draftsman for the Civil Service Department of the United States Navy. For some reason which he still cannot explain (having grown somewhat older), he quit his job in favor of enlisting as a flying cadet in the Aviation Division of the Navy. At the close of the war, he obtained a discharge from the Navy and came back to Minnesota to work for the Mechanical Engineer degree, which he was given in 1919. A contact with the Mathematics Department in the fall of the same year resulted in his present position. Professor Boehnlein keeps his interest in flying alive through the activities of the University Flying Club of which he is the faculty adviser.

Hans H. Dalaker

Hans H. Dalaker, Professor of Mathematics and Mechanics, is strictly a mathematician, having taught that subject ever since his graduation from college. Although he received his Bachelor's degree in the Arts College, Professor Dalaker has been with the engineers during most of the time that he has been teaching. At the present time, his classes are usually in calculus and differential equations, although he often teaches graduate classes in various types of advanced mathematics, including function theory, theory of equations, analysis, advanced geometry, and modern algebra. Dr. Dalaker is especially interested in infinite discontinuous groups, and has put in about three years study at Cornell on that subject. Reflecting on his Campus days, he remem-



bers when the R. O. T. C. was uniformed in blue-gray outfits that cost the students about fourteen dollars each. The whole unit drilled at once, there being just enough men to string a double file across the Armory with one platoon in the north wing. Every Saturday there was a grand review with a band 'n everything.

Hugh B. Wilcox

Shy, reticent, bashful, or something, Hugh B. Wilcox, Associate Professor of Mathematics and Mechanics, refused to talk about himself on the grounds that he didn't want to get into the limelight,—the old flatterer! Since when is the Alumni Page the "limelight?" But if he won't talk, his friends will, and the Techno-Log always gets its man.

Mr. Wilcox is a Lake Mills, Iowa, boy, who made good at the University, graduating in 1914, with very good grades. In 1916, he received his master's degree in E. E. His first job out of school was in the signal department of a railroad, but after a year of signaling, he went to Washington to become an examiner in the United States Patent Office. He stayed there for two years, long enough to gain inspiration to write a manual for patent office examiners. Following this, he came back to Minnesota to teach high school for a time. He began his University teach'ng in the Engineering College in 1920.

Professor Wilcox is very well liked on the campus, both by his students and by his fellow faculty members. He is a member of Triangle, Pi Tau Sigma, and numerous other engineering and mathematical societies. Among his accomplishments is the art of being a good toastmaster, and many campus affairs have been "put over" by his ready wit.

Between Friends

(*Continued from page 56*)

"The most of us took it on the chin," Pete pressed.

"Well, if you must know," Andy said in speech calculated to be out of range of the janitor who was cleaning up on the heels of a platoon of estranged and untidy miners in Drawing 11, "that analyt instructor marked time cards for the ol' man on one of his jobs, an' maybe he'd like to be doin' that again some summer, huh?"

"I sure thought it was somethin' like that," acknowledged the inquisitor.

"You flunked descrip, too, didn't you?" Pete asked.

"Yeah, but I was aces in that stuff until I lost the hat pin."

"Hat pin? What d'ye mean?" Pete drilled.

"You ain't smart, Pete," Andy reproved as his boyish face broke into an enraging grin. "That's what the instructor—what's his name?—used to put it across with an' I had mother send me one. Boy, with a hat pin you can make them co-points sit right up an' say uncle. An' then I had to go an' lose the dam' thing! Next time I'm goin' to have a dozen of 'em."

"What'd you do in surveyin'?" Pete wanted to know.

"Oh, just another F."

"Yeah?"

"But I didn't deserve it," Andy said with just a trace of bitterness.

"No?"

"No! The problem was to go aroun' about a eight sided piece of real estate with a tape an' a gun (transit) an' make it close. They was Ham an' me an' Carl in the party. When we was through we found out that she wouldn't close by more'n sixteen degrees an' two or three hundred feet. Then we tried to close it on paper an' still she was out. Sometimes you know, Pete, they give you somethin' that ain't expected to close just to catch you. So we handed it in just as she was."

"Well, we had wrote on the sheet 'we don't think this was ever intended to close.'"

"What'd Danny say to that?"

"Gawd! I wouldn't dare repeat it! He just blew up. Ast us where was our trig. Then after he calmed down some he said, 'Listen, you punks,'—an instructor can talk tough like that sometimes, Pete, an' you got to like it—'Listen, you punks,' he said, 'if I go north a given distance and then come back south the same distance the norths an' souths must balance, huh?' Well, I had him there dead to rights an' I said so. 'But we wasn't goin' due north and due south all the time; sometimes we was goin' away off sideways,' I said. I guess I had him there, didn't I, Pete?"

Pete, being just a bewildered mechanical, nodded tactful approval.

Just then gongs announced throughout the building that 1:30 classes were due to begin.

"Geez, Pete, there goes the bell an', even countin' the title, I only got thirteen words wrote on this dam' theme!"

"Well," Pete suggested as he recovered the wreck of a fountain pen, "you could wish him a Merry Christmas. You got lots of room left."

They Who Serve

So ambitious were the staff members this month, that the editor has been literally swamped with stories and articles. Many articles had to be shortened, and a still greater number had to be left out completely or held for future issues. The result of this situation is that many people have done work toward this issue, although their articles never got to the printer. To these the magazine is as much indebted as to those whose articles appear, for it is through having a large number of articles to choose from that a balanced issue can be obtained.

In addition to those whose names are listed in the masthead on the editorial page, many others have contributed. Charles Sweatt spent many spare hours and evenings gathering and writing up the faculty articles which appear on the Alumni page. He is not, however, responsible for the illustrations which appear on those pages. A new man, Orville Becklund, did a fine job of writing up the faculty sketch of Mr. Guthrie. Don't you think so? Another new man, Howard Kahn, also did some good work although it is not so evident.

Ed Marshall covered the chemistry department, and Nathan Budish did his part for the aeronauticals. Morris Cohen broke into the editorial page again. Although most of the illustrations in this issue are old pictures which have been dug up, we did find a job for Karl Ziegler, the staff photographer, and he was right on deck to do his stuff. Fred Warner, not only covered his regular beat of A.S.M.E., but also brought in a bunch of interesting news notes about his department.

In the business department, James Moore and Robert Dixon have been working days, nights, and Sundays on the advertising—or so they say, at least.

To all of these, and the many others who have directly or indirectly contributed to this issue, go the whole hearted thanks of the entire staff. Merry Christmas to all.

Fall Quarter Engineering Enrollment

Department	Fr.	S.	Jr.	Sr.	Un-classed	Total
Electrical Eng.	56	58	86	60	....	260
Civil Eng.	27	42	48	59	....	176
Chem. Eng.	60	54	62	46	....	222
Chemistry	15	34	30	32	....	111
Architecture	12	20	41	39	4	4
Arch. Eng.	....	....	16	13	....	29
Mechanical Eng.	27	52	57	50	....	186
Aeronautical Eng.	54	41	48	38	....	181
Agricultural Eng.	3	8	5	4	....	20
Eng. Pre-Business	14	32	5	....	....	51
Interior Architecture	....	....	6	4	....	10
Undecided	2	....	....	....	....	2
Total	270	351	404	336	4	1365

Around and About the Campus

News from the M. E. Department

General acceptance of electric welding has led the Mechanical Engineering department to offer courses in direct current welding, alternating current welding, and spot welding. The noise from riveted steel construction will soon be a thing of the past as over 100 cities now permit welded steel buildings. It is now possible to electric weld all ordinary metals such as mild steel, cast iron, stainless steel, aluminum, copper, and manganese steel. Two railroad bridges, several ocean going liners, and the new Yale Library, an 18 story building 150 feet by 220 feet, have been electrically welded. In 1930 about 13,000 miles of pipe lines for oil, gas, and gasoline were laid, all electric welded.

* * *

A small Detroit Rocking electric arc furnace has been installed in the foundry. It has a capacity of 125 pounds of metal an hour.

The modern electric melting furnace is rapidly replacing the old-fashioned coke furnace for the manufacture of castings. Castings made by the electric furnace method are far superior to cupola castings. With an electric furnace it is now possible to obtain cast iron showing a tensile strength of 50,000 pounds or better, and the electric furnace will also permit the making of steel castings and alloy iron and steel castings. A temperature of 3,000 degrees F. can be obtained. This furnace can make use of any kind of iron and steel scrap and metal shavings from the shops, thus saving a considerable amount in cost of raw material. The electric furnace will permit research in the field of alloy iron castings, which was not possible with the old-fashioned coke cupola.

* * *

A 50-ton hydraulic forging press for hot working of metal has been built in the shops. It operates by oil pressure at 1500 pounds per sq. inch. This machine will permit the development of new shop projects and the carrying on of research work in the field of hot working of metals.

A Gould and Eberhardt gear hobber has been installed in the machine shop. With the advent of high speed machinery it is imperative that gears be produced with extreme accuracy, and the shops have had no gear cutting machinery up to this time. The machine will handle gears up to 18 inches in diameter with an 8-inch face.

* * *

Two small moulding machines have been purchased for the foundry. They are a combination jolt and squeeze type. Up to this time all moulding in the foundry has been done entirely by hand. The machines operate by compressed air and will handle patterns up to about 18 inches square. A mould that would probably require thirty minutes for a student to make by hand can be made in about five minutes with the moulding machine.

* * *

Engineering Library Has New Volumes

Our Engineering Library boasts a number of new, especially interesting volumes both technical and non-technical. F. Henderson and W. N. Polakov, two very prominent commentators of the present era, are each represented by a volume relating to the effects produced economically and otherwise by a super-machine age. Mr. Henderson's work is entitled *Economic Consequences of Power Production;* Mr. Polakov's is *The Power Age.*

A symposium edited by M. L. Cooke entitled "What Electricity Costs" is another book which is at present in the public eye. It is a collection of papers on the cost of distribution of electricity to domestic and rural consumers.

Our division of the University Library has recently been presented with a copy of *Dredging in the Panama Canal* by its author, John G. Clayborn. He is a former University of Minnesota student who served under and with our great military and civilian engineers on the Panama Canal. His book describes the solving of dredging problems that were encountered during the construction of the canal.

The following are some of the most important recent acquisitions in technical literature: *Symmetrical Components* by C. F. Wagner and R. D. Evans, the first volume to gather together the fundamental theory of the solution of unbalanced electrical circuits by the method of symmetrical components; *Vector Analysis* by H. B. Phillips; *Procedure Handbook of Arc Welding Design and Practice* published by the Lincoln Electric Company of Cleveland, Ohio, a handbook "designed to present in convenient form for ready reference the basic information on arc welding in its present status"; *Photo Elasticity* by E. G. Coker and L. N. G. Filon, a handbook on photo-elasticity giving mathematical and physical data found necessary in investigations in this science and the principal technical developments of the science.

The library has just secured a French scientific classic published in 1898 at Paris. It is known as *Recherches sur Les Instruments, Les Methodes et Le Dessin Topographiques* by A. Laussedat.

Miss Gertrude Veblen, librarian, expects the library to have a comprehensive set of mathematical tables in the near future.

* * *

A. I. E. E.

The Minnesota chapter of the American Institute of Electrical Engineers met in the electrical engineering auditorium on Wednesday, November 22, with Ivar Pearson presiding. Henry Middel, senior electrical, gave an interesting and explanatory talk on X-rays and showed characteristic curves for the different X-ray tubes. Everyone was impressed by the excellence of the explanation, and underclassmen received an idea of what they must sometime absorb.

After the address, the members went to Northrup Memorial Auditorium and inspected the new sound equipment. As electrical engineers they were especially interested in the apparatus. Two projec-

tors equipped for either sound-on-disc or sound-on-film and the amplifiers are in the projection booth. The movable wide range loud speakers are placed directly behind the screen when in use. The equipment on the stage was also inspected.

A. I. Ch. E.

Last month's big smoker seems to have burst into flame by the look of the enthusiasm that has been generated in the student chapter of the American Institute of Chemical Engineers,—perhaps it was the six glasses of cider apiece that did it. A membership drive is now under way to gather in new members. A trip through the Experimental Mines Building is scheduled for the very near future, to be followed, before the end of December, by an excursion to Chaska to go through the American Sugar Beet Company's factory there.

The national organization of the A. I. Ch. E. is now publishing a newspaper for all of its chapters. The first issue was printed at Ames, Iowa, on December 1. A national convention will be held in the spring for the leaders of the student chapters.

•

They say that Clarkson, freshman football player, is ambidexterous. Many very handsome engineers (for benefit of Pillsbury Hall) have also the advantage of being ambidexterous. Next time we may publish names. Note: This is a dirty crack.

With Our Honoraries

Tau Beta Pi

J. A. Anthes
Glen Brokke
Benedict Cohn
Morris Cohen
L. J. Fischer
Homer Hagstrum
Wilho Junnila
Russell Johnson
Orville Jensen
C. W. Janes
D. A. Justus
J. Allan Tehman
Lewis Martin
Arvid Newhouse
John Osojnicki
Harold Sundstrom
John Scott
C. N. Sonnesyn
Segward Stavnes

The Minnesota Alpha Chapter of Tau Beta Pi, honorary engineering fraternity, held its forty-seventh formal initiation and banquet on the evening of December 6, in the sun room of the Curtis Hotel. Professor Hugh B. Wilcox of the mathematics department acted as toastmaster for the banquet and Dean Ora M. Leland presented the keys. Professor Lennox A. Mills of the political science department spoke on "Modern War and the Disarmament Conference."

The president of the chapter, Reynold L. Caleen, officially welcomed the newly initiated members and H. C. Hanson responded in behalf of the initiates. C. W. Janes won the $5.00 prize for writing the best essay among the pledges, "American Radio."

The informal initiation took place in Professor Richards' pattern-making shop on the evening of November 16.

Chi Epsilon

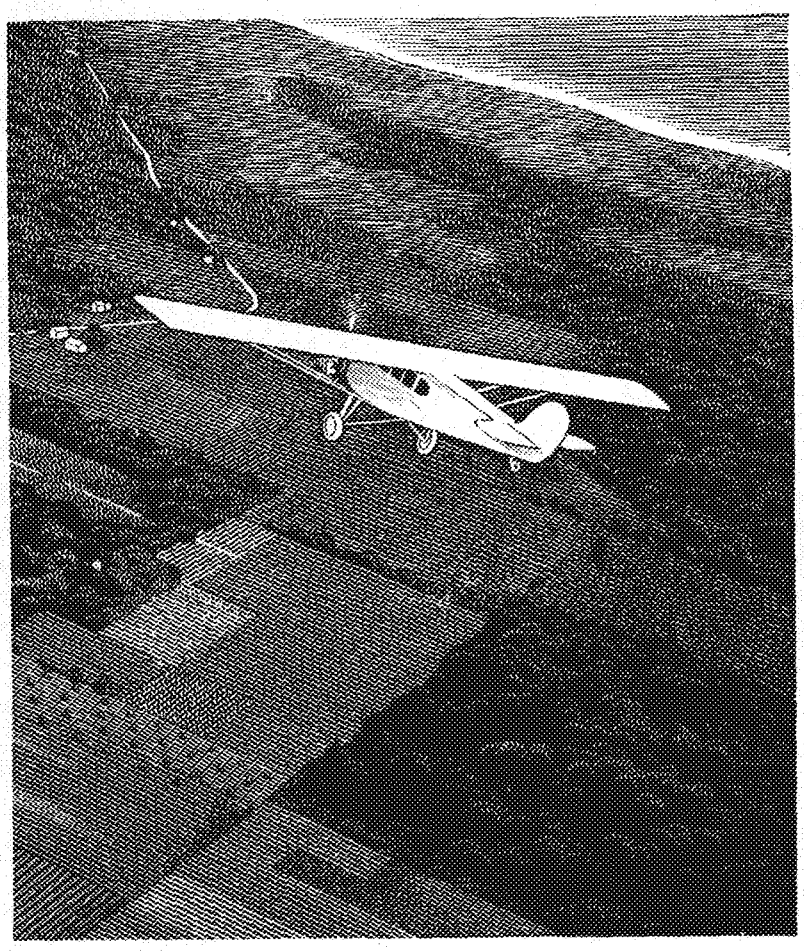
Glenn Brokke
Ralph Monson
Carroll Reese
Jacob Essen
Edward Silberman
Leon Turner
Harry Baker

Formal initiation ceremonies were conducted December 7 at the Curtis Hotel, the principal speaker being Professor Morris B. Lambie. In his address, Mr. Lambie spoke on the social side of engineering. The new members were introduced by Phillipp Kilpatrick, president, and Harry Baker responded for the initiates. Professor H. B. Wilcox was toastmaster. Informal initiation was held November 21 at the home of Professor Frederick Bass, at which the purple and white pledge ribbons were given out.

Eta Kappa Nu

Segward Stavnes
Henrick Middel
Clinton Janes
Wilho Junnila
Carl Pennig
David Kerns
John Peusch
Daniel Armstrong
Homer Hagstrom

After surviving an extremely difficult preliminary examination and an electrifying informal initiation, pledges of Eta Kappa Nu were formally initiated on December 4. The ceremony for the honorary electrical engineering fraternity was held in the Curtis Hotel. Professor Henry E. Hartig was toastmaster, and Professor John M. Bryant, head of the department of electrical engineering, was principal speaker. John M. Clarey welcomed the new members.



A bird's-eye view showed the way

Telephone engineers recently found the best route for a new telephone line by taking a bird's-eye view of their difficulties.

The territory was heavily wooded, spotted with swamps and peat beds, with roads far apart. So a map was made by aerial photography. With this map, the best route was readily plotted, field work was facilitated.

Bell System ingenuity continues to extend the telephone's reach—to speed up service—to make it more convenient, more valuable to you.

BELL SYSTEM

TELEPHONE HOME AT LEAST ONCE A WEEK . . .
REVERSE THE CHARGES IF THE FOLKS AGREE

ENARCH

The Arabs are dead!!

For several years there has been a great deal of publicity given the engineering dramatic organization known as the Arabs. Some years ago this organization put on several very creditable productions in which all parts, both male and female, were taken by the husky lads in engineering. These productions were written by engineering students, the music and lyrics were composed by engineering students, the parts were played by engineering students, and the shows were staged by engineers. They were, however, enjoyed equally by all of the many who attended. Then after several years of successful performances a bit of poor business put the Arabs several hundred dollars in the wrong column, and created a bad impression in the minds of many of the faculty and sponsors. Since that time, much has been said and little done about the Arabs. Therefore the Techno-Log takes pleasure in this article in burying the Arabs and performing the last rites with all due dignity.

However, ENGINEERING DRAMATICS ARE NOT DEAD!! Down deep in the hearts of many of us today is burning a desire to see an engeneering dramatic organization functioning. Perhaps we played a part in a high school play and enjoyed it, perhaps we had a little experience with producing, staging, costuming, or lighting in some capacity or another, or perhaps, we just have a burning desire to see what it is like—to see just what actually does go on behind the footlights. Those contacts which are made in the preparation of an amateur production leaves lasting inspirations and the friendships acquired are real. There is perhaps no more effective means for making lasting acquaintances than through dramatic contacts.

This, however, is probably not the most important reason for engineers being interested in dramatics. When one is acting a part in a play, he must step out of his own life and into the life of the person whose character he is portraying. He must completely forget the world in which he is living, and transplant himself into the imaginary world in which the play is set. This chance to temporarily forget the present with all its troubles is the greatest inspirational stimulus a student could receive.

Enough preaching — now for something new. In the November 1933 Techno-Log we made a statement that the most necessary thing for the revival of an engineering dramatic organization was a leader. That necessity has been fulfilled. A student who has the initiative and the experience required, has indicated that he is very anxious to take hold of such an undertaking and take over the formation of a new society. Already a name has been suggested and temporarily selected — ENARCH — ENgineering, ARchitecture, and CHemistry. Sounds forceful and romantic, doesn't it?

ENARCH is on the way. This is the first step. As soon as a sufficient number of interested persons have filled in the information cards on this page and turned them in to indicate that there is talent enough available, work will immediately begin. In order to get things going early next quarter so as to produce a play sometime this spring, it is imperative that these questionnaires be turned in as soon as possible. They may be turned in to the Techno-Log office, or left with Herb Jensen in the Engineers Bookstore.

In submitting this questionnaire it is our aim to find the talent capable of producing a show worthwhile. Other Universities have made great successes with such projects. It is a well known fact that engineers are in need of classic diversion—here is an opportunity.

In answering the questions below do not hesitate because to have had little or no experience. The fact that you would be interested is sufficient. However, if you have had experience, no matter how trivial it may seem to you, be sure to indicate it.

Have you ever taken part in a stage production? .....
If so, in what capacity did you act? .....
.....

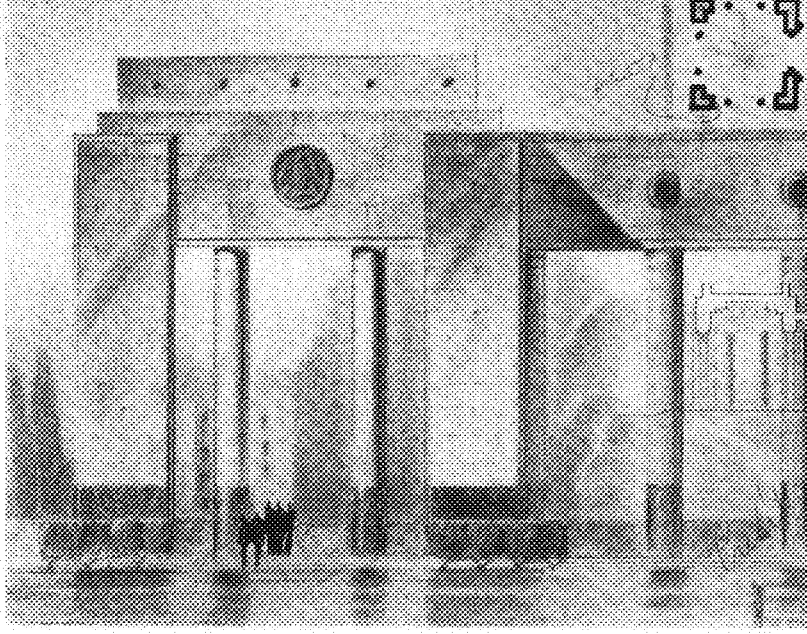
If you have never participated in any stage work, but are interested in doing so, check the items below that interest you.

Actor.....	Orchestra Instrument.....
Comedian.....	Scene Painter.....
Dancer.....	Scene Shifter.....
Singer.....	Scene Designer.....
Tenor.....	Stage Electrician.....
Baritone.....	Stage Carpenter.....
Bass.....	Make-up Artist.....

Have you ever composed music of the musical comedy type? .....
Have you ever written lyrics? .....
Have you ever written a musical comedy? .....

The Architects' Corner

By THOMAS TUDOR



Junior Sketch

To insure that the spirit of the sketch problem was fulfilled the second junior esquisse-esquisse was strictly "en loge." Besides being on their honor in regards to the rules forbidding the use of reference material and the obtaining of help, the students were supervised in their drafting room by two of the graduates. During the nine hour period nobody was allowed to leave the room without permission.

This program, cleverly written by Prof. Roy C. Jones, is typical of the description of a problem presented to the students. "In the design of a great public building, where the utmost in monumental expression is desired, the architect has proposed a composition by which two flanking porticoes, reaching out in front of the building like arms, enclose an imposing court of honor. The present problem concerns itself with the devising of a suitable termination for these porticoes. Such a termination would take the form of a pavilion which definitely, yet harmoniously, "stops" the running motif of portico openings; much as the clever draftsman brings his lines to a stop with a dig of his pencil, or the musician ends his theme with a strong chord."

George Thompson received first credit for the design reproduced above. The scribbling was done by members of the jury and suggests corrections and criticism.

Recent Problems

During the last weeks in November the major or five weeks problems of all classes were completed and judged. A very conspicuous result of the judgments was the fact that many problems received no credit. The new system of grading allows for no award for the not-quite-good-enough problems which might get coudition credits under the former method of judging.

It was supposed in the senior problem that in addition to its new embassy, the United States government has proposed to erect in Paris a building where transient diplomats, savants, artists, members of industrial and commercial investigating committees abroad, etc., will be housed during their short or prolonged stays in the French capital. The building would be called the "American House" in Paris, and should be, due to the quality of its guests and to the dignity and character of its architecture, a permanent center for American influence abroad. Because of its necessity for a complex composition and for the special character, the "American House" was a typical senior problem.

The juniors had a particularly interesting problem in the design of a moving picture theatre. The program termed it a "deluxe" establishment calling for provisions for refreshment and dancing. The problem offered many possibilities for originality. Although most of the students had a miserable time because they had turned in poor esquisses, several excellent solutions were submitted.

The design for a tennis club was the sophomores' major problem. The requirements besides the club house and courts included facilities for a championship court with stands for 1500 spectators. A straight-forward, uncomplicated arrangement of the grounds for entrances, parking, circulation, and seating was important.

Modern vs Classical

Why is our work usually modern? Does it represent our sincere expression of ideas, or is it sham evading real study? It may be assumed that students attempt modern because it is the easiest to do. Isn't it true that we can get by with poor modern decoration and detail, while we would be heavily penalized for the unlicensed use of a traditional style? Unlike the students of a few years ago we did not commence with a foundation of classical study. We need not be uncertain in elements of design, however. The study of modern architecture must be approached with common sense, for after all, bases of design were decided long ago.

The knowledge of traditional forms will be most valuable in attempting to understand the principles of modern design. Ordinarily, the undergraduate is seeking effect rather than honest expression. He likes modern design but often cannot explain it in a straightforward manner. The evasion that a creation is "functional" has become time worn, and it has never seemed very impressive. As an example, modernity is commonly portrayed by the stressing of verticals or horizontals, yet usually this motif is not consistent with structural logic.

Our generation may or may not see the fate of the modern trend in architecture. Many authorities prophesy that the new design will become the most distinctive of any style ever evolved. Considering the future, then, our bungling efforts may be worth while. Liking modern work may be enough, and we can do our part by presenting ideas. We should be sure of what we are doing. Explicitly, we can begin with what we know of good principles of planning.

Eric the Engineer Says—

Eric does not seem to have approved of our comments on his last letter. We are very sorry, Eric, to have hurt your feelings, or to have made you feel in any way that your letters about the college were not welcomed. We were merely trying to save the copy readers a little work. As to your discussions of tink and tank, we have consulted our dictionary, which was also written by Mr. Webster, and have found the following definitions which you must have overlooked.

"Tink—to make or emit a sharp, clinking, metalic sound." Have you ever noticed that when you are tinking? We haven't.

Also, we find that Mr. Webster has a definition for tinker which differs slighily from yours. He says that a tinker is a bungler.

We might also say in regard to the definition of the term "dead line," that no harm will come to you as long as your letter reaches us on or before that date.

How about giving us the lowdown on your Christmas vacation before January 8, 1934.

Merry Christmas,

THE EDITOR.

Mr. edtor tecklog;

Deer mr. edtor;

Ay don't tink you ban polite to interrup my latter rite in middle to rite me latter and make your latter all black tipe. Ay yust tink you should reed book by emly post bout etiket.

Vy for you rite p.s. When you meau "Think" please use tank instead of tink? Ay tink you crase. Ay didn't use to tank so until ay seed vat you rote. You must ban freshman. If you aint ay bet engl prof yust wood tare his hare if he no how little he taut you bout english langage.

So ay yust find out all bout it in mr. webster's d'ctionary and ay go see prof bout it to.

Vell prof he say, kind of soft like to himself, tink, o yes someting that some faculty tink a stewdent rarly do rond here and in my class most of the tinking that they expres shows that they have'nt ban tanking bout it before very much. Then he say, out lod, tink is defined as the exercise of the faculty of yudgment, conscription and interference and ay say to myself if they make faculty do it in von college vy don't mr. deen make em do it in engeering and arktecture, and ay tank bout fellars who don't play golf or noting on faculty of engineering and arktecture, it yust make me vonder.

Mr. edtor ay listen close to prof and he say tink vith *i* in it and *a* only his tung ban little tick and his *t* had send yust like air come out of tire.

After wile prof he call in nother prof and he ask him vat he tink bout it and they call in lot of prof and they talk long time. Vell von fellar he say shurly the present tence must be tink, the past tence tank, and the future rence tunk. Vell they don't all agree on that. Some prof yust use slide rool and oder look in lot of book and some yust talk.

Vell ay yust had to go to class so ay don't no how they vote but ven ay go back to see prof bout it he yust sit there like he ban all tired out vith hare all muss up and i all blod shot and ay say, vas ay rite and he say yust in horse visper, ay don't no. So mr. edtor maybe you is rite but ay don't tink so.

So ay look in mr. webster book and ay don't find any vord tank at all except vat meen sistern and tink aint there eder but ay find tinker and tanker.

Now a tinker is von vat tinks. Ay don't have to reed that von in book, ay no it. Mr. webster he say a tanker is von kind of boat and you no a boat can't tink. Ay don't tink mr. webster much good anyhow. Ay tank univ ought to by good dictionary. Ay still tink you ban crase and ay no prof do to, but you no he is wery polite and woodn't tell you, but ay tell you.

Nother ting ay don't understand in your latter ven you say dead line dec 5? How can a line be dead? Ay ask my frind sven, he vork in undertaken shop, bout it and he say they never buried von yet, he can't emagin.

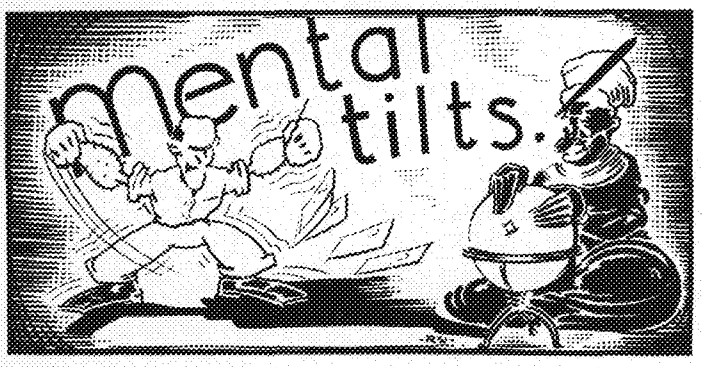
So ay ask nother prof vat bout a dead line. Vell he yust put pipe long time and say ay tink mr. webster say dead line ban a line drawn somevere vich it crost by anyvon they is libel to be instant shot. Vy for mr. edtor, you vant to shoot me? Don't you like me ven ay rite you latter bout college? Vell ay fool you anyvay, ay stay home in bed all da tues dec 5 and ay vont cross no line.

Vell ay like von ting in latter anyvay. Ay tank it is reel good ting that you vote for me for A.

Tank you,

Eric the engineer.

p.s. Ay tank ay don't tank you crase any more.



Extremely gratifying (to the Business Manager) were the results of last month's Mental Tilts competition. As you know, a cash award of $1.00 for the first correct solutions was offered. However, none of St. Pat's hearty disciples seem to be versatile enough to handle chimney cleaning, navigation, and hunting in addition to their studies of bottles, and the dollar still remains in the cash box (under six padlocks). The dollar is offered again, for the first correct solution to the new "tilts," and the problems are easier, so here is a chance, engineers, to make your Christmas vacation profitable.

The Divisible Eggs

A woman came to town with a basket of eggs. To the first customer she sold half her eggs and half an egg. To the second customer she sold half of her remaining eggs and half an egg. To a third customer she sold half of the remaining eggs and half an egg. Then counting the eggs remaining she found that she had exactly three dozen. With how many eggs did she start?

Why ?

Given: $16 = 48 = 64 = 96$

Adding 36 to each side: $16 = 48 + 36 = 64 = 96 + 36$

Factoring: $(4 = 6)^2 = (8 = 6)^2$

Taking the square root: $4 = 6 = 8 = 6$

Adding 6 to each side: $4 = 8$

Find the fallacy

A Frame-up

Four equal uniform rods of weight five pounds each are freely jointed together to form a square frame ABCD. The side AB is fixed vertically and the square is kept in shape by a string connecting A and C. Find the tension in the string.

Answers to Last Month's Mental Tilts

A Hunting Problem

The dog runs 188.8 feet.

The Chimney-sweep's Dilemma

The length of the stick is 13.1 feet.

•

Navigation for Duck Hunters

$2500(x - 100)dy + 2500ydx = 11x^2\sqrt{(x - 100^2) + y^2}dx$ describes the path of the duck.

•

The Two Bottles

Fill the five pint, then fill the three pint from the five pint leaving two pints, empty the three pint and pour in the two pints from the five pint. Fill the five pint and from it fill the three pint leaving four pints in the five pint.

or

Fill the 3 pint bottle and pour it into the 5 pint, then fill the three pint again and from it fill the 5 pint leaving 1 pint remaining in the 3 pint bottle, then empty the 5 pint bottle and pour in it also 1 pint from the small bottle, then measure 3 pints with the small bottle and add it to 1 pint in the large bottle.

From Long Ago to Now

(*Continued from page 55*)

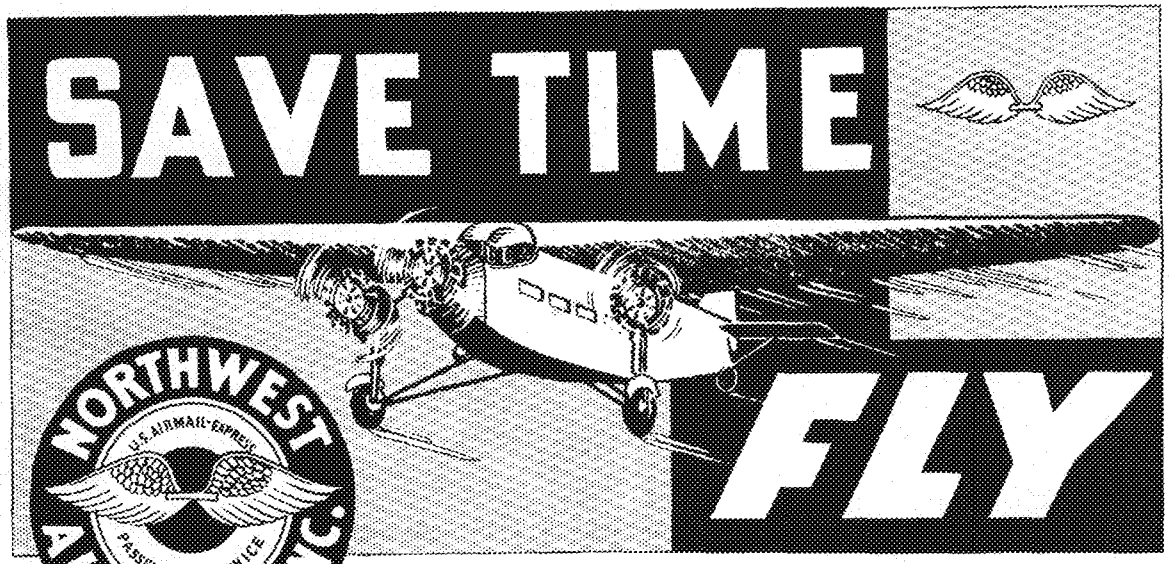
Many graduates of the engineering college have become prominent men. Arthur B. Fruen, C. E. '09, has been a member of the Minneapolis City Council for many years. Nels W. Eisberg, C. E. '09, is the new state highway commissioner. Walter C. Beckjord, E. E. '09, is vice-president of the Boston Consolidated Gas Company. F. R. McMillan, C. E. '05, is director of research for the Portland Cement Company and has attracted nation-wide attention for his work. Francis C. Shenehon, C. E. '95, dean of the College of Engineering from 1909 to 1917, is now a nationally known consulting engineer, noted especially for his work on water power development. Lawrence B. Anderson, A. E. '27, has recently been appointed professor of architectural design at Massachusetts Institute of Technology. Francis C. Frary, Ph. D., Ch. E. '05, formerly of the department of chemical engineering, is now director of research for the Aluminum Company of America. The present publisher of the St. Paul Dispatch and Pioneer Press is Leo E. Owens, M. E. '11. A glance at the alumni directory will show that most of the graduates of the College of Engineering today hold good positions in business or engineering work.

Plans are now under way for the formulation of two new courses in engineering. One will be a four-year applied science course with special emphasis placed upon the physical sciences, such as chemistry, physics, and mathematics. The other is a four-year course in industrial engineering which will give the student training in general engineering and economics, with emphasis placed upon courses in production control such as materials handling, time and motion study, etc.

What are the plans for the future? There is room for improvement. Our old friend, overcrowding, is again finding his way into our midst. Ample plans have been made to overcome this obstacle. Appropriations are lacking, however, and they seem to be the most important factor in a University building program.

The building plans call for a new Mechanical Engineering building adjoining Electrical Engineering and connecting with the Experimental Engineering Laboratories. Herein will be contained pattern, foundry, forge, machine, and heat treatment shops, together with the steam and power laboratories, as well as lecture rooms. Aeronautical engineering, which has grown very rapidly in the few years of its existence, must also be provided with space for laboratories. The space to the south of the Main Engineering building will eventually be used for additional laboratories, while a Chemical Engineering building is to be erected between Washington Avenue and the Chemistry building.

On the Mall directly south of the Physics building a technological building will be constructed, while next to it, on Washington Avenue, a building for architecture is called for. It can be seen that when such a plan goes into effect, Minnesota will have a balanced technological unit which will be difficult to surpass. The future history of the engineering college, as it can now be foretold, will show continuous development in the advancement of the engineering profession and in the training of young men to carry it forward.



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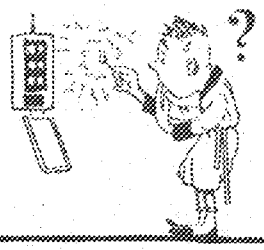
G-E *Campus News*



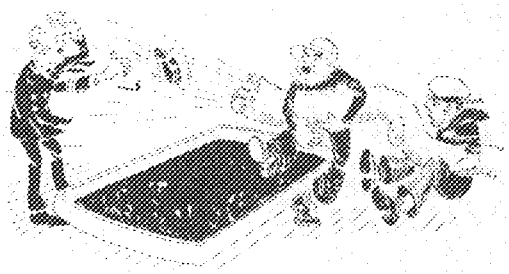
CENTLESS CIRCUITS

Conspicuous in nightmares of power company officials are ingenious, economical human beings who tinker with electric circuits, who rig up outlandish but convenient wiring. As a crowning touch to their handiwork, when fuses blow they use a penny. Lights go on. Protection goes out the cellar window.

To foil these handy-men-about-the-house, and to end blown-fuse troubles forever, G.E. has developed an ounce of protection — a little circuit breaker to replace the old-fashioned fuse box. It looks very much like an ordinary lighting wall-switch. When a "short" occurs, the arc is interrupted inside a small, closed, metal chamber in 0.008 of a second. A mere flip of the handle restores service.

Protection? The performance is so mild you can hear nothing and see nothing, even when 5000 amperes are being interrupted. And the breaker is safe and foolproof, too. The complete line will include ratings from 15 to 600 amperes. Let no more bridged-fuse bogeys disturb anyone's slumbers.

J. W. Seaman, Antioch College, '29, was very active in this development.

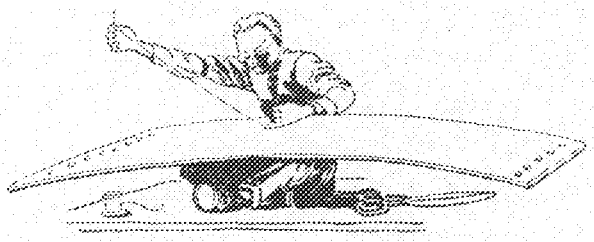


HATS OFF TO THIS ONE

The Sutorbilt Corporation of Los Angeles had a problem — to remove dried coconut meat (it's copra in the tropics) from a ship's hold to railroad cars at the rate of one ton every 60 seconds. That sounds like a lot of d.c.m. to most people — but it had to be done.

They built a machine with an 8-inch flexible metal throat and an amazing appetite. Not content with devouring copra, this machine gobbles up shiploads of potash, soda ash, borax, shale, grain, nuts — and even nibbles at the shirts, trousers, and hats of bystanders.

How? A G-E compensator starts a 150-hp. motor. An air compressor comes up to speed. Nature begins to "abhor a vacuum," and up comes everything but the bottom of the ship. If you have a cellar full of copra to be moved — or any similar problem — let us know.



STITCHING STEEL

Why not use vacuum tubes for speeding-up welders? So thought our engineers as they were working on the problem of stitching steel plates together with the rapidity of a sewing machine.

Thyratron-tube control for resistance seam welders resulted. H. W. Lord, '26 graduate of the California Institute of Technology, received a Charles A. Coffin Foundation Award" for developing an accurate timing circuit using Thyratron tubes — an important part of the control. Industry obtained a new high-speed production tool.

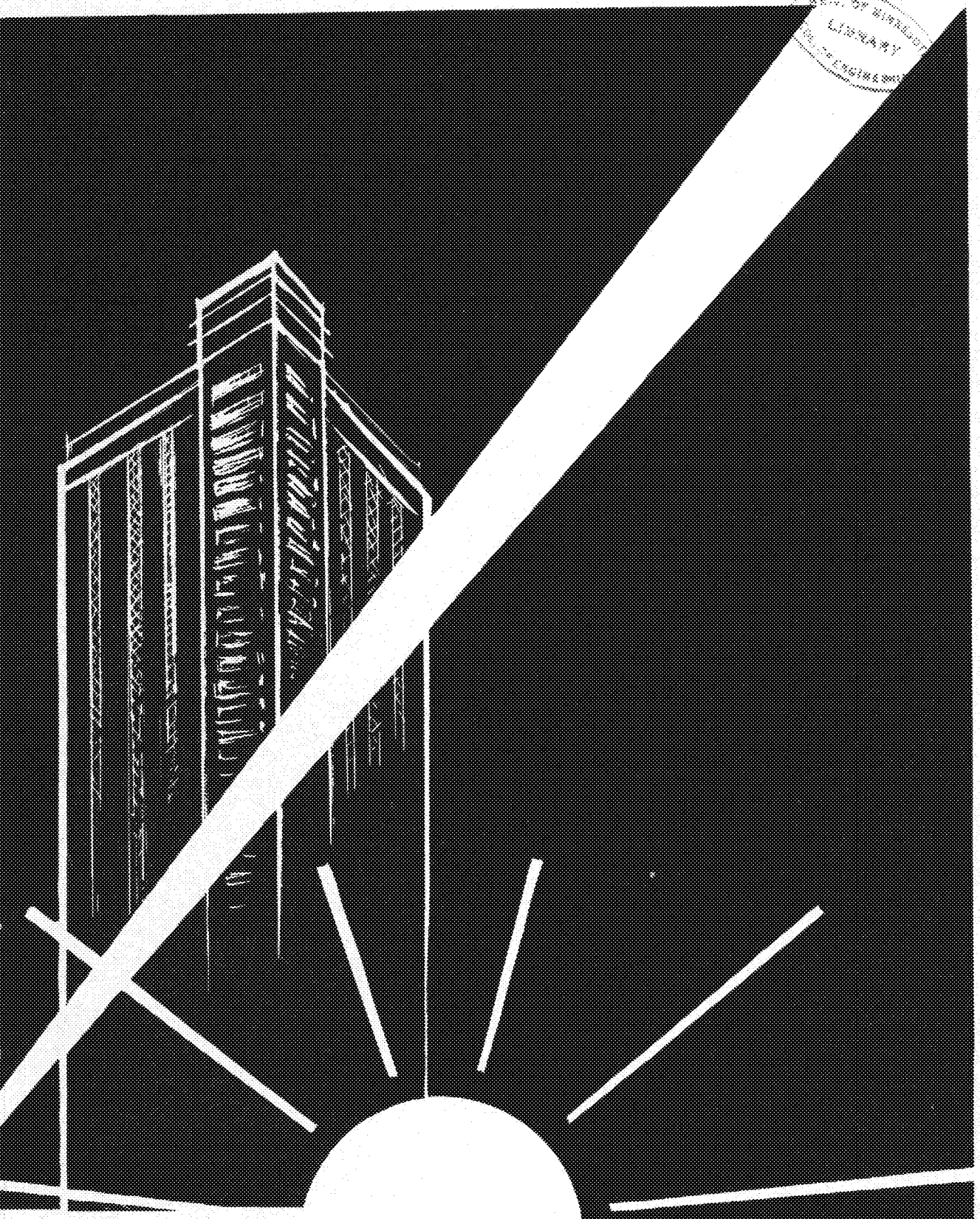
This control, when applied to line- or spot-welding machines, permits 1200 current interruptions per minute. Thus, it makes possible the stitching together of thin metal sheets to form gas-tight and water-tight seams. Thyratron-controlled machines will weld stainless steel, mild steel, chromium- and cadmium-plated steel, aluminum alloys, and many other materials. Steel barrels, pails, milk cans, and gasoline tanks are just a few of the many products now produced faster as a result of Thyratron welding control.

*A highly-prized company award, named after one of the founders of General Electric, that is awarded annually to selected employees for meritorious service.

96-5D8

GENERAL ELECTRIC

The Minnesota Techno-Log



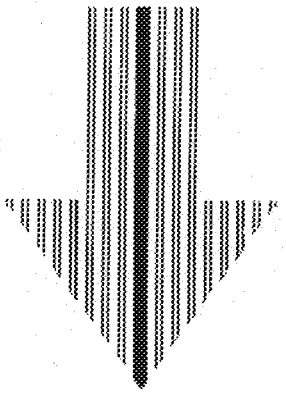
JANUARY 1934

VOL. XIV No. 4

MBER ENGINEERING COLLEGE

MAGAZINES ASSOCIATED

THROUGH CURIOSITY MAN ACHIEVED KNOWLEDGE BY INVENTION IT HAS SPREAD



Great has been the progress of man but great, too, has been his curiosity. Down through the ages, invention has succeeded man's thought. From the first crude weapon of stone that gave man supremacy over dumb animals to the present complicated, almost human achievements in mechanical steel, we trace his progress step by step as knowledge has been acquired, until today amid this maze of mechanical marvels that contribute to our high standard of civilization, we find the printing press, the result of one man's effort, who in seeking knowledge, achieved it and invented. By the invention of the printing press, knowledge has become widespread. Through it, the political, religious and economic life of civilized peoples of the world have been moulded. The printing press is one of the greatest instruments in human advancement. Truly, printing is a great civilizer.

The Editor Says:

Did you recognize the frontispiece? This old stone arch bridge in the milling district north of Washington Avenue has been carrying the railroad tracks since 1883. If you don't recognize this structure, better drop down there and see it sometime. It is historically worth seeing.

At last the Aeronauticals get a break. The first article in this issue gives us the lowdown on the latest developments in rapid air transportation—across the continent in seventeen hours. For a future issue we have another aeronautical story. J. I. Niemaber, Aero. E. '34, has written an article explaining the Naval Reserve aviation training interspersed with his own personal experiences.

With our Associate Editor in the second story, we take a trip down into the sandstone strata underlying the campus to examine the heating tunnels which carry the steam pipes which supply heat to the entire campus. You may find some "believe it or nots" in this article. For instance, the tunnels are ventilated with pure air from the Minneapolis sewers—"believe it or not."

This month Mr. Siler crashed through with a story of the Illinois Central Railroad in Chicago from which he jumped to Arizona winding up with a thrilling murder story.

Of course, we all know John Harrison Moffatt, instructor in foundry, but perhaps we don't all know his life history. Well, here's a chance to find out. The faculty sketch of him in this issue gives you the high and low spots of his entire life.

Well, the new quarter is well on its way and if this quarter's Techno-Logs seem to contain less than last quarter's, blame it to the fact that we are all trying to keep our grades up a little.

See you in February.

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Minnesota Techno-Log
37 ELECTRICAL BUILDING ... U of M

JANUARY 1934
Volume XIV Number 4

Ralph Monson
MANAGING EDITOR

Gordon Rosholt
BUSINESS MANAGER

Published monthly from October to June inclusive, by the students of the College of Engineering and Architecture, the School of Chemistry of the University of Minnesota

This Month

MEMBERS OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

Chairman: ROBLEY WINFREY,
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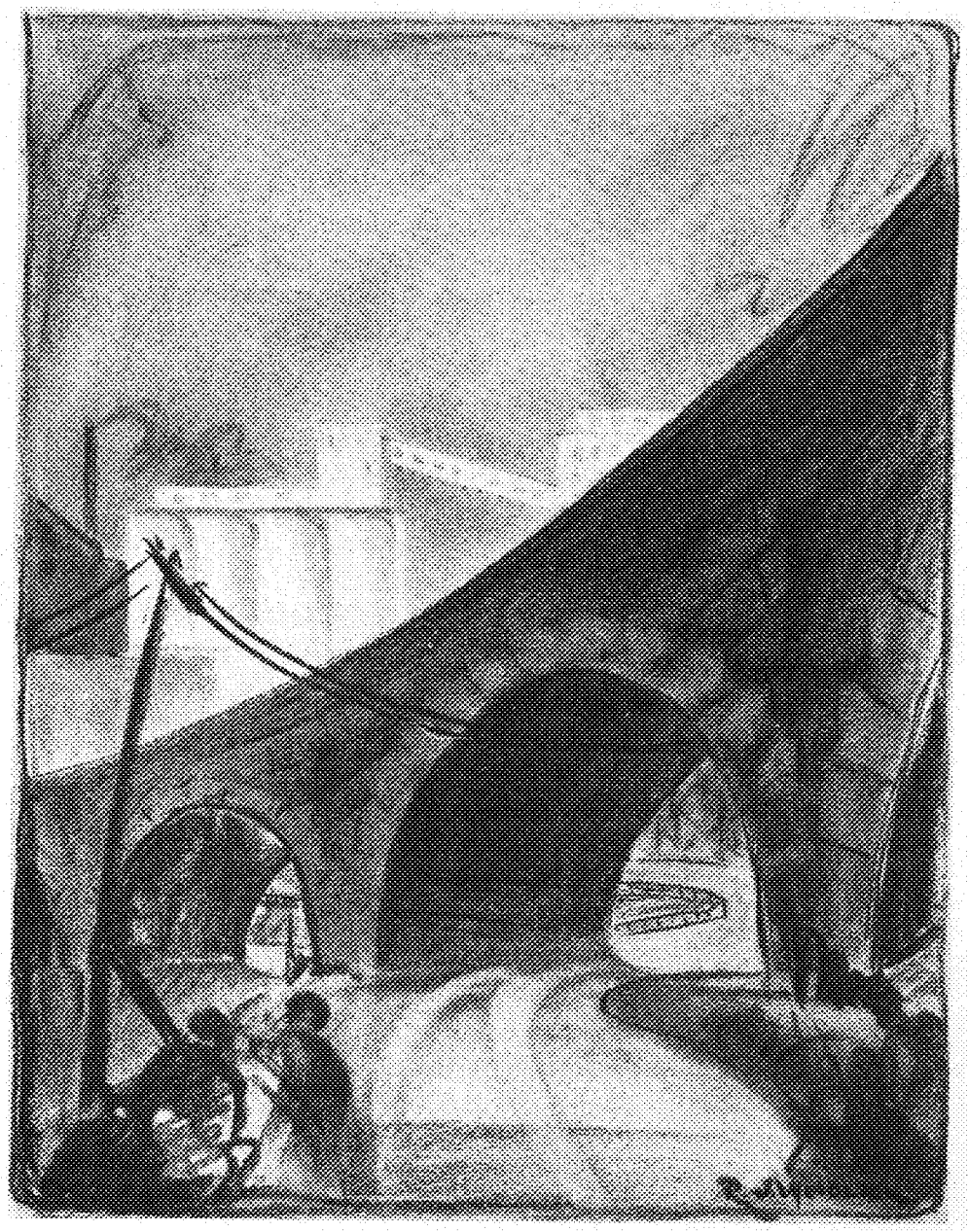


A Stone Arch

Built in 1883 and Still In Service In the Minneapolis Milling District

By Raymond Weidlich

fast planes operate

Northern Transcontinental Airway

thru twin cities

By FRED W. WHITTEMORE

Pioneering a new route across the continent, like the covered wagons of old, sleek new Lockheed monoplanes make the coast-to-coast flight in from 17 to 19 hours, breaking all records for transcontinental passenger and mail traffic. The new northern route which puts the Twin Cities in the air map of the nation, and which is responsible for the reduction in time, is the result of a patient and continuous effort on the part of the Northwest Airways, Inc., to provide a better air service to the people of the northwest

●

One of the most important developments in the history of air transportation is now being consummated. The Northwest Airways, Inc., are finishing up final details of a coordinated high speed service from Chicago via the Twin Cities, Fargo, Bismarck, Billings and Spokane into the West Coast country, finishing at Seattle and Tacoma, a run totaling 1950 miles. This will constitute a new northern air transcontinental and form the final link in a fairly complete chain of airways east and west and north and south covering the United States. The northern transcontinental airway has less mountain flying than the Central route and the altitude is about 2000 feet less. Considering all points of view, the northern route offers slightly better flying country.

In 1933 two fleets of Lockheeds were ordered with the purpose of extending service through on a coordinated basis to the Pacific Coast. The first of these fleets consists of single motor Lockheed Orion transports powered with 550 horsepower wasp engines carrying one pilot and five passengers. The second fleet consists of an entirely new design Lockheed Electra—an all-metal, low wing bimotor monoplane powered with two super-charged Wasp junior motors—th's ship carries two pilots and ten passengers and is representative of the latest ideas in air transportation. These new ships will furnish extremely fast schedules when all of them are finished and delivered. At the present time three of the Orions are in St. Paul and the first of the Electras will be test-flown approximately January 20th.

When all of the ships of both fleets are delivered, the bi-motor Electras will form the backbone of the service and permit schedules on a basis of from 12 to 14 hours from the west coast to Chicago. This, in connection with fast schedules east from Chicago, will mean a coast-to-coast record via the northern air transcontinental of from 17 to 19 hours.

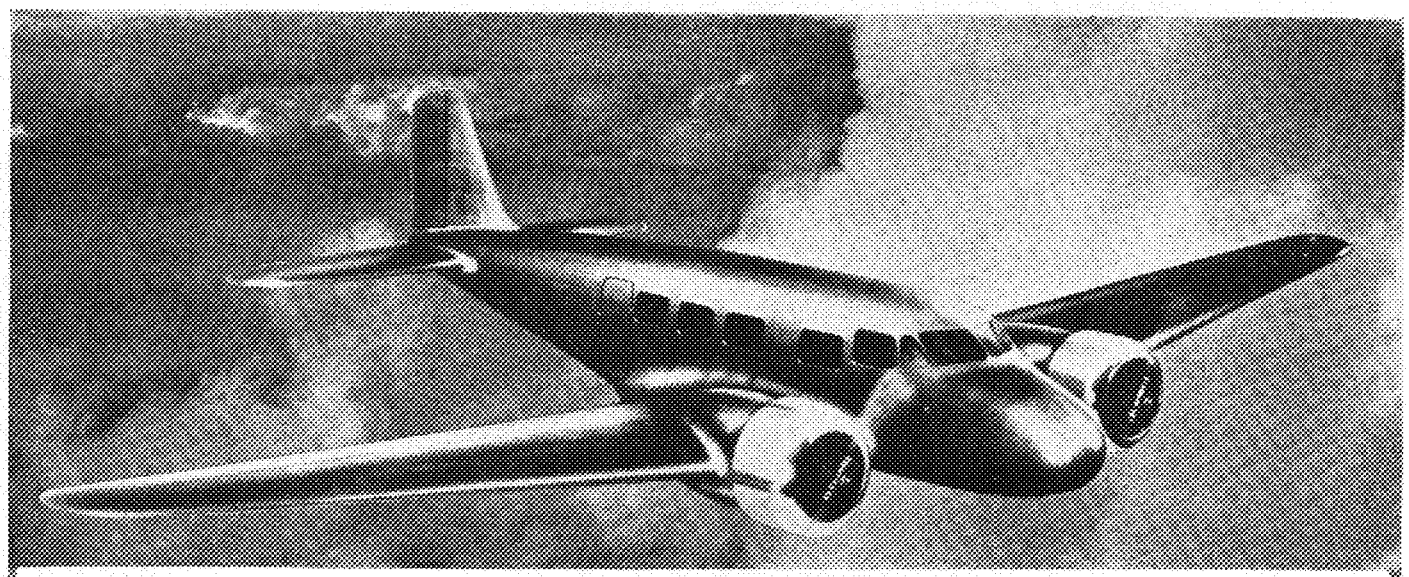
A comparison of these new Lockheeds with the present equipment of the Army and Navy will give an illuminating idea of the progress of commercial aviation. The present Boeing Hell Diver equipment of the Navy and the Douglas equipment of the Army cruises at approximately 115 to 120 miles per hour and tops at from 140 to 150 miles per hour. The new Orion passenger transports are at least fifty per cent faster than either of these ships and yet offer both comfort and safety to passengers.

The Lockheed Orion, which is rated to cruise at 206 miles per hour, means that the actual flying time from Los Angeles to New York, which is 2446 miles, is approximately 12 hours —or a trip from Chicago to Kansas City of 413 miles can be made in about 2 hours flight. This high speed means a substantial reduction in operating cost to the airline operator.

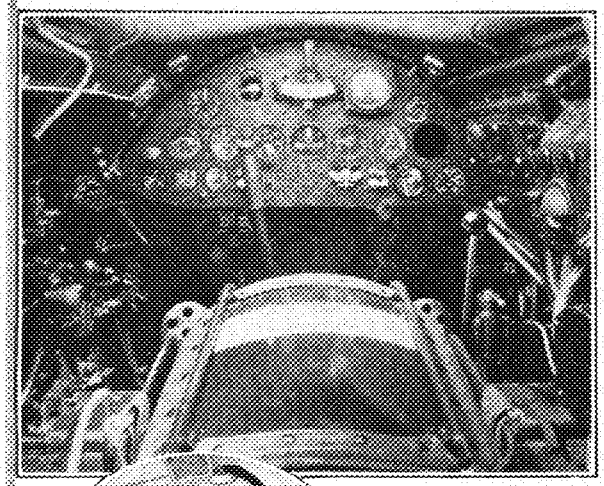
Bulletin No. 173 issued by the Congressional Information Bureau states: "Speed is the most important s'ngle factor in increasing the relative value of aircraft for national defense and in extending this use for commercial purposes." This explains the stress that Northwest Airways has put on high speed equipment.

The Orion as delivered to the Northwest Airways has a length of 27 ft. 10 in. and a span of 42 ft. 9¼ in. It has a gross weight of 5800 lbs., weighs empty 3325 lbs., and carries a useful load of 2475 lbs. It is rated at 206 miles per hour with the motor turning 2000 r.p.m. It has a top of 230 miles per hour at 5000 feet with the motor turning 2200 r.p.m. It is rated at top speed of 234 miles per hour at 10,000 feet at 2200 r.p.m. Rate of climb at sea level 1500 feet per minute. Service ceiling is 22,000 feet.

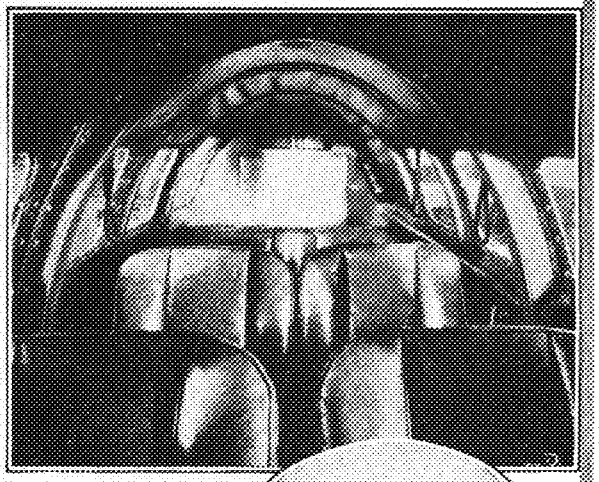
The power loading is 10.54 and the wing loading 19.72. It is rated as a 7-place ship. The Northwest has finished it to carry one pilot and five passengers. This makes due allowance for installation of two-way radio, together with baggage and air mail. It is powered with a Pratt and Whitney Wasp engine, series SIDI, which rates at 550 horse power, with engine turning 2200 r.p.m. at 5000 feet. Compression ratio is 6 to 1 and the blower ratio 10 to 1. The fuel system is provided with engine-driven fuel pump and a wobble pump for emergency. Eighty-three octane gasoline



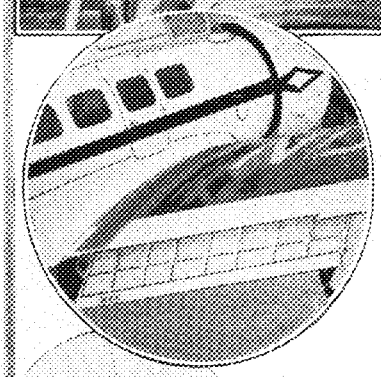
Lockheed Electra Bi-motor



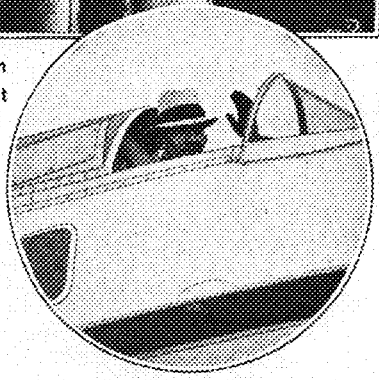
Instruments
Lockheed Orion



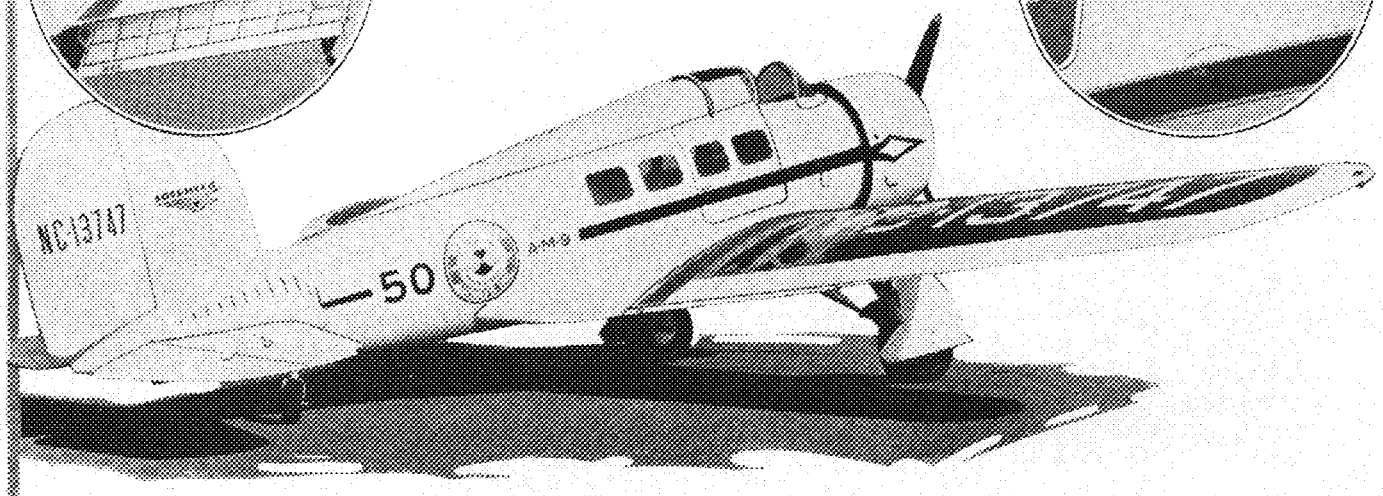
Lockheed Orion
seating arrangement



Wing Flaps
Lockheed Orion



Fred W. Whittemore
Operations Mgr.



Lockheed "Orion" Top Speed 230 m.p.h.

will be required in this engine. It is equipped with a Hamilton controllable pitch propeller of 9 ft. diameter.

The Lockheed fuselage is a semi-monocoque spruce plywood shell reinforced transversely with laminated diaphragms —average spacing 22 inches—and reinforced longitudinally with spruce compression members and nickel steel tie rods.

The wing consists of a single, all spruce, cantilever, plywood covered structure, rigidly secured to the fuselage. The wing is tapered both in plan and in section. The spars are of spruce box type construction and the ribs are truss type. There is no external rigging, wing heaviness being corrected by the bending up or down of narrow fairing strips on the trailing edge of the ailerons. The tail surfaces are of spruce construction, plywood covered, the structure being similar to that of the wing. The fin may be adjusted on the ground.

The retractable landing gear for the Orion is composed of right and left hand units and a combination hydraulic and cable operating mechanism. This system retracts the gear units simultaneously and completely into the wing or extends them to the landing position. The gear locks automatically when fully hoisted or extended. Two small red lights flash on the instrument board when the gear is fully up. Approximately 40 seconds are required for the hoisting operation. The gear extends nearly its full travel by its own weight; only a few strokes of the pump are necessary to complete the action, at which time two small green lights flash on the instrument board. Approximately 9 seconds are required to extend the gear.

The hoisting action may be stopped at any time and the gear remains in position, to be resumed whenever the pilot desires; or it may be changed to the down action before the hoisting action is completed. The oil used in the hydraulic system is a special product adopted because of its extremely low freezing temperature. It flows freely at 40° below zero. The reserve oil tank carries enough oil to operate the gear with an excess sufficient to take care of moderate leakage over a considerable period of time. A safety signal is connected to the engine throttle, which blows a loud electric horn if the landing-gear is not fully down when the throttle is retarded to 800 r.p.m.

The new landing lights developed by the Lockheed engineering department are located in the leading edge of the wing. They are placed in such a position that no light strikes the propeller. The lens is curved plate glass conforming with the leading edge and causing no drag whatsoever. The lights are mounted rigidly at an advantageous angle so that no adjustment is necessary. This eliminates the necessity for raising or lowering the lights at a time when the pilot may be busily occupied with other duties. They are always ready for use when the switch is snapped. The lamps are 20 ampere, medium prefocal base which in combination with the efficient reflector produce upwards of 500,000 beam candlepower.

The complete installation is very light in weight, easily installed and attractive in appearance. It is equipped with metal wing landing flaps and is the first Lockheed to be so equipped. These flaps may be dropped in a few seconds when landing by turning an electric control switch. This is one of the most interesting features on the ship. While cruising at over 200 miles per hour, it is entirely practicable to set the ship down with a light load under 55 miles per hour and with a heavy load under 60 miles per hour. The ratio of top speed to landing speed in tri-motor Fords is about 2¾ to 1. The Orion shows a ratio of 4 to 1. This assures safe landings in small fields.

The second and larger fleet of new ships for the Northwest will be made up of the new Lockheed Electra model. It is a bi-motor transport of the all-metal low wing type. It will carry 10 passengers, pilot and co-pilot, and provides a generous size cabin which will include lavatory facilities. It will be powered with two super-charged Wasp junior motors, each developing 420 horsepower. Slow, safe landing will be accomplished with simplified wing flaps. It will have new and improved important stream line developments and proven retractable landing gear. It has been designed and built by a group of men who have been prominently identified with commercial air transportation for many years. It undoubtedly supplies to answer to the demand for lightweight, economical, high speed performance, combined with passenger comfort.

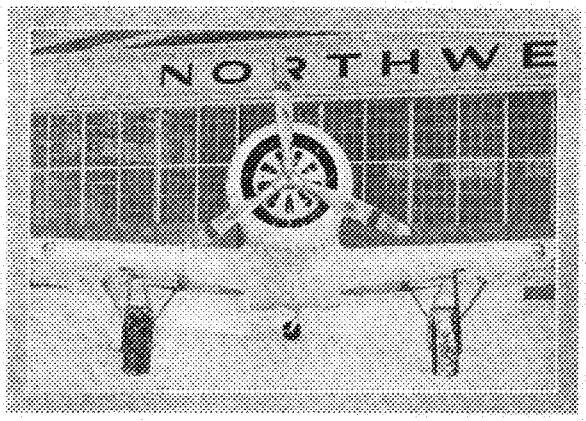
The full-sized cabin, measuring 58 in. wide by 60 in. high by 15 ft. long, incorporates many refinements and appointments, and satisfies modern requirements for comfortable transportation. It is completely sound-proofed by Western Electric engineers, who are the acknowledged leaders in this field. An efficient ventilating system combined with a thermostatic heat control scientifically maintains proper cabin temperature and assures proper fresh air conditions.

Excellent vision is possible from the pilot's cockpit, which is located forward. Conventional wheel controls are provided with complete instrument equipment including Sperry Directional Gyro and Sperry Artificial Horizon, together with a complete two-way Western Electric radio. All electrical wiring on the ship is enclosed in a metal conduit system with conveniently located junction boxes.

The retractable landing gear is operated electrically and has an auxiliary emergency hand-operated system. The wheels swing directly back into the rear of the nacelle and are completely faired into the wing in the retracted position. Goodyear air wheels are used with Goodyear hydraulic disc brakes, controlled by a hand lever conveniently located and differentially connected to the rudder pedals.

The construction of the bi-motor is all-metal, 24ST being used throughout for structural parts and 24ST Alclad for the skin. The wings are of semi-stress skin type construction, and are readily accessible and repairable. Detachable wing panels facilitate inspection and maintenance. Two fuel tanks of 100 gallons capacity each are located in the entering edge of the wing stub between the engines and the fuselage. The propellers are far enough forward so that the propeller disc is a few inches ahead of the pilot's feet.

Simple and effective wing flaps are incorporated, which materially reduce take-off and landing speeds. With the flaps in operation the gliding angle is reduced from approximately 14:1 to 8:1. Horizontal and directional balance is accomplished with adjustable flaps located at the trailing edge of



the rudder and elevator. The wings are of the full cantilever type, embodying the latest principles in design. The center section is built integral with the fuselage, but the wings are removable from just outboard of the nacelles to the tip. Thus, in case of wing damage, new units may be bolted in place in a very short time.

The center section, which contains the nacelles, landing gear, gasoline tanks and cargo compartments, is very strongly constructed and so reinforced that a person may walk safely over the entire upper surface. It is cut away entirely at the fuselage, permitting the fuselage to be placed partly within the wing, giving the airplane a very small frontal area. Only one spar is placed through the cabin, giving the least possible aisle interference. The fuselage has been placed down in the wing as far as possible to give smallest frontal area. It has been possible on this airplane to make the top of the fuselage but 39 inches above the top of the wing. The maximum width inside of the fuselage is 58½ inches, and the height from floor to top of cabin is 60 inches. The nose is well rounded to give minimum drag and maximum visibility for the pilots. Special attention has been given the tail of the fuselage to make rigid support for the cantilever type empennage and the tail wheel. The fuselage has been constructed such that the stabilizer and elevator rest on top of it. This gives a large clearance between the horizontal surfaces and the ground, giving maximum protection from flying rocks and stones.

In the nose ahead of the pilot compartment is a baggage compartment of 40 cubic feet capacity reinforced on the inside so that the baggage placed therein cannot injure the outer fuselage skin. The engine nacelles are located directly ahead of the leading edge of the wing, which, according to tests by the N. A. C. A., gives the lowest drag and the maximum lift. Wind tunnel tests of the "Electra" with and without nacelles verified the fact that the lift was the same in either case, hence the landing speed. The engine cowl has been designed with the nacelle to give the lowest possible drag. The nacelle not only supports the engines, but also the landing gear and landing gear retracting mechanism. The landing gear when retracted folds back entirely within the nacelle, only a small portion of the tire itself being exposed.

The control surface hinges are short coupled, giving great rigidity and are aerodynamically clean. In place of the usual type aerodynamic balance for ease of control, the rudder and elevator loads are satisfactorily lightened by making the tab act not only as a servo but as a trimming device. This allows a clean, close-coupled hinge line.

Landing gear is operated electrically by means of gears and torque shafts. One motor operates both wheels. The operation is automatic in that when the switch in the cockpit is thrown, say, for retracting the gear, the gear rises, and when up, the motor stops without further action by the pilot. An auxiliary hand mechanism is provided to raise and lower the gear in case the electrical system fails. The landing gear is equipped with Goodyear Airwheels (35x15-6) and hydraulically operated disc brakes. The brakes may be applied with the landing gear either up or down. The shock struts are Aerol and have a stroke of six inches. This, combined with the extra low-pressure tires, gives a fine chassis from the shock absorption standpoint.

The airplane is thoroughly soundproofed to give an extremely quiet passenger cabin. The soundproofing is installed under the direction of the Western Electric Company, pioneers in sound equipment. In the original design soundproofing was given a place. The soundproofing has therefore been correctly and adequately installed. One and three-quarters inches of space has been allowed completely around the cabin.

The radio has been conveniently located with respect to the battery, which is approximately 30 inches away. This permits short wiring, giving low weight. Furthermore, the distance from the radio set to the pilots' compartment is only about six feet, which, together with the proximity of the battery just mentioned, make a light, compact radio installation with the shortest possible controls. The controls for the radio are mounted on a sub-instrument board located just below the main instrument board and placed at an angle for easy observation by the pilots. Spare fuses for the electrical system are available to the pilots and may be easily replaced in flight.

The Wasp Junior engines are bolted to welded steel tube motor mounts. The motor mounts at the firewall are mounted in the latest type approved rubber shock units of the Lord type. The inner and outer cowls are supported either to the mount or by additional shock units, thus making the entire engine installation rubber supported. This arrangement permits very little of the engine vibration to reach the airplane structure. Each engine is equipped with the Pratt and Whitney oil regulator and heater assembly, thus eliminating the usual type oil radiator.

Engine control from the pilots' cockpit is by means of the Arens push-pull type. This type of control has been used on all engine controls, permitting easy installation with the smallest number of moving parts. At points where wear occurs large bearing pins and bearings have been provided. The engine cowling is of the NACA type with a small inner cowl. The leading edge of the outer cowl is in one piece and is not readily removable. This makes a solid, rigid support for the entire outer cowling. All of the cowl aft of the nose piece is easily and quickly removable. The nose piece has been placed far enough ahead of the rocker boxes to permit inspection and adjustment of valves and rocker arms.

The fuel and oil systems have been given careful consideration and are very simple. Rubber hose connections have been used plentifully to reduce the possibility of failure due to vibration.

100 Feet Below the Campus

miles of tunnel carry steam to campus buildings

By EUGENE PRICE, E. E. '35

The author of this article wishes to express his appreciation of the assistance given him by the Department of Buildings and Grounds and especially by Mr. Leslie L. Wood of that Department

Below the ground that makes up the campus of the University lies a system of tunnels and shafts comparable with the best the story writers have thought of for their mystery tales. However, their purpose is much less sinister than utilitarian. They are the heating tunnels, and they form a network that serves the whole campus with steam for the radiators. Altogether there are about three and one half miles of these tunnels beneath the ground level. Of these, two miles are deep tunnels and the rest surface distribution tunnels.

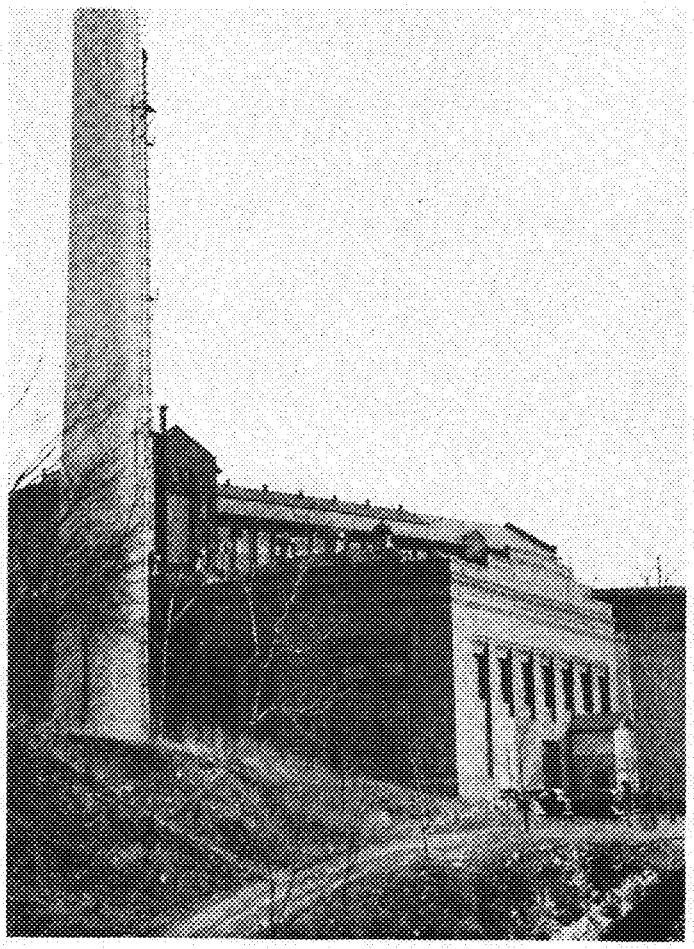
The surface tunnels lie five or six feet below the ground level. It is easy to find surface tunnels to inspect as they serve every building on the grounds. Suppose we investigate the tunnel system right here in the engineering group. We can start out from the E. E. building.

Let's go down through the service hall, into the generating room and then through the door that leads us under the Electrical Engineering building. Down here is the distribution point for the building's heating pipes. The pipes run the length of the building and all finally disappear into the floor above. We could spend a long time just looking at the system that serves one building. But our objective is the inter-building tunnels, so let's get going. Ducking under pipes we come to a little door that opens into the heating tunnel. As far as seeing anything goes, it is far too dark to be able to make anything out. Where is that light switch? Can't find it so we'll just have to start off in the dark. And is it dark! Have to watch our step. Even with the light from the door we have prudently left open it is easily the blackest place on earth. It's warm, too. The steam pipes seem to be hissing their disapproval of this intrusion. There's a weak spot of light ahead. As we approach it becomes clearer and clearer and turns out to a sort of grating that drips water on your face when you look up at it. Why, sure, it's one of those gratings up on the lawn that is always emitting wisps of steam on cold winter mornings. It seems to emit steam up and water down to just sort of balance.

Well, here's a light switch. Suppose we take a look at this tunnel we came through. The hissing steam pipes we heard in the darkness are at our right and we see that there are three of them. There is a big one about waist high, a small one a little lower, and right next the floor is a middle sized one. To the left, about level with our heads, are a couple of pipes which seem to be for cold water. At least they are not shielded and they are cool. The tunnel itself is about four feet wide and six high. It is of concrete construction.

Just ahead is a branch point from which tunnels extend off to the left and right. The left branch leads to the Experimental Engineering building and the right one to Main Engineering. Between this point and the Main Engineering building is a small room divided off from the rest of the tunnel by sheet iron doors. In this room a vertical shaft drops downward to connect our surface tunnel with a much deeper tunnel. Above the shaft is another of the gratings. This one may be seen just east of the Main Engineering rear steps.

The vertical shaft is lined with concrete and tapers gradually from the top to the bottom. In order that the service men may get from one tunnel to the other easily, it is equipped

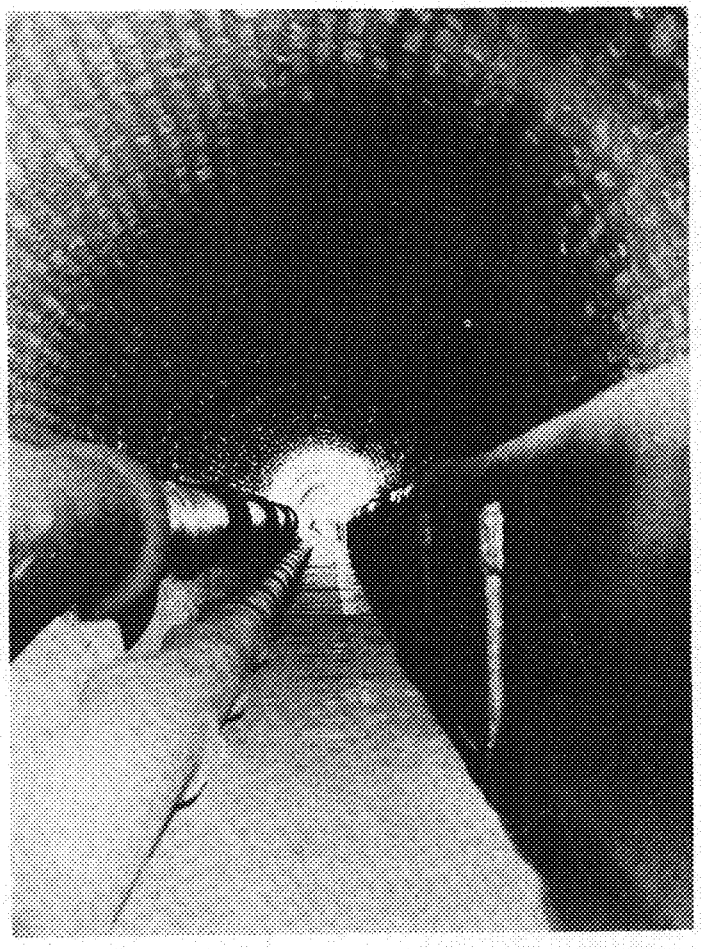


The heating plant, from the west

with an iron ladder. If we should go down the shaft we would find ourselves in one of the deep tunnels. There are, as we have stated before, about two miles of these on the campus. The first of these, the present main tunnel, was dug in 1912 and reached from the new heating plant to the Business building. As the number of buildings on the campus increased, more and more tunnels were added until now a complete loop encircles the campus. This insures that even if one branch of the system should fail, there would still be the other side of the loop to continue service.

Let us trace the network. Starting out at the heating plant, the main tunnel leads in a southeasterly direction to the Mines Experiment Station. Here a vertical shaft leads to surface tunnels which serve the Experiment Station and the Store House and Shops. The deep tunnel continues in the same direction to a point just behind the Women's Gym, where a shaft and surface system serves the Gymnasium, the University High School building, the Child Welfare Institute, and Pattee Hall. Still further along the line a branch tunnel leads straight south to the Library. Behind the Library building a shaft communicates with the surface tunnels which lead to the Library and the Law school. Continuing on, the branch leads to a shaft behind the Chemistry building which serves that building and the School of Mines.

At the point where the branch leaves the main tunnel a surface system serves Burton Hall, the Minnesota Union,



Notice the brick construction in this deep tunnel. To the left are main and summer lines, on the right, very indistinct, vacuum and return

Pillsbury Hall, the Armory, Mechanical Engineering, Wesbrook Hall, Music, Psychology, and Pharmacy.

Between the Auditorium and the Mechanical Engineering building an elevator shaft communicates with the surface. This shaft is 90 feet deep. It is used only for communication with the tunnel and does not lead any steam pipes to the surface. At this point the tunnel turns slightly to the south. Between the Administration and Physics buildings it is connected by shaft to the surface system for these two edifices. This is also a branch point, one arm of the tunnel going to the Stadium and Field House and the other to the Engineering Group.

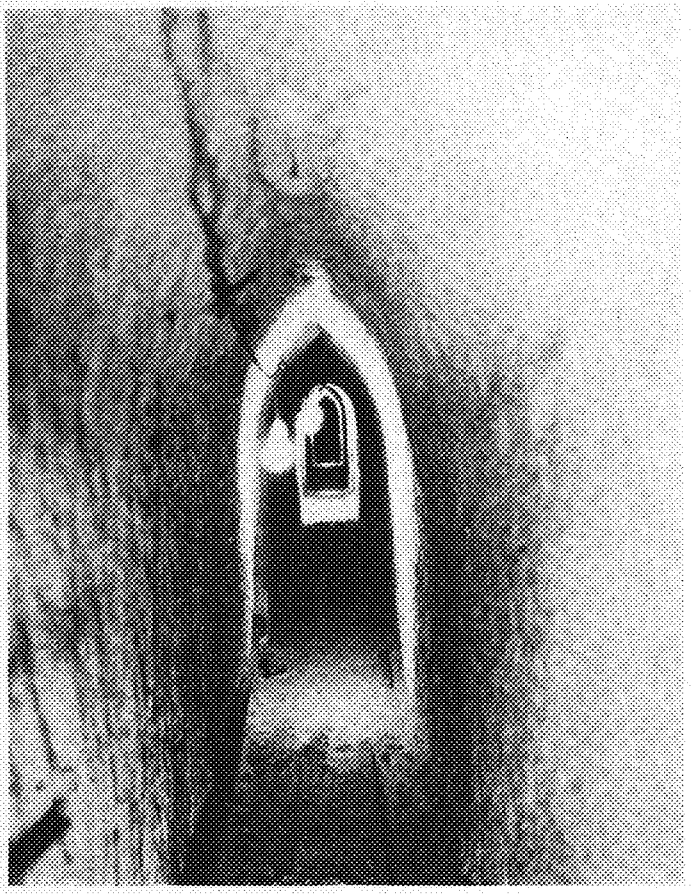
The shaft which we observed while investigating the surface tunnels is the connection between the deep tunnel and the Engineering buildings. At this shaft also, the tunnel turns to the south to the Medical Group south of Washington Avenue. Here a branch leads to Pioneer Hall and shafts communicate with the various buildings. From this group the tunnel runs west until directly south of the Chemistry building, then turns north and joins the first branch mentioned at the shaft behind Chemistry. This tunnel completes the loop which encircles the campus.

Now that we have traced the various paths by which the heat reaches our buildings let us consider the tunnels themselves. The main tunnel is an arch type tunnel, six feet in width and seven high. It is constructed of brick and is the oldest tunnel on the campus. The branch tunnels are either of brick or of concrete, according to their age. The brick-lined tunnels are being replaced gradually by concrete ones, as the lining is failing with age.

Under the floor of part of the main tunnel runs the sewer from buildings along that line. In other parts, tunnels cut in the sandstone underlying the campus connect with the sewer tunnels in order to provide the heating tunnels with ventilation and to cool them. At some points in the main tunnel, the temperature rises as high as 100 degrees Fahrenheit, and would be much higher if some provision were not made for cooling. The connections with the sewers makes it possible to draw a greater amount of cold air through the tunnels than would be possible without them.

Four pipes make up the system in the main tunnel. These are the main steam line, the return, a vacuum line, and a smaller summer line. The main line is a 14-inch pipe carrying steam under a pressure of 110 pounds per square inch. This high pressure is made necessary by machinery in the Mines Experiment Station. At the buildings using the steam only for heating purposes, reduction valves lower the pressure to one suitable for the radiators. The pipe is mounted on rollers which allow for the expansion caused by heating and cooling. At intervals along the pipe are placed expansion joints to compensate for the changes in length. In winter, when the main line is carrying steam all the time, the expansion joints are covered with plaster in order to insulate them better. In the spring when the steam is shut off the contraction of the pipe cracks off the plaster.

During the summer the main line is not used, as so little steam is required for heating. The summer line is provided to take care of the relatively small demand. This smaller pipe is also used during the winter as an auxiliary. At present the Mines Experiment Station and other buildings of that group are being served by this line. The steam carried by



This ventilation tunnel, cut into the main tunnel, furnishes air for cooling

the summer line is the exhaust from steam machinery used in the heating plant. This machinery is being used instead of electric motors in order to cut down the electric bill.

The return line carries the condensed water from the radiators back to the heating plant. In order that a vacuum pump can be used to draw the condensate back, the vacuum line is provided. The condensate might be pumped back by a combination pump for air and water, but as these pumps are not efficient a pure vacuum pump is used. In order that water may not get into this pump the vacuum line is trapped at frequent intervals and the water drawn off into the return line. This results in a satisfactory and efficient system. The vacuum pump is operated by steam generated at the heating plant.

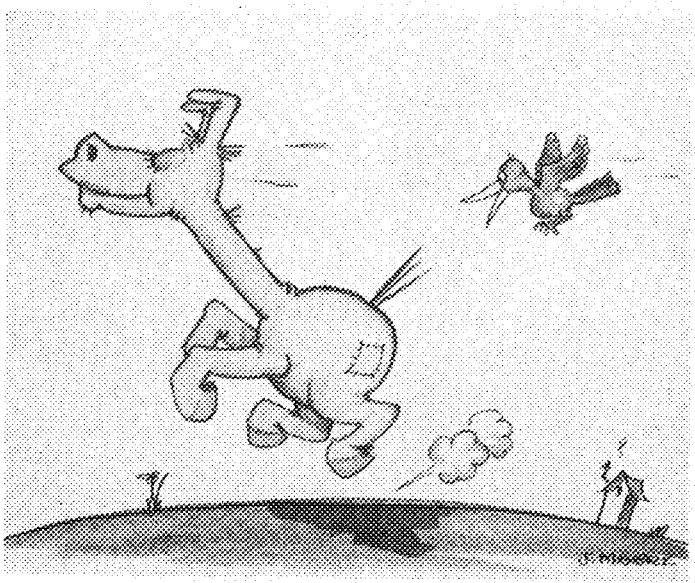
In the branch lines, most of which are newer than the main tunnel, the pipes are simply laid on small pipe platforms. There is not sufficient expansion and contraction to make the use of the more expensive roller construction necessary.

The Industrial Contracting Company of Minneapolis constructed the tunnels and shafts. Little trouble was experienced in the construction of the tunnels themselves. The earth removed during the excavation was taken out through small tunnels communicating with the river bank. There are three of these tunnels. The shafts, however, presented more difficulty. It seems that there is a layer of limestone lying below the ground level but above the level of the deep tunnels. This layer is impervious to water and as a result the ground water collects above it, draining out along the river. This water made the excavation of the shafts very difficult and several companies which undertook the digging of the shafts were forced to give up the attempt. Finally the following method succeeded. The shafts were blasted and dug out by the usual method until the level of the water was reached. In that region the shafts were dug in the same fashion that wells are drilled, by laying a casing as fast as the shaft progressed. A rich concrete mixture was used to line the shafts in order that it might harden quickly. In order that the tunnels below might be protected from the water seeping through around the shaft, a very ingenious method was adopted. Just below the limestone layer, a concrete cup was placed around the shaft. The water seeping through around the shaft is caught in this and drained to the sewer in under the floor of the tunnel. No trouble from seepage has been experienced with this method of protection.

The heating plant has been enlarged gradually with the growing demands of the University. In 1912, at the time the central heating system was installed, the whole equipment consisted of six 350 horsepower boilers. Four of these were the chain grate type, and the others burned a blast of pulverized coal. The chain grate furnace has a grate in the form of a belt which passes through the firebox. At the front of the firebox the coal is fed down onto the grate from a hopper. The rotation of the grate carries the coal slowly through the furnace, finally dumping off the cinders at the back. In the other type, the powdered coal burns as it is blown into the firebox by a powerful jet of air.

In 1916 two more 350 horsepower boilers of the chain grate type were added. Again in 1926 the equipment was increased by the addition of two 750 horsepower units, both chain grate machines. The latest installation was in 1930 when a pulverized coal-burner rated at 750 horsepower was added.

All the boilers may be operated either automatically or manually, according to the way they are set. Nearly all have a dual steam and electric drive. During running conditions they are driven by steam to economize on the cost of electricity, but while being started they are operated electrically.



Sparrow: "Who says two can't live as cheaply as one?"

From The Old I. C. To Arizona Apaches

By RODERICK WILLIAM SILER
Assistant Professor of Mathematics

In his usual interesting manner Mr. Siler this month takes us back into the past. Boyhood days, a railroad controversy, and a peachy murder story make two pages of good reading — — so lean back in an easy chair while our favorite story-teller spins his yarn

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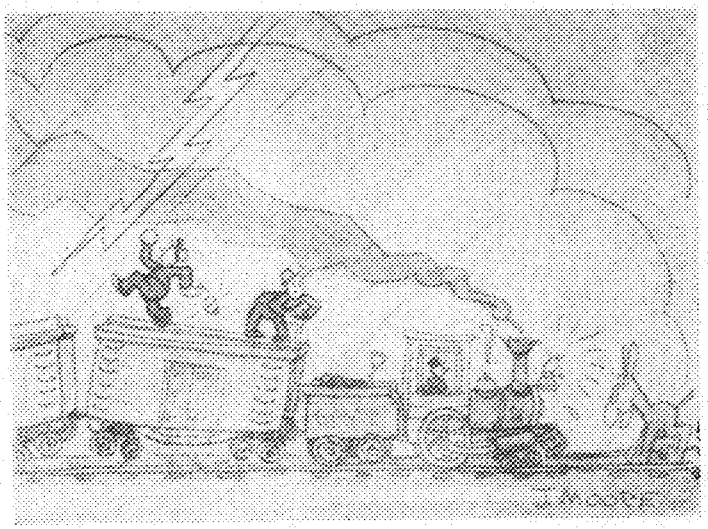
Those who attended the World's Fair at Chicago last summer must have noted along the western edge of the Fair grounds the tracks of the Illinois Central Railroad, over which shot at frequent intervals, by night and by day, trains loaded with visitors come to see the wonders of the world, accumulated on Lake Michigan shore and open to the public inspection at fifty cents per head. From the Fair grounds anyone with an itch to ride could take an I. C. suburban south as far as Hyde Park, a distance of something like five miles, I should say, and by keeping eyes east have had constantly in sight the wide waters of Lake Michigan.

When I lived in Chicago as a boy—which was quite a while ago, by the way—I harbored a grudge against the I. C. for occupying this stretch of lake front. Everyone else I knew suffered similarly. It was our feeling that the railroad interfered with our swimming. The truth is that a good many did swim despite the railroad, but in doing so always took the chance of being carved apart by a passing express train or being warmed up by a policeman's billy. However, since that time I have found that the I. C. is actually not to be blamed for owning this magnificent right of way. The right of way was given to the railroad by the city when Chicago had reached that stage in municipal development where nothing matters but to become the terminus of a transportation system.



Old days on the I. C. A scene which might have occurred anywhere along the right-of-way

The story goes back to more than eighty years ago, to the 1830's, to the days when Abraham Lincoln was practicing law down in central Illinois. The longest American railroad in operation in 1850 was the New York and Erie, 300 miles of it. But the proposed Illinois Central, to extend to the junction of the Ohio and Mississippi at Cairo, was to be 700 miles long. The question agitating Chicagoans in 1851 was how to bring the new road into the city.

The railroad made a proposition: it allowed to lay its rails along the lake front it would guarantee the city permanent protection against Lake Michigan. Considering the fact that the lake front of that time was swampy and about fifty per cent water, this was fair enough. At least so thought the people of Chicago's north and west sides, who were looking for a chance to escape paying taxes for building such protection. But the south siders, and especially those of Michigan Avenue, then the choice street of the town, had no intention of permitting a railroad to run by their front doors. The population divided up into two great camps on the question, and got into a considerable heat as result. The question went at last to the city council, and was there decided in favor of the ayes.

The railroad had won, the swells of Michigan Avenue were overcome. December 31, 1851, Chicago resounded with the ringing of bells, firing of cannon, speeches of orators, as work began on the road. May 20, 1852, the first passenger train ran down the lake front, and the south side nabobs inhaled their first whiff of engine smoke.

I will conclude with another story, a tragic one, but true, and illustrating the dangers confronting engineers of two or three generations ago.

In the year 1861, at an old silver mine, the Santa Rita, in Arizona, there were located four Americans: Mr. Grosvenor, superintendent; Pumpelly, a young mining engineer; Robinson, the bookkeeper; and another man whose name is unknown. This quartette, with some Mexican peons, were awaiting at the Santa Rita two wagons bringing material from another mine, the Heintzelman, forty miles away, by Mexican peons, were overdue, and it was known that the Apaches of the region were on the war path.

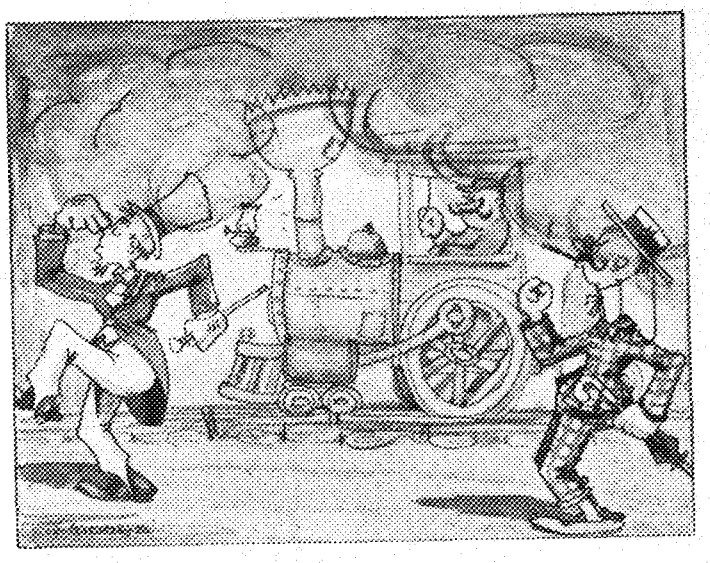
Just about twilight Superintendent Grosvenor decided to walk a short distance from the house in which the four

Americans lived, and try to get sight of the missing wagons. Pumpelly, Robinson and the remaining American sat down to the table to have something to eat. In half an hour they had finished their meal. The superintendent had not returned. Pumpelly and Robinson decided to go out and see what had become of him.

The two men stepped from the house to find the world outside very bright in the light of a full moon. The silence was complete. Probably Pumpelly and Robinson could not have been at any other spot on earth at that moment and experienced just the feeling they did here. They suspected they were surrounded by Apaches, yet there was not the slightest physical proof that an Indian was in the vicinity. The Santa Rita valley with its border of low mountains lay before them in the moonlight, but everything was motionless and silent. There were the mountains, precipitous and bare except for patches of stunted oak and pine. Beneath was the valley, its surface broken by the great jagged masses of rock peculiar to this region, which rose up like islands from the plain. The vegetation was composed of the strange growths of this dry country; chiefly agave, Spanish bayonet and cactus.

Whatever the two men felt they could not afford to waste much time with their thoughts. They began to walk down the trail leading from the house. They were somewhat worried about Mr. Grosvenor, and yet, since they could neither see nor hear anything suspicious, hoped to meet, at any moment, the superintendent returning.

The two came to the foot of a hill, and were advancing up it when they heard the mewing of a cat. This proved to be their own house cat, cruising around in the moonlight as cats will, and as it ran towards them Pumpelly picked it up in his arms. The cat was nervous and kept its eyes fixed on some object ahead. Then men looked in that direction. They caught a glimpse of a crouching figure, at the top of the hill and very clear against the sky, run behind a giant cactus. With cocked pistols the two Americans hurried forward. When they reached the top of the hill they found nothing there but the moonlight and the absolute silence.



The old I. C. makes "smoke-eaters" of the south-side nabobs

Pumpelly and Robinson, though certain now that Apaches were near, decided to go on a bit further. The road descended, and they soon found themselves following an arroyo, the dry bed of a stream. As yet, they had found no evidence of what they were looking for; not a sign of wagons, Indians or the superintendent. They came to a point of rocks. Here they stopped for a moment to reconnoiter.

It was then that they saw, across the arroyo and drawn off from the trail which lay there, one of the wagons. But of Mexicans or oxen there was still not the slightest sign. Had the peons or the animals been near or alive some sound of them must have been heard in the profound silence.

Pumpelly and Robinson began to advance again, more warily than ever. They came to within a few yards of the wagon when their attention was attracted by something white lying almost at their feet. Bending over, not without a feeling of dread, they discovered it to be a man, lying face downward, stripped of all clothing, stabbed in a dozen places by Apache lances, the head almost severed from the body.

It was the body of Superintendent Grosvenor.

Next Month

Did you know that the engineers were planning a winter excursion trip to sunny New Orleans and back via Mississippi river steamboat? It's true, and Mr. Siler tells all about it in the February Techno-Log.

J. I. Nienaber, Aero E. '34, writes on the Naval Reserve Air service. He gives us an interesting discussion of everything from the technical training to the social problems of young aviators. Having taken the training course offered by it, and had a year of active duty, Mr. Nienaber is well qualified to comment on the service.

The Industrial Engineer comes in for an article by Guy B. Arthur, '32. Mr. Arthur first defines industrial engineering, then guides us through a typical modern vacuum tube manufacturing plant and, as we go, points out the changes effected by that profession. It is a very interesting discussion of this phase of engineering and points out the splendid opportunities to be found in this type of work.

THE MINNESOTA
TECHNO-LOG
UNIVERSITY OF MINNESOTA

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Student-Faculty Relations

In the November Techno-Log, an editorial entitled "A Faculty Work Committee" was presented, in which it was advocated that a body be selected to hear complaints and make recommendations to the administration for the betterment of student-faculty relations. In the December issue, this idea was followed up by Dean Leland when he suggested through the medium of his editorial column that individual students or small groups of students could better deal directly with the particular instructor with whom they were concerned, offering to the instructor any suggestions regarding the conduct of the class, the method of presenting the subject, or the subject itself. This idea, being based on the assumption that every instructor is anxious to have each student get as much as possible from the particular course, seems logical, and we therefore present the following plan to both students and faculty for the carrying into practice of Dean Leland's suggestion.

At some particular time, whenever it is deemed wise, let each instructor in the college make some such assignment as this—the assignment to be completed before the next meeting of the class, and to be handed in to the instructor at that time. In presentable written form, have every student hand in suggestions for the improvement of the method of teaching the course, of the method of conducting the class, of the subject matter of the course, or of any other item regarding the course, class, or instructor. All of these papers would be handed to the instructor on the date assigned. The remainder of the process would depend on the individual instructor.

However, in order that he might be assured that the suggestions which were offered had really been given some thought and were not written on the spur of the moment, he might grade the papers and count them as the equivalent of a daily quiz or a set of problems. This grading would have to be made on the basis of neatness, grammar, and apparent thought given by the student.

With this group of suggestions in his hands an instructor would surely realize immediately what improvements could be made to give the students greater benefit from the course. If the suggestions were such that he could carry them out by himself without using further class time in their discussion, let him carry out as many as he thought advisable. Otherwise, let him bring up the suggestions at some future meeting and discuss them with the group.

This scheme has several obvious loopholes. First of all, it may seem undesirable for the students to sign the suggestions on the basis that it might result in a personal "un-favoritism" for that individual. If this were the case, it could be simply remedied by handing in all of the papers unsigned. Another weakness might lie in the fact that some instructors would not give the classes a chance to present such suggestions. To this we can only say that this method is no "sure-fire" cure for all of our evils. It is a step in the right direction, and as soon as the system is adopted by a few of the faculty members, pressure will be brought to bear on the others, and the number may be gradually increased.

The question of what time of the quarter is most opportune for such an experiment as this has been raised and is still debatable. However, it should prove of some value no matter what time of the year or quarter it is tried, since those who follow will benefit if the present class does not. It is now the end of the second week of the quarter—we have all had a chance to form some opinions of our instructors, and there is still time for us to benefit directly from any improvement — so why not bring up the question in classes next week and get immediate results.

Enarch

Enarch—the new engineering dramatic organization—is well on its way to become permanently established on the campus. At a meeting held this week, the organization was formed and plans were immediately laid out for the rest of the year. These plans tentatively call for a musical comedy to be produced in the spring quarter. The play itself will soon be chosen and rehearsals will start immediately. All engineers who can dance, sing, or act, who can write lyrics and plays, and who are interested in stage work and stagecraft are urged to immediately get in touch with the organization through the Techno-Log office or otherwise. The play will be completed and the cast chosen within the next few weeks. The first production of Enarch will be well on its way by the end of this quarter and Enarch will mark its first success in the spring.

How About It?

YOU CAN'T PUT OUT A MAGAZINE WITHOUT MONEY. You can take that for granted. Even a small college magazine like the Techno-Log has to have funds to keep going. There's paper and printing and engraving and dozens of small expenses to devour money to an astonishing extent. So, although the business staff is concentrating every effort on making the Techno-Log a paying proposition, expenses, cut to rock-bottom, each issue more than equals monthly income from all sources. What is the cause of this condition?

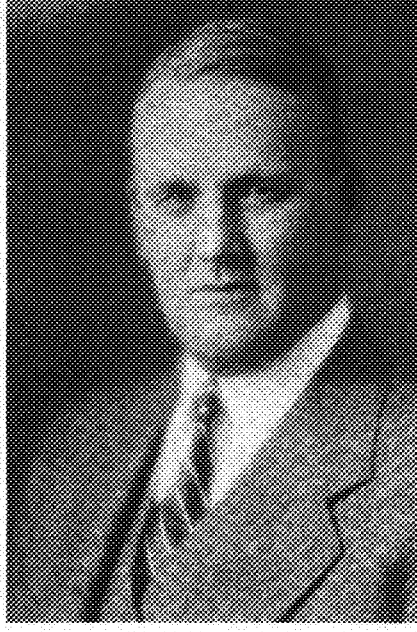
The answer can be found in local advertising which has fallen off to half of what it was a year ago. Let us make a comparison to show just what has happened. One year ago last month, in December, 1932, the Techno-Log put out a 32-page-magazine. In it were eight pages of local advertising. Last month there were less than four pages of local advertising. The result—a smaller magazine—operation at a loss—fewer illustrations—a loss of interest. You didn't get quite as much for your money.

We must get at the seat of the trouble before we can remedy it. It doesn't lie with the ad salesmen. They spend hours of their time every week soliciting advertising. It isn't that the advertisers lack money; other campus publications have proved that, where advertising is concerned, the depression is over. So what? The advertisers do not believe that a Techno-Log ad will get results.

We have a proposition to present to you. If you fellows who read the Techno-Log will give us a little support now when we need it we can repay you with a better magazine. Do you read the advertisements in the Techno-Log? If so, do you patronize our advertisers? Do you mention the Techno-Log to the people from whom you buy your books, candy for the girl friend, meals, or entertainment? We suggest that you do those things. The man who puts an ad in Techno-Log wants to say something to you. For your own benefit you ought to read it, take advantage of the offer he has to make, give him and yourself a break. But unless he knows that you got acquainted with him through us, it doesn't help us much. Here is where you can give us a boost. When you go in to make your purchases, just say "I saw your ad in the Techno-Log." Every shopkeeper who puts a feeler ad into the magazine is going to be brought just one step nearer to a long contract every time he hears those words.

You do that and here is what we do. We guarantee a bigger magazine, more illustrations, a more interesting magazine, more cartoons, a Techno-Log it is a pleasure to read. Get on the bandwagon. Let's go.

Dean Leland's Pen



Why are errors in English so common in the written work of students? Examination papers, communications, petitions and reports are frequently encountered which contain errors in simple words and sentences. Such refinements as capitalization and punctuation are often overlooked. Correct spelling and grammar seem to be regarded as useless frills of a past generation.

It is inconceivable that young men and women who have studied English grammar, composition, and literature for ten or twelve years before entering the University should be ignorant of the elementary rules governing the use of words, phrases, and sentences. The cause must lie in carelessness or indifference.

Some people may question the importance or necessity of using satisfactory English if the desired thought or idea is conveyed. A hermit living to himself without contact with others might use whatever language he desired, or perhaps no language at all, without affecting his standing with other people. On the other hand, persons who associate with others either in speech or writing are judged according to their actions and standards. No one wishes to be regarded by his associates as ignorant of proper social behavior. The use of correct English is an important adjunct to social standing.

Few, if any, of our students would be unable to discern and correct common errors in written work if they were required to do so. Similarly, they could correct their own mistakes in the great majority of cases if they would carefully scrutinize their work while or after writing it. Students would do this if they appreciated the importance of avoiding errors in English.

It is a rule of our Faculty that any student who persists in the use of incorrect English in his work may be required to take additional instruction in English before being recommended for graduation. This rule, of course, is rarely needed. If teachers would refuse to accept written work in which there were many errors, students would undoubtedly become more careful. The same effect could be obtained if deductions from grades were made when excessive errors in English were present. It would be necessary only to exert some pressure which would show students the importance of care in the use of English in their work. Probably many teachers do this; in my opinion it is fully justified. In the preparation of petitions to be presented to the Students' Work Committee, errors should be carefully avoided. A petition might reasonably be rejected if it contained mistakes indicating serious carelessness on the part of the writer. Students can use good English if they desire to do so and are willing to give a reasonable amount of attention to this important matter.

—*O. M. Leland.*

Professor F. M. Mann

alumni return To Teach

In this issue, the Alumni Department is continuing the series of faculty alumni sketches which it started last month. In order to complete the series in four numbers, the paragraphs have been shortened slightly making it possible to cover the School of Architecture and the Department of Drawing and Descriptive Geometry.

Frederick M. Mann

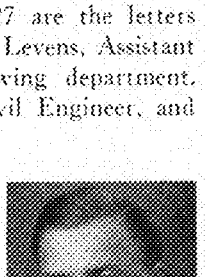
One of the college's grand old men is Professor Frederick Mann who has been head of the School of Architecture since it was organized. He obtained his Bachelor's degree at Minnesota in 1892, and his Master's at Massachusetts Tech in '95. Professor Mann has had a great deal of experience in the field of architecture both in teaching and in practice. Near the start of his career he won a competition which opened a position for him in an office in Philadelphia. After four years in that city, he went to Washington University in St. Louis as a teacher, and from there to the University of Illinois as head of the School of Architecture. In 1913 he came to Minnesota to take charge of our newly created school. Up until 1926, he kept a practising office in Minneapolis, and has done much building design in Minnesota. He now devotes all of his time to the architects, and that department has grown to be one of the finest schools of its kind in the country.

Donald C. Heath

Receiving his Bachelor's degree in 1916, Donald C. Heath, instructor in architecture, has been active in that field ever since his graduation. His first job was in the practising office of Professor F. M. Mann. By the opening of the war, he had become chief draftsman, but duty called and he joined the 33rd Engineers to do building and construction work with the army. At the close of the big struggle he returned to the drafting office and continued work with Mr. Mann for about a year. He worked with Carl Gage for a few months, and then became chief architect and designer for Harry W. Jones, now retired, who specialized in church design. Konton, China, boasts a church designed by that office. In 1924, Mr. Heath came back to the University as an instructor and also to complete work which led to a Master's degree in 1931. He now teaches classes in architectural history and construction.

Alexander S. Levens

A Bachelor's degree in 1922, a Master's in 1924, and a Civil Engineering degree in 1927 are the letters held by Alexander S. Levens, Assistant Professor in the drawing department. He is a registered Civil Engineer, and has done a great deal of work on the design and construction of bridges. His first job after graduation was with the bridge department of the Minneapolis and St. Louis railroad where he did drafting and inspection work. In the summer of 1922, he started work with the County Surveyor's office as deputy surveyor doing design work on bridges in various parts of Minnesota. In the fall of 1922 he received his appointment to the drawing staff, but he has continued his bridge work with the county surveyor during the summers. During the summer of 1931 he worked with Professor Bass of the Minneapolis water survey. He is interested in his descrip and structural drafting classes, but he says he would like to take a year's leave of absence and "see the sights."



Orrin W. Potter

A graduate of the School of Mines, Orrin W. Potter is now an assistant professor of drawing and descriptive geometry. He obtained his degree in 1914, and was a student in Mines when their entire building burned down in 1913. Mr. Potter's first job was with a Geological Survey in Wisconsin, after which he became attached to the Northwest Steel and Foundry Company. He came back to the University in 1925 and completed his work for a Master's degree. It was then that he received his position with the drawing department. Having always been in more or less close contact with the foundry industry, he was also given charge of an Extension Division course for practising foundrymen which he taught for five years. Still in contact with the industry, he is a member of the American Foundry Association and an honorary member of the Twin City Foundrymen's Association.

Graduate Students

Why do engineering graduates come back and study for master's and doctor's degrees? There are as many answers to this question as there are candidates for the degrees, and there are approximately 175 graduates of our own College of Engineering and Architecture and School of Chemistry back in school doing graduate work. The all inclusive answer would probably be "To increase their earning capacity." In a

and Study after graduation

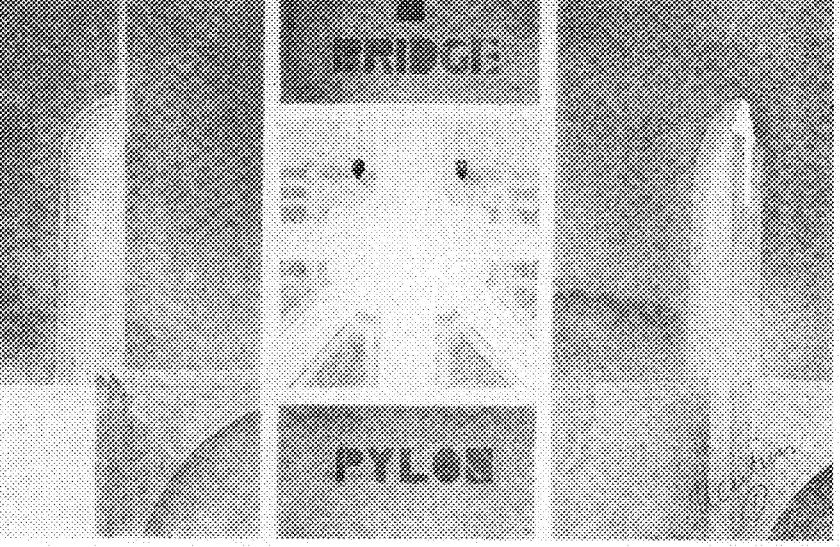
few lines of work, teaching being one, the degree in itself means quite a bit. For instance, the salary of a teacher in the Minneapolis public schools is partly determined by the number of degrees the teacher holds. But in most engineering fields the value of the graduate work depends not upon the sheepskin itself, but upon the work the student does while seeking the degree. To illustrate, Clarence Lund, M. E. '33, is over in the experimental laboratory studying the drying of insulating boards for determining the proper design of a dryer to be used in the manufacture of this product. Since the boards come from the mill containing 300% water which must be evaporated at an even rate, the drying process is an important step in the manufacture, and any improvement means greater profit. Realizing this, one of the insulation companies has provided funds for establishing a fellowship to carry on this work. Their competitors might receive just as much benefit from this work, since it is open to public inspection, being done at a state institution. But the advance of the industry as a whole benefits all concerned; and we dare say Lund has a pretty good chance of getting a position in the industry when he finishes his research and gets his M. M. E.

That is just one project in that big experimental lab of ours. Others are working on air conditioning, domestic stokers, oil testing, and what not. The experiments are chosen by the department with the object of benefiting the public and the engineering industries. With this end in view, the students gain valuable experience because every engineer's job is to serve the public through the engineering industries. The ventilation of buildings is fast gaining importance. We are fortunate to have here at Minnesota Prof. F. B. Rowley, nationally known figure in the ventilating line. Among the graduate students under Professor Rowley are Roy King, M. E. '33, Don Leslie, M. E. '33, and Robert Landers, M.E. '32 (M.S. '33), who are working with Mr. A. B. Algren, assistant director, on the problem of removing pollen from air. Pollen is that dust from flowers that floats in the air and causes so much suffering to those afflicted with hay fever and sinus trouble. To remove economically this pollen from the air is a real engineering problem involving the study of different kinds of pollen under the microscope, the concentration of the different kinds of pollen in the air, and filters to remove the pollen. Besides this work, the students mentioned are each taking nine credits per quarter, a requirement of the candidates for the master's degree. They are not working on their theses yet.

C. O. Anderson, M. E. '33, and Neil MacDonald, M. E. '32, are among the men studying under Prof. B. J. Robertson. Anderson plans to write his thesis on the domestic stoker —another product that is gaining importance on the market. Up in MacDonald's room may be seen 100 one-quart cans of lubricating oils purchased from practically every oil company in the Twin Cities. He is running viscosity, flash and fire point, carbon residue, pour point, and corrosion tests in an effort to arrive at some conclusions that may be given to the public so that they may purchase oils for their cars a bit more wisely. These tests have all been standardized and adapted by engineering societies, but one test remains to be devised—at least in practical form. This is the oxidation test. MacDonald is doing research along these lines for his thesis. Incidentally, Mac spent the past summer out in Montana with his friend, Forton Christoffer, M. E. '32, placer mining for gold with the Forton Mining Company. Mac said there's still lots of gold in "them thar hills," but that it's not quite as easy to find now as in the olden days. A few good finds were made last summer, however.

Over in the electrical laboratory there are some 15 to 20 students seeking their master's degrees, some of whom have been practising in the field since graduation, and others who have stayed right here in school after getting their bachelors' degrees. Cledo Brunetti, E. E. '32, highly recommends to all undergraduates who are really interested in their work that they stay in school and get their advanced degrees. The graduate work is much more interesting, and in fact so different that there really is little comparison to be found. After four years of doing routine work to learn the fundamentals, the graduate student is free to do as he wishes and to experiment with new things. Once while Cledo was deflecting a circular stream of electrons with a magnet he noticed that when he made the circle just so small the stream disappeared, and when he increased the circle to a certain point the stream divided into two circles, one having twice the diameter of the other. Now this phenomena is not explained in any text book. Here is another chance for the graduate student to investigate, and possibly discover some new idea. There are innumerable opportunities like this, but in choosing his research the candidate for the doctors' degree must have some objective in sight. It would be foolhardy for the student to expect to get his degree by attempting something that would probably take a lifetime to complete. Cledo has not yet chosen the particular research he will follow for his Ph. D. Neither has Walter Specht, E. E. '32. These two men, as all the electricals know, have been teaching fellows for the past year while working on their graduate studies. They are not endeavoring to get their masters' degrees, but are going right on towards their doctors' degrees. They will be the first men to be awarded doctors' degrees by the electrical engineering department at the University.

Many Ph. D.'s have been awarded by our physics department, perhaps because it has long enjoyed the honor of being one of the best physics schools in the world. Only three or four universities in the United States come up to the standard of our physics department. We have a prominent faculty, among whom is Professor J. T. Tate, editor of the Physical Review, which is the official publication of the physicists.



The Architects' Corner

By THOMAS TUDOR

A Bridge Pylon

The last problem of fall quarter in old grade one was the design for a bridge pylon. The students studied one of four monumental masses used to accentuate the approaches to a proposed bridge. The scale of the pylons in relation to the length of the bridge was considered important. Many excellent problems were turned in, and the class average was above former work. The above drawing received one of the "mention" awards and is the work of Armin Rhode. The panel on the left is an elevation looking toward the bridge. The perspective on the right is a view looking up toward the pylon from the river level. The central panel shows the plan of the approaches to one end of the bridge.

Prize Inspires Competition

In 1896 a group of Americans who had graduated from the Ecole des Beaux Arts in Paris formed the Society of Beaux Arts Architects to spread the influence of the Ecole in this country. They commenced a course of training by means of competitions in design, judged by practising architects of recognized abilities. Lloyd Warren (1868-1922) did most for this movement. His greatest work was the establishment of the Paris Prize, organizing the Society of Beaux Arts Architects to place it on a firm foundation by annually providing a donor for the funds. More important he began to build up a permanent endowment fund. This has come true and is dedicated to Mr. Warren.

The first competition for the Paris Prize was held in 1904. The prize winner is chosen by means of a series of competitive tests, constantly narrowing in their application, eliminating at each step to a smaller group, testing in these several steps different phases of architectural ability. No other scholarship is so keenly competed for; in no other competition is the number of competitors so great. The Paris Prize winner is admitted to the Ecole des Beaux Arts without taking the entrance examinations through special concessions of the French government.

On Monday, January 8, most of the seniors and some of the juniors took the preliminary sketch problem for this year's Paris Prize. These problems were judged in New York. The best sixteen will be allowed to take the main sketch problem. Eight of these will be allowed to proceed with work on the regular problem.

Housing Is Problem

The housing division of the P. W. A. under the direction of Robert D. Kohn has now been functioning for several months. With $200,000,000 to aid municipalities the Public Works Emergency Housing Corporation is back of the activities. The inauguration of a national housing program is reported to be a cherished aim of President Roosevelt. Housing has long been talked of, if only by the young architect who sees in such a job all the opportunities he has dreamed of. Now it is recognized as the country's most needed type of building, both socially and economically. At this time many projects throughout the country are being studied and surveys made. This month several of our graduate students have been aiding in the survey for Minneapolis.

Jubilee

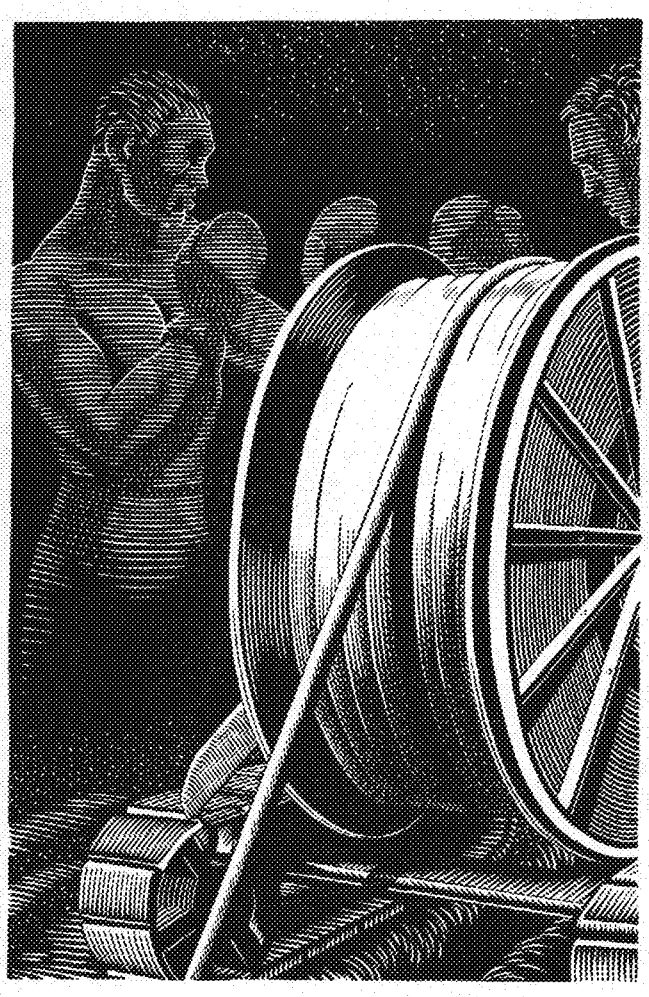
Everyone in the department is looking forward with anticipation to the Architect's Jubilee which will take place January 26. Because there was no Jubilee last year, many students have not taken part in such an affair. It is one of the major projects of the Architectural Society, of which Loren Abbett is president. This year's efforts of the society are ambitious and enterprising and much success is foreseen.

The Architect's Jubilee has a full day's program. All friends of the department are invited to the open house to see the exhibits of architectural design and fine arts. A tea dansant is planned for the afternoon. Tea will be poured in the library, and there will be dancing in the north studio.

The costume ball to be held in the evening will be modeled after the gay and colorful Beaux Arts ball of New York. To create an Oriental atmosphere the auditorium will be decorated like a Chinese temple, and the guests will don the exotic garb of the East to do their part.

George Davis, chairman of arrangements, is being assisted by the following and their committees: Lillian Haggard, Algot Anderson, Fred Segerstrom, Day Woodford, Robert E. Hansen, Russell Williams, Ted McKay, and Austin Fraser.

The manly art of self-defense



. . . *now applied to telephone cable*

Western Electric, manufacturing unit of the Bell System, now makes a tape armored telephone cable ready to meet all comers. When laid directly in the ground, this cable defends itself against moisture, grit, corrosion and other enemies.

Besides the usual lead sheath, the tiny copper wires in the cable are guarded by seven layers of paper, jute and steel tape—all saturated or covered with asphalt compound.

In pioneering and producing improved apparatus, Western Electric contributes to the year 'round reliability of your Bell Telephone.

BELL SYSTEM

WHY NOT TAKE A TRIP HOME BY TELEPHONE?
—TONIGHT AT HALF-PAST EIGHT

Light English Airplane Motor Is Purchased for University

The University of Minnesota has purchased a Pobjoy airplane motor from the Pobjoy Airmotors, Ltd., of Wirral, Cheshire, England, for the aeronautical department. This engine is one of the lightest per horsepower in the world, weighing only 135 pounds, which also includes the weight of the propeller hub. Another remarkable feature of the engine is the compactness of the parts and the small bulk of the engine.

The Pobjoy is a radial, seven cylinder, air-cooled engine developing 75 brake horsepower rated at 3,000 r.p.m. There is a reduction gear with a ratio of 1:0.47 to the propellor shaft consisting of a pair of substantial double-helical gears. The feature of the engine is the patented flywheel which is connected to the reduction gears and in this way reduces greatly the weight of the reduction gears. The flywheel is hollowed out and is used to filter the lubricating oil.

The Pobjoy is also very economical to operate, having a fuel consumption of about .53 pints per b. h. p. and an oil consumption of 1¼ pints per hour. In addition cowling is used on the engine to give better cooling and lower the head resistance as well as presenting a neat external appearance.

The Pobjoy is economical in maintenance. If the motor is run only at cruising conditions it is necessary completely to overhaul the motor but every 450 hours. In addition to the complete overhaul the motor should have a top overhaul every 150 hours. There is also a hand starter furnished with each engine, and a special rear drive can be supplied on the motor for the operation of autogiro rotors.

The Pobjoy airplane engines are used extensively in Europe and have set numerous records for endurance and climb. In November, 1931, Mr. C. A. Butler made a world's flight record from England to Australia in a plane powered with a Pobjoy motor.

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The Architectural Library

The architectural library is truly adapted to the use of the students. Because of its intimate atmosphere and the informality in supervision it is unique among libraries on the campus. The library has an important function as a laboratory for the department. Students are not allowed to take the books and periodicals into the drafting rooms, but boards may be brought into the library, and much work is done there. It would be difficult to try to design without reference material, for in learning architecture, tradition and precedence are extremely important.

Most of the courses in the architectural curriculum are closely correlated with the use of the library. History of architecture and furniture and design require about twenty-five plates each quarter. It is customary to make these from tracings of illustrations.

Books pertaining to architecture and related subjects such as construction, history, sculpture, painting, lettering, etc., are in the shelves. Including the periodicals, there are about fourteen hundred volumes. There are several really old and valuable books. The bound periodicals are much in demand. Those older than five years are in the main engineering library.

Structural Engineering Research

Research in the structural division o experimental engineering is mostly of long term nature, and investigations de scribed in the last May, 1933, Techno Log are being continued.

At the 1933 meeting of the America Society for Testing Materials, Profes sor C. A. Hughes of the structura engineering department presented a pa per on "Durability of Mortars." Com prehensive investigation of durability o cement mortars and concrete is bein considered under the direction of Pro fessor Hughes.

When the amount of money investe in structures built of concrete is con sidered it is evident that the durabilit or life of such structures is of suprem importance. Due to the rapid develop ment of Portland cement in recent year the attention of concrete engineers ha been centered on the resistance of con crete structures to weathering and othe destructive agencies. The investigation under way by the structural divisio include the effect of such variables a test procedures, constitution of the ce ment clinker, the paste ratio, aggregat grading, and aggregate quality. A six point recording potentiometer has re cently been added to the equipment. I is hoped that its use will materially aid in the correlation of the cycles of arti ficial freezing and thawing with year of natural weathering.

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A. S. M. E.

Mr. Calvin, University of Minnesot graduate and general manager of th Northern States Riverside power plan in Minneapolis, was recently host to th local student chapter of the America Society of Mechanical Engineers. Th station is the largest steam-electric plan in the Northwest. The boilers are i two units, one operating while the othe is being cleaned. Twenty-five thousan kilowatts are produced by turbin which are in four units. The boile are fed with coal by underfeed stokin The boilers are also equipped with h draulic sluice ash removers.

Akerman Is Appointed To State Commission

Prof. John D. Akerman, head of the Aeronautical Engineering department, has been appointed a member of the Minnesota Aeronautics commission by Governor Olson. The commission was provided for in the new state aeronautics law passed during the last session of the legislature. Professor Akerman is the commissioner in charge of aeronautical engineering and the operation of flying clubs and aviation schools.

Other members of the commission are: Col. L. H. Brittin, vice president of the Northwest Airways, commission chairman; Major Ray Miller, commander of the 109th aero squadron, commissioner in charge of airports; Richard L. Griggs, president of the Northern National Bank of Duluth, commissioner in charge of budgets; and Dr. W. A. McCadden, Minneapolis dentist, commissioner in charge of inspections and regulations.

Flying Club—M.S.A.E.

After the first meeting of the winter quarter the Minnesota Flying Club and the Minnesota Society of Aeronautical Engineers will hold combined meetings. It is believed that by holding the combined meetings of the two groups that better cooperation and more aviation activities will be sponsored by the two groups. These meetings are to be held regularly and men well known in aviation circles will be brought to speak before the two groups. In addition interesting motion will be shown.

The Unseen Army

A continually decreasing number of assistants have been turning in a continually increasing amount of copy. More than holding up under the strain are:

Charlie Sweatt (middle name Perspiration) who, in addition to writing his share of the Alumni Page, classifies cuts, sweeps the floor, and digs up portable organs for the amusement of the Editor and staff. He is noted as the one member of the staff who can write an article with a lead that doesn't sound like a postmortem. We'd be in tough shape without "Chollie."

Campus News garnerers Orville Becklund, Nathan Buddish, Fred Warner, and Edward Marshall. They are the last loyal remnant of that dw'n-dling department. Their stick-to-it-iveness in the face of a job which is mostly dull routine merits a lot of praise.

We are especially lucky this quarter in having a familiar contributor back. James E. Moore, last year's staff cartoonist, creator of engineering characters that pack a laugh, is again enlivening our pages with his pictured wit. Welcome home, Jim!

The man who drives the business staff crazy by writing easy Mental Tilts is Leander Fischer, a senior Mechanical. He is thoroughly familiar with ducks, rocket ships, and other aspects of the mathematical puzzle situation.

George Reynolds directed the collection of advertising bills, a tough job, and one that reflects credit on him for the way he has gone about it.

To these and any others who may have been inadvertantly overlooked, both branches of the staff feel very much indebted. To them, the unsung heroes of the deadline, we extend our thanks.

Faculty Sketch

John Harrison Moffett

John Harrison Moffett, King of the Foundry, at the University of Minnesota, was born in a log cabin—almost. Unfortunately a clapboard addition was made to the cabin before Mr. Moffett's appearance, and in this part of the house he was born. Mr. Moffett firmly believed he was akin to Lincoln with respect to birthplaces until last summer, when his mother corrected his misapprehension.

Until he was seven years old Mr. Moffett lived on a farm near Rushville, Indiana. During the depression of 1893 the family, due to a mortgage, lost the farm. Mr. Moffett did not go to the World's Fair of 1893. He can recall himself saying, "But I don't want a sailboat. I wanna go to the World's Fair." After waiting forty years Mr. Moffett made up for lost opportunities by visiting the Century of Progress Exposition three times. He was so enthusiastic over the World's Fair of 1893 that he and his brother memorized a book of pictures of buildings and exhibits so well that he was better acquainted with the fair than some people who went to it.

Mr. Moffet went through grade school and one year of high school in Rushville. He was fifteen years old at this time, and due to economic reasons he became a foundryman's apprentice. After three and one-half years of foundry work Mr. Moffett returned to high school. Holidays and vacations he worked in a foundry. Students in the Rushville High School whose grades and conduct rating were above 90 had no examinations. Those acquainted with Mr. Moffett have already guessed (and are right) that he worked in the foundry examination days. During his high school days Mr. Moffett was captain of the football team, editor of the high school paper, on the debating team, in the class play, and a coal shoveler. He and his brother shoveled half a car of coal between 5:00 A. M. and school time. In the afternoons he

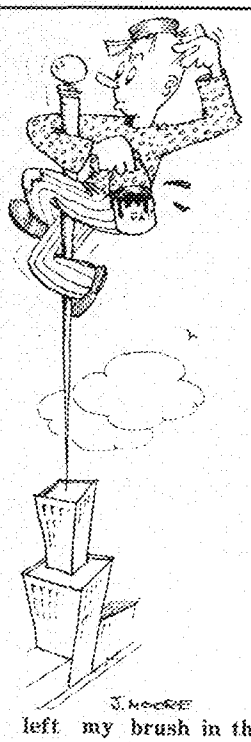
practised football. Being a good student as well as a prominent man Mr. Moffett had the added burden of helping a great many girls with their home studies. Or maybe it was just an excuse on the girls' part. In 1909 Mr. Moffett graduated from the Rushville High School, and then worked for two years as a foundryman.

In 1911 he started a co-operative course of Metallurgical Engineering at the University of Cincinnati. A co-operative course is one in which the student attends classes for a week and then works for a week. In his physical examination at the University of Cincinnati Mr. Moffett literally blew up the lung testing machine, which gave him the honor of having the largest lung capacity in the United States. It also explains why he stands so far away from the mold when he sprays it with molasses water. Mr. Moffett went out for football but gave it up because during his working week he had to make and pour 100 molds a day.

During the years between 1915 and 1920 Mr. Moffett was located on the Panama Canal working (and all at once) as cupola tender, molder, coremaker, and supervisor of furnace operation.

In 1920 he returned as a student to the University of Cincinnati where he was also a student instructor in the Metallurgical Laboratory and a member of the student tribunal. The students had self-government then. Mr. Moffett, then thirty-four years old, graduated June 18, 1921, with a M. Met. E. degree in the midst of the depression of 1921. Through his brother Mr. Moffett got a job as construction foreman. Before getting this job, he recalls standing in a line in answer to an advertisement for a grocery store manager. The man just ahead of Mr. Moffett had had thirty years experience in the grocery business and furthermore was well dressed between his spats and top hat. Mr. Moffett left the line.

The first of September, 1921, Mr. Moffett came to the University of Minnesota as Instructor in Foundry Practice. Here he has hung up a world's record—that of making Minnesota Seal book ends "a la mass production."



"D———! I left my brush in the basement"

the school of chemistry

1868-1903-1934-??

a sketch of dynamic growth and development

By HOWARD KAHN, Ch. E. '35

Supplementing the general history of the college of Engineering and Architecture in the December issue we present this summary of the growth of the School of Chemistry since its inception in 1868

●

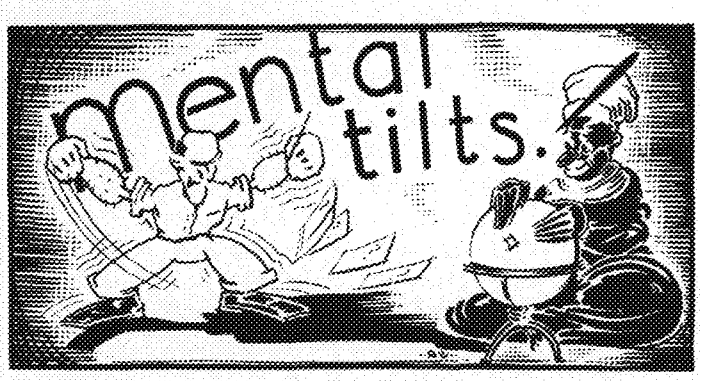
The formal record of the School of Chemistry begins in 1896, at which date the school proper was established, although the subject of chemistry has been included in the curriculum since the very beginnings of the University. In fact, chemistry was one of the subjects taught in the school which in 1868 became the reorganized University of Minnesota, and at that time Professor E. H. Twining, one of the original faculty of eight men, was given the double burden of conducting classes in both chemistry and French. At that time chemistry was included among the natural sciences but one year later was dignified by a separate chair. Thus did the status of chemistry remain until 1891, the course offered being analytical only, and for the purpose of fitting men and women for teachers, analysts, and investigators. In 1891 a full four-year course in chemistry was offered in the reorganized College of Engineering, Metallurgy, and the Mechanic Arts. Six years later another change took place and the School of Technical and Applied Chemistry was established—subsidiary to the College of Science, Literature, and the Arts. In 1903, the School of Chemistry achieved independence, with its own dean, its own administration, and the power to grant degrees. The courses were enlarged from one to three: an analytical course leading to a bachelor of science degree in chemistry; an arts and chemistry course leading to the degrees of bachelor of arts and bachelor of science in chemistry; and an applied course leading to a chemical engineering degree. Also, during this dynamic twelve year period, the facilities for the school were increased considerably; in 1890, in answer to a growing need for space, a new building, the present Minnesota Union, was erected for the use of the physics and chemistry departments, and in 1902, a year before the establishment of the separate School of Chemistry, this building was remodeled for the exclusive use of the chemists.

Much credit for this early expansion must go to Dr. George Bell Frankforter, first dean of the School of Chemistry. He came to the University as Professor of chemistry in 1893 after an extensive European training, and became the first dean of the school. During his regime, in 1913, the present Chemistry building was started, and was three-fourths completed and ready for occupancy in 1915, later, in 1922, the fourth quarter was added, completing the structure.

In 1918, during leave of absence of Dean Frankforter for War Service at Washington, Dr. Lauder W. Jones, of the University of Cincinnati, was appointed the second dean of the School of Chemistry, and in 1919 became the first dean of the combined College of Engineering and Architecture and School of Chemistry, which, though remaining two separarate schools with distinct faculties, were combined under one dean. In 1920 Professor Ora M. Leland of Cornell University succeeded Dean Jones, the second dean of the combined colleges. In 1926 Dr. S. C. Lind of the Fixed Nitrogen Research Laboratory was appointed professor and director of the School of Chemistry.

With the growth of the School of Chemistry, separate divisions or departments came into being, corresponding to the several branches of the field, namely, inorganic, analytical, physical, and technological chemistry. The last named is intimately related to the modern development of Chemical Engineering. In 1913 the first course in chemical engineering was offered although degrees in chemical engineering were given even before that. The course was mostly analytical with certain engineering subjects elected by the students during the fourth and fifth years of the five year course. However, there was little correlation between the chemical and engineering aspects of the work until the organization of the chemical engineering division in 1919. In that year Dr. Charles A. Mann came here from Iowa State College and became the chief of the division. The expansion in that department is clearly shown by the fact that at the time he came the department consisted of one professor, three small laboratories, and 36 students, while at the present time there are two full professors, one associate professor, one assistant professor, two instructors, and five assistants. There are now 21 individual laboratory and office rooms, and the enrollment shows 225 undergraduates and 23 research students. Although in 1915 a new building for chemical engineering was contemplated, no action was ever taken, and in 1922 a part of the new section of the present building was given over to this division.

In short, the expansion of the School of Chemistry as a whole is simply that of one of the units of a great, growing University. Since 1869 the material offered has been expanded from a simple analytical course to a curriculum containing every phase of modern chemistry, both pure and applied; the facilities have increased from one small basement laboratory to a massive five-floor building housing many lecture rooms, laboratories, and offices; and the teaching staff has grown from one professor to a faculty of 26 men, with 32 assistants and 18 employees, while the student population has passed a high point of 423.



The results of last month's Mental Tilts were gratifying to all but the Business Manager who will have to dig into his jeans for one of F. R.'s new silver dollars to give to John L. Mills, junior Chemist, who was the first to turn in the correct solutions.

Impressed with this great show of intelligentsia, a friend of the Editor, the great scientist, Dr. Q. P. Putschova, F.R.S., P.C.E., suggested that we publish some problems that had been bothering him, and that he, himself, would pay the dollar offered for the first correct solutions received.

Going Up!

The Doctor, as is well known, is planning a voyage into interplanetary space. He figures that he will be able to store enough energy aboard the ship to maneuver and stop the ship, but must depend upon the initial velocity with which the ship is projected from the earth to overcome the earth's gravitational effect. The Doctor would like to know the least value of the velocity required.

Going Down!

Aboard this space ship, the Doctor has installed two smooth pegs, two feet apart and on the same level, upon which he intends to hang the starting rope for his outboard motors. Assuming a normal gravitational field, what is the shortest length of rope that he can hang over both pegs?

Going Boom!

While experimenting to find a suitable fuel for his rockets, the Doctor took 100 cc. of Trinitrotoluene and mixed it thoroughly with a liter of Nitroglycerin. Then taking 100 cc. of the mixture, he added it to 900 cc. of Trinitrotoluene. Now the Doctor wants to know whether there is more Nitroglycerin in the Trinitrotoluene, or more Trinitrotoluene in the Nitroglycerin.

•

Answers to Last Month's Mental Tilts

The Divisible Eggs

295 eggs.

A Frame-up

14.14 lbs. tension.

Why ?

The fallacy lies in choosing the wrong sign for the roots of the polynomials of the third equation.

Speekin Thru the Keyhole

By HEOTTA B. SHOTTE

With due respect to other campus columnists, the excellent Freddy Frazier, Gorman and his pea-shooter (he shoots from the lip), and the boys who merrily boil the beaker over in the Daily Office, the Techno-Log somewhat hesitatingly inaugurates yet another colyum. We admit we're not a bit original, but we may get aboriginal—ask Miss Veblen if youse can use the dictionary. Nice alliteration, eh? Funny what a typewriter can do.

Where did Papa Leland get his first two names? Is he an engineer Ora Miner?

✓ ✓ ✓

The Engineers' Bookstore is an efficiently run organization. Yes, Harold, you're okay as manager, and how's the wife and baby? . . . . . The engineering social fraternities don't make enough of a bid for publicity. . . . . Al Nowicki is a swell gent. . . . He's a star touch-bailer as well as a damned good pedagogue or something. . . . . We admire Professor Cutler from afar. . . . . His business-like manner explains it. . . . . Why do they bother to leave the "No Smoking" signs on the wall. . . . . Their significance is practically nil. . . .

✓ ✓ ✓

Dr. Heisig, eminent expounder of the mysteries of chemistry to awe-stricken freshies and questioning sophomores, who also busily bustles about in his lab in the Chem. basement whenever he can find the time, pulled a good one in Chem. 13 awhile back. He was describing how people approach chemists to make analyses of samples: "They come into your office and pull a bottle out of their pocket . . . ".

✓ ✓ ✓

If Doc Mann were cross-eyed, he'd look like Ben Turpin.

✓ ✓ ✓

We like Drs. Dalaker and Hartig and, incidentally, their calculus book. . . . . That reminds us: Why do most engineers insist on selling their textbooks? . . . . . worth far more to them personally than the measly shekels received. . . . . Intrinsic value, you know. . . . . "Sunny" Sundbeck, secretary in the E. E. office, is a "swell gent." . . . Where did law instructor Ben Palmer get that cowboy hat? . . . . . We like your lingo, Ben. . . . . .

✓ ✓ ✓

A garbage collector and a woman's belt have at least one thing in common: they both gather up waste.

✓ ✓ ✓

She: Some moon, isn't it?
Geo. Taylor: Some dew, too.
She: Well, I don't.

Holiday Cheer

Rambling reminiscently 'round the round-table, I ran into a roaring roustabout running rearwards. Its name was Rosholt and he told me the following tale: "I had ten pints of wine in my cellar which my wife instructed me to dispose of. Sadly, I wended my humble way down the stairs, took the first bottle from the shelf, removed the cork, drank one swallow, and poured the remainder down the sewer.

The second bottle I removed from the shelf, and did the same as above, also swallowing one drink.

I took the third bottle from the cork, removed the sewer, drank one shelf, and poured the remainder into the contents which I drank.

Taking the fourth shelf from the cork, I removed the contents, drank the bottle and poured the sewer down the remainder.

The fifth sewer I took from the bottle, removing the shelf, and I poured the remainder into the cork, which I drank.

I drank the sixth cork, removing the shelf from the sewer, and poured the remainder down my neck.

While taking the seventh bottle, I pushed a button which made the room go 'round and 'round an' 'round. Then I reached up and hit myself on my floor with the head, thus causing the sewer to throat down my trickle. Quick take the other three bottles, sumbuddy — I then declensed a Latin reshishun: HIC—HAEC—HOC."

Just what does the eminent "Technical Commission" do to justify its existence? . . . . . John Hancock is quite a guy, with his air of lackadaisicalness—Whoa! . . . . . Nickname for P. J. Riley, curator over in chemistry: "Silent Joe." . . . . . We don't know Mr. French, but we imagine that he is a very painstaking and thorough gentleman. . . . . We like the way he has his office hours posted, and the handy appointment slips for consulting him in his capacity as student advisor. . . . . Why do the architects wear those multi-colored smocks? . . . . .

✓ ✓ ✓

Doc Straub is the most impressive looking man on the engineering faculty . . . It has been stated that he looks like Conrad Nagel. . . . He knows his stuff, but he likes to keep it a secret we hear.

✓ ✓ ✓

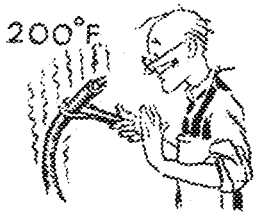
And why do the graduate students go around with such serious do-or-die looks on their faces? . . . . . Just what is the basis for the criticism by the Minnesota Daily (The World's Largest College Newspaper) of the so-called "excessive interference" caused by WLB? . . . . . The everlasting question: "What do we do after we graduate?" . . . . . A likeable gentleman is "Doc" Stoppel—because of his blasé sense of humor; a rare gift, indeed. . .

Our swashbuckling copy editor anonymously contributes the following delectation: "They tell us in hydraulics that the jet always has a higher velocity than the vane. Maybe, but I know of many a case where a vet was too slow for the jane."

✓ ✓ ✓

This year, there are more graduate students in chemical engineering than in any other branch. . . . . Why didn't they lay out the sidewalks on the campus conveniently in the first place so they wouldn't have to put up those maddening "Please Keep To the Walk" signs? . . . . . Among historical figures taking E. E. are: Charles Steinmetz and John Hancock.

G-E *Campus News*



CABLE-GRAM

It's not easy to tell you how, for many years, G-E chemists have been fiddling around with Glyptal (a synthetic resin of the alkyd type, made from phthalic anhydride and glycerine as base materials); or how, in studying high-molecular-weight organic compounds, they found that the flexibility of Glyptal could be varied by changing the length of the chains of the polyesters—ho, hum! But you may be interested in knowing that Glyptal compounds make excellent printing rolls, tooth-brush handles, gaskets, ash trays, automobile finishes, and—what not.

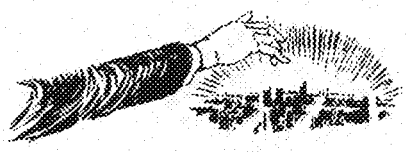
These chemists not long ago turned out Glyptal-cloth insulation for cable. Soak it in oil; it won't care. Heat it to 200 degrees F., if you wish. Its resiliency is remarkable; its tenacity, terrific; its durability—it makes other insulations seem like wrapping paper.

"X-RAY AS YOU GO"

It's just the thing for customs inspectors, veterinarians, baggage men, and detectives—this new portable x-ray announced not long ago by J. H. Clough, U. of Rochester, '16, new president of the G.E. X-Ray Corporation.

The set can be toted around easily, and operates, safely, from an ordinary light socket. It will make x-rays of the human body, industrial fluoroscopic examinations, and radiographs of locked trunks, suspicious packages, and the like. It is particularly adapted to making x-rays of animals and for use in cases where the machine must be moved to the patient. A layman can operate it easily and with safety.

It brings the x-ray within practicable reach of the veterinarian. The first set built was rushed from exhibition at Chicago to Belmont Park, and there used to inspect the right forefoot of one of the best-loved horses of the modern turf, which was on the point of being prematurely retired for a puzzling lameness. So simple and quiet was the operation of the x-ray that the horse was not in the least nervous. "Well, well, boys," neighed Equipoise, "I'm sure glad you came along."



99.9909% PERFECT

Soap that's "99.44 per cent pure" may be pretty good, for soap; but in the matter of reliable control of street lights—well, lend your ears.

Carrier current controls the street lighting in one district of Springfield, Mass. In the last year there have been but 32 failures (from all causes, lightning included) in 350,928 controller operations. That's within .0091 per cent of perfection.

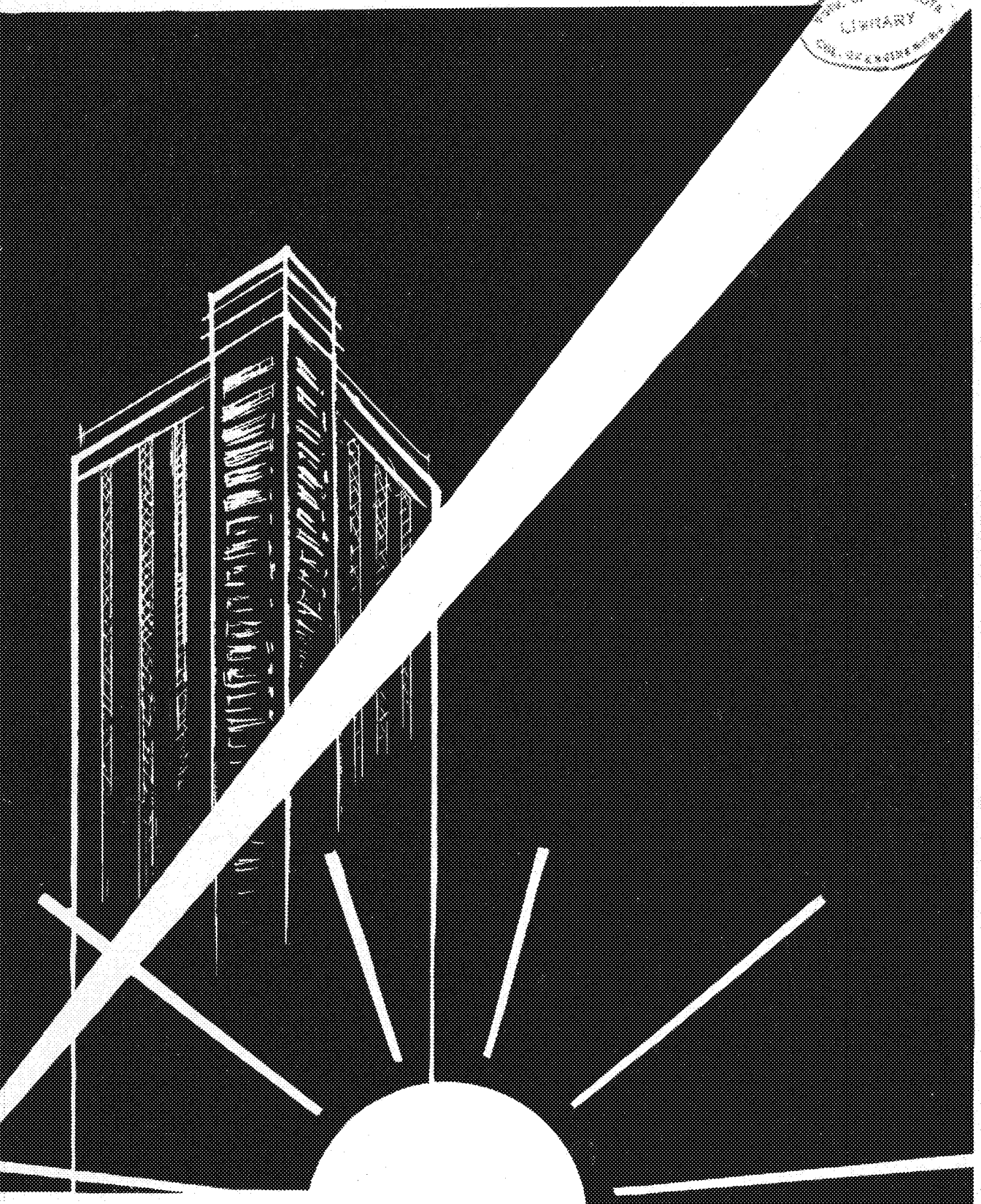
Carrier current makes use of wires and transformers already installed, avoiding duplication and congestion of circuits. In Springfield, a 700-cycle current, transmitted for eight seconds, operates 481 controllers, turns on 675 lights. Used 30 seconds, it turns them off. A second frequency of 460 cycles is available to control off-peak water heaters and other devices. This is the only G-E installation of its kind—a temporary distinction, we hope.

C. E. Jennings, Ohio State, '12; F. M. Rives, U. of Texas, '23; and J. L. Woodworth, U. of Idaho, '24, were responsible for this job.

96-27DH

GENERAL ELECTRIC

The Minnesota Techno-Log



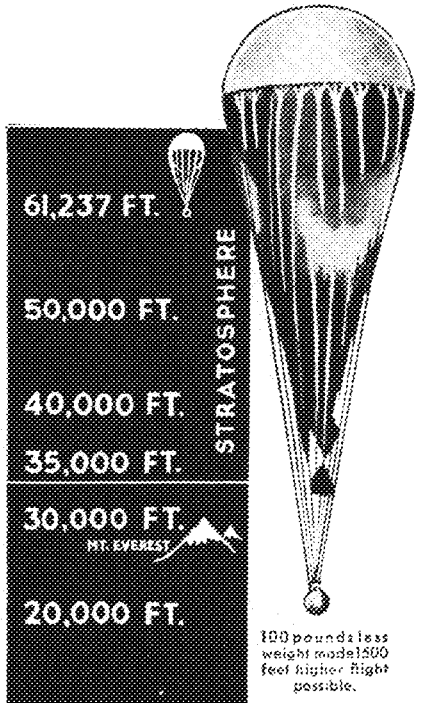
FEBRUARY 1934

ol. XIV No. 5

EMBER ENGINEERING COLLEGE
MAGAZINES ASSOCIATED

11.6 MILES UP—IN SAFETY

IN LIGHT, STRONG DOWMETAL GONDOLA



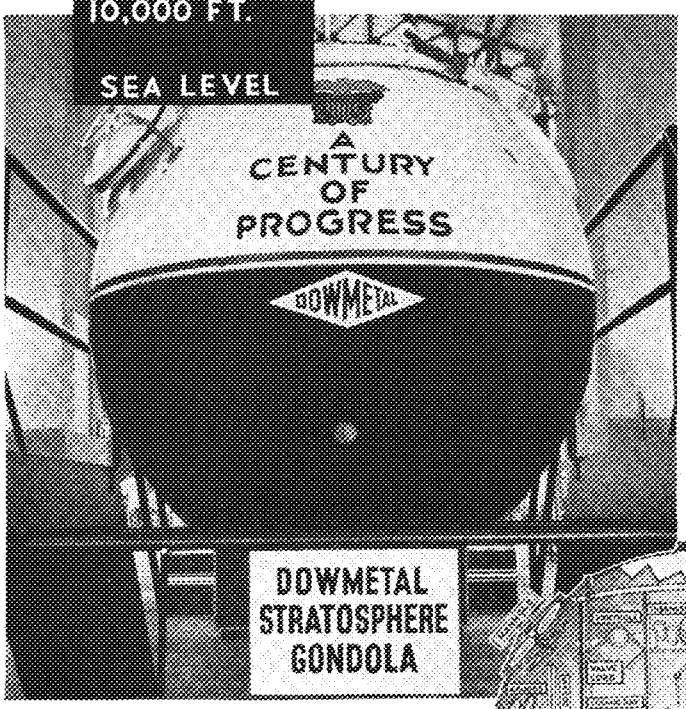
100 pounds less weight made 1500 feet higher flight possible.

AN unusual combination of properties possessed by dowmetal alone caused it to be chosen for the material from which the spherical gondola was made for the stratosphere flight. These properties were necessary to both safety of the occupants and success of the flight.

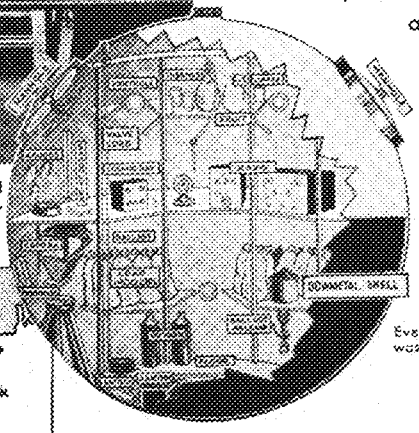
Lightness was sought because every pound saved made possible an additional 15 feet of ascent. This lightness was found in its greatest degree in dowmetal, lightest of all structural metals.

Strength must accompany lightness, so that the natural atmospheric pressures could be maintained inside the spherical laboratory-home without danger of the gondola bursting in the rarified atmosphere existing eleven miles up.

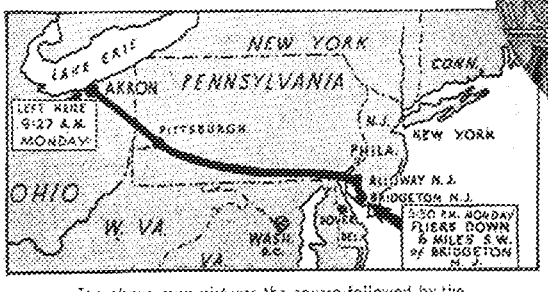
Dowmetal not only met the combined need of lightness with strength, but was also found most practicable for fabrication in the forms necessary. The main walls of the sphere were made of *rolled* plates of dowmetal. These plates were *welded* together. Hatches were dowmetal *castings*. *Sheet* dowmetal shelves were supported by *extruded* dowmetal posts. *Forgings* were used in certain important locations. These parts were fabricated by processes common in industry and equally applicable to the manufacture of more prosaic but very necessary structures and machines where light weight and strength mean less power, less wear and smoother operation. Write for complete data. State your problem.



The air-laboratory of dowmetal used by Lieut.-Commander Settle.



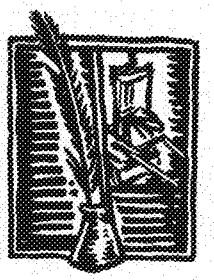
Every available foot of space was occupied in this 7-foot diameter ball.



The above map pictures the course followed by the stratosphere balloon on its ascent from Akron, Ohio.

DOWMETAL

THE DOW CHEMICAL COMPANY • DOWMETAL DIVISION • MIDLAND, MICHIGAN



The Editor Says:

This has been one of the most interesting issues of the year from the standpoint of the editing. A suggestion to kindle the imagination by Mr. Siler, two interesting and authoritative articles, and a bit of crusading in the editorials have added much to the enjoyment of getting the issue out.

Our first plea to the readers is—read the editorials. Even if you are one of those who believe that the editorial page is just a matter of form or a place for the editor to blow off excess steam, you won't be disappointed in turning to page 110. In bringing to a climax the crusade for the improvement of student faculty relations and the improvement of courses, we present on the editorial page, a group of statements expressing the actual opinions of some of the more prominent men of the faculty. These men have given of their valuable time to write these statements for you. All we ask is that you take a few minutes and read them.

Mr. Siler's dream of the engineers' excursion down the Mississippi is not as far fetched as it may sound to you or as Jim Moore's cartoon may have made it look to you. New things in education are being tried all over the country every day, and there is no reason to believe that this scheme will not be one of the next to receive its trial. Personally, your editor believes that a trip of this kind for the seniors or the juniors and seniors, would be of more value to the men themselves than anything which has yet been tried at Minnesota.

We only hope that you find this issue as interesting to read as we found it to edit.

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Minnesota Techno-Log
37 ELECTRICAL BUILDING U of M

FEBRUARY 1934
Volume XIV Number 5

Ralph Monson
MANAGING EDITOR

Gordon Rosholt
BUSINESS MANAGER

Published monthly from October to June inclusive, by the students of the College of Engineering and Architecture, the School of Chemistry of the University of Minnesota

This Month

A Naval Torpedo Plane

Naval Reserve

gives instructions and trains men for

Air Service

By J. I. NIENABER, Ensign U.S.N.R., Aero. E. '34

The author, having completed the Naval Reserve Training and his year of active duty, is well qualified to give the low-down on the Naval Reserve. Mr. Nienaber is now a senior in aeronautical engineering and is connected with the Naval Air Base at Wold-Chamberlain field

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The Naval Reserve Air Service has the same purpose as the general Naval Reserve; that is, to provide at low cost sufficient trained personnel to man completely and immediately all naval ships and stations in case of emergency. To be ready for such duty, the civilian personnel must have frequent and regular training. That men cannot be quickly and sufficiently trained was sadly proven during the last great war. These facts are especially true for the aviation branch of the service. The Navy does not consider an aviator experienced who has less than 850 hours of flying. Flying time builds up very slowly, especially the first 1000 hours, and in my opinion a pilot could not fly 850 hours in less than two years, and gain the maximum benefit from the experience. It is necessary for an experienced pilot to fly at least 20 hours per year to retain his ability.

We now approach the subject of the training of Naval Reserve aviators, which is perhaps of special interest to students or graduates who hope to get this training in the future. During the past two years no appropriation has been made for the training of new students, but considering the present naval policy of the President, it is not unreasonable to believe that there will be one for the next fiscal year which begins July 1, 1934. The applicant for student training must pass a flight physical examination, be a college or university graduate between the age of 18 and 26 and a citizen of the United States. Applications for this training may be made at the Naval Reserve Aviation Bases, where the commanding officer with the aid of the other officers attached to the base chooses the most likely candidates and submits them to the selection board (usually three executive officers of the naval district) for final selection. Those selected will be rated as seamen second class in the Naval Reserve and ordered to preliminary training for one month (at Great Lakes, Illinois, for this district). This consists of radio code, ten hours of flight instruction in seaplanes, and five hours of solo. At the end of the month those who qualify (usually about 50 or 60 percent) are ordered to the Naval Air Station, Pensacola, Florida, for further flight training; the others are "busted out" and returned home. All expenses and a salary of $36 per month are paid during the training period of one month at the preliminary training station and about nine months at Pensacola.

At Pensacola the time is divided equally between flying and laboratory or lecture classes, flying being done before noon one week and afternoons the next week. Many subjects are studied such as navigation, aerology, meteorology, torpedoes, aerodynamics, strategy and tactics, gunnery, radio, and airplane construction and maintenance. After about ten days of physical exams, psychological exams, initiation by advanced students, receiving of text books and flight gear, etc., the student is again started out with instruction in primary seaplanes as if he had never been in one before, and he usually acts like he hadn't. Up to ten hours of dual instruction are given, the student being given a solo check as soon as his instructor thinks he is capable of passing one. These checks are given by three or four of the senior instructors of the squadron. If the solo check is passed, the student is allowed one hour of advanced instruction and five hours of solo. If he gets "thumbs down" he is given two more checks and must pass both of them to get an o. k. If not he is busted out and sent home. This system follows throughout the entire course and needless to say is the cause of much worry, and it is rather unusual for a student to go through without busting at least one check. At the beach (referring to Squadron I or the primary seaplane squadron) three more checks are given, the 15 hour check, 30 hour check, and final check. In between each check advanced instruction is given, including tail spins, flipper turns, spirals, fish tailing and side slipping, wing overs, split S's, loops, figure 8's, taxiing, sailing, forced landings, and dead stick precision landing. In Squadron II, the primary landplane squadron, checks at intervals similar to those at Squadron I are given. More advanced instructions are given such as the falling leaf, snap rolls, Immelman's, precision spins, formation flying, and cross country flying.

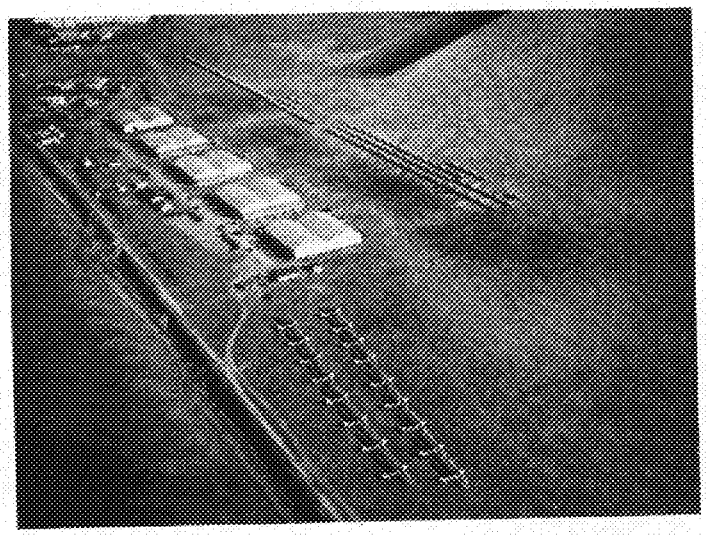
Upon completion of the work in this squadron the last and final check is given which is a very complete study of the student's ability, cool headedness, and judgment; the ability to handle the plane in case of emergency is especially tested. After passing this check a student seldom fails in the work that follows. Squadron III, which was twin float torpedo plane training, has been excluded from the curricula during the last few years. Squadron IV is the observation squadron where Corsair landplanes are used. Two students fly together alternating between flying and operating the radio during spotting and scouting practices. A total of about 60 hours is allotted to this practice. Then comes Squadron V with 25 hours of stunting and dog fighting, after that a few catapult shots and some instrument flying, which concludes student flying. The next flight made will be as a naval aviator and commissioned officer in the Naval Reserve, but not until after some more worries. Written exams must now

be passed which are not easy. However, students who flunk are given more time to study and another trial. Thus the goal is reached and in a short time the student is designated as a naval aviator and commissioned as Ensign U.S.N.R., a rating he must keep for four years before taking examinations for advancement to Lieutenant.

The Navy allows and expects each graduate to take one year of active duty with the fleet, with a pay of about $250 per month. His major duty is flying, although he is given an office to test as well as develop his executive ability. The type of flying done depends on the squadron to which one is ordered. The utility squadrons give flying in all types of ships from small fighters up to the bi-motored amphibians and flying boats, and are perhaps the most desirable posts from the standpoint of flying experience. The fighting squadrons stress aerial gunnery and bombing, while in the patrol squadrons only large flying boats are used. During the year the planes are taken aboard ships for a three months' cruise to either the vicinity of Panama and Cuba or the Hawaiian Islands. Sham battles are fought and experience is gained in flying from battle ships and battle cruisers via catapult, and from the decks of the aircraft carriers. Upon completion of the year of duty the officer is ordered to inactive duty and attached to a Naval Reserve Aviation Base, where he is required to put in a certain number of hours practicing aerial gunnery and bombing, formation flying, blind flying, cross country flying, night flying, and instrument flying. This requires a small amount of time, most of it being done during two weeks of active duty each summer; the balance is done on chosen week ends throughout the year. Thus he can live as an ordinary civilian and yet be ready to take his place with the fleet upon a moment's notice.

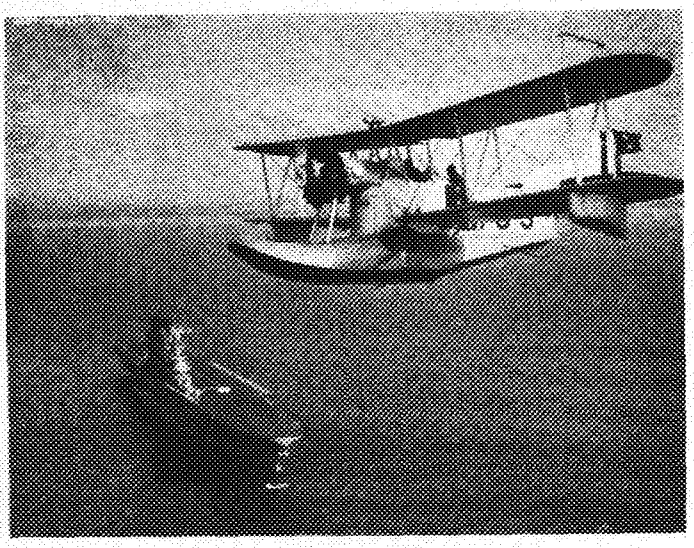
So far, I have been intentionally statistical. I shall now attempt to give a personal slant on the life in general which to me has been most interesting. I do not know of another situation that will affect one's feelings as greatly as flight training, or of any person who can make one feel quite as low and useless as can a flight instructor. In five minutes of flying you can become very cocky or you can decide that you are the dumbest, most useless mortal on earth.

A poor memory presents a few high spots: Vaccinations for everything but hangovers. The solo check—"Must be thumbs up, I still can think of a couple adjectives he hasn't used in telling me how rotten I am." The first solo hop—"If I can only get back without doing a full stall landing at an altitude of 15 feet, taxiing into the dock or some other assinine stunt that students reserve for solo hops." The solo party, and waking up the next morning hanging on to the bed post and being surrounded by a group of fellows with silly grins on their faces, who had been listening to and watching the trials and tribulations of an inexperienced pilot flying in some terribly bumpy air. "Make that cat quit stomping around, and I swear I'll never take another drink as long as I live." Oh well, there's only one first solo, and besides we became a member of the "Short Snorters Club," the membership card being an old fashioned big dollar bill of a few years ago, with the signature of all the members on it; if we don't soon get a job, the card will have to go for a better purpose. The Skipper, slowly handing out orders for Pensacola and I not knowing for sure that there were some for me until he got to the bottom of the bunch. A long, hot ride on the train to Pensacola and arriving just in time for an evening of initiation by the advanced students. Our title: Reserve Student Officer, or R.S.O. for short. When do we fly? We've been here for two weeks now and the only stick time has been with a broom handle sweeping down the decks. Military drill every day and it was usually about 104 degrees in the shade. Finally a flight instructor was assigned and we sized each other up. "He has twelve years of flying experience and is a senior lieutenant; surely with that experience he can get me by the checks." I imagine he wondered if I could be as dumb as the last student, and the same for the one following me, for there is no student that seems as hopeless to his instructor as a flight student. Well, we're off for further flight training, and after a few days of routine we like it, and find a lot of enjoyable leisure time besides.



North Island, San Diego, showing the navy hangars and planes. In the foreground are torpedo planes and at the background are fighting planes. The huge field extending into the background covers an area of approximately one and one-half square miles

The first swim in Santa Rosa Bay, after being assured that the sharks didn't come up in the shallow water, is well remembered. When returning to the shore from a sand bar, a 12 foot fish swished by, turned, and started back again. Lest a young aviator be "nipped in the bud" (or a more tender spot), I showed a spurt of speed that should bring offers of at least a board job and a place on most any varsity swimming team. When I quit puffing long enough to ask why everyone was jackknifed with laughter, I was informed that the fish was a playful porpoise and not only harmless but would have killed a shark, had there been one near. At the beach all students are required to stay and help stow away the planes at quitting time; thus if a student is late returning from a flight the entire group must wait for him. When he does return late, he is helped from the plane in no gentle manner by four selected huskies. Each one takes a limb and they carry him to the dock, swing him in hammock fashion and, with concentrated efforts, throw him as far as possible out in the briny brink. This lessens the temptation of the student to make a couple extra landings after his time is up



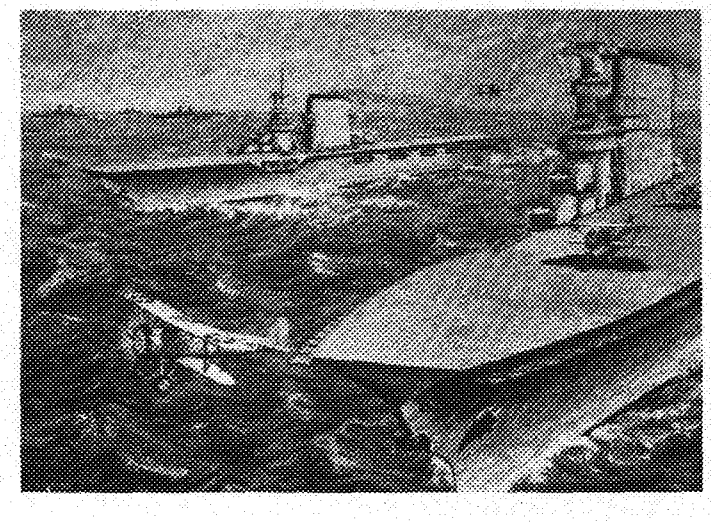
The ship in the lower left is the U.S.S. Saratoga. The plane is a Loening amphibian used as plane guard in carrier operation. The duty of this plane is to pick up the crew of any land planes which may be forced down on the water. The flag with two stars, which the plane is carrying, indicates that the admiral is aboard

and it is not long until things happen on schedule. The same cure is administered to individuals whose faults irritate others. This continues until the R.S.O.'s become one harmonious family of good fellows. A solo party to which all R.S.O.'s and officers are invited is given by each class when all of its members have soloed. Much "shinny" is usually dispensed with and a good time had by all. Water sports, tennis, football and baseball are all enjoyed to quite an extent. We have all heard of the Florida moon and its stimulating effects, but senoritas are made scarce by the abundance of men, and one is lucky when he can have the situation complete and give the moon a chance. My first date was slightly hindered by the uninvited mother who followed us out and made herself comfortable in the rear seat. I thought possibly she had known R.S.O. boys before, but found that it was just an old southern custom which fortunately was only followed by about 20 per cent of the mothers.

Flight checks are a constant worry to all as well as a doom to many. I believe 35 to 40 per cent usually "bust out." A student isn't allowed to see his grades and is led to believe he is just getting by. This is to avoid cockyness, since the cocky flyer is much more dangerous than the poor one. Of course some students get cocky anyway but soon end up before the "Crash Board" and get it all taken out of them. My final check lasted about 1½ hours. I did everything the check pilot asked for as well as I could have done in a dozen trys. He got out at the flight shack and waited till I had put the plane on the line and returned within hearing distance. From then on for the next 15 minutes I heard how "lowsy" I was. Not a single thing had been done correctly, and he didn't see how I could be around airplanes all this time without learning at least a few of the fundamentals of flying. By this time I had decided to go on a bumming trip before going home. On his way into the office he said, "Well, I guess I'll give you an 'up'. You tried hard anyway." That seems to be the procedure whether you are good or poor. Time went fast from then on, and soon came the opportunity that everyone waits for for about eight months, to get into one of those little whining fighters whose noisy dives have been sending tingles up and down their spines since the arrival at Pensacola. The thrill of stunting in a high powered fighting plane is one of the last to be lost to the experienced pilot, and is one that all pilots wish for, and should return to occasionally, to get that desire to stunt out of their system. All lest they forget themselves and start stunting a plane that wasn't built for stunting. Most students would just as soon miss the catapult shots. The first time it feels like your stomach is going through your backbone, but after the first few shots the thrill and the scare disappear.

In blind or instrument flying, you learn that you cannot believe your own senses, and that the instruments are always right. You would at times bet your last dime that the plane was tipped on its side when the instruments say level, but after a peep through the hood you find you're always wrong. Lack of belief in instruments has caused the death of many people. At present, however, all commercial transport pilots are well trained in instrument flying, and can fly through miles of dense fog without any difficulty. All flying being completed, a few days of "cramming" and writing eliminates the final exams; and the venerable admiral, with gold half way to his elbow, presents you with a pair of wings and you're ready for a year of active duty.

To me the year of active duty has been the most enjoyable and instructive year of my life. I was based at San Diego, California, and cruises for flight operations aboard the U.S.S. Saratoga provided interesting travel and experience. A few short trips were made up the Pacific coast. The main cruise was south. During this time I saw most of the country from Nicaragua to South America, some of the South Sea Islands and went through the Panama Canal to Haiti and Cuba. Plenty of time is allowed for fishing while in the South Seas, and an abundance of amberjack, yellow and red snappers, baracuda, and tunas, weighing from 50 to 100 pounds give plenty of amusement. Shark fishing can be done from the deck of the ship during any spare time at sea.



Photograph of a charcoal drawing showing the twin aircraft carriers, U.S.S. Saratoga and U.S.S. Lexington. The only difference between these two ships is that the Saratoga has a vertical black stripe on her stack and the Lexington a horizontal stripe. Each ship develops 215,000 horsepower, and is capable of a speed of 35 knots per hour

why not have

An Engineering College Afloat

on the mississippi?

Here is the story you have been waiting for, and if it doesn't stir your imagination, nothing will. If anyone cares to sponsor a movement to make the engineers' excursion a reality, they may depend upon the wholehearted support of Techno-Log

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Not very long ago, on a bright, beautiful, wintry morning, my car would not start. While knocking my head under the hood trying to discover what it was about the mechanism that wouldn't turn over at ten below zero, an idea struck me. Later, even after the car and my feet were thawed out, the idea still impressed me as good. I present it to you.

Immediately after the last football game in November—the day after Thanksgiving would do as well as any—let the faculty and students of the Engineering College, preceded by the University Band and the drum major, march in column of fours over to the municipal docks in St. Paul. Honestly, I don't believe it would be possible to gather together in this world a finer looking body of one thousand men. Even the freshmen in this college are handsome fellows. Well, as I was saying, let there be three large steamers waiting at the docks, with steam up. Let the corps immediately embark. Let the vans, containing books and other impedimenta, be immediately unloaded onto the steamers. Let the steamers immediately push off, and, after that walk, let us immediately have something to eat. And let it be understood by the wide world that the work of the Engineering College for the next few months would be done on these steamers, that the Engineering College would arrive in New Orleans at about the time of the Mardi Gras in February, and that it would then slowly steam back, reaching the Twin Cities in time for the opening of the baseball season.

I feel quite certain that if this proposition, whether to go to New Orleans or not, is presented to the student body, that body will be in favor of it. I do want to say that from an educational standpoint—and of course that is the angle from which I, as a faculty member, look at it—this excursion would be valuable. Here we are, on the banks of one of the great rivers of the world, of the great physical facts of the world, and how much do most of us know about it? Europeans rave about the Rhine and the Danube, Egyptians about the Nile, South Americans about the Amazon, and here we have at our feet a river which is the equal of any of them. Actually, I once knew a man from Poughkeepsie, New York, who would shed tears when he talked of the Hudson River flowing by that city. Now far be it from me to say anything against the Hudson River. It's a nice little stream, and it is a fact that the water is usually very clear. To tell the truth, it reminds me somewhat of the St. Croix. You know—where the St. Croix runs between those steep banks up near Taylor's Falls? But the Hudson compared with the Mississippi — — —

I have said that the Mississippi is a great physical fact. I can go further and say it may be regarded as the greatest physical fact in the history of this country. For generations it was the fact controlling the policy of this and other nations who were interested in this continent. France sent La Salle to discover the Mississippi and claim the country is drained in the name of Louis XIV, which La Salle loyally did. The constant effort of the United States, after the Revolutionary War, was to control and absorb the Mississippi basin. Thus every mile of the river has its background of historical events and personages.

The Engineering College on its excursion would pass the mouth of the Illinois River, out of which La Salle and his men paddled in February, 1682, on their way to the mouth of the great stream. We would reach the mouth of the Missouri, up which the Lewis and Clark expedition moved in 1804 to open up the northwest. We would pass St. Louis, and its levee, prior to the Civil War a lively spot, with scores of steamboats always moored there. On past the mouth of the yellow Ohio at Cairo, Illinois, and on into the South. The famous old river towns remain: Memphis, Vicksburg, Natchez, and others. The community, Natchez-under-the-Hill, is said to have been at one time the toughest and most sinful spot in this country. But it is gone, so there would be no use getting off the boats there. And so on to New Orleans and the Mardi Gras. The history of the United States lies in the past of the Mississippi.

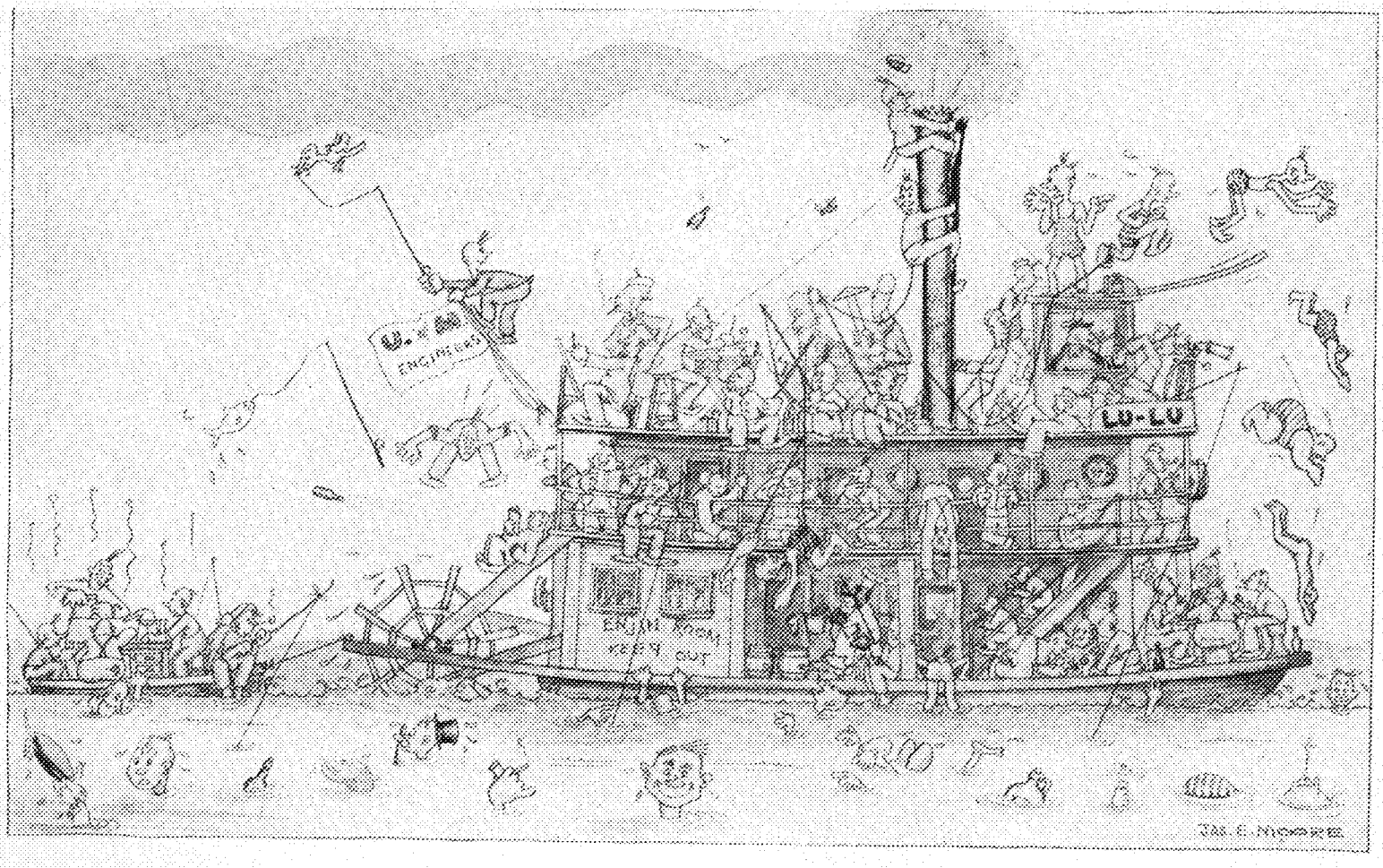
Yes, it is astonishing that so little is known today by most Americans of this tremendous river. Not only are people apparently indifferent to its glamorous and significant past, and to the possibilities of its future, but also to its present picturesqueness. Yet within a day's drive of the Twin Cities there is abundant proof of its beauty. The drive along the Minnesota shore from La Crosse to Hastings is something to remember. Lake Pepin, with its small towns on both shores, the bluffs which face it, and the winding roads and narrow valleys leading in between the hills and away from the river, certainly offers opportunities for driving and walking which would be hard to equal. The quiet and isolation of some of the little river towns is surprising to one who spends his days dodging annihilation in a city.

Last September I drove up along the Mississippi from St. Louis, holding as close to the river's edge as I could. There is nearly always a dirt road to be found within sight of the water, and if a man is not afraid of getting a little dust in his eye or picking up a nail occasionally, he will enjoy these quiet highways. Crossing the river some miles north of Quincy, Illinois, I saw the oldest ferry boat in existence. This craft daily struggled to and fro between two small towns on opposite banks. I would say that this boat operated during the Civil War, except for the fact that gas engines were not in use in 1861, and the ferry was certainly driven by a gas engine because no other form of propulsion could have raised such a row. But the trip was worth taking. The water was clear and deep, the day cool and bright, the two villages half hidden among the trees, and traveling at a speed of one mile per hour there was plenty of time to enjoy the scenery.

There is another spot along the river I would like to urge everyone to visit at least once in a busy life. That is Mark Twain's statue in Riverview Park, just north of Hannibal, Missouri. Though it was a fine day when I drove in not a soul was in the park, not a boat of any kind was to be seen on the river. I remained some time, partly because a tire got flat at this point. At the crest of a great bluff is Mark Twain in bronze, standing erect and looking out over the Mississippi. Just here the river makes a right angle turn, coming down from the north and flowing eastward. To the east it runs straight, but to the north it is a sight to behold. It curves, broadens and narrows, and presents a panorama of bayous and backwaters, sandbars and wooded islands. On the other side of the water stretches the farming country of Illinois to a low range of hills miles away. This is a great reminder of a great man. I imagine that if Mark Twain could return, and look from this spot as he probably did in his boyhood, he would be most impressed by the loneliness of the scene and the old river. Possibly if the statue had spoken while I was there it would have remarked that though steamboat travel in the old days had its drawbacks no steamboat was ever known to get a flat tire.

One thing more. The future economic history of the United States lies with the Mississippi and its valley. Here is the young engineer's opportunity. With the more intensive development of the Mississippi basin there will be much engineering along the river and its tributaries: erection of dams, development of water power, flood control, widening and deepening of river channels, creation of transportation facilities, and a multitude of other related engineering activities. These things are coming. All the nations of the world are today striving to make themselves self-contained, attempting to direct their energies towards internal development and improvement. This country is beginning to do the same. It is inevitable that the Mississippi and the surface it drains, a tremendous part of the United States, must be affected. Perhaps if the millions of dollars which have been spent at random here and there had been concentrated on a national project to bring the Mississippi back to its former place and significance the country as a whole would have derived more benefit.

Well, boys, don't forget the old river. A little thought and study spent on it will not be wasted, for your future is bound up very intimately with it, whether you realize it or not. And if you hear of anyone who has three large steamboats to sell, cheap, give me a ring.



The Industrial Engineer

co-ordinates modern plant operations

By GUY B ARTHUR, Eng. Bus. '32

Continuing a series begun in an earlier isssue, the Techno-Log presents this article on Industrial Engineering. No attempt is made by the author of this article to completely cover the entire scope of the field. He merely gives us some of his personal experiences which are typical of the profession. The author, Mr. Arthur, is associated with Majestic's tube manufacturing plant in Chicago

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Not so many years ago there arose from somewhere a group of men who called themselves efficiency engineers. It is pathetic to note that these individuals did their work so poorly that the name "efficiency engineer" has caused a shudder in certain quarters ever since. Many years prior to the arrival of these so-called engineers a man by the name of F. W. Taylor had founded a movement which he called "Scientific Management," and it was work of this nature which the efficiency men tried to exploit. Today that work is being carried on largely by two hundred registered firms and an unknown number of individual plant industrial engineers.

A firm of industrial engineers shows a profit, even in these trying times, by making industrial analyses which include control of the following divisions: managerial, personnel, accounting, financial, production, sales, technical, and market. They will, for instance, make a survey which will show exactly where a concern's market is located and how it should be reached, or they will completely reorganize a company from the foremost supervisor on down through all departments. They are called upon for advice in designing new products as well as means of balancing a stubborn budget. It is becoming quite customary for the manufacturing organizations to have an industrial engineering firm determine the location for their new plant. That gives some idea of what an industrial engineering firm does. You may wonder how the engineer justifies himself in such a world.

Let me take you on a two hour trip through a radio tube manufacturing plant employing about fifteen hundred people, so that you may witness the work which the industrial engineering division is carrying on. We will start in the planning department which schedules all of the work for the plant. We learn that this department was instigated by the industrial engineers to eliminate waiting time, thereby saving about five hundred man-hours per day. This department is the beginning of a complete production control system which will be installed in the plant step by step. Notice in the corner of the office a pedal arrangement which was designed to determine the leg fatigue of various pedal operated machines in the plant, so as to eliminate undesirable systems in use.

In the next room we notice winding machines whose operators are benefitted by a new pedal arrangement. These winding machines, incidentally, were redesigned to avoid their ever-common breakdowns. A new type of clutch and a different bearing performed the trick. Now each winding machine operator, as a result of a motion study which eliminated all the unnecessary motions and combined the tasks in the most efficient manner, is doing the work formerly done by three operators.

You will notice a newness about this room which is the result of a new department layout made by the engineers to obtain the most satisfactory arrangement of lines, coating machines, spray booths, winding machines, and scrapers. A new layout for this entire plant is being worked out so the materials will flow in a direct line from one end to the other. In this way all back-tracking of materials—raw, fabricated, or finished—will be eliminated and a smooth, steady assembly will result. Plant layout is one of the fundamentals of scientific management and is usually one of the first studies which the engineers makes on entering a new plant or department.

To the right are spray booths in which ninety per cent of the solution is wasted and if you are alert you will wonder about such a noticeable loss. However, the engineer sent samples of this dried solution to the company chemist for an analysis to determine the cost of salvaging. According to figures it was proven unprofitable to attempt saving the excess solution. The elimination of waste in the average plant is a huge helping for the best engineer.

Do you see the metal racks that girl is carrying into the booth? The use of those racks is saving approximately fifty man-hours per day and very clearly illustrates improvements in the handling of material—something the engineer is always looking for. In the future those racks will not be carried but will travel into and from the booths on a small belt conveyor. Every handling job in the plant is being studied to determine the fastest and best manner of moving materials. This involves the design of new trucks, conveyors, and elevators, to say nothing of new racks, trays, and other devices for safely holding the materials while enroute.

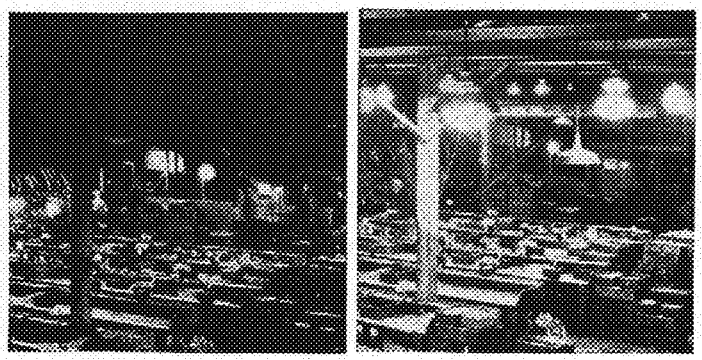
Take a look at the windows in this room and you will agree that there are a sufficient number of them to give adequate natural illumination. To be technical, the glass area is over thirty per cent of the floor area of this room and therefore sufficient. Innumerable studies have been made to determine the best methods of designing buildings for natural light, and the results of these studies have been made available so that guesswork can be eliminated entirely. Nat-

ural lighting varies, however, between such wide ranges, due to clouds and varying intensities at different times of the year, that it cannot be relied upon entirely. It has been suggested that all the windows in this plant be washed every four months because vertical windows lose fifty per cent of their efficiency through a six-month accumulation of dirt.

Notice next that the walls and the ceiling are painted white because this particular color has a high reflection factor and a low absorption factor. Both of these qualities are quite essential to either natural or artificial illumination. Man-made lighting consists of R. L. M. (Reflector and Lamp Manufacturers) standard domes with inside-frosted lamps mounted ten feet above the floor and twelve feet on center with the coefficient of utilization being 0.57. This general lighting is supplemented by local lighting where the nature of the operations warrants it.

A criticism of this system would be that those lights farthest from the windows cannot be turned on before those nearer the stream of daylight. It is now possible to mount photoelectric cells near the source of natural light so that as the daylight decreases the artificial lighting will turn on automatically. This innovation, called illumination control, has but recently been accepted by any manufacturers and is quite valuable when one knows that a bright day has approximately 10,000 foot-candles, while measurements prove that our most brightly lighted room has only twenty-one foot-candles unless we resort to local lighting, which will give us up to one hundred.

To relieve the imagination a second it will be well to note the difference between correct and incorrect lighting as shown in the accompanying illustrations, and then to realize that an increase in production as high as twenty-five per cent has been obtained by installing new systems of illumination as determined by a scientific study of the conditions. Allowances must be made for dirt accumulation, absorption, type of work, coefficient of utilization, and the depreciation factor. Indirect or semi-indirect lighting has many advantages and although more expensive its value far surpasses the cost, and especially, in a plant where fine work is being done. There must not be light and dark areas in the same room because a readjustment of the eye is then necessary every time an operator looks up from his work. Also it is interesting to note that the time of perception increases directly as the intensity of illumination.



(Cuts Courtesy General Electric Company)

One of the duties of the Industrial Engineer is to study the lighting of buildings. The photograph on the left shows a room in a textile factory before proper lighting was installed and the one on the right shows the same room after the installation

On leaving this room it might be well to mention that, due to the type of manufacturing in which we are involved, it is necessary to keep at a constant level both the humidity and the temperature. This is one phase of the work with which we have had no trouble up to the present, since the heating and ventilating engineers did a good job when they installed the system. Working conditions here are very good since dirt of any kind cannot be tolerated; the air must be pure; and the noise level, which is high in most plants, is being cut down in an attempt to increase production. Since we have various uses of power in the plant it has been essential that we make detailed studies before proceeding with any changes in layout or production methods.

Arriving at the fabricated parts stock room, one of the first things we notice is a large board covered with small holes, some of them filled with small colored pegs. This is called the production control board. It shows how long each line will run without further stocking as well as those lines in danger of running out of material later in the day unless more stock is made up or drawn from raw material stores as the case may be. Also on that specially constructed table a Kardex file will show at any minute of the day just which items are running close to the minimum ordering quantity. A system very similar to this is kept in the raw material stockroom. The production control board and the perpetual inventory are further evidences of the competent production control system which is being installed. Production control is another fundamental of scientific management and its value cannot be overestimated. Interchangeable steel bins are used for the storing of both raw and fabricated stocks.

Leaving the stock room we come upon a single line set at a distance from the rest. This is an experimental line operated by the industrial engineering division. When a new system of production is worked out it is tried here before being placed in the lines. The results of motion studies as well as sub-assemblies which the engineers decide should be divorced from the line can be checked here. In this way unproductive methods are eliminated without disrupting the whole plant. To our right are a series of ovens which heat-treat all parts before they are assembled. The type of oven and methods of operation have been determined by the engineering department. It is thought advisable, if production warrants, to have the parts run through these successive heating and cooling processes on a small conveyor. Next is the stem department. Much time is now being devoted to improve the flare and stem machines. We know already that twenty-four head equipment will materially quicken production but the cash outlay will not permit introduction of such equipment at this time. Going across to the assembly lines where motion studies, illumination studies, and fatigue studies have been made, we see the sealax and exhaust department. Here the machine capacity is the big factor in setting production schedules and temporarily this information has been obtained from past records.

In the future, motion studies will be made in this department as well as in the basing, ageing, testing, and shipping departments to eliminate guesswork and to speed up production. Next we see the very unique operation of spraying

metal, which was installed to cut down on manufacturing costs. The glass first goes through a sand blasting operation to roughen the surface. Then, under heat, molten zinc or copper is sprayed on to form the shield. All of this equipment can be made continuous and automatic for any production that is desired.

Time studies and the resultant setting of rates, which ordinarily come under the wing of industrial engineering are performed in this plant by a separate and distinct department. It is not unusual, however, for the time study department to consult the engineers regarding new rates or changes in standing rates.

Now we go through the parts department where we observe a number of small jigs, fixtures, and assembling machines. This is another important phase of the work here since it means taking slow and inaccurate hand-assemblies out of the lines and placing them in a separate department where quantity production of individual parts can be performed. All equipment of this nature is tested on the experimental line before being given to the parts department.

Our two hours are up and I must get to work, and so we must end our imaginary visit through the radio tube manufacturing plant. This is one of a thousand different types of manufacturing which the industrial engineer can materially improve through the application of scientific management principles. It is safe to say that in the next few years all manufacturers will more closely apply these principles to their work and the services of trained industrial engineers will be in demand. The reason I feel secure in making such a statement is that when applied these principles give but one result, namely: increased production at a lower cost—to say nothing of the benefits to labor of increased wages and improved working conditions.

More than in other fields of engineering, the training which the industrial engineer receives well qualifies him for executive positions. The business side of life which the majority of men are confronted with sooner or later cannot be underestimated, especially when one realizes that about eighty per cent of all engineers are concerned with the manufacture of some product.

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chemists carry on

Numerous Research Studies

in several fields

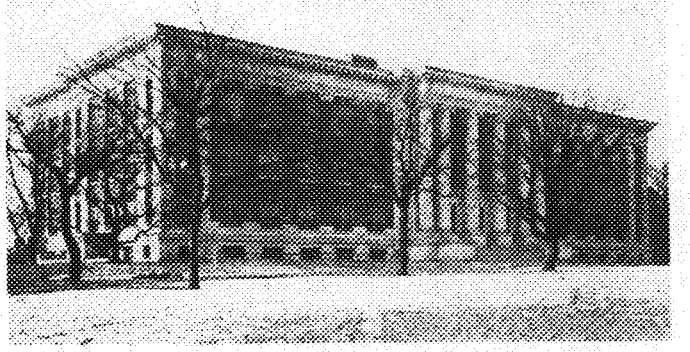
An unusual experiment is being carried on in the laboratory of Dr. F. H. MacDougall, head of the department of Physical Chemistry, by Dr. C. P. Roe, Fluid Research Fellow. This is the second year of Dr. Roe's research on the problem of determining the vapor density of acetic acid. A very complicated apparatus has been set up, involving a great deal of glass-blowing and intricate construction.

The Analytical Chemistry department, under Dr. I. M. Kolthoff, is now concentrating on problems with regard to the formation and properties of precipitates and problems of co-precipitation, especially the structural changes in freshly formed precipitates upon aging and upon heating. In recent and as yet unpublished experiments, it has been found that freshly precipitated lead sulfate, at room temperatures, is nicely crystalline under a microscope; still, its measurements with Thorium B as a radioactive indicator, has shown that the heavy crystals, immediately after they are formed, exist entirely out of surface; therefore, they must have an extremely porous and spongy structure. Upon aging, in contact with a super-natant liquid, the total surface of the crystals decreases rapidly; whereas, the appearance of the crystals under a microscope does not change. Oddly enough, it has been found that the addition of a little dye prevents aging and holds the structure intact. These experiments have been carried out chiefly by Dr. Charles Rosenblum. Other studies are being made on the absorbent properties of crystalline precipitates.

Extensive studies are being made in the department of Chemical Engineering under the direction of Dr. R. E. Montonna, on the properties and uses of cellulose and its derivatives. An interesting research on the utilization of the aspen, which predominates in the second growth timber of this section, for the production of alpha-cellulose, may lead to a new source of this rayon material and an added revenue to the farmers for a now useless by-product. The fibers of the aspen are too short for the usual wood-pulp uses. Dr. Montonna is working on this with Dr. L. W. Cornell.

Julius Katz is studying the theory of reaction and new methods of preparation of cellulose benzoate with the idea of improving the methods of production and utilization.

The effect of light on cellulose and its products is also being studied by Dr. Montonna, assisted in part by W. J.



The School of Chemistry

Mitchell, with the ultimate object of explaining such things as the failure of lacquer films, the discoloration of celluloid, and the deterioration of paper and textiles. A fundamental study on the effect of water on cellulose is being conducted by Dr. L. H. Ryerson and L. D. Schmidt, and it is hoped it will lead to a better understanding of what happens in a paper-mill beater. The exact nature of the physical and chemical changes which take place during the beating operation is at present unknown.

Another subject of great interest to the paper industry of the state is that of waste in the sulfite liquor. Fifty per cent of the weight of wood going into the mill is carried out as a solid material, known as lignen, in the dissolving liquid. A recovery of even a part of this large waste would be very profitable to the paper manufacturers. Lignen, however, is an organic material and is very hard to work with. Robert McAdam is aiding in the experiments being made on this problem.

Studies of plating from non-aqueous solvents are being made by Dr. C. A. Mann and John L. Beal. Dr. Mann is also studying the electro-oxidation of tolulene, and the electro-chemical reduction of nitro cyeme, the latter with Dr. M. G. Larian. Dr. G. H. Montillon is investigating the use of new plating baths, aided by Donald Gernes, and the plating of tri-metallic alloys, with Charles Faust.

Fundamental studies on the theories underlying some of the unit operations of chemical engineering are now in progress. In heat transfer, studies of steam film coefficients are being carried on by Dr. Montillon, assisted by J. F. Jurgenson and G. S. Michaelson. Dr. Montillon is also studying the rate of growth of crystals, assisted by Donald Gernes. Dr. B. F. Ruth is taking up filtration, with Lloyd Kempe concentrating particularly on continuous filtration on an Oliver filter.

Engineering Professors Give 1934 Sigma Xi Lectures

By ARNOLD COHEN

Engineering and the Social Order" was the topic selected by Sigma Xi, honorary scientific society, for its 1934 lecture series. The lectures were presented in Northrop Memorial Auditorium on four successive Friday evenings, January 26 to February 16, inclusive, and featured as speakers Professor W. T. Ryan, Charles A. Koepke, Alvin S. Cutler, and Henry E. Hartig, all of the College of Engineering. Motion pictures, slides, and demonstrations were a part of each lecture.

Professor Ryan, of the electrical engineering department, in opening the series with a discussion of "Power," sketched the historical development of the use of power by man, described the present wide use of power, and forecast some future possibilities, both in the field of utility management and control, and in the development of sources of power unused at present. As an example of the latter, the speaker described a method of obtaining power from the wind, explained in the January, 1932, issue of the Techno-Log by Professor John D. Akerman of the aeronautical engineering department.

Speaking of various plans of utility control, Professor Ryan asserted, "Personally, I feel that the eventual solution will be a combination of government and private ownership and operation, with the government and the private utilities co-operating and interchanging power instead of fighting each other. In any case, there must be unprejudiced consideration of this subject."

Professor Koepke, of the mechanical engineering department, the second speaker of the series, titled his talk "Production." Splitting the science of production into nine factors, he proceeded to point out that seven of these had already been developed either up to or beyond their limits of usefulness, while only two factors were capable of indefinite expansion.

The factors, he said, which have been pushed to their useful limits are: quality of cutting tool material, precision of physical measurements, limits of broad or of specialized fields, division of labor, size of the manufacturing unit, geographical location, and the scientific organization of the plant. The remaining two factors, capable of expansion, are materials and methods of production.

In connection with materials, Professor Koepke emphasized the growing tendency toward substitution of synthetic products for natural raw materials, particularly in the field of plastics. To illustrate changes in methods of production and to show the absurdity of restraining mechanization, the speaker displayed a number of cleverly prepared slides, which contained such farces as an "83-man peanut cracker," and a "four-man grasscutter."

On February 9, Professor Cutler, of the railway engineering department, delivered the third Sigma Xi lecture, the theme of his address being "Transportation." Although dwelling mainly on the railroads, the discussion did not fail to include other means of transit, such as motor busses and trucks, waterways, and even pipelines. The professor discussed among other things, various types of equipment, interesting new developments, and some proposed plans for the regulation of transportation.

Dr. Hartig, associate professor of telephone and telegraph engineering, fourth and last speaker in the series, lectured on "Communication" the evening of February 16. Tracing the historical development of the art of communication up to the present time, Professor Hartig led his speech into a non-technical discussion of interesting new developments in the field, and then provided his audience with an entertaining demonstration of some new ideas in communication and the uses to which they are put.

Among the several devices and phenomena demonstrated were the Rochelle salt crystal lapel microphone used in each of the Sigma Xi lectures this year, the loudspeakers used in talking movies, the practical separation of the high and low frequency components of speech and music and the auditory effect of their separation, the production of pure tones, the transmission of speech and music over a light beam, and the tuning of these light beam carriers by means of color filters. Slides depicted progress in picture transmission, and growth in world communication systems.

THE MINNESOTA
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UNIVERSITY OF MINNESOTA

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Our Progress Report

The plan for the improvement of student-faculty relations as advocated in the January Techno-Log will be in actual operation in several departments of the college before the passing of another month. The Civil Engineering department has a plan under consideration which, although it varies in details, is substantially that of the original Techno-Log suggestion. A similar system is being considered by the English department, and will probably be put into action within a very short time. Individual instructors in the other departments will no doubt use the method independent of department action.

In order to obtain the opinions of representative members of the faculty regarding the offering of suggestions by students, the heads of some of the departments of the college have been interviewed and their statements follow.

* * * *

With a constructive, co-operative attitude on the part of the students and instructors, the suggested plan might produce an atmosphere of mutual understanding which would result in increased confidence in the fairness and helpfulness of the teacher and an appreciation of the earnestness and the difficulties of the student.

—Ora Miner Leland, Dean

* * * *

Courses can be improved, and this is one way of doing it.

—J. M. Bryant,
Professor and Head of the Department of Electric Engineering

The Civil Engineering Department has this plan under consideration and an opportunity for the expression of student opinion will soon be offered. It is my belief that every teacher should at all times be willing to entertain any constructive suggestion from any student. In other words, this plan should be in continuous operation.

—Frederic Bass,
Professor and Chairman of the Department of Civil Engineering

* * * *

I am open to any suggestions students want to make at any time, and I am glad to be of service in assisting students to do their work and also to aid them in learning how to work.

—William E. Brooke,
Professor and Head of the Department of Mathematics and Mechanics

* * * *

If administered in the right spirit on the part of both students and faculty, I can see where it might accomplish much good. As far as the administration is concerned, the more simple the organization and the fewer the rules and regulations the better.

—William H. Kirchner,
Professor and Head of the Department of Drawing and Descriptive Geometry

* * * *

We are glad to have suggestions from students in regard to any phase of our work. The plan you suggest may prove valuable. It is worth a trial.

—H. C. Richardson,
Assistant Professor of English,
Head of Engineering English Department

* * * *

I do not think there is any instructor who does not want to receive any constructive suggestions from any member of his class. Such suggestions would be very helpful.

—Frederick M. Mann,
Professor and Head of the School of Architecture

The foregoing statements are evidence that the plan meets with the aproval of a representative group of faculty members. However, in giving these statements, several of these men have offered suggestions for improving the operation of the plan. The most outstanding difficulty appears to be the matter of signing the suggestions which are handed in. When an engineer is asked to express his opinion, he is naturally expected to sign his name to the statement. If anyone has a really constructive suggestion he should not hesitate to have his indentity known. However, there is some chance that the instructor's feelings will be hurt or that he may be subconsciously prejudiced against a particular student because of more or less revolutionary suggestions. To eliminate all of the evils arising from the identity of the student being known by the professor, the following suggestion is offered—particular to the members of the Technical Commission.

Let the Technical Commission—which has very few duties until the spring of the year—take upon itself the added responsibility of administering this improvement plan. Signed suggestions would be received from students of the entire college by the Commission, who would file the signed state-

ments and from them compile groups of suggestions to present to the individual instructors. The result of such a system would be that the student would be responsible for statements made, but the instructor would never have a chance to identify any student with a particular suggestion. By undertaking such a program as this, the Technical Commission might make itself a permanently useful and worthwhile body.

The Tech Frolic

The biggest engineering social event last year was the Tech Frolic. Anyone who attended that party will agree with that statement. This year there will be another Tech Frolic and judging from what information has leaked out, it will be even a bigger event than last year. The date has been tentatively set for the second Friday of the spring quarter, and arrangements are already being made for the place and orchestra. It is rumored that the same depression price of one dollar a couple which existed last year will be charged this year. Better start putting away a nickle a week, so you won't be short when the time comes around.

Production Is Under Way

ENARCH needs you—You, *You*, and YOU. The nucleus of the group is already organized and actively functioning. A play is now being written and will be completed within a week. Fifteen men have signified their interest in organizing an orchestra—as many more are needed. Thursday, February 29, the script will be completed and casting will be started immediately. It is then that Enarch will need the support of every engineer. A good cast can only be chosen from a large group of applications. At the same time that roles for the play are cast, orchestral tryouts will be held, and the orchestra chosen.

Now a little inside dope on the play itself—Permission has been obtained from the artist and the newspapers to use the characters and story of the Popeye cartoons. This idea is being used in preparing the script and will be followed in costuming, staging, and music. The production will be a riot of laughter from the first curtain to the finale. The speaking lines will be interspersed with musical and dancing numbers. This article is not intended to be advertising publicity for the play. Our intention is to interest you engineers in joining Enarch and doing your part to make this first production a success.

If you have ever acted any type of part in a play, if you can play any musical instrument, if you have had any singing experience, if you can impersonate May West, if you have ever had any stage experience, or if you would like to try your hand at any of these, line up with Enarch and do your part to make engineering dramatics worth while. Drop in at the Techno-Log office and leave your name with anyone who is there, or see Herb Jensen at the Engineers Bookstore.

Dean Leland's Pen

Drawing . . . A Language

The importance of drawing, in the training of the young engineer, is frequently overlooked. It is easy to understand how weak an architect would be if he could not express his ideas in an attractive manner on the drafting table, but the fact that engineering drawings are not required to be so artistic, as a general thing, leads many to the careless assumption that drawing for engineers is incidental rather than essential.

It is universally accepted that the engineering student, upon graduation, must be equipped with a certain amount of skill, along with his mental ability, as a result of his college course. In other words, he must be able to earn his pay on his first job. Generally, if he is in an engineering position, this work will involve actual drafting as well as the use and interpretation of drawings.

To be effective, drawings must be clear, accurate, and neat. If there is any one part of the process, however, which is particularly essential, it is the lettering, including the figures. Hence, it follows that the student who does very good lettering on his drawings has a definite advantage over those who are careless or who lack this ability.

The question naturally arises, how can skill in freehand lettering be developed by the student? The answer is, first, by learning a few rules and the characteristics of the separate letters and figures, and second, by practice. Examples of these rules are: Heights must be uniform. Horizontal lines must be accurately horizontal. Upright lines, whether in vertical or inclined lettering, must be parallel. The upper parts of such letters as B, E, and S, must be smaller than the lower portions. Much practice is needed to become so proficient that lettering may be executed satisfactorily without effort. For the student, this is obtained by using spare moments with pen or pencil and the usual class-room notebook, lettering headings, dates, names, etc., and by lettering with as much care as time permits on reports, themes, sketches, etc.; that is, by lettering whenever convenient and on various kinds of work. Recording dictated data rapidly, in the laboratory or field, furnishes excellent lettering practice.

The comment is sometimes heard, that the good draftsman is kept at the drawing board while other men are shifted around to a variety of work and so obtain more experience. But the general principle holds, that the man who attracts attention by his outstanding ability in any phase of his duties thereby rises above the crowd and is in line for special assignment. He becomes a member of a smaller, more select, group, which means promotion.

—*O. M. Leland.*

Minnesota
return to faculty

Henry E. Hartig

This is the third of the series of faculty alumni sketches being presented to acquaint engineers with those faculty members who are graduates of the college. In this issue the departments of Electrical and Civil Engineering are being covered.

Henry E. Hartig

A man of varied knowledge and experience is Dr. Henry E. Hartig, associate professor of telephone and telegraph engineering. His junior year at the University was interrupted by the war, but after serving in the 2nd Minnesota Field Artillery and the Signal Corps, he returned to school to get his bachelor's degree in electrical engineering. Soon after graduation he went to New York as a telegraph engineer for the American Telephone and Telegraph Company. He had been there long enough to do some development work on telegraph for small gage cable and to be married when an offer from the drawing department, together with the industrial confusion in the East, drew him back to Minnesota in 1919. In 1922 he transferred to the department of mathematics where he and Professor Dalaker compiled our well known calculus text. He came to the electrical engineering department in 1928 and has been teaching there since. He is director of the graduate student work, and at present, has seven students under his supervision. Doctor Hartig is a resident of Robbinsdale and is very much interested in the civic activities of that town. He has served as trustee on the village council for four years and is president of the school board. He is enthusiastic about American Legion work and is proud of the community projects sponsored by the Robbinsdale post.

William T. Ryan

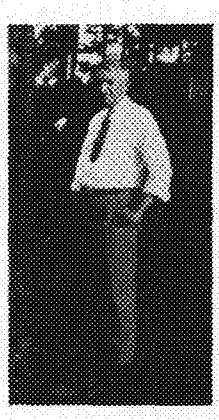
William T. Ryan, professor of electrical power in electrical engineering and first Sigma Xi lecturer for this year, was the third man to be added to the staff of his department. His first year after graduation was spent in Pittsburgh with the Westinghouse Manufacturing Company as a cadet engineer. He was then sent to Salt Lake City where he was made sales engineer. In 1907 he joined the faculty of the E. E. department. At that time, the late Professors Shephardson and Springer made up the staff.

Besides his class room work, Professor Ryan has found time for a great deal of outside activities. When the War boosted the price of copper, he was one of the first to investigate the properties of iron wire for high voltage transmission. He is an advisor to the engineering department of the Minnesota Tax Commission on the valuation of electric light and power properties in Minnesota and has taken a great interest in the various engineering societies, both local and national. He has twice been chairman of the Minnesota section of A. I. E. E., and in 1927 was vice-president of the parent society. In 1925 he was president of the Minneapolis Engineers' Club, and in 1929 he held the same office in the Minnesota Federation of Architectural and Engineering Societies. His favorite sport is golf, but he likes baseball and football via the newspaper and the grandstand.

Fred C. Lang

Fred C. Lang, associate professor of highway engineering, and engineer of tests and inspection for the Minnesota Highway Department, received a degree of civil engineering at Minnesota in 1908. For two years after his graduation he served as instrument man in the United States Reclamation Service. This was followed by five years as city engineer of Chisholm, Minnesota. Four more years were divided between highway contracting and construction, and work in Chicago and Cincinnati plants devoted to creosote treatment of wood paving blocks. Professor Lang came to the University in 1918 and at the same time accepted his position with the State. He now has charge of highway courses in the civil engineering department and of materials, inspection, and research for the highway department. Mr. Lang is active in committee work with the American Society for Testing Materials, the American Association of State Highway Officials, and the Highway Research Board.

Alvin S. Cutler



The civil engineering department has a man that knows railroading from the bottom up in Alvin S. Cutler, professor of railway engineering. His first experiences in the field were with bridge construction work just before he entered Minnesota in 1901. At the end of his sophomore year, he took an educational time out to work as instrument man and draftsman for the New York Central and to take part in a grade revision project on the M. & St. L. After two years, he returned to school and obtained his civil engineering degree in 1905. Graduation brought a position in the chief engineer's office of the Erie line, followed by rate adjustment work with the M. & St. L. In 1907 Professor Cutler began teaching railway engineering at Minnesota. While holding this position, he has done a great deal of special work for various railroads, including location, line survey, cost valuation, grade changes, and terminal layouts. Mr. Cutler is a member of the American Society of Civil Engineers, the American Railway Engineering Association and the Minneapolis Engineers Club. He also belongs to Tau Beta Pi, Sigma Xi, and Theta Xi. He is a faculty member of the Techno-Log board and is an ardent supporter of the magazine.

Graduates and work afield

Elmer W. Johnson

Elmer W. Johnson, associate professor of power and illumination, got his first job after graduation with the Westinghouse Manufacturing Company, spending a short time in their general engineering department on electric railway work. In 1917 he came back to Minnesota to accept a position with Northern States Power Company but soon went to war under the banner of the 33rd Company of Engineers. During fourteen months overseas, he did a great deal of electrical construction work in the port of Brest, France. While there, he was granted a four months' leave to study at the University of Paris. After the war he came back to N. S. P. for a time and then went west to work on substation maintenance for the Milwaukee electrified railway. After six months in Montana he joined the mathematics and mechanics faculty at Minnesota and taught "nearly every course they had." He then came to the electrical department and became an authority on illumination and power. Professor Johnson is an active member of the Illuminating Engineers' Society and the A. S. P. E. E. He has been faculty advisor for Tau Beta Pi for nearly ten years. Besides his B. S. degree which he received in 1914, he holds degrees in both electrical and mechanical engineering. He is joint author with Professor Bryant of a text on alternating currents which has already been published in part and will be completed this summer.

Gayle Priester, M. E. '33, says it's easy to tell the graduate students from the under-graduates at Harvard because the under-graduates all wear old clothes to school but the graduates dress up to look distinguished. Everyone wears full dress including toppers to the parties there at Boston. Boston is quite a theatrical town; in fact it has more legitimate stage than any other city in the country. All the new plays are put on there first to sort of test them before going to the larger cities. Apparently the Boston folks are good critics. There are many Grand Operas also. To complete with the stages, the "talkies" show two features every evening. Gayle says it's quite a problem for a bunch of fellows to decide what show to go to. One theater seems to have a good program but one of the bunch has seen "Love in the Dark" so they go to the next—then another pipes up, "I've seen that feature." Sometimes it's impossible to find a show where no one has seen either of the features.

Gayle, who graduated from our College of Engineering last spring is attending Harvard on a scholarship. He is taking a combined course in air conditioning and public health. He wrote that he is "rooming with law students, dining with business students, in laboratory with dentists, taking two medical courses, and studying for a master's degree in engineering." How's that for variety?

Tom Rogers, M. E. '33, business manager of the Techno-Log last year, is now a student engineer for the General Electric Company at Schenectady, N. Y. He will go through the one-year training course G. E. gives all their new engineers, but Tom intends to specialize in advertising. We feel sure he will make a success of it. He was one of the best business managers the Techno-Log ever had. After graduating from engineering last spring he entered the business school in the fall and was appointed business manager of the Ski-U-Mah. In this position he doubled the circulation and secured more ads for Ski-U-Mah than that publication has enjoyed for some time.

We believe we can safely say, without trying to flatter ourselves, that Tom's appointment with G. E. is proof of the great value of work in extra curricular activities at school.

* * * *

Willis Smith, M. E. '32, is a personnel efficiency man for Sears, Roebuck. That means he has to check up on the help and see that they are doing good work. If you get a job at Sears, it might pay to get in good with Willis.

Vern G. Rollins, M. E. '29, sent us the following letter:

"I am still with the National Advisory Committee for Aeronautics at Langley Field, in the aircraft power plants division. We have just started construction on a new $115,000 dynamometer laboratory which will be completed in ten months. I have just finished an interesting research on "The Effect of Cylinder Deflectors on the Reduction of Cylinder Temperatures." The work is very interesting but it would be much nicer were I located in "good ol' Minn". Got back home this summer, the first time in two years. I flew to Chicago in a small low-wing monoplane with the pilot and builder. We made the trip in one day with only three stops for gas. The chutes were a great comfort when flying over the mountains. I met my two brothers, Harvey, M. E. '33, and Lawrence, C. E. '36, and spent two days visiting the fair. From there we drove to Duluth, where I visited my parents. On the way back, I visited the campus to renew acquaintances. We drove on back to Chicago where I met my friend and we flew back to Langley Field. The cost of the round trip including gas and oil was less than twenty dollars. Try and duplicate it with a car at the same cost."

* * * *

A little late—but good:

"Gentlemen:

"I offer the following item for your publication.

"Minnesota engineers of 1929 report a Christmas reunion at the apartments of Smilow, Hakenjos, and Reed, all Washington, D. C. Frank Freeman, Bill Norley, Leo Smilow, Gordon Reed, M. E., Erling Saxhaug, E. E., and Fred Hakenjos, Arch., answered the roll call.

"The wives and kiddies of Smilow, Hakenjos and Reed participated. The wives, etc., of the others did not, because there ain't any as yet.

"Christmas carols by the kiddies (Ann Hakenjos—17 mo., Joel Smilow—8 mo., and Ella Reed—5 wks.) along with ye old Norwegian dialect stories by Freeman, Norley and Saxhaug (Sax for short) constituted the major items of entertainment." (Self-appointed reporter, L. Smilow.)

* * * *

Jack Crimmins, Arch. '30, of Minneapolis is a real estate appraiser.

The Architects' Corner

By THOMAS TUDOR

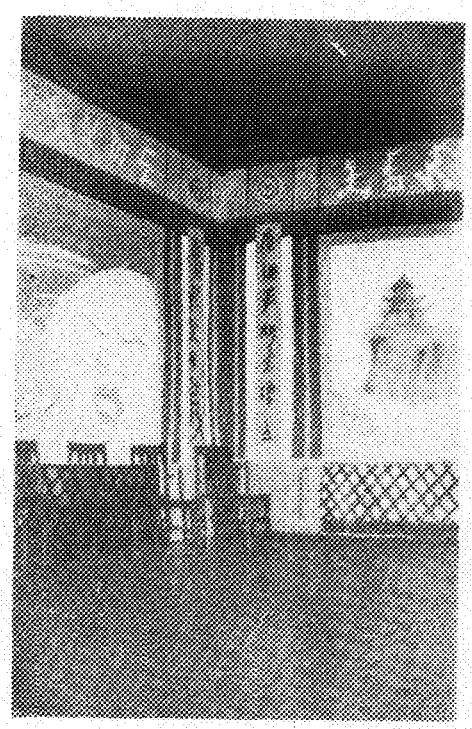
Recent Exhibits

Although most of us were in our busiest week the latter part of January, we were able to escape for a few moments to enjoy two excellent exhibits. Two Minnesota men had their work displayed in the Scarab traveling art exhibit sponsored by the national architectural fraternity. The group of sketches was judged by members of the Chicago Art Institute faculty in October during the fraternity's last convention.

L. Marnus, noted Danish architect and authority on Danish and Scandinavian architecture, lectured on Scandinavian architecture in the auditorium on January 30. The students were especially appreciative of his modern viewpoint on present architectural problems. Mr. Marnus displayed for several days a large exhibit of photographs of recent architectural work in Scandinavia. This exhibit which was at the World's Fair is at present being sponsored and shown by the Gargoyle Club in St. Paul.

Mr. Robertson Writes A Program

Mr. Robertson's charming sense of humor seems to extend even into the writing of his interior programs. The following is taken from a current problem. "A Modern Apartment": "A small apartment on the 27th floor of a new building has been rented by a man and wife in the early thirties who are both keen on the possibilities of modernistic decoration, but at the same time realize the necessity of not being too extreme as they are not rich enough to change their surroundings every few months or even every year. They have no children but are delighted with a new black Scottie who is used to apartment life. They drink pleasantly but do not have rough parties which demolish the finish on the furniture, spot the wallpaper, and burn holes in rugs and draperies."



(Photo by Roger Lehman)

The Eighteenth Jubilee

The crowning event of the architects' Jubilee was the Oriental ball held in the evening. It brought to an end the eighteenth annual all-day program which everyone considered the most successful in years. Those of us who had never seen a Jubilee could hardly believe that our auditorium could be changed into such a beautiful setting. Russell Williams and Austin Fraser were responsible for its transition into an Oriental temple.

This year's traditional freshman farce, "Madame Flutterby," was presented with typical madness. Older students smiled wanly as they recalled former imbecilities such as "Izzy Ded" or "If Not Why Not" played for the Egyptian ball in 1920 and "Wind in Her Window" or "The Fuss of Mrs. Fussbody" given at the Fete Moderne in 1932.

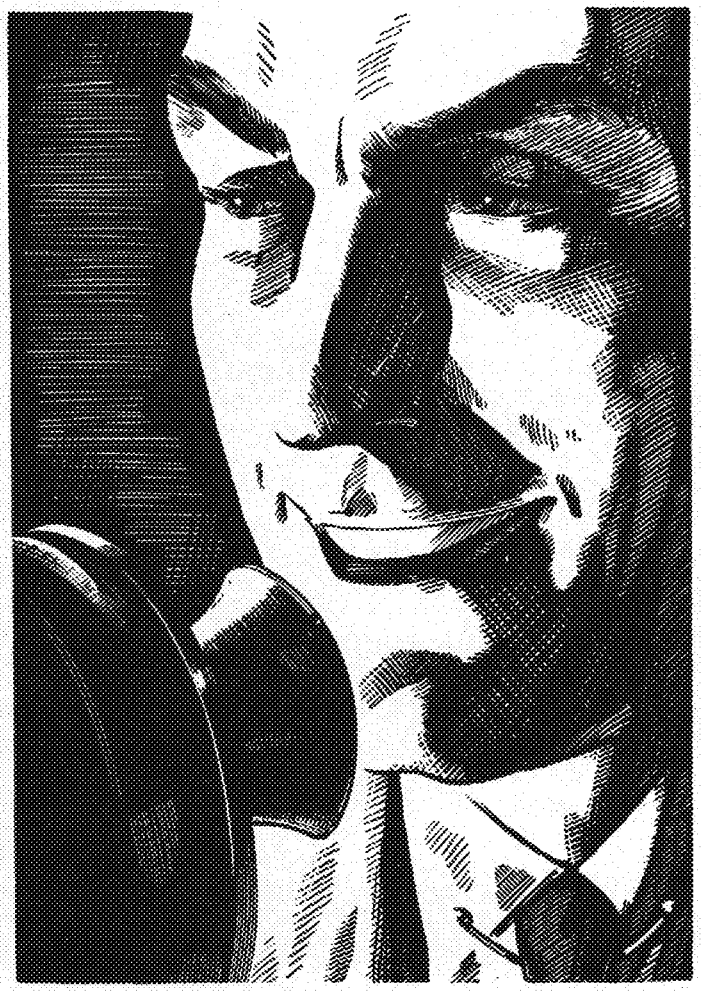
A climax for the evening was the grand march which preceded the announcement of costume awards. Esther Shapiro, Gordon Schlichting, and Collis Hardenbergh were given prizes for the most original and clever costumes.

Problems of the Month

The first junior project this quarter was the problem of housing 150 families on a ten acre plot. Presented when many cities are commencing the rebuilding of blighted areas, the work was particularly timely. The program provided an irregular super-block surrounded by traffic ways. Foremost considerations were the selection of types of dwellings and the grouping of units to best take advantage of light, air, and play areas. The problems to be met in working out the housing were many, and few students were successful in satisfactorily solving them all. Edwin Hewitt and W. H. Tusler, eminent Minneapolis architects, assisted at the judgment. The projects were generally fine and had diversified solutions. Walter H. Frost placed first, and additional mentions were awarded to C. Stuart Perkins, Floyd Holm, George Thompson, Holger N. Mortenson, and Victor Gilbertson.

For their problem the first year design students were to assume that a small city of about 20,000 has been awarded a new post-office by the federal government to serve both the local and adjacent rural postal service. The site selected for the building is a truncated triangle formed by two diagonal streets entering an important plaza. The interesting shape of the ground suggests and tends to influence many possibilities for the design of the building. Important factors in the working out of the problem included suitable arrangements for public service and easy trucking facilities. Although this was the first project the sophomores "rendered," there were many excellent results, and the draftsmanship on most of the problems was commendable.

Due February 10, was the seniors' major problem, "A College Library." Located on the axis of the main quadrangle around which the other buildings of the college are grouped, the library becomes the dominating architectural mass of the campus. Because of the complex requirements of the plan most students found the problem of evolving a logically arranged, symmetrical scheme a difficult one.



America's favorite SHORT CUT,

LONG DISTANCE

Miles shrink when you turn to Long Distance telephone service. You can get "there and back" in record time.

Improvements are constantly fitting the service more and more closely to the public's needs. Faster connections, higher quality transmission, "bargain hours" after 8:30 P. M.

Business today finds Long Distance a reliable and economical short cut to sales. You'll find it a pleasant short cut back home.

BELL SYSTEM

WHY NOT SAY "HELLO" TO MOTHER AND DAD?
—RATES ARE LOWEST AFTER 8:30 P. M.

Students Spend Third of Time In Study, Survey Indicates

Credits Are Not Properly Proportioned Among All Courses

As a theme assignment, each member of the English five classes of the College of Engineering and Architecture has made an analysis recently of how he spends his time. It is believed that this investigation on each student's part has been successful in carrying out the purpose of the assignment, to present to each individual a graphic picture of the apportionment of the day to his various occupations. The belief was held that when the investigator was able to compare the amounts of time devoted to his pursuits, he would be able to improvise a schedule that would enable him to use his day to a better advantage. There has been a question in the minds of many people as to whether or not credit for the different freshman courses has been given in the right proportions. The analyses made by the students seems to have answered this question at least partially.

In carrying out the investigation, each student, in most instances, provided himself with data that covered a whole week in order to determine the dividing of an average day. It was also necessary for the student to collect data for a week to enable him to make a comparison between the theoretical and actual time given to each course.

By making an analysis of the results obtained by a representative group of the students who carried out the investigation, it was possible to determine approximately how an average freshman divides his day. He gives a little more than eight hours to sleep, slightly less than eight hours to his studies, four hours to recreational activities, two hours to eating, and one hour to travel. Ten per cent of the students were found to be working, and the average time that each of these men spent on the job was one and three-quarters hours each day. Of course the periods of time given to the various occupations enumerated above had to be shortened to allow the participation in work.

The comparison between the actual time put on each subject and the amount of time that the men theoretically spend, according to the number of credits given for each course, proved very interesting. The credit, as explained in the University bulletin, "is supposed to require three actual hours of the average student's time per week for one quarter." Chemistry and drawing seem to be correctly credited; trigonometry does not require as much time as its credits warrant; English demands far more. Trigonometry, a five credit course, should take fifteen hours of the student's time per week; however, the average student apparently spends little over thirteen hours on the subject. English, on the other hand, should occupy only nine hours a week of the student's time; indications are that it takes more than fifteen hours.

Our Newshounds

Techno-Log staff members have worked hard and long to get their copy out this month. With so many social affairs on the docket, the campus news department has been fairly swamped with orders for publicity—well, you've got it and we wish you success! Among the more prominent newsgatherers, we can mention Fred Warner, Nathan Budish, Condit Bevier (a new addition to our staff), and Tom Tudor. Howard Kahn assumes full responsibility for the good old colyum this month. He says he is under age and can't be sued for libel. Whether you are satisfied or provoked, he'd like to hear from you. All contributions in the line of Winchelingo will be gladly accepted. We must not forget to mention the good work of Charlie Sweatt. The latter has been perspiring quite dutifully.

Aeronautical Engineers To Stage Annual Party

The annual Aeronautical Engineers' Dance sponsored by the University Flying Club and the student section of the Minnesota Society of Aeronautical Engineers is to be held on February 21 in the Minnesota Union ballroom. Rolland Nygren, Aero. E. '35, is in charge of general arrangements. Donley Olson, Aero. E. '34, is publicity manager; Jean Barnhill, Aero. E. '34, is social chairman; Benedict Cohn, Aero. E. '34, is in charge of finances. Ken de Villiers' orchestra has been engaged to play for the dance. The price of admission will be one dollar per couple. On the day of the dance, during convocation hour, a plane from the Northland Aviation Company will fly over the campus and drop free tickets.

Chi Epsilon

The members of Chi Epsilon, honorary civil engineering fraternity, held a meeting on Tuesday, January 23, in the Main Engineering building. A committee of three was appointed to facilitate carrying into effect the plan for improving student-faculty relations, as advocated in an editorial which appeared in the November issue of the Techno-Log. The group decided to co-operate with the other engineering honorary societies in planning the Inter-Honorary dance.

A. S. M. E.

The local student chapter of the American Society of Mechanical Engineers held its first meeting of the year in the Main Engineering auditorium at 7:30 P. M. on January 31. Two films, entitled "Hydro-electric Power" and "Valves," were shown. Norbert Sternal, president of the chapter, appointed Clifford Sonnesyn chairman of a committee, composed of Leander Fischer and Edward Petry, to take charge of the winter quarter inspection trip. The student chapter regional conference will be held in Chicago on April 23-24. Delegates will be picked by vote at the next meeting of the chapter.

American Chemical Society

On Thursday, January 11, Dr. E. A. Doisy, head of the department of biochemistry at the St. Louis University School of Medicine, addressed the Minnesota section of the American Chemical Society on the "Chemical Investigation of the Ovarian Follicular Hormone" in the Chemistry Auditorium.

His talk concerned itself with the secretion of certain glands in the body which exert a controlling effect on the sex cycle in animals. Dr. Doisy, who has done fine work in the field of organic biochemistry, has determined the structural formula of this hormone, using but a few milligrams of the substance.

A. I. Ch. E.

Thirty-one members of the A.I.Ch.E. attended the dinner meeting at the Minneapolis Honeywell Heat Regulator plant on Tuesday, January 30. After the turkey dinner, Mr. F. C. Shiplee, chief engineer of the plant, introduced Mr. W. F. Barstow, graduate in mechanical engineering of the University and now salesman in the industrial department. In his talk Mr. Barstow explained the value of automatic control devices in the various process industries such as the metal working, ceramic, food —and particularly, chemical—industries, and also demonstrated the types of devices in use. An inspection of the plant was impossible because of the lateness of the hour, but a cordial invitation was extended by Mr. Shiplee to the group to come back at a more opportune time for a plant tour.

A. I. E. E.

The student section of the American Institute of Electrical Engineers met on Tuesday evening, January 30, in the electrical engineering auditorium. Mr. J. A. Robinson of the National Carbon Company gave an interesting talk on "Carbon Brushes," which included a discussion of methods for correcting generator and motor operating difficulties. A large turnout of men from the Minnesota section also attended the meeting. The closing date for the A.I.E.E. prize paper contest was February 15th. The following awards will be made for the best papers: first prize, $15; second prize, $10.

A Letter from Eric

Editor's Note: The following letter from our mysterious friend Eric is self-explanatory. We are sure that this theme will warrant his getting at least a B in English

●

Mr. tecklog editor,
Deer mr. tecklog editor;

Vell ay tank ay rite you nother latter cause ay vant to ask you von big qustin.

Mr. editor ay get E in english and it makes me feel awful sad. So ay go see mr. engl prof and ay say vy come ay get E? Vell he yust say Eric your english is turrible and your speling is alful and you aint got no stile so ay cudn't pass you but ay thot ay give you nother chance.

Ay say vat you meen about stile don't ay weer collar yust like vat ad say in daily that all stilish men weer & don't ay weer exclusive suit ay by on vash av vat man say can't be duplicate in twin city?

The prof he yust thro up hands & say no no no no, ay tot he never stop saying no. Ay don't meen that kind of stile he say, ay meen your stile of riting. You should reed the old masters & lern their stile, like spokeshake, o ay meen shakespeer, or harriat b stow, or irving cob or—vell he yust talk & talk like that for long time about names of big authors. By golly ay neerly vent to sleep listening to him.

Vell corse ay don't vant to flunk so ay say vat can ay do to pass corse & he say you have to rite good theme about some ting. Ay say vat some ting & he say spose you rite about the college or the faculty.

Vell ay go to library & ay say ay vant book by mr. shakespeer & girl say vat play do you vont? Ay don't vont to play so ay yust snap rite back at her & say ay vant book by mr. shakespeer so ay can get his stile. So girl go to shelf & look all round & come back vith little red book & say this is the only von vat is in but it is von of his best.

It say on cover as you like it. Vell ay take it home saturday & ay start to reed him but by golly ay don't like it so ay don't reed it. Mr. shakespeer he rite crazy & he spel crazy to.

Vell ay vent to kirk sunday & the preecher he reed text from the book of ritings of themeotius & then he preech long time & ay vent to sleep & ay dreem ay rite story for engl prof yust like themeotius about college. By golly ven ay vake up ay yust say to myself mr engl prof vant old master stile & didn't text say mr. themeotius vas master of many slaves? Ay yust rite like themeotius & pass corse.

Ay vent rite home & ay rite all about college & faculty for mr. engl prof yust like stile of themeotius.

Vell ay showed it to ole, hes my partner, & he say it vas grand & he no engl prof vood like it. Mr. editor you no ole don't no much about old masters like editors so ay thot ay ask you about it.

So please mr. editor do you tink mr. engl prof vill give me pass in corse?

goodby,
Eric the Engineer

The College and Faculty

By ERIC THE ENGINEER

And it came to pass that it was decided to buildeth a college for the Engineerites and the Architites in the city where in is made the famous *Rowley* legs and the *McClintock* clocks and chimes and whither runneth the *Bryant* and *Johnson* carline.

And the *Alderman* of one of the wards, who was a former *Bail(i)e(y)* in Scotland, named *Campbell*, sayeth it shall be that the college be located on the *Heath* that lies on the *Hill* on the *Lee* side of the *Brook(e)*. And so it came to pass that the college was built by the *Ford* in the brook which is *Winding* its way thru the *Le(a)land*.

And the freshmen named the brook the *Aker(ma)on* because it became the River of Woe for many who tried to pass it.

Then comest the *Miller* and located on the *Brink(er)* of the stream and he placest his wheel, fastened by a *Gibb(s)* key, into the water, and grindest his wheat. There were many *Peebles* along the edge of the water.

So the brothern taketh the land for they behold that it would provide much food for the students for they argued are there not *Bass* and *Roe* in the water and *Peases* and *Green(s)* and *Bartlett* pears from the earth and *Teal* from the air and various kinds of *Hayes* with which we can feed the *Cow(ie)* to give us *Mylk(e)* and *Butter(s)*? For they saw numerous *Hayrick(s)* dotting the land. There was also *Sault* in the land and *Burr* oaks and *Forsyth(ia)* and sweet *William(s)* grew on it. And they watered it so that it was *Algre(e)n Alway(s)*. And they also findest there was *Frankforters* about the land.

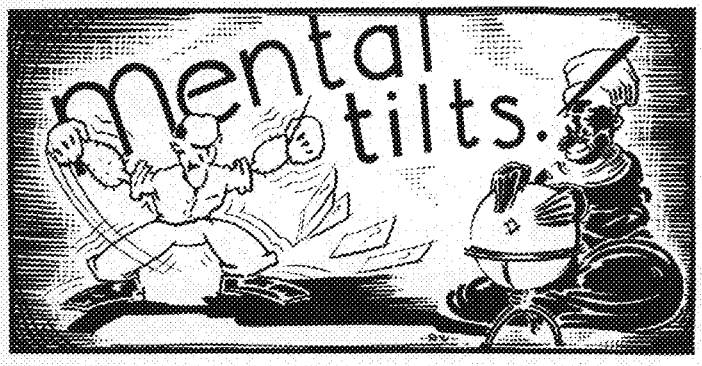
Wheneth they went to buildeth the college they findeth the farmer who lived upon the land in much of a *Huff* and was calling to his neighbor in a loud voice saying get that *Kolthoff* my field or my *Bull* will kill him.

So they buildeth many buildings of brick and *White* stone and equipped them with *Webster's* Dictionaries, and the grounds were made smooth there about so there was not a *Dent* anywhere, and many a *Young Man(n)* cometh into its halls.

From many walks of life cometh these men, the *Barber*, the *Cooper*, the *Fischer*, the *Potter*, the juggling *Palmer*, the *Carter*, the *Taylor*, and the *Bierman*, the *Cooke*, the *Piper*, the *Baker*, and the *Barker* were in their midst. Many of them became *Boon* companions.

Some cometh a long way; from *Brainard*, and *Richmond*, and *Hamilton*, *Dawson*, *Lansing*, and *Livingston*, *Montana* and they all bringeth their *Combs* with them.

Now it came to pass that the students said unto themselves we should display our talents in a play. So they sitteth upon the *Davenport*, and had a *Tate* a *Tate* for long hours. Then the *Wise* one spoke and sayeth *Nowicki* you are wrong we should give in*Stead Faust* and *Ruth* should *Star(r)* in the part of *Marg(ar)et*.



Much to the amusement of the good Dr. Putschova, who offered last month's prize, the Editor was forced to work the doctors problems himself as no correct solutions were received. The problems of this month were designed to fit the engineer for whatever financial status he may attain a few years after graduation. Incidently, the one turning in the first set of correct solutions will improve his present status by the sum of $1.00.

Good

After finding a job, (lucky stiff) the engineer finds himself in debt. Suppose for example, he is in the red $94. He pays off $24 the first month, $21 the second month, and so on, paying off $3 less each month as payday comes around. Problem: How long will it take to clear the debt.

Better

Take for a second example the man who stands in good with the boss's daughter. He clears $9225 in the first four years, getting a 25% raise each year. (This was in the good old days). How much did he get the first year?

Worse

The third example concerns those who make too much to fill out income tax reports. If a chain of prisoners can clear a mile of road in 6 hours, and with 2 more men, can clear the same stretch in 5 hours by each carrying 4 pounds more per trip, and if with 3 less men, it would take 8 hours if each carried 5 pounds less per trip, how many prisoners are in a chain and how much does each one normally carry per trip.

Answers to Last Month's Mental Tilts

Going Up!

25,200 miles per hour will be necessary.

Going Down!

5.44 is the shortest length of rope.

Going Boom!

There is as much Nitroglycerin in the Trinitrotoluene as there is Trinitrotoluene in the Nitroglycerin.

Now it so happened that the head *Boss* of the brothern who runneth the college goeth forth in the afternoon and playeth golf and he *Neal(s)* and places his ball on the tee. He swingeth heavily at the ball but low and behold it goeth not where he likest it to but where it is *Brier(le)y*. He exclaimest in deep emotion Oh *Schuck* for he is of clean tongue and no strong words passest his lips neither does he take his *Todd(y)* at the nineteenth hole.

Many men of note came before the students to discuss *Calvin* the *French* theologian, or *Tyler's* defense of the theology of Edwards as opposed to *Taylor*ism, or Patrick *Henry*, or *Peter(s)* the Great. *Howe* as an inventor, or the serious writings of Ella Wheeler *Wilcox*, or should have *Hagar(s)* the slave of Sarah been driven away with her son Ishmael, or the *Moffet* tunnel, or the merits of *Jones* sausages, or *Wiggins* of the cabbage patch.

But there was not all gladness in the land for one of the brothers was afflicted with a cold which caused him to *Huc(k)* and cough and there was a scarcity of *Nichols* to buy *Smith* Bros drops to *Stoppel* it.

The *Egger(s)* moth of the family Lasiocampidae layeth its eggs and spinneth its *Webb* in the foliage of the trees and its larvae did destroy all the leaves so not even a *Peck* of leaves remained.

And it came to pass that in late years the sons of former students also came seeking learning in its halls. There were the *Richardsons*, the *Robertsons*, the *Swansons* and *Swensons*, the *Thompsons*, the *Larsons*, the *Halversons*, the *Reyersons*, the *Stevensons*, the *Martinsons*, the *Christiansons*, the *Eriksons*, the *Petersons*, and the *Dicksons* yea from many tribes did they comest and thereby give great joy to the faculty and the dean.

Squeekin' Thru the Keyhole

By HOWARD KAHN

The Keyhole is surely destined for success since the Lip of Skum has given it official recognition . . . Of the fifty-odd college humor mags listed on the cover of the Yellow-Jacket of Georgia Tech, Skum is conspicuously absent . . . What, no humor? . . . Did you hear that red-dressed gal named Muriel calling out in the P. O., "Ski-U-Mah! All about the Jaybee and the facts of life"? . . . I'll take True Confessions!

* * * *

Doc Mann, of Ben Turpin fame, is a great exponent of the concentration method of study. In an example story he told of the freshman at the U. who was not only valedictorian in high school, but also led his class in scholarship. It shows what concentration will do for a man.

* * * *

Question and Answer Dept.:
Q.: I have been going steady with Glenn Seidel for over six months. What shall I do?
A.: If you haven't done anything yet, it's too late.

* * * *

Gordy Rosholt, junior in chem engineering, has no fears for the future. Two years ago Gordy was working at the Minneapolis Honeywell plant, painting metal with a spray gun, and highly technical work it must have been. At any rate intrepid Gordon decided a U. education would better his chances for success, and quit his job. His last chore before leaving was that of teaching the tricks of the trade to his successor, a graduate chemical engineer from the U. of M. Ho hum!

* * * *

Attention, Professor Wilcox:
According to Mae West, a curve is the loveliest line between two points!

* * * *

Open Letter to Ethelmar Eylar, A. O. Pi:

Little do you realize how horrible are the results of your public announcement in Ski-U-Mah that you do not care for engineers.

Since that time thousands of engineers have ended their lives, muttering, as they leapt to their watery graves, "Without Eylar, life has lost meaning."

Won't you stop this awful carnage by caring just a little?

World's Largest—Jan. 26:
"REPRESSED URGE MAY FORM QUEER HABIT
Have you ever wanted to swear at your professor?"
You **??¼¼))$$ right!

* * * *

What M. E. prof is built like the new Chrysler? . . . low center of gravity . . . I wonder how much gold John H. Moffett carries in his teeth . . . they say he has a regal mansion in Cincinnati . . . built of Minnesota-seal book ends, I suppose . . . Kershaw says he hates these goddamics quizzes . . . Dr. Hartig still thinks the Keyhole was being nasty about his calc book . . . tain't so . . .

What professor in architecture . . .?

What double-E prof is known to his students as "Goo-goo eyes"? . . . Girls in interior architecture offer $5.00 to any man who will let them cut his hair as they so desire . . . there's a haircut and a bonus for some of youse guys . . . Why did Gladys Wallene pass out divinity in M. E. lab? . . . It looks like a chisel . . . or a poison plot . . . I'd like to know the name of the gal whose chauffeur calls for her in that big black Pierce-Arrow . . . Other colleges may have their yes-men but Minnesota has its Pnyx-men . . . (They can't all be good).

* * * *

World's Best Technical Mag, January, 1934:
"These meetings are to be held regularly and men well known in aviation circles will be brought to speak before the two groups. In addition interesting motion will be shown."
Why not show French postcards once in a while to break the monotony?

* * * *

The World's Largest informs that a putrified rat arrived at the U. from the small village of Wheaton, Minnesota. Close friends of Eugene Eyster, also a native of the town, insist the headline should have read, "Wheaton Sends Second Rat to U!"

* * * *

Valasek, the human physics prof, says that unemployment is merely undistributed leisure . . . Jim Moore is a good fellow . . . to dodge if you smoke . . . he never buys . . . and boasts of it . . . Watching polo games is fun . . . if one can get used to the way the horses carry their tails . . . The cover of the World's Best is now one color only.

* * * *

Sign on Lake Street:
"Dance Thursday, Feb. first. Modern all evening."
No place for those with the primitive urge.

* * * *

Said Mr. (Mechanical) Ryan upon entering his classroom, "Take off your clothes, boys, and see what you can do."

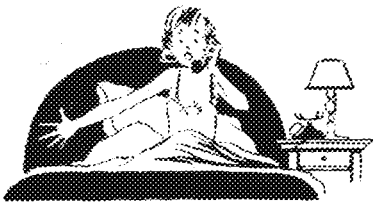
* * * *

A few issues back Assistant Editor Pederson wrote a magnificent story of the chem engineering department, staring Doc Mann. First fruits were gathered by Mr. Pederson only last week in the form of an A. But the triumph will be brief for eventually Doc Mann will discover who was the originator of the Ben Turpin idea.

* * * *

Heard in organic chemistry lab: "I'm a fugitive from a carbon chain gang."

G-E Campus News

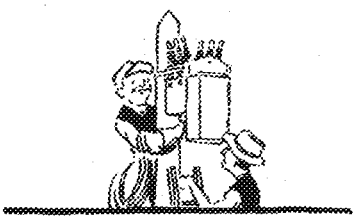


MOTOR TROUBLE

The lady in 856 had tossed and turned for hours. Finally, she called the room clerk: "There's a motor under my bed! I can't sleep!"

The motor wasn't under the bed. It was several floors away. Vibration, inaudible at the source, was transmitted and amplified by the building structure. Instead of a hotel, this might have been an office building, a school, a library, or a hospital. Instead of a sleepless guest, it might have been a patient.

For some time General Electric has built quiet motors, which do not sing, throb, hum, whir, or mutter. But, even so, good intentions are nullified unless motors are so installed as to check transmission of vibration. (Every rotating machine vibrates.) Now General Electric has made another contribution—*sound-isolating bases*, to isolate vibrations within the motor. E. H. Hull, Yale, '24, and W. C. Stewart, Washington U., '26, working with A. L. Kimball, Harvard, '14, did most of the laboratory work on this development.



CIRCUIT SURGERY

That well-known situation of the tail wagging the dog has a parallel in the distribution of electrical power. And General Electric engineers recommend that the tail be cut off.

To be specific, electric distribution circuits which supply current to large groups of customers should not have their reliability put in danger by less important circuits. This is fundamental. In many cases, circuits supplying outlying districts, where they are exposed to damage by lightning and the elements, cause most of the interruptions that raise Cain with the more important service. The tail-cutting-off device to remedy this situation is a new General Electric oil circuit breaker for automatically chopping off the less important circuit when damage occurs, and restoring service when the damage is repaired. General Electric engineers designed the circuit breaker especially for this service, and it can be mounted easily on a lighting pole.

"I'LL SEND MY BOY TO NELA"

Amid the popping of static in a nation-wide broadcast, the new G-E Institute at Nela Park, in Cleveland, was dedicated just before Christmas. It cannot boast of a football team; it has no stadium or band. But it does have laboratories and classes under the direction of a distinguished faculty.

Two former G-E "colleges,"—the Kitchen Institute and the Lighting Institute—have been combined to form this new school at Nela Park. It is a clearing house for down-to-date information on the electric home, and a training school for home appliance sales representatives and home-service directors of power companies and appliance dealers. It is also a laboratory where new ideas in kitchen management, meal preparation, home lighting, and the like may be developed and tested.

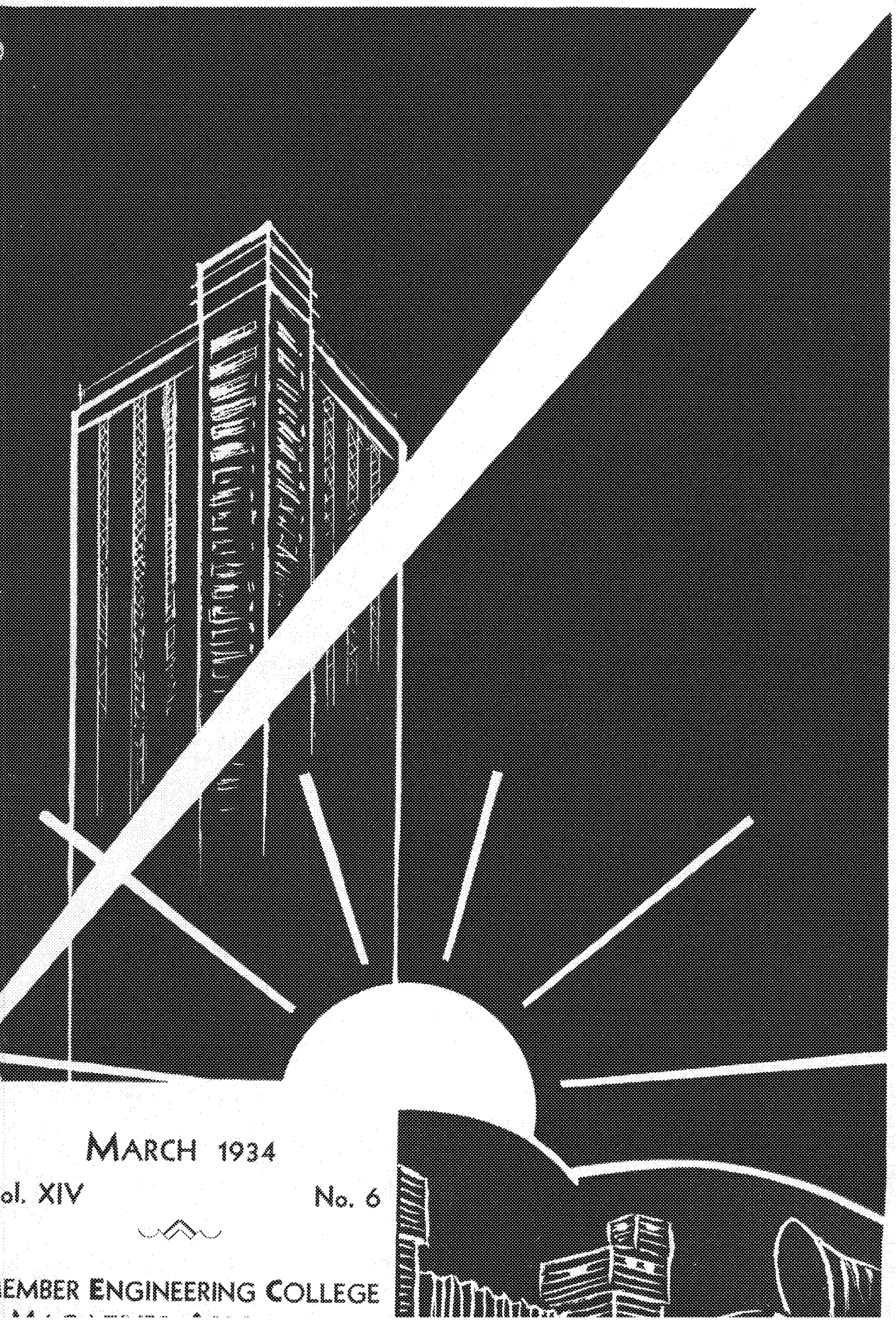
Besides the laboratory kitchen and classroom kitchens, there are model kitchens of every type, from the *de luxe* kitchen for a large home to the tiny apartment-house kitchen. There is also a model laundry, and an architectural planning department which not only assists home owners, builders, and architects in modernizing and planning kitchens, but also trains specialists to go out into the field. The Institute has 22,000 square feet of floor space for exhibits and demonstrations.

This new school is under the co-direction of L. C. Kent, University of Illinois, '13, and Paul H. Dow, Kenyon, '26.

96-22DH

GENERAL ELECTRIC

The Minnesota Techno-Log



MARCH 1934

ol. XIV No. 6

EMBER ENGINEERING COLLEGE

There'll come the

DAY

when we shall meet

FACE to FACE

So inextricably is printing woven into industry and business and the very lives of individuals . . . so vitally necessary is it in the scheme of civilized progress, that the day will come to you when you will meet with printing face to face. Now is the time to learn about this major industry.

There is a place where, without cost to you, you may observe and study printing in all its ramifications.

There is a place where a group of able men with wide, thorough knowledge of the industry will gladly show you through and answer all your questions concerning printing.

There is a place where you can see for yourself how the life blood of trade (ADVERTISING) is developed from the embryonic stage to the finished product. Where you can see the modern machines in action that make this publication possible. Such a place is The Jensen Printing Company and we invite you to come. You'll find it interesting and entertaining and we want to meet you face to face.

★

Telephone

GENEVA *2373*

★ ★ ★

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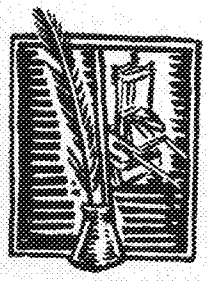

The Acting Editor Says:

The winter quarter has come and gone, and now is the time when all good staff members come to the aid of their beloved Editor, who has entrusted the responsibility of putting out this March number to yours very truly.

Messrs. Kahn and Pederson, whose names by this time should be quite familiar to Techno-Log readers, discuss the new sewage disposal project in the opening article. So highly does each of these boys think of the other, they staged a regular Gaston and Alphonse act, each trying to persuade the other that his (the other's) name should appear first in the "by-line." The argument became more and more heated, until finally the office boy stepped in and settled the question for them by flipping a car chip. Kahn lost, as you see. Too bad, old sport. Better luck next time.

Editor Monson, unable to resist the urge to write, just had to sit down and pound out an article on ready-mixed concrete. Then it was necessary for him to try and force through our thick cerebral shell the technique of putting out an issue. And as if that weren't enough work for one man, he insisted on reading and reviewing a recent book. What-a-man.

Professor Siler, rambling along in his usual entertaining manner, comes through with a blood-curdling tale of the studes and profs of sixteenth century France. We'd advise you not to read it late at night, unless—as the cigarette people say—you have healthy nerves.

Well, that's all the comment we can think of right now, so there's nothing like rounding off with a good old Latin quotation: "Sprigis Cub."

A. C.

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Ralph Monson
MANAGING EDITOR

Gordon Rosholt
BUSINESS MANAGER

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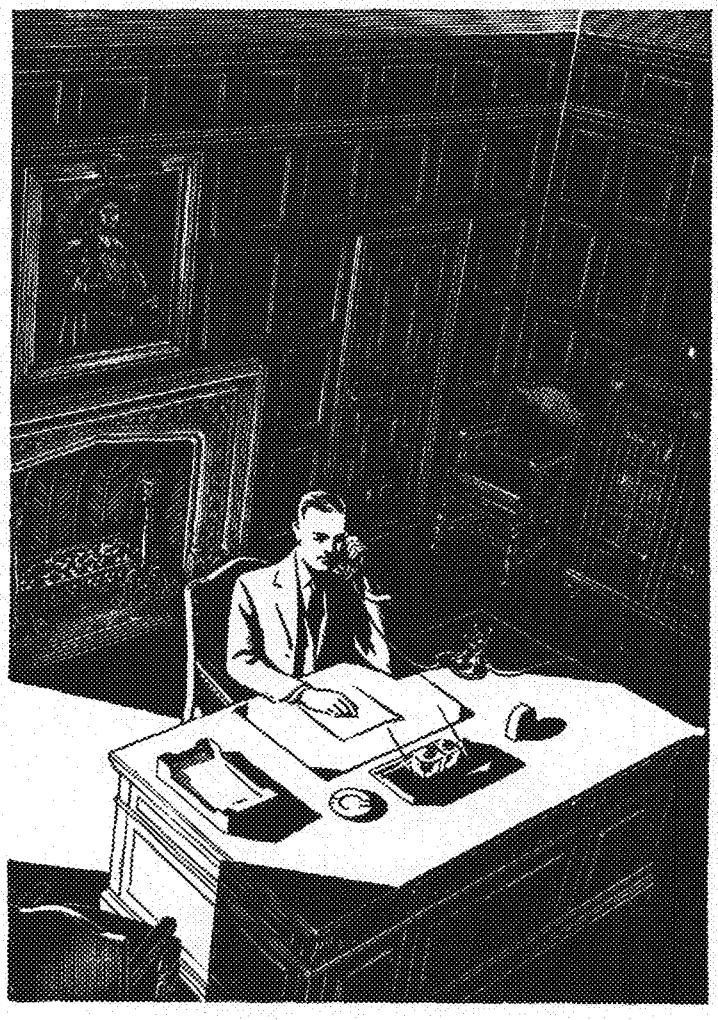
This Month



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BELL TELEPHONE SYSTEM

WHY NOT SAY "HELLO" TO MOTHER AND DAD?
—RATES ARE LOWEST AFTER 8:30 P. M.

$18,000,000 Sewage Disposal Program undertaken by twin cities

By HOWARD KAHN and RICHARD PEDERSON, both Ch. E. '35

Illustrations courtesy of the Minneapolis-St. Paul Sanitary District

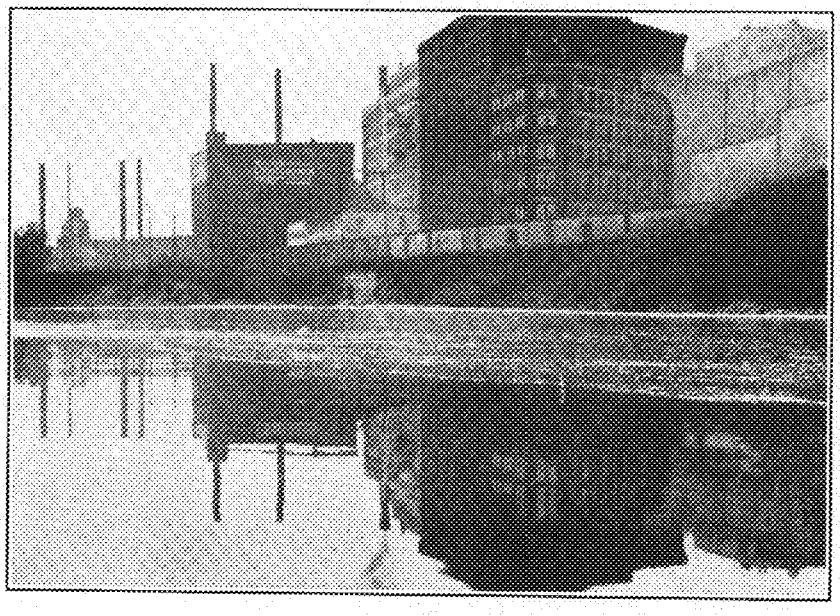
In this article are outlined the main features of the new sewage disposal system, which is being built in an attempt to rid the Mississippi of its present pollution. The authors wish to thank Mr. C. C. Wilbur, chief engineer of the Minneapolis-St. Paul Sanitary District, for his kind assistance in furnishing information relative to the project

The recent outflow of public funds from Federal tills into public works projects has suddenly crystallized the hope for a proper system of sewage disposal in the Twin Cities into a future actuality. The present conditions which exist are despicable. Both cities are discharging into the Mississippi River through some seventy different outfalls with no treatment. A condition of public nuisance is thereby created which is evidenced by odors, ebullition of gases, sludge deposits, and by floating and suspended material. Real estate experts are of the opinion that this state of pollution has depreciated property values, especially in the residential districts adjacent to the river. The injury to the health of livestock and to the fish life in the river is serious. The recreational value of the river has been destroyed. The recent construction of the dam at Hastings and the existence of the Twin City Lock and Dam at Minneapolis have further accentuated this condition by interfering with the natural flow of the river and the subsequent natural oxidation of the sewage.

The biochemical oxygen demand of a sewage is a measure of the oxygen required during stabilization of its organic matter to a harmless state by bacterial action. The combined effect of industrial waste and domestic sewage emanating from the Twin Cities is equivalent to the domestic sewage from a population of about 1,300,000 people when computed upon the oxygen demand basis.

The State Board of Health has repeatedly complained about these conditions since 1923, but as they have no official power, actual steps for improving these conditions could not be taken. In 1927, the state legislature created a body known as the Metropolitan Drainage Commission composed of representative engineers in this area. Their duty was to study the river pollution and to report on action for the future. In 1933, this commission completed their final report and submitted their findings to the legislature. These findings were published in book form and consist of a very complete discussion of almost every conceivable factor involved in the problem. Frederic Bass, head of the department of civil engineering at the University of Minnesota, and Francis C. Shenehon, former dean of the College of Engineering and Architecture and the School of Chemistry, were among those who served on the commission in an advisory or consulting capacity.

The state legislature then created a Minneapolis-St. Paul Sanitary District to succeed the commission and begin actual work on the project. At the present time, contracts are about to be awarded and construction will begin very soon. The Sanitary District has actual charge of all work common to both cities, while the respective engineering departments of the two cities will direct the projects which pertain only to their own sewage problems. The total cost of the entire project will be in the neighborhood of 18 million dollars. Thirty percent of this sum is an outright grant from the PWA (Federal Administration of Public Works) and the remainder is a long term loan. The expenses are to be borne jointly by the two cities in proportion to their assessed valuation. The ultimate result of this arrangement will be that Minneapolis will bear two-thirds of the cost of the common project and St. Paul one-third. The cost of the common project will amount to about $12,500,000. Minneapolis will pay out about $3,500,000 for supplementary projects of her own and it will cost St. Paul $2,500,000 more for additional feeder lines, mains, etc., within its city limits, bringing the total cost up to 18 million dollars. The cities will finance the project by floating 30-year bonds. Maintenance costs will be divided according to the volume of effluent from each city.



View of St. Paul river front, showing scum and sleek

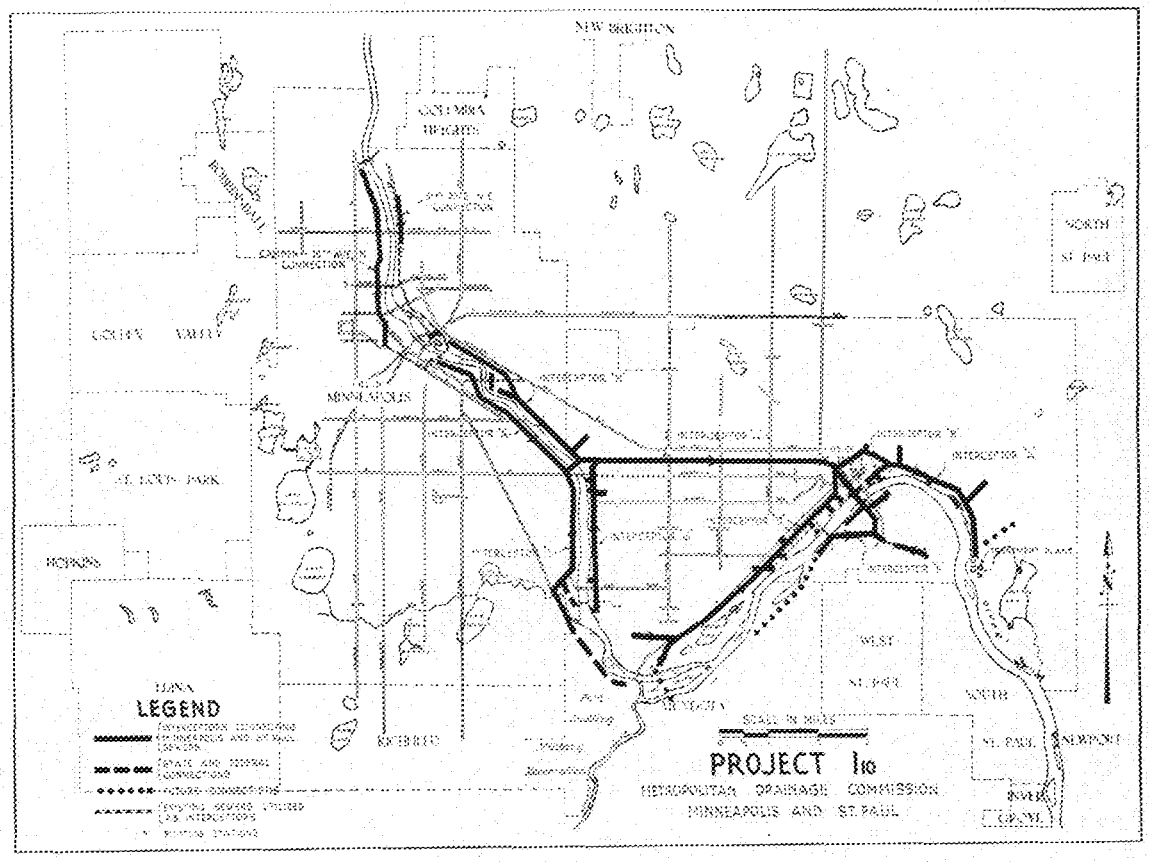
The project which was recommended by the Metropolitan Drainage Commission is known as Project I-10. It includes two salient features, a system of intercepting sewers and a sewage treatment plant. The main interceptor will be 9¼ miles long, running from Lake Street in Minneapolis underneath St. Paul, around the downtown section, to Pig's Eye Lake opposite South St. Paul, 2¼ miles south of Indian Mounds Park. Seven and one-fourth miles of this interceptor will be an underground tunnel constructed of cement, varying in diameter from 11 feet at Lake Street to 13 feet, 10 inches at Indian Mounds Park. The sludge will be carried by the force of gravity. It is extremely fortunate that this project has this natural advantage, as the cost maintenance will be reduced considerably. Pumping costs often constitute a large portion of the annual operating expense. The entire intercepting system will comprise about 53.2 miles of trunk and branch sewers of which 17.0 miles will be used exclusively by St. Paul, 9.0 miles jointly by the two cities and 3.0 miles exclusively by state and federal institutions; 3.7 miles are to be constructed in the future to connect outlaying areas. Of the total mileage of sewers, approximately 30 percent would be in open-cut and 70 percent in tunnel.

The large interceptor is, of course, the most interesting from an engineering standpoint. It will require about 300,000 yards of concrete for the tunnel and treatment plant and 400,000 yards of tunnel excavation, mostly in the St. Peter sandstone formation, which is characteristic of the greater portion of the subterranean strata underlying the Twin Cities.

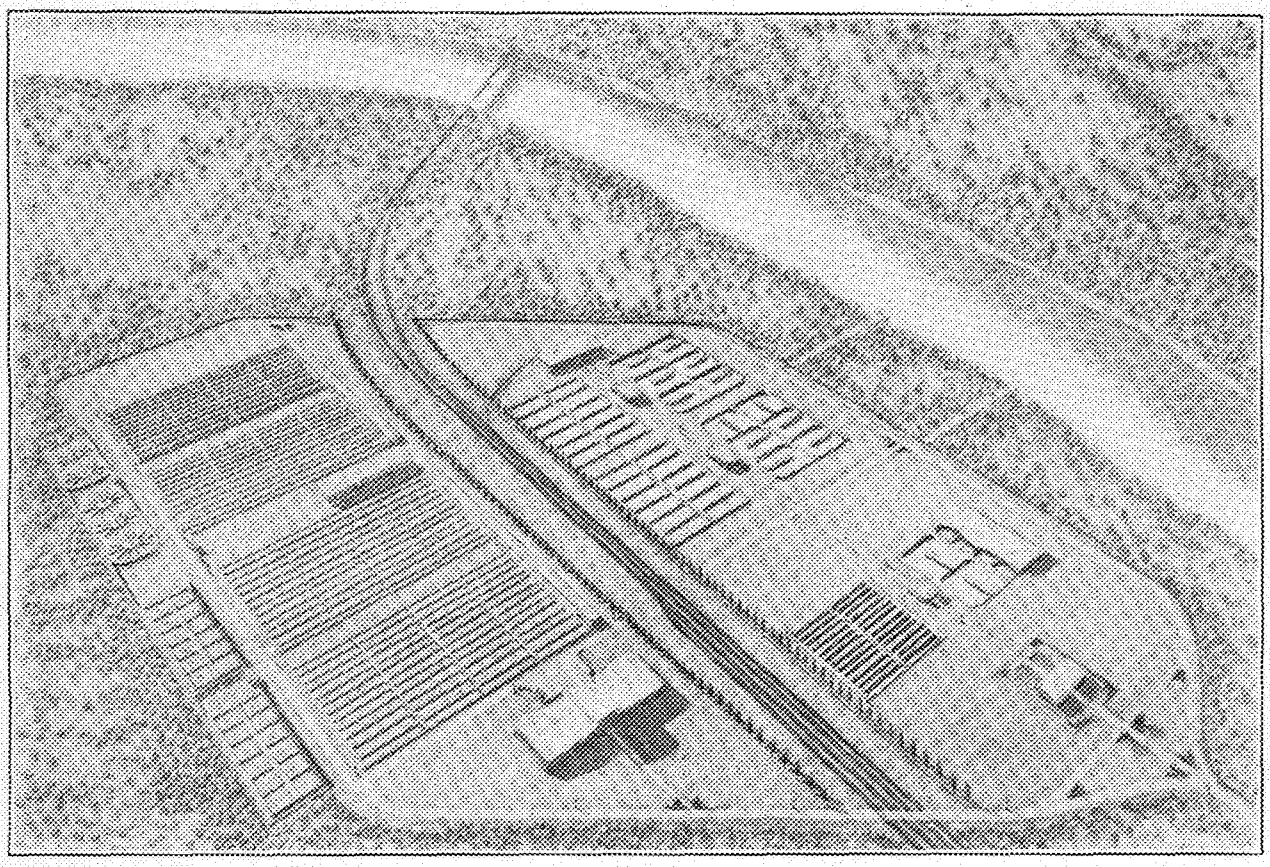
The concrete will be mixed above ground and forced in under pressure to the forms. The resulting shell will be from thirteen to twenty-six inches thick, depending on the compressive force of the earth at various points along the tunnel. Short holes are to be drilled into the earth at various points around the framework before pouring, thus providing a firm contact of out-jutting concrete with the substratum. A pressure of 5,000 lbs. per sq. ft. will be borne by some parts of the shell. At one point the tunnel will be 225 feet underground. An interesting feature can be pointed out here. The tunnel will actually be subjected to internal pressure at one point. It will be necessary to cause it to dip and rise again sharply, forming a U-shaped depression where it passes underneath the railroad tracks just south of the downtown business district of St. Paul. It will fill up with sludge at this point, thus causing an internal pressure.

The sewer entering the treatment plant will have a designed capacity of over 600 million gallons per 24 hours. The population which will be served by this plant is estimated to be 990,000 in 1945 and 1,420,000 in 1970.

It is interesting for the student of engineering to review the enormous number of factors which must be considered in planning a project such as the one just described. The Metropolitan Drainage Commission had to consider the engineering and economic factors for a period of over thirty-five years in advance in order to provide a system flexible enough to warrant the large initial investment. Population increases and future increase in sewered area had to be taken into account and estimated. Eighteen stations on the Mississippi River between Minneapolis and Wabasha were set up. Periodical water analyses over a period of two years (from January, 1931, to December, 1932) were made by the division of sanitation of the Minnesota Department of Health to determine accurately the extent of pollution and the amount of purification necessary. At present the state requires that the water should contain a certain amount of dissolved oxygen.



The proposed disposal system will utilize the present sewer arrangement with the addition of the interceptors shown on this map



Drawing of proposed activated sludge plant at Pig's Eye Lake in St. Paul

and it was necessary to determine the minimum amount of sewage purification necessary to keep the river water within the prescribed limits. The factors which control the free oxygen content of the river water are volume of sewage, river discharge, temperature, and season.

A choice of two methods for treating the sludge is open, by chemical treatment or by the activated sludge treatment. The main advantages of the chemical treatment are the lower initial cost of plant installation and the greater flexibility of operation. However, fixed charges for the purchase of chemicals, etc., will increase the maintenance cost. The mechanical method of activated sludge treatment calls for a higher initial cost, since more equipment is necessary. The maintenance charges are not as high, however, as in the chemical process. The method to be used in Project 1-10 has not yet been definitely decided.

In the activated sludge process, the sludge is first led into screen and grit chambers. Coarse particles such as "rats and overalls" are separated by screens consisting of bars spaced so as to provide a clear opening of about ¾ inch. The sewage then enters the grit chambers where the velocity is decreased in such a way as to allow the complete deposition of material having a high specific gravity such as sand and grit.

After passing through this stage, the sewage is allowed to enter the preliminary settling tanks where it is clarified under quiescent conditions for a period of 1 to 1½ hours, permitting about 50 percent of the suspended matter to be removed, and which corresponds to an oxygen demand reduction of about 30 percent. The solid material which settles in the preliminary settling tanks is disposed of and the impure liquor is led into long, narrow tanks where it is aerated in the presence of activated sludge. The air is bubbled up through the liquid and about one cubic foot of air per gallon is used. Part of the impure liquor is heated in digestion tanks to "activate" it before being passed into the aeration chambers. The hydrogen sulfide evolved is used for running an internal combustion engine to supply power for pumps and other plant apparatus.

From the aeration tanks the sewage enters the final settling tanks where the sludge is allowed to settle and the remaining water discharged into the river. The solid material settling out is placed on drying beds before being disposed of. The final product is a black, homogeneous mass. Most plants dispose of this product in dumps, but it is interesting to note that the Milwaukee plant makes a poor grade of fertilizer from it. This plant is located in the center of the city and carrying charges would be excessive for a long haul to outlying districts. They save money by selling the fertilizer at a loss. The chemical treatment proposed consists of adding a coagulant such as ferric chloride, alum, or lime to precipitate the sludge and reduce the oxygen demand.

The Minneapolis-St. Paul Sanitary District will have complete charge of the project as regards maintenance after it is completed. Methods of charging individuals for sewage service and how much they should be charged are now being considered. The idea of paying for such a service may seem rather unusual at first, but there is actually no reason why one should not pay for sewage disposal as well as for other services such as electricity, gas, and other utilities. The precedent has already been established by law in five states; some twenty cities in the state of Ohio alone make sewage charges. Maintenance and fixed charges for a large disposal system amount to rather large figures in some cases. Sewage rental may be based on the amount of water used, or upon flat rates depending on the number of fixtures or on the character of the premises served.

Ready-Mixed Concrete

simplifies construction operations

By RALPH E. MONSON, C. E. '34

The widespread use of truck concrete mixers during the last few years has aroused the curiosity of a good many of us. After a bit of search regarding the matter, the accompanying article, describing the ready-mixed concrete industry, was written

●

Standing on the corner of Washington Avenue and Church Street, we see an almost continuous stream of peculiar trucks racing back and forth, a small gasoline engine mounted high atop the odd barrel-shaped body "putting" away in an unmuffled staccato. After one glance at the machine, we do not have to guess that it is in some way connected with concrete, for its body is well bespattered with that material. We do wonder, however, just what the purpose of this fleet of trucks is, and especially do we wonder what that little motor has to bark so much about.

In earlier experiences, we can well remember the time our concrete sidewalk and driveway were installed. A truck brought several loads of gravel—pit-run they called it—which we learned by questioning the driver had come directly from a pit on the nearby river bank. Another truck delivered a few sacks of cement, and lastly came the contractor with his mixer. To us that was quite a machine—its noisy gasoline engine enclosed in a metal hood which was kept closed and locked to prevent little boys from tampering, and its revolving barrel-shaped mixer which tilted from side to side as the operator turned a crank were never-ceasing curiosities to our young minds. All day long we sat and watched the procedure. One man would dump in a pail full of water, then two of them would grab shovels and shovel gravel into (and around) the mixer, after which the first man would throw in a few shovels full of cement. After the mixer had run a minute or so, they would turn the crank which caused the barrel to revolve and dump the load into a waiting wheelbarrow in which it was wheeled into place and dumped. Most interesting to us, however, was the amount of concrete the men spilled, because at noon and night when they shut down, we were right there with our shovels to pick up the waste concrete and carry it around to the alley or nearby play lot where we built our own sidewalks.

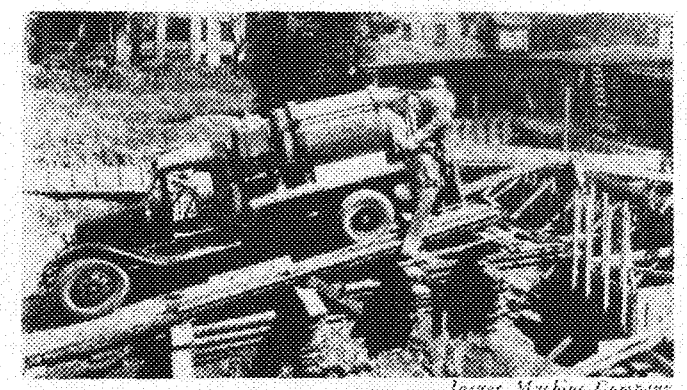
The next fond recollection occurred in the summer of 1926 when the street on which our house fronted was being paved. Here the process was somewhat different, and as we know, somewhat more refined. As interested onlookers, we noticed that the trucks which dumped into the mixer, contained not only the gravel, but also the cement. A nice rosy apple for one of the truck drivers resulted in a ride out to the gravel plant where the trucks were loaded. Here the sand, gravel, and cement were loaded by steam shovel into separate compartments in a hopper from which they were weighed out and delivered into the trucks, each truck containing the amount necessary to produce one batch in the mixer.

This resulted in a more accurately designed mix, greater speed, and a better grade of concrete being produced. How well we remember one eventful day on that job. The crew had finished pouring at an intersection rather late in the afternoon. When they left, they put up warning signs on the cross street and hung out red lanterns. Sometime during the night a citizen (probably more or less weathered) crashed through the warning signs, and mired his car in freshly poured concrete. The culprit escaped with about one fourth of the slab, but his car was later identified by the amount of concrete it carried, and he was apprehended.

But, leaving our childhood recollections, let us get back to these trucks which aroused our interest at the start. Let us follow one of them and see where they come from and what they carry—across the Washington Avenue bridge, and down Twentieth Avenue to the plant of the Ready-Mixed Concrete Corporation. After properly introducing ourselves to Mr. G. W. La Beau, manager of the plant, we are turned over to Mr. C. Wolslayer, who is to be our guide, and start through the plant.

"These are the aggregate storage bins," says Mr. Wolslayer, pointing to a peculiar looking, boxed-in railroad trestle. A closer examination brings to light that this portion of an abandoned railroad bridge, when supplied with timber sides, and a reinforced concrete bottom, made an ideal storage bin for sand and gravel. These materials are delivered to the plant in bottom-dumping freight cars from which they are unloaded by gravity into the storage bins. In the picture on the opposite page a car is shown unloading gravel by this method. On the other side of the plant is a supplementary receiving hopper into which trucks may discharge, in case delivery is not made by rail.

Beneath the aggregate storage bin is a tunnel, which at



Jaeger Machine Company

An end discharge truck agitator delivering concrete on a building job

first sight gives us the impression of a medieval dungeon. Running the full 210 foot length of the tunnel is a twenty-four inch conveyor belt supported on pulleys. Directly above the belt at about 15 foot intervals throughout the length of the tunnel, which is also the length of the storage bins, are discharge openings about a foot square. Each of these is equipped with a jaw-like valve through which the flow of materials onto the conveyor belt is regulated. Thus the aggregate which was delivered to the storage bins by gravity from the cars is transferred out of the bins and onto the conveyor also by gravity. This conveyor carries the materials out of the tunnel and delivers them to another belt which elevates them into the hoppers. This second belt is also 210 feet long and is inclined at an angle of 15 degrees to the horizontal. From the end of this belt, the sand and gravel are carried by gravity into hoppers directly above the weighing or batching device.

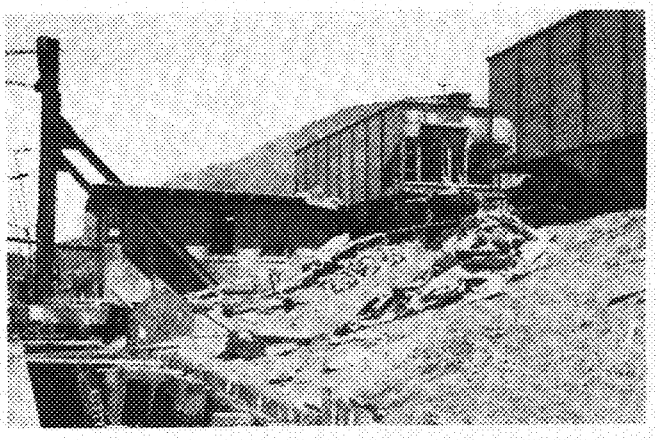
Having traced the course of the aggregates from their point of delivery to their position in the hoppers ready to be weighed into the mixer, let us take a carload of cement and follow its course similarly.

Cement is delivered to the plant in bulk in carload lots. It is unloaded by an elevator similar to a grain elevator and stored in a large steel bin until used. The bin at this plant holds 600 barrels of cement, which is half a day's supply when the plant is operating at full capacity. From the storage bin, the cement is carried in a bucket elevator to a hopper located at the highest point in the building, from which it falls by gravity into the hopper of the batching scale, where the proper amount is weighed out together with the proper weights of sand and gravel prior to charging the mixer.

Preparatory to charging the mixer, the operator weighs out the required amounts of sand, gravel, and cement. The proper amount of water is automatically measured by a siphon arrangement. At this plant, each of the two mixers is supplied with two 50 gallon water tanks from which water is discharged directly into the mixer. In order to measure the water, a pipe with a funnel-like opening is inserted into the top of the tank. With the discharge valve closed, the tank is filled with water. When the discharge valve is opened, water is siphoned out of the tank down to the level of the end of the pipe. The amount of water to be drawn out at any particular time is regulated by raising or lowering the discharge pipe.

Mr. Wolslayer tells us, that in the winter time, the aggregates are heated with live steam. That is, steam pipes from a boiler terminate in the aggregate hoppers above the scales and thus live steam is released in the hopper. Since the total amount of water going into the mix is an extremely important factor, it is necessary to sample the aggregates in the hoppers at frequent intervals and determine their water content, as this must be subtracted from the total water required in determining the amount to be added to the mixer.

Getting back to the operator who is controlling the mixer: After weighing up the proper amounts of materials, he steps on a lever which dumps the mix from the scales into the mixer, and at the same time he opens the discharge valve of the water tank. Simultaneously with this operation an automatic timing device is engaged which prevents the mixer from being dumped until a definite time has elapsed. This time varies from one to two minutes, depending upon the mix.



Concrete

A gondola car unloading gravel at a ready-mixed concrete plant. The gravel is dumped by means of gravity into bins below the track

The mixer itself is a seven foot drum containing six blades equally spaced around the circumference at the charging end, and twelve buckets at the discharge end. This combination results in a movement of the materials back and forth through the mixer as well as a general mixing action. The mixer is discharged by projecting the discharge spout into the drum so as to intersect the material falling from the buckets as they revolve. A 40 horsepower motor drives the mixer at a speed of 11 revolutions per minute. Because of the excessive amount of cement and other dust flying in the air it was necessary completely to enclose the motor in a steel jacket. From this jacket a pipe extends up about 100 feet outside the plant and through this pipe fresh air is brought down to cool the motor. The concrete is dumped from the mixer directly into the trucks which deliver it to the job. The concrete is completely mixed before leaving the plant, and the only purpose of the rotating paddles in the truck is to keep the mix agitated and thus prevent setting. This, then, is the only purpose of the barking little motor on top of the truck.

The body of the truck is simply a steel cylinder through the longitudinal axis of which runs the shaft which carries and drives the agitating paddles. Discharge is accomplished through an opening in the rear end of the cylinder, the body being tilted upward at a sharp angle by a hoist. This we observed after following one of the trucks to its destination, the new addition to Pioneer Hall.

The capacity of this particular plant is approximately two truck loads every five minutes from each of the two mixers. Since each truck load contains two cubic yards (about four tons by weight) the total capacity of the plant is about eight cubic yards (or 16 tons) in five minutes. The company maintains sixteen agitator trucks in which to make deliveries. A common question regarding this industry is that of range of operations or longest possible haul. This range is limited by the time consumed in transit and by economic considerations. The longest economical time is considered to be approximately an hour, thus limiting the maximum haul to 30 or 40 miles. These are not just theoretical values, as concrete has actually been delivered to Shakopee, a distance of 35 miles from the plant.

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UNIVERSITY OF MINNESOTA

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The Tech Frolic

With winter quarter finals upon us, we realize with a start that the school year is two-thirds over. What have we done so far in the way of activity? Looking back, we see that the engineers have had but one social function—the Aeronautical Take-off. As a group, however, we haven't had one show, dance, dinner, or get-together. From the looks of things, an outsider might conclude that we are just a dead bunch of book worms, interested only in mathematics, gears, and silly electric circuits.

But this, of course, is not quite the case. Leaving the retrospective mood and looking into the remaining third of the year, our observer will see that the engineers actually blossom in the Spring! Dances, banquets, musical comedies—and Engineers' Day! Plenty of action coming.

The first major engineering social function of the season, the second annual Tech Frolic, will be held this year on Friday, April 13. The Frolic is the engineers' own ball, and will be held at a downtown hotel, with dancing to the strains of a well-known orchestra. Committees are now being organized, and definite plans will soon be under way. If you happen to be a bit rusty on your dancing, there's plenty of time to practise up. And plenty of time, too, for the discriminating engineer to make a date. Social contacts are very necessary, you know, so by all means be sure to count on taking in the Tech Frolic this year. Start planning for it now.

Senior Finals

Graduating seniors, it is generally known, are abnormally burdened the last week of the spring quarter. Final examinations, pre-commencement functions, and commencement exercises all do their part to take up the senior's time and to provide more or less grief. The commencement exercises and the accompanying social functions are of course a part of every graduation; the examinations, however, might well be dispensed with.

By the time a student reaches the close of his senior year, he invariably knows all the faculty members in his department, and each instructor is quite familiar with the abilities of the student. The instructor knows, too, through regular quizzing, the standing of the student at all times right up to the end of the quarter. Incentives for keeping up a high grade of work would not be lost by elimination of the final examination, since the student's quarterly mark would be based solely on the quality of work done. To be exempt from the finals under any plan, the student must necessarily have a passing grade in the course.

The Technical Commission has circulated among all engineering seniors a petition asking that graduating students who are above passing in any courses at the end of their last quarter be excused from finals in those courses.

The plan set forth in the petition is purely arbitrary. The faculty is free to modify or amend it as they see fit. Discussion of the idea with various faculty members has shown many of them to be strongly in favor of such a move. At any rate, the plan is worthy of consideration and should be acted upon immediately.

A New Combined Course

A new plan for combined courses in engineering and business administration has been approved by both faculties and authorized by the Board of Regents to be effective at once. It provides that a student who completes the requirements for graduation from any one of the regular engineering curricula and in addition a list of business courses aggregating 74 quarter credits may receive the degree, bachelor of business administration as well as the bachelor's degree in his particular branch of engineering. Five years are needed for the combined course, the student being registered in the College of Engineering and Architecture for the entire period.

In general, the first three years of the engineering course will be followed in the usual manner except that economics and business law will be added in the sophomore year and accounting and corporation finance in the junior year in place of electives. In the fourth and fifth years the remainder of the business subjects will be distributed while some of the senior courses in engineering will normally be carried over to the fifth year to provide room for this distribution. The business degree is to be awarded on this basis only if the engineering course has been completed.

Several engineering students have already announced their intention to follow the new program, at least as far as they find it convenient to do so. They do not have to complete the business sequence if they wish to discontinue after graduating in engineering. The business courses constitute desirable electives.

—*O. M. Leland.*

The Architects' Corner

By THOMAS TUDOR

Problems of the Month

Except for certain definite requirements competitors could be entirely free in their interpretations of the recent senior problem, an ideal summer home. This residence could be located in any locality in the United States that the designer wishes: North or South, East or West, on the seashore, in the mountains, near a lake, or almost any place. It is to provide for summer home life, outdoor and indoor, for a bachelor architect whose hobby is painting. Besides the main house the problem also calls for the design of a guest house and the owner's studio, and it is necessary for the plan to express the grouping of these elements. The elevation was to express a definite character not only from an architectural point of view, but it must be harmoniously related to the landscape.

* * * *

In a rather specialized museum similar to the Freer Gallery, the Folger Library in Washington, or the Museum of the City of New York, there is reason for an important stairway from the main floor to the second floor. This stairway with its wall surfaces and ceiling was the subject of the last old grade one problem. Collis Hardenbergh received first mention for a very excellently done problem, and Ralph Swan and Malcolm Lein got mentions. According to the jury the best solutions had the stairhall two stories high, began the stairs directly up the center, and returned back on either side.

* * * *

The junior design problem recently completed was a loggia of an art museum. The loggia, terminating the entrance foyer of the museum gives access to an open court twelve feet below and connects with porticoes which surround the court. The plans being simple, pure design for the elevation became the dominant problem, and during the four weeks of criticism, students strove for monumental scale and detail characteristic of such a building.

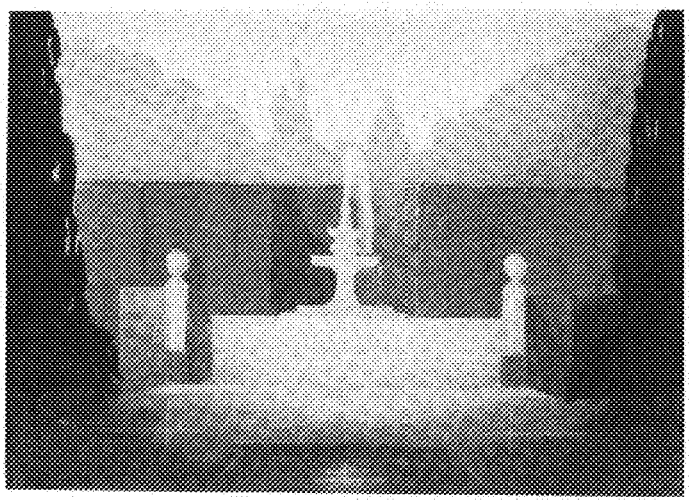
Versatility and Contract

In these days of mass housing, draftsmen's unions, and construction codes, it is refreshing for the student to reflect upon the architect as an individual. Looking at the lives of great architects for his models, today's scholar can parallel his academic education with foundations for a rich cultivation of his intellect. Versatility could well be his worthy ambition. This viewpoint sees beyond the mere mechanics of architecture, a contemplation which can encompass music, and literature and indulges in science, economics, etc. Architecture is the well-rounded, informed art that produced Leonardo, Michelangelo, and Wren.

An attribute to any professional man's success is his likeable personality. The architect should be socially toned in order to be able to contract the right people and to do so in a professional manner. A recent graduate has suggested that young architects are primarily obligated to themselves to acquire the social graces, become supplied with a fund of mundane small talk, and build up an appreciation for genteel and other-than-collegiate tippling. Satirically, perhaps, he admonishes that bridge is the final complement of conviviality since more than frequently architectural advancement either educationally or professionally depends on skill at contract. With worldly understanding the young man adds this axiom, "Ability may be put to use after conviviality and bridge have snared a client."

A Garden Stairway

The exterior stairway has become rather a perennial problem. The first minor *projet* in grade one this quarter was the design for a stairway on the axis of a public garden. Besides being a means for people to pass from one section of the garden to a level ten feet below, it is also one of its decorative motives. Fred Mann was awarded the second mention for his problem which is shown below. This solution was commended because of its simplicity and the fine effect gained by setting it back into the upper level. Problems in general rated according to how they achieved the proverbial scale and character.



To the Cemetery of St. Denis

By RODERICK WILLIAM SILER
Assistant Professor of Mathematics

For an interesting and pleasing subject with which to begin this article I am indebted to a man named Platter who was a student at the University of Montpellier, France, in the year 1554. Student Platter was one of that strange breed of men whom we of the Engineering College today refer to as "medics." Medics are naturally interested in anatomy; where an engineer will rave about steel structures, dynamos and flying machines, a medic, if given any encouragement at all, will converse with equal enthusiasm concerning the bones, nerves and muscles which are said to exist in the average human interior. Now, of course, for a medic to thoroughly understand the operation of the human machine it is necessary to occasionally take a machine apart, and this process is called dissection. Several years ago, in conversations with a medical student of my acquaintance, he would describe to me in great detail this business of dissection, and from the way he talked I was led to think that dissection is one of the most enlightening and delightful experiences a medic can have. He would always conclude by telling me that there was nothing in an engineering course to be compared with the joys of a medic's existence. Well, everyone to his tastes.

But to return to Platter, of the class of 1554 or thereabouts. In Platter's time it seems that for dissection there was always a scarcity of subjects with which to work. The medical student's situation then was similar to that of an engineer of today taking a course in gas engines but unable to get a single gas engine he can tinker with and separate into its constituent parts. I don't know just what an engineer would do in such a case, but in Platter's day the medical students were accustomed to take the matter into their own hands and go forth and obtain subjects. In other words, they occasionally robbed graves. Platter has left a record of his first thrill in this line. He says:

"We went to disinter secretly, in adjacent cemeteries, the dead who had been buried the same day. My first expedition of the sort occurred on December 11, 1554. At midnight, well armed, and observing the most profound silence, we repaired to the cemetery of St. Denis; we disinterred a body, employing nothing but our hands, because the earth had not yet had time to harden. Then we drew out the corpse by means of a cord, wrapped it in our mantles, and carried it on two sticks to the entrance of the city. There we rapped on the wicket; an old porter presented himself, and opened it; we asked for something to drink, and while he went for wine, three of us brought in the corpse, and carried it to the neighboring house of one of our comrades. Afterwards the monks of St. Denis were obliged to guard their cemetery, and they shot arrows at the students who came there."

One thing that can be said for the college boys of 1554, and indeed for their predecessors of several centuries in the old universities, is that they were no mollycoddles. Someone might ask whether these old fashioned students had profs and if so how the profs managed to keep alive among them and safe from dissection. Yes, there were profs. I find a man, in 1444, having this to report about his teachers: "They (the professors) gorge themselves with learning, but there is nothing civil about them, and they understand absolutely nothing about the management of affairs, public or private." At this some of you will exclaim, "Ha! What did I tell you! Profs never change: they were the same in the time of Christopher Columbus as they are today!"

But just a moment, please. On further investigation to show justification, after this discouraging start, for the continued existence of profs I find it recorded that at the University of Paris in 1335 a professor, omitting lectures, could present as an acceptable excuse the fact that he had been in jail at the time. Certainly this should be proof enough for anyone that in those old profs there was at least some good. One reason for the ancient professors being occasionally put into the dungeon—jails were like that, then—was that when students got mixed up in combats with the police the faculty was inclined to join in. All the evidence indicates that that which we would now call college spirit was very strong in medieval times.

In 1229, at Carnival time, the students of the University of Paris, full of spirits, youthful and otherwise, engaged in such a tremendous riot that two of them were hanged by the provost of Paris. The university demanded satisfaction and was told, in effect, to try and get it. Whereupon the university promptly closed up shop, the professors migrating to other schools, and the students following them. For two years the university remained closed. Until the citizens of Paris, evidently missing the boys, and the income and glory redounding therefrom, made complete amends. Again, in 1453, forty students of the same school who had been in jail were being escorted home in triumph by their fellows when a fight with the police resulted. A young professor was killed, several students wounded, and the rector badly injured. The next day the cessatio, or closing, was declared by the university. To end it the city promptly made amends. The hand of the man who had struck the rector was cut off. Eight of the provost's men, wearing nothing but their shirts and carrying lighted torches, had come to the university and apologized. Imagine the embarrassment of the constables.

So we should not look down our noses at those professors and scholars of bygone years as men who found no joy in college life. They had their pleasures, simple though they were.

With Our Alumni

In this issue we continue the series of personality sketches designed to acquaint technical students with those members of their faculty who are graduates of Minnesota. The complete survey shows that there are twenty-two such members included in the group of one hundred men and women who make up the teaching staff of the College of Engineering and the School of Chemistry. The others represent schools and colleges in all parts of the country. With a great deal of training from other schools to bring in new ideas and new viewpoints, and with enough "home grown" training to keep alive the spirit and traditions of our own college, the teaching unit of the technical schools is an efficient and balanced one.

This month we go over to the school of chemistry for our interview.

✓ ✓ ✓ ✓

Arthur E. Stoppel

Those courses in chemical engineering which have to do with power plant chemistry and especially with fuel and flue gas analysis are presided over by Arthur E. Stoppel, assistant professor of chemical engineering. After receiving a bachelor's degree in chemical engineering in 1920, Dr. Stoppel was a laboratory assistant for three years, doing graduate work at the same time. He obtained a chemical engineering degree in 1921 and his doctor's letter in 1924. Most of his graduate study was analytical, and included interesting studies of vanadium and molybdenum. In 1924, he was made an instructor of analytical chemistry, and classes in that department claimed his attention for several years. Professor Stoppel began work in his present field in 1927 when he joined the chemical engineering staff to teach courses in fuels and flue gas. Besides the courses for students in chemistry, he has charge of a class designed especially for mechanical engineers who are interested in power plant chemistry. This course includes work in the laboratory as well as lectures and recitation. Some time ago, Professor Stoppel made an interesting investigation into the inaccuracies of calorimetric determinations due to corrosion of the calorimeter lining. The products of combustion in the calorimeter contain acidic substances which often corrode the lining enough to render inaccurate results.

✓ ✓ ✓ ✓

Elliott L. McMillen

Chemical engineers are familiar with Mr. McMillen in classes relating to the processes used in chemical manufacture. After obtaining his bachelor's letters in '28, he completed study for a master's degree in '27 and a Ph. D. in 1931. Work other than at Minnesota includes a year of teaching at Lehigh and three years in the research laboratory of the New Jersey Zinc Company. With the latter concern he did considerable work on the physical properties of pigments. The physical make-up of these near-colloidal particles has a marked effect on the properties of the paint made from them. An accurate study of pigments is necessary for the economical manufacture of good paint.

✓ ✓ ✓ ✓

Ernest B. Sandell

Receiving his bachelor's degree in 1928, his master's in '29, and his Ph. D. in '32, Ernest Sandell is one of the more recent additions to the chemistry staff. His first three years after graduation were spent as a laboratory assistant, and in 1931 he was awarded a Du Pont fellowship. His graduate study under Dr. Kolthoff included a systematic investigation of unusual phenomena encountered in precipitating calcium oxalate. He now teaches a course in microchemistry covering the use of the microscope in inorganic qualitative analysis, as well as courses on the technical analysis of commercial materials, foods, and water.

✓ ✓ ✓ ✓

B. K. Hovey, E. E. '27, received his M. S. degree at the University of Pittsburgh in 1931 and his Ph. D. in 1933 at the University of Gottingen. He majored in applied mechanics and took as minors geometry and applied physics.

J. P. Byrne, M. E. '32, is teaching chemistry and mathematics in a high school in Kalispel, Montana. According to a letter to a friend he likes things out there very well—especially the girls and 3.2.

✓ ✓ ✓ ✓

Charles E. Calverley, Ch. '31, is an assistant in biochemistry at the Farm Campus.

Paul K. Honey, M. E. '31, is working in Texas for the Proctor & Gamble Co. Bet all the girls call him Honey.

Clarence M. Pappenfus, M. E. '30, was operating a gas plant at Brainerd but came to St. Paul to be an apprentice for the Gas Light Co.

Tom Hansen, Arch. '29, who is working for the R. E. McKee General Construction Co. in Texas was in town recently with his wife, Vera Mengeleoch, visiting her parents.

Pearson Submits Winning Paper in A. I. E. E. Contest

The members of the Minnesota branch of the American Institute of Electrical Engineers met on Wednesday, March 7, at 8:00 P. M., in the Electrical Engineering building for the reading of papers in the A. I. E. E. prize paper competition. Ivar Pearson won first prize of $15.00 with his paper on "Copper Oxide Rectifiers." The second prize of $10.00 was awarded to Morris Cohen for his paper on "Electrochemical Corrosion."

Other papers presented were "The Public Address System at the University of Minnesota" by Arvid Newhouse, "The Electric Micrometer and Several of its Applications" by Ernst Hovemeyer. The papers were judged by a special committee on the basis of subject matter, originality of treatment, clearness and explicitness of expression, and mastery of the subject as disclosed by the paper. After the presentation of the papers, John Hancock, graduate student, discussed and demonstrated a Braun type of cathode-ray oscillograph, showing the action of Thyratron rectifiers, distortion of amplifier tubes, and Lissajou's figures.

National Flying Club

The University of Minnesota Flying Club is organizing a national collegiate flying club. This organization will include flying and glider clubs throughout the country.

Some time ago questionnaires were sent to over 250 colleges and universities in the United States and very favorable replies were had from over forty of them. The project was first thought of at Washington, D. C., where the Loening Collegiate Awards last year were given. Thurman C. Erikson, president of the club, represented the Minnesota Flying Club which won second prize in the contest.

The purpose of th's new organization is to foster collegiate aviation, to stimulate interest in aeronautical activities, to endeavor to coordinate flying activities, and to promote the mutual educational welfare of its members. The plans, as they are now, state that the organization will conduct its elections and most of its business at a convention to be held once each year. Communication between the various colleges will be maintained through the medium of a mimeographed pamphlet.

The committee working on the project is composed of Flying Club members: Thurman C. Erikson, chairman, E. Jean Barnhill, Earl M. Bennetsen, Albert Driscoll, Leonard Proebstle, and John D. Mitchell.

Junior College News

The Duluth Junior College Engineers' Club will hold an alumni reunion dinner Easter vacation, Wednesday, March 28. The fete is expected to be one of the social highlights on the engineers' calendar. Many engineering alumni from out of town are expected to attend along with those who have remained in the city. Mr. J. Grant Waits, graduate University of Minnesota, '28, structural engineer of the D. M. & N., will be the speaker. Several entertainment numbers are sched-

aled. Robert Rhode is in charge of reservations. The other members of the committee are Forrest Schroer, Lester Hubert, and George Goldfarb.

At the last meeting of the Engineers' Club a "talkie" was shown on telephone and radio transmission. A short business meeting followed after which lunch was served. The engineers are planning extensively for their annual Engineers' Day under the direction of Sam Marcovitch.

Inter-Honorary Dance

Five honorary engineering fraternities are cooperating in completing plans for a dance to be held April 6. The location is to be announced later. The fraternities that are represented are Eta Kappa Nu, Tau Beta Pi, Pi Tau Sigma, Chi Epsilon, and Alpha Tau Sigma. The committees in charge of the affair are as follows:

General Arrangements: Reynold Caleen, Tau Beta Pi, chairman; John Clarey, Eta Kappa Nu; Edward Kells, Pi Tau Sigma; Ralph Monson, Alpha Tau Sigma; Philip Kilpatrick, Chi Epsilon.

Orchestra: Peter Riede, chairman, John Reusch, Robert Conary, Harry Baker.

Publicity: Robert Marshall, chairman, O. H. Peacher, Leon Turner.

Tickets: Benedict Cohn, chairman, Jennings Johnson, Glenn Brokke, Ralph Monson, H. E. Hanson.

Location: Ivar Pearson, chairman, Harold Shaw, Carol Reese, Gordon Rosholt, Richard Bossen.

Transportation: Russell Johnson, chairman; William Sears, D. A. Armstrong, Robert Fefferman.

Chaperons and Patrons: Miles Kersten, chairman, Leander Fischer, J. A. Anthes.

Refreshments: William Kaiser, chairman, Homer Hagstrum, Hugo Shogren.

This will be the first dance ever sponsored by the inter-honorary group and a good attendance by the members of the societies is anticipated.

New Member is Added to Aeronautical Faculty

Mr. Albert C. Reed has been added to the staff of the aeronautical engineering department. Mr. Reed is a graduate of the California Institute of Technology. After his graduation in 1929 he joined the U. S. Army Flying Forces, and after three years in that organization Mr. Reed returned to California for graduate work.

Book Notes

Science and the Motor Age

Beginning with the invention of the wheel as a primary mechanical device and following, step by step, the developments leading to the modern automobile industry, one of the newest books on the subject of transportation, *The Turning Wheel*, by Arthur Pound pictures the dramatic growth of one of the world's most widely known corporations, General Motors. The book is published by Doubleday, Doran, and Company.

Of special appeal to the engineer is the discussion of the rise of scientific investigation to its present highly industrialized state. In one chapter, Mr. Pound traces the growth of research from the days of pure science, from which no practical benefit was expected, to the present time when nearly every large corporation maintains its own well-equipped laboratory, employing dozens of scientists.

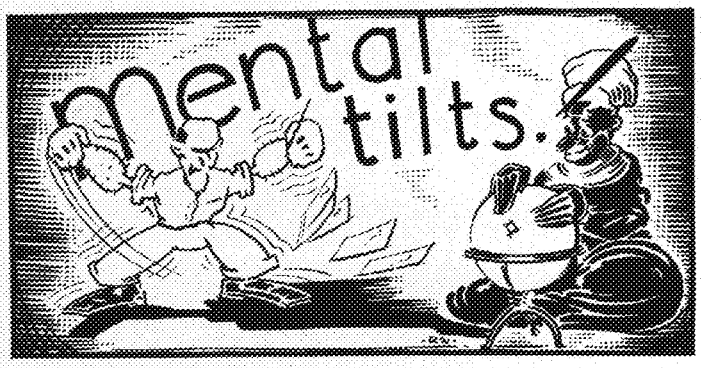
Scientific research up to the beginning of the present century depended upon the means of private investigators or upon universities and foundations for its support, the book says. Pure scientists sometimes "congratulated themselves on the prospect that what they discovered could never be of the slightest use to any one." In this respect, they are defeated men, the author asserts, for the pure science of yesterday usually became the applied science of today.

Before industry became interested in scientific research, a man upon graduation from the university was usually cut off from laboratory facilities and association with minds keyed to research. "The tendency was for him to consider that scientific progress ended on the day that he lost contact with it," says *The Turning Wheel*. "A mind of unusual resiliency marked the man who, faced with practical problems in engineering, day after day continued to peer behind the veil which hid the unknown.

"The independent inventor and investigator struggled along by himself, without backing, living largely upon hope of developing something patentable. After securing a patent he had to look far and wide for capital enough to bring it to market. Great as the achievements of these men were, industries growing in volume year by year could hardly depend upon such random and choice activities to produce the continuous improvements in technique upon which both earning and market leadership depended.

"Consequently large corporations took to financing scientific research. While this research concerns itself with long-reaching problems involving many branches of science which may be years in process of solution, the engineering staffs of the subsidiaries attack with equal energy the problems involved in improving models from year to year. Not only do the divisional staffs commercialize research findings and ascertain their practical applications, but they also originate and put through important innovations on their own account, either independently or in concert with other staffs."

Although the author, in preparing this book had access to the records of General Motors Company, the book is really a history of the entire automobile industry. Not only the



William R. Sears, senior aeronautical, was the first to turn in solutions to last month's Tilts, and as such will receive the customary $1 from the Business Manager.

The feeling of spring in the air brings to mind thoughts of fish and fishing and the question of why the fish that get away are always larger than those caught. The first Tilt of this month may throw some light on the subject.

It Got Away

Oscar connected with a good sized pike while trolling last year, but the fish, knowing more about fishing than Oscar does, wound the line about a submerged stump and broke away. Oscar saw the fish directly below him, about five feet under water and insisted that he looked to be two feet long. If Oscar's face was a foot from the surface, what would be the actual size of the fish?

Long Face

If Oscar's face is nine inches long, how long would it appear to the fish?

Pool Sans Fish

Not that it has any connection with fishing, but a game of billiards forms a good diversion when it rains. A practical problem is: How far above the center must a two-inch billiard ball be struck horizontally so that it will roll without tending to slide?

Stringing a Line

And while still diverted from the subject of fishing, what would be the least length of telegraph wire needed for a 20 mile line, if the poles are spaced 100 yards apart and the horizontal tension in the wire is not to exceed the weight of 1500 yards of wire?

Answers to Last Month's Mental Tilts

Good

Six months.

Better

$1600 the first year.

Worse

Eighteen men, and 50 pounds per trip.

scientific advancements, but also the financing and corporate organization of large corporations manufacturing automobiles are explained in detail.

The book is recommended to all who wish to keep up to the minute on the subject of the automobile industry.

R. E. M.

Kahn Notations

By HOWARD KAHN

Our private detective reports that there must be some mistake for Miss Ethelmae Eylar, who is "pet-peeved" at the engineers, has been steadying with one for over six years. Which reminds me that the business staff insists I publish thanks to Mr. E. L. Eylar. It seems that after this colyum's scathing comment anent his daughter, Mr. Eylar came to the Techno-Log office to buy ten copies of the mag. I suppose by now Aunt Hettie in Hoboken and Cousin Annie in Alabama have all read and re-read my humble comment. (We ought to sell twenty this time.)

* * * *

Scene on Washington Avenue the morning after the J. B.:

"Shay, buddy, could you tell me how t'get t'th'other shide o' th' e-e-campus?"

"Why yes, you just go up that way about three blocks."

"Thash funny. Wuz jus' over there, an' a feller there shaid 't'wuz over here!"

* * * *

Phil Potter was seen to take his Daily out of his P. O. box and throw it away. . . . We don't blame him either . . . The favors for the Jaybee were appropriately initialed . . . Junk Box, '34 . . . Yaw is the amount a ship varies from its set course . . . and varies from 3% on hand-steered to 0.5% on motor-controlled craft . . . oh yaw? . . . Doc Smith in chemistry keeps in trim by playing ring-around-the-rosy with carbon atoms.

* * * *

World's Largest—Feb. 28

"'Gay 90' Frocks OK for Footwork,
Wasp Waists Hinder Body Motions."
I thought we were talking about dancing.

* * * *

Prof. G. C. Priester tells the best story of the day. It seems a student walked in to a drug-store with a half-full gallon can to buy some alcohol. He told the druggist he had just purchased a half-gallon of the potent fluid and wanted to complete the gallon, whereupon the druggist obligingly filled up the can. Then the student discovered he had no money. The druggist would not give him credit, and so the student poured the half gallon back into the druggist's container. However, the student was the victor, for the original half gallon of liquid was very, very pure water.

B. J. Robertson, professor of intern combustion engines, is a real homemake To save the work of shoveling co through the wintry days, he devised small automatic stoker, designed to i crease the supply of coal to the furna as temperature dropped. However, o fine day Prof. Robertson came home find coal emerging from every door a window of his house. It seems the fi had gone out.

* * * *

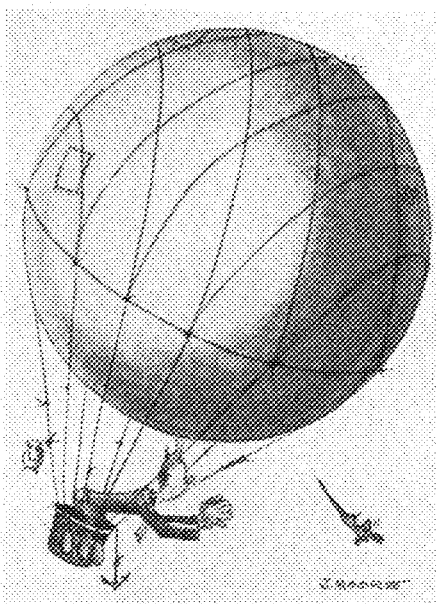
Strange Interlude:

Daily reporter (seeking news of the E gineering campus): What news, Mr. Ro holt?

Gordon Rosholt: Six men pledged Theta Xi in January. (Mr. Rosholt Theta Xi.)

Daily reporter: How do you like t weather?

Gordon Rosholt: Spring is a wonderf month! Spring hopes eternal in the huma breast!



"Shoo!"

World's Largest—Feb. 16

"Seven new N. C. T. C. boxing cha pions were crowned in the final bouts . .
Bill Proffitt, 118 pounds.

. . . . . .

Bill Proffitt, heavyweight."
Just a changeable sort of a fellow.

* * * *

Seen on Techno-Log Bulletin Board:

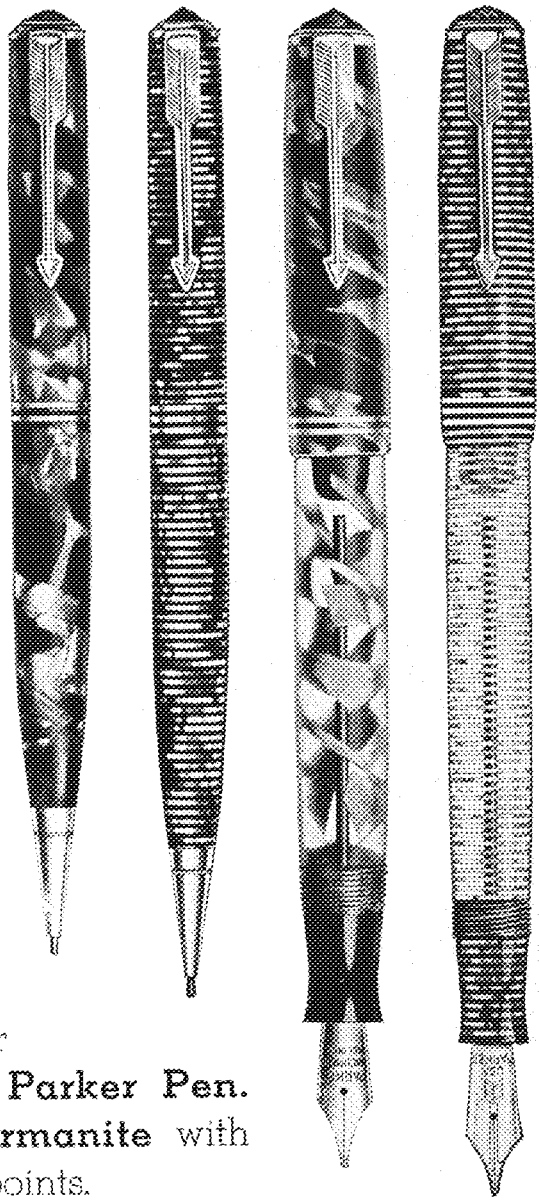
Keep your nose to the wind for new on the sewage project.

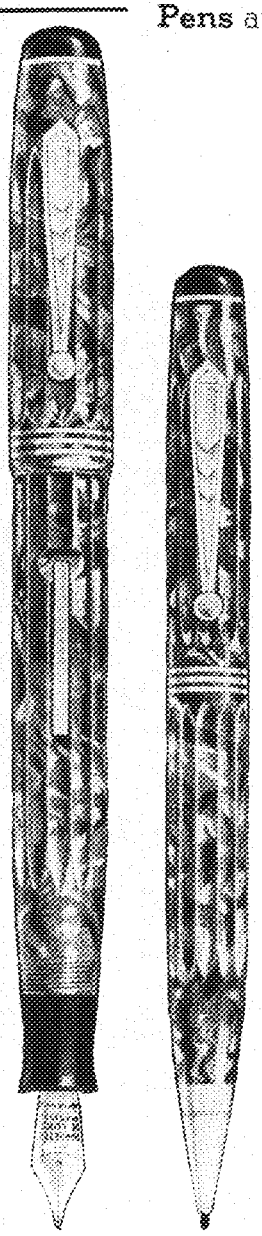
Parker
VACUMATIC

No sac, piston, valves, or faulty parts. This new miracle pen holds 102 per cent more ink than sac pens of the same size; writes two ways with its platinum-plated reversible, gold point.

Parker Automatic Pens come in a wide variety of colors, sizes, and points at . . . . . **$5.00** and **$7.50**

Parker Pencils to match **Vacumatic Pens** at . . . . **$2.50** and **$3.50**





Parkette
DE LUXE

Here's a real dollar-for-dollar value in a less expensive **Parker Pen.** Made of unbreakable **Permanite** with iridium tipped solid gold points.

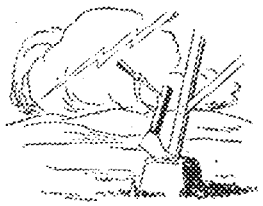
The **Parkette De Luxe** comes in Black, Burgundy, Grey, or Green colors with gold or chromium trimmings at only **$1.75**
Pencils to match at **$1.25**

All **Parker Pencils** propel, repel, and expel.

A complete line of **Parker** writing equipment is carried by your own . . .

ENGINEERS' BOOK STORE

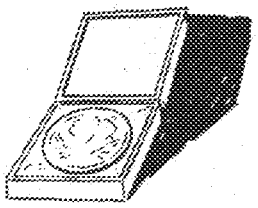
G-E Campus News



LIGHTNING SPIES

How many amperes are there in a bolt of lightning? Well, there are too many for comfort, and most of us are willing to let the matter rest there. General Electric engineers, however, were very much interested in knowing, so that they could better protect electric transmission lines and equipment from damage by lightning. And last summer they sent out over 2000 little spies. These spies are metal cartridges, hardly an inch long, which were placed on the legs of transmission towers on lines in Pennsylvania and Virginia. This territory is apparently one of lightning's favorite hangouts. When the surge from a lightning bolt passes through a transmission tower, the little spy is magnetized in proportion to the highest current in the bolt. Linemen carry the magnetized spies back to headquarters, where, when placed in a "surge crest ammeter," they tell their story. Many scores of the little spies have reported, and their stories are really shocking. The highest reading has been 60,000 amperes.

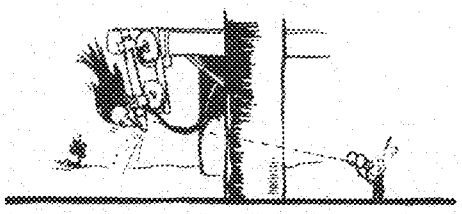
Clifford M. Foust, Carnegie Tech, '21, and Hans P. Knehni, Ecole Polytechnique Fédérale, Zürich, '20, of our General Engineering Laboratory force, were responsible for the spies and the meter to make them talk.



KEYS, MEDALS, AND RESEARCH

The engineers and scientists of the General Electric Company have individually received many keys of honorary societies, medals, and other tokens. On February 1, however, General Electric received a medal to hang on its collective chest. The donor was the 100-year-old American Institute of the City of New York. And the citation read: "For pioneering in industrial research . . . for great achievements in pure science that have furnished gainful occupation for thousands of workers and that have raised the standard of living, and increased health and happiness."

We mention this with pardonable pride, fully aware, however, that medals and honors are not the purpose of research. The real purpose is the discovery of fundamental facts at the border line of man's knowledge. The practical applications are worked out later. It was with this conviction that Dr. Willis R. Whitney, M.I.T., '90, Ph.D., Leipzig, '96, now vice-president of the company, in charge of research, organized the G-E Research Laboratory in 1900. In maintaining this tradition, he is ably assisted by Dr. W. D. Coolidge, M.I.T., '96, Ph.D., Leipzig, '99, the present director; Dr. Irving Langmuir, Columbia, '03, Ph.D., Göttingen, '06, last year's winner of the Nobel prize in chemistry, associate director; Dr. Saul Dushman, U. of Toronto, '04, Ph.D., '12; and Dr. A. W. Hull, Yale, '05, Ph.D., '09, assistant directors.

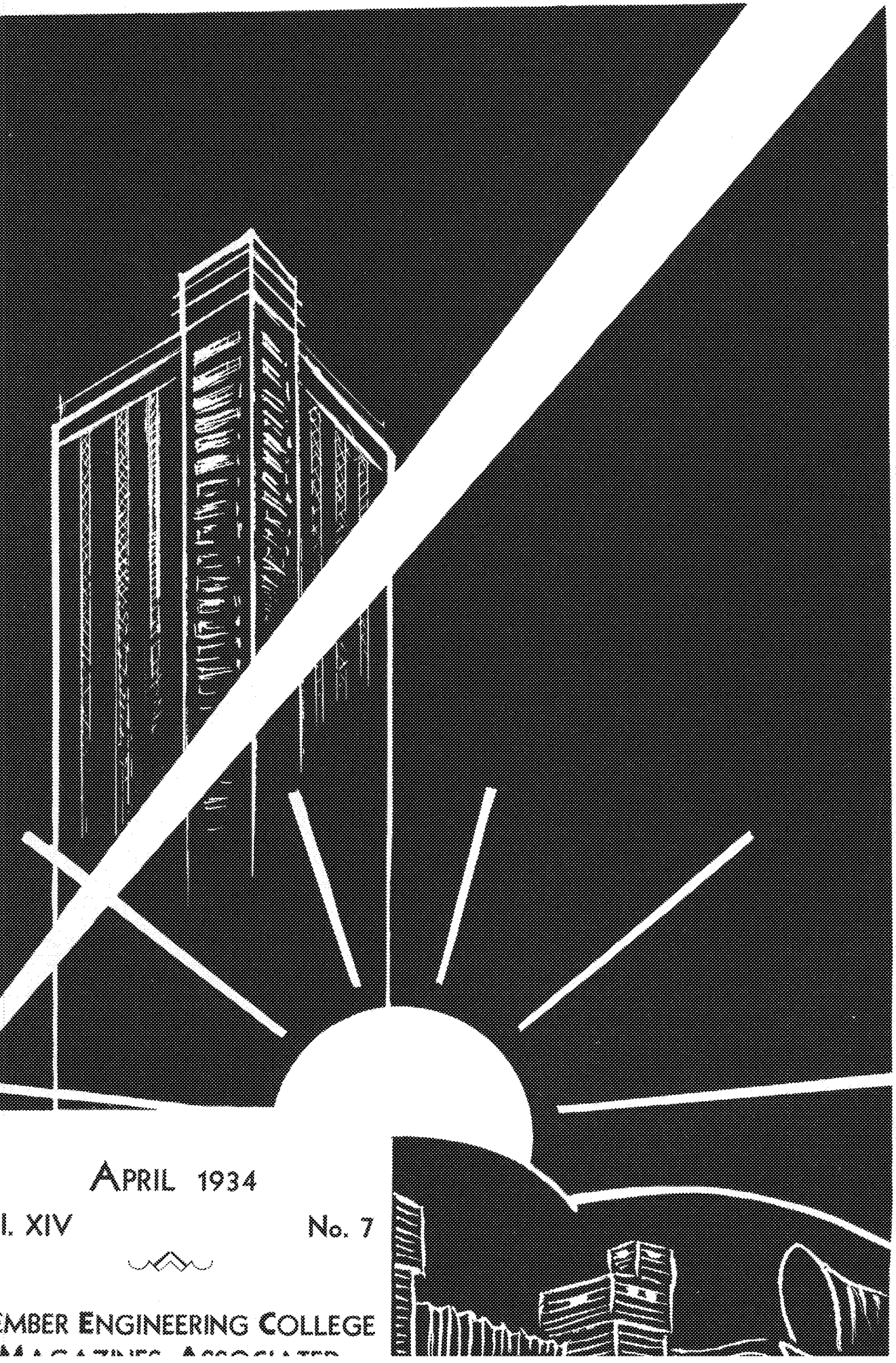


SOUTHERN SLEUTHING

Not since Cock Robin have our feathered friends figured in a real good mystery, until the other day. And this was not so much a case of violence as of mistaken identity. Down in South Carolina, a power company had been having a little difficulty. It seems that the cutout fuses, which serve the same purpose on electric distribution lines that fuses do in our homes, were blowing out without apparent reason. Finally, an engineer with a Bird Club in his past unraveled the mystery. He saw a bird perking at the soft fuse wire, apparently having a fine time. (It wasn't a G-E fuse.) Breathless investigation showed that other circuits had been opened in a like manner.

A G-E salesman on his next call recommended our new fuse links. Having copper in that part which the birds attacked, they proved to be im-peckable, and the trouble ceased. Now the birds are concentrating on worms, the power company on G-E fuse links, and everybody is happy.

The Minnesota Techno-Log



APRIL 1934

VOL. XIV No. 7

MEN—CAPABLE MEN

are the most important factors in any business » » »

Men in sales and executive positions who comprehend the significant value of customer good will and customer satisfaction, and who are imbued with the spirit of worthy service.

Men in the production departments to whom the clicking of type and the humming of presses has been music to their ears for many years—and other men, younger in point of service, who are rapidly absorbing the spirit of true craftsmanship in their chosen field of work.

Men who have grown up under the influence of The Jensen Printing Company's tradition of "always a big dollar's worth for every dollar invested in our products or services."

Men to whom printing is virtually a living thing, with human faults and virtues, and with almost unlimited possibilities.

Men to whom the great efficient, time-saving machines with which they work are as their own fingertips—who constantly plan for better work, to whom the improvement of a single operation is an epoch of accomplishment.

Men who risk their personal reputation in the product they send out—giving their product the best there is in themselves.

Men

and that is the principal difference between good printing and mediocre printing.

Experienced Men

and these men are at your service. Use this man power to its fullest extent in the promotion of your business.

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The Acting Editor Says:

Had a hard time getting all the ads in this month. Don't know whether someone lit a bomb under our salesmen or if the merchants suddenly found out that Techno-Log ads bring results.

A. G. Dewars, who incidentally is the man who interviews seniors for the Northern States Power Co., tells how the training courses conducted by large industries teach the men how to apply their knowledge gained in college to the particular problems of the company for which they are to work. He indicates in the article the characteristics in students which employers look for.

Professor Siler is good and Jim Moore is great, but when you put the story and the cartoons together—oh boy, Oh Boy, OH BOY! Look in this article for the secret to success, hidden between the bartenders and the pankratiasts.

It almost came to flipping a coin to decide whose name to run on the housing article. We asked Hans Wessel to write it but when we called for the article he said his partner, J. A. Brunet, did all the work. At first we couldn't figure out whether he was just being modest or what but finally decided on Brunet.

Got to run along now and help the boys on the next issue which is going to be out a few days before Engineers' Day.

—*D. B.*

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Minnesota Techno-Log

37 ELECTRICAL BUILDING U of M

APRIL 1934
Volume XIV Number 7

Ralph Monson
MANAGING EDITOR

Gordon Rosholt
BUSINESS MANAGER

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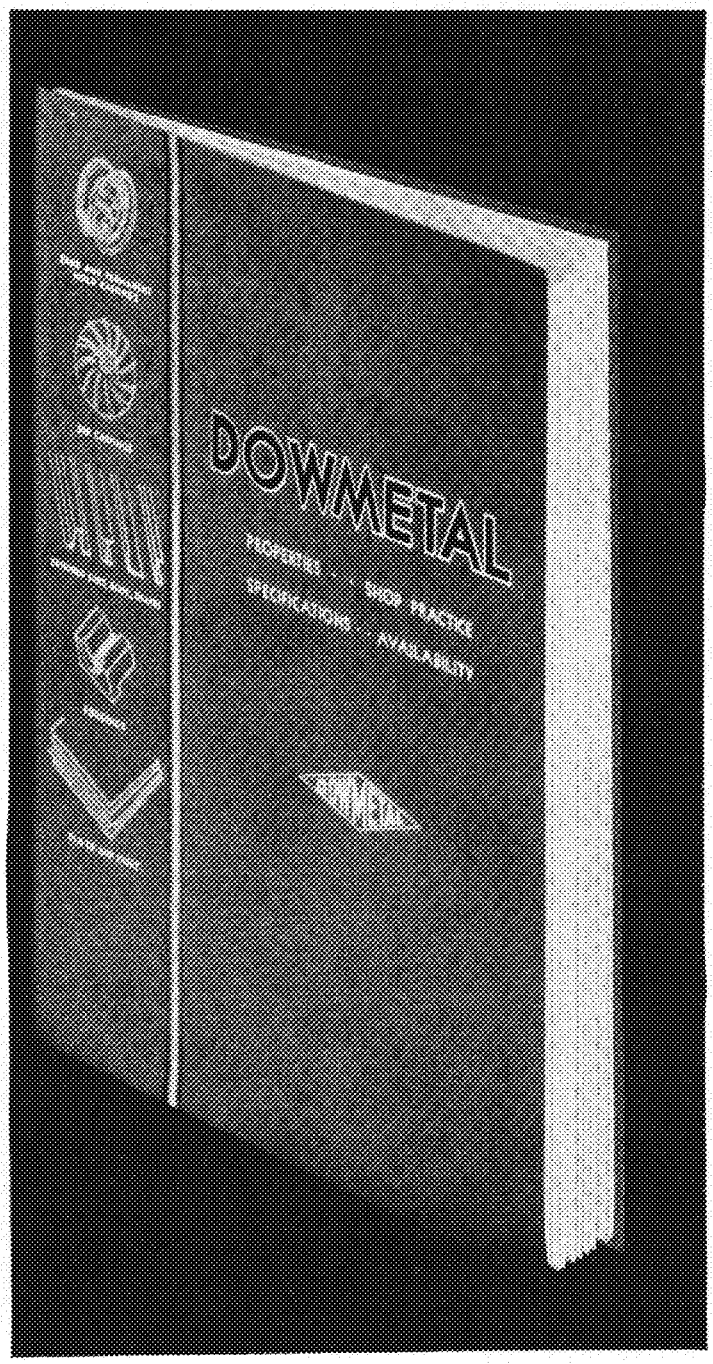
This Month

Just off the Press

A NEW DATA BOOK ON DOWMETAL



World's Lightest Structural Metal

DOWMETAL

HERE is the latest information on Dowmetal. This new data book describes current uses of Dowmetal and records significant accomplishments since the publication of the last data book, particularly in those sections dealing with "Available Forms" and "Shop Practice".

Light, strong Dowmetal alloys are being used in increasing amounts in the aircraft, automotive, machinery, and many other industries, particularly in such parts or products that have to be moved or carried or are subject to rapid motion in operating mechanisms. Its applications range from small portable tool castings to such structures as large auto-convoy trailers. Dowmetal is available in all of the common commercial forms such as sand castings, die castings, forgings, extruded shapes, plate, and sheet.

This new data book shows how the various forms of this ultra-light alloy can be fabricated by processes common in industry to the great advantage of both manufacturer and user. Write for your copy today. Kindly state your business connection and position.

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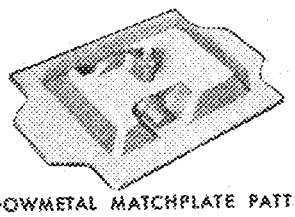
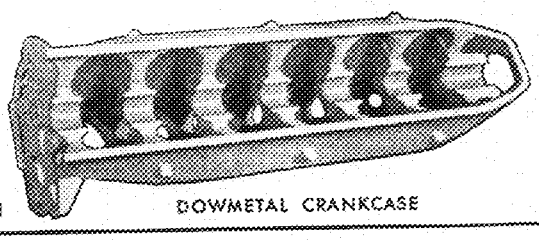
DOWMETAL



DOWMETAL MATCHPLATE PATTERN



DOWMETAL CRANKCASE

DOWMETAL SAW GUARD

controlled housing Would Solve Slum Problem in large cities

By J. A. BRUNET, M. S. Arch. '33

In view of the fact that the government has been considering the advocated plan of replacing slums with modern housing systems, this article is presented to point out the economic and social advantages of such a plan. The author, of the firm of Wessel and Brunet, consulting architects, compares the problem in this country with that in Europe, where controlled housing has been carried out extensively

Whenever a proponent of the question of housing in the United States wishes to impress his point, he quickly brings up the problem as it exists in Europe. But the most striking difference between housing in Europe and in the United States is seldom mentioned.

Housing of the lower classes in Europe has been a vital problem even before 1900. Housing in the United States has not been generally recognized until very recently, and if it had not been that we reached the bottom of the business cycle, we would probably never have known anything more about housing than that it was a subject studied by a sociology class. In Europe the problem was almost purely social. It was recognized by the various governments as a necessity to the promotion of good citizenship and the preservation of the general welfare of the people. It was heartily supported by the local and central governments. It was encouraged by huge propaganda programs. Housing societies were formed for almost any reason or purpose that might be imagined. Groups of craftsmen or various clubs would form their own housing societies through which they were able to obtain loans from the central government up to 100 per cent of the cost of construction. Provisions of the loan made private speculation impossible.

In the United States the study of housing has been carried on intensively by a few interested and socially minded people to a very high degree, from the purely social standpoint. Slum conditions have been studied from the highly technical standpoint of building, street layouts, and group planning; but it seems that it took the business depression to bring the need of housing to the fore. It was not brought forward by any philanthropic causes but by the desire of manufacturers, builders, architects, realtors, etc. to make a profit therefrom.

The reader should not suppose from the above statements that the United States has no housing problem and that it is just a myth brought about by the private individual's desires for gain. It has been discovered that some of our "nicest" slums are no better than the worst dives of Singapore, for the lowest dregs in the world have suddenly been discovered to exist in the City of New York. Other cities have as vicious slums as New York in varying degrees and forms. We are awakened to these facts by the same means through which we were held in ignorance of them. Those realtors, builders, and others who said that the United States has no slums, now tell us the opposite. These same business individuals, while attempting to illustrate the urgent need for housing and scientific group planning, have been unwittingly exposing themselves by disseminating information which has been gathered by the aforementioned socially minded persons. We now see for the first time our rugged individualism in the nude.

We have discovered that we have advanced beyond any other nation in manufacturing and distribution but that the building industry has lagged behind. Private enterprise and speculation has hindered certain fundamental parts of the building industry; namely, group planning, scientific street layout, and economical financing. Through blatant and extensive advertising private enterprise has forced upon us bad planning, ugly building and burdensome financing charges.

Now we find ourselves using modern motor vehicles in an archaic system of streets only adaptable to the horse and buggy. Our houses are placed in monotonous rows along these same horse and buggy streets, each house with its ash can and garage in the rear and its pretentious ginger-bread front. We are alarmed to learn that our population is tending to stabilize. Our cities and their suburbs are laid out for a rapidly increasing population and we are sure to lose that hoped for "unearned increment." Who is to pay for these miles of unused streets and sewers? A look at our tax statements is very enlightening. Of course, now that we recognize our plight, are we going to solve it by the same formula that brought it about?

Private initiative can not be relied upon to solve the problem. Private initiative must have its profit and little does it realize that its present gain may mean tremendous future losses. Every owner of land must have his finger in the city planning pie attempting to get his "cut."

If public initiative is to solve the problem, it must have extensive powers of control, it must have power of eminent domain. It must be able to originate zoning changes and adjustments and not wait for uninformed individuals to instigate such changes as are necessary at the present time. Our cities must not be allowed to extend their boundaries beyond their "taxability." In other words, as the density of a neighborhood is decided by the ability of its population to pay rent so must the density of a city be decided.

If we wish to point to European housing and planning as an example, let us not forget that its success was brought about not by private initiative, not by haphazard planning, but by central control through "directors of public works" or similar bodies who had the necessary powers and thereby were able to plan for the common good.

large industries

Conduct Practical Training Courses

to supplement college education

By A. G. DEWARS, E. E. '14
System Planning Engineer
Northern States Power Co.

"Good morning, sir."

We look up from the report which has been absorbing our attention to find a young man of clean-cut appearance facing us, radiating self-confidence, but respectful. Upon receiving acknowledgment of his greetings, he continues: "My name is John Doe. I am a senior student in the College of Engineering of the University of Minnesota and expect to receive my degree next June. I am highly interested in the electric light and power industry and would like very much to obtain employment with your company as soon as I have completed my college course."

The young man is one of many senior engineering students—perhaps you yourself might well be in that young man's shoes. We name the electric light and power industry merely because we happen to be closely associated therewith. Introductions being completed, the young man is invited to sit down and is encouraged to discuss his ambitions and aspirations. His replies to our questions bring out salient facts regarding both his collegiate work and his practical experience and, incidentally, we gain some insight into his general character. Sooner or later we ask, "Why do you think you would like to enter the electric utility field?" The reply? What answer would you make to such a question?

Experience has led us to expect a reply to the effect that the applicant is very much interested in the activities carried on by this, that, or the other department of the company. He will probably add that he has been careful to arrange his college curriculum in such a manner as to permit him the maximum time on subjects associated with the work he has in mind. And yet, if we ask for his conception of the activities carried on by those actually engaged in the work in which he thinks he is interested, he will find that his reply must be in the form of a few general statements lacking sufficient detail to make out a good case for himself.

As we do not expect such details, we are not surprised, nor are we disappointed in the young man. We know that the electrical engineering school must confine its efforts to the task of instilling into the mind of the student a thorough knowledge of the fundamental principles and laws governing the generation and use of electrical energy and that it has not the time available, nor does it possess the facilities necessary, to place the student in direct contact with the practical application of his knowledge. The college provides the foundation; the young engineer must build his career out of knowledge, gained from experience, and experience can only be had through contact with actual practice. And so, whether the young engineer realizes it or not, he must complete a long and somewhat tedious apprenticeship before he can qualify as a professional engineer.

Industry recognized this problem of the young engineer long ago and has carefully developed a means by which the newly-graduated technical employee may quickly acquire an intimate knowledge of industry's method of applying theory to practice. We refer to the apprentice engineers' training course offered by numerous companies engaged in the various branches of the electrical industry, such as manufacturers of electrical machinery and equipment, electric light and power companies, and communication companies. Regardless of the fact that the details of the courses offered by different branches of the industry must necessarily vary widely, the courses in general serve two common purposes: First, each course is designed to give the apprentice engineer an opportunity to study at close range the details involved in the practical application of engineering knowledge, and second, each course is designed to permit the employing company an opportunity to study the qualifications and characteristics of the apprentice.

For instance, the company with which the writer is associated conducts at intervals an apprentice engineers' training course for the purpose of preparing young engineers for future engineering or technological work with the company. The course extends over a period of forty weeks, during which time the apprentice engineer is placed in direct contact with —by means of actual participation—the various activities involved in the supply of electric service to the public.

At the close of each assignment, the apprentice is required to submit to the supervisor of the course, a written report giving his conception of the activities and responsibilities of the group with which he has just been associated, and in each of these reports the young engineer unconsciously injects definite indications of his interest or his lack of interest in those activities. At the same time the supervisor of that group is required to submit his personal estimate of the abilities and characteristics of the apprentice.

A careful study of the numerous reports thus submitted during the period of training leads to rather definite conclusions regarding the specific line of work for which each apprentice engineer is especially fitted, but before a permanent assignment is made, each apprentice is asked to name the department to which he would like to be assigned. This is the same question put to him before he started the course and in most cases he repeats his original choice. Occasionally, however, the apprenticeship course brings the young engineer into contact with activities of which he had only vague knowledge at the time he left college, but which he has since found to be of far greater interest than those which originally ap-

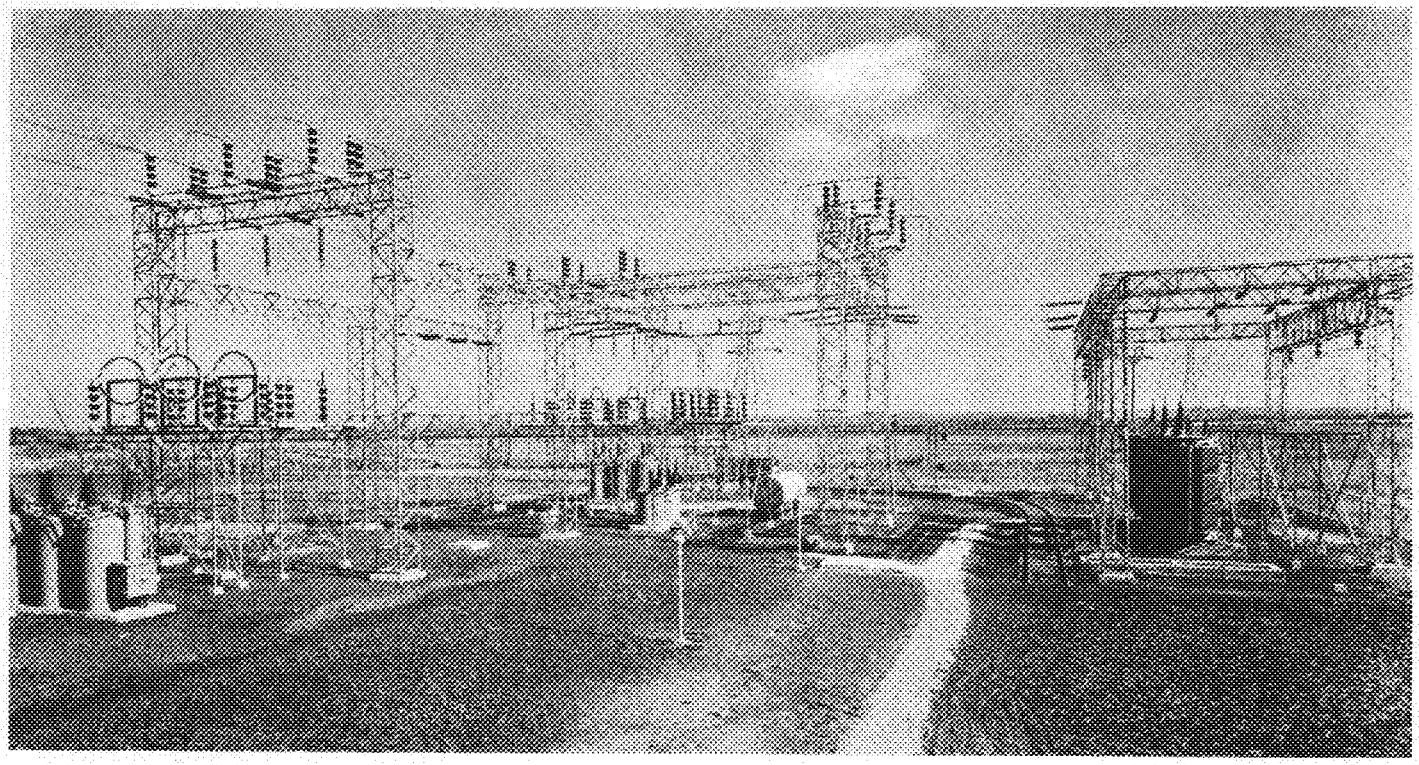
peared to be attractive. As a rule, the records accumulated during the period of training justify permanent assignment to the department chosen by the graduated apprentice, but occasionally we find a young man who is unaware of certain abilities and qualifications which make him particularly suitable for activities other than those for which he has expressed a preference and permanent assignment is made accordingly.

Nor is the graduated apprentice necessarily assigned to a subdivision of that general branch of the organization known as the engineering or operating department; he may receive an appointment to the sales or to the accounting and auditing departments. It is, therefore, not at all unusual to find graduate engineers in very important positions not generally thought of as requiring engineering training, but in each such case, close examination will bring forth the fact that the man reached that position because he had had an engineering training and possessed, in addition, certain outstanding qualifications which made him peculiarly fitted for the type of work in which he is engaged.

We have intimated that the apprentice engineer is always offered a place in our organization upon completion of the training course. This is true. Each applicant for a place in the course is required to make a written statement to the effect that if accepted, it is his intention to complete the course of training and to remain with the company afterwards. This is not a form of contract, but it is rather, a gentlemen's agreement between the apprentice and the company. The company has always recognized this agreement as binding and, therefore, before any group is selected, a careful survey of the engineering personnel requirements of the entire organization must be made to determine the number that must be added the following year, and the number enrolled in that group is limited accordingly. Naturally, all applicants cannot be accepted; in each case many times the number actually required are interviewed.

Scholastic records are of much interest, but in no case can such records alone insure acceptance of any applicant, since, in a large organization such as the one with which we are associated in which ability to cooperate with fellow employees is of extreme value, the possession of that ability to an unusual degree will usually go far towards counteracting a natural predisposition to look upon high scholastic rating as a paramount requisite. Integrity, sincerity, and determination are, of course, invaluable assets to any candidate for enrollment and much is known of these and many other attributes of each candidate before the selection of a group is completed. Since other companies exercise similar care and thought in selecting groups of apprentice engineers, enrollment in such a group is considered a great honor and it is certainly a most desirable method of getting a start in any branch of the engineering field.

To discuss apprentice engineers' training courses at the present time may seem somewhat futile, for there are at the moment very few opportunities for the young engineer to find a position of any kind, to say nothing of the choice opportunity of enrolling for such a course of training. But, economic conditions must eventually improve, and sooner or later training courses will again be offered by industry. When that time comes, by all means make every effort to enroll in a training course offered by a company actively engaged in that branch of industry in which you are most interested, for by this action you will place yourself in a position where you can quickly gain a panoramic view of the engineering activities which appeal to your interest and where you can at the same time orient yourself before definitely choosing the exact professional road you wish to travel.



A TYPICAL SUB-STATION

Actual work in the sub-station department is one step in the ten month training course which this company gives all their electrical engineers

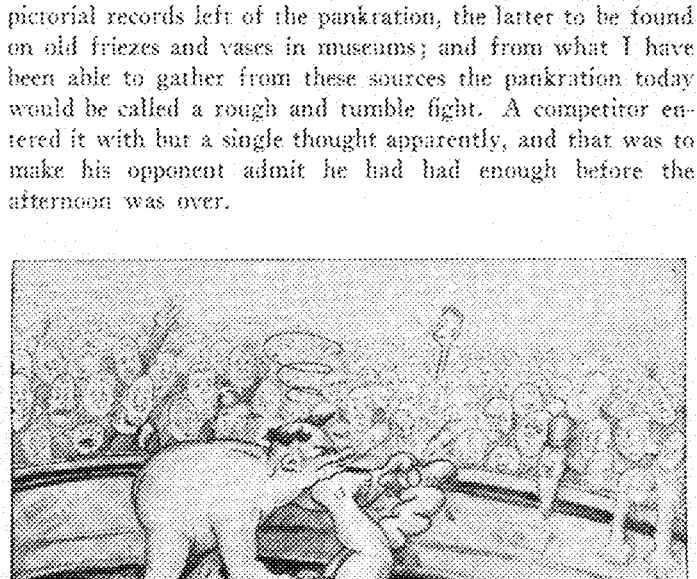
Signs of Spring

from pankratiasts to bartenders

By RODERICK WILLIAM SILER
Assistant Professor of Mathematics

Though a man might not want to bet on it yet I think there is reason to suspect that spring is here. Signs of baseball and track are in the air. The indoor athletic season in these parts may be said to have ended with a bang in the Golden Gloves Tournament at the Minneapolis auditorium and in the final boxing bouts at the University. The boys who engaged in those combats have by now either had their teeth straightened or new bridgework installed, and are looking forward to the humdrum life of summer. Boxing is a wonderful sport, and for real, good natured fun I doubt if there is anything in the line of athletics to be compared with hitting another man on the nose with a six ounce glove. However, before coming to a decision as to the relative merits of different sports, one invented by the ancient Greeks should be considered.

The Greeks, who had a name for it, called it the pankration. About the roughest types of physical activity of which I have ever heard, outside of actual war, are la savate, a French invention somewhat akin to boxing, but substituting feet for fists; or the old lacrosse of the Indians; or the Japanese jiu jitsu. The pankration preceded all these, however, but wasn't any milder because of that. There have been written and pictorial records left of the pankration, the latter to be found on old friezes and vases in museums; and from what I have been able to gather from these sources the pankration today would be called a rough and tumble fight. A competitor entered it with but a single thought apparently, and that was to make his opponent admit he had had enough before the afternoon was over.

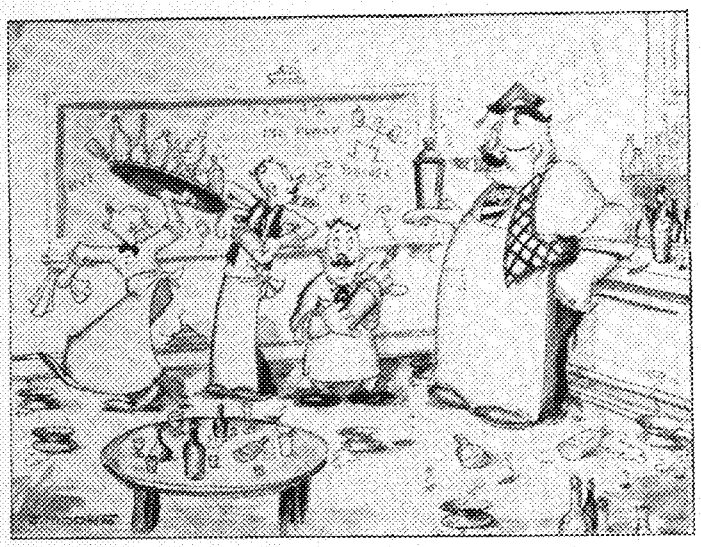


"Even biting and gouging were in good taste among the Spartans"

A written description which has come down to us of a championship contest, the winner of which died immediately after, states that strangling, twisting of arms, punching, kicking, and jumping on an opponent when down, were all allowed, and that even biting and gouging were in good taste among the Spartans. Various tricks were developed and employed. One famous pankratiast—a practitioner of the art was so called—made a practice of getting hold of an opponent's foot and, no matter what happened, hanging on and twisting until the other man could stand it no longer. In those days there were no such things as gymnasium mats, the contestants meeting on the open ground under the eyes of the spectators and, as in all Greek athletic exhibitions, being quite naked. This, no doubt, was why it was customary to spade up the ground and thoroughly soften it with water. I imagine that for the comfort of all concerned all small stones were removed, also, though I must admit I have found no actual record of this last.

Our seniors are about to take the annual dive into the cold world. I am inclined to think that one of the greatest shocks, in the ordinary run of events, that a man graduating from college will ever get results from the apparently profound indifference of the world as to whether or not he was ever in a college. To spend four years or more trying to collect enough credits to get a diploma, and then have the public show less interest in the sheepskin than it would in a handbill advertising a chain store's one cent sale is pretty startling, to say the least. But so it goes. A college diploma today is simply a ticket permitting its holder to enter the procession of the professions, but it will not assure him success unless he can stand the pace that follows. In other words, it is true that the world does not give a whoop about the diploma except in so far as it appears to indicate that its proud possessor has had a chance to develop in certain directions and has possibly profited by the opportunity.

If I were asked today to pick the winners in the long chase of the class of 1934 after fame and fortune I think I would base my choice chiefly on what the candidates seemed to know, or seemed capable of learning, of human nature. From the day the graduate tries to interest and impress a possible employer to that time when he is selecting his own associates, assistants and employes this peculiar knowledge will, beyond all else, determine his success or his failure. Such knowledge is likely to be limited in young men in engineering colleges who are inclined to get the idea that the world is just a



A school for bartenders has been recently founded in New York

●

place in which to design, manufacture and use machines. This ideal hasn't been reached yet, and I doubt if it will be even by the time the class of 1934 has long white whiskers. The problem of making a way in the world is primarily and constantly a human one, no matter how much people try to camouflage that fact; and the man who goes through college without having developed any ability to deal with it has reached for the shadow of education and missed the substance. What students often fail to realize, and what engineering faculties haven't always realized, is that strictly technical courses and activities are not sufficient to develop this necessary ability.

It is, I think, the impossibility of indicating by any system of figures or grades a man's complete knowledge, ability or capacity for development which makes the later careers of a graduating class a subject fit for speculation. All of which ought to make the class of 1934 as a whole more cheerful. The race is still wide open. And the rest of us can gather in the stadium on Commencement Day, gaze upon the countenances of those about to graduate, and write down the names of our winners with the comfortable feeling that it will be at least ten years before someone can step up to us and say, "Well, old top, you certainly picked the wrong guy."

I would like to conclude with an educational item of general interest, but just at this moment I can think of nothing but the recent founding in New York of a new institution of learning. It is called the American Bartenders' Institute. The information I have concerning it comes from the New York Times, which seemed considerably elevated over the thought that the New York educational system is to be thus rounded out. Like all up to date schools the Institute is to be co-educational. The courses seem to be chiefly lecture and laboratory. The article indicated there would be a good deal of time spent upon the study and perfection of English. There is nothing like a command of English for dealing with human nature. No doubt the scholars will also have a thorough athletic training, for the benefit of those customers who cannot be moved by well chosen words. Thus Time marches on, and Education with it. Perhaps we shall live to see the day when ads such as the following will appear in the public press: "Bartender wanted. Must be Institute graduate. Must also be first class pankratiast."

Hear Ye! Hear Ye!

St. Pat Speaks to Engineers

Hear ye! Hear ye! All good and loyal engineers attention! The time is fast approaching when we should all do honor to our esteemed patron, St. Pat, that worthy professional forbear who performed the most amazing engineering feat in all history. *He* chased the snakes out of Ireland. Nothing in our great modern age can equal such a colossal feat. In fact it was better than nothing. Was it not St. Patrick (that was what his dear old mother used to call him) who originated that term which has been handed down thru the ages?—"You snake in the grass"? And he was not referring to a Hawaiian hula-hula dancer.

A Techno-Log news hawk found this letter while snooping through Lloyd Walner's pockets.

Dear Lloyd:

Glad to hear you got appointed to that awful job of chairman. Lemme tell you, it's nerve-racking, so you hadn't better do much work on it. Let the other guy do it. That's my motto. I hear it's going to be on May 18th, this year. You've got about six weeks in which to do nothing. You had better get started on it right away, then.

Well, I have to close now on account of I have to do an Erin for St. Peter. After that we're going on a big drunk and review our hyperbolic functions.

Your friend and advisor,
St. Pat.

Engineer's Day will be a busy one, too, we can assure you, with the parade, knighting, green tea, dansant, and all the other goings-on. Mr. Walner has chosen a lot of assistants to see that everything clicks. Raymond Hoag has been hooked for the job of secretary, and John McGlone, in the position of treasurer, holds the purse strings of the enterprise. Herb Jensen and Leon Hamlet will assist Mr. Walner on the general arrangements committee. Roland Nygren looks around for music so that the lads and lassies can fox-trot at the Brawl. That eminent electrical, Carl Pennig, takes care of the broadcasting. Another Carl, Sivertson by name, assures us that the dansant will be properly handled. Gordon Rosholt will see to it that the alumni hear about the big doin's.

Paul Rossiter gets blood-blisters under his fingernails decorating the ballroom. The tea-pourers upstairs must have a boss, so Mary Emmel lays aside her smock for an apron. To Frank Pellegrino goes the job of sharpening up the sword for the knighting ceremony. William Gordon will make sure that visitors are made welcome at the open house. Publicity on the campus is handled by Richard Pederson and the downtown publicity by Charles Sweatt. Posters to advertise the affair are to be arranged for by Victor Gilbertson. John D. Peterson plays traffic cop and makes sure that the parade doesn't get lost in the big city. Supervision of the printing falls to the lot of John Claydon. And finally, the fellows who run around selling tickets must own Burton Thompson for their chief.

THE MINNESOTA
TECHNO-LOG
UNIVERSITY OF MINNESOTA

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Opportunities on the Farm

Why is it that boys born and raised on farms and having all the natural background for the business of farming come to college and study everything else but agriculture? Of the 9,004 students enrolled at the University, only 708 are enrolled in the College of Agriculture, Home Economics, and Forestry and only 18 of 960 engineers are taking agricultural engineering. Yet this is an agricultural state having an excellent agricultural college.

Do the students believe it is not necessary to go to college if one wants to be a farmer, or is it because they think there is no future in farming? In answer to the first question, we could point out any number of cases to prove that a college education is valuable to the farmer. It teaches him how to be a more efficient manager by proper care of livestock, by proper diversification of crops, by proper use and care of machinery, and by proper fertilization and care of the soil, including the use of soil erosion dams. The agricultural engineer is taught how to correlate the amount of product to be produced and the method of production so as to accomplish the desired result; namely, low production cost. He does this by determining through research the proper design and construction of equipment, as well as the proper selection and operation of the equipment for the various services the equipment must perform. The agricultural engineer can save valuable soil by the proper use of soil erosion dams. It is estimated that it takes 1,000 years of weathering to produce one inch of surface soil, yet one good rainfall is apt to wash this soil away. Twenty times as much plant nutrient is lost by soil erosion as by plant removal for a year of normal conditions.

These illustrations of how a college education can help the farmer to save his soil and produce at less cost also answer the second question, for surely there is opportunity for anyone who can produce for less cost. Farmers have to produce at less cost if they expect to meet the competition of products from countries where the land and labor is cheaper, such as wheat from Russia. Perhaps you recall seeing this sign on the prize winning float of the last Engineers' Day parade—"Three hours and three minutes of man labor to produce one bushel of wheat with farming practices of 100 years ago. Twenty years ago it took 10 minutes of human labor to produce 1 bushel of wheat. Under present farming methods it takes 4 minutes of human labor." The cost of production has been greatly reduced, yet mass production has been barely touched. What is to prevent capitalists from entering the nation's largest business and revolutionizing it as they have the industries? If they did, it would require engineers and executives trained in the methods of agriculture.

Whether such great changes will take place or not, the agricultural methods must be steadily improved and this takes trained men. To date it has taken every graduate of the department of agricultural engineering at Minnesota, for every single one is employed. Perhaps there is more opportunity for a young man in the business of agriculture than we thought.

Unnecessary Expense

The inconvenience of having to come to school two or three days before the quarter begins merely to registar is still fresh in the minds of most of us. For those who live outside the twin cities it is not only an inconvenience but an expense. Let us stop for a moment and figure how much of an expense this really is. At the beginning of the fall quarter the student must be at school Friday which means he has three nights lodging and eight or nine extra meals to pay for. If he comes to town Thursday, as many do, that increases it to four nights and ten or eleven meals. At the beginning of the winter and spring quarters he must be here Saturday, requiring four or five meals to pay for. His board is not increased as he probably pays for the room over the short vacation. Adding up we find that our present system of registration necessitates three or four nights lodging and 16 to 19 meals each year away from home.

The University's own figures on the estimated cost of room

and board, found on page 58 of the general information bulletin, amount to about 50 cents per night and 37 cents per meal. A little slide rule work shows that the present system of registration requires every out of town student to pay out $7.42 to $9.03 each year.

Assuming that the student can live half as cheap at home as at school makes the net expense about $4.00 per year.

Of the 960 students in the college of engineering it is safe to estimate that at least 400 come from out of town. Multiplying 400 by an average cost of about $4.00 per student we find that our Saturday registration system is costing the student body around $1,600 each year.

One would think that the administration would be willing to put up with some inconvenience to save the students this sizable figure. Perhaps a few letters from the folks back home who are paying this unnecessary expense would help to convince the administration that engineers should be allowed to register in advance as is done in the other colleges of the university.

No Local Texts

It would be interesting to study the results if a ruling were made to the effect that no texts written by instructors at this University could be used at this University. One thing is certain and that is our instructors would not write nearly so many books; many of the local texts are not used in any other colleges. It's not hard to understand why we have to use books which are not good enough for the other schools. When a group of instructors are selecting a text for the course they teach, and one of the group has written a book on the subject, no one will suggest another even though their fellow instructor's book is inferior. Once the local book is used it is hard to change to another, because that involves considerable expense to the student and hurts the local author's feelings as well as his income. In the long run, however, we believe it would be cheaper for the students if we changed to books written by outsiders. Have you noticed that in general the texts written by local instructors are revised more often, requiring us to purchase new ones?

The pecuniary angle is not the only one. When we use a book written by someone other than our instructor, we receive the benefit of the knowledge and experience of two men. Several lecture courses, not to mention any names, would be made vastly more interesting and educational if the professors would not stand and read from the book word for word as they do now. They would realize that the particular phrasing of the text is not the only way to say it if they were using another man's book.

We realize that there will never be a rule such as we suggest; we would not even endorse it ourselves. Some fine texts have been produced on this campus and the University should encourage the professors to write more. But while the author is revising and perfecting his book, is it fair to tell the student that he must buy the latest edition when only a few pages have been changed?

Dean Leland's Pen

Study The Teacher

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The advantages of such a varied experience become evident as soon as one discovers the analogy between an instructor in college and an employer or supervisor in industry. While their objectives are not the same in all cases, they are often similar. For example, the teacher is anxious that his pupil obtain a knowledge of his subject, an ability to apply that knowledge, and at the same time a certain familiarity with professional practice which will enable him to hold a position and advance into greater and greater responsibilities. The employer, on the other hand, although expecting satisfactory service from the young graduate in return for his pay, is interested in developing in the young man the same ability and usefulness which will make him continuously more valuable and worthy of advancement.

It is essential to the success of the young man that he please his employer. To do so, he must learn what is expected of him and to meet those requirements more fully and satisfactorily than do his associates, in order that he may stand out above the "crowd." If he has learned to study *men* and has acquired the habit of accommodating himself to the different methods and standards set up by various individuals who are in authority, it will be easy for him to fi into a new organization with a minimum of friction or los motion.

In college, the student has an excellent opportunity to stu each of his teachers, to determine how he wishes his work be done, and to develop the habit of conforming to procedures. The different teachers have different prefe rules, and methods, thus providing a variety of ex for the student in a laboratory of practical psycholo might be called. If he takes advantage of this opp he will obtain useful practice which may save u experiences after graduation when he enters the petition of industry. Undoubtedly, most students this process in college, without knowing it, an benefits which arise from the wide variety of they meet. These benefits would be greater intentionally studied his teachers. —*O*

With Our Alumni

Dr. F. G. Frary, A. C. '05, M. S. '06 (Ch.), Ph. D. '12, Director of Research, Aluminum Company of America, and H. H. Dougan, C. '08, executive assistant to the president of the Great Northern Railroad, have been appointed to committees to assist the Federal Coordinator of Transportation in a comprehensive study of present railroad problems, especially those problems concerning the question: "Is there need for a radical or major change in the organization, conduct, and regulation of the railroad industry which can be accomplished by federal legislation?" Dr. Alvin H. Hansen and Dr. William Stead of the University School of Business are also working on the railroad problem for the government, which has assumed the responsibility of preserving the railroads.

Many plans for constructive changes in the railroad system have been submitted; yet each has its drawbacks, according to a recent report of Joseph B. Eastman, the Federal Coordinator of Transportation and member of the Interstate Commerce Commission. He states, as examples, that in public ownership and operation lies the danger of political influence in management; and any combination of railroads to increase efficiency and prevent duplication of services means the discharge of employees, which is strongly opposed by labor organizations. So the problem is not easily solved; but the government has secured the assistance of many prominent economists and authorities on railroads in an effort to find a solution.

E. G. Chilton, C. '13, dropped in to see Professors Cutler and Zelner. He has been county highway engineer for Becker County for the past five years, and is now living at Detroit Lakes. Previous to 1928 he was a resident engineer in the northwestern part of the state for the state highway department. He has been married since 1921 and has four children.

Henry Lende, C. E. '20, has been married a year and is now in Los Angeles working for the Spencer-Lens Co.

Burt L. Newkirk, B. A. '99, and loyd Grober, B. S. (M. E.), '24, who are working together in the Research Laboratory of the General Electric Company in Schenectady, New York, were granted jointly a patent for a shaft bearing.

R. W. Orth, B. M. E. '30, is now writing advertising copy in the Publicity Dept. of the General Electric Company at Schenectady, N. Y. Bob reports that he has finally traded in the old Dodge. Otherwise, life goes on as usual.

Gerald T. Timmins and Melvin O. Jordahl, both C. E. '32, are U. S. Engineers working at La Crosse, Wisconsin.

Norbert Mengelkoch M. E. '33, has started working as an inspector for the American Can Company in Minneapolis. He was with the Knuz Oil Co. Frank Ventura, M. E. '33, has been with the American Can Company since graduation

Jasen Yaggy, C. E. '33, is working for the Curtis Publishing Company in Minneapolis.

Arthur Abrahamson, Tom Finnell, D. M. Bohrer, A. M. Fisher, L. M. Ross, all E. E. '29, C. L. Neill, E. E. '28, and Ed. L. Johnson, E. E. '30, are all doing sales work for Westinghouse.

LeRoy Abrahamson, E. E. '29, is at Sheboygan, Wisconsin, working for the Wisconsin Power and Light Company.

Leland Read, M. E. '29, is a research engineer for the Carter Carburetor Company of St. Louis, Mo.

What are the agricultural engineers doing? It is about time we heard from them. From the looks of things, all the graduates are very busy.

'33—Russell G. Carpenter. Russ is managing to keep busy making preliminary surveys and designing municipal lighting and heating plants for Burlingame & Hitchcock, consulting engineers in Minneapolis. He married Mildred Bosshart.

'30—Byrnon C. Colby is to be found out in the sunny state of California doing stream gauging work for the United State Geodetic Survey. From his results he figures the amount of surface water available for irrigation, industrial, and civic uses.

'30—Bruce R. Colby received his Master of Science degree at the California State University in 1933. At the present time he is with the United States Geodetic Survey in the vicinity of the Twin Cities.

'32—Arno R. Schwantes is doing air conditioning research work for the Waterman & Waterbury Furnace Company of Minneapolis. He worked for this concern while attending school his last two years. They seemed to like him, so they have been paying for his bread and butter since graduation.

'32—Earl R Young is with the Federal Land Bank, St. Paul. He is reading, filing, and checking appraisal reports of agricultural lands.

'33—Carl G. Widseth will be found up in the frozen north of Ely. He is educational director at a CCC Camp. Carl uses his technical training to instruct the corps at his camp in engineering practice. He says it is great to be married.

'32—Herbert M. Woolery, Lawrence Whiting, '31, and John J. Lenz, '33, are Junior Engineers for the United States Department of Agriculture directing erosion control construction at CCC camps throughout the southeastern part of the state. Their work includes calculation of the amount of surface water run-off, amount of discharge, and the time of discharge. Besides this, they supervise the construction of brush and masonary dams for checking soil erosion.

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and board, found on page 58 of the general information bulletin, amount to about 50 cents per night and 37 cents per meal. A little slide rule work shows that the present system of registration requires every out of town student to pay out $7.42 to $9.03 each year.

Assuming that the student can live half as cheap at home as at school makes the net expense about $4.00 per year.

Of the 960 students in the college of engineering it is safe to estimate that at least 400 come from out of town. Multiplying 400 by an average cost of about $4.00 per student we find that our Saturday registration system is costing the student body around $1,600 each year.

One would think that the administration would be willing to put up with some inconvenience to save the students this sizable figure. Perhaps a few letters from the folks back home who are paying this unnecessary expense would help to convince the administration that engineers should be allowed to register in advance as is done in the other colleges of the university.

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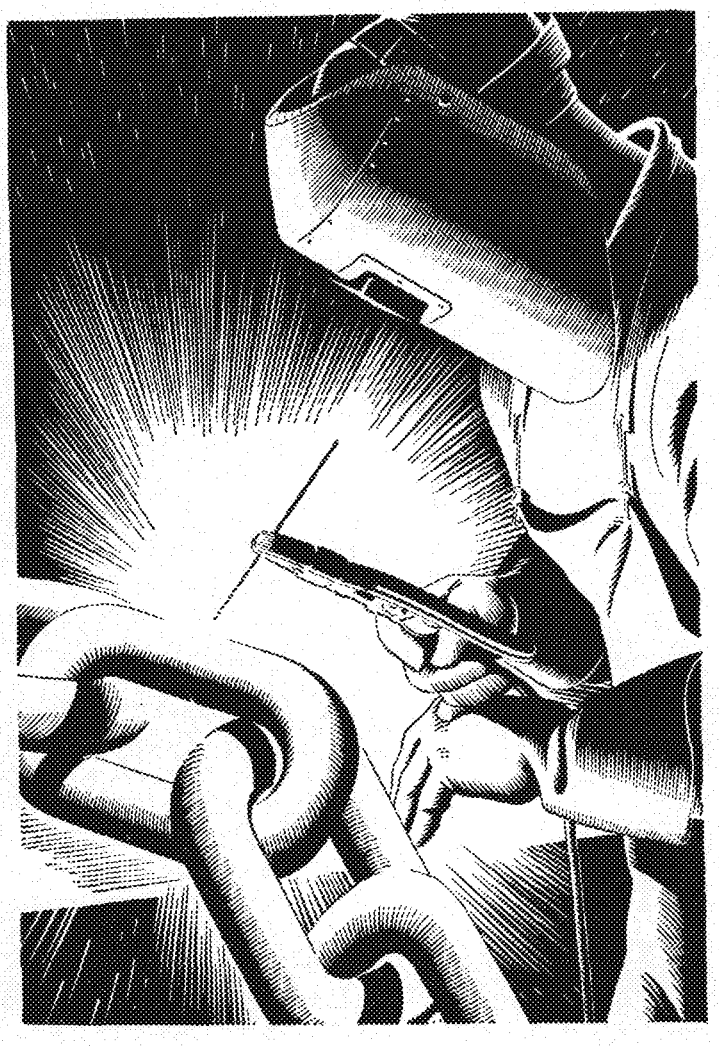
In college, the student has an excellent opportunity to study each of his teachers, to determine how he wishes his work to be done, and to develop the habit of conforming to those procedures. The different teachers have different preferences, rules, and methods, thus providing a variety of experience for the student in a laboratory of practical psychology, as it might be called. If he takes advantage of this opportunity, he will obtain useful practice which may save unfortunate experiences after graduation when he enters the keen competition of industry. Undoubtedly, most students go through this process in college, without knowing it, and derive the benefits which arise from the wide variety of the teachers they meet. These benefits would be greater if the student intentionally studied his teachers. —*O. M. Leland.*



From 27 links . . . .

ONE STRONG SYSTEM

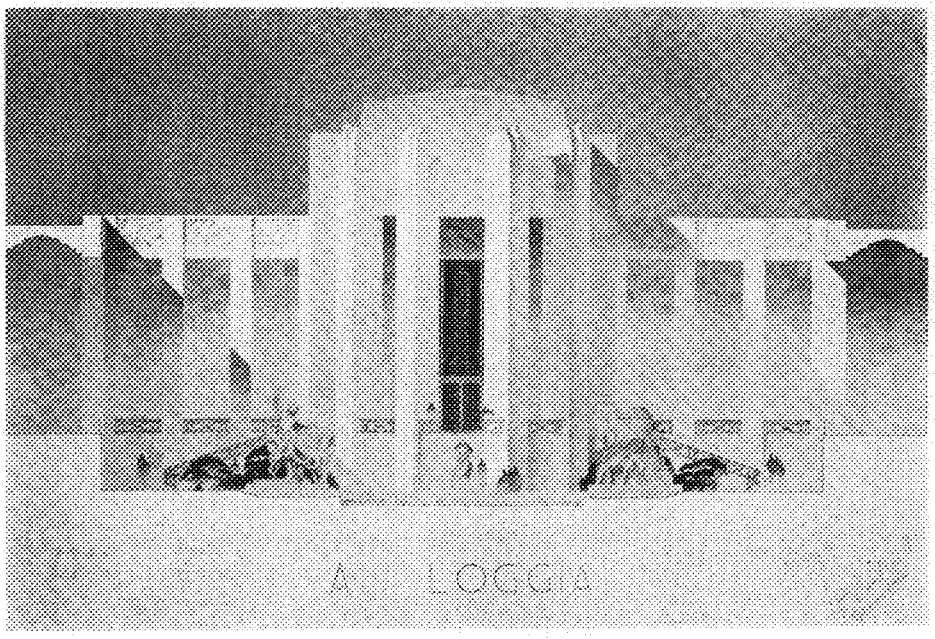
Welded together by common policies and ideals, the 27 Bell System companies work as one.

Operation is in the hands of 24 associated telephone companies—each attuned to the area it serves. Scientific research and manufacture of apparatus are delegated to Bell Telephone Laboratories and Western Electric. Co-ordination of all System activities is a function of the American Telephone and Telegraph Company.

Thanks to the skilful teamwork of these many Bell System units, you can talk to almost anyone, anywhere, anytime!

BELL TELEPHONE SYSTEM

WHY NOT TELEPHONE HOME ONCE EACH WEEK? REVERSE THE CHARGES IF YOUR FOLKS AGREE.



Mortenson Wins Scarab Medal In Loggia Design Competition

Coming as a surprise in the last week of the junior problem, "A Loggia in an Art Museum", was the announcement that the Scarab medal was to be awarded for that competition. The *projet* was a design for a loggia of the interior court of an art museum. Terminating the entrance foyer of the museum, the loggia gives access to an open court twelve feet below and connects with porticoes which surround the court. Primarily, it is a place for people to stand and view *objects d'art* in the court, and the expression of this function was of most interest to the jury.

Perhaps it was the incentive of the medal award that made the class finish up as it had never done before. As a whole the problems were exceedingly well done, and seldom have so many awards been given. Holger N. Mortenson received first mention and the Scarab medal. His work, which is illustrated, was commended for excellence of plan, grandeur of proportions, fineness of detail, and beauty of general design. The *projets* of Richard H. Tuscany and George L. Thompson, which are also awarded first mentions, were close seconds. Mr. Arnal said he would not attempt to criticize the first three problems; the schemes could only be compared. Mentions were awarded to the following: Algot B. Anderson, Caron E. Carlberg, Kenneth R. Waller, and Robert W. Auvinen.

The Scarab medal is awarded annually by Scarab fraternity to the student placing first in a specified junior competition. Besides receiving a silver emblem, the winner's name is inscribed on a bronze plate which hangs in the library. Mortenson received the medal at a recent luncheon held in his honor.

Junior College News

Many upperclassmen now attending the University of Minnesota gathered at the annual alumni dinner of the Duluth Junior College Engineers' Club held in Duluth, Tuesday, March 27, during the spring vacation. George B. Schuyler of the United States Coast and Geodetic Survey gave an interesting talk on the topographic survey now being carried on in the Duluth area. Among the Minnesota engineering students who attended the dinner were Carlyle Burton, Sylvester Laskin, Ar-

nold Cohen, William Campbell, Paul LaLibette, Richard Pederson, E. Bernard Olson, Jack Brewer, and Norbert Sternal.

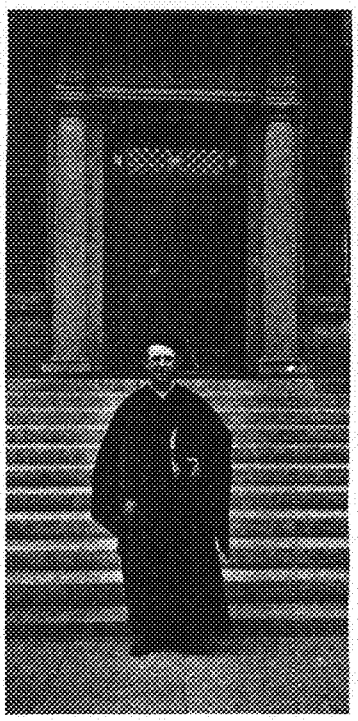
All E. E. Lab. Equipment Put on Standard Trucks

Under the direction of L. C. Caverley, Asst. Professor of Electrical Engineering, all electrical machines in the laboratory are being fitted with standardized trucks. These will make it possible for any two pieces of equipment to be readily coupled together. These trucks are all of the same height and the machines are so placed upon them that the center lines of all shafts are at the same height above the floor. This is accomplished by placing blocks of varying height between the truck frames and the machine bases. The blocks range in height from one-half inch to two and three-quarters inches. The largest motors and generators are mounted directly on the truck frames which are of H iron. They are castered with two swiveling and two fixed casters.

For coupling two machines together the trucks are fitted with cold-rolled steel bars, each having a peg set into the side of the bar at one end and a hole of the same size as the peg diameter at the other end. The center line of the shaft lies directly above a point midway between the two. The distance between the peg and socket is the same on each machine. Any of the motors or generators may then be coupled to any other machine by simply bringing the two together so that the pegs and sockets meet. The shafts are equipped with couplings which also operate on a peg-and-socket principle, and by aligning them properly the machines may be simply brought together, and setscrews tightened in the sockets to hold the pegs from slipping out.

The result of such an arrangement is to make it possible for any two pieces of equipment on the floor to be coupled together with a minimum of time and labor. All troubles of shaft alignment are automatically done away with, as well as eliminating the necessity for bracing bars in connecting the machines.

Here Comes the Groom . . . . Thin as a Broom?



This academic looking gentleman is none other than Hermann Fors, genial caretaker of our stockroom over in Experimental. The news blew around to the Techno-Log office last Thursday afternoon that he was about to embark on a connubial career, whereupon a Techno-Log reporter was immediately dispatched to interview the nervous, would-be bridegroom.

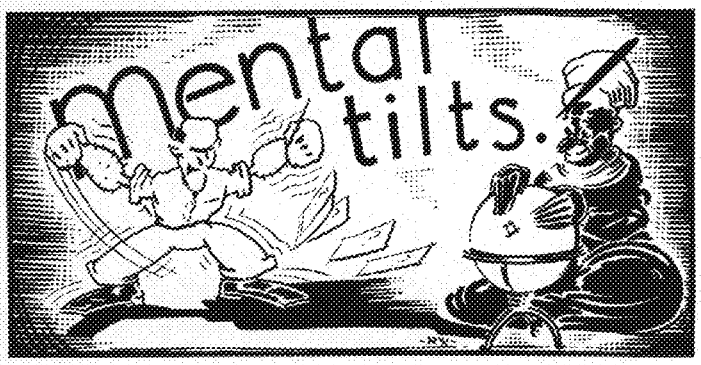
"I hear you're going to get hitched," remarked the newshound, "I wonder if you have a statement to make at this time."

Hermann let out a loud guffaw and laughed and laughed. "What the hell," he said," I can't tell you anything now. Wait until it's over with. I'll say this, though, I've been in the fire once before, but I'm going right back into it again."

Several days later it was found that Mrs. Esther Oman was the lucky lady. They were married at her home last Saturday, April 14th. Hermann is now busy at his old position in the instrument room receiving just rounds and rounds of congratulations.

New Drawing System Saves Time

Blueprints of partly finished plates will be furnished students taking elementary machine design next year. Only the salient features of the drawing such as dimensions and section views will have to be added by the student thereby saving him the laborous job of laying out the plate. Blueprints having mistakes will be given the student for correction, thus enabling him to gain valuable experience in checking.



David M. Kerns, junior electrical, came through again last month and won the usual $1 offered for the first correct solutions to be received for the Tilts.

This month Dr. Putschova has again offered some problems concerning the space voyage he contemplates (never more than that) making in the near future.

Going Back

One night the good Doctor awoke in a fit of cold fear, it having suddenly occurred to him while he slept that it might be unpleasant on the moon, and that complications might arise when it would be desirable to return to earth. It has therefore become necessary that he know the minimum projection velocity on leaving the moon if it is to carry him from the moon back to the earth. Assume the earth and moon to be stationary, and take as the radii of the earth and moon 4,000 and 1,100 miles respectively, the distance from center to center 240,000 miles, and the ratio of the mass of the moon to the mass of the earth 1/81.

Going Up

The Doctor would like to use an old reliable pendulum clock that he owns as a standard of time on a stratosphere ascension that he also intends to make. If the balloon rises with a uniform acceleration so that it reaches an elevation of 900 feet in the first minute, would the clock deviate from standard time, and if so, by how much?

Going Around

Herr Doktor is also a devotee of billiards and noticing the billiard ball problem last month, asks, "How far would a billiard ball roll before it stopped slipping if it were placed, while spinning with an angular velocity of w about a horizontal axis, upon a horizontal table with a coefficient of friction of u. The radius of the ball is a.

Answers to Last Month's Mental Tilts

It Got Away

The actual length of the fish was 1.58 feet.

Long Face

Oscar's face appeared to be 8.53 inches long.

Pool Sans Fish

The ball must be struck 0.4 inches above the center in order that it will roll without tending to slide.

Stringing a Line

The least length of telegraph wire was 20.0037 miles.

Kahn Notations

Bubbles off the Beaker has me frothing at the mouth. He has been so rash as to cast reflection publicly on the manhood of the chemists. Beware! Mr. Sevareid! We of the South do not hold these things lightly, suh! I, as public defender of the chemical school, do hereby challenge you to a duel—cream puffs at twenty paces. And allow me to warn you that I am the best creamer puffer at twenty paces—er, in these heah parts. Yowsah. (I even scare myself. Run, boys!)

* * * *

Heard on campus:
"It must be Spring! All the chemists and engineers are flirting with strange girls."
Go on. All girls are strange.

LIFE

The time I've spent in wooing
In watching and pursuing
The light that lies in woman's eyes,
Has been my heart's undoing.
Tho Wisdom oft has sought me,
I scorned the love she brought me;
My only books were woman's looks,
And flip's all they've brought me.

—Anon.

FISH

The Lutefisk is a lovely fish,
And has a fine aroma,
But when they lute it in Spokane,
They smell it in Tacoma.

By the same guy.

* * *

UNCERTAINTY

I'd rather flunk my Wasserman test
Than read the poems of Edgar Guest.

* * *

What chem engineer turned down a Tau Bete bid because of money trouble? . . $28.50 or thereabouts to become a brother . . . what price glory? . . Professor Richards loves golf . . . it is reported that talking about it is uplifting . . . around final time.

* * *

Why can't the engineering campus have mid-quarter registration instead of requiring their students to come back two days early? What happened to Enarch? . . So far they have a new name and little else.

* * *

Why does Doc Mann always save a front seat for the only girl in his class? . . . B. Grodin would like to know if the color of a girl's hair is proportioned to the wave-length . . . R. Frederickson, in his conclusion to a stream-gaging experiment in hydraulics, reported, "There is evidently water flowing" . . . I call my girl banana-skin because she's quite appealing to me . . . and she's just a slip of a gal . . . Prof. John Kuhlmann looks more like Hitler than does Hitler himself . . . The picture of the Chemistry building in the Feb. issue of this mag showed no fourth floor or library . . . which were added to the building in 1922 . . . (Our news is fresh.)

According to temporary editor Arnold Cohen, my name headed the by line of the sewage article because I lost the flip of a coing against Dick Pederson. The only error in the story is the fact that I won. (As if u didn't know.)

* * *

Doc Stoppel reports that in the United States the closed system of flash-point determinations is used while in Minnesota the open system is standard . . . You never can tell about these foreigners . . . Doc Lauer of the organic department coughed 89 times in 29 minutes of lecture . . . Heat-engines Gibbs says, "idee," and "agin the wall" . . .and there was the frosh who thought statics was the study atmospheric interference phenomena . . . Franz Montgomery, English instructor of two years ago, is now teaching at St. Thomas after a year in Germany . . . The phrase of the month is "toss the ox" . . . . (throwing the bull to you) . . . Spring is in the air.

* * *

Genial Doc Mann offers another. It seems that the process for the oxidation of ammonia is subject to variation in various plants, and each guards its own method very jealously. One plant in particular would allow admittance to only ministers, women, children, and imbeciles. "Well," quoth the Doctor, "When I went thru the plant ! ! !"

* * *

Skum's editor Baring-Gould calls it Stenchno-Log . . . Just fair. Robert Mumm gravely announced to his prof that his name is spelled with all "m's" except the "u" . . . mumm's the word . . . Les Matherson calls his girl Dust Pan because she has the latest dirt . . . Doc Stoppel spells them "bouy", "diaphram", and "phamplet" . . . and Wisler's Hydraulics speaks of homegeneous bodies . . . and Doc Lauer coughed 97 times in a one hour lecture.

* * * *

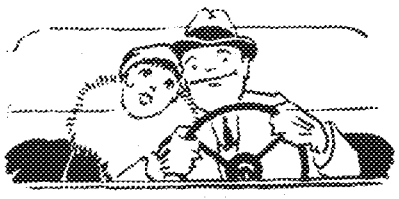
Probably a lot of youse guys think you can write a funnier column than this—and I don't doubt you're right. But for the present why not help me along with a few original contributions?

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.

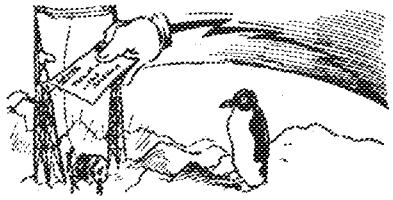


FREER WHEELING

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.

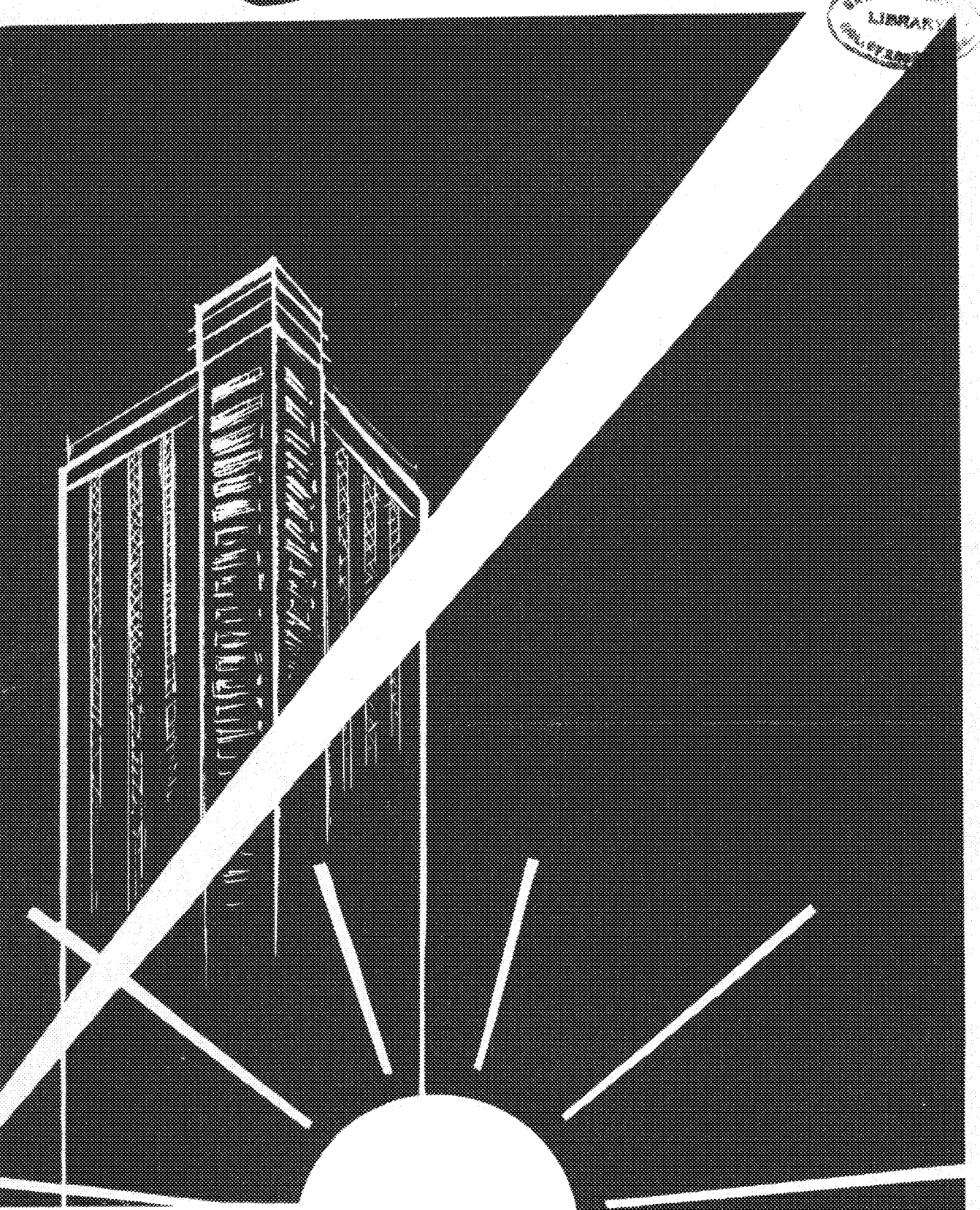
This air mail goes through regularly and quite clearly, thanks to a special directive antenna designed by Dr. E. F. W. Alexanderson, Kungliga Tekniska Hogskolan, Stockholm, Sweden, 1900, a G-E consulting engineer. For the benefit of short-wave radio enthusiasts: this antenna is of the horizontal checkerboard 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.

96-41DIR

GENERAL ELECTRIC

The Minnesota

ENGINEERS' DAY



ENGINEERS' DAY ISSUE
MAY 1934
ol. XIV No. 8
EMBER ENGINEERING COLLEGE

EXTRA

SERVICE
at your disposal

Long ago, we at Jensen's discovered that there are certain types of business that require something more from their printer than just printing—the extra services, such as sales advice and advertising assistance, embracing art, layout copy, etc., and to fulfill that need we have built our organization.

Printing with us is a professional job. We take pride in the fact that beyond being the most completely equipped printing plant in the Northwest, we are in a position to offer these extra services to business and industry.

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The Acting Editor Says:

Engineers' Day is just about here, and it therefore occupies a prominent place in the Techno-Log this month. First you will find a program of the day, presented in a rather novel manner. A page out of the diary of a Knight of Saint Pat, written in the Pepysian manner, is, we hope, a more interesting way of giving you the program than by just listing the time when each event occurs.

Mr. Gibbs, of Heat Engines fame, writes an article for us this month, and discusses the possibility of large natural gas engines being used in the Twin Cities in the near future. From time to time you may have heard of attempts being made to have the natural gas lines which serve some parts of Minnesota extended to Minneapolis and Saint Paul. Mr. Gibbs discusses the possibilities and describes the engines and some of their uses.

Following that is a story which ought to command the attention of anyone who likes stage shows. Gene Price went down and mingled with the chorus girls and managers, and came back with this effort. We hope that the story sticks to the mechanical arrangement and workings of the backstage area, which was the purpose in writing the article, and doesn't have too many detours to discuss the choral beauties.

Then follows the Insert, Editor Ralph Monson's latest brain child. It tells graphically the story of Engineers' Day, and shows the Engineering College at work and at play. All the campus organizations and departments get their pictures in the paper with little action shots added to enliven it.

Roderick William Siler, our best-liked writer, and our most regular contributor, gives us a story which discusses everything from cabbages to walls of water 100 feet high. Mr. Siler is always interesting, and his typical style is always fresh, no matter how many of his articles you may have read.

Well, we'll see you all at the big doin's on Engineers' Day, so: so long 'til then.

—E. P.

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Minnesota Techno-Log

37 ELECTRICAL BUILDING ••• U of M

MAY 1934
Volume XIV Number 8

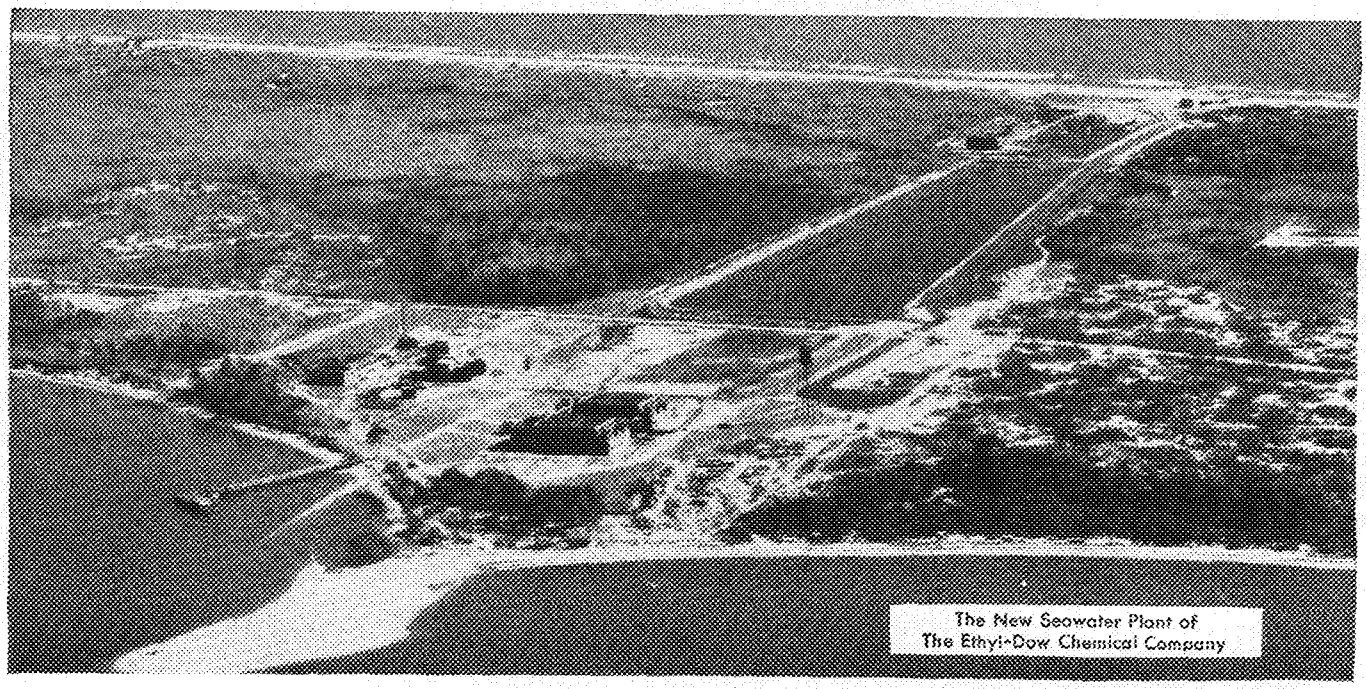
Ralph Monson
MANAGING EDITOR

Gordon Rosholt
BUSINESS MANAGER

Published monthly from October to June inclusive, by the students of the College of Engineering and Architecture, the School of Chemistry of the University of Minnesota

This Month

ANOTHER OUTSTANDING DOW CHEMICAL COMPANY ENGINEERING ACHIEVEMENT



The New Seawater Plant of
The Ethyl-Dow Chemical Company

NEW PLANT EXTRACTS BROMINE FROM WATERS OF THE ATLANTIC

Two features mark this outstanding achievement in chemical engineering:

The first commercial extraction of bromine from ocean water.

The construction of this large plant in the short period of five months.

The Ethyl-Dow Chemical Seawater Plant in North Carolina was built to supplement the supply of bromine available from the Dow Chemical Plant at Midland, Michigan. The demand for bromine used in the manufacture of Ethyl fluid has grown so rapidly that an inexhaustible supply has become desirable.

Thousands of gallons of ocean water pumped into this plant every minute yield 15,000 pounds of bromine daily; enough for the anti-knock fluid in millions of gallons of gasoline. It is hoped this leads the way to the recovery of other valuable products existing in the oceans of the world.

This visible mark of progress is typical of the scientific developments continually applied to the 250 Dow Chemical products now in commercial use and in the development of others to meet new industrial applications and uses.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

TRADE DOW MARK

A KNIGHT'S LOG

being an account of engineers' day

7 Up betimes, and find myself much excited with thinking of the coming events of the day. So barbing myself against my going out and discoursing with mine wife on the merit of the occasion it being Engineers' Day at the schools. Thence to break fast, and off near nine of the clock, that I might come early to the OPEN HOUSE, thinking thereby to obtain a souvenir or twain. And much aghast on seeing machinerie huge, and with such complication of parts that I do become all of a soliloquey at the manner of things that man doth make. So, hurrying on to the Electrical building, observing a most intriguing exhibit, where one, with the aid of much weird apparatus of wood and wyre, may draw blue sparks of fire from off his fingertips. Thence to the long edifice wherein the young engineers do tynker with flying machinerie, and divers other mechanical devyces.

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Thus until eleven of the clock, when suddenly there came upon mine ears a sound like unto an band disporting themselves with their pipes and tryangles. I did rush out to behold, indeed, a PARADE of most monstrous size, with bandes and floates which did seem more like unto nightmaires than to the sober creations of engineers. This did I follow until it finally come to an end at the Knolle where one garbed as Saint Patrick and a fair ladye as his Queene ascended the throne, and did knight the engineers graduating, as prettie a ceremonie as it has been my lot to see this twelvemonth.

noon

1

2

So to dinner, the knighting having come to an end, being mightily fatigued after the doings of the morn, and dined upon the better part of an haunch of beef, steaked, at mine old fraternitie (they all entertaining at like FRATERNITIE DINNERS for their graduated members). This about one o'clock. Then until three, about in mine best garb, to the Open House again, there meeting with Lloyd Walner, whom they say hath engineered this festival, and many another, we making a party and going thence to the DANSANT, where manie fair wenches did serve us with GREEN TEA. Dancing thus, from about three of the clock, to the musick of one Ed Fleck; and paying many compliments to the ladies there. About the hour of four one came saying that the Open Houses were now closing, and spoke most commendingly of them, I agreeing heartily thereto. So until near five, when I and my lady did depart to make ready for the BRAWL, where we did repair at half after nine of the clock.

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There we met with many others, and did dance until the hour of twelve. Thence, I, with some of mine cronies, to an inn, where we did make

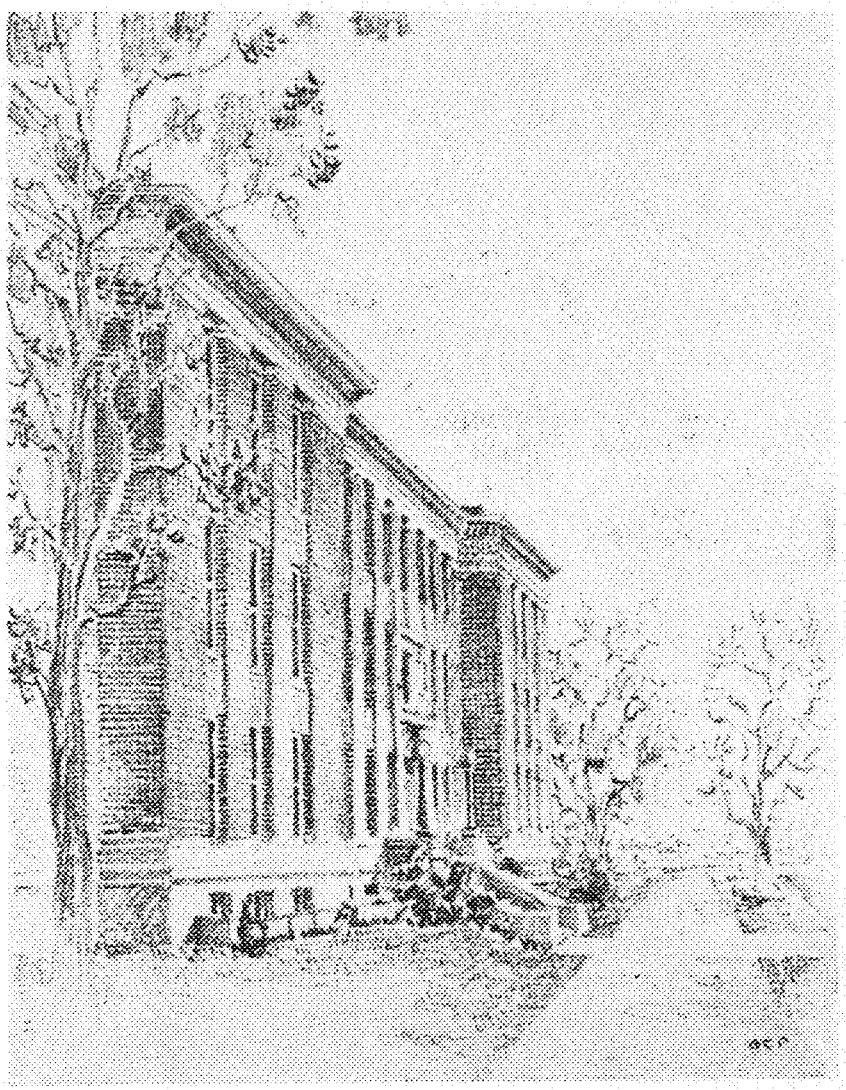
8

They Arrange Engineers' Day

GENERAL ARRANGEMENTS COMMITTEE

Lloyd Walner, *chairman*

Raymond Hoag, *secretary*
Leon Hamlet
John McGlone, *treasurer*
Herbert Jensen



BRAWL

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William Johnson
Oscar Wehman
Arthur Dwyer
Floyd Robbins
Graham McVicker

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Leonard Willis
Gerald Lupient
Douglas Kuehn
Henry Haslett
Edgar Howard
Gordon Maas
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Gordon Comb
Armand Rohde

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Charles Shortley
Walter Cutler
Alden Carpenter

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Mariam Bend
Mable Johnson
Gladys Kluegel
Alice Beardslee
Mary Lou La Be

KNIGHTING

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Al Blanchard
George Assad
Melvin Peterson
Earl Diekhoff
Robert Bergman
Robert Clifford
Archie Stone
George Johnson
Francis Langer
Al Roquist

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Robert Bost
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Harold Hoefer
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Roger Lehman
Carl Holvick
Dean Lundholm
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John Lindstrom
Julius Ostrow
Donald Grover
Gilbert Bauer

OPEN HOU

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Robert Butts
Sylvester Laskin
Carlyle Burton
Thomas O'Brien
Caron Carlberg
Leon Turner
John Beske

ALUMNI PUBL

Gordon Roshold,
William Barnum
Eugene Eyster
Howard Keene
Herbert Scobie
Arnold Sward

twin cities may use

Large Gas Engines

if lines are extended

By RUSSELL E. GIBBS
Associate Professor of Mechanical Engineering

Mr. Gibbs, as you all know, teaches Heat Engines and related subjects. This article, save for some few changes which have been made was run in the February issue of the Southern Power Journal. Mr. Gibbs and that magazine have kindly consented to the Techno-Log's printing of their article, and Southern Power has even allowed us to use one of their cuts to illustrate it. This article is particularly timely, since there has been much talk recently about extending natural gas lines into Minneapolis and Saint Paul

In localities where natural gas is available at low prices or where blast furnace gas is available, large gas engines have been successfully used as prime movers for a long time. The large gas engine has also been practically without a rival in compressor stations on the natural gas trunk lines and large numbers of them are in use in this important service.

There has been a great extension of natural gas lines and distribution facilities in the Northwest in recent years. Natural gas is already being used in many cities and towns in Minnesota, South Dakota, and Iowa. These localities are supplied through a system of pipe lines reaching more than 1900 miles. Of the above states, Iowa leads in pipe line mileage, with approximately 420 miles. Minnesota has about 120 miles, and South Dakota has about 70 miles. Natural gas has been used in Rochester, Minnesota, for some time, and there is much interest at the present time in extending the lines into Minneapolis and St. Paul. In many small and moderate size plants where natural gas is available the gas engine often proves a solution in the problem of reducing power costs. If natural gas can be offered to the industries in the Northwest at favorable rates, even in seasons when the heating load is light, there is a probability that the gas engine will be more generally used in this locality.

The large gas engine is practically always built in the four-cycle design, although some progress has been made toward perfecting two-cycle units. These engines are generally constructed in two types: the horizontal double-acting tandem engine which may be either single or twin-tanden, and the vertical multi-cylinder unit. Each of these two types has advantages peculiar to its design, which makes it favored in certain installations.

The horizontal, double-acting tandem type as compared with the multi-cylinder, single-acting engine has several advantages. By one cam or eccentric shaft running from a gear back along the cylinders, the valve is greatly simplified. There is only one crank, connecting rod, main frame, and one main and one outboard bearing in case of the single tandem, serving two double-acting cylinders which in effect are equivalent to four single-acting cylinders. In case of the twin tandem engine, there are only two cranks, connecting rods, main frames, and two main bearings serving the equivalent of eight single-acting cylinders. Accurate alignment is therefore not so necessary. This design, besides having a much smaller number of working parts, has the advantage of the parts being much more accessible for inspection and repair. In operation it is easy for even the least observing operators to detect troubles such as hot bearings, failing oil supply, sticking or even leaky valves from the engine room floor. In dismantling for repair, practically all of the parts can be reached from the engine room floor, a minimum of headroom being sufficient. Lubricating oil consumption is less with this type of engine and the oil is comparatively easy to keep free from contamination as it is not exposed to hot piston and cylinder walls.

The disadvantages of the horizontal double-acting tandem type are for the most part the advantages of the multi-cylinder, vertical type. The vertical engine requires far less floor space and a somewhat lighter foundation. It can be run at considerably higher speeds of rotation and this tends to keep the size and first cost below that of the horizontal double-acting type. This higher speed of rotation is particularly desirable in electric power generation and some other classes of service. The horizontal tandem engine has very large reciprocating parts and is seldom run at speeds greater than 150 to 160 r. p. m. on generator drive, and seldom more than 130 r. p. m. on compressor drives.

For compressor work, the vertical engine is at a disadvantage when compared with the horizontal engine, for with the horizontal unit the compressor piston-rod can be connected directly to the main cross-head by means of tie-rods. This construction does away with the compressor cranks, and connecting rods, and also takes the compression load off of the connecting rod and main bearings in the engine, which materially reduces the maintenance besides in-

creasing the mechanical efficiency. Due to this and other advantages already mentioned the horizontal engine is used almost altogether in the compressor plants on the natural gas trunk lines.

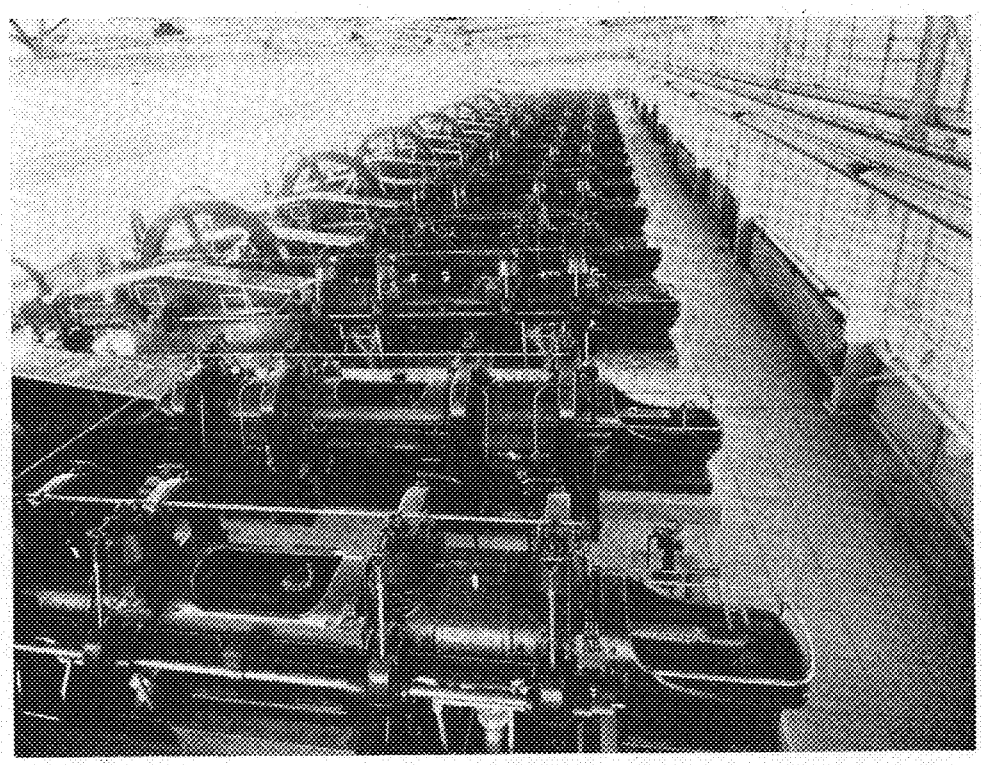
In fuel economy, these types are about equal except as was pointed out above. Under ordinary operating conditions of load, the gas engine will develop one horsepower-hour on something like ten cubic feet of natural gas. With natural gas selling at about 35 cents per thousand cubic feet, this compares favorably with the Diesel engine when operating on oil at 5 cents per gallon. However, advocates of the gas engine claim more reliable and smoother operation, and lower maintenance costs than with Diesel engines of corresponding power. The explosion pressure on the gas engine piston is but little more than half in pounds per square inch than generally used in oil engines. This results in somewhat lighter construction and smaller forces in the gas engine. In the case of gas engines no fuel storage facilities are required as with the oil engine plant, and the cost of these items is thus eliminated.

In recent years there has been considerable interest shown in the conversion of gas engines to oil engines or vice versa, and there are now manufacturers offering both engines of this type and parts for converting previous designs of their engines. These engines designed for conversion will, without doubt, win favor in certain localities where gas is offered at reduced rates during off-peak load seasons.

In operation, both types of gas engines perform well when properly installed and cared for. Some difficulties have been experienced in the past with large gas engines, due to faulty foundations. In installing gas engines, it does not pay to economize on the amount of concrete. This is particularly true in the case of the horizontal type where the large reciprocating forces are likely to "rock" the foundation. The foundation should always be as large as the dimensions on the builder's drawing. If the ground is not fairly solid, or has been recently "filled in," a larger foundation or a large footer should be used.

In general, the gas engine is not so flexible to changes in load or so well adapted to overload conditions as steam equipment. However, much improvement has been made in this respect in recent years, and today the gas engine usually provides all the flexibility that is desired. For carrying large overloads, some of the largest and most modern engines have been equipped with superchargers to provide the added capacity. With the large horizontal tandem engine, an M.E.P. of 75 lb. per sq. in. can be carried in the cylinders of a well designed and built engine. Most operators agree that this M.E.P. should be reduced to something like 65 to 70 lb. per sq. in. in the single-acting engine built without water-cooled piston or exhaust valves.

Both types of engines are highly developed and accessories are provided for keeping them in efficient running order. On the horizontal tandem type, separate mixing valves and adjustments of both mixture and ignition are provided on each cylinder. These are also provided on some of the multi-cylinder vertical engines. There are usually indicator motions provided so that the operator may take cards at will. On many of the multi-cylinder engines, ways and means are provided for detecting any misalignment of the main journal bearings. Ignition troubles have been largely overcome by improved designs of ignition systems in both types, and in general, the modern gas engine may be said to be as reliable and trouble-free in operation as most service demands.



Ten 1000 h.p. engine compressor units in a Louisiana compressor station

ingenious arrangement of

Backstage Wonderland

makes stage shows possible

By EUGENE PRICE, E. E. '35

The author of this article wishes to express his appreciation of the kind assistance given him by Mr. Emil Franke, manager of the Orpheum, and Mike Morris, chief engineer, as well as that given by those mentioned in the article

While the last scenes of the feature picture fade from the silver screen, the curtains of the stage draw together, hiding it from the gaze of the audience out front. From the orchestra pit comes the opening number of the revue. A brilliant spotlight brushes over the orchestra, shifts to the draperies which mask the stage. These quiver, linger hesitantly, then sweep smoothly back, disclosing a modernistic bar and dance floor. A gay chorus prances onto the stage, stepping to the toe-tingling rhythms of the orchestra.

Choruses, gag men, solo dancers, duos, follow one another onto the stage in a flood of melody. One scene appears only to be supplanted by another. Each takes the place of the former with scarcely a gap between. To the audience, the parts blend into one harmonious whole, progressing from beginning to end without a hitch, a brilliant, easy-flowing carnival of beautiful girls and sparkling wit. Another road show is running its short span on the boards.

Were the spectator to think particularly about it, he would probably before long be wondering just what goes on behind the scenes of this gay spectacle. How is it all accomplished, each scene so different from the last, each with its own atmosphere and effects? What makes possible the even, uninterrupted tenor of the show? Suppose that we conduct a little survey and find out just what makes possible such a production.

One of the first things we noticed about the show was the spotlight which heralded the first scene. Through the kindness of Mr. Charles R. Wells, in charge of the projection booth at the Orpheum, we are permitted to examine the spotlights and to watch them being used.

The important part of any spot-light is the light source. This is a carbon arc, drawing, in the installation at the Orpheum, 100 amperes. The second requirement is the control of the size, shape, and color of the spot. The diameter is regulated by shifting the arc back and forth. A "framing" control enables the operator to change the width and height of the spot. The intensity of the light is regulated by an iris diaphragm similar to that used in a camera. This presents an aperture of varying diameter which regulates the amount of light falling upon the lens.

Seven colors are available on each spotlight. These are selected by dropping properly colored translucent masks in front of the light beam. The masks are suspended by a simple chain and quadrant mechanism. Although this precludes any means of fading one color into the other, there are many different combinations which may be used to create pleasing effects or draw the attention of the audience to the desired point. For instance, in one case, when a principal and the chorus are on the stage together, the principal is given a small, intense, white spot and the chorus a large less intense pink spot. This gives the result of drawing attention to the principal and at the same time creating a pleasing effect. Where two performers are on together each may be followed by a spot of any desired color. The colors of the spots used are so selected that they harmonize with the basic color scheme of each scene. These methods of securing the various results go on practically unnoticed by the audience, but the effects they produce are among the most important in maintaining the feeling of each scene.

Besides the spotlights there are many other units which illuminate the stage. Everyone is familiar with the footlights, the traditional symbol of the stage. They are also regulated as to intensity and color. However, here the same results are obtained by different means. All stage lights are regulated from a panel by the electrician. The switchboard is a confusion of switches and rheostats. To change color here, a different circuit of lights must be thrown in, and the intensity may be varied by means of the rheostats. Other lights which we shall meet are also regulated from this switchboard.

With the kind permission of Mr. J. M. Griffin, manager of the show, "Take a Chance," let's go backstage and watch what takes place during the presentation of a typical road show. We find that we are in surroundings totally different from those which the stage presents to the crowded house. Here, instead of the scenery of various kinds which we see from out front, are creations of canvas and wallboard, some resting on the stage, and, if heavy, castered for ease of moving, and others pendant from above. These, as Mr. Griffin explains, are the "flats." Those which are rigid are "wall" flats and they are held upright by wooden braces, known as "stage braces," and "stage screws" which hold the braces from slipping. The hanging curtains are known as "flats

that fly" since they are drawn up into the loft above the stage at the end of each scene.

As we watch, the action is going on out on the stage and, as the scene climaxes, actors and chorus pour off from the stage through the openings furnished by the "tormentors" and "returns." The tormentors, or teasers are the movable flats which regulate the width of the stage opening and stand parallel to the curtains and at the side of the first stage. Perhaps it is well here to digress long enough to define "first stage." The stage is divided up into sections known as first, second, third, and full stage. First stage is from the footlights of the first curtain. The second stage lies between the first and second curtains, the third from the second to the third, and full stage is anything beyond the third curtain. The "returns" which were mentioned above, are the doors and arches which appear in the wall flats and permit the actors to go on and off the stage.

While we have been talking, the performers have gone to their dressing rooms to get ready for the next scene, and the stage hands have rushed forward and are dismantling the scenery. The drops rise mysteriously to the loft, the wall flats are folded up and whisked to the back of the stage, others are selected and hustled into position, the stage braces snapped into place, the "backings" take their places, and the new drops descend to their positions, all in the space of less than a minute.

This speed is typical of everything which goes on back here. In order that there may be no interruption in the production, the necessary mechanical actions must be performed rapidly and accurately. Even the necessity for changing scene is not permitted to break the action of the show, for, while the changes have been made a couple has been putting on a dance routine out on the first stage. As they come running off to the wings the chorus and others come down the stairs from the dressing rooms and take their places for the next entrance. Again the curtains part, the action begins, and backstage it is momentarily quiet. While it is, let's seize the opportunity to acquaint ourselves with some of the features of the place.

Here and there in the wings we see lights of various kinds. Some, known as "ladders," hold a vertical arrangement of 1000-watt bulbs on a pipe standard. They may be moved from place to place but are not so mobile as the "towers," which have a platform large enough for an operator and two or three spots and may be moved about to follow the action on stage. High above the first stage is a long horizontal panel of lights of various colors, directed back and downward. These are the "border" lights. Similar to the border lights but placed back a stage farther are the "x-ray" lights. Both of these may be shifted up and down to suit the requirements of the scene. Built into the stage on either side are the "standing strips," rows of lights resembling the border lights but lying in a vertical plane.

In order to accommodate all the lights which rest upon the stage, dozens of floor sockets are scattered over the floor. Into these are plugged the cords for the towers, bunch lights and so on, besides such "prop" lights as street lamps and modernistic floor lamps. All may be controlled from the electrician's panel. In order that they may properly attune the lighting to the action, the electrician and the spot operators in the booth receive cue sheets. These are four or five typewritten sheets telling the essentials of the action and indicating when each light is to be used. These, Mr. Wells says, they condense to one page, and that, too, is discarded after the first performance.

While we have been examining the lighting arrangements, the final scene has been drawing to a close and we must step back while the stage is cleared. The actors disappear to their dressing rooms as the doorman tells each one "next show, six o'clock." Flats are again hustled back and drops rise to the loft. Here is a blue curtain simulating the sky slowly rising, while, just in front of it a drop cut out to form a city sky-line accompanies it. The stage is left bare and deserted, so we can move around a little more.

On the opposite side of the stage, hidden from us before by the flats of various kinds, we find a group of ropes passing up to the blackness of the loft, each one wrapped around pins in a long beam reaching from the back of the stage nearly to the front. This is the "rail," and each of these ropes leads to one of the drops, the weight of which is nearly balanced by iron counterweights. This makes possible the prompt, smooth action which we have seen. We find also that draped drops, known as "legs" and used at the edges of the scenes as masking pieces, may be hung on carriages which run on pipe rails above the stage. They may be shifted back and forth and are then known as travelers.

Besides the world backstage there is another important part of the theater which is practically indispensable to the comfortable enjoyment of the program. This is the heating and ventilating system. The Orpheum maintains a large plant for this important task.

The heating of the building is done through the medium of the ventilating air which is driven through the building. Cold air is drawn down from the roof of the building through a large stack. Dampers on the roof, which are operated by air pressure from a master panel in the basement, control the inflow of air. A twenty horsepower motor drives the fan which sucks the air down to the basement. The fan capacity is 52,000 cubic feet per minute. From the fan the blast of cold air passes through a water spray, used in summer only, then to the steam heating coils. In order that the temperature of the air may be further regulated, a by-pass is provided which can be adjusted to shunt the desired amount of cold air past the heating coils where it mixes with the heated air and reduces its temperature.

From the heater and by-pass, the air passes to a large space under the floor, from which it is allowed to escape into the theater. A mushroom system under the seats is used to draw off the impure air, which is then discharged outside.

The water spray for cooling the air in summer is a very interesting part of the ventilating apparatus. When the building was built twelve years ago an ice machine was provided for cooling the air. It has never been used. Instead an 800 foot well has been dug, and water at a temperature of 48 degrees Fahrenheit is pumped from the well and driven through the cooling pipes. It forms a very efficient and economical method for accomplishing the desired cooling. The temperature of the air entering the theater is regulated both from the basement and from the chief usher's panel upstairs.

Cabbages and Things

By RODERICK WILLIAM SILER
Assistant Professor of Mathematics

Mr. Siler this month takes up his space with stories of violence. Whether you particularly like to read battle stories or not, you will find one here, told so you will want more. And you will find more of the same interesting style in the second story, whose principal actor is a wall of water

The most exciting thing that has occurred in the sphere of higher education recently was the battle of some weeks ago at Harvard University between the anti-war students and their enemies, the boys who want to fight. Proof of the intensity of feeling that this question, whether to fight or not to fight, is arousing among college men the country over is found in the fact that in the combat at Harvard cabbages were used as projectiles by the opposing armies. This makes the affair quite serious, for to be hit by a speeding cabbage is not so funny, the cabbage being undoubtedly the hardest of all vegetables, with the possible exception of a frozen beet.

It seems to me that the anti-war boys at Harvard made a great mistake, and in a way violated their own great principle, which is never to fight, when they returned the fire of their opponents. If they had simply stood there while the cabbages were arriving, and showed they could take it, without any resentment or dodging, they would have proved to the rest of the world that a man doesn't have to fight to be hit, and therefore doesn't have to become a soldier to prove he is a hero. The question that naturally arises in the minds of those of us who sympathize with this effort to put a stop to war is how Harvard men can expect to keep control of themselves when war threatens if they lose their tempers simply because they are hit by a few cabbages.

This struggle at Harvard brings to light one of those inconsistencies in human nature that will have to be ironed out before war ceases on this earth: namely, that no one wants war, but that under certain circumstances everyone wants to fight. I, myself, have a lot of admiration for a man who will face even a cabbage for his beliefs, but I feel that when a student identifies himself with the anti-war movement he must be prepared never to touch a cabbage in anger if he is to get anywhere in advancing the great principles for which he stands. As a matter of fact, propaganda against war in this country is quite simple compared with what it would be in certain other parts of the world, where if a man publicly stated he would under no conditions go to war he would immediately be hit by something considerably harder than a cabbage.

Next Decoration Day will be the thirty-fifth anniversary of a never to be forgotten holiday along the valley of the Conemaugh river in western Pennsylvania. There the morning of May 30, 1889, was overcast, and followed in the afternoon by steady rain. About midnight the rain became a terrific downpour. On the morning of the 31st the Conemaugh, where it meets Stony Creek at Johnstown, was overflowing its banks, and the rise steadily continued throughout the day. Nervous persons in Johnstown thought of the old dam located further up the valley, twelve miles away.

As the morning passed, people near the dam noted the water back of it rising at the rate of a foot an hour. By half past two in the afternoon water was running over the crest and spouting out through leaks in the face. By three the water passing over the crest was a foot deep. A few minutes after three a part of the top of the dam was carried away. Almost immediately afterwards, for a length of 430 feet, the dam, sixty feet high, collapsed from top to bottom.

The solid wall of water, thus released, rushed due north for two miles, to a point where the valley made almost a right angle turn to the west. Here was the railroad and the small town of South Fork. The water, pouring west for another mile, struck with terrific force a projecting cliff through which the railroad was carried by a narrow cut. Only part of the flood could pass here, most of it being deflected and following the river bed, making a great curve before rejoining the first stream at the lower end of the cut. At this junction point the wall of water is said to have been one hundred feet high.

Continuing on down the valley the flood struck in succession the towns of Mineral Point, Conemaugh, and Woodville. At Conemaugh four trains were standing on sidings, held there because of damage caused by the continual rain to the track ahead. Three of these trains were passenger, the fourth a freight. They were swept away, piled in one mass on top of each other, and against this barrier were hurled thirty locomotives from the roundhouse at Conemaugh, the flood then sweeping on and over them. It engulfed the Cambria Iron Company's plant covering acres of ground, putting out the fires and furnaces there to the accompaniment of a series of tremendous explosions.

The final obstacle in the path of the water was the city of Johnstown. Of the 30,000 people there hardly a soul had any warning of what was coming. One person records that in looking out of a window he saw the wall of water, a mile off, approaching, but before he could get himself and family out of the house, the house collapsed. Because of the earlier division of the flood it struck the town in two waves. There was a fine stone bridge in Johnstown which, lying parallel to the flood rather than across it, survived, and against this bridge, because of the back currents and eddies caused by the water after it had reached the town, there was piled an enormous mass of wreckage, composed of trees, houses, barns, telegraph poles, railroad cars. This caught fire, and in that holocaust was reached the dramatic climax of what is known as the Johnstown Flood.

THE MINNESOTA
TECHNO-LOG
UNIVERSITY OF MINNESOTA

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That Glee Club

In another section of the Techno-Log you will find an account of the formation of a Technical Students' Glee Club. The club is to draw membership from the College of Engineering and Architecture and the School of Chemistry, with the possible addition of the Miners. The idea of a glee club for engineers we believe to be a good one. It will supply a need which many engineers have felt for some sort of musical representation on the campus. The technical students, as a group, have not the time to study music as intensively as many would like to. Almost automatically, therefore, they are eliminated from musical organizations where they would have to compete with men who are studying music as a profession. There is bound to be a great deal of musical talent among any group so large as the technical schools. To mention but one case, one man, a tenor, now signed up with the new glee club, won in 1930 the state high school music contest. It is not right that he and many others like him, should make no use of their natural gifts.

Possibly you feel that you haven't enough training. Don't let the fact that there are a few men of proven ability in the organization discourage you from signing up. You haven't even been fair enough with yourself to make a trial if you do. It was by taking a chance like this that those men found they could sing; you will never know until you try. The great majority of those who have signified their willingness to join are no better than yourself. Think about it a little, maybe you have a little edge on some of them. And there is no harm in trying. It may be Pollyannaism to say "try, try again," but just this once isn't going to hurt you any. Of course, any activity like this is sort of habit-forming. You just seem to sink deeper and deeper into it until you could hardly get out if you wanted to. But you never want to. You want to be careful, if you do sign up, or you will find yourself, like the lotus eaters, having the best time you have ever had, and not even wanting to stop. And that would be too bad.

Or, would it?

Engineers' Day Again

Here it is Engineers' Day again, and the Techno-Log comes along just in time to run interference for the big occasion. Each year at this time the engineers put on their big celebration at which St. Pat and his Queen reign in honor of the first Saint Patrick, whose particular function it is to look after all good engineers everywhere. The publicity men for Engineers' Day will tell you all manner of fanciful tales about the origin of the day, the unbelievable history of the Blarney Stone, and why Saint Pat is everywhere acknowledged as the engineers' patron saint. But deeper than all these is the real significance of the day for Minnesota engineers.

Engineers' Day is a date which every Minnesota engineer should feel proud of. It is a tradition of the oldest standing, and traditions improve with age, like fine old wine, or rich antiques. The engineer is a most important part of society, and there is nothing more fitting than that once a year he should put on his big show, blow his own horn, we might say, since no one else seems disposed to do it for him.

There are many things to interest the engineers and their guests on May 18. The program of the day you will find given in a rather novel form, in one of the first few pages of the magazine. There you will see such things as the Parade, a long procession of floats and cars, led by St. Pat and his Queen, on horseback. This will lead the graduating seniors to the Knoll, to the knighting, a romantic ceremony which has become firmly entrenched in Minnesota traditions. You will see there the Blarney Stone, whispered to be the one and only original, long reported to be built into the walls of Blarney Castle. But be that as it may, there is the "brick," and lost indeed, would be the engineers if they did not have the Blarney Stone as a symbol of the romance of Engineering. The Open House will represent the practical work of the technical man and all sorts of engineering exhibits will be on display. For the social side of the engineer's life there are the Dansant and Brawl, in the afternoon and evening, respectively, where you may indulge your gregarious instincts to the full.

Let us close by asking you to take advantage of all these things which are presented for your entertainment. Look around the Open House; see what other engineering groups are doing. Bring the folks or the girl friend, and throw out your chest a little. And go to the Brawl. Just remember the Tech Frolic if you don't think the engineers can throw a real party. You owe it to yourself to get a little enjoyment out of your school life. Will we see you there?

Selling by telephone gets results. In many lines of business, salesmen are finding they can cover more customers more often—and close more sales at lower cost—by telephone.

Bell System men have worked out a number of plans for systematic market coverage by Long Distance telephone. They have also devised telephone plans for more efficient handling of production, purchasing, administration, distribution, collections.

Because Bell System service is fast, economical, adaptable to specific needs, business more and more turns to the telephone.

BELL TELEPHONE SYSTEM

WHY NOT SAY "HELLO" TO MOTHER AND DAD?
—RATES ARE LOWEST AFTER 8:30 P. M.

Engineering Grads Organize Delta Radio Manufacturing Co.

John T. Bailey, E. E. '29, Arch E. '32, and Parker Lowell, E. E. '33, have organized the Delta Radio Manufacturing Co. at 3rd Ave. and Talmadge Ave. S. E. in Minneapolis. Their product is an unusual and distinctive remote control unit for auto radio sets. The device has proven popular, and is commanding attention from all over the United States and Canada although it has been on the market only a short time. Interesting write-ups have been given the device in several of the popular radio magazines, and the outlook for the new organization is very bright.

John Bailey married Miss Eleanor Hargrave, Arts '31, in 1933. They make their home at 1812 First Avenue South. After graduation John was employed for a time by the Concrete Street Co., he then went to the Minnesota Machine and Foundry Co. From there the Jalisco Radio Service Co. claimed his attentions until the Delta Radio Manufacturing Co. was organized.

After being graduated Parker was employed successively by the Porter Electric Co. and the William P. Johnson Electric Co., both of Minneapolis. A period of research work for the CWA at the University was followed by the decision to organize the Delta Radio Company.

The design and production of the remote control unit are credited to John, while Parker is managing the affairs of the company. Parker managed the 1933 Electrical Party, so he ought to be fitted to take charge of the company's business.

ALUMNI

Harvey Rollin, M. E. '33, is in the engineering department of the Wm. Bros Boiler Company.

Russell Erickson, M. E. '32, has been employed by the Minnesota and Ontario Paper Company. He is laying out a steam pipe line from the plant to Fort Francis, a distance of about half a mile.

Henry Rahn, Ch. E. '33, is now at Barberton, Ohio, working in the manufacturing control department of the Pittsburgh Plate Glass Company, but expects to be transferred to their new plant at Corpus Christi, Texas, according to a letter just received by C. O. Anderson, M. E. '32. Henry mentioned visiting Archie Japs, Ch. E. '33, who is working for a rubber company in Akron, Ohio.

Paul K. Hovey, M. E. '31, has been transferred to State Island, New York, by the Procter & Gamble Company, for whom he has worked since graduation.

Cupid Scores Again, Mel Peterson Weds

Dan Cupid's chubby little hand stretched out once more over the technical campus this spring, and tweaked the ear of none other than our great and good friend, Melvin Peterson, junior electrical engineer.

Following in the footsteps of his now famous predecessor, one Hermann Fors, Melvin made a proposal to Miss Ruth Garvey, 5532 Kellogg Avenue N., as to the possibility of tying the well-known knot. Miss Garvey, being a very sensible young lady, accepted with much grace and demureness. The natural outcome of the whole thing was that another wedding took place.

The couple were united at Melvin's home, 3701 Newton Avenue N., on the evening of Wednesday, May 2nd. The Rev. L. F. Imm officiated at the ceremony and Carl Pennig, junior in electrical engineering, acted as best man at the wedding.

Mr. and Mrs. Peterson received many beautiful gifts, among them a silver serving set presented by the junior double-E's. After the ceremony, the bride and groom were entertained by a few close friends at the Radisson Hotel.

Music-Minded Engineers Form Technical Students' Glee Club

On May 2 the first voice trials were held for the new Technical Students' Glee Club, which is being sponsored by Dean Leland, who has appointed Professor Zelner to supervise its organization. Professor Earle Killeen is acting director of the club, which will draw its members from the College of Engineering and Architecture, the School of Chemistry, and possibly the School of Mines. At the time of the first voice trials 110 men had signed up for tryouts. An acting committee has been formed which will be in charge until officers are elected. The committee men are: Merlin Berg, chairman, Robert Marshall, Carl Pennig, and William Johnson.

So far the deeper voices outnumber the tenors and second tenors. The baritones have the greatest following. Some men are still undecided what parts they wish to try out for. The organizers of the club are urging that more men try out for the higher voices. They emphasize that there is still plenty of chance for men interested in singing any part.

Out of the 110 men already signed, 49 are freshmen. There are several seniors who, although they cannot remain long with the club, are helping to give it a good start for next year. It is hoped that a group of from eight to sixteen men can be organized to sing for some part of the Engineers' Day celebration. In years past, a quartet sometimes entertained at the Green Tea and Dansant, and, after the organization gets under way, the glee club may take part in all Engineers' Day programs in addition to other campus affairs.

Gargoyle prizes won by Thompson and Fugelso

George Thompson and Norman Fugelso received the first and second prizes, respectively, in the Gargoyle Club prize competition, a regular problem in the junior curriculum. Prizes of $35 and $15, to be spent on books, are given by the Gargoyle Club of St. Paul, a professional architectural society. The subject of the competition was a county court house, providing three court rooms and the various court services, such as jury rooms, judge's chambers, witness rooms, etc. Good schemes, well developed, marked the prize-winning problems.

* * *

The spring quarter this year is the most interesting and the most economically worth-while time of the year for the Architectural School. Three prizes will be given—the Northern States Power Company Prize for the interior architects, the Alpha Alpha Gamma Prize for the New Grade II, and the Gargoyle Club Prize for the juniors.

Answers to Last Month's Mental Tilts

Going Back	About 1.5 miles per second.
Going Up	It would gain 28 sec. per hr.
Going Around	The ball will roll $\frac{2a^2 \ w^4}{49 \ u \ g}$

Kahn Notations

Attention, Pica Passer!
Minneapolis Journal, Sunday, April 15: "Minnesota alumni of Kappa Gamma sorority will be given Saturday evening at the Commodore Hotel, St. Paul." There's an opportunity for some of you lads who haven't much mazuma and still crave the best.

* * *

Here is a little tale showing that there is a power which rewards the just and punishes the unjust. It seems that Dick Pederson, of Techno-Log staff and Phi Kap shack, decided that a little spirituous liquor might help liven up the Technical Frolic, whereupon he and a friend bought a pint of bootleg for one dollar. The friend, being very young and gullible, took one or possibly two drinks, and then entrusted the bottle to Richard, who proceeded to make off with the remainder of the contents, aided by a crony or two. Of course the friend's rage was boundless; but Nature has devious ways indeed, for Richard became violently ill and white of face, and much regretted his rash deed. And the friend has been happy ever since.

* * *

The Minnesota Daily:
"Easy sale for high class U. S. grads in India, grad writes!" Some people don't care what they do for money.

* * *

The Old Man of Ski-U-Mah speaks of "peddling enthusiasts in shorts" . . . Working their way through college, no doubt.

* * *

One often wonders if instructors have real blood in their veins, if they laugh and cry as do ordinary mortals. One daring student wrote on his quiz paper these words (in very small letters and on back of the sheet): "Fooey on you too!" The instructor rose to the occasion nobly by replying in large red pencil "Says You!"

* * *

Time is the thing that keeps all events from happening at once.

* * *

At last come a few tales from the boys who took the senior chem engineers' spring inspection trip. It seems that one night Messrs. Palya, Moulton, and Anthes started out on an inspection trip of their own, having to do with some actress named Helen. Of course the three to one ratio was a bit troublesome, and the net result was that Palya and Moulton entertained the actress's mother (they all have them) while Anthes inspected. The mother drank all the gin, Anthes had all the fun, and the rest of the group had a headache.

* * *

Midquarters . . . with five quizzes in four days . . . The summer has crept up so suddenly that I caught my first cold in four years . . . this is certainly no place for an human being to live . . . and am I in the dumps . . . work, work, work . . . a pretty girl in a filmy dress . . . the wind is blowing and the sun is shining . . . maybe she'll smile . . . no chance . . . and not so far away soft breezes are blowing over still water . . . sure I read it in a book . . . Arts students dressed to the teeth with "hi swings," bright ties, white shoes . . . I wish I were back on the farm.

* * *

(Editor's Note: That's where you should be, you horse's neck.)

Furnishers to
his Majesty

St. Pat

Since 1920 the Engineers' Bookstore has been the Engineers' own supply store, furnishing students with every necessity in its line and catering to the wants of each individual Student.

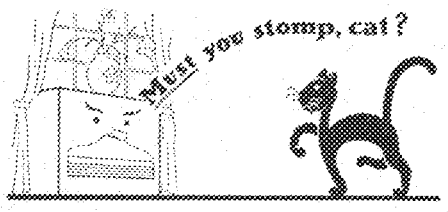
G-E *Campus News*

STREAMLINED MOTOR

The new automobiles and airplanes have nothing, as far as streamlining goes, on an electric motor recently manufactured by General Electric. And undoubtedly many visitors to Langley Field, in Virginia, where the motor is now located, will think it some kind of miniature "Zeppelin." The motor is being used in investigations of the noises made by various types of propellers, the objective, of course, being to design a propeller in which noise is reduced to the practical minimum.

The motor, of the wound-rotor induction type, rated at 200 horsepower, is probably the first of its kind ever built. The propellers are mounted directly on the motor shaft, and can be run at speeds of between 1000 and 3600 rpm. The noises are picked up by a microphone and analyzed by means of special measuring devices.

The motor was designed by C. J. Koch, M.I.T., '24, and M. H. Wells, Syracuse, '02; and the control by A. Suksdorf, Washington State, '16.



LESS NOISE

Until recently, noise has been regarded as a necessary evil, something that has come quite naturally with higher speeds and more complex civilization. But someone noticed that noise gives us the "jitters"; rubber tires began to appear on milk wagons, and rubber cushions on ash cans. So, when General Electric was developing its air-conditioning units, noise became an important factor. Propeller-type fans, which had to run 24 hours a day to circulate air, were used, and they made too much noise for comfort. The Research Laboratory was given the job of doing something about it.

Research scientists examined the blades and found that on conventional fans all parts of the blade did not push air at the same rate of speed; in some cases, in fact, some parts pulled air back instead of pushing it forward. Blades on which every bit of surface pushed air at approximately the same speed were designed. And lo! not only was the efficiency of the fan tremendously increased, but the fan was quiet. Furthermore, a system was evolved whereby accurate fan-noise rating is possible. As a result, air-conditioning units which make no more noise than is present in a closed room on a quiet day were developed.

This quiet-fan development was done under the direction of K. D. McMahan, Oklahoma A. & M., '29, of the G-E Research Laboratory.

CHARLES PROTEUS STEINMETZ

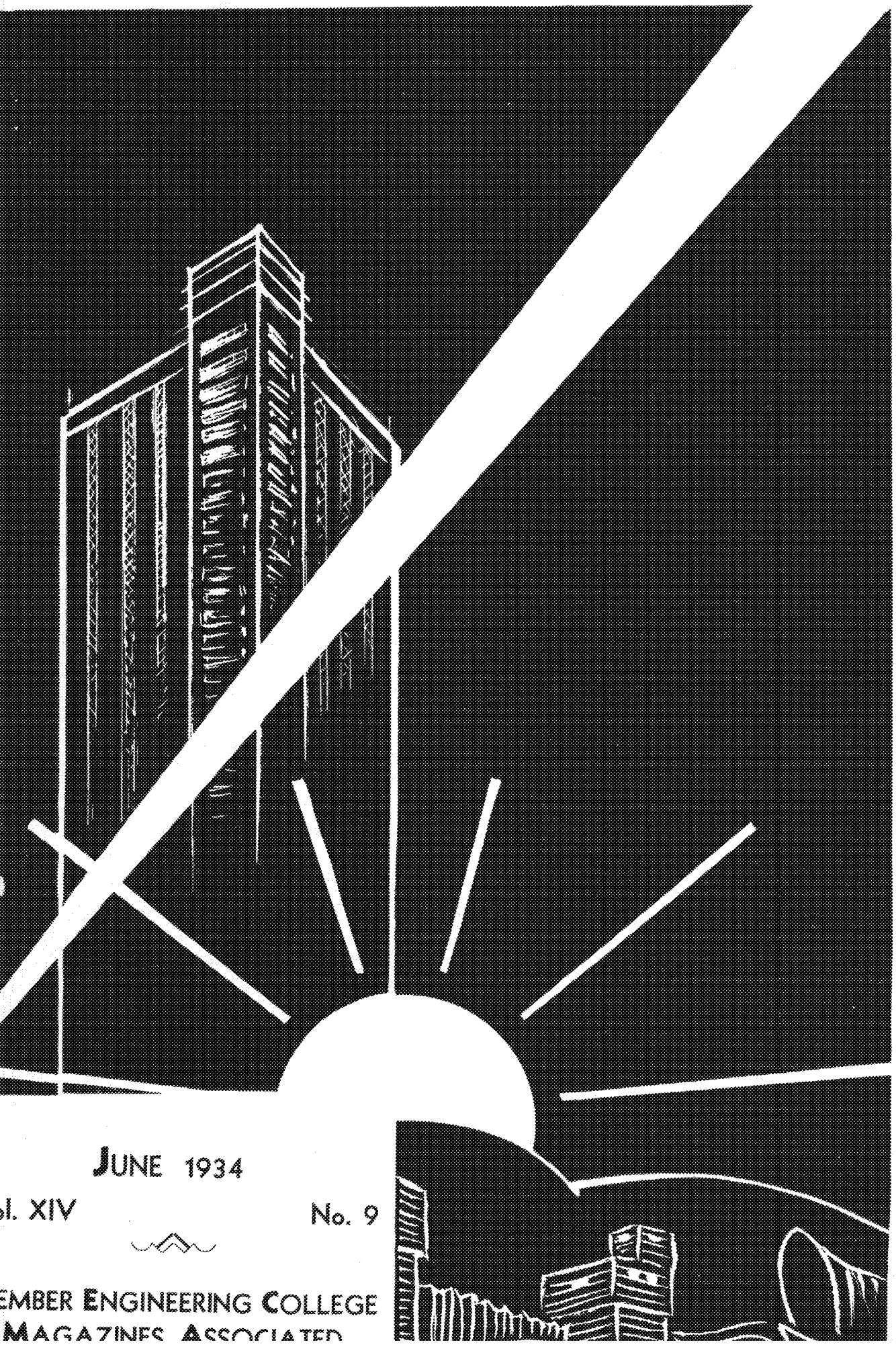
"Guide, philosopher, and friend" to his generation of electrical engineers, he would have been 69 years old had he lived until April 9. From his 30 years of work with General Electric came the mathematical formulas involving alternating current, the discovery of the laws of hysteresis, and methods of protecting transmission lines from lightning damage.

These, to name a few, were basic aids in establishing present-day standards of electric service.

Yet, the heritage left by Steinmetz is the memory of not only a great scientist but of an essentially charming, kindly, helpful man of wide interests.

Out of the past, on the night of April 7, his voice spoke to radio's thousands—a voice that lives on a strip of film, evidence of our victory over time. Thus was inaugurated a three-day tribute to one who was loved for his human qualities as well as revered for his engineering achievements.

The Minnesota Techno-Log



JUNE 1934

Vol. XIV No. 9

MEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED

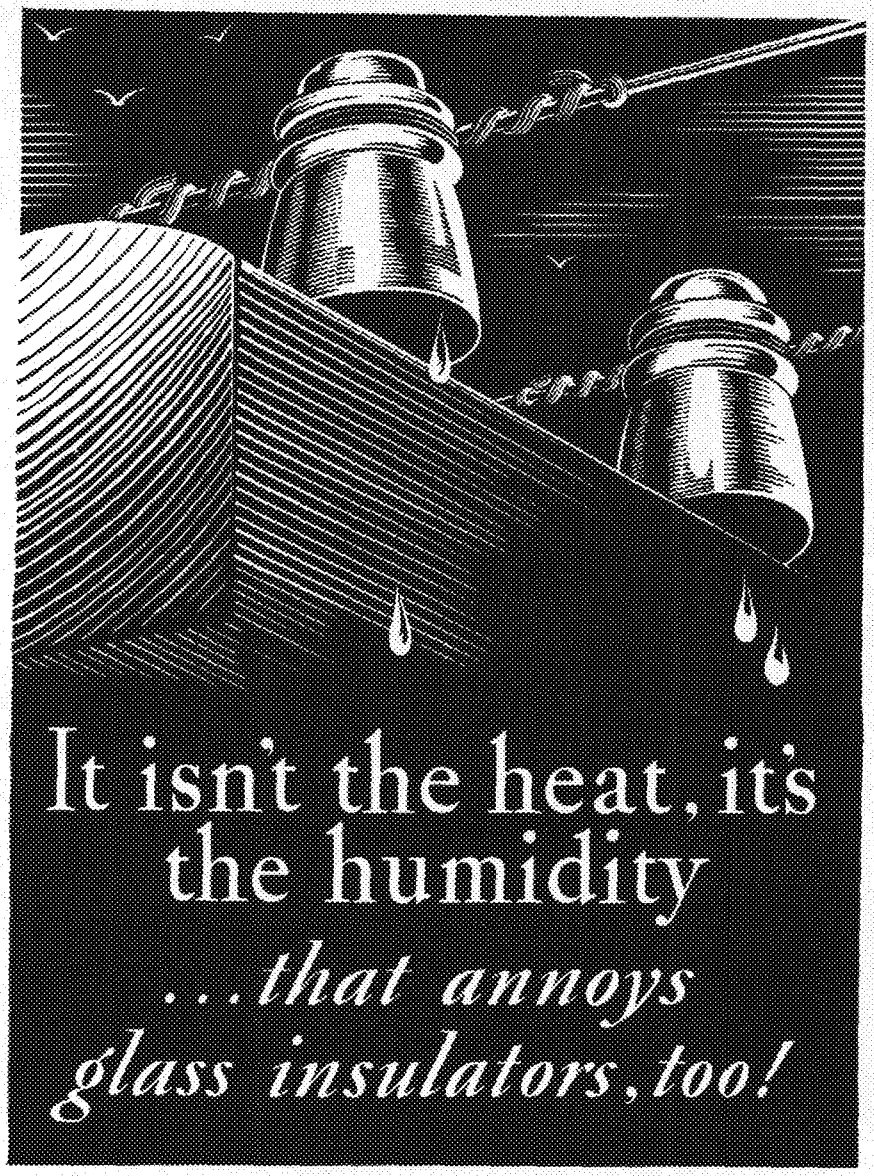
Human DESIRE
Paves the Way to PROFIT

Perhaps you haven't thought of it in this light before, but nevertheless it is true—men are constantly striving to improve their living standards and conditions. The utter insatiability of human desire keeps all of us reaching for the things we do not have, and it is this desire that business feeds and grows upon.

There isn't anything made or produced that isn't desired by someone. It is therefore a foregone conclusion that the market for your product or service is already established and while human desire in your particular trade territory may lie dormant, it can readily be aroused through the use of printed advertising.

Concentrate on human desire through the use of direct mail advertising and you'll be sure to profit.

Tickets at special student prices may be obtained at the Techno-Log office or from Gordon Rosholt, Gladstone 2464, throughout the summer.



Even glass insulators behave badly toward telephone currents when humidity is high. This has been proved by experiments at Bell Telephone Laboratories.

When it's humid, a film of moisture forms on the glass. The more humid, the thicker the film—and the more electrical current escapes! Important factors governing amount of leakage are the chemical nature of the glass, its shape and age, the amount and kind of dirt on its surface.

Through exhaustive studies, telephone men have developed more efficient types of glass insulators—and are seeking ways to make them still better. Close attention to every detail of Bell System equipment leads to constantly improving service.

BELL TELEPHONE SYSTEM

WHY NOT TELEPHONE HOME ONCE EACH WEEK? REVERSE THE CHARGES IF YOUR FOLKS AGREE.

The Acting Editor Says:

The final issue of the year, and your acting editor is bidding you goodby for three months, or thereabouts. The Managing Editor and the Business Manager are saying their final farewell in this issue. Well, let's see what's in the magazine.

That isn't a rogues gallery, that is a page dedicated to the old and new Editors and Business Managers. It makes a poor frontispiece from point of beauty, but you have got to give the poor souls a break somewhere. You fellows would probably appreciate a good picture of Sally Rand a little more, but just what are you going to do about it? Anyway, there's where you get the lowdown on the fellows who put out this publication.

Then follows a list of honorary societies and their initiates, and a list of the prizes which have been awarded to engineers, architects, and chemists. Another page or so tells you who is going to graduate, they hope. And Kolyumist Kahn slips up the lowdown on what the boys are going to do after the dear old school days are over. My, my, Mabel, what a lot of vacuum cleaner salesmen.

E. L. McMillen writes us an article on the viscosity of paint. Did you know why paint flows under the brush, yet hangs on the wall? You will find the answer, among many other things, in this interesting article by a man who is an expert on paints and other thixotropes. Didn't know we could use that kind of language, did you? Don't tell anyone, but we swiped that from the article, too.

As we said before it is time to say farewell. We have tried to give you an interesting magazine this year, and we certainly hope that we have succeeded. Next year the Techno-Log will be back again, with a new staff, different ideas, a changed face. We hope we can carry on.

—E. P.

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Minnesota Techno-Log

37 ELECTRICAL BUILDING ... U of M

JUNE 1934
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Ralph Monson
MANAGING EDITOR

Gordon Rashait
BUSINESS MANAGER

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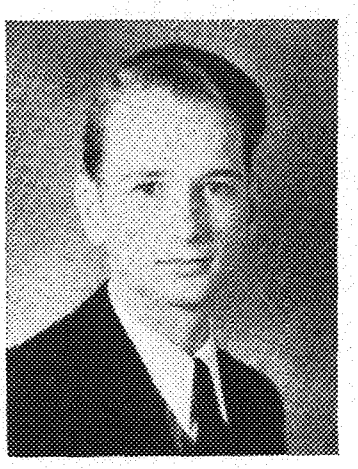
This Month



Ralph Monson
Editor

The retiring editor sounds like a good Scandinavian—his nam is Ralph Monson, he comes from Wisconsin—Wausau, to b exact. And, that name, Wausau, is a choice bit of India slang meaning "far away." Quick, Watson, the reading glass! We've got an explanation for that "far away look." Ralphy, as his playmates call him, took the fatal step a shor while back, and has had great sport keeping the world i general guessing whether or not he really is married.
In spite of his "home work" and Techno-Log activity, Ralp has been active in several societies. Chi Epsilon, Plumb Bob and Alpha Tau Sigma keys are among his treasures, and h is President of the latter this year.

1933--34

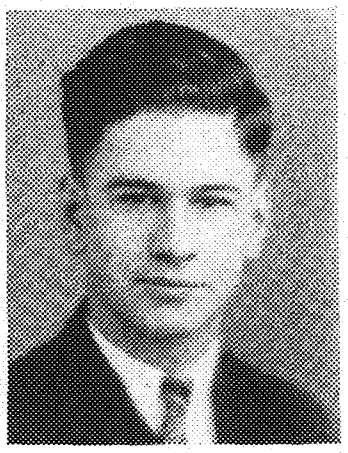
Gordon Rosholt
Business Manager

Gordie will be a senior in chemical engineering next year. H is planning to work on a chemical process of making red ink more cheaply; the stuff IS expensive, you know. Mr. Rosholt comes from Chicago and makes his living by checking a World's Fairs. It has Christmas tree decorating beat all hol low, he says. Gordie has two bad habits, changing suddenly from blondes to brunettes, and leaving the keys to the cash box lying about. The retiring business manager is treasurer of Alpha Tau Sigma, president of the Inter-Fraternity Council editor of the council's yearbook, and a member of Theta Xi He is noted at the Techno-Log office for his inspiring bulletin board notices.

Eugene Price
Editor

Gene is our new editor. He made it all in one hop from the assistant editorship to the editorship. His life, up to the present, may be summarized as follows: Born in Wisconsin reared in Montana, now learning bad habits at Minnesota His advice to earnest freshmen is, "If you aspire to the editor ship, work hard and long in the Techno-Log office." Then as an after-thought, "But you also must go to a class now and then." Gene is a member of Alpha Tau Sigma and the American Institute of Electrical Engineers. The new editor and the new business manager of the Techno-Log are still in the running, and, as a consequence, expect to have better luck in acquiring a number of stenographers.

1934--35



David Buck
Business Manager

Local boy makes good. Dave is the only Minneapolis specimen on this page. His duty is to hold down the position of busines manager for the next year, and to hold up the financial en of the Techno-Log. He hails from south Minneapolis and som day we're going down to look up his record at Central High He is one of the head Pnyx men in engineering and agree that it might be a good idea to get acquainted with th nurses before the next election. Dave is vice-president of th Board of Publications, a brother in Pi Tau Sigma, keeper o the coffers for Phoenix, and an annual dues-payer of Alph Tau Sigma. He will be a senior in mechanical engineerin next year. It's our guess that he used to tear apart all th clocks in the house when he was a youngster.

Those Honored

Iron Wedge

Iron Wedge, an honor society for senior men in all colleges of the university, has this year elected the following from the technical colleges:

Roger Bossen, Max Moulton, and William Rindsland.

Grey Friar

Grey Friars, an organization for outstanding senior men, has admitted the following from the College of Engineering and Architecture and School of Chemistry:

Robert Conary, Harold Mattlin, William Sears.

Phoenix

Phoenix, all-university junior men's honor society, has elected the following juniors in the College of Engineering and Architecture and School of Chemistry:

David Buck, Donald Heng, and Gordon Rosholt.

Silver Spur

Silver Spur, junior honor society for men from all schools of the university, has elected the following from the College of Engineering and Architecture and School of Chemistry:

Clarence Ender, and William Gordon.

Plumb Bob

Plumb Bob, honorary engineering senior organization, has this year elected to membership:

Roger Bossen, Robert Conary, Thurman Erickson, Craig Gaskell, Alva Kalliher, Edward Kells, Lewis Martin, Harold Martlin, Ralph Monson, Ivar Pearson, and William Sears.

Technical Commission

The Technical Commission is composed of the presidents of the professional engineering societies. The societies represented are the American Institute of Electrical Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Chemical Engineers, the Minnesota Society of Aeronautical Engineers, and the Architectural Society. This year's president has been Lewis Martin, A. S. C. E.

The new members are:

Harry Cottingham, A. I. Ch. E.; Albert Driscoll, M. S. A. E.; Everett Enns, A. S. C. E.; Victor Gilbertson, Arch. Soc.; Edgar Howard, A.S.M.E.; and Leonard Ostergren, A. I. E. E. Gilbertson was elected president for next year.

Techno-Log Board

Members of the Techno-Log Board for next year are:

Rex Gales, architecture; Leon Hamlet, civil engineering; Frank Pellegrino, electrical engineering; Gordon Maas, mechanical engineering; George Lemke, aeronautical engineering; and Herbert Jensen, chemistry.

Bookstore Board

The Engineers' Bookstore Board will have for its members next year the following men:

Thomas Tudor, architecture; William Burgum, civil engineering; Carl Pennig, electrical engineering; Thomas Bragdon, aeronautical engineering; Eugene Eyster, chemistry; and Lee Whitson, mechanical engineering.

Alpha Tau Sigma

Alpha Tau Sigma, a national honorary engineering journalistic fraternity, was founded for the purpose of encouraging journalism among engineering students. Membership to the society is determined on the basis of outstanding journalistic work on the Techno-Log, or on other engineering publications.

This year's initiates are:

David Buck, Arnold Cohen, Robert Dixon, Herbert Jensen, Howard Kahn, James Moore, Malven Olson, Richard Pederson, Eugene Price, Charles Sweatt, and Thomas Tudor.

Sigma Xi

Sigma Xi is a national honorary society for scientists. The 62 chapters of which it is composed encircle the globe and its total membership at present numbers approximately 7500. The Society of Modern Scientists, the forerunner of Sigma Xi, was founded in 1886 by Prof. Henry S. Williams of Cornell University. Louis B. Wilson of The Mayo Foundation at Rochester, Minnesota, is the present national president. The purpose of Sigma Xi is to promote the interest of science by encouraging investigation, by discussing scientific subjects, and by publishing such matter as may be deemed desirable. The Sigma Xi Quarterly is published by the national headquarters. The membership includes workers in the following fields: mathematics, medicine, chemistry, astronomy, sciences of the earth, biology, anthropology, physics, engineering, and the various branches of these subjects. Wherever there exists a group of Sigma Xi members which is not large enough to be established as a chapter, a club may be formed. These clubs, however, do not possess equal privileges with the chapters.

Minnesota was enrolled in 1896 as the sixth chapter. Dr. S. C. Lind was the 1933-34 president, F. K. Butters, vice president; F. B. Hutt, secretary, and Alice Biester, treasurer. A meeting is held annually for the election of new members. Potential members are admitted by virtue of original theses which must first be approved by a chosen committee. If a prospective member be refused admittance he must wait a period of five years before again applying. Every winter the local chapter of Sigma Xi sponsors a series of weekly lectures in one of the various branches of science.

This year's initiates from the College of Engineering and School of Chemistry are:

From the faculty: H. B. Roe, agricultural engineering; H. B. Wilcox,

mathematics; R. C. Brinker, civil engineering.

Graduate students: Knox A. Powell, mechanical; G. Hama, D. F. Jurgensen, R. M. McAdam, C. L. Meyette, and F. M. Nelson, chemical engineers; R. O. Denyes, L. R. Hac, C. M. Langkammerer, and J. R. Vincent, organic chemistry; F. W. Martin and C. E. Morrell, physical chemistry; W. M. MacNevin and W. T. Tomsicek, analytical chemistry; and A. E. Cameron, chemistry.

Tau Beta Pi

The Tau Beta Pi Association was founded at Lehigh University in 1885, and the local chapter was organized in 1905. It is the purpose of the society to mark in a fitting manner those who have conferred honor upon their Alma Mater by distinguished scholarship and exemplary character as undergraduates, or by their attainments as alumni. Distinguished scholarship, while the primary requisite for admission, is not the sole criterion. After the scholastic requirements have been fulfilled, the selection is based on integrity, breadth of interest both inside and outside of engineering, adaptability, and unselfish activity.

The method of election of men at Minnesota is as follows: In the fall quarter of each year, the three junior students having the highest scholastic averages of all the junior engineers are eligible for election. These men are chosen on the basis of outstanding scholarship and personality and integrity, and if elected are known as honor students. In the spring quarter of each year the fifteen students having the highest scholastic averages are eligible for election. Also in the fall quarter of each year, the fifteen seniors having the highest scholastic rating of those students not already considered are eligible for election. Also three men may be chosen during the year who do not have quite the scholastic requirements but are outstanding because of extracurricular activities. One year's residence at the University is requisite for election.

New officers of the association are John J. Reusch, president; Lee S. Whitson, vice president; George E. Mitchell, recording secretary; Edward Silberman, corresponding secretary; Harold W. Shaw, historian; and Homer Hagstrum, editor of the Bent.

1933-34 initiates are:

John Anthes, Daniel Armstrong, Keith Bleuer, Glenn Brokke, Harry Brown, Morris Cohen, Benedict Cohn, Leander Fischer, Ralph Fredrickson, Homer Hagstrum, Helmer Hanson, Ernst Hovemeyer, Clinton Janes, Orville Jensen, Russell Johnson, Wilho Junnila, Donald Justus, David Kerns, Raymond Kochevar, Alan Lehman, Lewis Martin, George Mitchell, Arvid Newhouse, John Osojnicki, Carl Pennig, John Reusch, John Scott, Lyle Scott, Harold Shaw, Edward Silberman, Sigward Stavnes, Harold Sundstrom, and Lee Whitson.

Chi Epsilon

Chi Epsilon, honorary civil engineering fraternity has elected the following men to its ranks in the past year:

Harry Baker, Glenn Brokke, William Burgum, Jacob Essen, Edward Graves, Ralph Mouson, Carroll Reese, Howard Schleiter, Edward Silberman, and Leon Turner.

Eta Kappa Nu

Eta Kappa Nu is the honorary electrical engineering fraternity. The organization was founded on October 28, 1904, by Norris L. Carr, a student at the university of Illinois. Ten members composed the original chapter. Since the founding of the organization it has expanded to 23 chapters in the leading electrical engineering schools in the country. Omicron chapter is located at Minnesota.

Omicron chapter is composed of 18 active and 3 honorary members. The honorary members are Professors J. M. Bryant, H. E. Hartig, and E. W. Johnson, all of the electrical engineering department. Officers of Omicron for 1933-34 were John Clarey, president; Morris Cohen, vice president; Ralph Hammond, recording secretary; Charles Martin, corresponding secretary; and Jennings Johnson, treasurer.

The purposes of the fraternity are three: to stimulate fraternal ideas and spirit, to bring students and faculty together, and to allow for student discussion of technical and academic subjects.

1933-34 initiates are:

Daniel Armstrong, Keith Bleuer, Earl Diekhoff, Homer Hagstrum, Ernst Hovemeyer, Clinton Janes, Wilho Junnila, David Kerns, Hendrick Midde Clyde Norton, Leonard Ostergre Carl Pennig, John Reusch, and Si ward Stavnes.

Pi Tau Sigma

Pi Tau Sigma, honorary mechanic engineering society, originated jointly the University of Wisconsin and at th University of Illinois in 1914. Gamm chapter, at the University of Minnesot was started in 1922. At the present tim there are sixteen chapters in this rapidl growing organization. Some prominen alumni of the society are: J. V. Mar tenis, Col. Paul Doty (president of th senior American Society of Mechanica Engineers), Charles Shoop, Charle Koepke, John Dupriest, Hugh Wilcox and Burton Robertson.

There are ten members in the chap ter at Minnesota at present. Member are selected from the upper seven pe cent of the class. A competitive exam ination is given covering mechanica engineering, mathematics, and genera knowledge. About a half of those tak ing the examination are elected to mem bership. Last fall the four members o the chapter were all elected to Tau Beta Pi. They also went to the nationa convention in Chicago last fall.

Initiates this year are:

David Buck, William Gordon, Ed ward Hartzmann, Gordon Maas, Har old Shaw, Lee Whitson, and Leonard Willis.

Tau Sigma Delta

Tau Sigma Delta, national honorary fraternity in architecture and the allie arts, has announced the initiation of fiv new members. Election to this fratern ity is based chiefly on the nominees demonstrated proficiency in scholastic work, with special emphasis on architec tural design and their promise of pro fessional capability. Active members o the Minnesota chapter besides those jus initiated are Hillis Arnold, John R Bergan, and Gordon M. Comb. Arnol is enrolled in the Minneapolis School o Art while the other two are in the de partment of architecture:

1933-34 initiates are:

Robert Auvinen, Leonard Currie Victor Gilbertson, Walter Lindstrom and Edward Lofstrom.

Graduating Seniors

aeronauticals

Anderson, Harold
Bannerman, Robert
Barthelmy, Robert
Caleen, Reynold
Cohn, Benedict
Collins, William
Dedon, William
Domming, Loyal
Erickson, Thurman
Gaalaas, Carrold
Grady, Powell
Gregg, Mirza
Kujawa, Leo
Lehman, Allen
Mitchell, John
Moe, Harris
Napavance, Nicholas
Nelson, Richard
Nienaber, Jewell
Norsen, Dwight
Ohman, Thorsten
Olson, Abraham
Pribyl, David
Prieve, Howard
Reynolds, Chesley
Safford, Walter
Sears, William
Swift, Herbert
Thompson, Richard
Tolefson, Harold
Wicklund, Erick
Withee, Wallace

agriculturals

Johnson, Loyal
Nelson, Leonard

architects

Abbett, Loren
Anderson, Andrew
Cushing, Reginald
Fraser, Austin
Grosz, Paul
Kesler, Gale
Kilp, Paul
Leadholm, John
Lindstrom, Walter
Mackay, Edward
May, Harlow
Penney, Raymond
Selles, Malvin
Severud, Gordon
Shaffer, Harold
Weidlich, Raymond
Wells, Theresa
Whitney, George
Williams, Russel
Woodford, Charles

arch engineers

Baker, Russell
Bergan, John
Carey, John
Carlson, Evert
Carney, J.
DeLong, George
Ekroot, Elmer
Fisher, Albert
Henderson, David
Jurenes, Steven
Kurtz, Robert
Williams, Henry
Woyke, Melvin

chemists

Berry, Manly
Forderbrugen, Kevin
Hill, Archie
Hinchie, John
Hochman, Harry
Lindstrom, Harold
Phares, Carmony
Rapp, Francis
Reinchenberg, Aaron
Remus, Francis
Riegert, Stanley
Ruoff, Milton
Ruoho, Armas
Rupp, Eldor
Rush, Leonard
Yaeger, Carl

chem engineers

Agre, Courtland
Anthes, John
Benson, Norman
Bossen, Roger
Broz, Charles
Conary, Robert
Dahlquist, Carl
Dulaker, Erling
Farel, Newton
Flynn, Francis
Geib, Amiel
Hampel, Clifford
Hollingsworth, Gordon
Hotvet, Walter
Hull, Donald
Jilk, Lawrence
Justus, Donald
Kaiser, Edward
Kreher, Harold
Lundquist, William
Nicholsen, Richard
Pasich, Wm.
Ruley, Marshall
Skala, Jacob
Stacy, Maurice
Treacy, George
Wendorff, Harold

civils

Anderson, Marx
Anderson, Wilbur
Andrus, Milton
Armstrong, Jack
Berg, Merlin
Bina, Gordon
Buck, Victor
Brewer, John
Brokke, Glenn
Campbell, Floyd
Cooper, Maynard
Fefferman, Robert

Fiaata, Harold
Gaebe, Ralph
Gaskell, Perry
Gross, Sewell
Gruenhagen, Wallace
Hass, Raymond
Haverland, Fred
Heiseth, Oswald
Hermanson, Marvin
Holmquist, Goodwin
Jacobs, Donovan
Johnson, Wesley
Karlen, Roy
Kersten, Miles
Kilpatrick, Emerson
Kilpatrick, Phillip
Klessig, Arvel
Koropov, Joseph
Lawrence, Thad
LeCount, Finely
Martin, Lewis
Mattlin, Harold
Mayerson, Harry
Mitchell, Sidney
Monson, Ralph
Myers, William
Ogrosky, Harold
Olson, Carlton
Olson, Francis
Osmundson, Verne
Ramsland, Max
Reese, Carroll
Rindsland, William
Ripken, John
Schaefer, Francis
Schuett, Richard
Sagalovitch, Wolfe
Shogren, Hugo
Solheim, Albert
Solstad, Waldo
Solum, Arthur
Tetrud, William
Vorpahl, Lucian

electricals

Amren, Stanley
Beckjord, Archie
Bugni, Ronald
Burch, John
Cabana, Vincent
Carr, Lester
Clarey, John
Clark, Earl
Cohen, Morris
Fredine, Earle
Freno, Edwin
Graves, William
Hammond, Ralph
Hartman, William
Headen, Harvey
Iversen, Milton
Janes, Clinton
Jensen, Orville
Johnson, Helge
Johnson, Jennings
Jonnila, Wilho
Kernkamp, Melvin
Kalsher, Alva
Lauermann, Jerome
Lehner, Gerald
Lerner, John
Lillyblad, Robert
Lundberg, John
Malek, Sidney
Marshall, Robert
Martin, Charles
Middel, Henrik
Miller, Everett
Mills, Theodore
Moe, Arnold
Newhouse, Arvid
Newman, Sam
Nichols, Howard
Norelius, Russell
Norris, Stanley
Osojnicki, John
Pearson, Ivar
Phillips, Ray
Quealy, John
Rockney, Selmer
Robbins, Floyd
Ruuhela, Uno
Schott, Oscar
Scott, Howard
Selvo, Anthony
Smith, Myron
Sowden, Howard
Spurbeck, George
Staynes, Sigward
Storkerson, John
Tureck, Joseph
Wall, Ross
Webster, Wallace
Williams, Charles

int archs

Christenson, Harriet
Linsmayer, Alice
Shapiro, Esther

mechanicals

Anderson, Thor
Brandt, Fred
Burnett, Allen
Campbell, William
Carlson, Andrew
Diamond, David
Erskine, Douglas
Fischer, Leander
Gersug, Bertram
Gimpel, Hershel
Hanson, Arthur
Hanson, Helmer
Healy, Charles
Johnson, Russell
Jue, Kay
Kells, Edward
Laitala, Everett
Lavacot, George
Libby, Edward
Lindstedt, Theodore
Maddock, Edward
Mikkelson, Henry
Olson, Carl
Olson, Fred
Parks, Merwin
Paterson, Werner
Petry, Edward
Prachar, Otakar
Riede, Peter
Smith, Fred
Snyder, Merton
Sonnesyn, Clifford
Sperry, Philip
Steen, Holger
Sternal, Norbert
Sturm, Gordon
Taylor, George
Vobeyda, Frank
Vrooman, Alonzo
Wallfred, Paul
Wood, James
Yohe, Robert
Wallene, Gladys

Tau Beta Pi Prize

The Tau Beta Pi prize of $25, awarded to a freshman in the College of Engineering and Architecture, the School of Chemistry, or the School of Mines, on the basis of high scholarship and merit, was received by Orville Becklund.

American Institute of Architects Medal

The American Institue of Architects medal is awarded to the senior in each of the leading architectural colleges of the United States who has the highest scholastic standing throughout his course. At Minnesota the recipient of the award was John Carney.

Scarab Prize

Holger Mortenson was the winner of the Scarab medal, which is awarded to the student winning first place in a designated design competition in the regular work of the junior year in the course in architecture.

Gargoyle Club Prizes

For a special design competition in architecture, the Gargoyle Club offers two prizes of $35 and $15, respectively, in books.

The books this year were presented to George Thompson, who took first place, and to Norman Fugelso, second prize winner.

Eta Kappa Nu Prize

To the regular sophomore in electrical engineering who has maintained the highest scholastic standing during his first five quarters in the College of Engineering, the Omicron chapter of Eta Kappa Nu, electrical engineering honorary, presents an electrical engineering handbook.

The prize was received by Russell Neilsen.

Phi Lambda Upsilon Prize

An annual prize of $15 is offered by Phi Lambda Upsilon, chemical honorary, to the male sophomore registered in the School of Chemistry or specializing in agricultural biochemistry who has the highest scholastic standing at the beginning of the spring quarter.

Edward Marshall, of the School of Chemistry, was awarded the prize.

Alpha Chi Sigma Prize

The Twin City Alumni Association of Alpha Chi Sigma offers an annual prize of books to the value of $10 to that male sophomore in the School of Chemistry having the highest scholastic average at the end of the winter quarter.

The fraternity this year awarded the prize to Frank West.

Shevlin Fellowship

The Shevlin Fellowship in Chemistry was awarded to Henry Yutzy. This is one of four fellowships established by the late Honorable Thomas H. Shevlin in four colleges of the University: namely, Science, Literature, and the Arts; Agriculture, Forestry, and Home Economics; Medicine; and Chemistry.

Chemistry Faculty Prize

The faculty of the School of Chemistry offers annually a prize of $25 in scientific books or journals to the senior who while registered in the School of Chemistry has attained the highest scholastic average in the work of the sophomore and junior years and of the first two quarters of the senior year.

William Landquist was the recipient of this award.

Chi Epsilon Prize

Richard Springer was awarded the engineer's handbook which is given by Chi Epsilon, civil engineering honorary, to the regular sophomore in civil engineering who has maintained the highest average in his class during his first five quarters in the College of Engineering.

A. S. C. E. Prizes

The Northwestern section of the American Society of Civil Engineers offers prizes annually to upper class students in civil engineering on the basis of scholarship. The prizes and their winners:

First prize, $25, Miles Kersten; second prize, $15, John Ripkin.

Pi Tau Sigma Prize

Minnesota Gamma chapter of Pi Tau Sigma, mechanical engineering honorary, presents each year a mechanical engineering handbook to the regular sophomore in mechanical engineering who has maintained the highest scholastic average in his class during his first five quarters in residence in the College of Engineering.

Milo Bolstad received this prize.

A. S. M. E. Prizes

The Twin City section of the American Society of Mechanical Engineers gives annually $75 for three prizes, open to members of the Minnesota student chapter of the society, for the best original paper presented in one of the regular senior courses.

First prize, Kay Jue; second prize, Franklin Vobeyda; third prize, Gladys Wallene.

Architecture Faculty Prizes

Edward Lofstrom received the first prize, while the second was divided between Robert Auvinen and Robert Currie.

Alpha Alpha Gamma Prize

Gordon Schlichting received the prize of $15 in books offered by Alpha Alpha Gamma sorority to the author of the design placing first in a designated competition consisting of one of the regular long problems in the sophomore course in architectural design.

Northern States Prize

For the best solutions of problems involving special concealed or built-in lighting features, the Northern States Power Company awards two prizes of $25 and $15, respectively.

The prize winners this year: First, Esther Shapiro; second, Ralph Swan.

THE MINNESOTA
TECHNO-LOG
UNIVERSITY OF MINNESOTA

Wherein The Editor Speaks

It has been one hectic year, and I'm glad it is over. Another month of this would drive me crazy. And, here are the reasons to prove that statement.

The year started off fine — — — — that is with the exception that no one of last year's active staff members returned to offer his services. The first few days were spent putting up signs in and around the engineering buildings advertising, begging (if you will) for men to work on the Techno-Log. Two responded—then three, and four, and finally about the time the November issue was to go to press, that total had mounted to about ten.

Fortunately not all ten of these were freshmen. None were seniors. Not more than one had ever worked on the Techno-Log before. Now, for the readers' benefit let me explain that there are several responsible positions on the Techno-Log. The Managing Editor must have a reliable and competent Associate Editor to help with the routine duties; he must have a dependable copy reader who has A's or better in English; he must have a Campus News Editor who not only has an eye, ear, and "feel" for news, but who has the personality and ability to get reporters to work for him. Those men together with someone who is acquainted with the tactics and doings of the Alumni are absolute essentials to the publication of the Techno-Log.

The masthead of the October issue carried the names of no one excepting the Editor and Business Manager, and appropriately so, even though the reasons for that occurrence was not founded on work on that issue. To make myself absolutely clear, I want to take one last slam at the men who were carefully trained and helped in their positions by last year's Editor, and who then failed to even show up and offer excuses for not doing something in return for the experience they had gained. Enough for them.

Getting a staff was just the beginning of the trouble. Advertising was hard to get and especially for a poorly organized staff which utterly lacked salesmen. That meant consequent retrenchments in expenditures necessitating a smaller magazine and fewer original illustrations. However, we all made the best of things as they were and did our best to put out a magazine which was the best that could be possibly produced under the circumstances.

One day an idea was born, and from it sprung the child of an overworked brain which finally developed into the plan for a picture section—sixteen pages of solid pictures. Of course it would take a little money, possibly a subsidy. But no one was willing to undertake the responsibility of furnishing the money or trying to raise it, so the picture section dropped off to eight pages which the Techno-Log itself would finance on advertising expectations.

So, pictures were taken, groups were assembled on the stairways and lawns for their photographs, Editor and photographers ran around like wild for two hectic weeks, cutting classes, doing no studying, but taking pictures—and more pictures. Finally the pictures were secured, the best ones selected, makeup planned, dummies drawn up, and copy turned over to the printer just barely in time to make the May issue before Engineers Day.

With any kind of a break that would have been about the biggest thing Techno-Log had ever done. But, what happened? About the time the plate, which was being made in Minneapolis, was ready to ship to the printer in St. Paul, the Minneapolis Truck Drivers decided to strike—a couple of days delay. Then the picture section when printed was held up a couple more days before being delivered to Minneapolis to be bound with the rest of the issue. By that time it was too late, so as an emergency measure we gave the students the May issue without the picture section. This month they get the pictures which they should have had last month. Then and there the last of the Editor's fond dreams slipped down the sewer, and there ends this year's tale of woe.

Last fall several juniors offered their services to the Techno-Log, and they were promptly assigned duties. To those men goes the credit for the few things Techno-Log has been able to accomplish. To Eugene Price, Arnold Cohen, David Buck, and Thomas Tudor go the real credit for coming in, without experience or training and taking over jobs that really required experience. Richard Pederson, a member of last year's staff, returned to the fold about January, and has been contributing nobly since. To all of these many thanks. To all of our readers, thanks for your loyalty in sticking with us throughout this transitional year. And to the men who have received training and experience on the staff this year, show up next fall and let the Editor know that you appreciate the opportunities you have had.

—*Ralph E. Monson.*

A First Word

This is the new editor of the Techno-Log speaking. Next year he is taking over the publication of this magazine, and, like many another editor, he finds that he is going to need men to help him carry out his plans. So this is the first call for those men who are going to put out the Techno-Log in the year 1934-35. Maybe we ought to put in an ad to attract the attention of the men we want. It would probably read something like this:

> WANTED: Next year's sophomores, juniors, and seniors in the College of Engineering and Architecture and School of Chemistry, to write news, feature articles, and editorials; to draw cartoons, read copy and help with the makeup of the Techno-Log. Those interested please apply at Room 37, Electrical Engineering.

That is pretty near all-embracing. All the departments and all the classes who are with us now that will be with us next year. We like to have men around who are representative of the school as a whole, and not of just one part of it. Possibly you wonder what we can find for all these different kinds of men to do.

First we said sopohomores. By that we mean men who will be sophomores next year. These are the men who will be doing the reporting, gathering the campus news, and getting the fundamental training which each needs to step into a higher position. The sophomore who reports early next year, will be given assignments which do not carry a great deal of authority. He will not be immediately raised to assistant editor. As the army boys have it, you have to learn to follow before you can lead.

Then there are the Juniors. One of next year's Juniors will edit the 1935-36 Techno-Log. That is liable to be one of the men who has been with the Techno-Log this year. But that is not at all certain. If you should come in and prove that you were better than the men who seem to be in line now, you would get the job. We're not just trying to make things look rosy for you either; in recent years at least two juniors have come fresh into the Techno-Log organization and carried off the Editorship. The first thing a junior would be asked to do would be just what the sophomores are going to be doing. But if you do that well, if you show the editor that you are capable of doing good work, promotion is the only logical step. If you don't feel that you want to try to become Editor in one year, there is always a great demand for writers of feature articles and editorials. That is what we want the Seniors, also, to do.

Writing features is the job that the seniors and juniors can do best. These two classes have the required technical knowledge that they need to do writing of this type, and generally in two or three years they have become interested in something which they would like to pass along. That is a good thing for you men to be thinking about this summer. Summer experiences may provide you with the material on which to base an interesting article. Everyone is interested in how other men spent the summer: there is just one suggestion out of many.

Suppose you do come around and work for the Techno-Log. Just what are you going to get out of it? You can't all be editors, where do the rest of you come in? The answer to that is pleasure, contacts, and training. It is real fun to work on a publication, to be at the cross-roads of the particular group which you represent. The training which you receive working on the Techno-Log will be of real benefit to you in your engineering career. Don't get into the habit of thinking that mathematics and stresses are all you need to know to be a real good engineer. Your very mathematics professors will tell you that you need more training in speaking and writing intelligently. On the Techno-Log staff, you will find the opportunity to practice putting your thoughts into words. More than that, you will find an opportunity to make contacts with men who are important in the engineering professions. Work on the Techno-Log may lead to a job after school for you, as it has for others. The practice you will get in meeting people, in talking to them, will be very beneficial to you. As graduates and other men in the field have often told us, Engineering above all else, is dealing with men. You can get a lot of elementary practice in just that by your work on the Techno-Log.

Well, drop around the first thing next fall, and let us know that you are on deck. You will be given something to do immediately. Don't wait until the year is half over, it is too late then to get a good start. The man who is on the job while that first issue is being prepared is the man that is going to be remembered when the staff positions are handed out.

—*Eugene Price.*

In Memoriam

This quarter Death stepped in and chose two from the ranks of the Junior Electrical Engineers. Leon Kochevar passed away at the University Health Service, the victim of a sinus infection. Leon's death followed several days of treatment for sinus infection. He was working for Professor Rowley in the Experimental Laboratory and was very well liked by his employer and fellow students. Leon has one brother, Raymond, attending the University, a junior in aeronautical engineering. His home was in Chisholm and he attended the Hibbing Junior College before coming to the University.

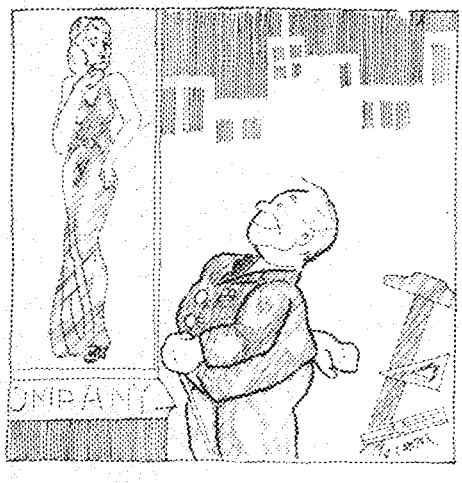
Alfred Blanchard, of 3018 Johnson street, Minneapolis, was drowned in Wolfald Lake, Memorial Day, May 30. Alfred was a federal student and was working for Professor Bryant on his electric power survey of the campus. On the Friday just preceding his death he pledged Triangle, engineering fraternity. He was very well liked by his fellow students, and his loss is felt keenly by his classmates.

Spying on Our Grads

And in the spring a young man's fancy lightly turns to love, or so it seems, to note the number of marriages and blessed events among our alumni these last few months. The architects and interior architects, especially, were cupid's victims, proving something about the theory of propinquity — or something.

There's *John Crimmons*, for instance, an architect of 1930 who persuaded *Inez Wood*, Int. Arch. '30, to take the fatal oath on the twenty-fifth of May. Inez worked a short time with the Northern States Power Company after she left school, and then did some writing on interior lighting, but from now on, her major duty will be to keep the buttons on Johnny's shirt. John, by the way, has an appraiser's job on some city real estate board, and they have made their home in Minneapolis.

A local girl that made good in the big city is *Norma Edwards*, Int. Arch. '30, who is now employed as a stylist for Marshall Field in Chicago. Norma designs clothes of no little chic and charm, they are made in the big plant down there, and then she throws her own style show; modeling her creations for the boys that decide what the well dressed women will be wearing soon. We hear that Norma is planning to do the Lohengrin march some time next fall on the arm of an advert'sing man from Chi. Here's wishin' 'em luck!



. . . her own style show

Most engineers are familiar with John's Place down on Sixth street, but not many know that the fellow that runs it is *Howard Woo*, Arch. '29. Howard has been married for some time, and proudly displays his three months old baby to friends. When in school, he was interested in dramatics and took an active part in Arabs.

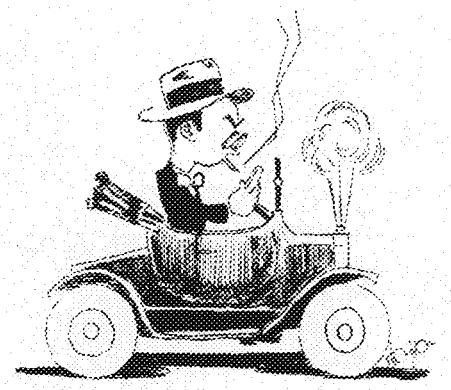
Another boy that cupid snared is *Irwin Malakowski*, an architect who graduated in 1931. He picked himself a helpmate from among the girls over in dental hygiene, and now the neighbors listen to the midnight serenading of his month-old chip off the old block. Mal is another architect who boasts a job with the City of Minneapolis.

The folks upstairs remember *Bunny Engstrom* as the girl who completed all but the last quarter of her course in interior architecture and then ventured out into the cruel cold world to work for the Twin City Milk Producers' Association. But it didn't stay cold after *John Huchthausen*, Arch. '33, came along, and the wedding was announced in May. The happy couple live out Cedar Lake way in south Minneapolis.

Howard Harvey, Arch. '31, holds down a nice job in his home town, Virginia. His title is Assistant District Engineer of the Saint Louis County Highway Department, but we understand it isn't nearly as bad as it sounds. After he left school, Harvey got acquainted with a little girl named *Audro Eddy* to the tune of a marriage license, a "Mrs. Harvey to you, please," and now an infant addition to the family roll call.

Vernon Erickson, Arch. Eng. '31, writes that he is back in Duluth again with the U. S. Engineers' office. Vern was down in Detroit for about a year, but was recently transferred back to his home town. His job includes making soundings of Lake Superior, and he says that cold baths in the lake are frequent. Personally, it seems that a graduate of our college ought to be able to keep from falling off a boat, but maybe his thoughts were wandering back to school days and the little blonde on the desk next to his.

Paul Kingston, C. E. '29, is now working for Millinowski and Druar, consulting engineers in St. Paul. He worked for a while under Professor Bass in the civil engineering department, and was well known by the chain and transit boys. Paul still lives down in Hastings and puts a lot of miles on the old wagon between his home and the office.



. . . miles on the old wagon

William McGrath, an architectural engineer who graduated in 1932, is with the Globe Wrecking Company of Chicago. Bill has done considerable traveling while with that concern, and has worked in Chicago, Baltimore, Erie, Cleveland, and other cities. His latest transfer is to Buffalo, New York. Working with him in Chicago was *Fred Haack*, also an architectural engineer. They will be together when the company tackles the job at Buffalo.

A man to whom the architectural students and faculty point with pride is *Bob Cerny*, Arch. '32. Bob took a master's degree at Harvard, and was appointed to a position with Roosevelt's Tennessee valley project. His latest achievement is the Robinson Traveling Fellowship from Harvard, which gives him nine months of travel in Europe. Simultaneously with this award, he received a raise in salary from the T.V.A. and then a leave of absence to make the European tour. Bob writes that he expects to leave for overseas in early fall.

where the Graduating Seniors Get Their Say about jobs

By HOWARD KAHN, Ch. E. '35

Well, so the boss says to me, "Let's see a little work for a change. They tell me that a few boys are graduating from this here institution and maybe our subscribers would like to know what they're going to do." So I grabbed a telephone and a list and here are the tales that I heard.

The first man to answer the phone (I just dial any old number in the hope that I'll find a graduating engineer) was P. Milton Ruoff, B. C., (chemistry to you), who was overjoyed to report that he is going to the chemical school of Johns Hopkins University on a fellowship sponsored by the Hormel Packing Company. Continuing with the chemists I found that Bill Lundquist is getting an assistantship at Illinois University; Bill Kaiser is taking an assistantship at the "U", while Roger Bosson and Courtland Agre will be intense rivals, for the former is going to the B. F. Goodrich Rubber Co. at Akron, Ohio, while Courtland Agre will be with the Goodyear Rubber Co. in the same city. Paul Liechty said he had a number of ideas but none very good, and that he planned to play golf all summer, while Harry Kaess is going back to Wheaton for unknown reasons. (Of course, he lives there.) Many of the other chemists reported hot leads and hot plans but nothing definite.

Among the Civils I found that Oswald Helseth has decided definitely against being a sharpshooter, with a gun, that is. Craig Gaskell, the lucky devil, has a position with the Truscon Steel Co. in Minneapolis. Reynold Caleen, aeronautical, may go to California, and Benedict Cohn, another aviator, is going East and will report at later date.

Of course, about this time the editor demanded the copy, the phone was taken out for non-payment, and I lost my glasses, and so many of our departed brethren were unsolicited. Rumor hath it that many will be working soon, while others will have a chance to rest after the strenuous four years session. To many it will be both interesting and heartening to hear over thirty-five graduates of former years of the chemical engineering course, unemployed for several years, were placed by the chem engineering department at the "U" during the last year. So perhaps there is hope for all of us.

Paint--
Solid or Liquid?

By E. L. McMILLEN
Instructor in Chemical Engineering

If you were asked whether a paint is a solid or a liquid most of you would, no doubt, reply, "It is a liquid as it may be poured." The viscosity of paint appears to be about the same as that of castor oil or a moderately heavy mineral oil. If these oils were brushed upon a wall it would not be long until they would be found in a puddle on the floor. What is it that causes paint to stay where it is applied?

Paint, composed of solid pigment particles dispersed in a liquid drying oil, such as linseed oil, to which may be added thinners and driers, belongs to that class of materials known as plastics. Plastics are soft solids, retaining their shape under low stress, flowing under moderate stress. Butter is a plastic we are all familiar with. Finished articles made from plastics, such as Bakelite and the casein plastics, are no longer really plastic, but at one stage of their manufacture they were plastic and could be moulded. Paint is such a weak plastic solid that it will not even support its own weight to any noticeable extent. It cannot be piled up. The pigment settles in the can due to its own weight. The shearing strength of paint may be as low as 0.0001 pound per sq. in. Yet even this extremely low strength of the paint contains at least part of the answer to why paints stay where they are applied. Since the paint film is only a few thousandths of an inch thick great strength of the plastic structure is not required to hold it in place. The oxidation of the drying oil to give the final durable paint film is usually a matter of hours. The strength of the plastic paint holds it in place, or at least retards its escape, until oxidation occurs. We have thus a picture of paint flowing under the severe stress of brushing and obligingly becoming solid when the brush is removed.

According to the older conception of the behavior of plastics the ability to flow was thought to be determined only by the stress the plastic was subjected to and to be not at all dependent upon the past history of the plastic. The bristles of the paint brush create hills and valleys in the paint surface. If the paint immediately becomes solid upon the removal of the stress of brushing, as the older conception of plasticity pictured, these brush marks would remain indefinitely. Indeed in certain paints these brush marks do remain in the film as permanent eye sores. In other paints, particularly good enamels, the elimination of these brush marks is complete and still the paint remains where it is applied. Our picture of the behavior of plastics is evidently still incomplete.

Surface tension in the surface between the paint film and the air, tending to make the amount of surface as small as possible, is the force responsible for leveling out the hills and valleys of brush marks and is opposed by the shearing strength of the plastic paint. From a detailed consideration of the forces involved it has been calculated that the shearing strength of 0.0001 pounds per sq. in. mentioned above is more than sufficient to prevent complete leveling of the brush marks. An ideal paint would be one that would remain fluid for a sufficient length of time after brushing to allow surface irregularities to be eliminated and would then attain sufficient strength to hold itself in place until the oxidation of the paint film is accomplished. Actually this is the way most paints behave. The rapidity and extent of the changes in viscosity that a paint undergoes after the disturbance ceases are most surprising. Experimental measurements of the viscosity of a certain paint while being violently disturbed, as in brushing, showed a viscosity of about ten poises. Twenty seconds after the disturbance ceased the viscosity had increased ten fold, in two minutes one hundred fold, in five minutes a thousand fold, in twenty minutes ten thousand fold, and in about an hour a hundred thousand fold increase in viscosity had occurred. At the end of this time the paint had attained a viscosity of one million poises; yet the shearing strength was still less than 0.0001 pounds per sq. in. Because paint is such a weak plastic solid, these enormous changes in viscosity can take place right before one's eyes without being detected. These changes take place entirely apart from any oxidation of the drying oil.

Plastics that require time to regain their strength after being disturbed have been termed thixotropes and the phenomena, thixotropy. Thixotropes are solid if undisturbed, become fluid if disturbed and require time after the cessation of the disturbance to regain their former solidity. The cycle may be identically repeated indefinitely. The faster the thixotrope regains its solidity after cessation of the disturbance, the greater its degree of thixotropy is said to be. Thus a plastic requiring no time to regain its strength, and having an ability to flow dependent only on the stress it is subjected to, possesses the highest possible degree of thixotropy. For this reason there is no necessity to distinguish between plasticity and thixotropy, as they appear to be just different names for the same phenomena. The complete description of the behavior of a plastic or thixotrope should include the knowledge of how fluid it becomes when disturbed, how solid it becomes when at rest and the rate at which it goes from the fluid to the solid condition.

In paint, if the rate of regain of solidity after brushing ceases is too rapid, the paint is not fluid for a sufficient length of time to allow surface tension to level out surface irregularities, and brush marks remain. If the thixotropic change is too slow leveling is accomplished, but the paint does not attain sufficient viscosity or sufficient

Alpha Tau Sigma

The formal initiation of Alpha Tau Sigma, honorary engineering journalistic fraternity, was held Tuesday evening, June 5, at the Techno-Log office. The ceremony was followed by a gala banquet at the Prince of Wales Inn on Lake Johanna. Professor Hugh B. Wilcox served as a very able toastmaster, and short talks by Dean O. M. Leland, Harlow C. Richardson, and R. W. Siler enlivened the occasion. President Ralph Monson presented the initiates, and Eugene Price, next year's editor of the Techno-Log, responded for them. The new men are David Buck, Arnold Cohen, Robert Dixon, Herbert Jensen, Howard Kahn, James Moore, Malven Olson, Richard Pederson, Eugene Price, Charles Sweatt, and Thomas Tudor. The present officers of the fraternity who arranged the affair are Ralph Monson, president; Gordon Rosholt, vice-president and treasurer; and Robert Marshall, secretary.

At the close of the banquet the new members held an election meeting to choose their officers for the following year. Eugene Price was elected president of the chapter; Charles Sweatt, vice president; and David Buck, secretary-treasurer.

Design Problems

The last problems of the quarter in the various grades of architectural design were all due on the same day. Because this coincidence resulted in a scarcity of "niggers," or helpers, because many students were commencing new grades of design, and because several seniors made desperate efforts to graduate, the whole school was over-energetic in closing the year's work.

Old grade two had to design a suburban house and grounds. The practicability of such study was obvious, and the class has not been so enthusiastic over a problem in months. The *projets* of the two lower classes, a wall fountain and a metal grill were rather prosaic and unimaginative, but surely the heat wave was partly responsible. The seniors expected to have a good time designing a brewery, but towards the end of this problem it seemed rather dull and uninspiring. Interior students, also, could not get excited over the presentation of a regency interior at a rather absurdly small scale.

Architectural Society

After several months of uninspired existence the Architectural Society recently sponsored a talk by Professor Upjohn of the fine arts department. The subject of the informal address was "The Principles of Modern Design," and it attracted much interest in the school.

New officers of the society under the leadership of Victor Gilbertson, the new president, have planned a program of activities for next year. A series of talks by outside speakers, sponsored tours of important local buildings, the traditional jubilee, and the publication of a yearbook made up an ambitious program.

strength to hold itself in place until oxidation of the film is accomplished. Running or sagging of the paint results. A properly formulated paint will possess a rate of thixotropic regain of solidity between these two extremes so that leveling is accomplished and sagging is avoided. When one is applying a paint that tends to sag, probably due to being applied too liberally, the natural reaction is to brush at the paint some more trying to put it back where it belongs. This usually defeats its purpose, since the added brushing renders the paint again fluid and sagging occurs still more easily. The only way additional brushing will cure sagging is to have the brush free of paint so that it removes the excess that has been applied.

The most startling example of a thixotropic mixture to come to my attention was possessed by a ceramic chemist. When he shook this mixture in a flask it swished about much like any liquid and appeared to be quite fluid. Yet when he inverted the flask, which he usually did above a spectator's head, not a drop would pour out of the flask. Here the change from a moderate viscosity of a few poises to millions of poises must have occurred in the fraction of a second it took to invert the flask.

Many interesting things might be further written about pigments used in paints, their manufacture, particle size, color, brightness, refractive index, etc. In this short space I have confined the discussion to the flow characteristics or rheology of paints partly because of greater familiarity with that phase of paint research and partly because the subject is so religiously avoided in the courses offered to engineering students. As a matter of fact a large share of the materials the engineer must work with are neither true solids nor true liquids, but are plastics. Whether he is a civil engineer constructing an earthen dam or placing a foundation on soil, or a chemical engineer filtering a sludge, or a mechanical engineer designing a machine for filling sausages, the material he deals with is plastic.

Kahn Notations

The peace demonstration brings to mind the case of John D. Peterson, military man of the engineering school, who is also a member of the National Guard. It seems that Mr. or is it Capt. Peterson attends Guard meetings nonchalantly swinging a saber and smoking a large black cigar in true military manner. His comrades in arms dignify him with the title of "Turkey Neck."

* * *

It has been bruited about in local gossip circles that the pride of a certain chemist took a fall the other nite. The man in question attended a banquet given by a campus honor society in honor of the initiates. Now this man, being a famous hail-fellow-well-met, proceeded to mix about and soon espied a stranger standing all alone by the wall. And so up our hero trotted with introductions, questions, answers, and advice, but was interrupted in the midst of his monologue by the stranger, who confessed he was merely a waiter.

Loud and long were the debates which followed the famous Oxford resolution against war. In many colleges and universities were held special meetings for the purpose of discussing the resolution and what should be the attitude of the American student on the subject, with all deadly seriousness which only peace meetings can have. And yet, according to Fred Hovde, former Rhodes scholar and present assistant dean in the General College, the whole resolution was written in a spirit of fun and foolery, with no thought of shocking or challenging the world. And they say Englishmen have no sense of humor.

* * *

It is rumored that since the Alpha Tau Sigma initiation banquet, held at the smart Prince of Wales roadhouse in St. Paul, Dean Leland has refused to speak at any functions for initiation purposes. At the close of the banquet, as the group was leaving, an inebriated young lady of easily less than fifty years accosted the Dean in very familiar terms, and offered him a drink of beer. When the Dean resisted her advances as all good Deans should, the gray-haired play girl grew very angry and muttered words which made even your hardened correspondent blush. But evidently she held no lasting enmity toward the Dean, for her last words to him were, "By the way, there, whyncha c'mup' 'n' see me sometime?"

* * *

And why didn't the peace demonstrators close the session by singing "No More Drill"?

* * *

The Saga of the Soiled Shorts
or
Secrets of Alchemy Revealed

Perhaps a good many of you saw the very excellent alchemy exhibit held in the chem building during Engineers' Day by the Alpha Chi Sigma brothers. Being chemists and so of course very methodical and neat, the fraters returned the next day to clean up the shop, and used an old rag that they found there to wash and scrub up the apparatus. Well, dear readers, loud and long did the roars resound when Dr. Larian discovered to what use the brethren had put his underwear.

* * *

Doc Mann's suggestion for drouth relief is to put green glasses on the cows and feed them excelsior. But the whole plan awaits some genius who can synthesize the odor of new mown hay. Hay! Hay!

* * *

Which reminds us of a story about an instructor in the physics department who may know his optics but who limits himself to this alone. It seems that a Phi Beta and Sigma Xi man taking the course would, in his examinations, invariably write at the conclusion of his problems Q. E. D. (*Quod erat demonstradum* to you, which means "which was to be demonstrated" and is quite proper.) And invariably the instructor penciled large red question marks through the letters, indicating he was puzzled. Perhaps if he has not investigated yet, this little item will set him aright and allow him to get some sleep after all these nights spent in wondering.

* * *

Seen on the P. O. Bulletin Board:

"Room Wanted! Must be reasonably priced but fairly habitable. Prefer U hospital vicinity. No moral preaching tolerated. If you believe you have it, write to P. O. ....."

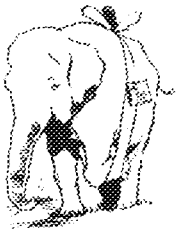
We have it, but we don't know what to do with it.

* * *

SWAN SONG

Like all things, good and bad, this year has come to an end. To some it has brought pleasure, to others pain, to all another birthday, and that is all we can be sure of. In my own tactless way I have endeavored to offer to you a few moments of relaxation, a view of some of the more comical antics of your fellow engineers. I cannot measure my success; of comments there have been none; and it is often said if a man cannot excite either approval or disapproval, then he is nothing. However, I have had my pleasure in writing this column and so for me the books are balanced. Au revoir and a pleasant summer.

G-E *Campus News*



HAY THERE, NIZIE

Too many peanuts and not enough hay and other roughage proved to be a bad policy for Nizie, a highly trained dwarf elephant. Nizie was part of the troupe of Nicola the Magician, exhibiting in Chicago, recently. The elephant's part in the performance consisted of a disappearing act, requiring some agility, and when his left foreleg stiffened up for no apparent reason, the veterinarian was at a loss to know what treatment to prescribe. The situation seemed to call for x-ray, but even a dwarf elephant is a little bulky for hospitalization.

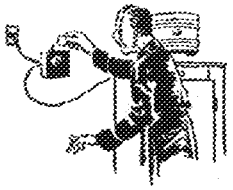
Engineers of the General Electric X-Ray Corporation had solved a similar problem last fall for C. V. Whitney's famous horse, Equipoise. Armed with a newly developed, small, portable, shock-proof outfit, they paid a visit to the elephant's stall. Whereas it took but five seconds to make an exposure of Equipoise's leg, the elephant's thick hide required 45 seconds, during which time Nizie was kept in place by chains and promises. The x-ray recorded every detail of stiffened joints and bone formation, and a verdict of arthritis, or gout, was handed down by Dr. F. M. Kent, together with a prescription for a change in diet.

NEW DIAMOND SETTING

Only about half of the diamonds mined are good enough for setting in jewelry. Of the rest, approximately $4,000,000 worth are used annually in industry in such things as grinding-wheel dressers, drills, wire-drawing dies, and stone saws. And the settings for these stones, although not decorative, are even more important than those of their fancy-cut diamond friends.

The old method of setting these hard-working diamonds in holes in soft steel and holding them fast with copper has many drawbacks. Cracking, looseness, vibration, and loss are quite frequent. After investigating the subject for several years, workers in the G-E Research Laboratory found that under certain temperature conditions, cemented carbides, such as Carboloy, have a peculiar affinity for diamonds. This was a fortunate combination, for it comprised grains of diamond, the hardest of all substances, and Carboloy, the hardest of all metallic bodies. The adhesive bond between Carboloy and the diamond is so strong that when a mass of diamond-impregnated Carboloy is fractured, the grains lying along the fracture are split through, each part adhering to the Carboloy matrix. Diamond-impregnated Carboloy is now being used principally for wheel dressers, and to some extent in drills, but new applications are constantly being made.

The work of developing this new diamond setting was carried on under the direction of George F. Taylor, University of North Carolina, '15, Sorbonne, Paris (one year), '19, of the G-E Research Laboratory.



A WAY TO PAY

You might say that "human engineering" prompted the production of the new G-E coin-operated time switch. Hitched to an electric refrigerator, for example, it turns on the juice. As long as a quarter is slipped into the slot every day, current will be supplied. Long-term planners can put in as many as 15 coins in advance, if they wish. The box will hold more than 200.

This is a safe and painless method of collecting payments on electric appliances. The switch is relentless, honest, and immune to feminine charms. Husbands who may wish to place their money on a "sure thing" might be cajoled into dropping quarters into the time switch, when the reward is a refrigerator. J. H. Stark, U. of Illinois, '23, of the company's Meter Engineering Division, is responsible for the design of the instrument.

96-60DH

GENERAL ELECTRIC