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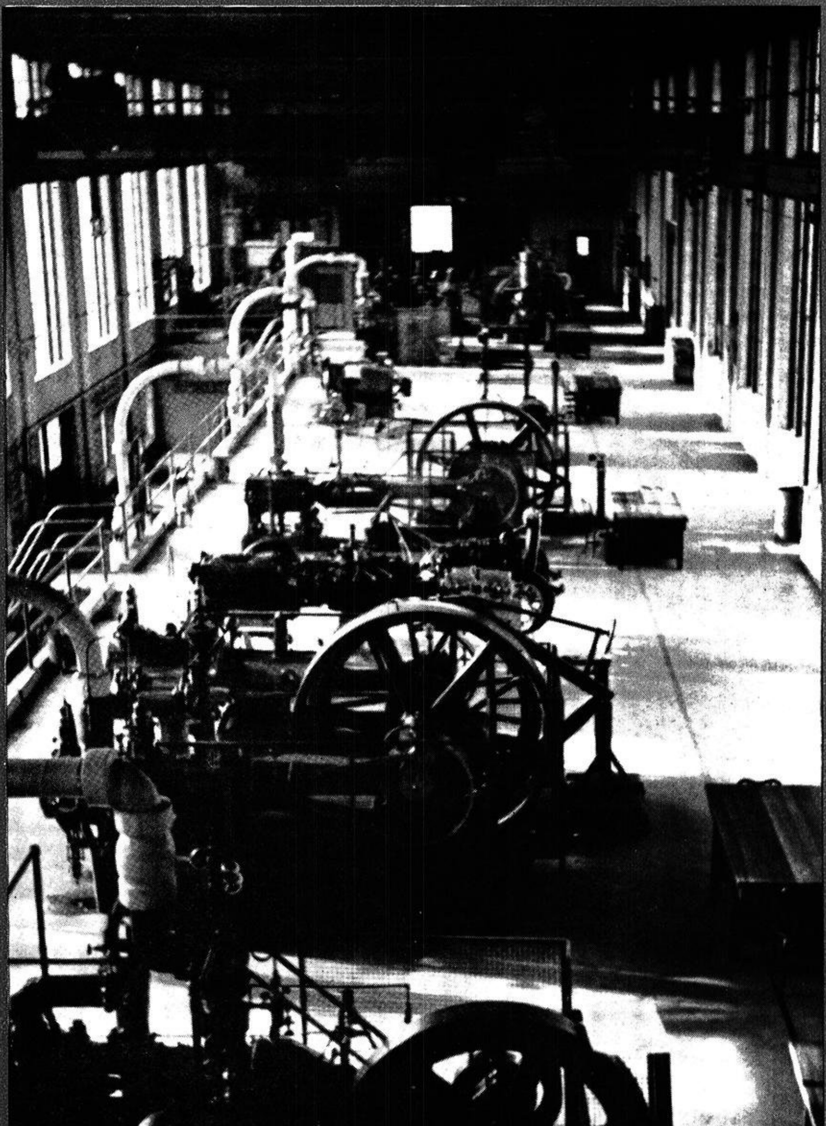
THE WISCONSIN ENGINEER

IN THIS ISSUE

Dry Ice

Big vs. Little

Strip Mill



NOVEMBER 1937

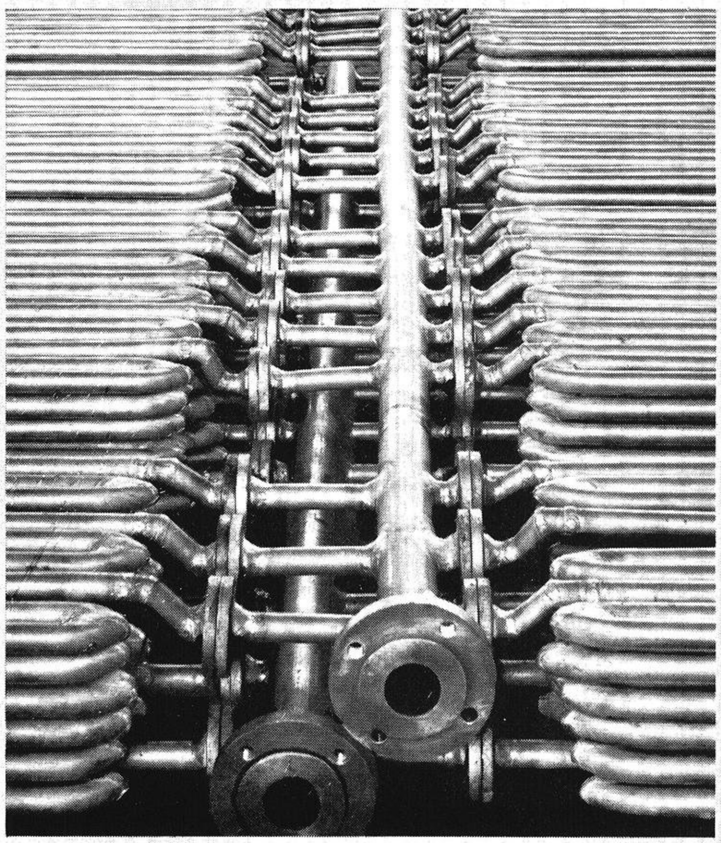
Member, Engineering College Magazines, Associated

How WELDING—
makes Better Piping Systems

Oxy-acetylene welding contributed to the better design and trouble-free construction of this intricate piping system. The pipe, bends, reducers, headers and flanges were all made into an integral welded unit. Every weld will remain leakproof for the life of the pipe. Welding stripped the entire system of every pound of excess dead weight and made it stronger, sturdier, more rigid—yet added not one cent of extra cost.

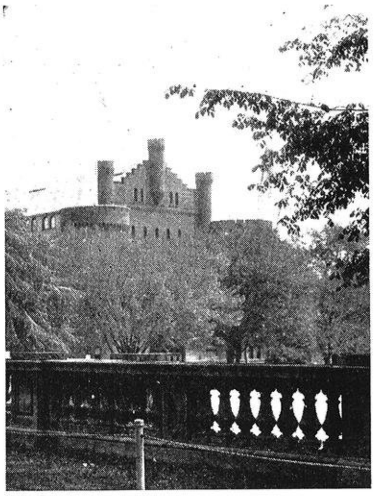
Tomorrow's engineers will be expected to know how to apply this modern metalworking process to a wide range of metals—steel and iron, aluminum, copper, brass and many other alloys and metals, including platinum.

Technical booklets describing the application of the oxy-acetylene process of welding and cutting are available from any Linde office. Write to The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York, N. Y.



Everything for Oxy-Acetylene Welding and Cutting

LINDE OXYGEN • PREST-O-LITE ACETYLENE • OXWELD APPARATUS AND SUPPLIES FROM PRODUCTS OF UNITS OF UCC UNION CARBIDE AND CARBON CORPORATION LINDE UNION CARBIDE



Gymnasium

With the Contributors . . .

- Dry ice is becoming more and more important in present day refrigeration; find out how they make it from the carbon dioxide present in power plant flue gas. Page 22.
- Seniors, have you decided whether you would like to work for a big company or a small company? The case for the small company is given on page 24.
- Those miners are still with us on page 31. They seem to be the only live wire student organization in the engineering college.
- A sort of "resume" of the senior inspection trips comes up on page 32.
- Freshmen, Professor Van Hagan gives you some hints on how to study on page 34.

As usual, the editorials are way at the back. See page 40.

The Wisconsin Engineer

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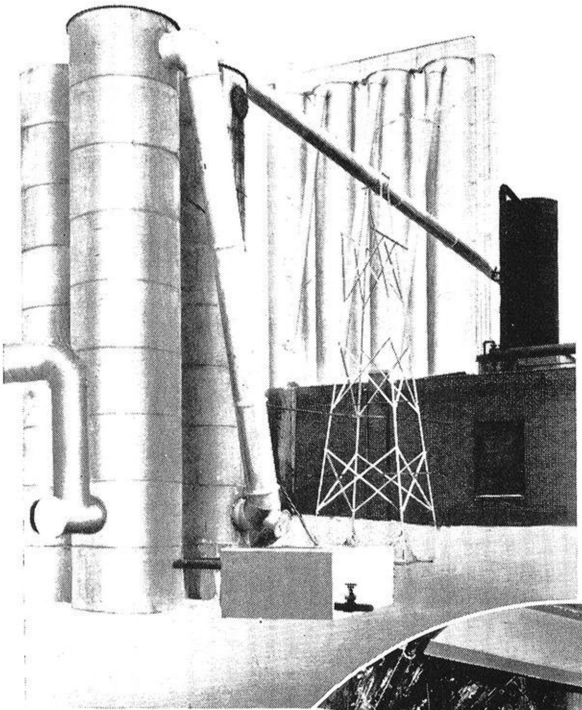
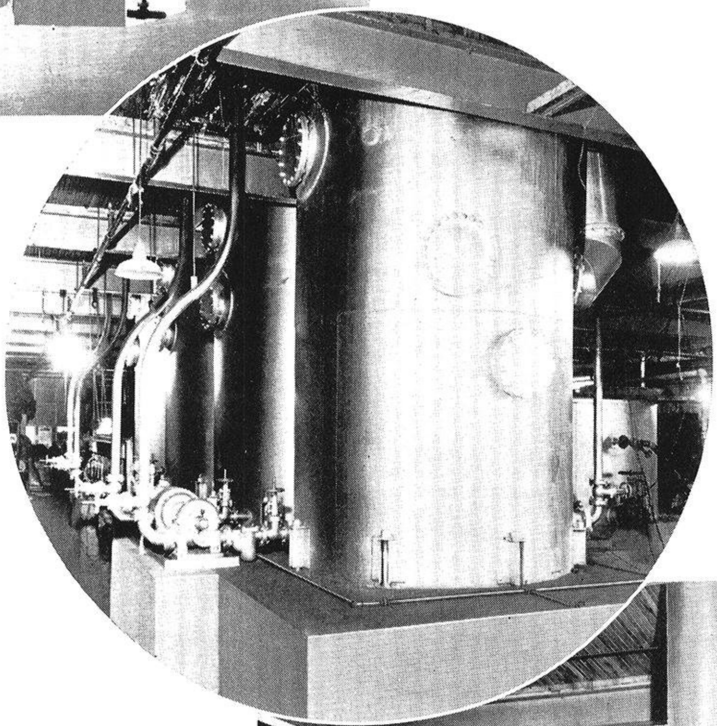
Dry Ice From Power Plant Flue Gas

by **PHILIP WINTER ch'38**



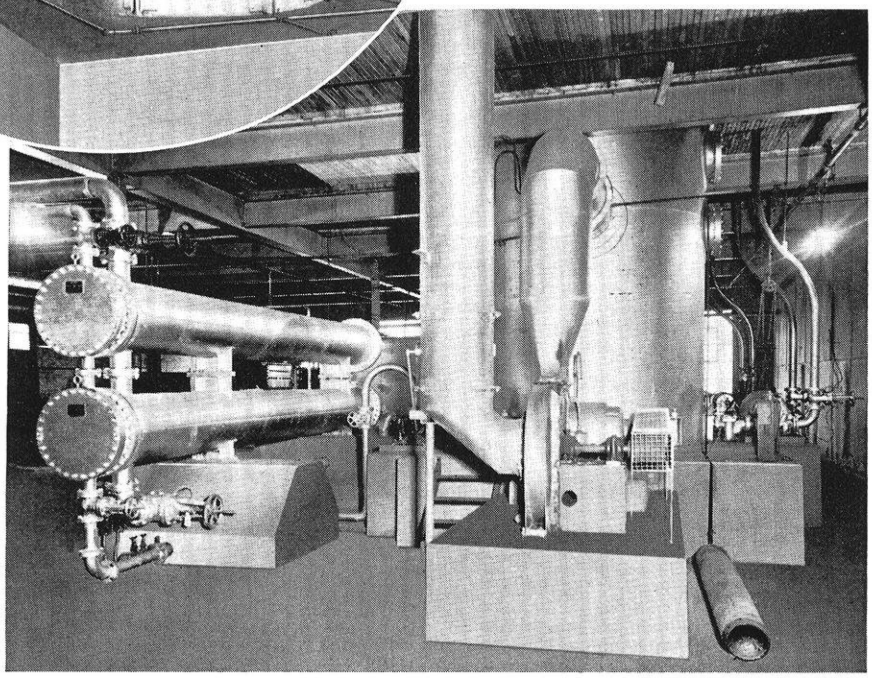


THE POSSIBILITIES opened by cheap production of pure carbon dioxide from the flue gases of plants operated for power production are especially important in the solid carbon dioxide or "Dry Ice" industry when supplies are needed at consuming markets to avoid losses in handling and shipping this refrigerant. Its practical economy has already been shown and it is probable it may be able to compete with present production from by-product gas.

The recovery of carbon dioxide from gas mixtures has attracted investigators and inventors for more than half a century. At the present, carbon dioxide from flue gases is recovered by absorption with potassium carbonate and water. This reaction might be represented by:

$$K_2CO_3 + CO_2 + HOH \text{ yields } 2KHCO_3 \quad (1)$$

As long as the concentration of carbon dioxide in the flue gas is high, the reaction will proceed to the right. Thus, the progress of



• (Top) Flue-Gas Water Scrubbers with Carbon Dioxide Absorbers (Rear Center) and Lye Boiler (Right)

• (Center) Carbon Dioxide Absorbers Showing Lye Circulating Pumps (Left)

• (Right) Gas Feed to Macmar-Process Carbon Dioxide Absorbers, Showing Flue Gas Blower (Center) to Absorbers, Ammonia Supply Cylinder (Right Foreground), Lye Heat Exchangers (Left), and Lye Circulating Pumps (Right)

Illustrations courtesy Industrial and Engineering Chemistry this reaction to the right is limited by the oxygen content of the air supplied the fire. However, the most serious limitation is the low speed of the reaction at practical temperatures, which requires the use of large equipment or prevents close approach to equilibrium in practicable equipment.

Many of the early attempts to increase the efficiency of the absorption process were partially successful in pushing the absorption equilibrium to the right. However, none met the new needs imposed on the process by the requirement of the industry for solid carbon dioxide for widely distributed production at low cost.

Carbon dioxide can now be economically recovered from gases of low concentration by a newly developed method using ammonia to assist in the absorption. Recovery at low cost is feasible and the product obtained is pure and satisfying enough for the most stringent specifications.

This latest process using ammonia was developed by the Macmar Corporation and is known as the Macmar Process. To a great extent, it overcomes the defects of the alkali carbonate absorption at very low cost without endangering the purity of the product.

In this process, carbon dioxide in the gaseous phase combines with ammonia in the presence of water vapor converting the carbon dioxide into ammonium carbonate, which is readily soluble in the alkali carbonate solution. In this way, the capacity of the absorbing system can be actually doubled reducing the concentration of carbon dioxide in the exit gas to less than 1%. The reaction may be written:

(2) $2NH_3 + H_2O + CO_2$ yields $(NH_4)_2CO_3$

Since this reaction takes place in the gas phase, it proceeds rapidly; the best temperature is found to be 130° F. In the presence of water, the solid ammonium salt is rapidly removed from the reaction zone; the only limit to the completion of the reaction is the decomposition pressure in the aqueous solutions of ammonium carbonate formed. By having an excess of ammonia in even a very short section of tower, practically all the carbon dioxide will react. The loss of ammonia with waste nitrogen is prevented by washing the waste gas with water condensed by cooling the carbon dioxide evolved from the lye boiler after it has been washed with cooled lye at 100° F.

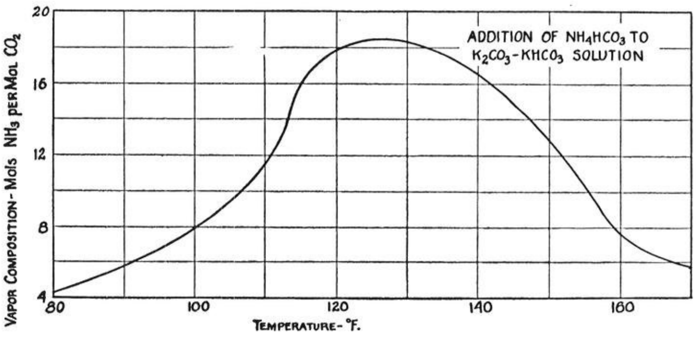


Figure 1

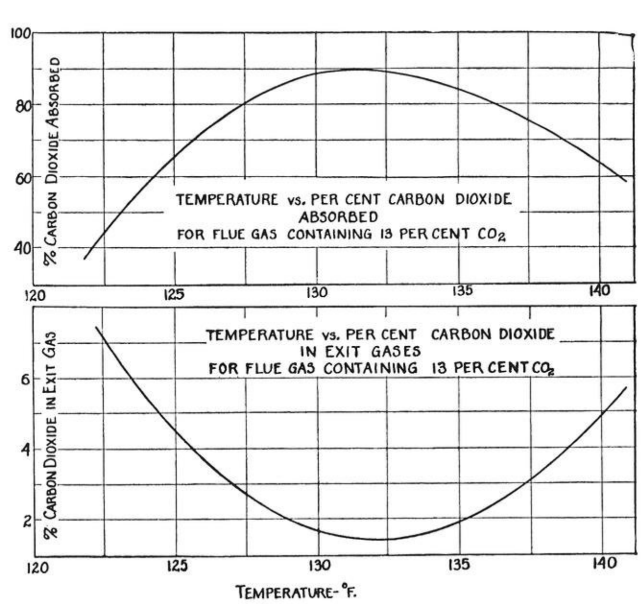


Figure 2

The feed to the tower is ordinary carbonate lye from the lye boiler previously cooled to 120°-140° F. This dissolves the ammonium carbonate and liberates the ammonia for further carbonate formation:

(3) $(NH_4)_2CO_3 + K_2CO_3$ yields $2KHCO_3 + 2NH_3$

Most of the ammonia previously introduced is liberated leaving the carbon dioxide combined as potassium bicarbonate. This last reaction takes place best at 130°-140° F. using cooled lye direct from the lye boiler having the highest ratio of carbonate to bicarbonate possible. The zone of this reaction is followed by a cooler absorber section (100° F.), fed with lye further cooled from reaction (3), whose function is to wash out ammonia remaining in the flue gas. In a single tower system, this is accomplished by recirculation of part of the exit lye from the tower through a cooler to its top. Here the cooled lye and water condensed from the gas generated in the lye boiler clean up the ammonia from the waste nitrogen. As the lye falls down the absorber column, warmer lye from the lye boiler is added to the stream to bring the next section up to the optimum temperature for reaction (3).

Preferably, the absorber tower system is divided into three distinct sections or towers. The first section receives lye, cooled to about 100° F. from the second, and also receives the fresh flue gas washed free of dust, sulphur dioxide, and other impurities. The second section takes gas from the first and lye direct from the lye boiler plus that from the third section; the temperature is regulated to 130°-140° F. Gas to the third section comes from the second and its liquor supply is cooled lye (100° F.) from the second section and condensed water (containing ammonia) from the purified gas coolers.

The absorber system is similar to those now in use. Experience has shown that steel turnings are preferable to coke as a packing material. Bubble-plate towers also have high efficiencies, but greater construction costs as well as higher back pressure in operation has excluded their use.

Apparently, ammonia acts somewhat as a catylist in carrying the carbon dioxide into the lye solution. As $(NH_4)_2CO_3$ is formed, it is dissolved in the lye whose alkalinity decomposes it, freeing ammonia to reenter the vapor-phase

(continued on page 38)

BIG vs. LITTLE

by **MARK A. BUETTELL**

This is the season of the year when seniors begin, perhaps for the first time, to consider the job problem. From now until late in the spring a steady trickle of interviewers and personnel men will flow through our school, each searching for men with special qualifications. Likewise, it is time for the prospective applicants themselves to make personal classifications of the jobs they are out to get. A major decision is the choice between the big company and the small company.

This article is reprinted from the October, 1937, issue of the Iowa Engineer as the first of a series of discussions in which the Wisconsin Engineer will attempt to present impartially both sides of this question. It is written by Mr. Mark A. Buettell, editor of the Iowa Engineer in 1925 and at present chief engineer of the Ideal Commutator Dresser Company of Sycamore, Illinois, who herein presents the case for the small company.

"THE 1937 CROP of engineering college graduates is not going to be particularly successful."

This information was gained from the head of one of the engineering departments of a large mid-western university. It was given to me after he had attempted to secure interviews for me with 18 of his senior graduating class. He could not arouse enough interest in these 18 seniors to get them to talk with me. "They are badly spoiled," were his conclusions. He then brought out charts which he had been keeping for more years than his appearance would lead me to believe. "This curve," and he showed me one beginning back in a previous severe depression and showing a steady, consistent rise of considerable magnitude, "represents the average pay by years to date to the boys who graduated from my department back in that particular year."

He showed me other curves beginning in relatively poor business years all showing the same consistent, upward trend. I was then shown some other curves, starting in exceptionally good business years, which had nowhere near the consistent increase nor the amount of rise shown by those curves beginning in depression years. "These curves," he said, "are for those boys who started with the 'cream' of jobs from which to select. Those other curves starting in depression years are for the boys who had to 'scratch' to get any jobs at all."

And thereby hangs this tale of a small, independent electrical manufacturer who "stuck his chin out" in big time competition for inducting some of the 1937 crop of engineers into his organization.

In determining a policy of obtaining engineers for our rapidly growing organization, we have two options: first, to select from the available supply on the market, either unemployed or in jobs where the individual wants to make a change, or, second, to get engineering graduates just out of school and break them into our organization through an apprentice training. As a matter of fact, we use both methods, but have found the latter to be more satisfactory.

It may be of some interest to relate our experience in trying to select engineers already out of college. By contacts, through advertising mediums and employment departments of the recognized engineering agencies, we obtained a good many applicants. Of these applicants approximately 75% have masters or doctors degrees in their particular line. It did not take us long to size up this situation. Apparently industry is not particularly interested in the engineers with a lot of degrees, but little practical background in a business organization. This fact is also quite noticeable in interviewing this type of applicant. Their attitude of mind seems to be such that an engineering job is a solution of a technical problem for the sake of the solution itself and not for the end which the business has in view of rendering a service and making a profit.

This is simply an interesting "sidelight" on our experiences in one avenue of attempting to secure applicants and may be worth while for reflection by undergraduate engineers.

Our other avenue of approach to securing applicants from the mid-western engineering schools was also productive of some interesting results. We first contacted the schools by addressing a letter to the head of the particular engineering department from which we wanted to obtain graduates. This letter was usually posted in a conspicuous place in the engineering building or information from the letter was transmitted to the senior engineers in the department.

Our first difficulty, in this method of approach, was to secure any interest from the seniors. Our company is small, and does not do a lot of institutional full-page advertising whereby its name would become well-known. Hence, practically all of the senior engineers were entirely unacquainted with the name of our company. The few "nibbles" we, therefore, secured from the senior engineers were more or less out of curiosity or because the more prominent companies had passed up these particular graduating engineers. Consequently, our grade of applicant was relatively low.

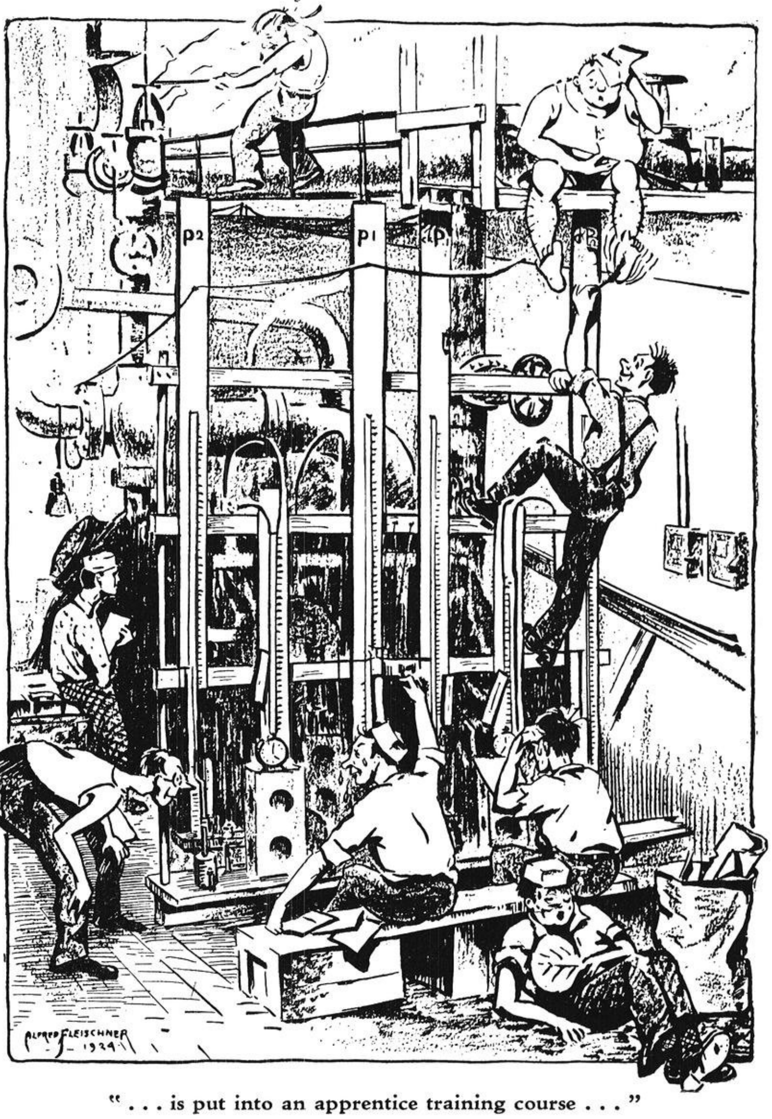
Having been on the receiving end of half-a-dozen offers for jobs when I graduated from college, I had some background as to how the larger companies go about securing their engineering apprentices. I knew something of the interviewing squads sent out by some of the large electrical companies, but I was not quite prepared for the really stiff competition which these larger organizations offered in the approach which they were able to make to the engineering senior way back before this same senior had any idea he was being considered. The technique of the big organization may be changed now, but I am giving the story for what it may be worth as I obtained it from a prominent electrical engineering graduate of one of our mid-western universities who was hired by one of the big electrical companies some 15 years ago. My informant, who was prominent on the campus while he was in school, an athlete of exceptional ability, a fraternity man, and involved in all that goes with a well-rounded collegiate career, was, like most of his type, much sought after. Here is the method which was used on him and which he discovered later.

The large concern that hired him had in its organization many engineering graduates of the institution which he was attending. From one of these men the company selected an "advance" man, so termed in circus parlance, who was sent to the university and to his fraternity house to look around and begin spotting the sophomore engineering students, perhaps in this man's own fraternity or at least from the same department from which he graduated, who gave promise of becoming outstanding engineering graduates. This information was then taken back to the headquarters of the company. The names of several engineers who seemed to give most promise were then noted and a further check made running back to their high school experience, the type of family from which they came, and other pre-college references.

Careful check was kept of these individuals as they progressed in their engineering work at college up to the time they were seniors. Then at the proper time and possibly in the fall of the senior year of these "marked" engineers, the company sent to the university application blanks to be filled out by those students in the senior class who wished to apply for jobs. Among the considerable number of applications turned in would invariably be those of the particular "marked" individuals whom the company had been checking up on for so long a time. Then along in the spring the interviewing squad was sent out and arranged interviews with those sending in application blanks. To those who were not on the select list, this interviewing was more or less a matter of form. The real drive was made on those "marked" students on the select list and it was usually only those students who secured employment. This, in brief, was the story my engineering friend told me of how he was hired.

Sizing up this long range angle of approach by the larger companies, I was forced to admit that I was really running into some stiff competition in attempting to hire the real worth while seniors. The information, however, helped when mapping out our program.

A second tip was given me by another engineer who had graduated about 20 years previously and who has been doing some intensive thinking concerning his present connection, again with one of the large concerns. This man



" . . . is put into an apprentice training course . . . "

gave me this particularly interesting background. In looking at it in retrospect, he said this is what happens to the young engineering graduate who is taken into one of these huge organizations and into an old established engineering graduate apprentice course.

The young graduate is put into an apprentice training course with a good many other graduates of the same age and temperament. The wage is the going wage for engineering graduates, living conditions are good, companionship with other young fellows in the company is congenial, the surroundings are pleasant and the training course offered by the company is not particularly arduous.

After the training course there is the particular department into which one is fitted, depending upon his inclinations to a certain extent, but depending more upon where the company wants to use the individual. The years slip by, working conditions are ideal, companionship in the business organization with others of a familiar frame of mind is pleasant, salary increases are moderate and there is nothing to disturb the innocuous and trouble-free induction and progress with the organization.

Then some day the thought occurs, like it did to my friend, as to just where he is getting in the organization and in his individual position with the company. He has had no opportunity to compare salaries being paid in other concerns and perhaps upon inquiring about he finds that his apparently satisfactory salary is far below that of some of his classmates who have, by force of circumstances, jumped around into other organizations. His comfortable surroundings, however, and the soporific effect of being a part of a well known company deadens the impulse for him to change jobs and he stays on at his moderate salary until St. Peter calls the roll of all such faithful engineers.

This was another angle which I had not considered and gave me further ammunition for my sales talk when I visited the universities. I started out to call on the various mid-western engineering schools to do the hiring where it is really done, in personal interviews. Again I was met with rebuff. The good seniors had all been hired or had their eye on jobs with some companies which had still not given them definite answers. My company was unknown. The mere thought of working for one of the big electrical companies with the name and prestige behind it was in itself enough to win over three-fourths of the engineering seniors without any effort. I ran into difficulty in arranging interviews. The large companies had several interviewers on hand and had been doing the job consistently for scores of years and the universities welcomed them "with open arms." I had to squeeze my interviews in between interviews of the large companies and often my inviews ran far into the night with some faithful stenographer helping me arrange the appointments.

Many of the students with whom I talked were mildly interested or absolutely apathetic. My company or its product meant absolutely nothing to them. I had almost no opportunity to talk with the real leaders of the senior class since they had already been spotted by the big organizations. By dint of such effort I did get to talk with some fair students and as I told some of the heads of the engineering departments I visited, whenever I got to talk to an engineering senior I was really able to put a story across which opened the eyes of many of them.

Two boys I talked with had already signed up with one of the big electrical companies. What was their reason for going with the company? They had no reason, except that they thought it would be nice to effect a connection with such a well recognized concern in the industry. I asked them what type of work they would be given to do, where they would be ten years from now, and if they would be obtaining the well-rounded experience which they should have while they were still young. They hadn't thought of these points, but still they had signed the contract with the big company and felt morally bound to go through with the bargain.

Here is what I told them. In the larger company they are a part of a vast organization. They can scarcely hope to get more than a cursory idea of the general operation of this company and eventually become specialists in one department. The smaller company has few in its organization and in a year's apprentice course in such an organization, there is no part of the business which will not be practically an open book to the engineering apprentice. Here is where the young engineer really finds out what a business organization is all about; what it takes to convert orders into accounts receivable, thence to collections and into payroll, inventory, overhead expenses; what it means to be assigned to a problem, and handle it from start to finish and if it isn't turned out as a good job, to bear the full brunt of the responsibility.

In a big organization you can submerge your mistakes as you do your victories, since among hundreds or thousands of individuals one person's faults or virtues are not discoverable. In the small organization, the success or failure evolves directly on the individual responsible. There is no side-stepping. This develops initiative, aggressiveness, and the knack of assuming responsibility. You are kept continually on your toes, and are a definite factor in the progress of the organization. As your success or failure is easily discernable, so your rewards, with increased pay, or the danger of being fired are equally sure.

In concluding I hark back to my preamble of the 1937 engineering graduates' not being markedly successful. There are qualifications, of course, to this statement. I think what the department head had in mind was that when there are five or six jobs offered to every engineering graduate and starting pay is "jacked up" because of bidding between companies, the young engineer is apt to get an exaggerated idea of his importance and accept the job with the highest starting salary rather than with the greatest experience value or future opportunity. From my observations and experiences, I would say that a good many of the 1937 class passed up a good bet in opportunities with smaller companies, and that 20 years from now some of those who started with the big companies will be looking longingly at the positions held by those who started with the little, fast growing organizations.

ALUMNI NOTES

Electricals

GLUESING, WILLIAM H., '23, who was in charge of the General Electric House of Magic at the World Fair in Chicago, gave a demonstration of Electrical Magic at Eau Claire October 14.

LILJA, EDGAR D., '24, resigned from the Woodward Governor Company of Rockford, Illinois to resume employment with the Barber-Coleman Company where he is in charge of electrical development.

BAUMGARTEN, HARRY, '27, is with the Wisconsin Power and Light Company at Mineral Point as District Engineer.

SARGENT, HARRY, '31, is with the Superior Light and Power Company as assistant electrical engineer. He is also chairman of the Meter Committee of the Wisconsin Utility Association.

CURTIUS, ROBERT, '32, accepted the position of chief meter foreman for the Wisconsin Power and Light Company at Mineral Point.

FLATH, HERBERT, '34, is the proud father of a son. Herbert is manager of the brickette plant of the Riss Coal Company of Green Bay.

HEIAN, TED S., '37, is the local manager of the Darlington Electrical Company.

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Civils

POETTER, REUBEN S., '05, was found dead from heart attack on October 23, in a boat on Van Vliet Lake in Vilas county, where he had been duck hunting. For many years he had been a banker in Milwaukee.

MINEAR, VIRGIL L., '23, is associate engineer with the U. S. Bureau of Reclamation, located in the U. S. Custom house, Denver, Colo. He has been engaged in inspecting and reporting upon foundation grouting on various western dams.

ZANDER, ARNOLD S., '23, MS'30, is national president of the Federation of State, County, and Municipal Employees.

ACKERMAN, ADOLPH J., E'26, CE'32, has resigned as head of the construction plant department of TVA at Knoxville, where he had charge of the design of plant and equipment for the construction of the numerous large dams in the Tennessee Valley. He will be associated with a private firm that is building flood control dams above Pittsburgh.

SCHRADER, ROLAND R., '26, is design engineer with the Bethlehem Steel Co., at Bethlehem, Pa.

LIDDLE, GEORGE F., '27, has been city manager of Muskegon Heights, Mich., since 1933.

BINISH, STANLEY E., '29, Law '35, is with the North law firm of Green Bay, Wis.

PERSEN, EDWARD A., '34, is with the U. S. Engineers in the Rock Island District.

GOELZER, VERNON G., '35, is with the U. S. Engineers in the Milwaukee District.

BENNETT, KEITH H., '36, began work with the Wisconsin Conservation Commission on July 1, as surveyman.

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Miners and Metallurgists

KEMLER, HERBERT J., '22, is now General Manager of the Houston, Texas plant of the Shell Petroleum Corporation.

ROSCOE, DAVID C., '26, is Sales Manager in the Pipe Department of Bethlehem Steel Corporation, Bethlehem, Pennsylvania.

SPARLING, WILLIAM J., M.S.'31, who is located with Chain Belt Company, Milwaukee, was married on June 19 to Miss Ardith M. Anderson of Wauwatosa, Wisconsin.

ARCHIE, G. E., '31, M.S. '33, is subsurface engineer for Shell Petroleum Corporation, McPherson, Kansas.

SIREN, J. E., '33, has the position of mining engineer for Republic Steel Corporation at Iron Mountain, Michigan.

LIEBERT, WILLIAM J., '35, was married at Green Bay, Wisconsin, during August. He is located with the Hubbard Steel Corporation, East Chicago, Indiana.

BEECHAL, GRAYDON R. '36, who is a mining engineer for the Mountain City Copper Company, Rio Tinto, Nevada, was married August 15 to Doris Litch, of Oregon, Wisconsin.

HOLM, HOWARD, '36, M.S.'37, former Alumni Notes Editor on the Wisconsin Engineer, works as a metallurgist for the American Rolling Mills Company, Middletown, Ohio.

KERHAUSER, T. E., '36, is assistant to the production engineer, Shell Petroleum Corporation, McPherson, Kansas.

MULLIN, ELI, '36, is working as a metallurgist with U. S. Steel Corporation, South Chicago, Illinois.

NELSON, FLOYD, '36, is a Geologist for the Shell Petroleum Corporation, St. Louis, Missouri.

Mechanicals

FOSTER, ARLAND G., '35, was married to Ruth V. Lathrop on October 9th at Madison, Wisconsin. Mr. Foster is connected with Gisholt's in Madison.

HAUSLER, GEORGE MAX, '35, was married to Catherine Pearl Broomhall on Saturday, the 16th of October, 1937, at Schenectady, New York. Mr. Hausler is in the employ of the General Electric Co. in Schenectady.

CADWELL, ROBERT J., '36, recently employed by the Winter-Front Co. of Chicago, is now taking graduate study in the Mechanical Engineering Department of the University of Wisconsin.

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Chemicals

GRIBBLE, STEPHEN C., '16, is a professor in the Department of Education at Washington University, Saint Louis, Missouri.

WESTMONT, O. B., '21, is plant superintendent of Johns-Manville at their Lompoc, California, plant, where insulating materials and filter aids are manufactured.

EDWARDS, D. H., '23, is in Station 3 of the Du Pont Company at Buffalo, New York.

MONTGOMERY, A. E., '27, is western manager and vice-president of J. O. Ross Engineering Corporation of Chicago. Montgomery has taken an active part in the activities of the Technical Association of Pulp and Paper Industries. He is chairman of the Heat and Power Committee of that organization.

SCHIEL, MERRILL A., '27, presented a paper with S. L. Hoyt on the Fractional Vacuum-fusion Analysis for Oxygen in Steel before the American Institute of Mining and Metallurgical Engineers.

BEYERSTEDT, R. L., '33, is doing design work for the Frank G. Hough Company, New Holstein, Wisconsin.

JUSTL, OTTO, '34, has been transferred to the Portage, Wisconsin gas plant of the Wisconsin Power and Light Company.

GAPEN, CLARK, '35, was married on August 28 to Miss Betty Rice. Gapen is still with the Corn Products Company of Argo, Illinois.

SENSKE, WILLIAM '37, passed through Madison on his way home from New York City to Spokane. Bill gave up his job with a printing ink company in New York because he prefers the far west and hopes to stay there.

ON THE CAMPUS

Civils Frolic at Devil's Lake

Extra! Extra! Bob Zwettler and girl lost in woods. Can you beat that! How could a civil engineer get lost in a woods which he had just finished taking six weeks to survey? It sounds rather goofy to us, but that's what they say actually happened. In fact, they had Ed Strand, summer camp bugler, blow recall in a vain attempt to locate the missing pair. However, all stories must have a happy ending, and Bob (and company) showed up just in time to leave for home.

All this happened at the first annual summer camp reunion held at Devil's Lake on Sunday, October 24. Professor Owen was the guiding light of the affair and deserves a big bouquet for the success of the picnic. Orchids also to John Fitzpatrick who did most of the work. Approximately forty civils, who attended summer camp, were at the picnic with their dates. Steaks, broiled over a huge fire in Professor Owen's grill were the main item on the menu, with cider, doughnuts, sandwiches, and popcorn to top off the feast. Most of the afternoon was spent either in hiking about the lake, playing ball, or looking for Zwettler. Arnold Voss and Carlton Laird claimed to be the only ones to hike all the way around the lake.

If the pictures which the graduating seniors have to have taken look anything like the one of Ted Hoffman which is on the civils' bulletin board, they would stand a better chance of landing a job if they didn't have them taken.

In Memoriam

This summer the class of '39 lost one of its finest members. Don Waters, junior mechanical, was drowned on the Fourth of July while swimming in the Brownstone Bowl near his home in Washburn, Wisconsin. Members of his class who knew him well have missed his smile and pleasant personality. Always ready to lend a helping hand, he was everybody's friend.

As a fine student, hard worker, and devoted friend, Don will always be proudly remembered as a member of the class of '39.

Practical Course in E. E.

Prof. L. C. Larson of the E. E. Department is again teaching a Friday evening vocational class in E. E. at Appleton. The class, started last year with an enrollment of over thirty, has been reduced to a select group of about twenty men, the majority of them holding responsible positions in the paper pulp mills in the vicinity of Appleton. Since they maintain and operate costly electrical machinery, they have a natural desire to learn some of the theory of design and operation of their machines.

Some subjects taught include DC circuits, single-phase and three-phase circuits, DC and AC machinery, etc. Lessons are supplemented by demonstrations in meter connections, oscillograph studies of circuits, and examinations of new equipment such as electric fences, new metering devices and the like. In addition to this, practical problems submitted by the industries in the vicinity are worked out in class. These problems involved inspection trips to such plants as the Interlake Pulp mill, Kimberly Clark mill, and the Wisconsin Power Company, meter division.

Polygon Smoker Big Succses

Approximately three hundred engineers came, saw, and enjoyed the first smoker sponsored by Polygon this year in Great Hall of the Memorial Union. The program was especially good with Professor Mathews of the Chemistry Department as the speaker of the evening. His subject, "The Detection of Deception," was particularly interesting to engineers. Entertainment of a lighter vein, but highly enjoyed by the slip-stick artists was offered by Sardoni, the magician. His rendition of the "Perils of Belinda" or "He Came Between Them" almost brought down the house. Needless to say, the beer and pretzels topped off the evening in fine style, although there was panic among the ranks for a few minutes when the portable bar couldn't be found, and it looked as if the beer would have to be drunk directly from the barrel. Soooooo . . . if too many of the engineers showed up for classes Friday entirely unprepared, we hope the instructors made allowances for them. As a matter of fact, there were a good many instructors there, themselves.

Tsk, Tsk . . .

Best - crack - of - the - month honors go to Windy Wilson, junior mechanical. It seems he lives down on Langdon where almost anything can happen, and usually does. In this case it involved a group of girls living next door to friend Windy's house who didn't know what shades were for. After coming to class for days with that "morning after" look, Wilson was finally compelled to call up the girls one night and tell them to "either pull down your shades or go to bed early. I want some sleep!"

Notes from the Hydraulics Laboratory

As carpenters civils would make good plumbers if the actions of Don Viereg, senior civil known as the "Tom Collins Fiend" and "Madison Terror," are any criterion. It took him a full ten minutes to bore a hole in a defenseless little two-inch piece of wood the other day. He, J. P. Michalos, and G. C. Krechik are working with Kenneth Tuhus on a thesis investigating hydraulic jump and tailwater conditions at the Big Eau-Pleine Dam near Knowlton, Wisconsin. Right now they are building the model which will be an exact replica built to 1/40th scale. Kenneth Tuhus is a civil and a graduate of Wisconsin in '33. He formerly worked for WPA in North Dakota, and is now doing graduate work in hydraulic engineering. Absolute necessity for the results of the tests is the reason they are at work so early in the year, but judging from the first class gold-bricking advice being handed out by Michalos they were getting nowhere fast.

Memoirs of last year's activities . . . Bill Littleton's thesis model is still up and in working order. That means a nice job for somebody when the work of tearing it down for the new thesis projects begins.

A. M. McLeod, appointed research fellow, is working with Professor Woodburn on Wier Discharge Measurements this year.

Run Storage Battery Test

Fred Neumann, senior electrical, and Rodger Schuette, e'39, are at the present time working on a storage battery test for the E. E. Department. The test is being run by automatically charging and discharging the batteries, but at an accelerated rate. Both Rodger and Fred are members of that famous crew that ran the washing machine test last year and found it impossible to get their sheets clean. This summer Rodger worked for the Standards Laboratory, Bureau of Engineering, doing general electrical survey and maintenance work.

Among the activities of the staff of the E. E. Department was Professor Johnson's attendance at the Power Conference and Meter School held at the Michigan College of Mines and Technology at Houghton, Michigan, on October 14 and 15. In addition, Professor Bennedict attended a conference on electronics at Ann Arbor, while Professor Price went on a fishing trip into Canada this summer.

Art Jark, e'38, is testing electric fences for farm use and electric fish fences for E. E. 180.

Freshmen Receive Awards

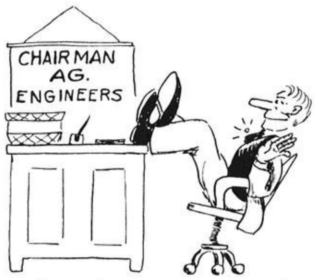
At the lecture for freshman engineers held at 11 o'clock on Friday morning, October 15, 1937, in the auditorium of the Chemistry building, the following awards were made:

Tau Beta Pi, the honorary engineering fraternity, presented its annual award of a slide rule to Stewart E. Miller, e'40, who made 100 out of a possible 102 grade points during his freshman year, leading his class in scholarship. The presentation was made by Kenneth M. Brown, ch'38, vice-president of Tau Beta Pi.

A Civil Engineering Handbook was presented to Evan H. Schuette, c'40, by Chi Epsilon, the honorary civil engineering fraternity. Evan made the highest record last year of all those taking the freshman civil engineering course. The presentation was made by Robert F. Zwettler, c'38, vice-president of Chi Epsilon.

Six others in the freshman class did work at high honor rate last year. They were John M. Erickson, 2.94; Robert J. McCarter, 2.91; Edwin R. Stellmacher, 2.90; Curtis C. Stueber, 2.89; Bertrand J. Mayland, 2.88; Charles J. Eck, 2.86. For the complete list see the bulletin board in the Engineering building.

Inconsequentia



Overheard en route to the Mechanical Engineering building: "Where am I going? Over to the Seed and Weeds campus. Have a tough afternoon ahead of me in Barn Cleaning 129."

Did you know that Wisconsin's first string right end is none other than our own John Loehrke, a junior mechanical. Our hat is off to any boy who can find time to play football and carry a full engineering course at the same time.

In reply to Chuck (Bow Tie) Schmidt, may we say that he isn't the only sensational "Twerpsichorean" that graduated from Case's this summer. Fred, Women-Hater, Cape is a pretty fair trucker in his own right. The demonstration he gave at local joint recently when asked to "shine" was enough to make the best trucker in the country green with envy.

Frosh Follow Fathers' Footsteps

If our statistics are correct, there are twenty-two sons of Wisconsin alumni enrolled as freshman engineers this year. They represent sons of graduates from classes as far back as 1904 and as recent as 1917. The illustrious twenty-two are John Anderson, B. J. Bennett, E. J. Brill, David Clark, Willard S. Comings, James Haessly, Charles H. Hall, Robert T. Herdegen, John R. Hulten, Richard James, Donald F. Johnston, Robert Langdon, Victor Pfanku, Ferrel Phelps, David J. Price, John Rosenberg, James Scheifer, Warren L. Sommer, David A. Voeck, John D. Wakefield, and Charles Yerkes.

"STATIC" *by* ENGIN EARS

We start off the page this month with a very unusual type of item, that known as a contribution:

"Pat Hyland told us the other day in lecture how they figure out the number of hours to allow us on our machine design plates. He says they do an hour's work on a drawing and figure we should do it in three. Then they allow us four more hours and hope to God we get it in!"

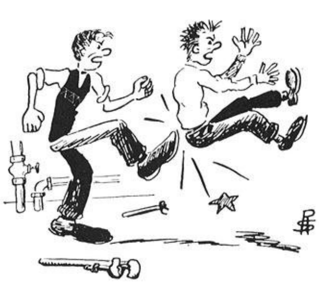
» » « «

"She'll hit on some of the cylinders all of the time, and she'll hit on all of the cylinders some of the time, but she won't hit on all of the cylinders all of the time."—with apologies to A. Lincoln.

» » « «

Although hydraulics has the reputation of being a fairly smooth pipe course, occasionally one runs into some pretty tricky problems, involving a lot of head-work.

» » « «



We heard that the boys got John Koehler very embarrassed the other day by asking him what he thought of Steam and Gas 3 in front of a girl who didn't like swearing.

» » « «

One day a chem engineer went to Niagara Falls for a visit, and his host took him out for a walk. Presently they came to the great falls, but the engineer said nothing. "Well," said the host, "Ain't that a wonderful sight?"

"Ain't what a wonderful sight?" asked the engineer.

"Why, all that water pouring over the great precipice."

"Well," said the engineer after a period of thought, "what's to hinder it?"

» » « «

And when we were in the library looking through exchanges we ran across the one about the unluckiest man being a seasick man with lockjaw, which didn't impress us much the first time, but when we'd found it in about half a dozen other magazines we decided it ought to be funny enough for you guys.

» » « «

Sign in a boiler room: "Have faith in the Lord but keep a full gage of water."—**California Engineer.**

» » « «

Prof. Watson: "You missed class yesterday, didn't you?"

Pitchard: "No, sir, not in the least."

» » « «

We suspect that a certain waitress in a little underground restaurant in Chicago will remember editor and Tau Bate president Ketchum for a long time to come. Finding the modulus of toughness of his chop to be very high, Ketchum, ordinarily so proper but now just fresh back from the wilds of Texas, reverted to the primitive, whipped out his trusty bowie knife (overall length three inches), and proceeded fiercely and determinedly to attack his meat with it. The waitress, happening along about then, burst out laughing so hard she collapsed on a neighboring table, and though she did shortly recover enough equilibrium to get back on her feet, she didn't recover her full faculties and marked most of the checks wrong the rest of the evening.

» » « «

Alan Ross orated the following in Steam and Gas lab one day:

"Ah Fui sat on Chu Chui track,
Ah Fui no see Chu Chui.
Chu Chui no see Ah Fui.
Ah Blui."

» » « «

We're sending the regents a request that they include in next year's budget an appropriation to buy a table of specific gravities for Mechanics instructor Tauxe, who said in class one day, "Is that specimen of cast iron floating around here?"

» » « «

Note to Prof. Wendt:

The ultimate bending moment of a log log vector slide rule has just been experimentally determined by Carl Walter as a research project and found to be the time it takes to make one-half revolution between belt and pulley of a 50-KVA alternator turning up 1,200 rpm. Walter now has a slide rule reading circular functions directly, but other computations must now be carried out by more roundabout methods.

» » « «

A couple of electricals, a senior and a freshman, were discussing tastes in beer—one kind was all right, something else wasn't so good, another kind was rotten, and so on. Finally the senior said:

"Well, I still like good old moo-juice better than anything else."

"Moo-juice? Never heard of it," said the freshman, puzzled.

"Never heard of moo-juice? MOO-JUICE" repeated the surprised senior.

"Nope. Is it a Milwaukee beer?"

"No, it comes from the country."

"Well, let's see . . . No, I never heard of it."

"Look here. Did you ever see an animal that says 'Moo-oo-oo'?"

"A . . . you mean a cow?" wondering what connection this had with beer.

"Sure, a cow. And what do you get from cows? Moo-juice!"

"Milk."

"Moo-juice!"

"O-o-o-oh, you mean milk! Well . . . "

(Bang!)

ORE FROM THE DRIFT

Our Mining Club

Slap-stick comedy began to flourish anew when Hipskind and Etzkin teamed up in the chemistry laboratory recently.

Just how it happened that Etzkin flooded the titration table and also the chair nearby with a solution of diphenylamine indicator in concentrated sulphuric acid he will not tell. It is only that he wiped off the table to remove the evidence of his mishap and scooted away.

A minute later, Hipskind, quite satisfied that he hit his iron titration right on the head, got up from his chair but left the seats of his pants and underpants on that same chair that had caught the flood of Etzkin's reagent. Though it is regular laboratory practice to wash any part of the body contacted with acid, Hipskind preferred to test the acid resistance of his posterior hide rather than to sit in a bucket of water.

•

An instructor's prank baffled one of the students of the Mining 121 class when he sought the professional advice of instructor Rosenthal in the matter of how he could best pick up a silver bead dropped on the floor. (A silver bead in fire assaying is a minute globule of silver.)

Mr. Rosenthal offered to let him use his "silver-magnet" if he "would be careful with it." After the student made assurance that the instrument would be handled with care, the instructor, surprised at the student's credulity, began searching the store-room for a likely looking object. Finding a highly polished bar, he handed it to the eager fellow, who scampered off to the spot where the bead lay.

With face to the floor, he tried everything but magic words in his effort to coax the bead to cling to the bar. Finally the trusting student returned the fake instrument and naively apologized, "I'm very sorry, Mr. Rosenthal, but I guess I've ruined it. I dropped it on the floor."

•

Horrors lurked along the pathway between the rocky cliffs stretching from the Eagle Picher Mine proper to the mill. The man whom John Kildsig succeeded as chemical-man last summer was found in a heap along this pathway. He was murdered . . . mysteriously murdered.

John had to make a nightly trip from the mine to the mill to inspect the tailings at the mill. A man was murdered between these hills, but John was not scared . . . no, not till one night when he came upon a man lying at the foot of a cliff moaning. Upon returning to the office, John reported the spectacle. He was gruffly told that he was crazy. As nights passed, rocks . . . large rocks were rolled at him from on top the cliffs, sinister figures lurking behind boulders made passes at him, and even snares were set for him; but Kildsig escaped them all.

"If only I had a good light," thought John. (John's light was glimmering on its "last candle.") He recalled that the electrician had a good light. But the electrician had loaned his light to the watchman. The watchman passed on the light to the pipe-fitter who had some little job to do in the "yard." But the pipe-fitter dropped a wrench on it and broke it. At last John caught on. A good light would have foiled the nightly drama along the pathway. Those men from Ruby, Arizona, are no amateur kidders, learned Mr. Kildsig.

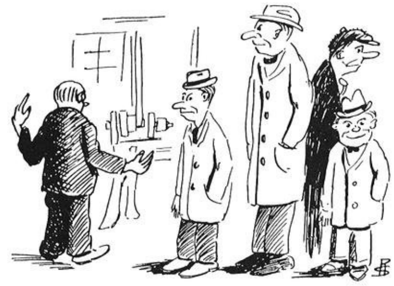
A record attendance of miners and metallurgists filled the library of the Mining and Metallurgy building at their first Mining Club meeting of the year, held on October 14.

After the dinner, very successfully prepared by chef John Yarne and his staff, President Howard Grange called the meeting to order. Professor Edwin R. Shorey introduced Mr. Philip C. Rosenthal, the new member of the Mining and Metallurgy teaching staff. He then welcomed the freshmen to the club. In his address to the members, Professor Shorey pointed out the importance of organization activity to success in professional practice. Professor Joseph F. Oesterle in his talk promised the new members the help and cooperation of the faculty in any of their problems. He strongly urged the new students to see them often.

Included in the business of the meeting was: the appointment of a committee to study plans for the organization of a local chapter of the national society of the A. I. M. E.: the election of George Billings to the office of "chief mucker."

The latter part of the meeting was carried on in informal fashion. All members who worked in mines or metallurgical plants during the summer were called upon to make three-minute talks on their experiences. Howard Grange wound up the talks with a convincing discourse on the necessity of being a "regular" fellow in order to get anywhere in the metals professions. He used as illustrations for his argument his interviews and experiences at the General Motors Research Laboratories, where he worked last summer.

After the meeting adjourned, the members pitched in with the dishes.

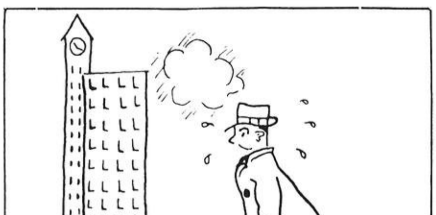


IN OLD CHICAGO

By Our Industrial Spies

FALL brings us football, falling leaves, mid-semesters, and senior inspection trips, all as a matter of course. To lower classmen the last has a romantic ring, but to seniors inspection trips are but one of three things: (1) A chance to make whoopee amid the bright lights; (2) A technical orgy; or (3) A pain in the neck.

But this is neither the time nor place for a handbook on inspecting; we can but relate the milder events of the last expeditionary force to Chicago. The metallurgists are still a little dazed by it all. Ten strong, and under the wing of Professor R. S. McCaffery, they descended on the Wisconsin, Inland, and Carnegie-Illinois Steel Companies October 6, and spent two quiet days "casing the jernts." As they tell it, they were really out to learn, scampered about with proper curiosity, asked intelligent questions, and lived the righteous life. Knowing metallurgists, we are skeptical . . . having heard rumors of how Nick Friese in shirt-sleeves (higher thermal efficiency) floored 'em as he led the "polka" at the University of Chicago's International House. "Fred the Buzzard" Bemis, practicing his engineering econ, decided fruit is to be eaten rather than to adorn tables, so cleaned out the fruit baskets of Carnegie-Illinois' exclusive dining room; he is also suspected of having spent his evenings robbing fruit stands in company with that ex-model youth, William Wright. Incidentally, the above dining room is barred to all employees under the rank of superintendent; ever gentlemen, our heroes washed the grime from their hands before sitting down . . . but no one had said anything about washing faces, too! Joe Beck is still wondering which sparks from the spark testing grinder were which. "Sleepy" Place also has that brooding look on his pan, this due to the "robbing" he took for his couple of beers at the Blackhawk. "Anyway, I had a good time," sez he. What the rest did at night they won't say. Tony Ozanick and pipe camped together in grimy, villainous South Chicago, his old stamping grounds, but whether it was because he just likes mill scenery, because no one would endure the flue gases produced by that notorious tobacco incinerator, or because he had found a rose among the thorns, none can say.



October 18th through 21st found a new regiment of plumbers, the electricals and mechanicals encamped in the Windy City. Their annual inspection trip to the Rialto proved a flop, but still the evenings could not be called dull. We don't believe that Pritchard and Albrecht ever did find out how soft the hotel beds were. There must have been **something** about Gordy Fuller that prompted the house detective to stay on his tail all one evening. Nor was "Oh Gordie" Michelson the only one to look on the wine when it was red. Even Professor "Pat" Hyland, it is rumored, spent the first evening bending elbows with his former students.

The souvenir business was not so brisk this year, the boys being older and wiser due to last spring's experiences. An alternator or an I-beam bulge too much under the coat. The electricals, however, had planned to bring back a baby gas job, each man having a piece assigned; this plan fell through as Baird declined to turn in the cylinder block.

A couple of days of stiff hiking, the clamor of shops and the smoke of mills used up most of this excess energy. The electricals still had the old zip, it seems, for scouts were sent out at regular intervals to gather up their Professors Bennett and Watson who had a knack for getting lost back along the production line. Dave Bogue, mechanical, likewise never caught on to the idea that most companies frown on candid camera fiends. Wayne Mitchell wanted to sleep so much that he climbed into the baggage rack of the bus and dozed on the journeys to and from the plants. Bob Sharp neatly cut the afternoon tour of the steel mill to go shopping in Marshall Field and Company, but there was a heart interest in that, too. The mechanicals, who did some fast construction estimating of the girls in the Elgin Watch Works report regretfully that the latter are still true to Robert Taylor, whose phizzz is to be seen tacked up all over the shop. Phooey . . . and he only a distant L. & S. graduate. In the human interest line, the driver of bus A, fraternally known as "Jake," became the bouncing father of a proud boy just before the start home, which left him too excited to continue the trip. Whereupon the mechanicals good-heartedly took up a collection to buy the baby a present and bade him godspeed, then returned to Madison, to home, to books, and to piles of unfinished and overdue reports.

Suggestions On How To Study

by **LESLIE F. VAN HAGAN, c'04, C.E.'19**

Professor of Railway Engineering

THE ABILITY to study effectively is an art that has to be acquired by intelligent effort; it is not a gift of nature. It has its technique that must be learned and put into practice, just as have singing, painting, and prize-fighting. No one, however naturally gifted as a fighter, would care to risk his ears in the ring with a trained boxer, even though the boxer might rate very low in his profession. The dub cannot compete with the professional in any line of endeavor.

The man in college is assumed to be a professional in the field of studying. He is, supposedly, well acquainted with the technique of studying. Probably most college men and women meet a reasonable standard of excellence in this respect. However, any teacher of experience realizes that many of those who enter college apparently have little or no knowledge of the fundamentals of the art. They seem to have wangled their way by brute strength and awkwardness to the portals of the university. They are dubs thrown into the arena where the ability to study effectively is essential to their further successful progress. Without this ability, they inevitably succumb. Their failure is caused, in many cases, not by lack of intellectual capacity, but by lack of training in the technique of studying.

The work of the university is based upon the assumption that the student wants to learn and knows how to study. The college instructor does not want to be a drill-master; he hopes to be a guide and leader. Like the scout who leads the train of covered wagons across the plains and over the mountains to the promised land, he desires to lead his class across the plains and through the dangers of the subject he knows so thoroughly himself. He does not want to sit on the driver's seat of the covered wagon and hammer a team of uninspired mules over a trail in which they have no personal interest.

Unfortunately, the college instructor is forced to do a good deal of hammering. The conditions demand it. Students do not just go to college; they go to college to get a degree. There is an implied contract to the effect that the student who gets by in a sufficient number of courses will be graduated and given a diploma certifying that he is "educated." The instructor who fails any large portion of his classes finds himself in trouble. He has his choice of passing the students, regardless of how well they know the subject, or hammering something into them by such methods as his ingenuity can devise. In a professional school, such as this college of engineering, the practice of passing men who do not know their subject is highly repugnant to instructors.

Many years ago, the writer prepared a list of suggestions on how to study for the use of his sophomore students. The effort was made to make the suggestions brief, pragmatic, and fundamental. Details were avoided for the reason that individuals will differ in regard to the details. The suggestions are presented herewith for the purpose of giving them a somewhat wider circulation and making them available to the freshmen, who, perhaps, need them most.

The question may be raised: Have the suggestions been effective in the classes in which they have been used? The answer is: Only to a limited extent. The remaining problem is: How can the students be made to study the list of suggestions? Like the well-known horse in the old adage, the student can be led to the pool of knowledge, but he can't be made to think. There must be a desire for learning before the learning process can go into effect.

Suggestions on How to Study

1. Study is the act of making an earnest mental examination of a subject for the purpose of understanding it.

2. Successful study depends upon (1) a desire to understand, (2) good mental condition, and (3) good study habits.

3. The desire to understand must be genuine and strong enough to carry the student through difficulty and discouragement. The desire rests upon a variety of reasons. It is natural in some people, who find pleasure in study. The engineer has a professional motive, since his professional success depends upon a thorough understanding of the fundamentals of engineering. The student should keep constantly in mind the close connection between the work at hand and his professional competency.

4. Good mental condition depends upon general good health and freedom from worry. Good health, in turn, depends upon getting the right kind and amount of food, exercise, recreation, and rest. The individual must discover what is best in his own case, because individual requirements differ. The conditions causing worry are often beyond control of the student, but it is possible to acquire the power of maintaining mental poise in the midst of disturbing conditions.

5. Good students have study habits that are much alike. The main points in their study technique are outlined in the following paragraphs.

6. They have a quiet place for study where they can concentrate.

7. They study systematically. They schedule operations for the week and the semester, just as they will have to do later in their engineering practice. They have fixed hours for study and a place in the schedule for each subject. They stick to the schedule. They use odd moments instead of wasting them. They know about what they can do in a given time.

8. They are thorough. Students who fail in this re-

spect include (1) persons of quick intellect, who are often inclined to be superficial, (2) those who find it easier to memorize than to understand, (3) the immature, who are still childish and light-minded, and (4) the lazy.

9. They are able to analyze a subject; take it apart until they have reduced it to elements that they can understand. The ability to analyze a new problem is one of the outstanding characteristics of a successful person in any field.

10. They maintain a critical rather than a credulous attitude in regard to what they hear and read. They investigate and ask questions until they are convinced one way or the other. Understanding and conviction go hand in hand.

11. They do not leave a point until they understand it. If the text book is not clear upon a certain point, they consult some other text upon the same subject. If the point remains troublesome, they consult the instructor, either in class discussion or in his office.

12. They have good vocabularies. In scientific and professional literature, words are used more exactly than in common discourse, and a clear understanding of a text depends upon a knowledge of the exact meanings of words used in the text. Many students owe their scholastic difficulties largely to lack of vocabulary.

13. They take notes. This practice will help a student in almost any course. The notes should be neat and intelligible.

14. They try to understand the purpose and organization of the course as a whole. A study of the Table of Contents and the Introduction of the text book helps toward such an understanding.

15. After studying an assignment, they rehearse it. An effective way is to close the book and outline **on paper** what has just been studied. Compare with the book, note omissions, and try again.

16. They solve assigned problems, not in the mental attitude of a clerk, but with the idea that the problem is intended either to furnish drill and so impress the memory or increase skill, or else to illustrate some fundamental principle and show its application. They invent new problems and solve them until they have gained understanding.

. . . LIBRARY NOTES . . .

Using the Library

What use can a lower class man make of the library? Seniors and juniors are assigned technical subjects and can find plenty of uses for the library but during the first two years only fundamental courses like drawing, physics, mathematics and chemistry are given and the textbook is all the reference needed.

How about getting some professional atmosphere by reading current engineering magazines? Form the habit of keeping up to date in your profession by regular reading of professional publications. And how about those English themes? The scientific method is to get the facts, then draw your conclusions. The library is a store house of information and a good place to garner a few facts when you want something to write about. Then there are the biographies of Watt and Bessemer, Steinmetz and Edison and Westinghouse, and scores of others; the story of whose lives is the story of engineering development. These and the stories of great engineering works make excellent leisure time reading.

Believe It or Not

The first sentence in the second chapter of Smithells book, Gases and Metals, reads, "Under suitable conditions, certain gases are able to pass through solid metals." Sounds interesting, doesn't it? So is the remainder of this little book on the behavior of gases and metals in contact with one another.

Looking Ahead

Sooner or later, every engineer looks for a job. The forward looking student will be thinking about what kind of a job it is to be and what preparation he will need to make to fit himself for it. As a senior, he will have to sell his services to some employer. Two articles in the November issue of Civil Engineering have some pertinent suggestions.

In "The Engineer Looks Ahead," on page 781, E. R. Needles gives some valuable suggestions on preparing for the job; and on page 808 William L. Fletcher gives a personnel counselor's suggestions on methods in technique of locating good jobs. The title of his article is, "Are You Looking for Work?"

STRIP MILL

Making Steel Up To 94 Inches Wide

by HUGH R. RATHER, m'38

IN RECENT years there has been an ever increasing demand for sheet steel in the wider widths. To meet this demand, the Republic Steel Corporation has recently completed a plant that is capable of turning out sheet steel up to 94 inch widths at the rate of 70,000 tons per month. The building of a steel mill is analogous to the breeding of elephants, it just doesn't happen very often, and its construction presents many, varied and unique engineering problems. To an embryonic engineer, such as your writer, who worked on the construction in a small way, the witnessing of some phases of its building was an engineering education in itself.

The construction of the strip mill was started in February of this year and the hot mill and continuous pickling departments have just been completed. The cold mill and annealing sections of the plant are to be finished some time in the near future. This may or may not be record time for the erecting of a steel mill of comparative size, but nevertheless it can be considered as exceptional.

The plant is located just south of Cleveland, Ohio, in the Cuyahoga valley otherwise known as the "Flats." Here in this valley are located other steel mills, most of which use the Cuyahoga River, which flows through the valley and empties into Lake Erie, as a source of cooling water and a means of receiving raw materials via lake freighters. This mill will be run in conjunction with the present Corrigan-McKinney steel mill, a subsidiary of the Republic Steel Corporation. It is located on a plot of ground comprising some 120 acres of which 21 are under cover. Some of the land upon which the plant is built was reclaimed by diverting the flow of the Cuyahoga River and offered none too stable a foundation. A solid foundation was obtained by sinking 19,000 piles into this sticky mass to an average depth of 40 feet. The longest section of the plant, the hot mill, is 1,796 feet in length. Some 120,000 cubic yards of concrete was poured in its building, and considering all the various and sundry pieces of pipe used, if laid end to end would reach a total distance of approximately 250 miles.

One might go on and enumerate the staggering quantities of material used in the mill's construction, but this would have no meaning as to its operation. It is not within the scope of this article to present the more technical points of interest in this plant as this would entail a lengthy and detailed discussion. However, a description of the process of manufacturing the product produced will be endeavored.

Primarily, the story of the strip mill is this: steel slabs come over from the Corrigan-McKinney plant, a short distance north in the valley. These slabs are rolled out in the new strip mill, and leave in the form of coils, sheets, or thicker sheets which are called plates.

The slabs of steel which are fed into this plant are custom made to suit the requirements of the customer. They are not only of the right size, but are of the proper composition for the job. Such sheet steel is now being used for automobile bodies and will prove a blessing to the automotive engineers who have long desired sheets wide enough so that the "Turret" type automobile top can be made from one piece. Refrigerator panels, cooking utensils, etc., will also provide an outlet for the product. It is expected that if the pre-fabricated house becomes a reality, this industry will be a user of the product. Of course, these various customers must have certain characteristics in the finished product so the slabs fed into the mill are controlled as to carbon, silicon, manganese, etc., content.

On arriving at the new mill, the slabs are stored under cover in what is known as a slab yard. When ready to be used, a particular slab is picked up by an overhead crane which then places the slab into one of the three gas-fired furnaces, each of which has a heating capacity of 50 tons per hour. Instrument panels notify the attendants of the various conditions within the furnace and the temperature of the slabs is controlled with precision. When the slab has reached a temperature of 2,250 degrees Fahrenheit, it then starts on its journey.

The hot slab after finishing the heating process is started down the hot mill on a table fitted with motor driven rolls. The first process of reducing the slab in size is by a huge set of "maulers," otherwise known as scale breakers. In the process of heating, a thin scale of oxide forms on the surface of the slab and this must be removed. Two big rollers break the scale and a spray of water at extremely high pressure forces the scale off. Next the hot steel goes through the broadside mill and squeezer, where it is squeezed to the proper width called for in the specifications.

Next come the roughing stands, three of them, containing mammoth rolls, each spaced a little farther apart than the last, because the steel is increasing in length all the time. High up on the wall facing these stands are control houses from which men watch the machines, regulate the speed, and control the operation.

From the roughing stands the ever lengthening strip passes into a battery of six finishing stands. Each succeeding roll must go faster than the preceding one in order to take up the increasing length of the steel—for quite often the same piece will be going through all six of the stands at the same time. This battery of six stands is intricately coordinated to take care of this, for unless this coordination is perfect, the sheet of steel will buckle or be torn apart.

After the steel comes from the finishing stands, the ragged edge of the front end is sliced off by flying shears. It then proceeds along the run out table, where each roller is driven by an individual electric motor. Steel which is to be coiled passes through the coiler, a huge machine which is extremely delicate.

The operation on the slabs in the hot mill is an entirely continuous process, no reversing occurring at any point along the line. The production rate of this line is quite rapid; some 2,200 feet per hour being produced in the sheet form. As one would expect, a good deal of power is required to drive the various machines along the line, and five motor-generator sets are provided in the hot mill motor room to produce the current required. Some of the motors turning the various stands range as high as 4,500 horsepower.

Some of the steel is now ready for use. Some of it must be given tempering treatment, in which case it goes to the annealing department. Also some of it must be given a pickling treatment so as to produce a smooth surface. If it requires special temper the steel goes to the cold mill for further processing. All the steel that goes to the cold mill goes in the form of coils.

The pickling treatment is carried on in a continuous process in a section of the plant designated as the continuous pickling department. The steel reaches this department in the coiled form and is then uncoiled by a special machine designed for this purpose. It is then fed by a machine into a series of tanks containing sulphuric acid, each tank end being adjacent to the preceding one. The strips are stitched together before passing into these tanks and then it passes into the tanks and travels to the far end of the section where it is first run through a cold rinse and then a hot rinse of water. Finally the strip passes into the looping pit where it is rewound into coils; the stitched sections are then cut out. This department can be classified as semi-automatic in operation as attendants are only required to see that the coils are properly placed on at the start and taken off at the end of the treatment.

The cleaned coils end up in the cold mill, where there are three stands of four rollers each. The steel is thinned down to the desired gauge, rewound again, and then taken to the annealing department, which comprises five batteries of four furnaces each. Here the coils are given heat treatment to get rid of unwanted hardness and brittleness. Then the coils are returned to the cold mill finishing department for surface treatment.

Nowhere else in the world are they able to roll a sheet 94 inches wide on a continuous hot mill. The actual width of the rolls are 98 inches and is designated as a 98 inch mill.

Dry Ice From Power Plant Flue Gas

(continued from page 23)

reaction zone. This cyclic process repeats itself. Figures 1 and 2 indicate best operation to be at 130° F. in the absorbing tower. The boiling off of CO_2 from the lye is conducted by the usual methods.

As the cooled carbon dioxide from the condenser, freed from all but slight traces of ammonia, is compressed in the compressor system, the residue of its moisture content is trapped out between the compressor stages and in this condensate, the ammonia is dissolved. Thus, the product is free from ammonia.

There is a slight ammonia loss from the system with the waste gas. However, this loss (about two pounds per ton of carbon dioxide output) is so small that it would be uneconomical to attempt is recovery.

Obviously, this mechanism of reaction, in the gaseous

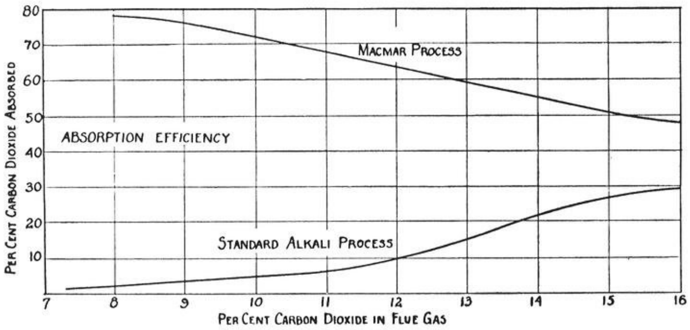


Figure 3

phase avoids the slow transfer of carbon dioxide through a gaseous film and a liquid film encountered in the alkali absorption method, and the increased reaction velocity with gaseous ammonia indicates that no such decelerating effect is experienced.

From low concentrations up to about 15% CO_2 in the flue gas, the use of ammonia as a supplementary absorbent is highly valuable. Since this is the range into which most flue gases from power plants fall, the process may be seriously considered as making dry ice producers out of power plant operators. Figure 3 brings out this fact very vividly.

The economical recovery of carbon dioxide from power plant stack gases in locations where populations are fairly large is simplified at once by the Macmar ammonia alkali absorption process. Production costs are lower for this method than for independent carbon dioxide recovery plants; transportation and evaporation problems are largely eliminated.

GLASS MEASUREMENTS

A new instrument, the profilometer, by which it is possible to measure instantly variations of a millionth of an inch in the surface of a sheet of glass while in the process of manufacture, has been developed by the Ford Motor Company.

The device consists of a metal box, which is attached to an amplifying cabinet. On top of the box is a dial; in the bottom, a diamond tipped needle. As the box is pushed across the surface to be measured, the needle follows the contours. Variations in the surface cause variations in the electric current. These are amplified in the cabinet and returned to the dial. By watching the flickering of the needle closely, the operator can tell immediately the location and depth of any roughness. The profilometer is made use of during the grinding and polishing operations. Any unusual roughness in the surface indicates the possibility of an inaccurate mix, or of an improper grade of sand in the grinders. By means of the instrument, unusual roughnesses can be detected and remedies applied long before maximum tolerances are reached.—**The Glass Industry.**

Tau Beta Pi

National
All-Engineering Honorary
Fraternity

Thursday evening, November 4, Tau Beta Pi initiated twenty-six new members. Professor M. O. Withey was toastmaster, Paul Ketchum welcomed the new men, and Daniel Dobrogowski responded for the initiates. The speaker of the evening was Justice J. D. Wickhem of the Wisconsin Supreme Court.

The initiates are:

Seniors

Frederick C. Alexander	Wayne T. Mitchell
Kenneth M. Beals	Alan K. Ross
Daniel T. Dobrogowski	Robert A. Sharp
Alvin Edelstein	Lewis L. Sheerar
Howard W. Fiedelman	Raymond P. Spors
Howard L. Grange	Roger U. Stanley
Willard G. Hanson	Carl P. Walter
Ted B. Haufe	Philip Winter
Arthur H. Krumhaus	John L. Yarne
Thomas G. Laughnan	Lyle F. Yerges
Harold Leviton	Joseph Zamsky
Aldro Lingard	Lee M. Zawasky

Juniors

Leo J. Fuchs	John J. Huppler

EDITORIALS

"There is no use arguing with a small mind that is made up on a big subject."

—ANONYOMOUS.

TO OUR YOUNGER BROTHERS

For several weeks we've sat in our lair, watching with mixed emotions the annual renewal of college life, watching you newcomers troop in and out of Engineering. We've rubbed elbows with you in the halls and listened to your chatter; we've come to the conclusion that you are a pretty good gang. For all your cocksureness, your noisiness, and your boners, you're a more impressive lot than we were three years ago.

Most of you are fresh from high school. Last year you were big shots. That was last year. Now you are very small frogs in a very large pond. Though the caste system for freshmen went out with the oil lamp, there is an awful lot to getting acclimated. You may discover that an engineer is considered the lowest form of animal life on the campus. As a group we have little time to dabble with campus politics. For the same reason we produce few stellar athletes. A great many of us are working our way through school, nor are we on the whole much in the social whirl. It won't take a semester for your instructors to demonstrate to you that you are here to work. And work you will for four straight years.

Then they turn you loose with a diploma. You are ready to enter your profession, but the world doesn't even acknowledge that profession. It uses your highways, your power systems, your alloys, but socially it still ranks you one step above the bricklayer . . . and pays you one-half as well. Someday, we will remedy all that. Men are at work today, organizing on the lines of the bar and medical associations, setting up standards, examination and licensing boards. There is talk of a six year engineering course. Ours is an ancient profession, but just now coming aware of itself.

You have a long row to hoe. But if you learn one thing —to think, to analyze, to reason in an orderly fashion— and if you maintain your sense of humor, and your pride in your profession, we think you'll like it here. We do.

LEARNING VS. BEING TAUGHT

This is written for the men in the college: the freshmen. It is inspired by experience in trying to train students to take level notes. It might seem that, given so simple a task as learning the form of notes, a large percentage of a class would learn to do the work through its own efforts. However, out of a class of sixteen men, one did a perfect job on a test, six more did a passable job, and nine did unsatisfactory work. It was necesasry to **drill** the nine men until they could do a passable job in this elementary but essential operation. Seven of the men **learned**; nine of them had to be **taught**.

Learning implies an inner impulse; an earnest desire to understand and to fix in the memory. It is a noble process, worthy of highest type of intellect. Being taught is a much less noble process. It is possible by using intelligent methods and strict discipline to teach very low grades of intellect. Even the primitive pseudopod has been taught to keep its feet out of the ray of light that distresses it.

The work of a professional school cannot be adjusted to the level of the pseudopod; it is based upon the assumption that the men who present themselves as freshmen for the training that will qualify them to practice a profession will have the inner impulse necessary for **learning.** Only those who have that inner impulse can hope for much success in the college. Each of the 523 freshman engineers should understand the situation perfectly at the beginning of his college career. It will make his four years in college much more productive and pleasant.

In another column of this issue, we offer some suggestions for studying that we believe to be entirely practicable of application. The intent has been to strip away all nonessential suggestions and to present only those that can be defended against challenge. Help yourself. —L.F.V.

OUR PROPOSITION

This is, as the title proclaims, the editorial page. That statement alone produces a definite reaction in the average reader's mind. Four chances out of five it is one of disinterest or distaste. If so, the blame lies with us— for the editorial page should be the one argumentive, live, definite, issue-raising voice between our covers. When it is not (how often that occurs), someone is asleep at the switch; the publication becomes a text-book, not an organ of student thought.

So saying, we herein repledge ourselves to keep the the breath of life in our editorial body, to say what we think diplomatically, bluntly, or with sarcasm, as the situation warrants. We know from vast experience that any outburst of untoward enthusiasm will be machined down to proper moderacy by faculty censorship. Undaunted we invite our readers' say-so. **The Wisconsin Engineer** is published for and, presumably, by the undergraduate engineering body. It should record their will, their gripes, their interests. Not that it always does; that is in part their fault. Frankly, most students must be hit over the head with a club to make 'em show that interest.

Write in, complain, insult us if you will. Even that is an encouraging sign. We won't guarantee to print your opinions, but we'll fight with you about 'em. As a more comprehensive student mouthpiece your magazine will mean more both to you and to us . . . and there should be little need of artificial respiration for this page.

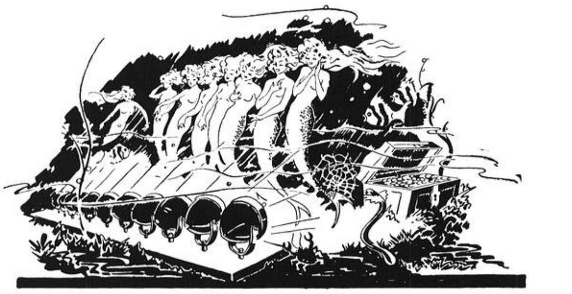
G-E Campus News

A 40-MILE-AN-HOUR MINE HOIST

The problem of hauling a 25-ton load up a steep mine shaft at a speed of 3,600 feet per minute, or approximately 41 miles an hour, was recently undertaken by the General Electric Company for a Southeastern coal company. Upon completion, this mine hoist will be the largest and fastest in this country.

More than 6000 feet of wire rope wound around an 18-foot drum will hoist an unbalanced load of 50,800 pounds to the surface. The driving power for this tremendous weight will be a 2500-hp G-E hoist motor with dynamic braking as a safety factor to reduce the speed when men are being carried.

For the last 40 years the General Electric Company has been engaged in the manufacture of electric mining equipment. Much of the new design and development in this field has been contributed by college-trained men who were on Test.



FLOODLIGHTING DAVY JONES' LOCKER

When Capt. John D. Craig, deep-sea diver and photographer, descends to the black depths of the Irish Channel to photograph the salvage operations of the Lusitania, Davy Jones' Locker will be floodlighted for the first time in history.

The hulk of the ill-fated Lusitania lies buried in shifting sand at a depth of approximately 300 feet, with a treasure in her coffers valued at between \$4,000,000 and \$15,000,000. To illuminate the wreck for filming, the General Electric Laboratories in Nela Park, Cleveland, Ohio developed a 5000-watt lamp, built to withstand a pressure of 500 pounds to the square inch—more than three times the pressure believed to be around the vessel. Capt. Craig will use a battery of 12 of these lamps mounted on a submarine stage to floodlight the inky depths.

So widespread are the uses of electricity that the development of an underwater lamp merely illustrates the problems encountered by G-E engineers. Many of these men were on the college campus but a few years ago.

MODERN LILLIPUT

Wire, three thousandths of an inch in diameter, flattened between two polished rollers to a thickness of nine ten-thousandths of an inch; pivots ground to a point and then rounded to a radius half the diameter of a human hair, yet still sharper than the sharpest needle; sapphires not as large as the head of a pin. Such Lilliputian parts are to be found in the West Lynn plant of the General Electric Company.

A pivot with a point two thousandths of an inch in diameter, yet it supports a pressure of many thousands of pounds to the square inch. Hundreds of such parts are assembled to produce instruments—instruments that measure small flows of current, great flows of current, light, sound, vibration, strain, and time. These instruments are so sensitive that they measure the smallest quantities, yet sturdy enough to withstand the severe vibrations of a locomotive cab or an airplane dashboard.

The design and manufacture of precision instruments is but one of the many fields which are open to technically trained men in the General Electric Company.

GENERAL ELECTRIC

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