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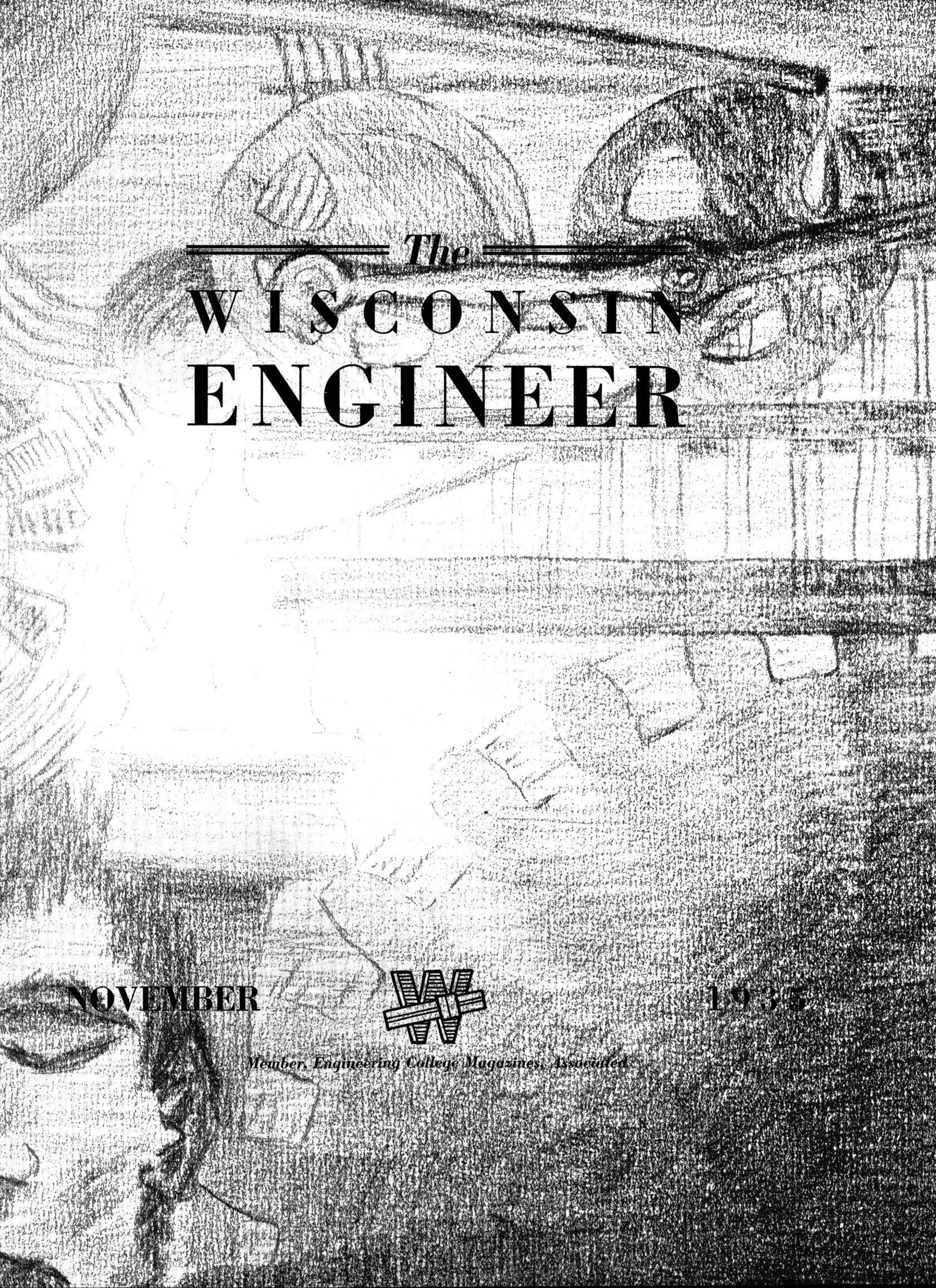
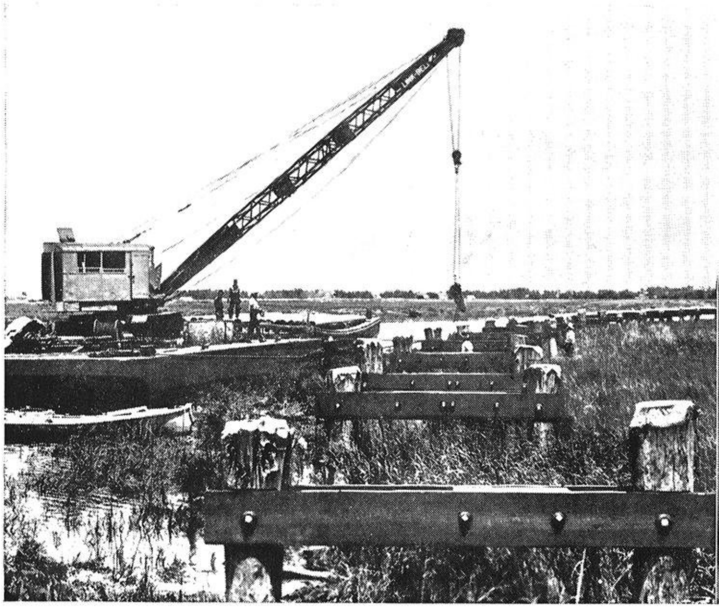


The WISCONSIN ENGINEER

NOVEMBER 1935

Member, Engineering College Magazines, Associated



Two 10-in., one 14-in., and one 6-in. lines were laid on this trestle. Insert shows close-up of Multi-Flame Lindeweld Head in action.

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With the Contributors . . .

△ Lawrence N. Collins writes on the operation of a blast furnace to tell us about the many interesting details of its construction and operation.

△ Have you ever seen an electrical engineer take his radio to the repair shop? Here's one E.E. that doesn't, and he's gone further to tell us how a public address system works.

△ A time keeper's job on a construction crew has always been considered a snap, but read here a story about how a time keeper should keep time.

△ And how do you like our new cover designs? They're constructed by an engineer, and there will be a new one every month.

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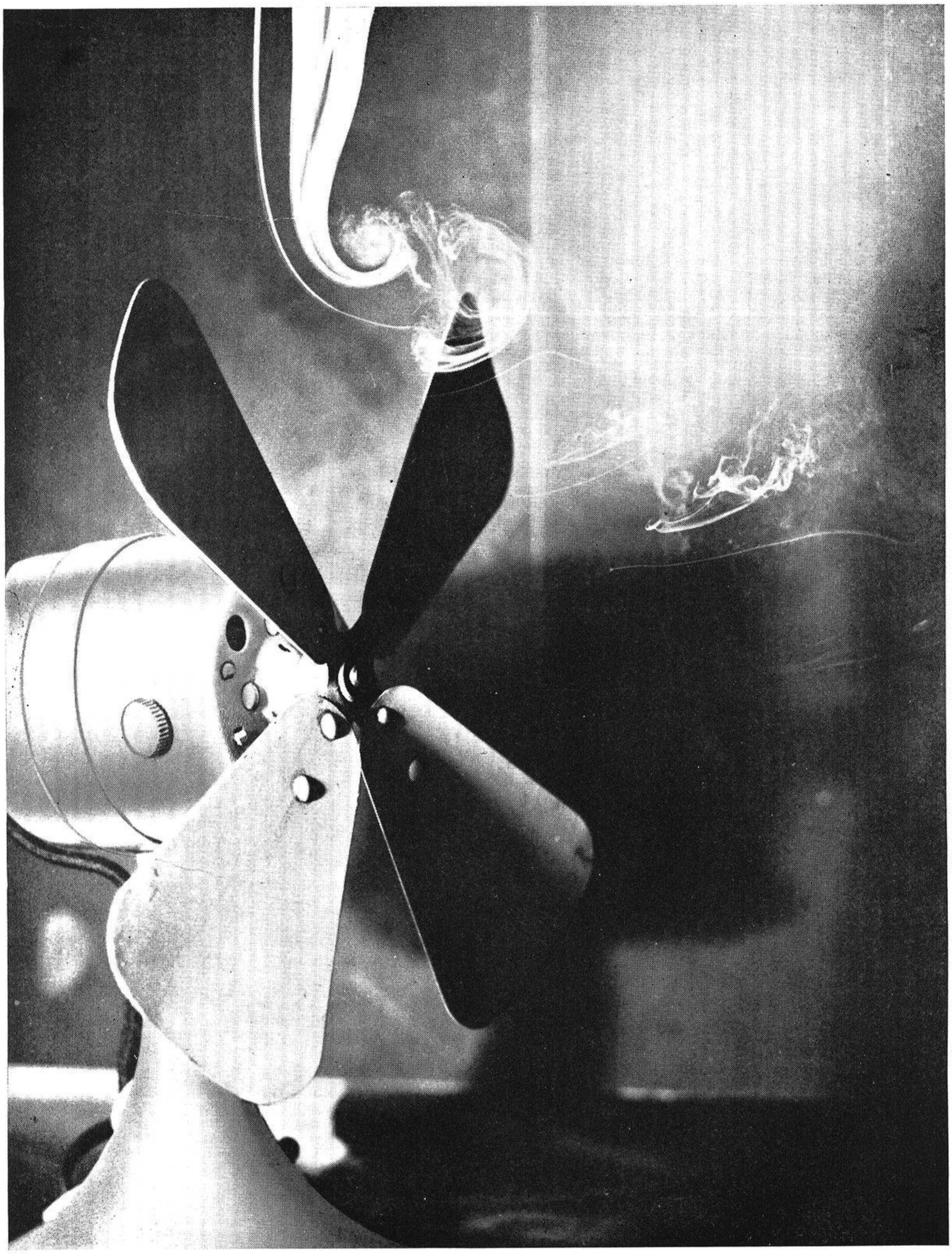


THE INSTANT MADE ETERNITY

Courtesy — Mechanical Engineering

The **WISCONSIN ENGINEER**

VOLUME 40, NUMBER 2 NOVEMBER, 1935

The Blast Furnace and Its Operation

LAWRENCE N. COLLINS, m'34

TO THE layman and even the graduate engineer, the manufacture of pig iron is a process that is recognized, but very hazily understood. It is probably known that iron ore is mixed with coke and limestone and heated to high temperatures and the melted iron from the ore is drawn off to form pig iron and residue is left in the form of slag. But to know the real inside story of pig iron manufacture is a revelation, and, with this story in mind, a much clearer picture of the Steel Industry as a whole will have been gained.

Without the blast furnace, the manufacture of steel on a large tonnage basis would be cut down to a minimum and the famous Bessemer process of steel manufacture would be an impossibiilty. The Open Hearth process would be required to rely on scrap iron entirely for its steel making and the analysis of its product would be wholly guesswork; a factor that has been outlawed from steel making today. With these thoughts in mind, we look to the actual pig iron manufacture or blast furnace operation.

The blast furnace proper is a tall circular structure from 90′ to 120′ in height, built of fire brick and externally reinforced by a close fitting steel shell and encasing internally a circular space of varying diameters. The furnace is divided into four main parts. The bottom section is known as the hearth, is cylindrical in form and extends to a depth of 10′ or 12′ in the large present day furnace. The middle section is called the bosh and extends 12′ or 13′ above the top of the hearth section. Extending up from the top of the bosh to a height of about 70′ is the stack. Topping the stack is the furnace top. An inspection of the furnace cross section on the following page will show clearly these four main divisions of the furnace. The hearth is that portion of the furnace which serves as a receptacle for the molten iron and slag. It is about 20′ in diameter in the modern furnaces—an evolution from the small 8′ hearths of the early furnaces—and has a bottom thickness of about 12′. It is interesting to note that this large volume of brick is entirely replaced in time by iron. This iron mass is known is a 'salamander.'

The bosh is made up of brickwork about 30″ in thickness held in place by heavy steel bands. Inserted in the walls of the bosh are "bosh plates" or cooling plates. These plates are of different shapes in different furnaces but they all serve to cool the internal brick layer. The plates are hollow and have inserted in them, at opposite corners, two pipes through which water flows continuously. These plates are necessary because the bosh is that portion of the furnace directly above the fusion zone, hence the bricks receive the highest heat of the furnace.

The stack is the part of the furnace where the iron ore goes through the initial reduction stage before being completely reduced at the bosh zone.

The furnace top comprises the top mechanical features of the charging hoist and the "bell" equipment for transferring the charge to the inside of the furnace.

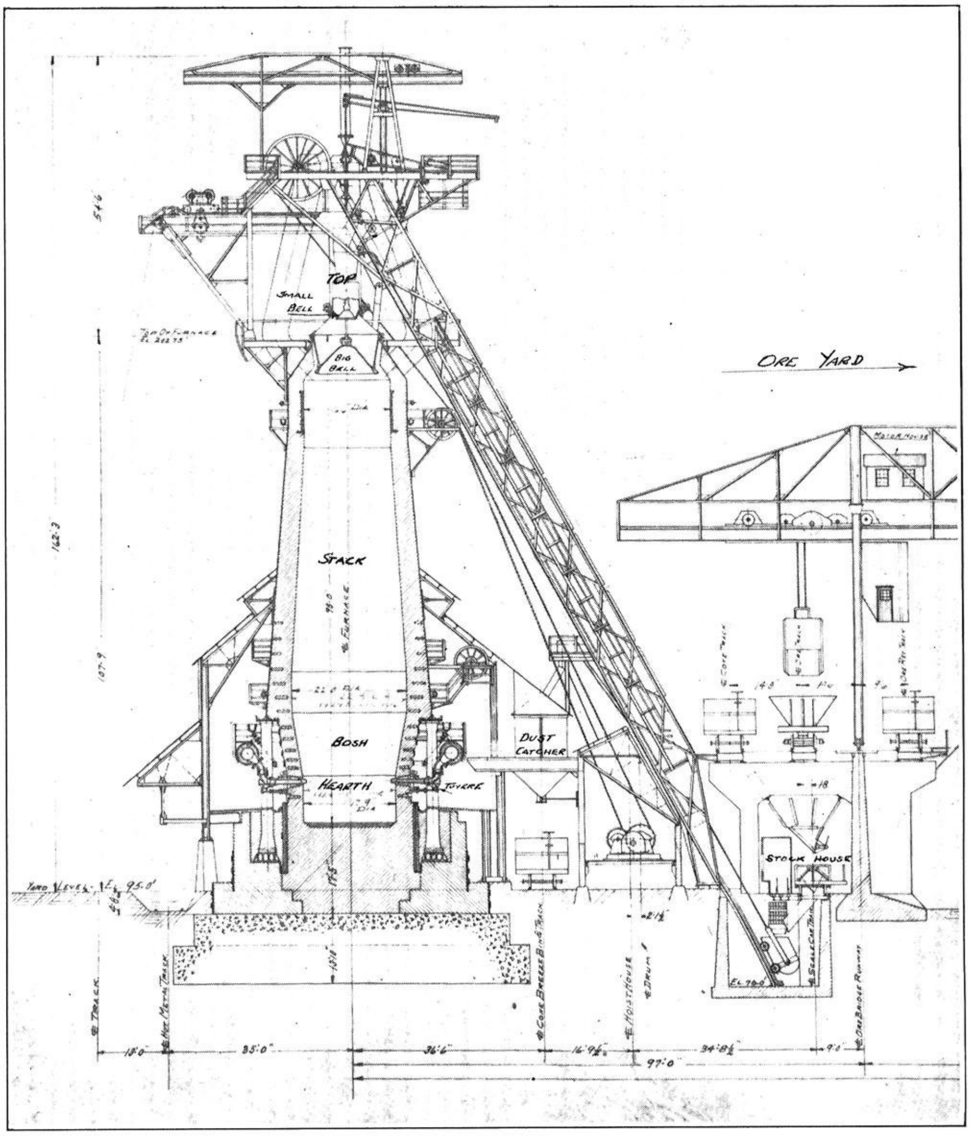
A very important feature of the furnace construction is the brickwork. The brick used is the fire clay type and, because of the conditions under which it is used, must be of the highest quality. There are three types—hearth and bosh brick, inwall, and top brick. The hearth and bosh brick must be able to withstand high temperatures and the action of flux and slag. The inwall brick must stand abrasion, at moderately high temperatures and the top brick is qualified to withstand impact and abrasive forces of the charges as they are dropped into the furnace.

The tapping hole or iron notch is situated at a convenient point on the circumference of the furnace at the level of the hearth floor. It is usually about 4½″ in diameter and widens out at the outside to permit the easier entrance of tapping tools. Directly above the tapping hole is a splasher plate to prevent the molten iron from splashing as it leaves the furnace.

The cinder notch or slag gate is situated about 5′ above the iron notch and is usually placed from 45 to 90 degrees from this opening. Unlike the iron notch, this opening is amply water-cooled to protect the bricks from the fluxing action of the slag. The opening encased by the brick is about 2′ in diameter on the outside and 1′ on the inside.

In this is placed a copper water-cooled "cinder cooler." Inside this is placed the intermediate or monkey cooler which fits snugly into the cinder cooler and is likewise water cooled. Inside the monkey cooler fits the monkey. The monkey, also water cooled, has an opening for the slag of 2″. By use of these three water cooled, copper cores, the brickwork is protected and the taper fit construction causes the monkey to be entirely within the furnace.

The tuyeres, from ten to sixteen in number, are distributed symmetrically about the hearth just below the bosh. They provide for the passage of air blast into the furnace. The copper tuyere is fitted into the copper tuyere cooler which is set into the brickwork and packed with fire clay.



Cross-Section of a Modern Blast Furnace

While we are discussing the main features of the furnace proper, an elaboration of the furnace top would be in order. In itself, it is a complicated affair. In earlier times, the waste gases were allowed to burn in the open air and escaped through the furnace top which was open. A few years later the gases were employed to heat small stoves and to burn bricks. About 1845 a plan was evolved to preheat the air blast and raise the operating efficiency of the furnace. At first the pipes carrying the blast were laid across the flue tunnels where the furnace gases passed over them. Then the principle of the stoves came into use. A discussion of the stoves will follow later. The evolution of the use of the gas caused changes in top construction of the furnace to be made. Various "tops" were in use until the double-bell-and-hopper of the modern furnace came into being. Referring to the diagram, we see two bells at the top, one large and one small. The small bell is placed directly above the large bell. Above the small bell is the small hopper into which the charging skip dumps directly. Both bells, when raised, meet the edges of their respective hoppers at the extremities of the flare of the bells. When the small bell is lowered, the charge falls onto the large bell. The small bell is closed and the large bell is lowered, causing the charge to go into the furnace. In this way, the furnace top is gas-tight at all times.

The furnace stoves are of vital importance to the efficient operation of the blast furnace, much the same as a pre-heater is of importance to the modern boiler. For the larger furnaces, the stoves are about 22′ in diameter and 100′ high and usually number four to a furnace. The stoves are lined with a porous fire brick. The gas from the furnace is burned in the stove for a period of six hours and then the gas is changed to another stove and the blast is blown through the heated stove. This process is alternated so that there is one stove "on the furnace" and three "on gas" at all times. The hot blast volume ranges from 20,000 to 70,000 c.f.m. and its temperature is maintained from 800° to 1700° F. The stoves require from 25 to 30% of the gas produced. If the furnace blowing engines are driven by gas engines instead of steam, the consumption for this use is about 15%. Hence, about one half of the total gas produced is available as surplus for the generation of electrical power, etc.

An important part of furnace work is the cleaning of the furnace gas. The gas is carried down from the furnace tops by two large ducts, called "downcomers," into a "dust-catcher." The gas is heavily laden with flue dust which, of course, if allowed to enter the boilers or stoves, would soon necessitate cleanings and would cut down on heat absorption by the stove brick or boiler tubes. The dust-catcher is, in reality, a sudden enlargement of the downcomer. The principle involved in its construction is the great reduction in velocity accompanied by sudden change of direction of the gas flow. This serves to knock enough dust from the gas so that it may be used under the boilers. In up-to-date furnaces, the gas is subjected to further cleaning by several different types of patented gas cleaners.

In the Republic Steel Corporation plant at Youngstown, Ohio, the gas is subjected to two cleanings after passing through the dust-catcher. The first is the gas washer. The gas enters a tank through the bottom and passes out the top. Several fine sprays are brought in contact with the gas and considerable flue dust is washed out. From the gas washer the gas passes to the Cottrell Precipitator. This consists, in brief, of a tall circular tank, containing pipes of a slightly shorter length than the tank and about 10″ in diameter. Down the center of these pipes is a twisted steel rod ¼″ in diameter. The space between the pipes is blocked off so that the gas must pass through the pipe conduits. A voltage of 75,000 volts is impressed across the pipe walls and the rod. This serves to ionize the dust particles left in the gas by the dust-catcher and they are deposited on the pipe wall which acts as a cathode. A small flow of water washes the wall continually and the sludge is collected and removed at the bottom of the tower. The precipitator brings the efficiency of the cleaning system to about 99.6% or reduces the dust content of the gas to about 0.009 grains per cubic foot.

There may be a question in the reader's mind as to the disposition of all the dust removed from the gas. It is not discarded by any means, as its iron content is around 50%, so it is returned to the furnace. It is not returned in powder form as it would only blow out again, but goes through a comparatively new process to the steel industry known as Sintering.

In the Sintering process, the flue dust is mixed with fine coke and fine ore and the mixture is heated. The result of the fusion is an ash-like substance, solid enough in form to be charged into the furnace with no fear of its being blown out again.

The charging of the furnace is a part of the routine that must be done with great care and cannot be interrupted as the furnace tends to empty itself rapidly and constant vigilance is necessary to keep the stack full. The three main materials charged into the furnace are: iron ore, limestone and coke. The relative proportions and amounts of the materials charged are determined by the specifications of the finished pig iron. The weights of the charges are known as the "burdens." The burdens are carefully predetermined to meet the required limitations of silicon, sulphur, phosphorus and manganese content in the iron. The individual charges of coke, limestone and ore are drawn from the storage bins into a larry car. The car weighs the charge and records the weight of it on a scale tape. The charge is carried to a chute and dumped into a waiting skip which carries it to the top of the furnace and dumps it onto the aforementioned small bell. As each charge is put on the bell, it is lowered and the charge falls onto the big bell below. When a complete 'round of ore, limestone and coke has been hauled to the top and placed on the big bell, it is lowered and the round falls into the furnace. The average weight of a round is usually about seventeen tons. A furnace receives from four to eight rounds per hour.

It might be timely to mention that the operation of the blast furnace isn't simply the filling with raw materials and extraction of slag and iron. The furnace must be carefully watched at all times and the air blast temperatures constantly regulated to suit the best operating conditions. The iron and slag troughs must be cleaned of the solidified matter from the previous casts and carefully relined with clay and sand. This sand must have the correct moisture content as the union of water and molten iron causes an explosion, hence, excessive moisture in the sand spells disaster. At times, the material in the stack will "hang up," i.e., the compact mass will form a self supporting arch and will not move down into the combustion zone. To remedy this, the blast is cut down suddenly and the drop in pressure from under this suspended mass usually causes it to fall into the combustion zone. This slackening of the blast is known as checking. If a furnace is checking excessively, it is said to be "sick" and all the vigilant doctoring of the furnace man is necessary to keep the furnace in working order. To correct a "sick" furnace, the burdens are sometimes changed, as well as the order of filling, but considering that it takes a certain charge from ten to fourteen hours to travel from the top to hearth zone, the operator is sometimes subjected to an anxious wait.

The foregoing is a very sketchy description of the manufacture of pig iron and blast furnace operation. A detailed analysis would fill volumes with descriptive matter, but it is hoped that this short dissertation will make clear some phases of this vital branch of the steel making industry.

E. C. M. A. CONVENTION

When the organization of Engineering College Magazines, Associated held its annual convention last month at the University of Pennsylvania in Philadelphia, sixty editors and business managers of engineering college magazines assembled to learn a great deal about the business of publishing a student publication. The discussions during the two day session were led by Chairman Leonard H. Church, representative of McGraw-Hill publications, and were designed to acquaint the delegates with the methods of modern technical journalism.

This year the Wisconsin Engineer received two awards in the contest conducted among the twenty-four member magazines. An article written by Jack Havard, min'35, in the December, 1934, issue won first place as the best student written article. The alumni section won third place for the year.

The final activity of the convention and the highlight of the program was the address by Philip W. Swain, editor of "Power," who spoke on careers, success, and job getting. Delegates of the Wisconsin Engineer who attended the convention were G. H. Cook and T. J. Williams.

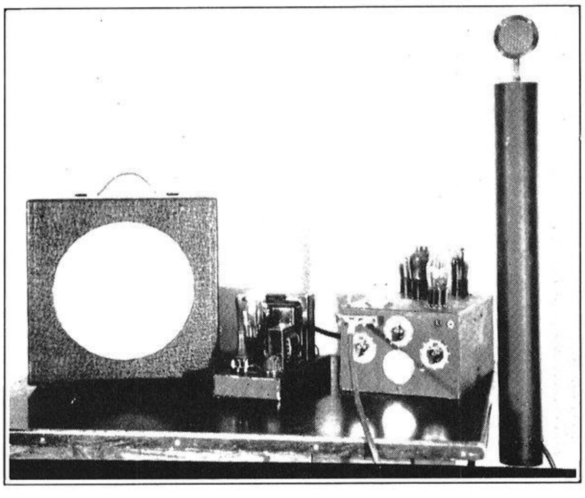
PUBLIC ADDRESS SYSTEM

by **HAROLD GOLDBERG, c'35**

THE spectacle of the E.E. carrying his radio to the radio service man for repair is quite common. People, of course, wonder what is wrong with the engineering curriculum when an E.E., after taking radio courses, cannot fix his own radio. Members of the other engineering clans snicker and then suddenly remember that the M.E. usually takes his car to the garage. So it goes. The gap between theoretical and practical is the cause of this state of affairs. Unfortunately, a theoretical knowledge of vacuum tube circuits does not supply a knowledge of current practice in radio set building and design. The service man is familiar with this practical phase and can fix the radio just as the garageman fixes the car without even knowing why it runs. Once the theoretical knowledge is coupled with the practical knowledge gained by actual experience, it becomes a very simple matter to fix the radio or car in question, given the necessary materials.

The bible of all who ever expect to do anything practical with radio tubes is the R.C.A. tube manual. Design work in radio and public address systems is largely cut and try. The tube manual gives all the operating data of the tubes involved and some applications. Other data can be obtained from experiment and the experience of others. Building several outfits gives the necessary personal experience. With this experience, successful results are more the rule than the exception.

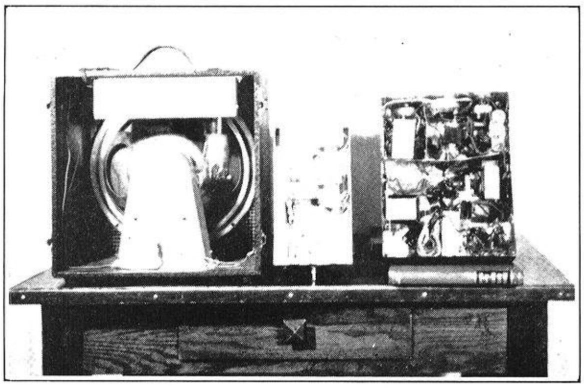
This article concerns the design and building of public address systems. The public address system designed and built by the author and Mr. Warren E. Gilson are described. There are several steps in the design of the public address system which must be considered before anything is built. The use to which the public address system is to be put determines the design. Permanent installations that are built to order are usually of rack and panel design. Portable units must be made light and small. Music requires high fidelity. Amplifiers for speech only, do not require fidelity. The type of microphone used and its distance from the amplifier determines the necessary gain and whether or not a preamplifier is necessary. The size of the place in which the public address system is to be used determines the number of speakers and the necessary power output. When the public address system is to be rented for various uses, it must be made flexible so that it can be made to supply low and high power, operate with various types of mikes, both near and far from the main amplifier, and operate the required number of speakers both near and far from the amplifier. It should be made so that more than one input circuit is provided so that, for instance, as a performer may perform against a background of phonograph music. It can be seen that the rack and panel design permits easier construction than does the portable unit. The portable unit must have all the parts put in a small space and yet oscillation must be prevented. In all cases, separation of the power supply from the main amplifier does way with the need for transformer orientation in preventing hum.



Portable Public Address System

Having determined the necessary voltage gain, the problem of the choice of a few high gain tubes or many low gain tubes to obtain this gain arises. Whether or not the stages preceding the output stage shall be push pull or single is another question to be answered. Men who know the practical end of radio and have had little or no theoretical background are prejudiced in favor of low mu triodes. It is their contention that several low gain stages give better quality than a few high gain stages. They likewise insist that resistance coupled amplifiers are inherently unstable and that transformer coupling is the only satisfactory means of coupling. But an examination of equipment built by R.C.A. and the results of experiment show that high gain tubes will give good quality and with less space, and parts. The '56, which is favored by the practical men, is a good tube and gives excellent results, but requires many stages for high gain. Resistance coupling gives very high quality and is very stable in operation if properly designed and built. Transformer coupling, if results are to be good, is expensive, takes space, and is heavy. A portable amplifier, where space and weight must be kept to a minimum, and where fidelity is required, makes resistance coupled, high gain stages imperative.

The system built by the author consists, at present, of a crystal mike and '32 preamplifier, amplifier with 15 watt output, and a single 12" dynamic speaker with individual field supply. There is provision for the use of a velocity, inductor, or condenser mike instead of the crystal mike now being used. The carbon mike was not even consid-



Expose View of Apparatus

ered because of its poor frequency response. Provision is made for connecting extra speakers. The preamplifier and amplifier have a total voltage gain at full volume of 140 db. (107) and a frequency response that is flat within 5 db. from 80 to 8000 cycles. This voltage gain is more than ample for satisfactory operation with any of the mikes mentioned. There is, in addition to the mike input, a phonograph input designed primarily for use with a high impedance pickup. This input may be mixed absolutely independently with the mike input without the use of T pads or similar equipment. The output gives a choice of 8, 16, 250, or 500 ohm outputs, thus permitting the use of one or more speakers either directly or through 250 or 500 ohm lines. The power output is sufficient to drive up to three large speakers or five small speakers.

The crystal mike used with this system was chosen because it is comparatively inexpensive; has a good frequency response; requires no polarizing voltage; is light, compact, and durable; and does not require a spring mounting. Although it could be used even with a fairly long line without a preamplifier with good results, it was deemed advisable to use a preamplifier in order to obtain a low noise level. The usual practice of using two '30 tubes for the preamplifier was discarded in favor of using a '32 screen grid tube. As far as the author knows, this is a new use of the tube. Another departure from practice was the placing of the filament batteries for the tube in the mike stand, thus allowing the use of only a two wire shielded cable to the amplifier. No transformers are used in the line. The performance of the preamplifier exceeded expectations in that it reduced the noise level to such an extent that it was below audible level. The velocity mike could also be used with this preamplifier and is much more preferable to the crystal mike except for the fact that it is much more expensive. Its main advantage is that its directional qualities allow one to prevent a certain amount of acoustic feedback.

The main amplifier uses a '57 as a pentode; and a '53, one triode unit of which is used for the mike channel, and the other unit which is used for the phonograph channel. Both channels are coupled into the grid of a '59 connected as a triode which drives the final transformer coupled push pull to a 2A5 class A' output stage. These tubes and all the component parts associated with them are mounted in a metal box, 9x11x6 inches in size made of tin plated sheet steel. The '57 and '53 stages are individually shielded, in addition to the shielding of the filament supply leads to these two stages. The power supply cable is plugged into the side of the amplifier. Volume controls for each channel, a tone control, and a plate current meter are located on the front face of the amplifier case.

While the use of the '57 tube as a triode has been widespread lately, its use as a pentode has not been very widespread. As used in the amplifier, it is a pentode and has its screen voltage supplied by means of a dropping resistor in the plate supply in the same manner that the screen voltage to the preamplifier tube is supplied. This system of supplying the screen voltage is not as good as the potentiometer method, but works very satisfactorily in the case of the '57 and '32 tubes. The '57 tube is resistance coupled to one triode unit of the '53. The volume control for the mike channel is a potentiometer in the grid circuit of the one triode unit of the '53. The phonograph input is fed into a potentiometer in the grid circuit of the other triode unit of the '53. This one stage of amplification is all that is necessary for even a crystal pickup. Both triode units of the '53 are then resistance coupled to the '59 driver. This system makes independent mixing of both channels possible without the use of T pads. It is possible to feed the output of a mike and preamplifier into the phonograph pickup and to have another mike connected directly to the preamplifier input. With this arrangement, both channels give sufficient amplification for the operation of even very low output mikes, such as the velocity type. The input is thereby made very flexible. This type of mixing can be extended to more than two inputs.

The '59 tube is transformer coupled to a push pull class A' 2A5 output stage which can deliver 15 watts output with 5% harmonic distortion using self bias. A 2A5 is usually used as a driver for this type of output stage, but the fact that the '59 can be used and happened to be on hand dictated its use. The '59 is used as a triode, as are the 2A5s. Any output transformer designed for use with '50 tubes in push pull can be used with 2A5s. In fact, the transformers used were ones formerly used for a push pull '50 stage. The 2A5 was used in preference to 2A3s, '50s, or '45s for the following reasons: The 2A3 is a delicate tube; is not a heater tube (will give hum); requires fixed bias for a 15 watt output; and is hard to adjust in a push pull circuit. The '50 is not a heater tube; requires a very expensive power supply because of its high voltage and current requirements; and necessitates the use of a bleeder resistor to supply plate voltages to the other tubes. The '45 is not a heater tube and requires a much higher plate current for the same output than do the 2A5s. Class A' amplification is used in preference to Class B because the distortion is less and in preference to Class A because of its higher efficiency.

The power supply uses a 5Z3 as a full wave rectifier and supplies 2.5 volts for the tube filaments, 5 volts for the rectifier filament, and 350 volts D.C. at 100 milliamperes for the plate supply. The filter for all the tubes except the preamplifier tube uses only one choke and has condenser input. The power supply contains an 800 volt, 8 microfarad, paper condenser, as input condenser for the filter, and a 16 microfarad, 500 volt, electrolytic condenser after the choke. The amplifier contains two 8 microfarad, electrolytic condensers as additional filter and a 1000 henry choke as filter in the plate supply line to the preamplifier. This is an impedance coupling choke and may be used because the preamplifier draws only one milliampere of current. Since the tubes which require less than 350 volts on the plate are all resistance coupled, the drop in the plate resistor makes the high plate supply voltage desirable. The plate voltage to the '59 is dropped by a resistor which also serves as a decoupler.

The frequency response shows a peak of 7 db. at 6000 cycles which is caused by the transformers used. Better transformers would improve the frequency response but this is not necessary since the present frequency response of the system is better than those of the ordinary P.A.s found on the market. The tone control flattens this peak out and makes the response flat to within 1.5 db. up to 7500 cycles. The tone control will also remove "s" sounds caused by the performers speaking too close to the mike.

With the mike located within 25 feet of the speaker, acoustic feedback limits the permissible gain to about 50 db. This requires that the speaker come fairly close to the mike. The velocity mike makes it possible to raise this limit in gain some 10 or 15 db. and to make it possible to have mike and loudspeaker next to each other. With the mike and loudspeaker separated by several rooms and the intervening doors closed, enough gain can be attained without acoustic feedback to amplify heart beats to a surprising volume and to make a good wrist watch sound like a trip hammer.

The hum level is below audibility and is not amplified as the gain is increased. After a gain of 100 db. has been reached, a background of shot noise starts to make itself noticeable. A comparison of the output of an oscillator and the amplified output of this same oscillator was made in an oscillograph with the following results: For frequencies from 25 to 100 cycles, no distortion was noticed even for maximum gain unless the oscillator output was increased to the point to where the grid of the preamplifier was driven positive. The actual input to the preamplifier is never that high in actual use. There was, however, a phase shift of about 10 degrees in the output of the amplifier which was constant for all frequencies as far as could be determined. As long as this phase shift is constant for all frequencies, there is no distortion.

Keeping Time *on a* Road Job

***by* JOHN I. BERCHENS**

THE first job that many a newly graduated engineer gets is that of timekeeper. This is usually his first contact with practical problems. In this capacity, he is likely to consider himself in a soft job, but timekeeping, if well done, is just the opposite.

A timekeeper to be of true value to his employer must be able to do more than stand on the bank of an excavation and place a neat mark after the name or number of each laborer who heaves into his sight. His true value lies in his ability to anticipate and prevent delays, and carry on with his other assigned details. The delays will come from two sources; break down of equipment and lack of material. The assigned details will cover many fields. However, to place the picture clearly in mind, it will be well to take some specific example. In view of the present building activity, we find that road construction is by far the most prominent. Let us not forget that there is no set method of timekeeping procedure that will cover all types of construction work.

Upon analysis we find a road job is different in timekeeping aspects from an office building or a sewer-laying project. A road job is extensive in the ground covered. It will be from one to ten miles in length. The type of hand labor will be local and invariably of farm origin. At first the men will be slow and awkward in performing their tasks, mainly because they will be confused by the rapid movement of trucks and other machinery about them. This apparent lethargy on the part of the men will wear off in a few days and they soon will do their work with alacrity.

There are two points of feverish activity, the paver and the "set up," which includes the gravel and sand hoppers, and the cement hoppers. Now with a skeleton picture in mind, we find that keeping time on the laborers will necessitate the covering of a lot of ground during the day. On the average sized road job there will be from 75 to 100 men engaged in the paving operation. This does not include the crew that does the rough grading or grubbing. If the job is under state regulation the 30-hour week will undoubtedly be in effect. This will necessitate an extra shift and bring the total number of men actively engaged up to 200 men. Now the use of two shifts involves more complications. The laborers will be forever asking for a day off when their shift is working. They are more than willing to work on some other day, usually on a different shift. As a result your time book will become a jumbled mass of erasures, mainly because you cannot locate the man during that shift.

The usual method of keeping the names in the timebook according to shifts and occupation is theoretically sound, but in practice it bogs down somewhat. To illustrate the point, we will go to the paver to take the time of the crew there. We start at the fine grade which is about 1000 feet ahead of the paver itself, we find the crew all present except a man called John Jones. You inquire of the foreman where Jones is, and you learn that he has changed to the cover gang which is about one-fourth mile back of the paver. A note is made in the time book recording: J. Jones absent from the fine-grade gang. The timekeeper proceeds to the paver itself and takes the time of the men there. Proceeding to the cover gang, time is taken of the men there. However, we find no J. Jones in this gang. The cover foreman says that J. Jones has traded shifts with some other man on the fine-grade gang. This means the changing of the man's name from one crew to another and from one shift to the other. The next time you find this J. Jones you have to thumb through four or five pages of time book looking for his name. Besides being annoying to the timekeeper, this changing of shifts and jobs by the laborers will lead to errors in their pay checks. These pay check errors will have to be made good if the laborer is short. Such errors engender more detail and trouble in the next week's payroll.

The practice of having the foreman take care of the time for his group has several serious disadvantages; one is that the foreman himself is likely to get the time muddled up more readily than the timekeeper. Another good reason is that the foreman's duties demand all of his time and attention.

The labor turnover on a road job is not likely to be great. At the beginning of the job the turnover may be quite high, about 10 men a day for three or four days. As the job progresses, the rate of turnover will be about three men per week. A large labor turnover will give high operating costs and inefficient work. Try to establish a crew and keep it well organized. Have harmony in the crews, but eliminate the formation of cliques and dissension immediately. Remember that familiarity breeds contempt.

Records are kept so as to show the number of man-hours spent on each detail of the construction. That is, how many hours did it take to perform the setting of the steel or the placing of the curing canvas, etc.? It is a matter of keeping an account of past performance for future reference and study. This system enables one to analyze the costs of operation and to bid intelligently on future jobs. These costs can be determined from the time book. It may not be necessary to work them up daily; weekly accounts will be quite suitable.

Now comes the matter of payroll. On the larger road jobs, paydays are usually taken to be the first and the fifteenth of the month. That is, the time goes in on the night of the thirtieth or thirty-first and the night of the fifeenth. Thus the timekeeper will have to add the time of the two weeks on the closing night. To add the time of 200 men will take at least six hours of good solid work. Payment is usually made by check. It will take another six hours to write out the checks and they can all be signed in approximately one hour. Thus if the time goes in on the fifteenth, the checks should be ready for distribution on the forenoon of the sixteenth or at least on the night of the sixteenth. Each contractor may have a different way of handling pay-day, but the above method is quite common.

If a laborer disagrees with the time given him, check the addition of the time for the two weeks. If the error is not found there, call the foreman and have the laborer give his time, day by day, before you and the foreman. If the foreman does not check the laborer's time, have the laborer give a more detailed account for each day. If the foreman does not then check the laborer's story, accept the word of the foreman. It is better to accept your foreman's word because he is looking after both the interest of his men and your interests. It is rather difficult for the foreman to be fair under such circumstances. A laborer will try to bluff a timekeeper but will not attempt to bluff his foreman. Usually, common laborers will not quibble about a time shortage less than 1 hour. If you are fair in other dealings with your men they readily overlook the smaller errors. Do not become involved in any heated arguments with your men. Don't become loud or boisterous, maintain your self control.

If the job is under the National Recovery Act, there will be the payroll reports to hand in every month. The report is placed on the large sheets furnished by the Highway Commission for that purpose. On a fair-sized job there will be at least four of these sheets. They are quite involved and should be kept up daily.

Besides the actual mechanics of timekeeping there are innumerable other tasks to be performed. The first is the writing out of the injury reports. Three copies are made, one for the insurance company, one for the Industrial Commission, and one for the files of the contractor. These reports should be made out immediately following the accident. The amount of red tape encountered in dealing with the Industrial Commission or an insurance company is multiplied a thousand fold by failure to file a report immediately.

Next we have the item of spare parts or replacements. The timekeeper usually orders all parts following a requisition by a foreman. He should be familiar with the local hardware stores, garages, and supply houses; he should be "up on his stuff" in regard to such items. He should also know the approximate amount of building materials on hand. The timekeeper who has such knowledge at his finger tips is worth money to the contractor. It shows that he has an interest in his job.

Next comes the item of gasoline. It is an important item on a road job. It is well to have a tank truck on the job at least four times a day or the greater part of the forenoon and afternoon. It is nothing to consume 200 gallons a day on such work. This amount does not include what is used by the batch trucks. For a piece of machinery to run out of gas on a job is costly and indicates poor foresight. The timekeeper should check where and in what quantity the gasoline is used.

To accomplish some of the above duties may seem difficult but if the embryo engineer has confidence in himself, a little ingenuity, and a vast amount of initiative, he will find this type of work both interesting and profitable. Promotion will be forthcoming to the enterprising timekeeper.

THE CRITICAL ANGLE . . .

> *I disagree with every word you say, but I will defend to the death your right to say it.*
> —VOLTAIRE.

WHEN WILL IT HAPPEN? "Education does not mean that we have become certified experts in business, or mining, or botany, or journalism, or epistemology; it means that through the absorption of the moral, intellectual, and aesthetic inheritance of our race we have come to understand and control ourselves as well as the external world; that we have chosen the best as our associates, both in spirit and in the flesh; that we have learned to add courtesy to culture, wisdom to knowledge, and forgiveness to understanding. When will our colleges produce such men?" With those words in his **Mansions of Philosophy,** Will Durant tears open our old sore again.

Engineers, the campus' forsaken race! In ancient days, the Greeks had their slaves trained to do the manual labors and lowly tasks. Slaves were not permitted to delve into the cultural things in which their masters found delight. If a slave were taught a language, he was given that cultural bit in order that he might be a proficient interpreter for his master.

But we engineers do not receive even that much of a smattering of culture! Oh, no! For such knowledge cannot be technically exploited. Such learning will bring money to neither the engineer nor his employer!

The engineering student is riddled with facts, formulae, and theories until he is rendered insensible to the spiritual things in life. He is shot through and through with the technical subjects that will some day mean money to others and himself — mostly to others. What will he do when his working day is over? He will, out of sheer ennui, bury himself in the scandals of the yellow press or in the silly superficiality of the modern movie! For him were never meant the artist's brush, the classic's pen, nor the piano keyboard.

When are we going to have things otherwise? Just when are the educational institutions going to give us an education instead of an animal training?

SOME LECTURE GRIPES Perhaps coughing is one of the most unnecessary evils infesting our lectures today. It is highly disturbing to both speaker and listeners, and there is no real need for it. Professor Kahlenberg once demanded that the freshmen in his chemistry lecture stop coughing. And they did! You do not really have to cough as much as you do. A bit of an effort and consideration for others will help make lectures richer and more enjoyable. Coughing seems to be a direct insult to the speaker, and those who are responsible for bringing good men from outside the university to speak to you are considerably embarrassed to find their guest "hacked" to death.

The "pencil pusher" is another public enemy in the lecture. Some people insist on copying every word of the speech. The attention of the listener is a queer thing — it functions spasmodically, snapping off and on every few seconds.

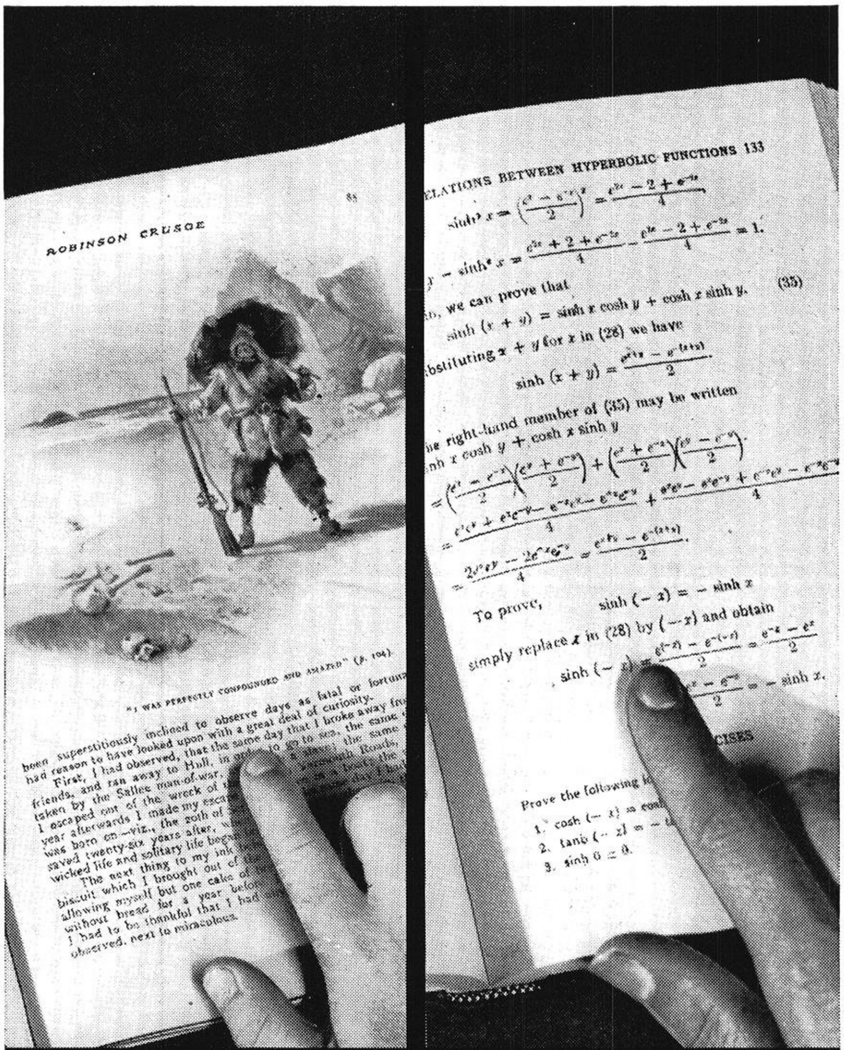
And there are many other things you should be kind enough to refrain from in lectures — you need not fidget in your seat, whisper to people about you, make empty exclamations, keep applauding long after others have had sense enough to stop, make queer noises, drop things, or commit a score of other pestiferous deeds.

Please try to make lectures pleasanter for people.

CONCERNING ALL OF US There is a situation on the campus which needs some thought applied to it. It is the lack of interest shown by our men in the student branches of the various engineering societies. This state of affairs could be due to the fact that the large majority of students are busy with studies or outside work, but indications seem to prove otherwise. While many are too actively engaged to take time off every night in the week, once or twice a month is not out of reach of most of us.

Upon going over the reports of student activities in a number of the **Wisconsin Engineer** exchange magazines, there was exhibited a wide variety of worthwhile suggestions for overcoming this apathy. The general tendency of the programs listed was to present something of interest at the meetings, as well as something constructive. Refreshments, while not always in evidence, were often included as part of the evening's entertainment. A few of the outstanding highlights specifically mentioned were: addresses — both by seminar students and professional men — on interesting problems and questions relating to their particular fields, humorous talks by professors and practicing engineers on what the aims and objectives should be and what the future in store is for the group being addressed, an explanation of what membership in his professional society means to an engineer and the reasons why it pays a young man to get in early touch with his organization by joining the student branch, and lastly, when it is possible, the following of the program mapped out by the National Administration of the Student Branch.

These are concrete suggestions for variety at the meetings. Anyone wishing a more detailed or specific list can obtain it by perusing the **Engineer's** exchanges in the library. By taking advantage of these or other suggestions offered, it is possible for programs to be of just as great instructive value as formerly and at the same time be entertaining enough so that members will look forward to society meetings as a pleasure, rather than a duty. This month, let's start a movement for more appealing programs and greater attendance at the meetings.



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. . . *neither have we*

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• • ALUMNI NOTES • •

CHEMICALS

COLEMAN, EDWIN D., '23, Ch.E.'25, developed a new circuit and model for a hydrogen ion measuring device. He has graciously presented one of his instruments to the electrochemistry laboratory.

MITCHELL, MALCOLM, '21, says his firm, Rilly-Jarr Chemical Corporation, Indianapolis, Indiana, manufactures about everything from coal tar, except dyes and medicinals.

FLUCK, WILLIAM Z., '35, decided to return to the university to study accounting.

BARDELSON, MARGARET, '35, leader of her class in scholarship, reports, "Since I am now married, I have a permanent job trying to keep house for my husband, who is a chemist for the Cliffs Iron Company.

OUWENEEL, W. E., '24, writes that he is still with the Commercial Solvents Corporation, Terre Haute, Indiana. He has with him there, **HUGH STILES,** a research bacteriologist, and **KING, K. J.,** m'24, a construction engineer.

LADON, AARON A., '15, acts as divisional sales manager of the Masonite Corporation of Chicago.

SCHEIL, MERRILL A., '27, M.S.'30, was married to Miss Marion Gladys Krug on Saturday, October 26, at Madison. Mr. Scheil at present is employed as a research metallurgist for the A. O. Smith Corporation of Milwaukee.

ELECTRICALS

BURGESS, C. F., '95, E.E.'98, Hon. D. SC.'26, has been elected to the newly created office of Chairman of the Board according to a recent announcement of C. F. Burgess Laboratories, Inc., of Madison, marking the close of twenty-five years of its corporate existence. The company also announces that **ARABA B. MARVIN,** '00, has been elected president. Mr. Marvin has been in the organization of the Laboratories and acted as its attorney for more than twenty years, and is thoroughly familiar with the Laboratories' purpose of doing scientific research on a commercial basis.

WING, O. H., '24, has the position of chief electrical engineer with the Great Lakes Power Company, Sault Ste. Marie, Canada.

CARLSON, M., '25, is connected with the CCC.

VAN DERZEE, GOULD W., '08, is vice-president and general manager of the Milwaukee Electric Railway and Light Company of Milwaukee. He was assistant general manager from 1918 to 1934 and was elected to a vice-presidency in 1925. Following his graduation from the university, Mr. Van Derzee taught two years at Houghton in the Michigan School of Mines. He then went to the General Electric, entering the test department. After this training he was transferred to the power sales division of that company and, in this position, became closely associated with the power sales development of the Milwaukee Electric Railway and Light Company. In 1913, he became assistant to Mr. S. B. Way, who was then assistant general manager of the concern.

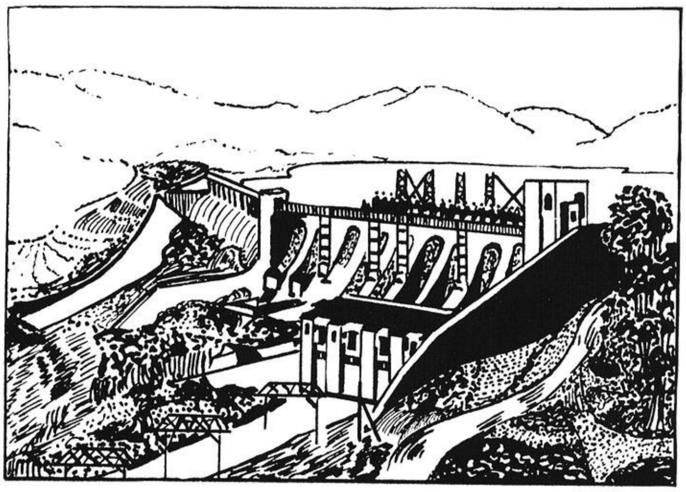
COLE, EVERETT L., '18, has finished a refrigerating job in a new U. S. PHS spotted fever laboratory at Hamilton, Montana, on which he has been working the past year.

GAPEN, J. CLARK, '03, died on November 2, in his home at Evanston, Illinois, from a cerebral hemorrhage. He had been ill for three years. Survivors besides the widow are a son, Clark C. Gapen, Evanston; four sisters, Mrs. W. L. Stevenson, Long Beach, California; Mrs. E. P. Schoenfeld, Janesville; and Mrs. Roy Jaberg and Mrs. John D. Germann, Sr., both of Monroe; and a brother, George W. Gapen, Williamina, Oregon.

MECHANICALS

BURKHARDT, GEORGE J., '34, writes that he has accepted a position at the U.S.D.A. Experimental Station at Maxaguez, Puerto Rico. His present capacity is that of associate agricultural engineer working on the utilization of bamboo and the development of coffee processing machinery.

OTIS, CHARLES K., '33, who became a junior soil erosion engineer on graduation from the university, is now camp superintendent in the Soil Conservation Service under the U. S. Department of Agriculture.



HODGINS, WILLIAM, '35, of Honolulu, T. H., is now in the employ of the Hawaiian Sugar Planters Association at their Waipio Experimental Station.

GREEN, JOSEPH GREGORY, '32, corresponds that he is a mechanical engineer on marine and stationary Diesel engines at the Fairbanks Morse Co., Beloit, Wisconsin.

SIMPSON, JOHN, '34, has accepted a position of sales engineer for the American Blower Corporation of Baltimore, Maryland.

GROBE, RALPH E., '33, works as a draftsman and layout man in the engineering department of Kearney and Trecker Corporation, manufacturers of milling machines in Milwaukee.

PETERSON, GERALD D., '35, has enrolled as a student pilot at the U. S. Naval Reserve Aviation Base at Great Lakes, Illinois.

BLOEDORN, CHARLES W., '34, is associated with the steam turbine department of the Allis-Chalmers Manufacturing Co. of Milwaukee.

WHITTEMORE, HERBERT L., '03, M.E.'10, holds the position of chief of the National Bureau of Standards in the engineering mechanics section at Washington, D. C.

GERHARDT, ADELBERT P., '21, is an industrial engineer with the Condit Electrical Manufacturing Corporation of Hyde Park, Massachusetts.

NAUJOKS, WALDEMAR, '26, has advanced to the position of chief engineer with the Steel Improvement and Forge Co., Cleveland, Ohio.

MINERS AND METALLURGISTS

MACKAY, SCOTT, M.S.'26, who until this semester was an associate professor of mining and metallurgy at the University of Wisconsin, accepted an appointment as professor of ferrous metallurgy at the Rensselaer Polytechnic Institute of Troy, New York, for the current school year.

BEMIS, REGINALD S., '29, M.S.'32, has sailed for Moracocha, Peru, where he will be employed as assistant mine foreman by the Cerro de Pasco Copper Corporation.

LINK, MARCUS W., '21, acts as mining engineer for the Ostiz Mine and Milling Company at Los Cerrillos, New Mexico.

KNOLL, WADEMAR A., '14, M.S.'22, who is with the Pickands Mather Company of Ironwood, Michigan, is their general superintendent.

GALLISTEL, JR., ALBERT F., '35, has returned to school to further his education by taking graduate work.

GENERALS

HOTCHKISS, WILLIAM OTIS, '03, C.E.'08, Ph.D.'16, who has been president of the Michigan College of Mining and Technology at Houghton, Michigan, for ten years, took over the duties of president of the Rensselaer Polytechnic Institute at Troy, New York, in September.

CIVILS

LEFEVRE, WINIFRED C., '34, who spent last year in graduate work and worked for the Wisconsin Highway Commission out of Green Bay this summer, is teaching mathematics at Washington Hall prep school in Brussels, Belgium, this year.

FERBER, HERBERT J., ex'32, left for Venezuela, S. A., on April 1 to work for the Gulf Research and Development Co.

BREIVOGEL, MILTON W., '24, is city planning engineer for Racine.

BURMEISTER, WALTER L., '32, is technical foreman in the Soil Conservation Service stationed at Mt. Horeb. He has been on the job since August 1.

DIBBLE, JOHN T., '34, **LEO F. PRATT,** '29, and **MAX A. WERNER, '35,** were recently added to the staff of Mead, Ward and Hunt.

HITCHCOCK, FRANK A., '10, is professor of structural engineering and head of the department of civil engineering of George Washington University.

PLATZ, GEORGE A., '32, is director of WPA at Racine.

VAN HAGEN, ROBERT L., '32, has been designing engineer with WERA at Stevens Point since June 3.

UEHLING, VICTOR B., '34, has been in the bridge department of the Wisconsin Highway Commission since April 10.

McMICKEN, ROBERT H., '32, has been in the Rhinelander office of the Wisconsin Highway Commission since May 1. Prior to that time, he had spent six weeks with the Worden Allen Co., working on steel alignment on the Whiteman Dam on the Mississippi River about twenty miles above Winona.

ZERVAS, WALTER O., '22, is manager for the Electrical League of Milwaukee, which has its headquarters at 744 N. 4th Street.

NEWING, CHARLES W., '31, was married on May 4 to Margaret Leithe Thompson of Madison. Newing is with the U. S. Forest Service at Marquette, Michigan.

BIRKENWALD, EDWARD, '27, was married on April 22 to Lois Marcia Hayden of Augusta, Maine.

JENTZ, G. L., '30, who is connected with the U. S. Engineering Department, is in charge of dredging operations on an 880,000 yard contract at Green Bay harbor.

DREW, SID., '31, works for the E. E. Gillen Company, which has the contract on the Green Bay harbor project.

STRIEGL, A. R., '21, supervised the designing of a steel hull for the government dredge "Kewaunee" this summer. He had working under him **EDWIN** (Pat) **SCHLONDROP,** '29, and **MARCUS** (Mike) **HUNDER,** '30. They are all connected with the U. S. Engineering Department.

ON THE CAMPUS

CONFERENCES

During the coming year, there are a number of conferences to be held on the campus under the sponsorship of some branch of the university.

In the Mechanical Engineering department, two conferences are planned, both to come sometime in the second semester. Prof. B. G. Elliott is head of the committee arranging the "Solid Fuels and Domestic Stokers" conference, while Prof. G. C. Wilson is in charge of the arrangements for "Diesel Engines and Diesel Fuels."

The department of Geology annually sponsors a Well Drilling conference, also held sometime during the second semester. Casing, driving, well drilling machinery and other practical problems of the well driller are discussed at this meeting.

In the department of Hydraulic and Sanitary Engineering, two short courses are definitely scheduled. The short course for Sewage Plant Operators meets for five days in January, and the Water Works Superintendents' short course runs for four days in February. These courses are put on cooperatively by the State Board of Health, the State Laboratory of Hygiene, and the department of Hydraulic and Sanitary Engineering. Lectures are given hourly in the morning, and the afternoons are devoted to a series of laboratory experiments. All meetings are held in the Hydraulics Lab.

A later issue will contain exact dates and more particulars on these meetings.

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LIGHT ON THE SUBJECT

Prof. R. E. Johnson, assisted by Byron Powers and J. K. Babbitt, has been conducting street light tests at Monroe. They measured the illumination produced by ordinary and various types of a new processed street lamp. These lamps have reflecting surfaces plated on the glass bulb to more effectively direct the light in a given direction. They are interchangeable with the ordinary lamps.

MEHREN TALKS TO UPPER-CLASS MEN

"A succesful engineer must possess sound judgment, common sense, the ability to analyze, and must have a thorough professional preparation," said E. J. Mehren, president of the Portland Cement Association, and former editor of The Engineering News Record, to the junior and senior engineering students, on October 7, in the auditorium of the Engineering building.

"An engineer is not through learning when he leaves school," continued Mr. Mehren. "The ability to learn from others, a form of open mindedness, is next in importance to the fundamental requisites."

Courage in forming and standing by his opinions, team work, the ability to "stand the gaff," and handle and organize people, must be cultivated while the engineer is in school. The fact that he should be able to form a widely prepared organization and select good "second men" when he finally receives a responsible position, was stressed by Mr. Mehren.

"As engineers grow older, and go along in the profession, they look back with gratitude to those of their employers who made them toe the mark." According to Mr. Mehren, life is just a contest. "If we look upon life as a game, it's well worth while," he said in conclusion.

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THE POLYGON SMOKER

Polygon had its first smoker of the year Wednesday night, November 6. Joel Hougen was master of ceremonies, and he started the evening by introducing Dean Goodnight, the speaker for the evening.

Dean Millar spoke for a few minutes. He was followed by some movies and a number of accordion selections by Pat Smith.

Then all the engineers, about four hundred of them, adjourned to Tripp Commons, where they had beer, pretzels, and cigarettes.

It was announced that Polygon would have its dance Friday night, December 6.

HYDRAULICS PROJECTS

There is a great deal of research going on at the present time down at the hydraulics laboratory. Among the current work is a long and involved series of tests and experiments in an endeavor to ascertain standard specifications for grease and oil incepters.

Another set of experiments is being run on the precise measurement of the flow of viscous fluids over triangular notched wires. This project is under the personal supervision and direction of A. T. Lenz.

Professor Kessler has recently completed a bulletin on friction losses in wrought iron pipe with screwed connections. This article will be available for distribution in a few weeks.

Mr. Kessler is also working on a systematic study of the activated sludge method of sewage treatment. Despite the fact that this is one of the most widely used methods in use today, very little is known about it.

Mr. A. A. Kalinske has been working for some time on the securing of data and the preparation of a bulletin giving results of tests on the hydraulics and pneumatics of plumbing systems.

There are six other projects under way in the laboratory which are not sufficiently advanced to warrant discussion at this time.

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"DANNY" MEAD

The nominating committee of the American Society of Civil Engineers has selected Prof. W. D. Mead as its official candidate for president of A. S. C. E. Even though the exact time at which the election will take place is uncertain, it can be said that Prof. is practically sure to be elected.

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STILL ANOTHER

In our list last month of the freshmen whose fathers graduated from the College of Engineering, we missed one, George H. Morgan, of Ladysmith, Wisconsin. George is a civil engineer and the son of Mr. Walter D. Morgan, g'05.

GRIDIRON ENGINEERS

Four men, all juniors and all from different schools, represent the engineering college on this year's football team. These men are Ed Jankowski, mechanical; Ed Christianson, mining; Bill Parrott, electrical; and Emil Malesevitch, civil.

Although Jankowski is the only regular among them, all of these engineers see plenty of action. Christianson, after playing great ball as a sophomore, has been in a slump the first part of the season due to injuries and is just rounding into the form he showed last year. Parrott and Malesevitch are both quarterbacks, the blocking position in Spears' offense, and the two are staging a first class dog fight for that post on the second team.

Jankowski is probably the best all-around player on the Wisconsin eleven. Eddie's specialty is backing up the line on defense, and in this duty he is without a superior in the Big Ten. In addition to this, the rugged Milwaukee junior has started every game since he became eligible last year, and has put in more time in competition than any other man during that stretch of time. Strictly a sixty minute ball player, Jankowski.

TIME AND MOTION STUDIES

"The individual is the center of the machine age problem; he is the center of activity," stated Dr. Gilbrett in her talk before the senior engineers Monday, Nov. 4, in the Engineering Auditorium. To make the work more effective, to eliminate fatigue and to get the most for the time and energy put in, are the major reasons for time and motion studies in industry. A statement of the problem, simple and clear, is the biggest job, since there is much jealousy and human resistance to be overcome. The biggest value of small change in motion is making the worker motion conscious. These and many other interesting points were brought out by Dr. Gilbrett, who is nationally known for her work and research in a field that has just began to open up.

FACULTY

Chemical engineers have found out by this time that Prof. O. A. Hougen is back this year after a year's leave of absence. Prof. Hougen was in charge of reorganizing the laboratories and developing the research and consultant phases of the U. S. Testing Company, the largest research and testing organization in this country. The U. S. Testing Company is a cooperative organization supported by the large textile concerns to work out technical details, do general testing of products, undertake research and development, and assist in establishing standards for the textile industry. Under the NRA, it took care of consumer adjustment on any complaints of defective merchandise. In addition to this, it stores and tests three-fourths of the silk that comes into this country.

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Mr. Graham Walton is a new instructor in Hydraulic and Sanitary Engineering. Mr. Walton came to Wisconsin from the South Dakota School of Mines and is a graduate in Sanitary Engineering from the Massachusetts Institute of Technology.

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There were two promotions in the faculty of the College of Engineering this year. Mr. Edmund D. Ayres was promoted to Associate Professor of Engineering Economics and Mr. G. C. Wilson was promoted to Associate Professor of Steam and Gas Engineering.

In the Civil Engineering department, Walter H. Tackey, instructor in Railway Engineering, and Frank T. Matthias, instructor in Topographical Engineering, have resigned. Mr. Matthias is an Hydraulic Engineer with the TVA at Knoxville, Tennessee. Mr. Tackey is at WPA headquarters at Milwaukee, passing on projects and checking estimates. J. E. Henry and Eldon Wagner, student assistants, are taking Mr. Matthias' place. Mr. Henry was chief of party for the Wisconsin Highway Commission at Green Bay this summer. Mr. Tackey's place is being filled by James P. Kayser, c'33. Since graduating, Mr. Kayser has been engineer in the CCC camp at Dunbar, Wisconsin, has been with the C. M. St. P. & P. R. R. working on track depression on the northwest side of Milwaukee, and has been with the Wisconsin Highway Commission for two summers on maintenance work.

Philip McCaffrey is doing research in the Mining Engineering department.

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Mr. Edward Anderson is back at Wisconsin as an instructor in Steam and Gas Engineering. Several years ago, he was an instructor here in Drawing and Steam and Gas.

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E. T. Hansen, instructor in Steam and Gas Engineering, is on leave of absence this year.

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In the Drawing department, there are two new student assistants. They are Ronald Dagget and Lloyd Jedeka.

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SPECIALIST

"Wisconsin's chief specialist" is the title recently conferred upon Chester A. Obma, c '32, by a newspaper writer who described his work in selecting sites for farm outhouses and supervising their construction as a WPA project. Obma's official title is "director of rural sanitation." The new type of privy would, it is asserted, make Chic Sale turn green with envy. It is said to be utilitarian, sanitary, and esthetic. "It is quite a trick," Obma states, "to select a location that is both esthetic and utilitarian."

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CONVENTIONS

At the Wisconsin Utilities Association Convention at Green Bay, November 11 and 12, Messrs. V. M. Murray and L. C. Larson presented a paper on the subject: "An Improved Non-Metallic Sheathed Wiring Installation for Rural Buildings." Mr. Murray was an instructor in Electrical Engineering last year. Professors R. E. Johnson and E. D. Ayres also attended the meeting.

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Professors Price, Jansky, Tracy, and Bennett, and Messrs. Fredendall and Benedict attended the national A. I. E. E. meeting at Purdue University, West Lafayette, Indiana, October 24 and 25. Prof. Tracy presented a paper entitled, "Split Phase Starting of Three Phase Motors," which he prepared jointly with W. E. Wyss, Prof. Bennett and Mr. Fredendall presented a joint paper on "Control of Potential Over Insulator Surfaces."

In connection with the national convention, part of one day was devoted to a student A. I. E. E. convention. A number of student papers were read and Morris Swanson, EE4, presented a paper on "Streamlining," which was well liked.

"STATIC"

by ENGIN EARS

● Boy - o - boy! What goings - on amongst our crowd these last few days. Tsk, tsk! This outfit of engineers is certainly carrying on at a wicked pace.

Take, for instance (if you can catch up with them), those two demons of speed, "Burn 'em up Bernie" Wrensch, E.E. 4, and "Blaster" Boening, E.E. 3. They are on their way to classes ten minutes before the rest of us decide to go — they even beat the freshmen! It is rumored, also, that Boening is the proud possessor of several other so-called "accomplishments."

Yessiree, it's getting to be plenty tough keeping up with the boys. Why, did you notice all the engineers at the dancing classes in the Union? And, most remarkable of all, not an engineer came to the Polygon Smoker in his overalls. In fact, some of the boys were even wearing neckties!

In spite of all the speed, though, some of the fellows are lovers of the past, and they're not particularly worried about rushing ahead. Norm Van Sickle, for example, heads the "Back-to-the-Past" Movement with a paper he handed in last month — it was dated 10/17/32.

Even the faculty has become infected with this fast life — or at least Prof. Sokolnikoff has. In the Calc. 54 lecture the other day, he said something about interesting curves in math and the romances connected with them. "In fact," he remarked, "romance is always connected with curves!"

»» ««

● By the way, did you know that the M.E.'s, E.E.'s, and Miners in the senior class went to Chicago on an inspection trip three weeks ago? Guess you must have heard something about it, 'cause most of them are back in school by this time. But have you heard . . .

That Koller got first prize for clearing out of the Mars Candy Company with the most candy?

That Herbie Dow got the booby prize for recommending the worst ten cent show on State Street to the boys?

That Profs. Ayres and Watson were seen in the burlesque show district of State Street one evening — no doubt watching over "our boys"? (It might be well to mention here that Profs. Hyland and G. C. Wilson were not seen in that vicinity. Pat said he knew of some much better shows than those.)

That Saue sported his elegant head-piece throughout the trip, but that Clarence J. ("Otto," to you) Mueller forgot to drag his slide rule along, so he had to hang a chunk of cast iron from the South Works on his belt in order to feel normal once more? (Ain't some of these engineers queer?)

That Ed Gross got some pretty nice publicity in the way of several skyrockets on a couple of Chicago's very best street cars? He managed to find a seat next to a pretty girl. (Just as we've said . . . plenty quick, these engineers.)

That Sanderson went high-hat on the boys and took a date to the Blackhawk? (Incidentally, we found out that some of the flit-about stags were neatly escorted out of that place by a very nice bouncer.)

That a lot of other things happened, but they are better left unprinted.

»» ««

● Oh, speaking of what a speedy bunch the engineers are getting to be, just take a peek at the fast one Stuewe tried to pull on the Mechanics department last year . . .

EXPERIMENT 00

The Use of the Scleroscope for the Testing of Hard Liquor

by H. A. Stuewe

Object: The object of this experiment is similar to practically all other experiments performed at the university. Namely, to keep the mind of the student in a more or less state of unconsciousness which Prof. McNaul thinks is just north of the state of Florida, but then he graduated from M. I. T., and hasn't had any education to speak of. In these days of high taxes, it seems that most of the faculty live in that state to avert an overtaxed mind.

Apparatus: The apparatus used consisted of:

1 cocktail shaker

3 lemons

3 qts. of 3 different types of liquors of varying hardness

10 cc. of white soda (in case there's a sissy in the assembled multitude)

1 feather bed

10 hours to sober up

1 scleroscope

Method: The scleroscope, besides being used to determine the hardness of metals, is sometimes used to determine the hardness of liquors. However, when used in this capacity, it is of a slightly modified form. In this case, the diamond pointed plunger is placed on the bottom of the cocktail shaker and the liquor poured over it. One end of a rubber tube is attached to a 15″ graduated glass tube of 1″ diameter. The other end of the tube is placed in the operator's mouth. (Care must be taken that there is an observer, since one person can't perform the experiment alone.) The glass tube is lowered into the filled cocktail shaker until it is approximately 1½″ from the bottom. The operator now attempts to raise the heavy plunger from the bottom and up into the graduated glass tube by reducing the pressure at the mouth end of the rubber tubing. The experiment is made more enjoyable by the fact that with the tube so far from the bottom, and with such a large diameter, it is practically impossible to ever move the heavy plunger.

Discussion: The business of the observer is to provide sufficient liquor in the cocktail shaker, and since the time required for the suspended animation of the operator determines the hardness of the liquor, it is also the business of the observer to record this time, and he therefore starts his stop watch at the beginning of the experiment. A slightly flushed nose indicates the limit of proportionality of the operator. The drooping of the eyelids and the curling of the corners of the mouth indicate the operator's yield point, and after this stage the experiment is nearly complete. As the operator falls from the chair, the watch is stopped and the time elapsed recorded.

Curves: The curves seen by the operator are not permanent, and hence a record of them can't be made. They are undescribable on paper, and no man (due to insufficient data) has ever been able to write the equation of the curves.

Conclusions: A damn good experiment.

Error: Sources of error occur, in that some liquors dissolve the diamond point on the plunger. In this case, the liquor must be diluted with aqua regia. By far the greatest source of error lies in the human element.

● Notice on board of Pat Hyland's Mach. Des. 3 class during the first game of the World's Series — "Start on problem 4, as your instructor may be a trifle late today."

»» ««

● Being constantly reminded of that insipid habit the senior lawyers have of carrying canes, brings visions of chemical engineers carrying stills, econ studes wearing wigs and L&S (loaf and smoke) students carrying davenports. Better keep your canes handy — St. Pat and his loyal supporters will be here again next spring.

»» ««

● Theron Place is perhaps the class of 1938's chief claim to fame. One of the finest sleeper-in-lectures in the county, Place has a technique that defies improvement. On being interviewed by an Engineer reporter after going to sleep three times in calculus lecture, Mr. Place reported that he enjoyed Mr. March's lectures far better than those of "Louie" Kahlenberg last year, since he claims that the former's voice is far more soothing and that he is also much more considerate in waking up tired engineers. Mr. Place is one boy who should know.

»» ««

● The prize pun for the month of October was unconsciously pulled by a farmer whose land was crossed by the field party on the N.Y.A. resurvey. The erudite agrarian warned all prospective hunters away from his land with the sign "No Hunting Aloud."

SOMETHING FOR ENGINEERS

NOW that we engineers are well entangled in the meshes of our cumbersome courses, we find ourselves with one of two attitudes toward our educational set-up—either we are sorry we have no time for cultural subjects, or else we are glad we have an excuse for not taking them. Whatever your attitude, certainly this ought to be brought to your attention. Have you been to one of the lectures on "Significant Living"? If not, you owe it to yourself to spend your next Sunday evening at one of them.

Here is a group of lectures which are of more importance to us than to the other students of the campus. The subject matter is the kind of thinking which we engineers know to be going on among non-engineering students, but of which we ourselves get little, yet are more in need of it than are the other students. At these lectures, our machinery is looked at and considered in a light different from that generally shown us in our classrooms. We are sadly in need of that other perspective.

Therefore, you are urged to attend one of these lectures, whether you go to escape the rigid routine of the engineering college, or whether you go to prove to yourself that such things are not worthwhile. Regardless of the frame of mind in which you go to one of these lectures, you will find cause to agree or disagree with what the speaker says — and when you have been sufficiently provoked to agree or disagree, the purpose of the lecture has been well fulfilled. Because those lectures are being given to make you think!

MOST POWERFUL PERMANENT MAGNET

RESEARCH in the field of permanent magnet alloys has resulted in a new material, much more powerful than those used heretofore, it was disclosed recently by W. E. Ruder, of the General Electric research laboratory. Known as Alnico, the new magnet alloy, powerful enough to lift 60 times its own weight, opens entirely new fields of application for permanent magnets. Various control and other electric devices hitherto operated by electro-magnets can now use permanent magnet fields at a considerable saving in costs and greater simplicity of construction.

Alnico was originally developed by the General Electric Company as a heat-resisting alloy which resisted scaling and deterioration at high temperatures. Some work on the magnetic properties of alloys of this type was later carried out by Prof. T. Mishima, of the Imperial University, Tokyo. General Electric has perfected a process of heat-treating by which the magnetic properties of this alloy are fully developed. Its name is derived from the combination of aluminum, nickel and cobalt which are added to the iron in forming the alloy.

Alnico, a cast material, at present cannot be machined but is finished to shape by grinding. It follows, therefore, according to Ruder, that this alloy must be cast in quantities for commercial applications, and that it is not available in standard bars for individual fabrication.

Like other permanent magnet materials, Alnico does not magnetize easily, but once magnetized it retains a large proportion of that magnetism when, in use, it is subjected to demagnetizing force. Unlike steels hardened by quenching, it is produced by a precipitation-hardening process, with the magnetization promoted by heat-treatment. In use it withstands a demagnetizing force twice as strong as does cobalt magnet steel, is more resistant to vibration and stray magnetic fields, and maintains a large part of its magnetic field at much higher temperatures.

RUF HELPS SOLVE CANNING WASTE PROBLEM

HAROLD RUF, instructor in sanitary engineering at the University of Wisconsin, recently returned from Huntingdon, England, where he spent the summer doing research on the treatment of canning company waste.

Mr. Ruf went to England last June, following a visit of officials of an English canning company to this country in search of information on how to purify the waste which poured from their canning company into a stream on which a group of small English villages were located.

When the officials learned that Wisconsin was a leader in this field, they visited state board of health officials, who referred them to Mr. Ruf.

Mr. Ruf has worked six summers with the state board of health on disposal and treatment of industrial wastes in Wisconsin, and has played an important part in cleaning up the state's lakes and streams. He has charge of the sanitary engineering laboratory at the university.

Mr. Ruf's work in England was entirely successful, and a method was determined whereby the industrial waste of the canning company can be treated so as to clean up the stream on which the factory is located. The company expects to build a waste treatment plant in the near future based on the data obtained by Mr. Ruf.

A. I. Ch. E. HOLDS ANNUAL MEETING IN COLUMBUS

THE twenty-eighth annual meeting of the American Institute of Chemical Engineers will be held at Columbus, Ohio, on November 13-15 with the Deshler-Wallick Hotel as official headquarters. Morning meetings for the three days will be devoted to presentation and discussion of technical papers on applied chemical engineering subjects. The first two afternoon sessions will be given over to the inspection of chemical plants of Columbus and central Ohio. On Friday, November 15, both morning and afternoon sessions will be devoted to discussions on principles of chemical engineering. A group luncheon will follow each morning technical session and on the evening of November 13 an informal dinner will be held, followed by entertainment. On the following evening the annual banquet will take place.

Here shall the Press the People's right maintain,
Unaw'd by influence and unbrib'd by gain. — **Story**

LUBRICATION ENGINEERING MAY OPEN NEW FIELD IN MANY INDUSTRIAL PLANTS

In response to a national demand for some organized method of supplying authentic information on industrial lubrication problems, there has been established the Industrial Lubrication Council, Inc., a non-profit organization for educational purposes.

Technical schools and colleges on finding that the registration of applicants in the mechanical engineering courses has fallen off greatly have been urging the training of students in the new occupation of lubrication engineer.

Trade and technical and business journals have found it difficult to supply their readers with authentic and unbiased information on recent thought and development in this important field.

With the increase of speeds at which modern machinery is run and the bearing pressures used, the matter of lubrication in industry is acquiring greatly increased importance. It is not sufficient to have an outside man called in once in a while to attempt to specify the necessary lubricants to reduce power costs and to increase the effectiveness of shop and plant machinery and other valuable equipment. Formerly, with the moderate conditions of operation of all machinery in any industrial plant, such machinery would perform acceptably when cared for by the usual mechanical personnel, assisted by a few routine oilers and their oil-cans. Nowadays, the modern plant is so highly geared up that it must be constantly under the care of a trained lubrication specialist, usually with an organized corps of assistants and supporting laboratories, in order that it may operate continuously and produce economically.

The Lubrication Engineer

Due to the economic changes of the past decade, there has been a general extended employment by the manufacturing industries of the plant lubrication engineer, a trend well along. These men, as a rule, are used for the purpose of reducing the cost of lubrication by making the cheapest oils obtainable do the work in order to justify their employment. There has been no method of instructing these industrial lubrication engineers on the finer points of lubrication. They have no uniform manner of handling their problems. Each man is a law unto himself.

Training the Future Lubrication Engineer

When general indutsry demands lubrication engineers to be members of their maintenance staffs, they should be able to secure through the regular channels men of sufficient initial training to handle the usual lubrication problems presented by every plant. There has never been a definite plan for the uniform training of lubrication engineers, due to the lack of authorized text books on the subject.

Uniformity of lubrication practice does not and never has existed. Therefore, when it comes to the method of extending the use of lubrication engineers throughout general industry where several thousand men can be employed in the future, it is necessary to establish some uniform manner of teaching the fundamentals so that these men will be trained in a necessary branch of mechanical engineering the same as every other specialist, such as, for instance, the automotive engineer, the aeronautical engineer, and the engineer in every other branch of mechanical engineering.

The aims and objectives of the Industrial Lubrication Council, Inc., may be summarized as follows:

(a) Formed for the advancement of the art and science of machine lubrication.

(b) To provide adequate equipment and personnel to conduct general education on the fundamentals and practice of machine lubrication.

(c) To develop and establish in the technical and trade schools and colleges the profession of lubrication engineering.

(d) To stimulate throughout general industry a greater interest in fine lubrication and the acceptance of the lubrication engineer as a member of the engineering staff of industrial plants.

(e) To provide reasonable and sound technical material in the shape of special articles, text books and bulletins for the continual training of the lubrication engineer in general industry and his information as to the latest thought and practice and experiments under way.

(f) To establish and maintain a clearing house for the exchange of ideas on all problems of application and research on the broad subject of lubrication for the benefit of the membership of the Council and educational institutions.

(g) To conduct conferences and meetings and to provide an open forum for discussion of specific lubrication problems, to provide and give lectures and to provide facilities for demonstrating whatever is new in the field of machine lubrication.

FRONTISPIECE

The frontispiece this month is a high speed photograph of a stream of smoke impinging upon the blades of an ordinary household fan revolving at a high speed. The use of high speed photography has given the scientist and engineer another tool whereby he may investigate the flow of fluids in pipes and orfice meters to visualize the theory which he works out on paper.

CAMPUS ORGANIZATIONS

A. S. M. E.

A. S. M. E. was fortunate enough this month to have both their national secretary and national president visit them.

At 7:30 Friday evening, October 18, the national secretary, C. E. Davies, attended the student chapter's first meeting of the year. He spoke about "Building a Profession." Reginald T. Saue, president of the student chapter, then assigned committees for carrying out various activities in the society's program for the coming year.

Mr. Flanders, the national president of the society, addressed our local chapter Friday evening, November 15.

After each of those meetings, the speakers dined at the Union with the student officers and some of the faculty.

President Saue is pleased to report that about 70 students have already joined the national chapter.

TAU BETA PI

Luna Leopold represented the Wisconsin chapter of Tau Beta Pi at its national convention held at Detroit and Lansing, Michigan, October 10 to 12, inclusive. There were 75 delegates from the 75 chapters, located in engineering colleges throughout the country. The convention started in Detroit, where the delegates visited the River Rouge plant of the Ford Motor Company and also Dearborn Village.

From Detroit they went to Ann Arbor, where a Smoker was held at the University of Michigan Union, and then on to Lansing to the main convention. The delegates were entertained royally by 75 beautiful blind dates from Michigan State College at a formal ball . . . and reports have it that they really were beautiful. During the convention at Lansing they inspected the wind tunnel being used at M.S.C., the Oldsmobile plant, and the Fisher Body Works.

In about two weeks, Tau Beta Pi will hold its initiation and banquet, at which time those honored will be announced.

MINING CLUB

Two meetings have been held by the Mining Club this semester. The first on October 9, and the second on October 30. At the last meeting a cost dinner was served by Graydon Deechel, the head mucker, in the library of the Mining building. Professor Shorey gave a very interesting talk on "Gold Mining in Manitoba." The club decided to present a slide rule to Fred Krenzke for obtaining highest freshman honors for mining and metallurgy students.

Due to the success of the dinner meeting, it was decided that the next meeting, to be held November 20, be a Thanksgiving party which will be prepared by the club members. Everyone is looking forward to a great time and a real meal.

CHI EPSILON

Chi Epsilon held its annual initiation and banquet in the Beefeaters room of the Memorial Union on Wednesday evening, November 13. Professor Van Hagen acted as toastmaster and Professor Louis Kahlenberg was the guest speaker. Those initiated as members were: Gerard A. Rohlich, Bernard TerNaath, John Eppler, Arthur Luecker, and Edwin J. Voss.

The society was honored in having Mr. Ferebee, present national officer of A. S. C. E., as a guest at the banquet.

PI TAU SIGMA

On Wednesday, November 13, Pi Tau Sigma held its annual initiation and banquet at the Memorial Union. The initiates were as follows: Robert W. Mortenson, Charles A. Behrens, Charles W. L. Burroughs, James W. Laurie, Jr., Carl B. Sohns, Allison L. Wefel, and Dean A. V. Millar, honorary member. Professor Ben Elliott acted as toastmaster at the banquet, introducing Dean Scott H. Goodnight as guest speaker of the evening.

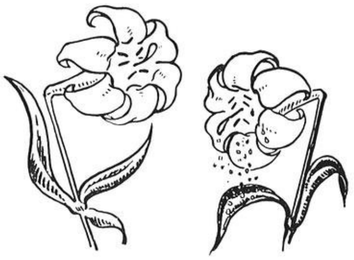
The 18th National Convention of Pi Tau Sigma, held at Purdue University, Lafayette, Indiana, November 15 and 16, had as representatives of the Wisconsin chapter, Edward Gross, Al Cole, John Thomas, and Professor G. L. Larson.

The study room in the Mechanical Engineering building is under way. The first piece of furniture, a settee of modernistic chrome tubular construction with red leather seats, will arrive within the week. It is the hope of the society that each graduating class donates some article to the room, so that more comfort and enjoyment may be provided for future students.

BE SURE TO ATTEND

THE NEXT MEETING OF YOUR ENGINEERING SOCIETY

G-E *Campus* N*ews*



PATENTED LILIES

WHEN left to their own devices, regal lilies get themselves all spattered by yellow pollen. It's a messy business—like a man in a white linen suit spilling egg yolk all over his vest. So the florists have to watch these blooms carefully and pluck the pollen-laden anthers before they have a chance to burst.

In the General Electric Research Laboratory, C. N. Moore, Dartmouth, '05, has for years been investigating the biological effects of x-rays. Among other things, he treated 75 regal-lily bulbs with varying amounts of x-rays. Untreated bulbs of the same batch grew up normally. Among the treated bulbs, there were some monstrosities and some apparently normal flowering plants. The results were different the next season. The progeny of two of the bulbs that had received 30-second doses of x-rays produced flowers with nonshedding anthers. Each year the new strain has continued true, and the nonshedding property is considered a fixed characteristic. The Roentgen lily, as it is called, is now established as a variety of regal lily.

AWARD FOR COURAGE

IN the face of a difficult and serious competitive situation, the entire personnel of the Tennessee Electric Power Company, of Chattanooga, under the leadership of its president, proceeded to develop one of the most unique sales programs ever carried out by an American public utility. Every individual in the organization, regardless of position, became a salesman for the company's kilowatt output. One of the bases of this program was a substantial reduction of rates. The result was a great increase in electric-appliance sales, and a 26-per-cent increase in residential consumption.

The company co-operated in the sale of appliances with dealers, with the TVA, and with the EHFA. Its industrial department has been at least partly responsible for the location of 29 additional industries, employing 1995 workers, in the territory it serves.

For these accomplishments, the Tennessee Electric Power Company received the annual award for 1934 of the Charles A. Coffin Foundation, which was established by General Electric in 1922 in honor of its first president. The award comprises the Charles A. Coffin gold medal, a certificate, and a check for $1000 to be deposited in the treasury of the utility's employee welfare association.

GOOD-BYE, GARBAGE CAN

THE oil furnace has placed the skids under the ash can. And now, a new device developed in a General Electric laboratory promises to do away with the garbage can. This new device, operated by a ¼-horsepower electric motor, grinds the waste food. Grinding knives made of Carboloy—a metal next to diamond in hardness—shred all types of waste food, including bones and other hard substance. The only things it cannot handle are glass and tin cans. Reduced to a fine pulp, this waste is flushed by water into the sewer.

The grinder is simple to install and operate. The entire unit weighs about 75 pounds, and may be installed under any style of sink as a part of the outlet plumbing. The hopper inlet is covered by a perforated cap, flush with the sink bottom. When the hopper is full, all one has to do is turn a handle which projects conveniently from beneath the sink. This closes the hopper and starts the grinder. In the average family, the grinder will operate not more than five minutes a day, and its average cost of operation per month will be about one-half that required for operating an electric clock.

96-179DH

GENERAL ELECTRIC