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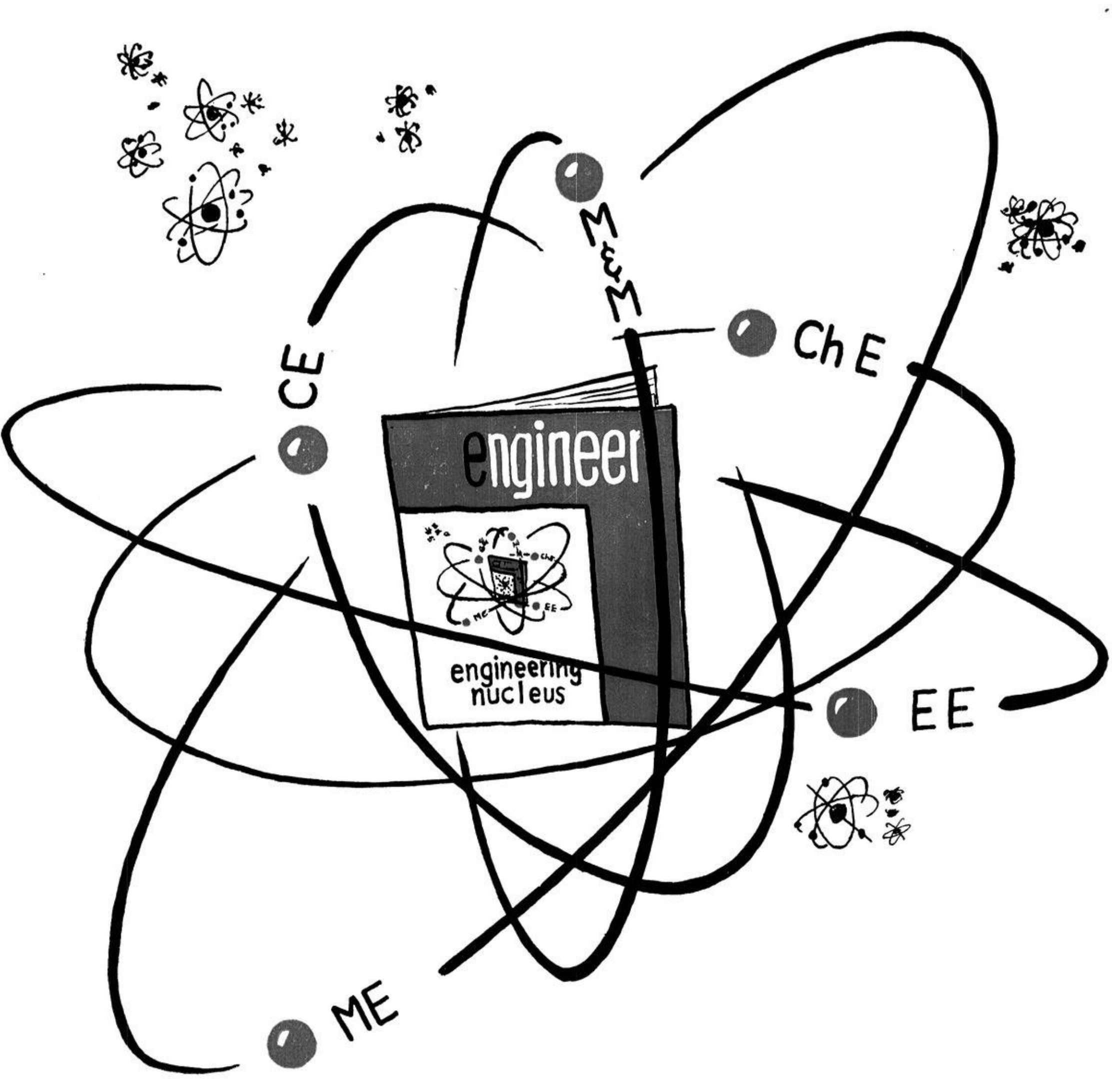
The Wisconsin

engineer

October, 1949



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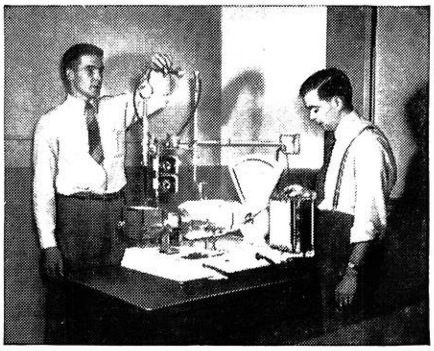
UNITED STATES STEEL

THE DU PONT DIGEST

FOR STUDENTS OF SCIENCE AND ENGINEERING



H. A. Van Etten, *B. S. Ch., Colgate '42, and E. R. Grisé, M. S. Ch., Worcester Polytechnic Institute '48, investigating the properties of vinyl compounds used in plastic-coated fabrics.*

Research across the U. S. A.

YOUNG SCIENTISTS ARE BUILDING CAREERS WITH DU PONT FROM CONNECTICUT TO TEXAS

When you think of Du Pont research, you may think first of Wilmington, Delaware. Actually, only eight of the Company's 36 research groups are located there. Du Pont scientists now pursue their studies in 11 states scattered from Connecticut to Texas.

Each of these laboratories is a self-contained operation. It may be devoted in part to fundamental research and applied research, or to investigations looking to the development of new products—sometimes a combination of these activities.

An unusual Du Pont laboratory is one opened last year at Newburgh, New York.

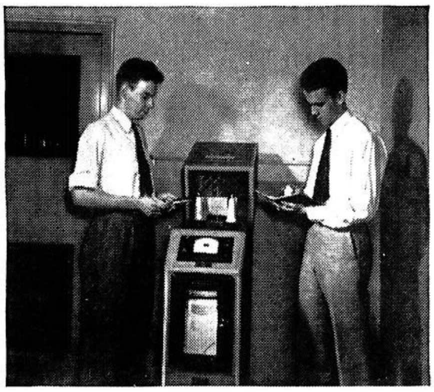
Inside the Laboratory

In the three-story building at Newburgh, scientists have at their disposal the most modern equipment for study of coated fabrics and plastic sheetings under all sorts of conditions. For example, a new product can be tested in a room maintained at a temperature of −20° F. In other rooms, the effects of high temperature and humidity can be studied. Equipment is available for testing tensile strength, tear resistance, fading, flex and flame resistance, and many other characteristics. One of Du Pont's 33 libraries has quarters in the building; there is a photographic darkroom, as well as offices, conference and work rooms.

The Newburgh Laboratory works closely with the adjacent plant, which makes "Fabrikoid" pyroxylin coated fabrics, "Fabrilite" vinyl resin coated fabrics and plastic sheetings, "Tontine" washable window shade cloth, bookbinding materials, and other coated and impregnated fabrics and plastic sheetings for many uses.

Research at Du Pont

Research has long been a major activity at Du Pont, and it flourishes in an atmosphere of appreciation, encouragement and patience. The new products, the new plants, and the new and better jobs of the years to come will develop from the painstaking research programs being carried on today in the laboratories.

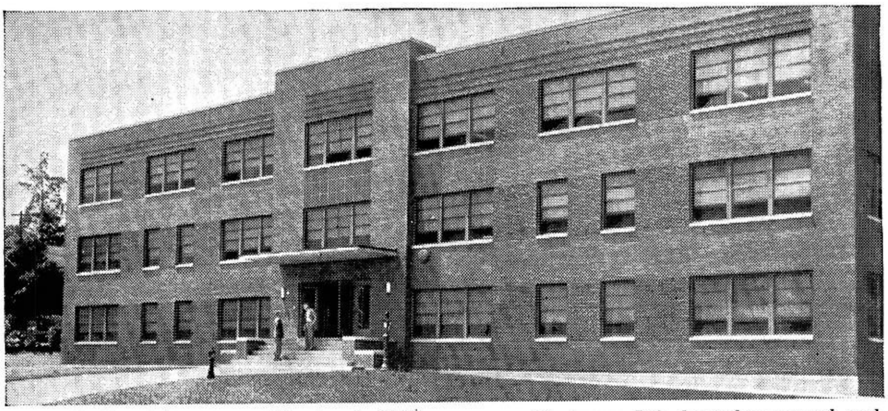


K. F. Richards, *B. S. Ch. E., Cornell '48, and E. K. Holden, M. S. Ch. E., Delaware '48, studying "Teflon" tetrafluoroethylene resin insulating material with special apparatus at the Newburgh Laboratory.*

Choice of Careers

Each of the Du Pont manufacturing departments conducts continuous research. They operate much like separate companies, with interests ranging from heavy chemicals to plastics and textile fibers. Each holds challenging opportunities for college-trained chemists and physicists, as well as chemical, civil, electrical, industrial and mechanical engineers, also those specializing in production, sales and many other fields.

In this alert, ever-growing organization, young graduates can choose from a variety of careers the one that suits them best as their ability and interests develop.



Newest Du Pont laboratory, *at Newburgh, N.Y., was opened last year. It is devoted to research and development work in the field of coated and impregnated fabrics and allied products.*

WISCONSIN ENGINEER

Founded 1896

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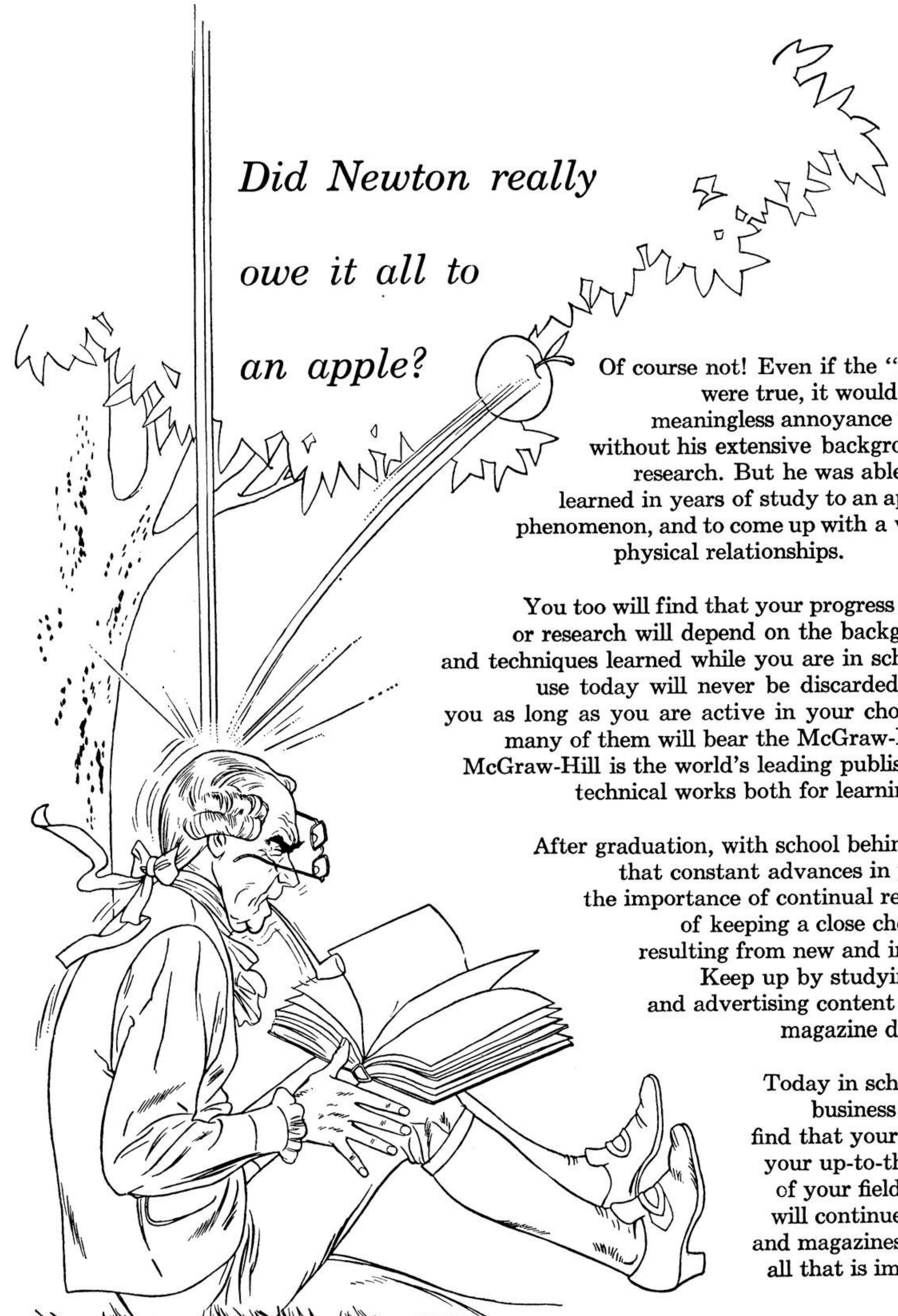
In This Issue . . .

COVER:

Engineering Nucleus—The goal of our magazine. (Artist: David Severson).

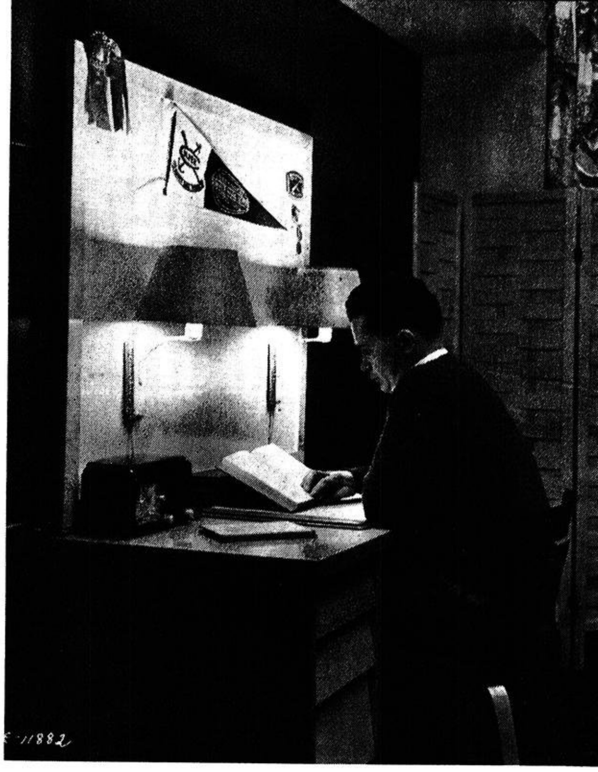
Articles

Departments



brick by brick our campus expands:
the new engineering building

(Foton Photo)



by kenneth g. firchow e'50

The greater portion of the college student's study time is in the evening. Thus the problem of adequate artificial lighting presents itself. Despite the fact that most college students realize the importance of lighting, they are not aware of methods of obtaining the maximum benefits from their present system. It is believed that 90 per cent of the students could reduce eyestrain due to studying by improvement of their present lighting system and study conditions.

General Electric engineers recently have completed a study on lighting of desks and have made available information concerning study conditions and lighting. In these tests such conditions as desk placement, student eye position, desk finish and desk size were experimented with until ideal conditions were met.

The location of the desk then is of primary importance. The location selected was with the desk flat against a wall. This then makes possible the control of brightness because there are definite boundaries of the visual field. Another added advantage is the increase in illumination on the desk surface due to the reflection from the walls. Placing the desk in the center of the room results in undesirable visual distraction. One of the most important of the don'ts that is commonly violated is placing a desk in front of a window. During the daytime this gives a very high brightness ahead of the student and the activities that are being engaged in outside may be distracting. In the evening much of the illumination is lost due to the windows.

Now, when placing the desk against the wall the character of the walls is important. It should be of a non-glossy finish with a reflectance factor from 45% to 65%. If the wall pattern is distracting or not of the proper finish it may be advisable to hang a large tack board against the wall.

Desk finish should also be considered. It should, of course, be non-glossy with brightness ratios with the working area not exceeding three to one. If the desk is found to be too dark the situation may be remedied by the use of pastel blotters.

The tests that were conducted used 14 inches as the eye position above the desk. An average level of illumination of 40 foot candles was considered desirable. By holding such conditions as desk placement, desk size, desk finish, and wall finish constant, tests on some of the most common commercial luminaires were made. The two important zones under consideration in the test were the reading zone and the relaxing zone. The reading zone then includes the reading matter and the desk top. The relaxing zone is that area of the wall directly in line with the student's eye level.

Figure 1 is a test of a typical study lamp. Dimensions and brightness values are included on the photograph. It should be noted that due to the height of the base illumination levels

modern desk lighting

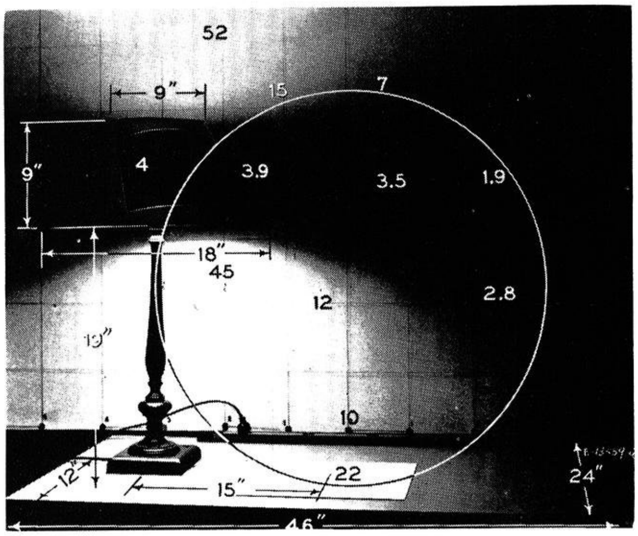


Figure 1
Tan opaque paper shade, white lined, on former certified I.E.S. specification study lamp; 100-w lamp in 8" blown glass bowl; average 31 ft-c. Source of brightness 1400 ft-L ratio direct to indirect illum.: 85:15.

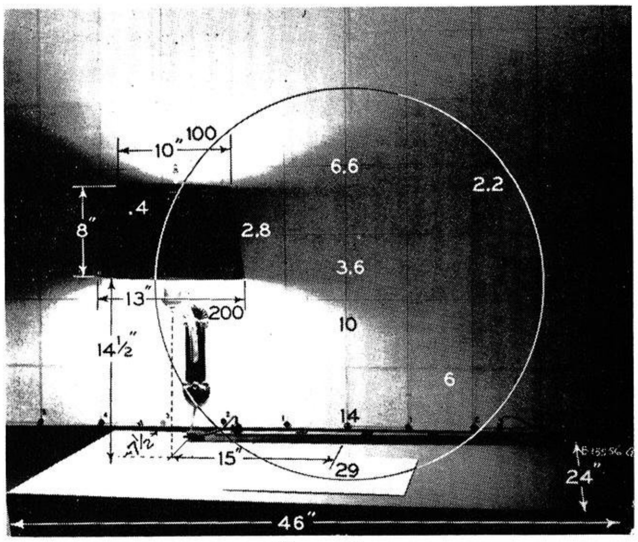


Figure 2
Dark opaque paper shade, white lined; 50-150-w bulb in C.L.M.(B) glass bowl; average 41 ft-c. Source brightness 2250 ft-L; ratio direct to indirect illum.: 89:11.

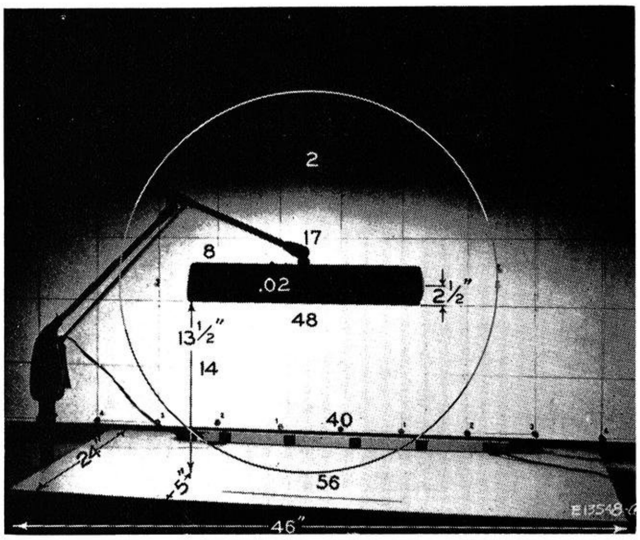


Figure 3
Bronze outer finish, interior white enamel; two 15-w T-8 fluorescent lamps; average 80 ft-c. Source brightness 2500 ft-L; ratio direct to indirect illum.: 95:5.

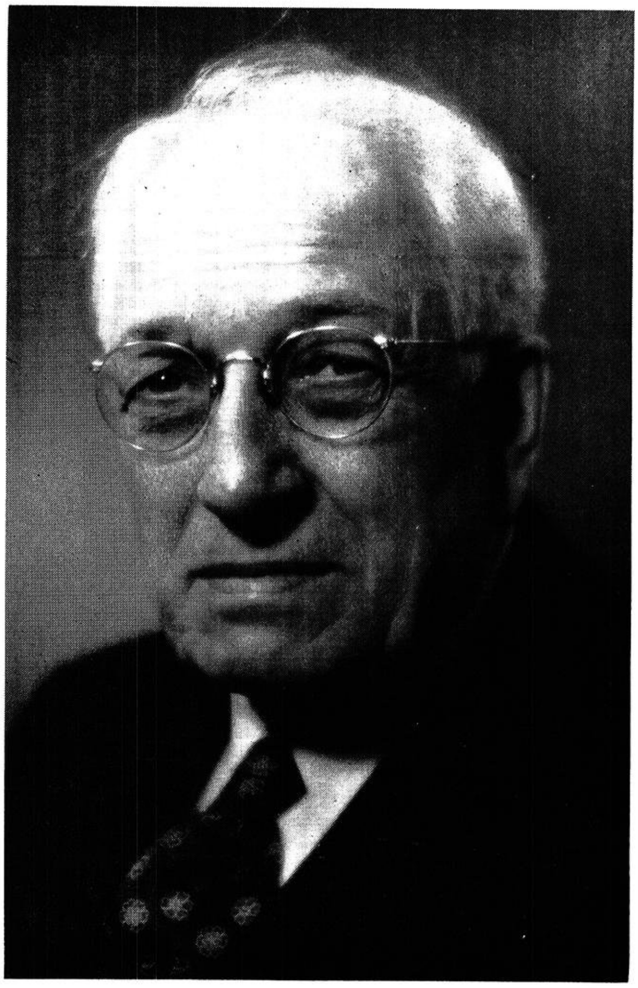
(Photos courtesy General Electric Co.)

are greatly reduced and there will also be the distracting view of the inner shade. It was therefore recommended that the height be decreased three inches thus eliminating the undesirable characteristics. The relaxing area may be brightened by the use of an overhead light.

Figure 2 is that of a commonly used bracket light. The shade produces a darker area in the relaxing zone. Equally important is the fact that the brightness on the table top is uneven. Therefore, it is necessary to use the overhead ceiling lighting unit.

Figure 3 is that of a commercial fluorescent luminaire. The adjustable reflector is tipped up toward the wall at an angle of 30 degrees, thus reducing specular reflection and increasing the lighted wall area. A reflector with a much higher reflectance factor would decrease its annoying dark feature.

The illustration on page 7 incorporates all the desirable features of lighting and related conditions. Notice the desk placement flat against the wall. The use of a large tack board offered a solution for the low reflectance factor of the wall. The size of the desk is such as to adequately accommodate student needs. Twin bracket lights offered high illumination levels on the working surface. The working surface also has a high reflectance factor. Shades are luminous and of high R.F. values thus allowing enough illumination in the relaxing area. The overhead is used to supplement the bracket lights and thus increase the wall illumination. Quite often the visual acuity may be increased by tilting the reading material (as shown in the lead photograph) without any marked increase in glare or loss in illumination. Eye level is as important in relation to the luminaire as to the working area. It is recommended that the eye level be not more than one inch below the lower edge of the luminaire. A greater distance will result in a distracting brightness from the bulb.



Emeritus Professor Frederick Eugene Volk

(Photo by Hone)

Frederick Eugene Volk was the oldest child of Alfred and Ida (McKenzie) Volk. He was born October 8, 1878, on a farm in Oconto County, Wis., near what is now the village of Gillett. Both parents were born in Wisconsin to early pioneer families who came here from New York.

His education began in a typical one-room country school, but he later entered a similar but larger two-room village school, which gave some things beyond those given in the eighth grade.

One of his teachers aroused his interest in mathematics and a higher education by his explanations of square and cube roots, and of applications of the relations between the sides of a right triangle. But the nearest high school was 20 miles away and his parents were financially unable to send him to Oshkosh Normal. He therefore took all he could get at the village school and even dug into elementary algebra as best he could by himself without the help of a teacher.

During his last term in the village school, the county superintendent of schools held an examination for teachers in the village school building. Fred took the examination and found himself the possessor of a third grade teacher's certificate.

He began to teach in a country school near Oconto Falls at the fabulous salary of $25 per month. The next year he got another school at a raise of $5 per month. A friend who lived at Ripon, Wis., advised Fred to go to Ripon Academy. On January 1, 1900, at the age of 21, Mr. Volk arrived at Ripon with his total savings of $125 in his pocket. Expenses were not as high then as they are now; board at the Economia Club cost $2 or less per week. Householders paid from $1.25 to $1.50 per cord for sawing the wood into 16-inch lengths, splitting it to cook stove size and piling it in the woodshed. So Fred bought an ax and a buck-saw and went into business. He just broke even on his expenses until June and was "broke" when he bought his railway ticket for home.

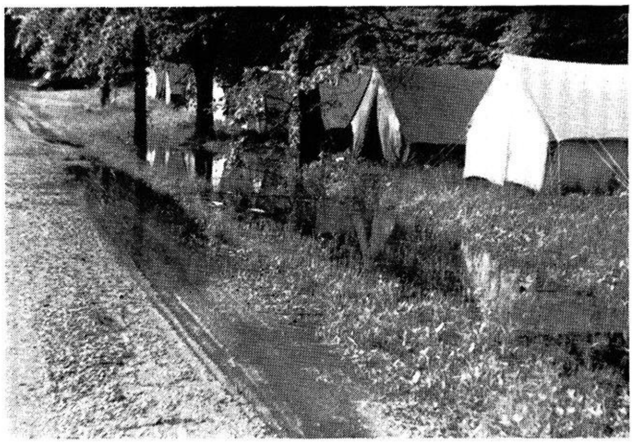
The next year he returned to school in September, and he finished his last year at the Academy in June, 1902. His was the last class graduated from the "Prep" course and the Academy was then discontinued. He entered Ripon College in September, 1902, and received his B.A. degree in June, 1906.

He entered the University of Wisconsin as a graduate student but most of his work required undergraduate

(please turn to page 40)

AZIMUTH CITY

by Charles Scala c'51



Home.

Many engineers were still writing final exams on June 11, 1949, but the eager civil engineers who were going to attend the first session of the summer survey camp at Devil's Lake were already busy at work erecting the camp. By camp is meant just that. Two rows of 15 tents each were set up next to the old Merrimac road. They were to be our residence for six weeks. The camp is in the heart of scenic Wisconsin, with various points of interest located around it: Devil's Lake, 1,000 feet east; Baraboo, three miles west; Badger, two miles southeast; Madison, two hours' hitch-hiking, also east; and the Dude Ranch is northwest one mile, a 20-minute walk or a two-hour Saturday night stagger.

The purpose of the camp as intended by the professors and instructors was to gain actual experience in field surveying, computing and mapping, but the ideas of faculty and students differed. It appeared some came to play cribbage or pinochle, a select few to entertain Girl Scout counselors, others to blaze trails, and the rest to play softball.

Latest reports from the Bularena Mine indicate another spur line will be run in behind South Bluff to the other end of the vein to handle the increased output. Mr. Korbitz and Mr. Rhude are on the board of directors of the camp and are inquiring as to the possibilities of being awarded the contract.

Are you here?

Dogs and other pets were not allowed or kept at the camp, but the camp had a frequent visitor after hours, behind and a few times inside the mess hall. The coon was large and would knock the cover off a can and feast. It seems the near-pet disappeared suddenly and no one knew an explanation. Many wondered and still do if mutton was served one evening. Rumors that all the rattlesnakes had disappeared from the area were stopped immediately when three were discovered. One was caught alive and two were tanned by a local taxidermist. New members of the Rattlesnake Club are Neil Bodenstein, Ben Houden, and Prof. G. A. Beebe. Eye-catchers at the camp were the cars of the faculty. They were Professors Wagner and Wesle jogging along in 15-year-old cars, Professor Beebe with a Packard, and Ron Nord's Oldsmobile.

The first session was very "wet" in many ways. The elevation of the lake rose about a foot in four days following the heavy June rains, and the pier constructed by Mr. Beebe had to be rebuilt. The bonfire was held on July 10 with Fire Chief Tom Wilson and his six able assistants performing a splendid task in getting themselves wet, the rest of the camp wet, and even the fire soaked. Dave Collins didn't appreciate swimming that morning; neither did Mr. Rhude's best lady friend.

Fred Bessert, Dave Chrisnelly, and Orv Sallander should have taken lessons in canoeing from the Girl Scouts. Mr. Wesle told the flag man to stay seated, as 1,200 feet isn't too far from shore, and is a nice afternoon's exercise. Jim Sivley on West Bluff was doing his (if you'll pardon "Buck" Gaeth's expression) usual fine job taking readings on his transit of the points of capsizing and landing. These points were determined to find the distance between them. Speaking of wet—the Devi-Bara Dude Ranch will have to move to the shores of Lake Mendota to entertain the ex-campers on weekends.

Any reader interested in visiting the camp, stop in next summer, and for those who are like Wildroot hair oil, non-alcoholic, the commissary also has Pepsi-Cola.

Physics Option

by Charles L. Teeter m'50

When a physics option is mentioned to a student engineer at Wisconsin with regard to his pursuing such a course, his reactions are seemingly many and varied. But upon sorting and analyzing his thoughts and questions carefully, one will find they usually follow a general pattern that can be shown by the four questions listed below.

1. Is there a demand for engineers with physics training?
II. What kind of work and jobs are open to engineers with physics training?
III. Am I interested in this type of work?
IV. What does the university have to offer me in the line of special physics training, and what are the requirements for a physics option?

In pursuing this article each of the above questions in its order will be discussed.

I. **Is there a demand for engineers with physics training?**

The anwer here is an emphatic yes, for many employers are known to look with favor upon employees in their engineering staff, who have physics training. Today is, as most students know, a day of specialization. Having advanced physics training is a good way of setting an engineer apart as a specialist.

The idea of physics training as specialization for an engineer may sound strange; as physics teaches the basic fundamental principles, while engineering subjects teach and stress applications (which are just a small part of the principle) of these principles already developed.

This type of specialization in the broad field of physics has its advantages for the employer. He can use men on his staff to coordinate his physics and engineering departments. He can take engineers on his staff and use them instead of hiring consulting physicists.

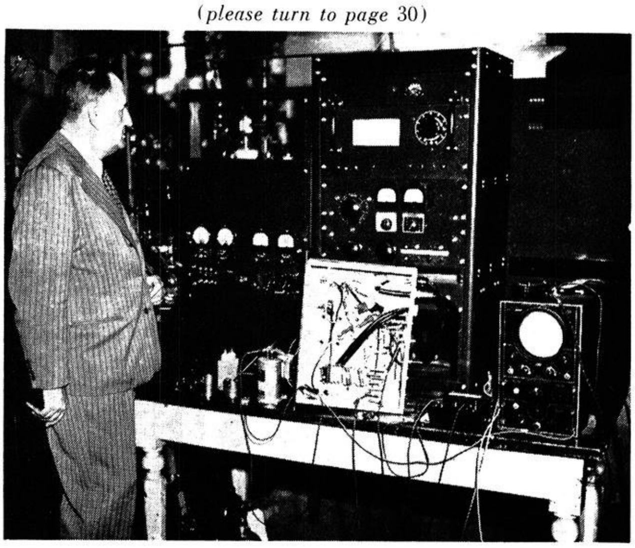
An engineer interested in physics will undoubtedly keep up on the improvements in physics and thus the employer has this information at his disposal, along with someone who can interpret it for him. Also, there are jobs where an engineer could be constantly using his physics training. An attempt is made later in this article to elucidate on these positions. In connection with these jobs the employer is demanding physics training beyond the usual basic courses. He is looking for a specialist.

II. **What kinds of work and jobs are open to engineers with physics training?**

A complete answer to this is of course impossible. But to give an idea in general terms the following industries are named as to those which will absorb most of the men. The electronics industry in general and the radio and television industries in particular. Here a knowledge of electron characteristics, ionization potentials, and gaseous discharge phenomena would be helpful.

Workers in the petroleum industries, who are working in research, would be aided by a knowledge of electronic instrumentation, vapor and pressure laws, diffusion laws, and kinetic theory of gases. These things are covered by the chemical engineer in his curriculum but not in a broad enough sense for the more advanced types of research. Workers on atomic research must of a necessity have a background in atomic theory either from the chemical end

(please turn to page 30)

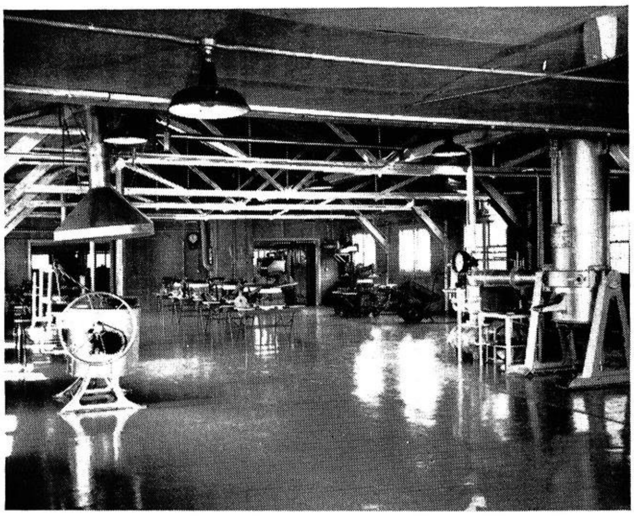


Prof. H. B. Wahlin viewing the control equipment for the mass spectograph. *(Foton Photo)*

a Future in FOUNDRIES

by Peter O. Kirchoff, m&m '50

One of the many problems facing freshman engineers is what branch of engineering to follow. Many engineering schools provide a standard first year curriculum. This provides the young student an opportunity to have more than his pre-college experience upon which to base his vocational choice. For example, the boy who spent his spare time converting junk heaps into hot rods may not find mechanical engineering to his liking and may fit into civil much better.



The University's Metal Casting Laboratory showing the furnaces and molding equipment.

The College of Engineering offers degrees in seven branches of engineering: biochemical, chemical, civil, electrical, mechanical, metallurgical, and mining. In addition, various options are available in several of the above mentioned fields.

It is the purpose of this article to provide information on a comparatively new field of engineering—the foundry.

The foundry industry is a truly basic industry as casting is often the most economical method of forming or shaping a metal. For many years casting was classified as an art, and it is only in recent times that it has come to be regarded as a science. The tricks and secrets of casting were passed on from generation to generation. In many cases, the reason for performing an operation in a given manner was unknown; the method was successful and that was sufficient.

In former days the making of a casting was entirely a hand operation; none but a husky man could work in a foundry. However, the machine age has finally reached the foundry, and there are now a few completely mechanized companies in the industry; most foundries are at least partially mechanized. In addition, the industry as a whole is doing a great deal to make foundries more pleasant places to work.

The student may well ask, "Where can I fit into this picture?" The mechanization of the industry is only the start toward the application of scientific principles to the foundry industry. Tons of castings are produced daily that must be scrapped due to defects. With proper engineering, these defects can be eliminated. Casting quality is constantly being improved to meet modern inspection methods.

Radiographic testing would scrap many of the castings sold today, and more and more purchasing agents are being sold on the idea of radiography.

The proper design of castings will eliminate these defects. New metals and alloys are being developed constantly, and many of these can be adapted for castings. The materials used in the manufacture of castings, such as sands, oils, and patterns, are continually altered and adjusted.

A ripe field for young metallurgical engineers (or other engineers for that matter) is foundry sales. It was this author's privilege to attend a sales meeting of the Steel Founders' Society of America. They are preparing to launch a large sales program having as its main objective the casting of many articles that are now being fabricated by welding.

There are relatively few sales personnel with technical backgrounds, and it is just such persons who are most needed. Among the comments were statements to the effect that men are trying to sell steel castings without any detailed knowledge of their product.

An instance cited was that of a salesman who did not know the effect of the various alloying elements in steels; another did not know the meaning of tensile strength; it was just a figure to tell the prospective customer.

If this is not sufficient to interest the young engineer, the industry is interested in obtaining technically trained men to assist in foundry management. At present, most of the executives in the industry are men who started at the bottom of the ladder years ago. With the recent technological changes, men with scientific backgrounds are necessary to take over the leadership.

The foundry industry in the United States is located chiefly in the northeastern and middle western states with Ohio being the keystone of the industry. Foundries are classified in several ways; as ferrous and non-ferrous, and as production or jobbing.

Ferrous foundries produce one or more of the following types of castings: grey iron, steel, or malleable cast iron.

(please turn to page 26)

BELTLINE ——→ COMPLETION

BY WAYNE THISELL, C,4

Remember 'way back to 1940 when Wendell Willkie was touring Wisconsin? About that time you may have seen in the paper a small, obscure article entitled "Begin Plans for Madison Belt Highway."

It may not have been very interesting then, but now if you drive out near Middleton, or along the Seminole Highway south of Madison, or over near the Dutch Mill on the east side of town, you'll be amazed at the construction that has been and is being done. Take Middleton, for instance. There's a terrific grading operation going on there with turn-a-pulls, cats, dozers, carry-alls, graders and scrapers all pitching in and lending a hand.

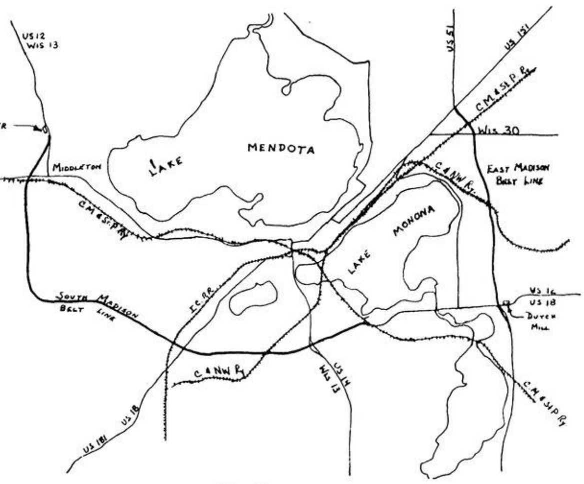
This "belt line" highway as it is called will enable the truck and passenger traffic from Chicago to the Twin Cities to skirt Madison thus easing a portion of the traffic problem of the four lakes city. The new construction is divided into two parts—known respectively by Division One of the Wisconsin Highway Commission as the "South Madison Belt Line" and the "East Madison Belt Line."

The South Line will take the truck traffic from Route 13 and divert it west around the south end of town, swing north just below Middleton and join the now-existing Route 13 near the Chanticleer. Passenger and truck traffic on U. S. 12 and 18 will use this route also. The East Line allows traffic on U. S. 51 to flow directly north from the intersection with 12 and 18 to the intersection with 151 and thence along the now-existing route. A major portion of the grading operation is completed and the temporarily graveled road from Middleton is open to traffic.

The current construction is two-lane concrete pavement offset 36 feet to the west and south of the center line of the right of way and in the future another two-lane pavement will be set at an offset of 36 feet to the other side of the center line of the right of way, thus giving 72 feet from center line to center line insuring a sufficiently wide center strip separating the two roadways.

The South Line consists of two 11-foot lanes with 8-foot shoulders while the East Road has 12-foot lanes and 10-foot shoulders. Both lines have a 5-inch gravel base course and 9-inch pavement. Engineers hoped to hold the maximum grade to 3% but at one section of the South Line they were forced to use one of 4%. Surprisingly enough not too much trouble has been encountered due to marsh but instead, the location happens over solid rock making progress slow and tedious.

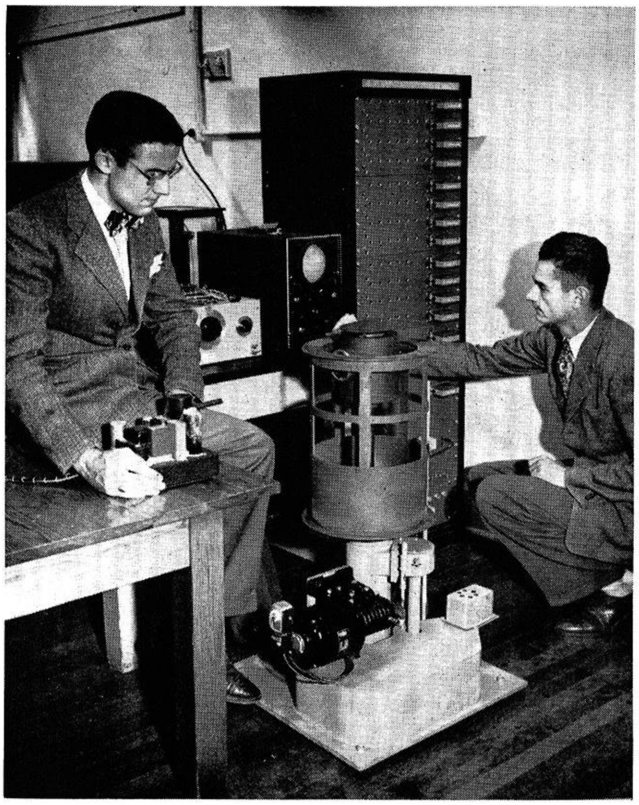
Beginning about a quarter of a mile south of the Chanticleer, the South Madison Belt Line heads south by west and crosses over highway 14 near Middleton by means of a half cloverleaf which allows traffic to continue on its way or change direction with a minimum of difficulty and confusion. It also crosses over the C. M. & St. P. on an overhead. Both of these structures are now under construction. After swinging south and east, the road meets U. S. 18 and 151 at grade, continues east along the Seminole Highway, crosses U. S. 13 and 14 by means of an interchange still in the design stage, and spans the C. &. N. W. Railway and the C. M. & St. P. Railway with overheads. The total length is 11.96 miles and yet the total cost for right of way, grading, interchanges and paving is estimated to be approximately two and one-half million dollars.



Madison

The East Madison Line commences about a half mile south of the Dutch Mill on U. S. 51 and proceeds northerly over the C. & N. W. Railway and the C. M. & St. P. Railway on overheads and intersects U. S. 151 and 51 at grade where the latter two highways now split. This project is 5.57 miles long, of which 4.6 miles are now under contract, and will cost approximately one and one-half million dollars.

That's a total length of 17.53 miles with a complete cost of four million dollars for the first stage of the undertaking. The project is being financed 50% by the federal government and 50% by the state using that which had been allotted to the county as well as its own funds. State engineers estimate that it will be 1951 or 1952 before the project will be completed and then it'll be time to commence with the second stage of Madison's belt line highway.



Research fellows C. Adler and R. W. Tate adjusting the analyzer.

research: drop counter

by richard pieri e'50

In approximately one year an accomplishment has been engineered by the cooperation of three departments which would have taken any one of the departments working alone at least five or six years.

This accomplishment is in the form of a series of operations designed to analyze the size distribution of the particles from a spray nozzle. The three departments that have their contributions in the involved pie are Chemical Engineering, Mathematics, and Electrical Engineering.

The need for the atomization analyzer originated in the Chemical Engineering department where Professor Marshall and others constantly encountered the tedious task of counting drops.

There are several accepted methods of obtaining the size distribution of particles in a spray (all of which use counting) allowing the particles to fall on a greased or magnesium coated slide, allowing the particles to make tracks on a soot covered slide, or allowing the particles to fall in a small cell containing a petroleum base solvent (such as kerosene).

Obtaining a size distribution while the particles are still in suspension would be more ideal; but, as yet, this is considerably more difficult.

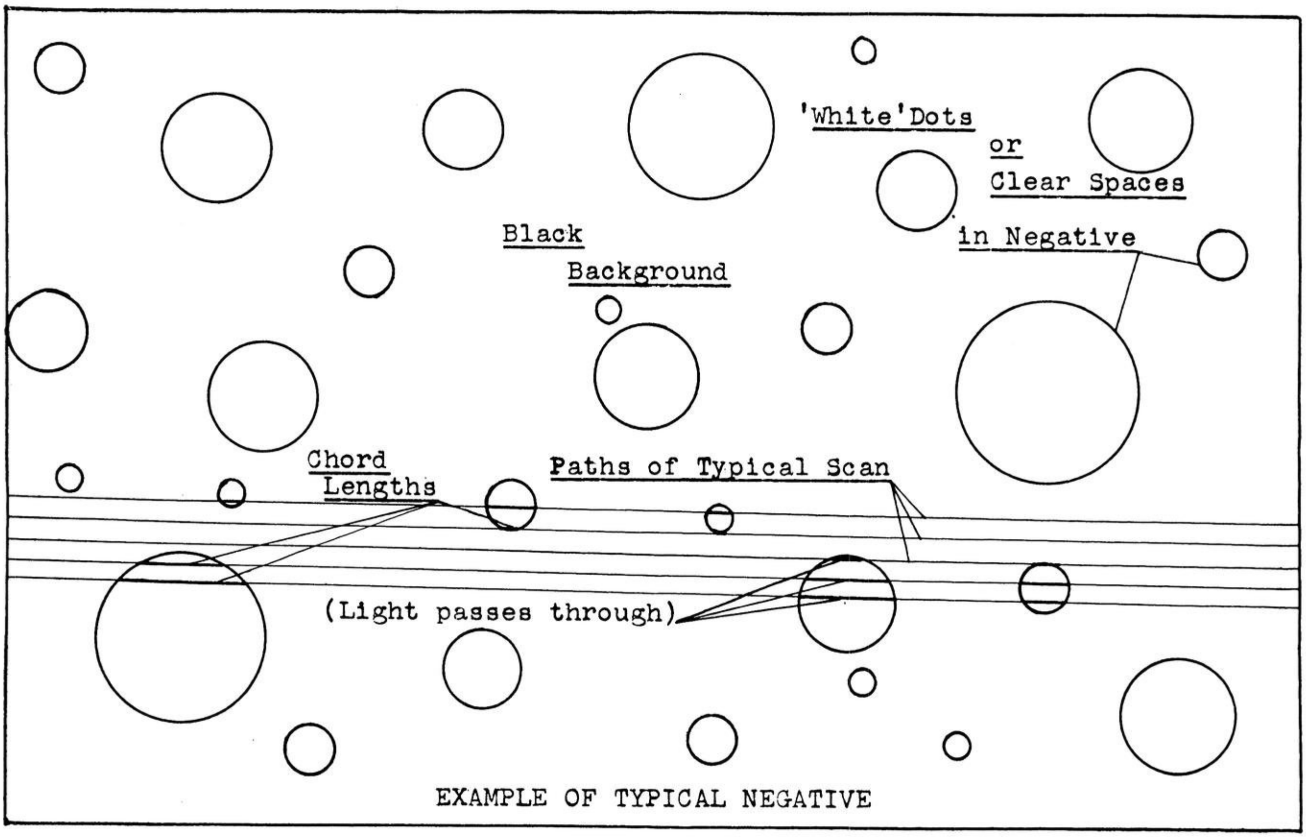
The cell method is most used by the Chemical Engineering department. After the droplets have settled to the bottom of the cell, a special Baush & Lamb camera is used to photograph the droplet pattern. To get a well defined pattern on the negative, a black dye is used for the atomizer spray. The negative is then a black background with white dots and is magnified 25 to 50 times. Despite the magnification, there are many dots in the negative which are extremely small. To get an accurate statistical sample 8,000 drops are counted.

The time consumed to insure accurate counting is about eight hours. Besides consuming time and being tedious, counting involves eye strain and patience. It is no wonder then that a method was looked for to count the many negatives that needed analysis.

At this point a little explanation may be desired to point out the importance of nozzle work and of the resultant negatives—both of which are currently increasing. Nozzles are used in every walk of life from baby food to jet airplanes. They are used for spray drying, for spray absorption, in cooling problems, in mist and dust removal, for fighting oil fires, and for fuel injection in diesel and gas engines.

The U. S. Army is seeking better nozzles for injecting the fuel into the turbo-jet engines, where a flow of three gallons per second is sometimes required.

These are a few of the myriad purposes for which nozzles of various degrees of spraying efficiency under various pressures and quantities of flow are used.



EXAMPLE OF TYPICAL NEGATIVE

The fundamental idea used for counting was conceived by the Chemical Engineering department. This idea was to mount a negative on a vertical drum inside of which is contained a light and optical system. The drum would revolve while advancing upward. The light would then pass through only the light spots (dots) on the negative and pass through another optical system to a photocell. The photocell would then transmit the light impulses of various durations into electrical impulses which would operate a counter.

Simple as the first idea sounds, there are complicating facts about the negative pictures of an atomizer spray. The drops are not of the same size nor are they arranged in neat rows ideally suitable for scanning.

This then presented the mathematical problem which Dr. A. M. Mark of the Mathematics department solved. He divided the light impulses into 15 different groups of /ʃ length long. Since chords of the drops were to be measured and not diameters, this number of divisions was necessary to present a good size-distribution curve. (An infinite number of divisions would have been required for a perfect curve.)

To illustrate Dr. Mark's principle, and the actual operation developed by the Electrical Engineering department, every chord would register in the first group. In the second group only the chords that produce an impulse of two /ʃ or more would register. In the third group only the chords that produce an impulse of three /ʃ or more would register, etc., for 15 groups.

To find out how many light impulses were in any one length group, all that is necessary is to subtract (from that group) the number in the succeeding group; i.e., to find the number of light impulses of 10 /ʃ long, subtract the number found in the 11 /ʃ group from the number found in the 10 /ʃ group. To arrive at the approximate number of dots actually having a diameter of 10 /ʃ, the number of chords of 10 /ʃ length is merely multiplied by a factor determined by Dr. Mark. Each group has such a factor to determine the number of dots having the diameter of that group.

The electrical engineering problem was the final stage of the counter. Prof. R. J. Parent developed the fundamental idea and basis for constructing the necessary apparatus.

The start of the electrical system is at the photocell. This is really a photo multiplier tube of 1,000,000 magnification. The light, of the order of micro-lumens, enters a minute hole of about 50 microns in diameter. After the multiplier tube, there is an amplification stage having a gain of about 1,000. This signal is then fed into the sorting chasis which changes time impulses into step waves. Each step in turn operates a particular biased circuit. As a last step, each biased circuit is followed by a binary scaling chain and a mechanical counter.

Although the assemblage of units has not been tested as yet, due to several mechanical difficulties in assembling, there have been only optimistic reports for the success of the plan. The actual time for counting 8,000 dots, however, will be in the neighborhood of five or six minutes compared to the eight hours at present.

Professor Parent expresses the view that the counter may find use in other studies where it is necessary to find the distribution of sizes of large numbers of items.

Activities for You

by Robert Gesteland e'52

Welcome back to the grind, gang, and a hearty handshake to the new students entered in "Engine" school.

A page this month is devoted to anyone who is not familiar with the engineering fraternities and societies at Wisconsin, particularly the freshmen.

With initials and Greek letters as prevalent as predictions on Ivy's chances, we thought that you might welcome a chance to get 'em all squared away.

It might be well to mention first that most of the societies and fraternities believe in mixing a good time with their educational activities. Programs for most of the groups consist of a speaker, refreshments, and a bull session. Trips, outings, and parties are often included during the year.

TAU BETA PI

This national all-engineering honorary has been active in the United States since 1885 and at Wisconsin since 1899.

Requiring at least junior standing and high level scholarship, it is the top goal for the embryo engineer in college. Both social gatherings and business meetings are on the docket for this year.

CHI EPSILON

Chi Epsilon is the national honorary civil engineering fraternity. Founded at Illinois in 1922, Wisconsin was the sixth chapter established. Scholarship and character are (as the time table would say) the prerequisites for membership.

ETA KAPPA NU

Theta chapter of H.K.N., honorary electrical engineering fraternity, has been at Wisconsin since 1910. Besides the usual activities the fraternity annually presents an award to the outstanding freshman electrical engineer.

PI TAU SIGMA

Founded jointly at Wisconsin and Illinois in 1916, Pi Tau Sigma is the honorary mechanical engineering fraternity. Last year the national convention of actives and alumni of the fraternity was held at Wisconsin. Each year the F. M. Young award is presented by the group to the most deserving mechanical engineering junior.

S.A.M.

This newest of the societies on our campus, chartered last year, the Society for the Advancement of Management, is a kind of hybrid mixture of engineers and commerce students. (Any and all branches of the engineering field are represented.) They meet in a domain of Comm. school, Sterling Hall, and advertise on the bulletin boards of both Sterling Hall and the M.E. building.

S.A.E.

Prof. L. A. Wilson acts as adviser for members of the campus branch of the Society of Automotive Engineers. Again the M.E. building bulletin boards carry all the dope about S.A.E. activities.

A.I.Ch.E.

The student branch of the American Institute of Chemical Engineers operates in the Chemistry building, and its activities are usually posted on the bulletin boards in that building.

Robert S. Kirk is adviser for the group. All of the professional societies provide valuable knowledge and connections which are often of considerable help after you've graduated.

A.S.C.E.

The civil engineers are represented by the American Society of Civil Engineers. Prof. James G. Woodburn advises the group and they usually post their notices in the M.E. building or the Hydraulics Lab.

I.R.E.

The Institute of Radio Engineers is also a well established national group with a branch on the campus. Devoted to E.E. students also, the M.E. building usually sports their posters and meeting notes.

A.I.E.E.

The American Institute of Electrical Engineers is also a student branch of a national organization for professional electrical engineers. Mr. J. C. Weber is adviser, and meeting announcements can be seen in the lobby of the M.E. building.

A.S.M.E.

The American Society of Mechanical Engineers under the advisership of Prof. W. S. Cottingham is obviously a group for the M.E.'s to look over. As for the preceding groups, A.S.M.E. is well established nationally and has headquarters in the M.E. building.

Science Highlights

by Donald Miller m'50

LIQUID OXYGEN CONVERTER

An apparatus for the conversion of liquid oxygen to warm gaseous oxygen has been developed at the National Bureau of Standards for use on aircraft. The converter is fully automatic, and requires no electricity or other source of power. Other desirable features are the sturdiness, simplicity of design and operation, rapid attainment of correct pressure, and economy of oxygen.

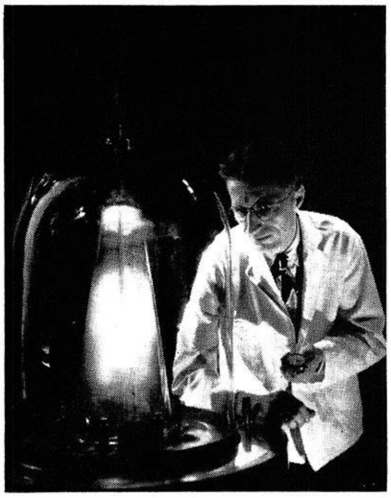
In military use of oxygen a problem has always been the returning of heavy empty gas cylinders for refilling. Using liquid oxygen greatly reduces the weight and bulk of the containers. The advantages of liquid oxygen have long been recognized, but its use has been prevented by continuous evaporation during storage and the necessity of controlling pressure for use in breathing equipment. The new design solves the pressure problem, but evaporation losses are still a limitation with small containers.

The liquid oxygen converter consists of a metal Dewar flask with a bottom drain through which the liquid oxygen flows into a coil where the liquid evaporates and expands into the space above the liquid in the flask, thus raising its pressure. Excessive pressure is prevented by the closing of an automatic bellows-type valve that stops the flow of gas to the top of the flask. Gaseous oxygen within five degrees Centigrade of atmospheric is withdrawn through another coil. The converter is arranged to permit its use in an inverted position without change in performance.

The total converter unit is 25 inches high and 18 inches in diameter. It weighs 60 pounds and holds 62 pounds of oxygen, enough for ten men for ten hours. To supply this quantity of oxygen from gas cylinders at 1800 psi would require 21 tanks of 514 cubic inches each, which would weigh 350 pounds empty.

CATHODIC ETCHING

A unique metal-etching method, never before used in industry, is being used to prepare metal surfaces for photographic and microscopic examination. The process, developed by the Ford Motor Company, depends upon the bombardment of the metal sample by ionized argon atoms.



Cathode etching of a sample at the Ford Motor Company's applied physics research department.

The technique, called cathodic vacuum etching, is as follows: The metal sample is placed in a partial vacuum with argon. Twelve thousand volts are charged into the gas, creating argon ions which bombard the metal surface and knock off minute particles.

Cathodic vacuum etching has brought an important improvement. It enables the taking of an unusually clear photograph of flow lines, which are a strata-like pattern which indicate the direction the metal flowed when forged. The flow lines were previously unseen with an acid etch. The cathodic etching method also brings out the true microstructure of the metal with greater detail and clarity.

HYPSOMETER

A new type of instrument for measuring altitudes attained by weather balloons has been developed for the Army Signal Corps.

The operation of the instrument is based on the principle that the boiling point of a liquid drops as the pressure decreases. Therefore, as the weather balloon ascends, the steadily lowering boiling point is recorded and radioed to the ground. From this information it is possible to determine the balloon's altitude. This instrument was designed to replace the bellows-type devices because they are not accurate at extreme altitudes.

The new instrument, the "hypsometer," looks like a radio tube. The heart of the instrument is a small vacuum flask which holds about ten cubic centimeters of liquid, usually carbon disulfide, because of its low freezing point. Above the boiling liquid, suspended in the vapor, is a thermistor, a delicate device which is a temperature sensitive resistor. As the vapor temperature changes as the altitude increases, so does the electrical resistance of the thermistor. This information, when received, permits the calculation of the altitude of the balloon. Heat need only be applied to the liquid once, for after the liquid has begun to boil it continues to do so for the balloon rises fast enough to keep the liquid at its boiling point even though it is steadily growing cooler. It is said that the hypsometer is accurate within 100 feet when the balloon is 20 miles up.

MEASUREMENT OF WEAR

A convenient and non-destructive method for the measurement of the abrasive wear of textiles has been developed at the National Bureau

(please turn to page 32)

Alumni Notes

by Hank Williams e'50

C. E.

Harold Ward Gardner ('05) died from a sudden heart attack on July 19 at his home in Golden, Colo.

Besides the B.S. degree in general engineering from Wisconsin, he received a Master's from the University of Kansas in 1911 and a law degree from Westminster College in Denver in 1928.

After holding teaching positions in various schools, he joined the staff of the Colorado School of Mines at Golden, in 1919, as head of the Civil Engineering department and served until, in 1930, he opened a law office.

He became interested in politics and was elected state senator for two terms. At the time of his death he was City Engineer for Golden, which position he had held for 12 years.

He was a veteran of the Spanish-American War, a Mason, and was listed in Who's Who in America.

Edward F. Tanghe ('14) has been appointed superintendent of the Milwaukee Water Works.

Millard B. Smith ('25) has been appointed assistant vice-president for operations for the Wisconsin Telephone Company at Milwaukee.

Stanley E. Binish ('29) is now in private practice as a patent attorney at Green Bay, Wis. He received his law certificate from Wisconsin in 1936 and his Master of Laws from George Washington University in 1945.

E. E.

C. B. Bradish ('12) has been appointed assistant to the Works Manager, engineering, of the General Electric Company's Schenectady Works.

Bradish joined G.E. as a student engineer in 1912 on the Test Course. In 1913, he joined the Works Laboratory, working under the late Dr. C. P. Steinmetz. A few months later, he was transferred to what is now the Control Divisions as an engineer, and became assistant designing engineer in 1924. He was appointed Engineer, Control Divisions, in 1942. In December, 1947, he was appointed manager of engineering in the Control Divisions.

Joseph Rosecky ('31) is the production and works manager of the Heil Company of Milwaukee.

(Photo courtesy G.E.)

T. C. Glenn

M. E.

T. C. Glenn ('22) has been appointed manager of the Engineering Division of the General Electric's newly-created Michigan district. He will be in charge of all application and service engineering work of the district as well as all types of installation contracts. He will also be responsible for all the Michigan district service shops.

Robert Freund ('38) is in the industrial relations department of Giddings and Lewis of Fond du Lac.

Mr. Wilfred A. Pollock has recently been promoted from Senior Test Engineer of Power Plants to Technical Engineer of Power Plants, of the Wisconsin Electric Power Co., Milwaukee.

Walter A. Zarris ('49) is a test engineer at Collins Radio Co., Cedar Rapids, Iowa.

Ch. E.

Lt. Col. Frank H. Stone ('37) has been appointed senior consultant to the Comptrollers Section of Headquarters, United States Army Caribbean, Fort Amador.

Colonel Stone has had previous service in the Caribbean area, having been stationed in Trinidad, British West Indies. Among his other assignments have been the Command and General Staff School, the Adjutant Generals' School, service at Fort Lewis, Wash.; the Presidio of San Francisco; Camp Wheeler, Ga.; Fort Washington, Md.; Camp Adair, Ore.; Camp Swift, Tex.; Fort Dix, N. J., and the European Theater of Operations.

He is a graduate of Fond du Lac High School, Fond du Lac, Wis.

Donald C. Slichter ('22) was recently made a vice-president of Northwestern Mutual Life Insurance Company. He had been director of public utility bond research for the company since 1934.

After graduation, Slichter worked for the Lake Superior District Power Company, Ashland, until 1925. He then became a partner in a consulting engineering firm of Madison and Toronto, Ont.

Slichter's present duties will be in charge of bond investments. His previous capacity was in charge of investigations and recommendations of investments in public utilities and industrial securities.

THE PROGRESSIVE KILOWATT

by Douglas G .Schinke e'50

In these days of brilliant street light illumination, electric motors for all purposes, electric toasters, electric razors, and countless other devices for our illumination and comfort, we seldom think of the humble beginning of the industry that now is the very nerve center of our country.

Out of a shaky and doubtful start in about 1880, the electric power industry has moved forward and expanded to the point where we can scarcely live without it.

Back in the 1880's the gas and oil lamps had moved into prominence, horses and buggies provided the means of locomotion with a little help from the horse car and the newly developed cable car. The streets were dimly lighted, if at all, with gas lights. The telegraph was beginning to prove its usefulness and the telephone too was coming to be realized as a potentially practical means of communication.

Problems then were not national, they were local. Each town worked out its own problems because each of the towns was more or less isolated. There were no four-lane highways then, and only those towns located on a railroad could hope to have any reasonable contact with other communities.

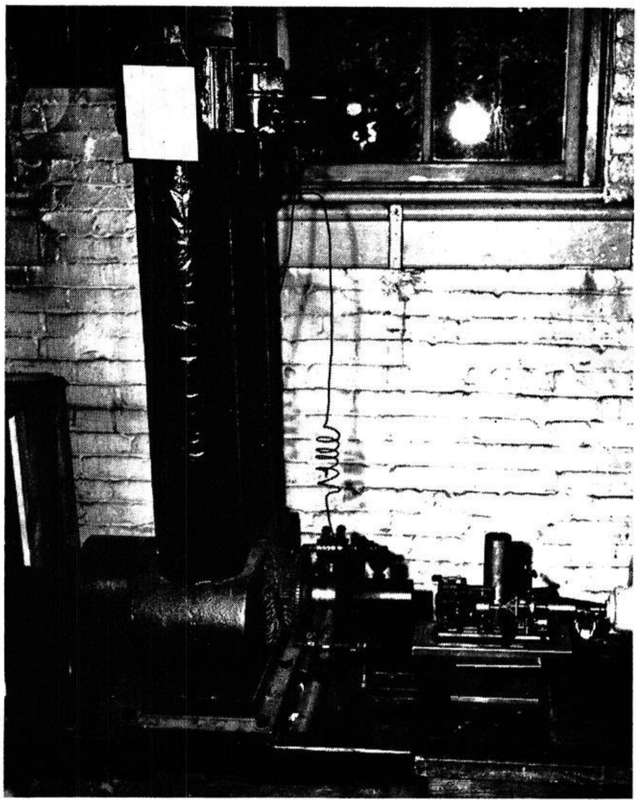
EXPANSION

Manufacturing, previously concentrated along the fall line because of the presence of water power, had now started its movement westward. The advent of the steam engine carried factories as far west as the Mississippi. The typical midwestern town was just coming into the limelight.

Once primarily a trading center, it was now on the road to being a thriving metropolis. Gas light dimly lit the downtown area, but the residential sections were in darkness except for the light of the gas or kerosene lamps that crept out of the house windows. Conveniences in the home were practically non-existent. Some food could be stored in the cellar for a few days, but keeping milk and perishables was next to impossible. The bath room was still far in the future, and the Saturday night bath in the kitchen was still the much joked about ritual. Water was heated on the crude wood range which made the kitchen unbearable in the summer. Some of the better homes had hot air furnaces with their large iron registers. Steam and hot water were coming into use in some sections.

The Edison lamp was made to replace the gas light in the homes, office, and factory. Many today think that Edison suddenly had an idea to make an incandescent lamp. This is not true. Edison's inventive genius, of course, produced the electric lighting system, but it was a group of New York business men that induced Edison to try to develop the incandescent light.

These men risked their money to provide for the experiments, which were successful only after about 6,000 attempts. They also provided the management and money to promote the adoption of this new invention in the cities and towns of the country.



Old Edison generator on display in the dynamo laboratory of the electrical engineering department. *(Foton Photo)*

The New York Times, even then a great newspaper, was among the first to install a complete lighting system. The New York streets, too, were aglow at night, a great improvement over the gas lamps. The horse was still supreme as the transportation medium, but the cable car was making its bid with faster transportation. The buildings had now reached the "skyscraper" height of ten stories. This terrific

(please turn to page 38)

ON *the Campus*

by John F. McCoy e'50

Thomas Hubbard

Robert K. Allen

THOMAS HUBBARD

On September 9, 1949, the University of Wisconsin lost one of its most outstanding students. Tom Hubbard finally succumbed from the intestinal troubles which had hospitalized him since early last spring.

A senior in Mechanical Engineering whose home was in Shorewood, Wis., Tom established an impressive record at the university. Despite the fact that he was working his way through school, he was president of his social fraternity, Phi Gamma Delta, the chairman-elect of the Society of Automotive Engineers, the president of the American Society of Mechanical Engineers, a laboratory instructor in chemistry, and a member of Polygon Board, Phi Kappa Phi, Tau Beta Pi, Pi Tau Sigma, and Hoofers.

As a freshman, he won his "W," but had to withdraw from competition due to a back injury.

In honor of his activities, Polygon Board has presented Tom's mother with a Polygon key.

Apparently Tom had been working very hard and was pushing himself terrifically when he fell ill. The Engineering College as well as his many friends wish to pay tribute to this high ranking scholar, classmate, and campus leader.

LINCOLN FOUNDATION SCHOLARSHIP

A highlight this summer was the $1,000 scholarship award to two University of Wisconsin M&M students, Robert K. Allen and Alvin H. Kasberg.

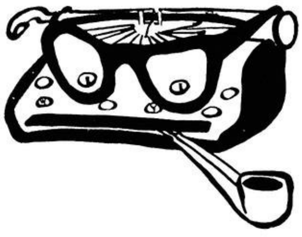
The award was made by the James F. Lincoln Arc Welding Foundation in its annual scholarship contest for papers on welding. First prize was awarded their paper entitled "A Study of the Welding Characteristics of Ampco-trode 160 and Ampco-trode 10."

In addition to the prize won by Mr. Allen and Mr. Kasberg, the university was presented four $250 scholarships by the Foundation to be used in the M&M department. These scholarships will be administered by the department, and they are to be awarded on the basis of scholastic achievement, imagination, ingenuity, and ability without regard to the financial need of the student.

Alvin H. Kasberg

The School of Engineering is proud of their accomplishment, and THE WISCONSIN ENGINEER wishes to

(please turn to page 31)



The Way We See It

FAME AND FORTUNE

Recently two University of Wisconsin students entered the Lincoln Arc Welding contest, and won; won one thousand dollars, national recognition, and, even more important, an insight into the problems and situations which arise in the field which they explored. Unfortunately however, all too infrequently does this situation arise.

No, we don't mean winning prizes and gaining glory; we mean the very fact that they entered the contest at all. Somehow, there seems to be a definite apathy toward writing papers of any kind, especially if they're not required for one course or another.

Sure, we know that you're taking eighteen credits, but then, the majority of students in the College of Engineering are taking at least that many. And, unfortunately, the majority of Engineering students probably feel as little interest in writing a paper as you do.

Perhaps you say that there are many fields in which you are not interested, or competent, enough to write an article about. But these reasons are not sufficient. In the very process of writing the paper you can develop an interest in the subject, and you will certainly know more and more about it as you progress in your search for material. No man ever becomes an expert without trying.

Then too, the ability to write a clear, concise, and meaningful technical article or report is an accomplishment not prevalent among undergraduate engineers. The experience gained in this line alone is well worth the effort put forth.

There is now a contest underway, also in the welding field, which could give many students the opportunity to "try their wings" at writing a paper of this type. This competition, sponsored by the American Welding Society, to "encourage and stimulate interest in welding", is open to all undergraduates and offers a two hundred dollar first prize. This contest would be worth entering for the money alone!

But if you're not ready for the so-called "big time" as yet, why not try some of the local student programs such as the AIEE and ASME awards for best student papers? You win a small prize and a trip to the district convention at which your paper is presented. Not a stupendous reward surely, but well worth the effort.

In fact, win or lose, any competition of this type is worth the time put into it. It's nice to win prizes too. But you can't win if you don't try.

A.M.N.

ENGINEERING NUCLEUS

Beginning this month, the WISCONSIN ENGINEER plans to step forward. We are going to give you, as readers, what you as student engineers asked for in our Reader Interest Survey last spring. More campus coverage; more semi-technical articles; and more feature articles on helpful ideas—job opportunities for example.

This should be your magazine. Undergraduates in all walks of campus life are doing the work which creates the WISCONSIN ENGINEER. The cover this month is done by an art major—an L & S student!

We want to give you a magazine which contains technical items of interest to STUDENT engineers, stories about industry and jobs, articles of current interest concerning campus and engineering school activities, and of course jokes to keep up our "reputation."

If you have a particular interest in a particular subject, come in and talk with the editor or a staff member. We want to have subjects of interest to YOU. On page forty of this issue is a short list of articles to appear in forthcoming copies. Do you like them?

The idea on the cover is that we want to be useful. It has been our purpose this month to carry this theme throughout the magazine; we hope to follow this pattern for the entire year.

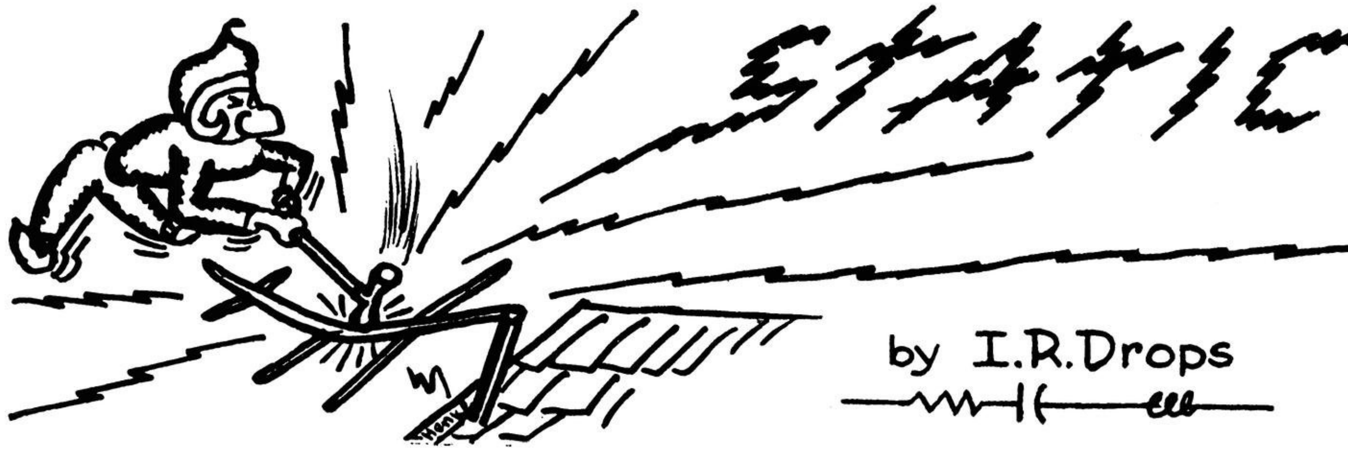
"Slipstick Chatter" appearing in the CARDINAL this year is but one of our attempts to serve the student engineers. You need some good publicity: engineers ARE leaders in society and in education.

All of the engineering societies need publicity. There are a lot of things engine school fellows do without much heralding. Notice the terrific job they did on Freshman Circus! Just watch for Campus Carnival this year.

We want to see Engine School move! You men should get doing things around the campus if you don't want to merit blasts from the CARDINAL such as on September 29.

The WISCONSIN ENGINEER is here to serve you; it is your publication, and it is going to be the nucleus of the engineering college yet! Make use of it for all of your outside activities—and then send us notices of your meetings, any up-to-date news from alumni, sharp stories or ideas, or even bring yourself if you are interested in a "Job with a Future" on the most progressive campus magazine: THE WISCONSIN ENGINEER.

R.R.J.



A cultured woman is one who, by a mere shrug of her shoulders, can adjust her shoulder straps.

* * *

She was only an aspirin maker's daughter, but you ought to see her bayer.

* * *

ILS Student: "We have a bird that lays square eggs and talks."

One and Only (for today): "What does it say, Bill?"

Intensified Loafing and Smoking Stude: "Ouch!"

* * *

Then there is the bartender in Australia who sells hops to the kangaroos.

* * *

He: "I suppose you dance?"

She: "Oh, yes, I love to."

He: "Great, that's better than dancing."

* * *

"I shall now illustrate what I have in mind," said the ILS prof. as he erased the board.

* * *

Calc. students, remember — TV = V/do.

* * *

Some girls are cold sober. Others are always cold.

* * *

She: "I'm so discouraged. Everything I do seems to be wrong."

He: "What are you doing tonight?"

* * *

My daddy's a bounder,
A dirty rounder,
His chin's all covered with foam.
I've oft heard him utter,
While stretched in the gutter,
"My gawd, it feels good to get home."

* * *

The zipper is the undoing of the modern girl.

* * *

Iceman: "Hello, son."

Little Boy: "Hey, when you say that, smile."

Lawyer: "I want a ticket to New York."

Agent: "By Buffalo?"

Lawyer: "That's okay if the saddle's comfortable."

* * *

Sign in a bar: Please sit down while the room is in motion.

* * *

Student (in bookstore): "How much is this paper?"

Clerk: "Seventy-five cents a ream."

Student: "It sure is."

* * *

Then there's the story of the unfortunate man who, night after night, dreamt that someone was tightening up his navel with a screwdriver. Every night he would awake with a terrific cramp and would be unable to get to sleep again.

After several months of this he decided, in desperation, to visit a psychiatrist. After relating his experiences to the doctor the doctor advised him to place a screwdriver next to his bed so that when he woke from his dream he could get up and loosen his tightened navel.

The man felt vastly relieved and resolved to follow the doctor's advice that very night. Following his usual dream, he jumped out of bed and began to loosen up his anatomy. Suddenly he stopped, horrified, and rushed down to the doctor's office.

After admitting him the doctor asked, "Well, what happened?"

The man said, "I did what you told me. I went to bed, had the dream, and when I awoke I began to loosen my navel."

"Yes, yes," said the psychiatrist, "then what happened?"

The man heaved a forlorn sigh and said: "My fanny fell off!"

* * *

Women's faults are many
Men have only two
Everything they say
And everything they do.

* * *

People who live in glass houses shouldn't.

Then there was the drunk leaning on a Quebec lamp post, muttering, "Can't be done . . . jesh can't be done."

When a policeman approached and asked, "What can't be done?" the drunk pointed to a large sign reading "Drink Canada Dry".

* * *

An ashtray is the place where you put your butts when the room you are in doesn't have a floor.

* * *

Engineers sure have a deep respect for age, if it is over eight years old and bottled.

* * *

"Did that course in English help your boyfriend at all?"

"No, he still ends every sentence with a proposition."

* * *

She was only a shoemaker's daughter, but she gave the boys her awl.

* * *

He married Helen.
Hell ensued.
He left Helen.
Helen sued.

A convertible top covers a multitude of sins.

* * *

"Is she a nice girl?"

"Moralless."

* * *

Webster says that "taut" means tight. I guess the fellows in ILS are taut a lot after all.

* * *

Guest: "Just straight ginger ale."
Host: "Pale?"
Guest: "No, just a glass will do."

Foundries . . .

(continued from page 12)

Non-ferrous castings are chiefly made from a copper base alloy, aluminum, or magnesium.

A production foundry turns out large quantities of a few articles, while a jobbing foundry produces as few as one item of each article. Several foundries produce castings by the centrifugal casting process, their chief product being cast iron soil pipe. The growing baby of the industry is die casting. The die casting field is limited to small articles at present, but recent developments promise rapid growth.

Foundry engineering is a branch of metallurgy. The University of Wisconsin is one of the relatively few schools in the country granting a degree in metallurgy, and is one of twelve considered to have an acceptable course of instruction in foundry.

At the present time three foundry courses are offered. M&ME 33 is a basic course required of all mechanical engineers. M&ME 131 & 137 are basic and advanced courses respectively for metallurgical students. The Department of Mining and Metallurgy is fortunate in having the up-to-date Metals Casting Laboratory, located in the rear of the M&M building.

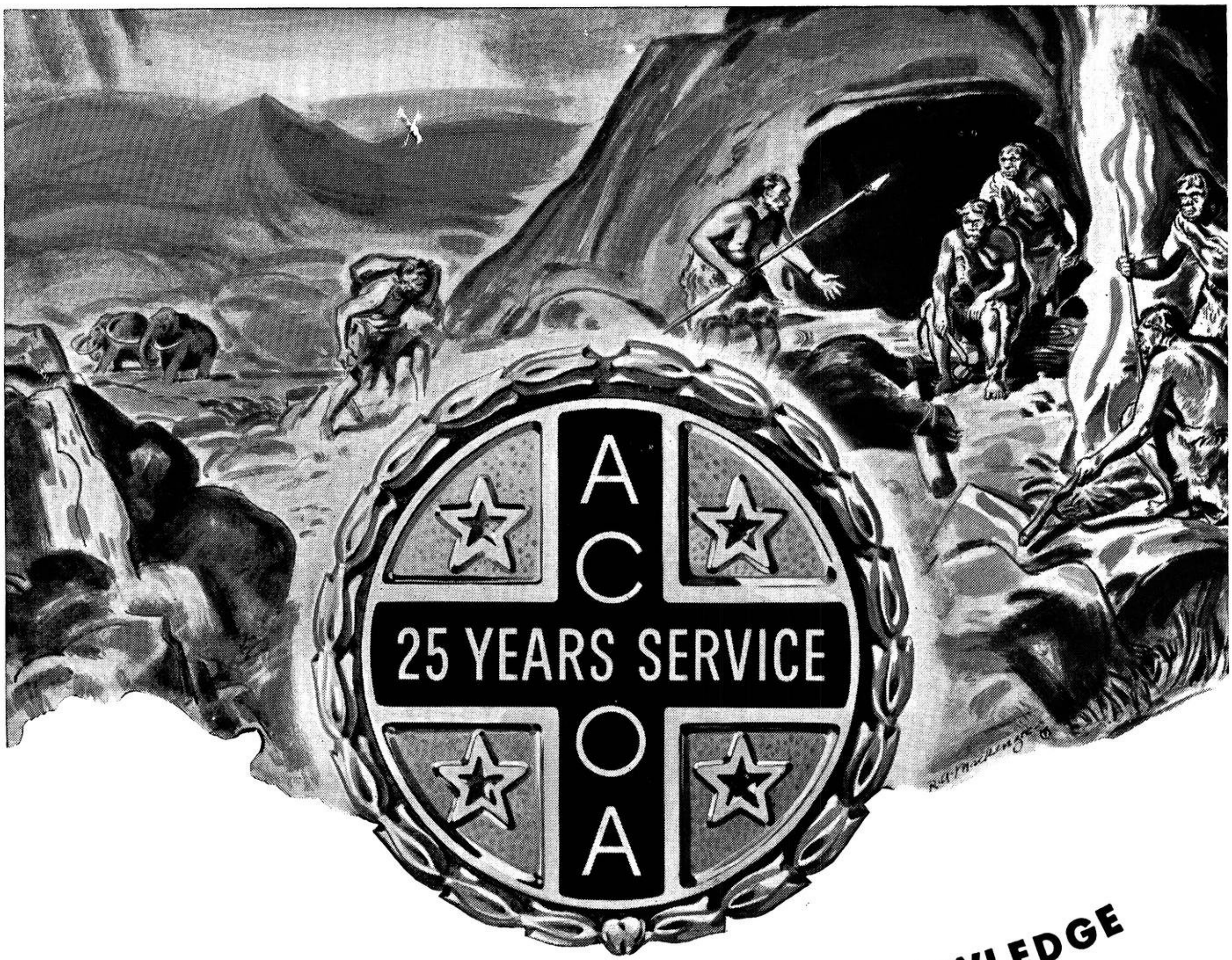
In addition to these strictly foundry courses, much information concerning castings is covered in other M&ME courses. For example, industrial alloys are studies in M&ME 133 and many of these alloys are used extensively in the foundry industry.

An indication of the great demand for engineering graduates in the foundry industry is the Foundry Educational Foundation. Several years ago several of the more foresighted men of the industry realized the necessity for technically trained men. Various foundry technical societies organized the Foundry Educational Foundation, with the purpose to encourage young engineers to enter foundries.

To aid this program, the FEF has raised $155,000 to be used for scholarships. At the present time six schools are identified with this program: Alabama, Case Institute of Technology, Cincinnati, Cornell, M.I.T., Northwestern, and Wisconsin.

These scholarships are available to junior and senior engineers, generally mechanical or metallurgical, who display an interest in foundry management and who maintain good scholastic records. They are awarded on an annual basis, the value being $500. The FEF also seeks to find employment, both summer and permanent, for those interested in foundry experience.

It is true that for many years the foundry was a dirty, tough place to work; it was a low class industry. Hard work by workers and management have turned foundries into enjoyable places to work. The foundries have seen other industries surge ahead in industrial development, but they are no longer satisfied with out-dated methods. They are moving forward.



SYMBOL OF 85,000 YEARS OF KNOWLEDGE

If you had been born 85,000 years ago and were still alive, think of all you would know about what happened on earth.

And if you had devoted all those years to working with one particular material found on earth . . . say aluminum . . . think what you would know about that.

Actually, man has known of aluminum for less than 150 years and didn't really start to use it commercially until 1888 when Alcoa started producing it. Yet in Alcoa's employ today is a group of men and women who possess a total of 85,000 years of aluminum working knowledge.

These people, 2,900 of them, proudly wear this button as members of the Alcoa 25-Year Service Club. Many have been in the family longer than 25 years. Their jobs range all the way from mill hand to president, from engineer to chairman of the board. They are a fourth of all the employees Alcoa had 25 years ago, pretty good indication that it's "a good company to work for".

But here's the most significant point: Sixty-one years ago, when Alcoa started, only five men were employed. Today about a million people have jobs in the aluminum industry, an industry comprised of: companies who produce aluminum from ore; companies who smelt aluminum scrap; others who make semi-finished aluminum products; and hundreds of companies who manufacture useful articles in which aluminum plays an essential part.

Today the same pioneering spirit that marked the founding of this industry is evident in Alcoa's laboratories, mills and foundries. Here men are developing new uses, new techniques that promise even more for the future of aluminum. ALUMINUM COMPANY OF AMERICA, Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM

ALCOA
A C O A
ALUMINUM

POLYGON BOARD

1949

by G. E. Kempke, President

"20,000 See and Smell Student Egg Battle" — "St. Pat Halts Two Hours of Warfare" — "Police Cars Drip Yolks".

Headlines such as these more than ten years ago signified the occurence of another St. Patrick's Day parade. Tradition had it, in those days, that the lawyers and engineers did battle in what was generally regarded as one of the most useless fights in the history of mankind.

Engineers traditionally held a parade to proclaim that St. Pat was one of their own. This brought the lawyers storming to halt the movement since they too believed the great man was their guardian saint.

Today, the some organization, namely, Polygon Board of the Engineering college still does sponsor a dance, a beard growing contest, and a basketball game with the lawyers in order to commemorate the occasion.

However, by no means is this the limited program of the organization. Polygon has come far since the rowdy parade days of the 1930's. It has lived through a period of semi-inactivity during the war, and like most healthy beings, has come back stronger after the rest.

In the words of its constitution, Polygon is "A central committee which can act for the interests of the College of Engineering and represent the students in their relations to the faculty." It not only sponsors those activities previously mentioned, but also smokers, expositions, job conferences and many other matters that come up before the college.

The fourteen members are elected for one year terms by their respective engineering societies. The societies are I.R.E., A.I.E.E., A.S.C.E., A.S.M.E., A.I.Ch.E., S.A.E, and the Mining club each elects two men at different times during the year. Officers of the Board are elected for terms of one semester at the end of each semester

Polygon is financially self supporting. A certain amount of revenue is gained from the annual St. Pat's dance and from any other paying event the Board may schedule. On the other side of the ledger it pays for signs, posters and booklets, and other material publicizing engineering events, the Engineering school, smokers and picnics.

The name Polygon itself is very fitting since the Board represents all sides or fields of engineering—hence Polygon—a multisided figure. The history of the organization dates from Feb. 10, 1925. Two men from each engineering society then on campus (A.S.C.E., A.I.E.E., A.S.M.E., A.I.Ch.E., and the Mining club) met to elect officers and make plans for an Engineers parade, an exposition, and a combination Engineers-Lawyers dance.

By 1934 the Board had enough prestige to submit a plan to bolster the declining subscription rate of the **Wisconsin Engineer** and to rejuvenate the College's organizations. Under this plan (the Polygon Plan) each student enrolled in the College of Engineering paid a one dollar activity fee per semester. This entitled him to be enrolled as a junior member in the professional society of his choice, and to be enrolled as a subscriber to the **Wisconsin Engineer,** and finally, to be entitled to free admission to the events sponsored by Polygon. This plan was passed in May of 1934 and remained in operation for several years. As years passed, Polygon sponsored smokers, parades, dances, and expositions until it has finally become recognized as hte only instrument for integrating the extra-curricular activities of engineers.

This year, following tradition, Polygon is planning a smoker, and a dance as social functions and is taking an active part in several all-campus activities such as the Freshman Activities Circus. In connection with the St. Pat's dance next spring, a beard growing and button design contest will be held. A Job Opportunities Conference will probably round out the year's work.

Polygon is living up to its name: the Engineering student's representative in the large sphere of University life.

Physics . . .

(*continued from page* 11)

or the physics end. Engineers interested in working for photographic companies should take courses in photography and the theory of light.

From the above it seems as if advanced physics training leads to research work. This may be over-emphasized in this article due to the author's keen interest in this phase of engineering, but the close relation of physics and engineering research can be seen in the research laboratories in the engineering schools. Usually the research workers in mechanical, electrical, and metallurgical engineering take some advanced physics courses and many elect physics as a minor to satisfy a requirement for advanced degrees. Some of the advanced students in chemical engineering and mechanics also find it profitable to elect advanced physics courses to supplement their curriculum.

III. **Am I interested in this type of work?**

To answer this the engineering student must look to his own personality and ambitions. By the time the student is a sophomore he usually has a fairly concrete idea of what kind of thing he wants to do in life. As for his personality, the student can check that at the Student Counseling Center. After checking these two points (which are vital to him in any case), the student should check his interests in his basic physics course. From these three things one can determine if he should enter into the advanced phase of physics.

IV. **What does the University of Wisconsin have to offer me in the way of a physics option?**

About five year ago, Professor L. A. Ingersoll of the Physics department made a thorough study of how other colleges and universities had integrated the topics of engineering and physics. He found that the following three methods were being employed: (1) a set of physics and engineering degrees, (2) a physics degree with engineering option, and (3) an engineering degree with a physics option.

From his experience and study of other curricula and the success of the various curricula he suggested that the last of the above mentioned plans be used. This was done. The great advocate for this plan is its flexibility. With a set engineering and physics degree too much is covered which is required for each separate degree to leave any time to specialize. With the second plan not enough time is available to get much of the basic engineering courses after getting the liberal education that goes with a physics degree.

The plan used at the University of Wisconsin enables a student to get an engineering degree with all the trimmings and have his electives and a few of the required engineering courses he is not interested in replaced by physics courses. This gives him most of the requirements of a physics degree if he so chooses or a group of courses in a selected field of physics.

With the above in mind the physics option for undergraduates was inaugurated. Its only requirement is enough credits in physics courses plus those required for the engineering degree to total 22 credits in physics. Now this is truly comparable to the requirements for a degree in physics; 32 credits of which 10 are comparable to those required for an engineering degree and courses such as "Heat and Thermodynamics" and "Electricity and Magnetism" are covered in most engineering curriculum.

From a study of the various physics courses it may be noted that a comparatively new course Physics 106 (Atomic Physics) is required for many of the other courses. Because of this and the very nature of the course—it is an introduction to many of the phases of physics—it is strongly suggested that it be chosen by students who are starting a physics option. This course is a year course and covers most of the subjects of interest to engineers. The course is taught by Professor Herb who is otherwise busy with experimental work in nuclear physics. Thus the course is extremely interesting to those students who are interested in pursuing this branch of physics.

Also of great interest to engineering students are the following courses: Physics 118 (Kinetic Theory) and Physics 124 (Mathematical Theory of Heat Conduction), which are both taught by Professor Ingersoll and have engineering applications brought into the courses. As an example the theory of the "Heat Pump" is discussed at length in Physics 124. With these courses available it seems that the University of Wisconsin is well prepared to give engineers training in physics and a degree in engineering with the words **Option in Physics** on the degree.

Campus . . .

(continued from page 20)

congratulate these two men for their achievements.

Mr. Allen is now a welding engineer with the General Electric Company in Erie, Pa., and Mr. Kasberg is enrolled here at the university as a graduate student in M&M.

Undergraduates interested in applying for this contest this year may apply through Prof. G. J. Barker, chairman of the Department of Mining and Metallurgy.

LEONARD FRANK, M&M '49

Another first prize! The M&M department has been going all out for the student paper contests. This year Leonard Frank won first prize in the undergraduate student paper contest of the Chicago section of the AIME.

Frank's paper, entitled "A Metalligraphic Study of Certain Copper Artifacts" won the $50 prize at the meeting. Despite the fact that it is still unpublished, the paper has created great interest in archaeological circles and is expected to lead to important discoveries.

Mr. Frank graduated from the university last spring and is now abroad studying in England.

ACTIVITIES CIRCUS

The College of Engineering was well represented at what was perhaps the outstanding event of New Student Week: the gala Activities Circus. The Polygon booth was prominent among the many intriguing displays which encircled the Stock Pavilion "Midway" on Wednesday evening, Sept. 14. When brief skits were not being given on the center stage, milling crowds divided to single out the booths. Each display represented the individual society's contributions in extra-curricular activities.

The Engineers' famed "Iron Man" arrived from Florida in time to dominate the scene at the Polygon booth. Armed with a huge slide rule, a St. Pat button, and a golden Polygon key, Oscar welcomed Engineers, L. & S. students, and even a few lawyers to the eight engineering exhibits.

Under the chairmanship of Jack McCoy, Polygon director from I.R.E., representatives of the professional engineering societies and THE WISCONSIN ENGINEER answered questions about Polygon, about society membership, subscriptions, and exhibits. Each freshman engineer was presented with a booklet explaining Polygon and the professional societies. (Extra copies are available in the lobby of the Mechanical Engineering building.)

THE WISCONSIN ENGINEER exhibit directed by Bob Johnson and Chuck Strasse displayed back issues of the magazine and a stroboscope experiment, thus attracting both the literatti and the scientifically minded frosh.

Kieth Jensen of the American Society of Civil Engineers manned a model of Hoover Dam and a surveying transit. The transit became especially popular when someone

(please turn to page 36)

Science . . .

(continued from page 17)

of Standards. This method depends only upon the change of capacitance of the specimen. The new method measures the capacitance, a property very closely related to the amount of material remaining in the portion of the fabric tested.

A number of other tests have been used previously such as: time required to abrade through a sample, changes in thickness, air permeability, light transmission, and breaking strength of the abraded material. These tests are not as satisfactory as they do not accurately represent wear of the fabric or they are destructive. For instance, light transmission and air permeability, although not destructive, can be changed in heavy materials by flattening of the nap, which does not represent wear, as no material is removed. The capacitance test does not alter the specimen in any way and it may be used for a complete set of data.

As the dielectric properties of textiles vary markedly with percentage of absorbed moisture, the moisture content of the sample must be kept constant by working in a conditioned room.

SKY COMPASS

A compass of an unusual design has been developed at the National Bureau of Standards. Based on the polarization of the light of the sky, the Pfund sky compass has been developed principally for use during twilight, and when the sun is several degrees below the horizon. The compass is most useful in the polar regions because of the long duration of twilight and the weakness and inaccuracy of the magnetic compass.

The light of the sky during the day is partially plane polarized, the polarization being a maximum at right angles to the incident beam from the sun. The plane of polarization at any point in the sky thus contains both the observer and the sun. Establishment of this plane also gives direction to the sun. When this has been found, all other directions may be obtained.

PISTON FITTING

In the production of pistons and cylinder assemblies, two ten-thousandths of an inch clearance is required. These close limits are not practical to follow in production, so special machines have been designed which take over the "selective fitting" of pistons into cylinder bores, a slow process formerly done by hand.

The cylinder bore is measured at four points and marked in one of eight sizes, the operation taking only a few seconds for each engine.

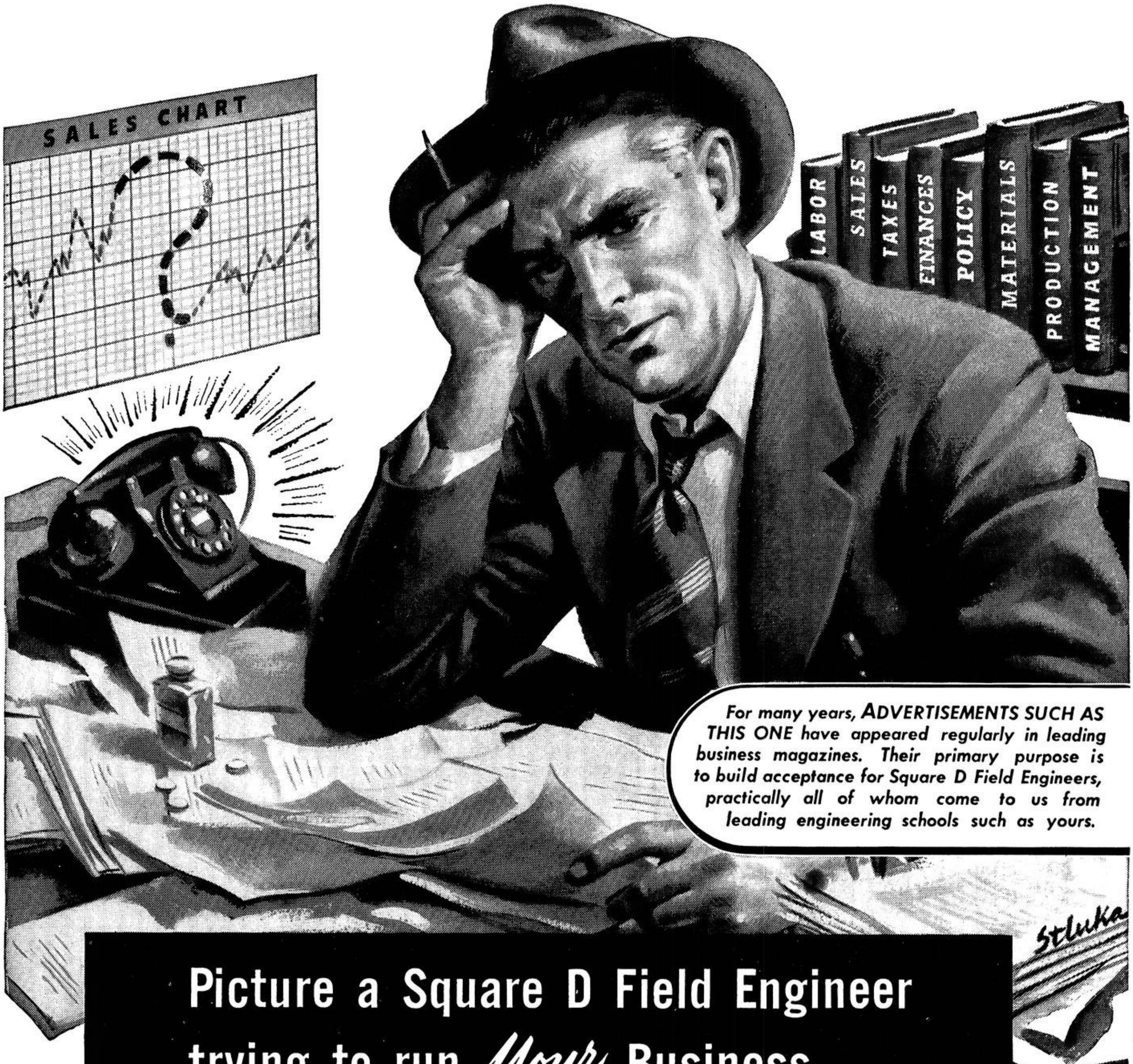
Another machine measures 500 pistons an hour and does an automatic computation to determine which size of cylinder bore each piston will match. Special conveyors then automatically take orders from the cylinder bore measuring device and carry the proper piston sizes in correct sequence for the fitting into matching bores on the engine assembly line.

CARBOLOY MORTARS

Another use has been found for cemented carbide. The use of mortars made of this metal and pestles tipped with it has practically eliminated the danger of contamination of drugs by the crushing or chipping of particles off the mortar. The carbide metal used in these mortars is the hardest metal commercially available, approaching the diamond in scratch hardness, and is far more wear-resistant than steel, cast iron, agate, glass, and ceramics that are now being used for mortars.

MORE POWERFUL PERMANENT MAGNETS

The General Electric Company has announced the development of a new permanent magnet material called Alnico 5 DG, a modification of Alnico 5, in which the crystal structure of the magnet is aligned in the direction of magnetization the letters DG referring to directional grain. As a result Alnico 5 DG will provide the highest external and residual induction of any permanent magnet material known today.



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why pick on
THE ENGINEERS?

An Editorial by Robert R. Johnson

Why hit engineers alone for specialization? A one-sided technologist is an inadequate person — similar, no doubt, to the most narrow and desiccated Ph.D. in English, or psychology.

Engineering is pointed to one of several goals:

research
development
production
sales

Each of these general branches requires specific knowledge. Modern technology is a vast field. How can a man be expected to acquire all this material, plus a thorough background in all the fine arts and social sciences, in a mere four years?

Perhaps to a greater extent than any other type of college training does the engineering curricula teach the student to think clearly, accurately, and conclusively. On top of this, the student engineer is taught to integrate theory and practice—AND PRODUCE RESULTS.

Despite this training, there is very often raised the complaint against student engineers that they are "uncultured", "narrow", "too practical", or "anti-social".

This criticism could be due to the personalities involved or to the course of studies pursued. Actually the Engineering School at Wisconsin offers unlimited opportunities in its own fields. It also has available the vast potentialities of the Liberal Arts colleges for studies in the more "broadening courses".

Should he so desire, the embryo engineer at Wisconsin can take quite a few liberal arts credits. And he can get into a great many activities at college which are very broadening and worthwhile.

But he cannot take a larger scholastic load than he already has and assimilate the material.

The CARDINAL stated on Sept. 29 that MIT and Carnegie Tech offer "fewer courses per semester and whenever possible, substitute more general professional courses for the highly technical. . . . the most important element of curriculum at MIT or Carnegie is the emphasis both put on human relations."

That writer appears uninformed and is attempting to present a bad impression of "engine" school. Both of those schools present technical material to their undergrads which is far in advance of that presented to our own students.

These schools can so operate because they are privately endowed institutions whose freshman entrance requirements are so far above those in the Big Ten that they teach their freshmen technical courses equivalent to our sophomore curricula.

Wisconsin is a state school; but the undergraduate departments of MIT and CIT are not rated above us, in either technical or cultural studies.

Compare, for example, the percentage of our total credits required for graduation in electrical engineering which are devoted to the "humanities" with MIT and CIT:

University of Wisconsin (Including open electives	11% min. to 22.6% max.
MIT (all required credits)	12.5%
CIT (all required credits)	23%

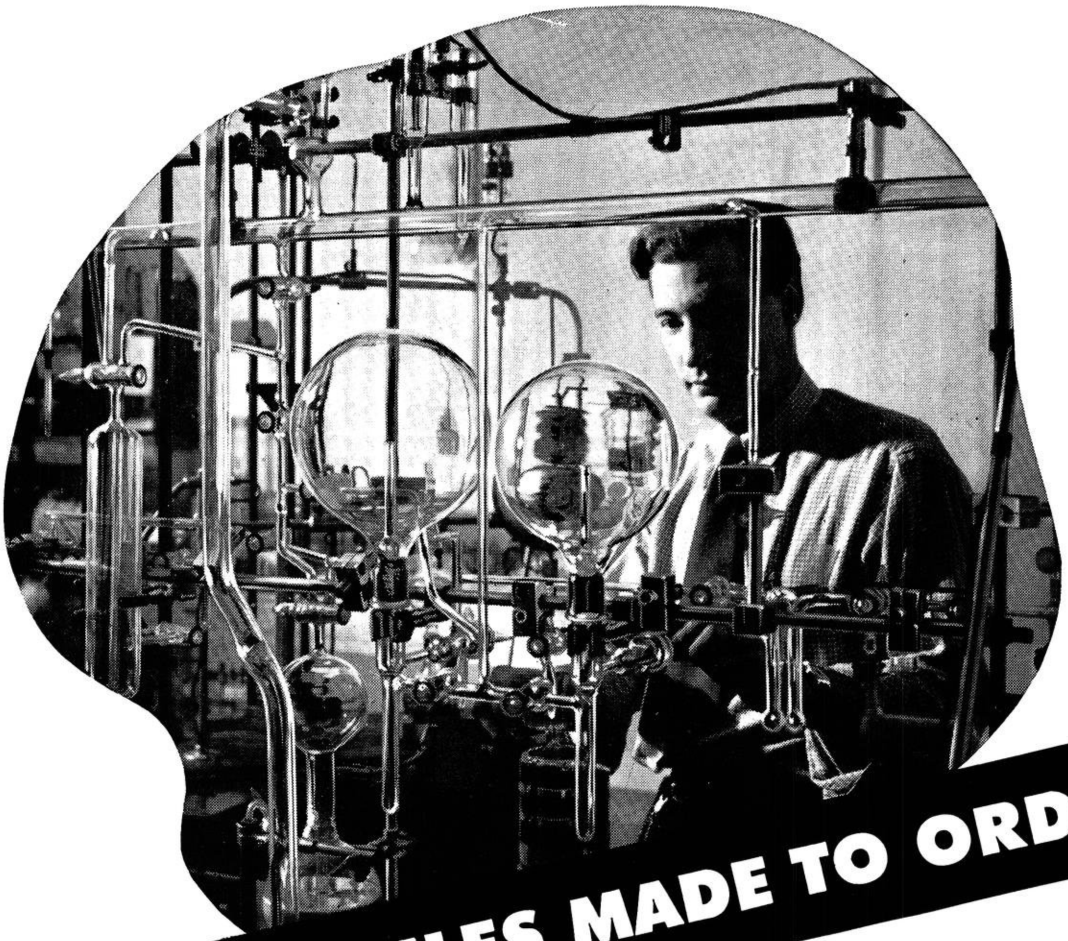
Our faculty is aware that engineers do need training in the "humanities", and much progress is being made by way of revisions in current curricula. But the college cannot do everything—you engineers must help by widening the scope of your activities.

Engineering is striving to attain professional status. What better way to get there than by giving you students a truly professional background?

Lengthen the course to five years. Better still, utilize a pre-engineering program similar to that in medicine or law. The subject matter certainly merits this treatment; why skimp on your education?

One hundred years of intensified study in technology have not brought Utopia, but these efforts have greatly improved our standard of living.

The "humanities" might help rediscover the human being and aid in curing the ills of the world, but the best results will be found when the technologists, chemists, philosophers, and psychologists all are smart enough to pool their thinking. No one group knows all the answers—NOT EVEN THE ENGINEERS.



Campus . . .

(continued from page 31)

focused on a picture of a Varga Girls posted high in the rafters at the far end of the pavilion.

The American Society of Electrical Engineers and the Institute of Radio Engineers, represented by Bill Bryan, Glenn Peterson, and Fred Kohli, joined forces to operate a hearing-response demonstration.

Clyde Plaskett and Roy Eisenhower of the American Institute of Chemical Engineers were responsible for the popular and colorful Ch.E. display, an apparatus designed for studying the effects of scale formation on the rate of evaporation. Clyde had developed a three-minute lecture, and bronchitis by the end of the evening!

The Society of Automotive Engineers and the American Society of Mechanical Engineers sponsored the exhibition of the sectioned, radial aircraft engine which appeared in a photo on the front page of the Daily Cardinal's special Orientation Week issue. Bob Wilson, George Drew, Bruce Roberts, and John Liebman were on hand to talk engines and professional societies to the M.E. freshmen.

Gil Kempka and John Helm of Mining Club introduced circus-goers to the mining and metallurgical arts with a selection of mineral samples displayed under microscopes. Here, as with other exhibits, audience participation was the keynote.

A.I.E.E.-I.R.E. MEETING

Fall activities for the E.E. professional engineering societies were initiated on Sept. 28. The U. of W. branch of the American Institute of Electrical Engineers met at 7:30 p.m. in 105 M.E. At 8:30, the Institute of Radio Engineers' Student Branch met in the same room. Following the I.R.E. meeting, movies were shown.

A.I.E.E. officers for the 1949-1950 term are: Bill Bryan, Chairman and Polygon Director; Floyd Peronto, Vice-Chairman; Vic Hermann, Secretary-Treasurer; Bob Dickinson, Polygon Director. Prof. Vincent C. Rideout is Faculty Advisor.

Members of the I.R.E. Executive Board are: Chairman, Glenn Petersen; Vice-Chairman, George Hurlbut; Corresponding Secretary, Roy Harris; Recording Secretary, Charles Navratil; Polygon Directors, Fred Kohli and Jack McCoy.

DIESEL ENGINE CONVENTION

The Diesel Engine Manufacturers' Association under the direction of Harvey T. Hill of Chicago held a symposium from August 29 to September 3 on the University of Wisconsin campus. The meeting was the second of a six-year program to improve the quality of men entering the Diesel field. More than 200 representatives of the Diesel industry and of the engineering colleges met to discuss the problems of industry and instruction.

P. Kilowatt . . .

(*continued from page 19*)

height was due, in no small part, to the development of the steam hydraulic elevator, the primitive forerunner of our electrically driven high speed elevators of today. These old elevators were crude affairs with their frightening noise of escaping steam, clanging cables, and grinding gears, but they were a starter for what we have today.

The smaller towns, too, soon came to know electricity, as pioneering people supplied their time and money. Most of the first generating plants were midgets indeed, compared to our modern installations of today. One and sometimes two Edison direct current generators supplied power and lighting service. In most cases steam engines supplied the motive power for the generators, since few towns had access to water power. Street lights were usually the first installations, followed closely by lighting in stores and houses. The downtown sections were the first to have electric service. Many people were skeptical about this new system of lighting. In 1896 the gas companies developed the incandescent gas mantle. This pure white light, many said, would end this nonsense about electric lights. It wasn't long, however, before the manufacturers came out with new light bulbs of much improved quality, and electricity was here to stay. The old horse-trolley lines soon began to convert to electricity. Yes, electricity was becoming more popular every day. More business places and homes started clamoring for this power that flows in wires. Many of these would-be customers were on the outskirts of the cities and thus, quite some distance from the downtown generator plant. Direct current was too costly to transmit this distance and it was much too costly to operate a number of power plants, due to the small load in most areas. Alternating current with its more economical method of transmission using voltage transformation was the answer. The steam engine was fast being outdated and the turbine moved into replace it. Faster speed, less bulk, and more efficiency were all points in favor of the steam turbine.

Lighting was the principal service then. Houses were wired in a crude fashion; the wires were usually run along in slots in wooden boards and another board was nailed over the slot. Floor and wall outlets were unknown in those days, but an adapter plug was developed to fit in the electric sockets. The electric appliances then were crude electric fans, hair curlers, and electric irons.

INDUSTRY MODERNIZES

Another step in the expansion of the electric industry was soon to be taken. This was the electrification of industry. Up to this time steam engines supplied the industrial power, which was transmitted through a maze of drive shafts, pulleys and belts to the individual machines. The first move was to substitute electric motors for the

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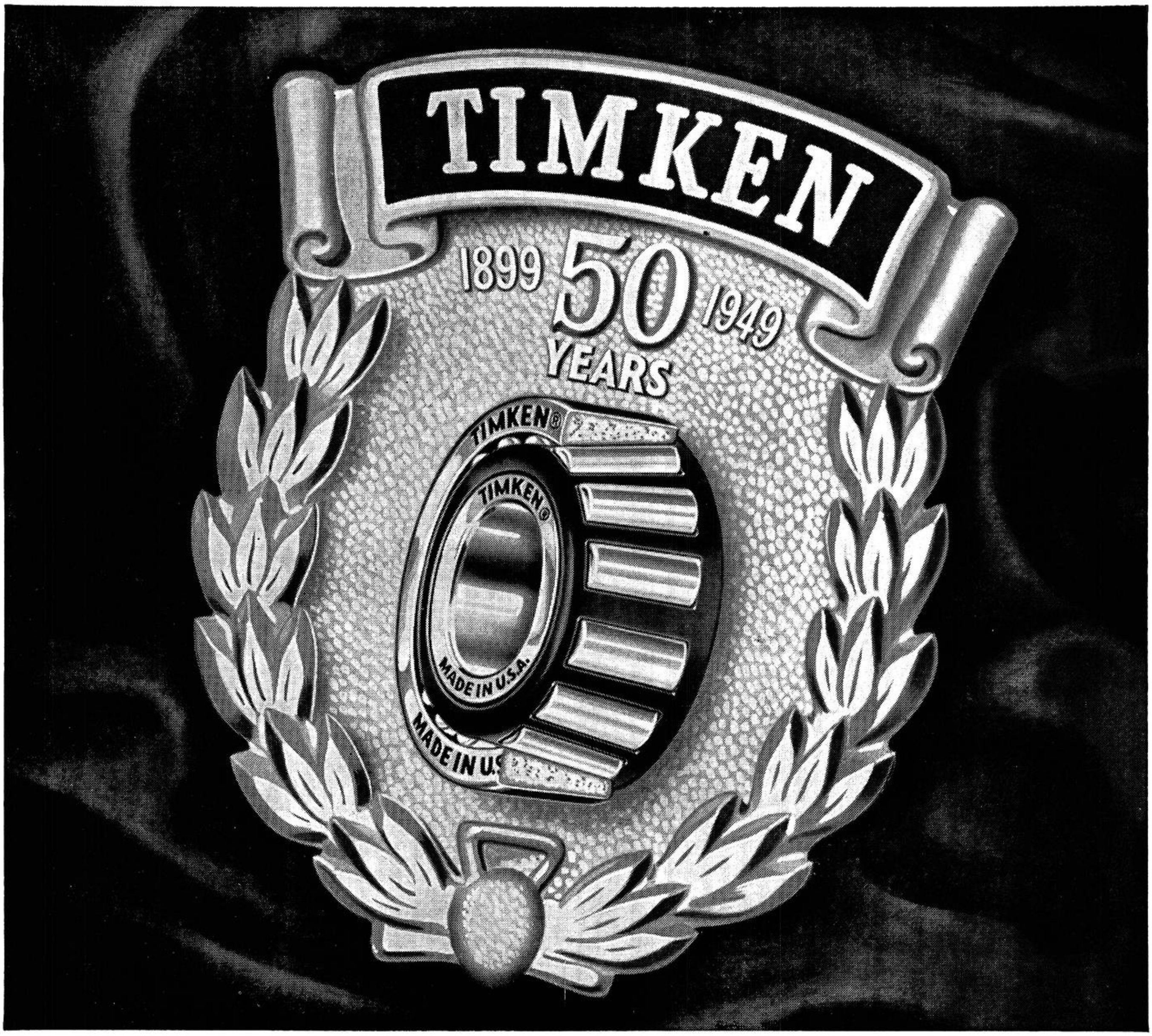

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Experience over the years has shown Timken products to be the finest in their respective fields. And many thousands of men and women are working hard to keep them that way. No wonder it has become a habit throughout industry to look for the trade-mark "TIMKEN". The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

Volk . . .

(continued from page 9)

courses in Engineering and he received his B.S. in Electrical Engineering in June, 1908.

As General Electric Co. promised him a job in its testing department, but was not ready for him by September, he took a job teaching Mathematics and Geology in the Marquette (Mich.) High School. The boys' athletics were also assigned to him as his part of the extra-curricular activities of the school.

He went to work for the General Electric Co. at Schenectady in July, 1909. His age and practical experience helped here and he was soon put in charge of a squad. He was later assigned to the testing of generators, converters, and motor-generator sets of 300 KW capacity or over. That summer he took a vacation to come to Wisconsin to be married.

He was married to Cora E. Morse at Ripon on August 24, 1910. They made the traditional visit to Niagara Falls on their way to Schenectady where they expected to remain for at least a year. When they reached Schenectady he found a letter from Dean Turneaure offering him a job as librarian of the College of Engineering. He accepted and was back in Wisconsin ready to go to work October 1.

Before 1910 there was a reading room in the Engineering building with a few reference books and some current engineering magazines. That year a large wing was added to the west end of that building which is now known as the Education and Engineering building. In the remodeling the reading room was enlarged to a seating capacity of 96 and a stack room was provided with a capacity of about 12,000 volumes.

There was plenty of room at the start but this was the beginning of a rapidly increasing volume of technical literature. New storage space was soon needed and it has been necessary to make extensive additions to the stacks about every ten years. The library has now grown to more than 40,000 volumes.

When Professor Volk came here in 1910 it was proposed to create the Engineering Library as a branch of the University Library, by moving all the technical engineering books and periodicals to the Engineering building, and adding the necessary indexes, encyclopedias, dictionaries, and a sufficient number of the best books in the general sciences of physics, mathematics and chemistry to make a working library.

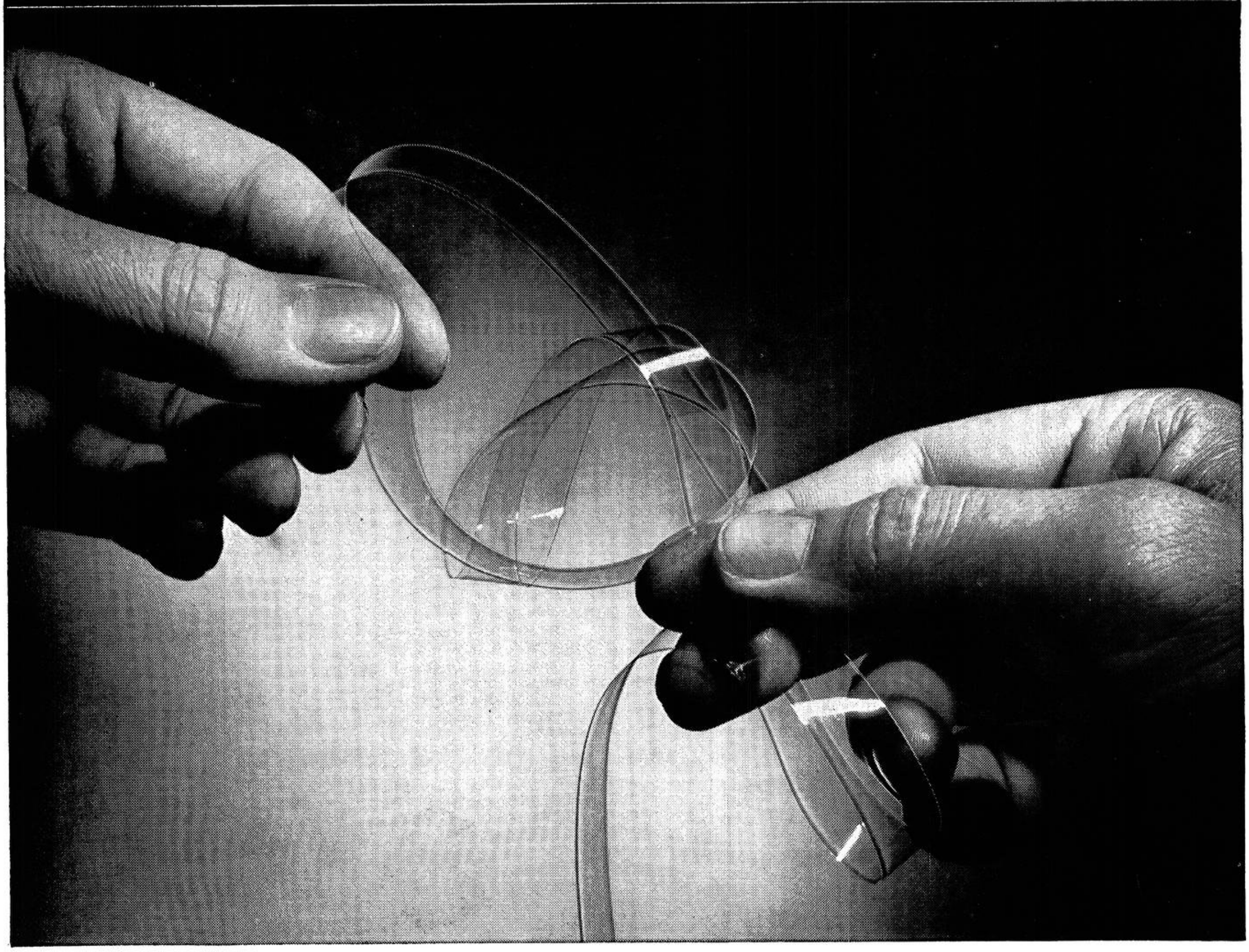
When he came to put this plan into effect, Mr. Volk had no experience in library work. Fortunately the building was still under construction and was not ready for occupancy until February, 1911. That gave him time to familiarize himself with library methods and practice by working with Walter M. Smith, the librarian, Miss Harriet Coddington, the head cataloguer, and other members of the staff in organizing and equipping the new branch library.

With everything ready, and a student assistant, Mr. Clarke Richards, the equipment and books were moved in during the recess between semesters and were all ready to go on the first day of the second semester in February, 1911. How the move affected the use of books by students could not be checked, for there were no long records of such use. But the records of faculty members were kept on large sheets covering a long period. Comparing the records of this semester with the records for corresponding earlier semesters showed an average increased use of 50%.

Among other activities Professor Volk was secretary of the Engineering College faculty for 25 years. He was a member of the Board of Directors of THE WISCONSIN ENGINEER about the same length of time, being faculty adviser to the student staff for several years. He resigned from the Board of Directors to make a place for a younger member of the faculty, and the rush of library work after the war made it necessary for him to ask to be relieved of his duties as faculty secretary, and also from membership on the University Committee on Student Loans and Scholarships on which he had served for several years.

He has been a member of the Madison Technical Club since it was organized. He was president of the Nakoma Homes Company from its incorporation in 1920 until its functions were taken over by the city when Nakoma was annexed to Madison; and he has taken an active interest in other community affairs.

Mr. Volk was made an assistant professor in 1915, and associate professor in 1927. Since June 30 he has been serving part time on an emeritus basis.



P. Kilowatt . . .

(continued from page 38)

steam engines. The second big move, which did not come until many years later, was individual motor drive for each machine. The rental plan was first used by power companies to induce industrial plants to use electric motors. Price ranged from $2 a month for dentist's drill motor to about $100 for one that would turn an industrial plant's drive shaft.

As electricity came to be used in new applications consuming varying amounts of power, the problem of charging the customers for their exact power consumption arose. Only the large direct current accounts had been metered in the past. Flat rates were charged for all lighting service; even the metering of these larger accounts was somewhat of a problem. The Edison chemical meter was used. These meters were small bottles with two-inch zinc plates in each bottle. The zinc plates were weighed after a period of service and the loss in weight was used to determine the quantity of current used. Both alternating and direct current services must be metered to give the customer a fair deal. The kilowatt-hour rate was brought into use, employing the same type of sliding rate schedule that we know today. The first rates were about 15 cents for the first block of kilowatt-hours and about eight cents for the rest.

The growing pains of the power industry were evidenced in still other ways. The demand for daytime service increased due to things like electric irons, which housewives wanted to use during the day. Service in the past had been confined to the twilight and dark hours of the day. Twenty-four-hour service became a must, and has remained so since the early 1900's.

This was the age of superlatives. People spoke of buildings in terms of height, the 47-story Singer Building being considered a great wonder. Automobiles were classed in terms of maximum speed. The new high speed-high lift electric elevators and the electric railway and interurban communication helped fill the people's demand to "Get there quick."

The manufacture of artificial ice, which was often combined with the early electrical plants, had become an industry in its own right. Refrigerated cars now made fresh foods available the year around. The field of recreation also offered new possibilities for electrical use. Moving pictures, night boxing, band concerts in the evening, carnivals under the lights, and even outdoor sports lighting became realities with the use of electricity.

Very few people knew much about electricity and how it worked. This is illustrated by the customer who called up the power company for an immediate light bulb deliv-

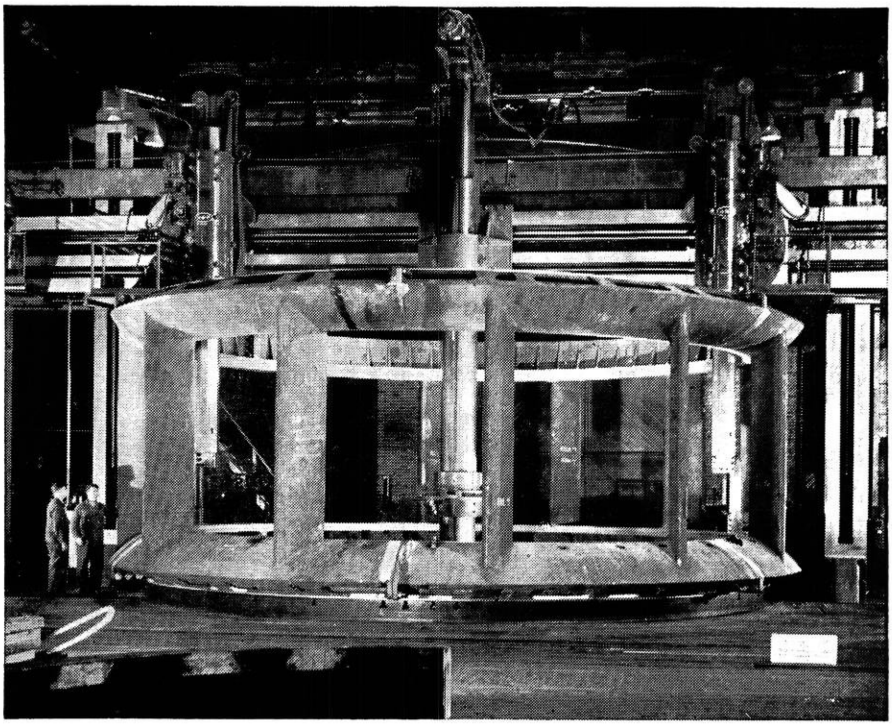
(please turn to page 44)

BUILD the basic machines of an industrial world!

by CARL MALMBERG
Superintendent, Tank and Plate Shop
ALLIS-CHALMERS MANUFACTURING CO.
WEST ALLIS WORKS
(*Graduate Training Course—1930*)

PRODUCTION METHODS have become a good deal more technical and complicated in the last few years. There is a big difference between the way we do things now and the way we did them when I left the Allis-Chalmers Graduate Training Course to work in the machine shop in 1930. That is why there are more and more opportunities in the manufacturing end of the business for young engineers who get a thrill from watching a project grow from a roll of blueprints to a big electric power installation or machinerv for a giant processing plant.

CARL MALMBERG



Machining speed ring for a 55,000 hp turbine on a 40' boring mill, one of the largest in the country. Many A-C machines and methods are unique because of the tremendous size of work pieces and wide variety of operations required in building the world's greatest range of industrial equipment.

Close Coordination

In my section of the shop we specialize in fabricating machines and parts from sheet and plate steel. We work closely with the design engineers to develop the most economical way of producing their designs and we do much designing on our own. We work closely with every other manufacturing department, because more and more Allis-Chalmers products are being designed to replace cast members with welded members, and in my work we do the welding for the whole plant.

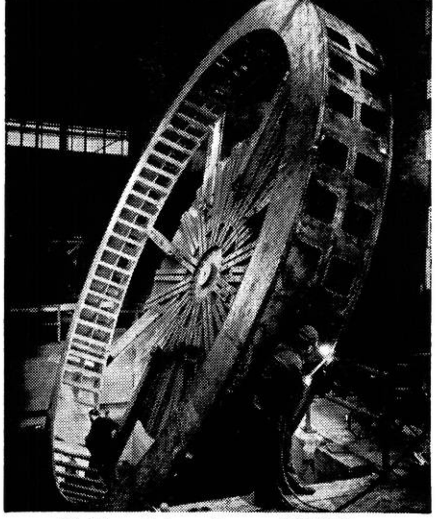
One recent interesting project was the fabrication of stainless steel buckets for impulse-type hydraulic turbines to replace the old cast-type buckets. Working with design engineers and hydraulic engineers, our tank and plate specialists developed a design and method of manufacturing that produced buckets with several times the life of the old type.

Opportunities Everywhere

New developments in every department mean almost endless opportunities for young engineers. Right now, the erection shop is building a big crusher for processing taconite in the Mesabi range, and we are supplying most of the other ore processing equipment for this gigantic plant, too. At our Norwood plant, engineers have completely rebuilt the production system on motors and small pumps for greater efficiency and lower costs.

In fact, here at Allis-Chalmers there are big opportunities for young engineers in all phases of engineering work—design, research and development, manufacturing, sales and erection—in nearly any industry you can name. For Allis-Chalmers builds primary equipment for electric power . . . mining and ore processing . . . pulp and wood products . . . flour milling . . . steel . . . agriculture . . . public works . . . for *every* basic industry.

The thing that influenced me most when I left the University of Illinois to join Allis-Chalmers, was the tremendous breadth of opportunity. Some of my friends from that GTC class of 1930 are sales engineers now, some are design engineers, some have traveled around the world with erection crews. I chose manufacturing because I like to see things take shape before my eyes. I tried a good many things before I made my choice and my choice has been good.



Welding stator yoke on 38,889 kva hydraulic turbine-driven generator.

Write for details of the Allis-Chalmers Graduate Training Course—requirements, salary, advantages. Representatives may visit your school. Watch for date.

Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin

A-C ALLIS CHALMERS

ALLIS-CHALMERS

P. Kilowatt . . .

(continued from page 42)

ery. "I'm not blaming you," he said, "but some blankety-blank stole the bulb right out of the socket and I want to get it plugged up right away before any more juice leaks out. The way you folks charge I can't afford to lose any."

The power industry had now reached the age when its main problem was not to convince people to use electricity, but to find ways of supplying the demand for power. Many of the early generating plants had begun to wear out; the equipment was in need of constant repair. Each city had its own plant and since there was no interconnection between the individual systems, long delays resulted when equipment went bad. Some small villages along the interurban line were taking service from the trolley. This caused their lights to dim and flare with each passing train. In some towns things got so bad that people had to go back to kerosene because the power company could not afford to replace the worn-out equipment.

The answer to this problem was not only interconnections of the present systems but in consolidation of the companies in order to amass enough capital to build new generating plants, transmission lines and distribution lines to make reserve power available in the event of an emergency and prevent long and frequent delays. Power companies now began to assume the proportions of large corporations. Stock and bond sales were on the increase.

The consolidation brought immediate advantages to the customers. Service was much better and soon the rates were reduced. The expansion program was now begun all over again, this time on a much larger basis. The electrical demand for the average home in 1910 was about 15 kilowatts per month. Power companies began to step up their sales programs. More appliances in the homes meant larger loads and more money for the industry. The tungsten bulb came out about this time and pushed into obscurity the last of the gas mantle lights. However, women were still somewhat afraid of this thing that was called electricity. Many were afraid to use an iron when it was plugged in; salesmen often found the irons they had left for trial being heated on the stove with the old flat irons. There is the story about one hardy salesman who apparently had the key to the problem. After his iron demonstration he would unscrew the plug (remember that there were no wall outlets then) and say, "And now, to show you that there is no serious danger in electric ironing." Then he stuck his finger in the socket. This generally assured the sale. Other appliances too were sold, not all in such a crude fashion, however.

By this time industrial engineers had come to realize that electricity could do things faster and more economically than any other kind of power. Electricity was put to work welding and cutting metals, melting and alloying metals, tempering steels, reducing chemicals, baking enamels, and simplifying the loading, storing, and transportation problems around the plant. This made possible the lowering of the prices of many industrial goods. Mass production increased in popularity with the industrialists, and the automobile was brought within the price range of the average family. Still closer to electricity itself was the radio. Probably no other device in modern times has brought such relaxation and enjoyment to the average American.

By 1920 the customer's confidence in the power industry was established, shown by the ease with which the companies were able to sell stock. The story is told about one middle-aged woman who came into a company office carrying an ordinary market basket. It seemed, by her appearance and conversation, that she might buy one or two shares. She promptly announced that she wanted 130 shares at which point she dumped $13,000 out of the basket onto the table. Scattered through the money were several dozen moth balls. With this continued confidence in the power industry, electricity became more and more connected with everyday American living.

This was the age of the holding company. In the power industry, as in many other industries, these companies were formed, and although the holding companies were later put out of business by the government, they did seem to help the power companies when they needed it most. The power companies were able to obtain top-notch technical and consulting men to aid them in their broad planning. New generating plants were proposed and built. Transmission facilities were expanded. The inter-system connections were being developed to interchange power and obtain the maximum economy from the generating plants, in addition to their use in emergencies.

Rural electrification was slow at first because the farmers did not see the advantages of electricity. Once they were convinced that electricity was practical, as well as ornamental, the power companies had difficulty keeping up with the demand. The problem was largely economic as rural electrification had to pay for itself as it expanded. The power companies had to start from scratch and the urban customers could be assessed for the cost of electrifying farm areas.

Public service commissions or their equivalents now controlled the rates of the power companies. The rates were adjusted so as to give the power companies a fair return on their investment in their generation, transmission and distribution equipment. Some people just didn't understand electrical rates. Public relations departments were established, whose sole business was to deal with customers and inform them on matters like rates.

The depression came, and while many industries became panicky and unsteady, the power industry, due to good management and sound economy, came through practically intact. They were able to participate actively in the recovery program. The part of the power industry in the late war is within the memory of all of us. Post-war expansion has been tremendous. Now, today, we see an industry that may double or triple in the next decade and it all started and grew because of . . . well, it is hard to say in a few words, but I guess most of America helped.

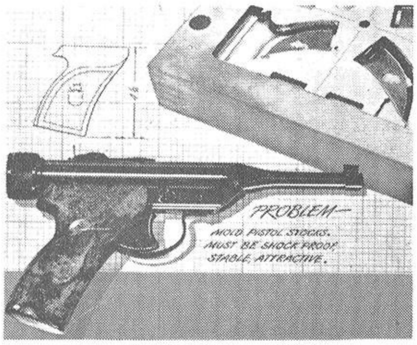
. . . a great name in research with a big future in CHEMISTRY

PLASTICS—A MULTIMILLION-DOLLAR INDUSTRY AND STILL GROWING

"Plastics" to most people connotes something modern—something new. And the plastics industry, as it now exists, is still an infant, but a lusty and vigorous one.

How fast it has grown in a short span of years is indicated by these figures, which show the number of plastics molding plants in the United States in the last thirty-nine years:

1910	8 plants
1920	63 plants
1930	172 plants
1940	575 plants
1949	1,160 plants (estimated)



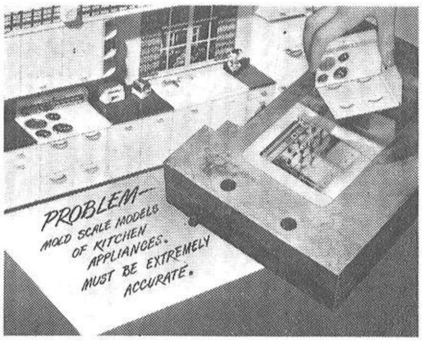
The Ancients Molded Plastics

But the art of casting "plastic" material in molds is an old one. As long ago as King Solomon's time, asphalts and mineral tars were being molded into useful shapes.

These natural molding materials were the only ones available for centuries—until the invention, in 1869, of the first modern synthetic plastic, celluloid. Today the plastics industry makes dozens of synthetic materials with a wide range of molding characteristics.

General Electric entered the plastics business more than fifty years ago by molding carbon rods for arc lamps from clay and lampblack. Later, G. E.'s plastics operations expanded rapidly, when plastics began to be used extensively in electrical insulation.

As General Electric's plastics operations grew, it became practical to offer plastics services to other companies.



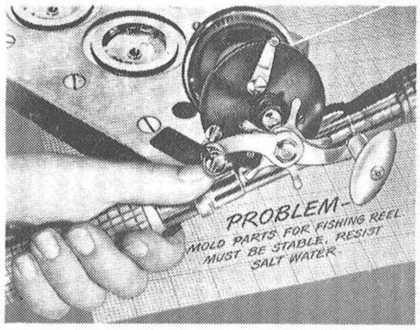
Now General Electric is unique in the industry, being both a manufacturer of plastics molding materials and one of the world's largest plastics molders.

G. E. provides a complete plastics service. It has facilities for producing special types of molding compounds and for designing, engineering, and molding any kind of plastics part or product.

You may breakfast at a dinette table with a surface of G-E Textolite* (a laminated sheet plastics); your toaster may have a base of plastics, molded by G. E.; the breakfast service may be G-E plastics plates and cups in beautiful pastel shades. Your automobile, your refrigerator, your radio, your camera—all are likely to incorporate plastics parts produced by General Electric.

The Scope of G-E Chemical Department's Operations

Molded plastics are just one part of General Electric's Chemical Department's operations. Other products made and sold by the Chemical Department include the amazing new materials of organic-silicon chemistry called silicones, Glyptal* alkyd resins, insulating varnishes, permanent magnets, and plastics molding compounds. Every month new chemical developments are coming from the G-E research laboratories. And the variety and scope of G-E chemical operations promise to broaden tremendously as this research progresses.



For more information, write Chemical Department, General Electric Company, Pittsfield, Massachusetts.

A message to students of chemistry from

F. W. WARNER

Engineering Manager of the G-E Plastics Division

The rapid growth of the plastics industry in the last ten years offers us some idea of the progress we may expect in plastics within the next decade. For a young man who wants to "grow up" with a rapidly expanding business, the field of plastics seems to offer particularly attractive opportunities.

*REG. U. S. PAT. OFF.

GENERAL ELECTRIC

CD49-B2

PLASTICS • SILICONES • INSULATING MATERIALS • GLYPTAL ALKYD RESINS • PERMANENT MAGNETS • MOLDING COMPOUNDS