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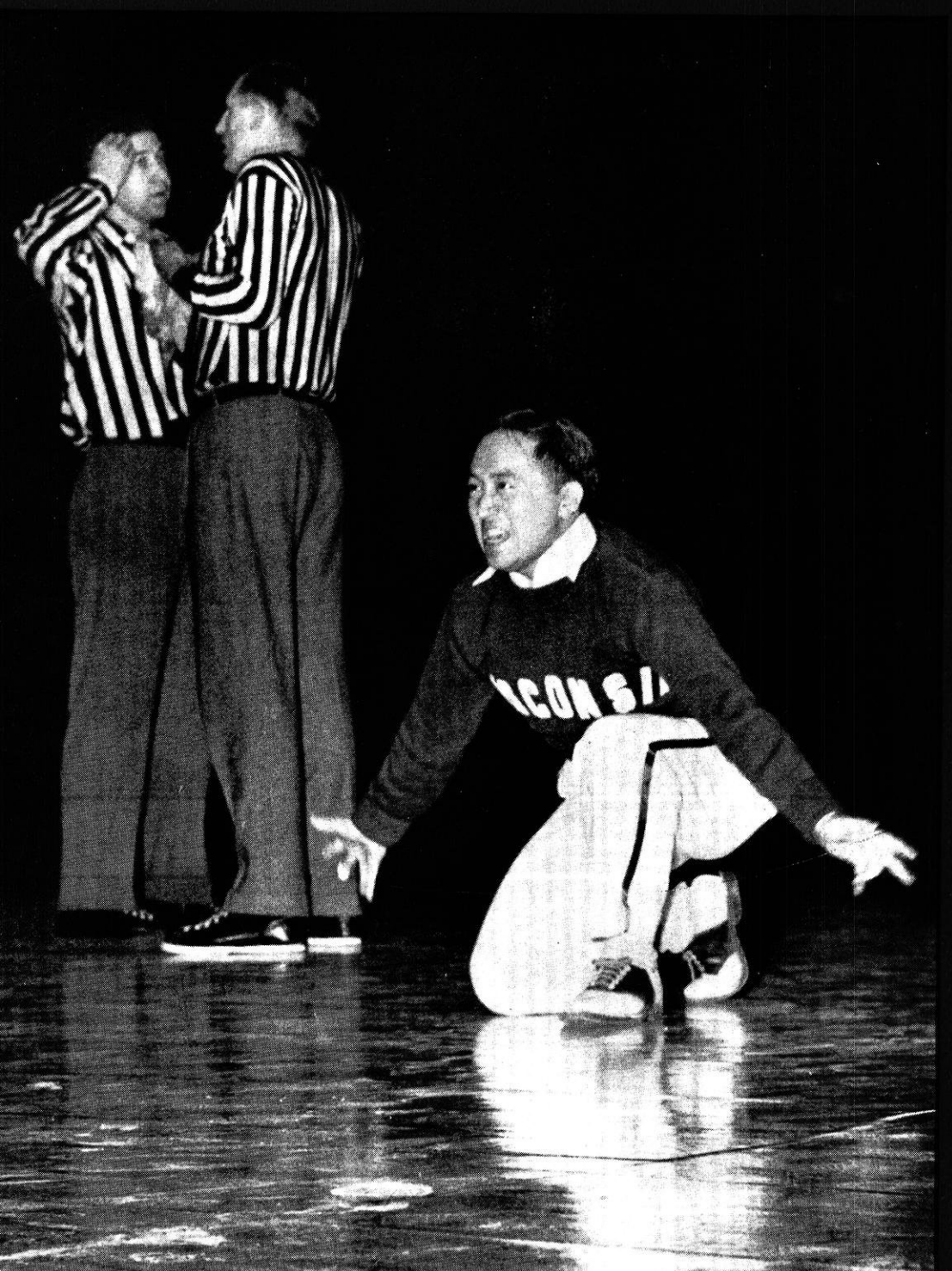
engineer



March, 1948

In This Issue:

Heat Power Lab.

Miniature Ball Bearings

WKOW

On the Campus

Wisconsin's Iron Mines

Engineering Social Report

15¢

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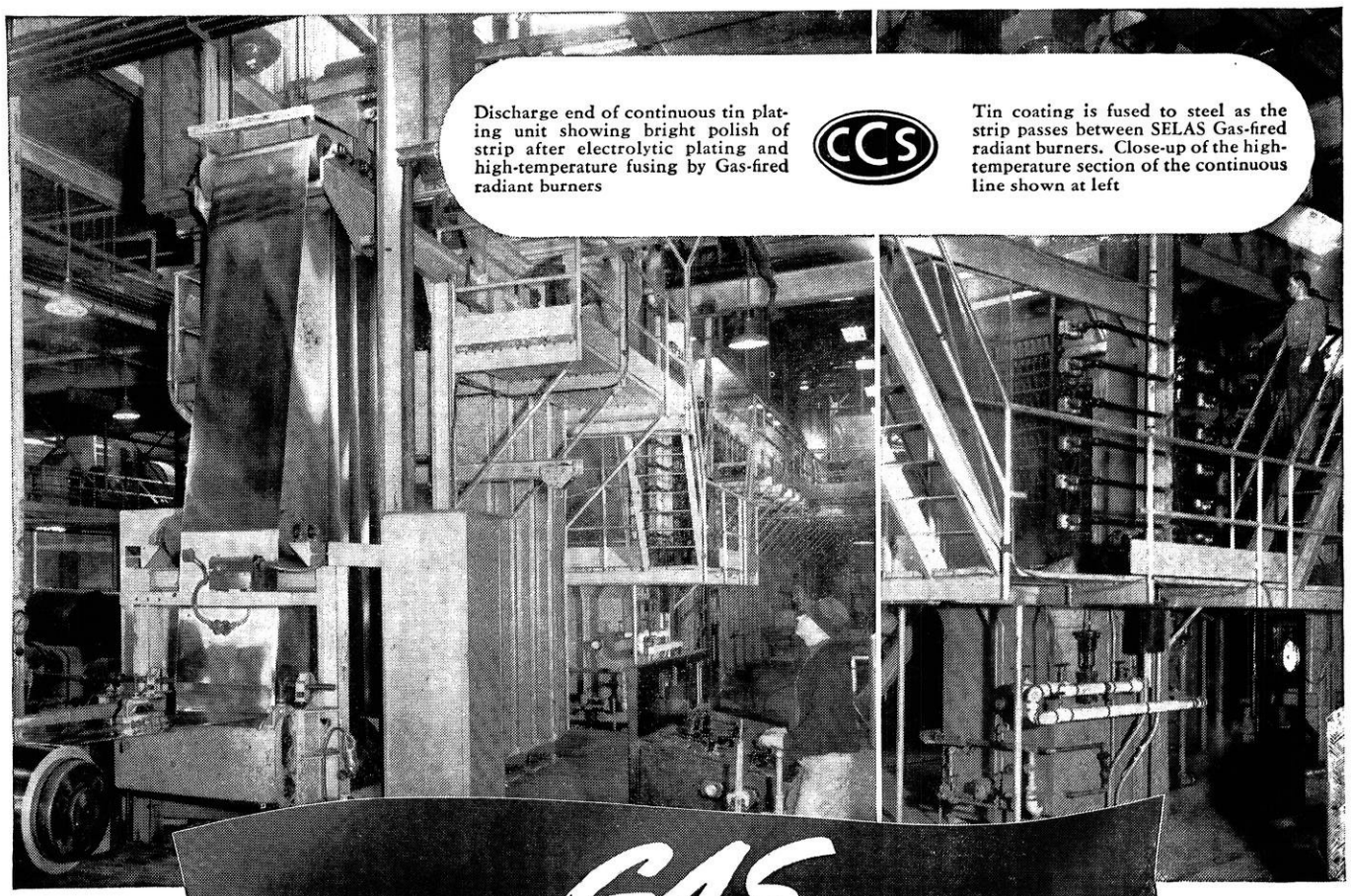

Discharge end of continuous tin plating unit showing bright polish of strip after electrolytic plating and high-temperature fusing by Gas-fired radiant burners

Tin coating is fused to steel as the strip passes between SELAS Gas-fired radiant burners. Close-up of the high-temperature section of the continuous line shown at left

RADIANT GAS BURNERS *create high-temperature* tin-coat fusing zone

BRIGHT FINISHING was the problem—and engineers of Crown Cork and Seal Company, Inc., Baltimore, adopted a high-temperature method for fusing tin to low-carbon strip, with resultant high-polish surface, in a continuous production mill.

Then, to obtain the high temperatures necessary for heat-processing, these engineers selected GAS and modern Gas Equipment. By directing the heat of radiant GAS burners over a concentrated area of the freshly-plated strip it was readily possible to coordinate the fusing action with the plating process to accomplish continuous high-speed production of bright finished strip.

This typical installation demonstrates the flexibility of GAS and the applicability of modern Gas Equipment for continuous, production-line heat processing. Compared with available fuels GAS is most readily controlled by simple automatic devices; Gas Equipment can be adapted for use with existing machinery or incorporated in new machinery without radical design changes, or expensive supplemental apparatus.

Manufacturers of Gas Equipment and the American Gas Association support continuing programs of research designed to assure the most efficient use of GAS for every heat-processing requirement.

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A BEARING QUIZ FOR STUDENT ENGINEERS

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Do you know that the Timken Roller Bearing is more than an anti-friction bearing; more than a radial load bearing? That it is an all-load bearing — can carry, all at once, radial loads, thrust loads, and any combination of them with full efficiency and certainty?

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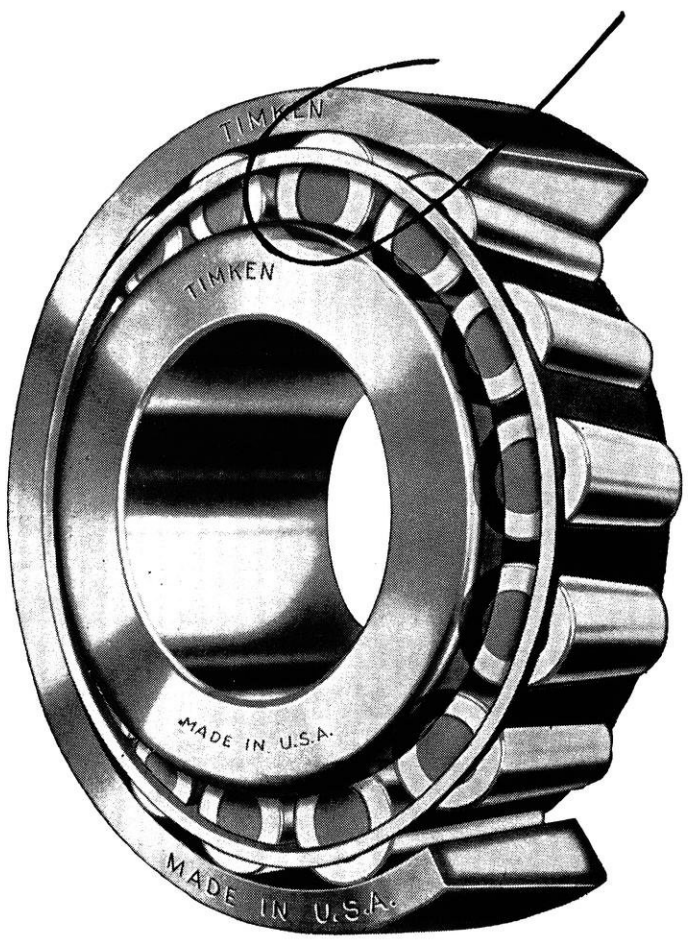
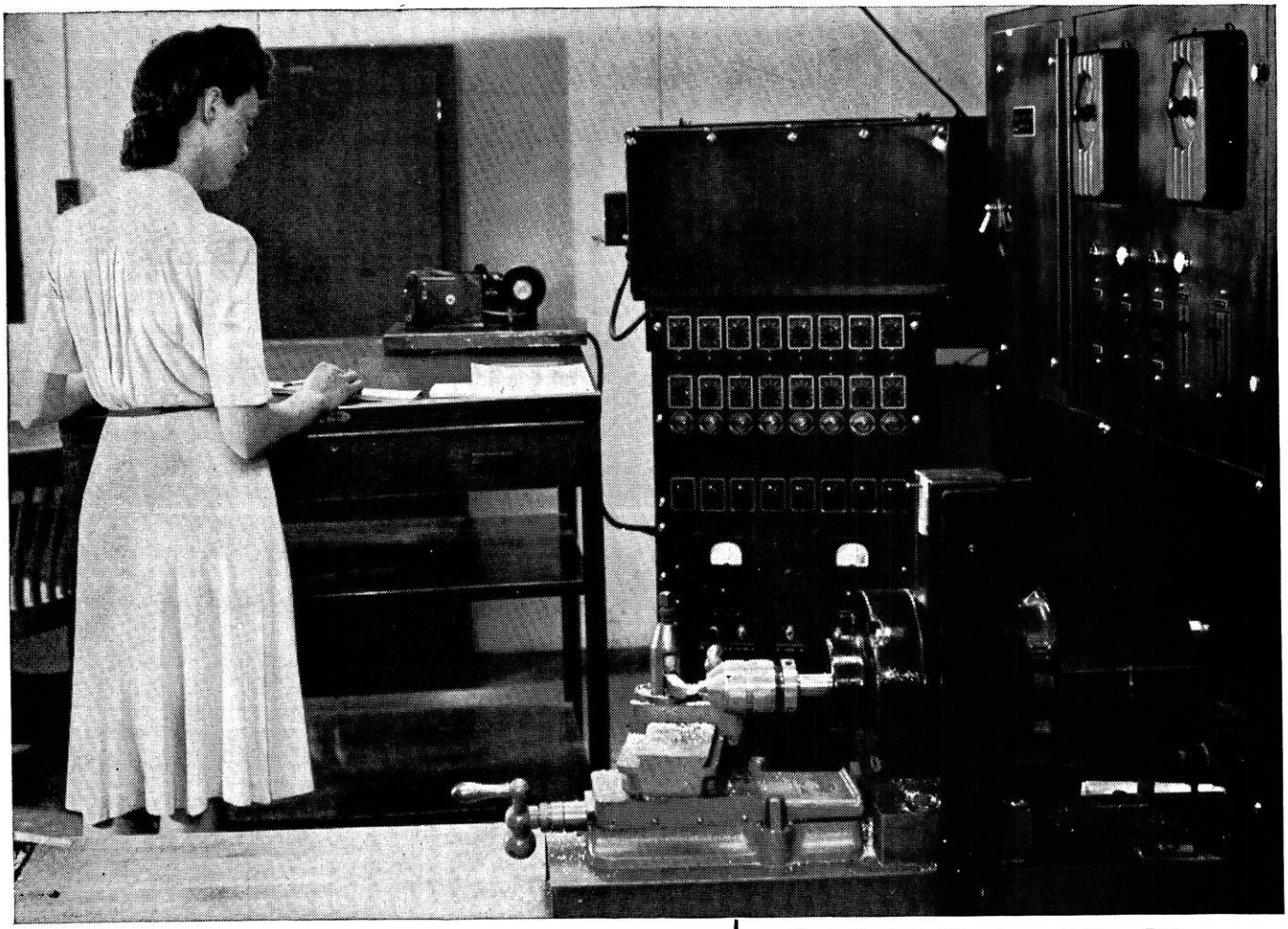


Do you know that the special alloy steel from which Timken Bearings are made was developed in our own metallurgical laboratories and is produced in our own steel plant? That the Timken Bearing is the only bearing manufactured under one roof from raw material to finished product?

Would you like to know more about the Timken Bearing, particularly how it can help you in your engineering career? Write us. The Timken Roller Bearing Company, Canton 6, Ohio.



Typical of its laboratory activities, Dow recently developed this direct-reading spectrometer that electronically measures concentration of elements in alloys—automatically records analyses in 40 seconds.

Horizons of Chemistry constantly beckon . . .

Dow is deeply interested in colleges and technical schools and maintains close ties with them. The very nature of our business makes this a logical course for us to pursue.

We are producers of chemicals essential to industry and agriculture. We are developers of plastic materials. We are the pioneer producers of magnesium, recovering this lightest of all structural metals from ocean water. We are developers of magnesium alloys and methods for their fabrication.

To carry on this work, research is a necessity and a considerable portion of our efforts and resources are devoted to it as an undeviating policy.

All these activities require trained men—scientists and technicians—chemists and chemical engineers—metallurgists, biologists, physicists, entomologists. Dow employs such men in large numbers—keeps an eye on them as they emerge from their academic training—gives many of them special schooling at the Dow plants, according to the jobs they are slated to do.

In peace as well as in war, chemistry is an essential occupation because it deals with materials essential to industry and to the health of the nation. It is a developing business with horizons that constantly beckon—a profession to intrigue any ambitious young man with an eye to the future.

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WISCONSIN ENGINEER

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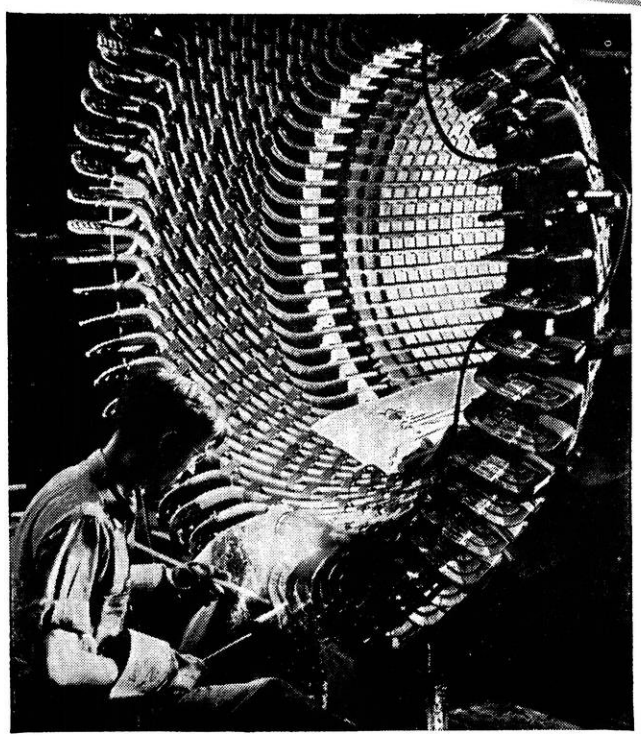
In This Issue . . .

COVER:

Toru Iura, a Mechanical Engineering student, calls for a big yell at the Michigan State game for the bewildered officials who can't seem to figure it out.

There's a future for you in *Manufacturing* at Westinghouse



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to improve efficiency in methods of production.

PRODUCTION CONTROL ENGINEERS . . .
to get the right materials at the right place at the right time.

QUALITY CONTROL ENGINEERS . . .
to supervise inspection of materials and workmanship at every step in the process of manufacture, and help develop the highest standards.

TEST ENGINEERS . . .
to see that correct and uniform methods are applied in testing apparatus to assure compliance with the customer's specifications.

PLANT LAYOUT ENGINEERS . . .
to plan installation of new manufacturing facilities or revamping of the old.

Here's a challenge for your future. The field is limited only by the initiative and resourcefulness of the engineer himself. G-10002

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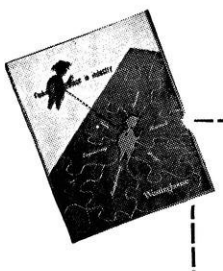

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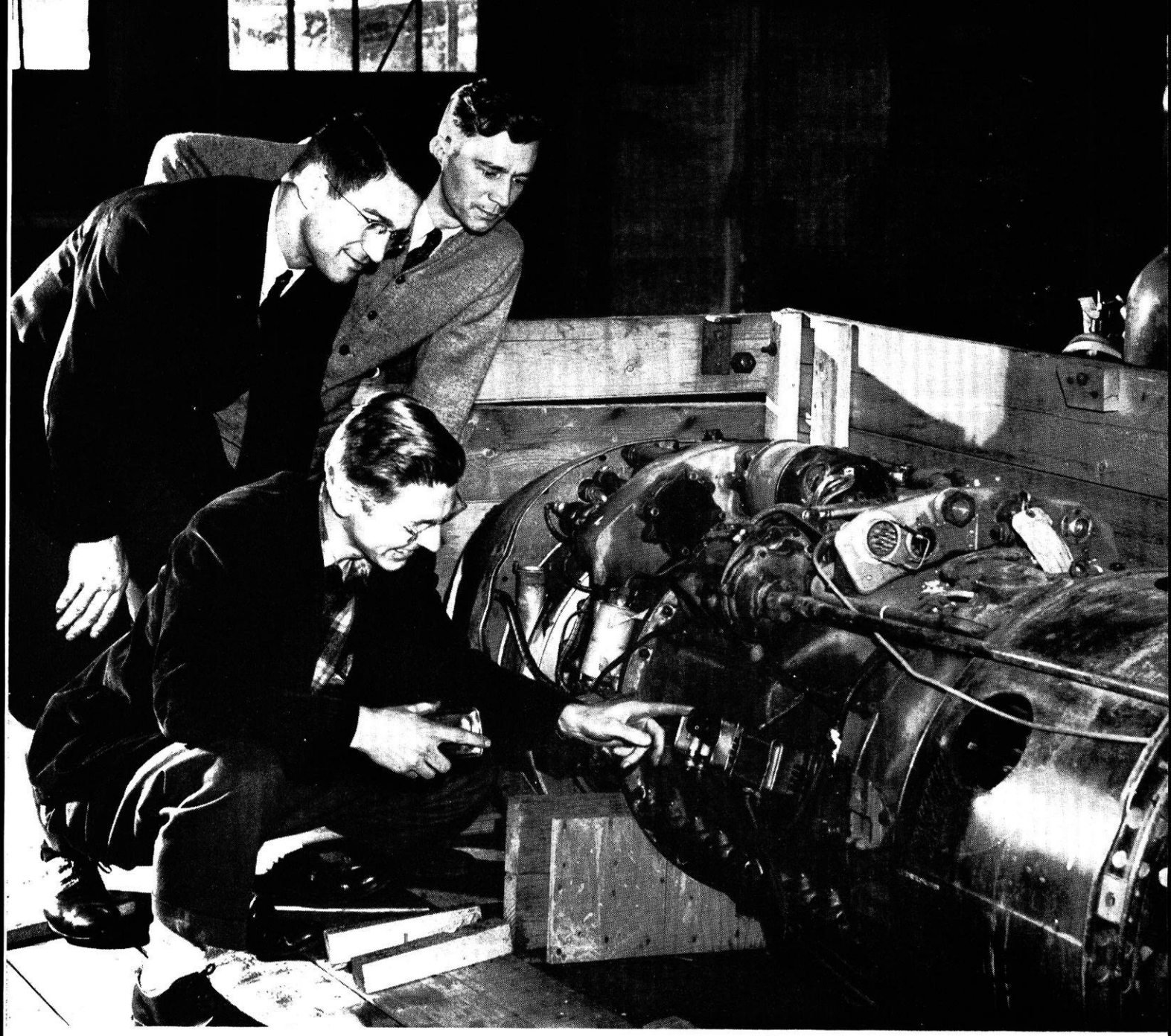


Myers, Feiereisen, and Schweitzer of the Mechanical Engineering Department inspect the German Jumo 004 jet engine, a recent addition to laboratory equipment. The engine itself shows very careful planning in most details. During the war it was used to power the famed German interceptor, M.E.262. The simplified mounts and electrical connections made it possible to change engines in a very short time.

Photos by H. R. Wahlin

Face Lifting . . .

In the Heat Power Lab

by H. R. Wahlin m'49

Students taking heat-power courses at the U. W. during the next few semesters are due for a number of pleasant surprises as Chairman Wm. J. Feiereisen and the other members of the heat-power laboratory committee get some of the new equipment which has been pouring in, set up.

As of the date of writing, February, 1948, some thirteen pieces of new apparatus are in the process of being made ready for use, either as exhibits or actual working setups for lab experiments. They are:

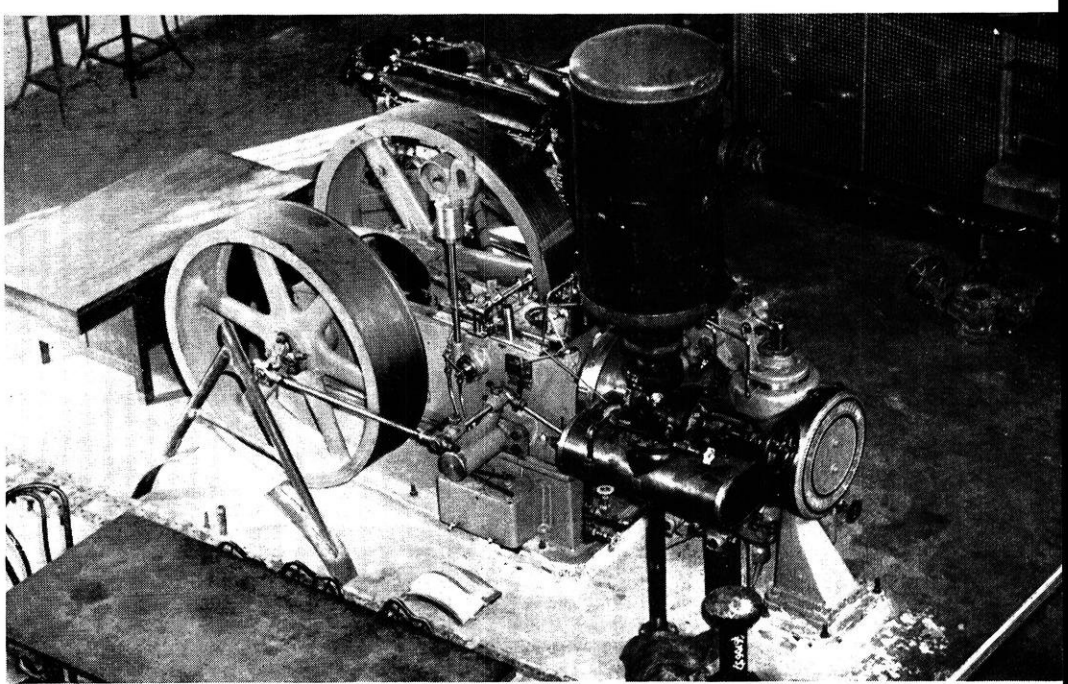
1—a Skinner 80 hp. uniflow steam engine
2—a General Electric twin turbine educational unit which will generate 40 KW of AC at full load
3—an American-built copy of the V-1 "buzz bomb" engine which is to be set up for display
4—a Jumo (JUnkers MOtor works) 004 German jet engine, such as was used on the ME during the war, also for display.
5—a 1942 Cadillac 150 hp. V-8 automotive engine, of the type used in light tanks
6—a 1940 Chevrolet 90 hp. six-cylinder engine (Both of the latter are to be used in the automotive testing section of the lab.)
7—a Fairbanks-Morse three-cylinder, opposed-piston diesel generator unit capable of putting out 100 KW of AC and 20 KW of DC simultaneously
8—a Cummins six-cylinder 60 KW AC diesel generating unit
9—a Pratt & Whitney "2800" radial aircraft engine, rated at 2200 hp., to be set up for display
10—a 225 hp., six-cylinder, inverted, in-line, air cooled "Ranger" aircraft engine
11—a "Continental" six-cylinder, 165 hp., air cooled aircraft engine
12—a Clayton hydraulic dynamometer
13—test cell equipment for large engines, obtained from the Packard Motor Company
14—Japanese radial engine—display
15—"Yankee" diesel engine

Some of this new equipment has been purchased at full cost, such as the G. E. turbine unit. Other items, such as the test cell, jet engines, and the Clayton dynamometer, have been obtained at nominal prices as war-surplus goods. To gain an idea of the saving on war-surplus material, consider the fact that the Allison liquid-cooled aircraft engine which has been in the lab for some time now was bought from the government for little more than the cost of transportation! Don't rush right off to buy one for your "hot-rod," though. The U. S. is giving these bargain prices only to educational institutions.

The Chevrolet engine mentioned above was donated to the university by the Socony-Vacuum Company, after having been run for about forty hours in the process of lubrication tests.

Two engines which have been in the lab for many years and are now obsolete are being removed to make room for the new equipment. They are a White & Middleton gas engine, and a Chicago Pneumatic Company semi-diesel.

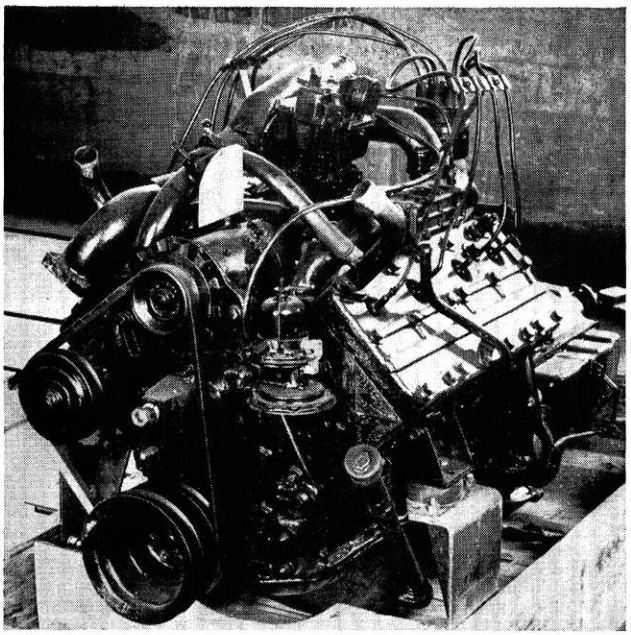
This sudden influx of new equip-



One of the newer additions to the heat power lab, a unaflow steam engine.

ment is not the result of any long term planning, but is rather due to "the golden opportunities in war-surplus goods after the end of the war," according to Mr. Feiereisen. The cost of these acquisitions has been fitted into the regular laboratory budget. It is planned to revamp the lab schedule during the next two years so as to include all the new items in the program. Tests will be run on such of them as are operative to determine operating characteristics and performance under various service conditions.

Undoubtedly the two jet engines are the most fascinating of the new pieces, but they will not be run because, according to Mr. Feiereisen, "We have neither the fuel nor the space to run them. Besides, that V-1 would make a racket that would stop every class for blocks around; and it is very inefficient—only about two or three per cent." No other data is available on the "flying stovepipe," but the Jumo is estimated to develop 2,000 to 3,000 horsepower at normal bomber speeds. It has a static thrust of 1,970 pounds, and a fuel consumption of 1.38 pounds of fuel per hour per pound of thrust. This would mean an overall thermal efficiency of about 8.6%. The Jumo has an axial-flow compressor similar to our own Westinghouse jet engines.



1942 150 h.p. Cadillac V-8 engine.

The recent addition of the "Yankee" Diesel engine ends more than a campaign for new equipment for the lab. The interesting history of this unit began on the highways of the California coast, where the need for a dependable, heavyweight powerhouse was recognized in the large coastwise trucking industry. The University of Southern California's Mr. C. L. Straub had an idea for a two-cycle Diesel which he felt was the answer to the bulk and efficiency problem. He left the University to go to Milwaukee (in the late 30's) to develop his engine.

Work first began at the Fairbanks-Morse Company in Beloit, Wisconsin. Later, Mr. Straub made arrangements with the Davis and Thompson Company of Milwaukee for the original six-cylinder model. Work was interrupted when the company changed hands, and the engine was finally finished by the Waukesha Motor Company. This is the same unit that is in the lab today.

The chief characteristics are the V-type cylinder arrangement (for space conservation) and the rotary valve arrangement. Bulk was a major consideration in the design of the engine, and this factor was rather successfully dealt with. In the case of efficiency, however, the results were not so impressive as those of the contemporary General Motors automotive Diesel. It was further recommended that the engine be built in eight cylinders to eliminate "roughness" encountered at and above 1800 R.P.M.

Mr. Straub (then Lt. Cmdr. Straub) became occupied with war duties, so did not get to correct the flaws detected in the first model. His death in early 1947 left the engine in the hands of The Wisconsin Company, Milwaukee. They in turn dedicated the engine to the University

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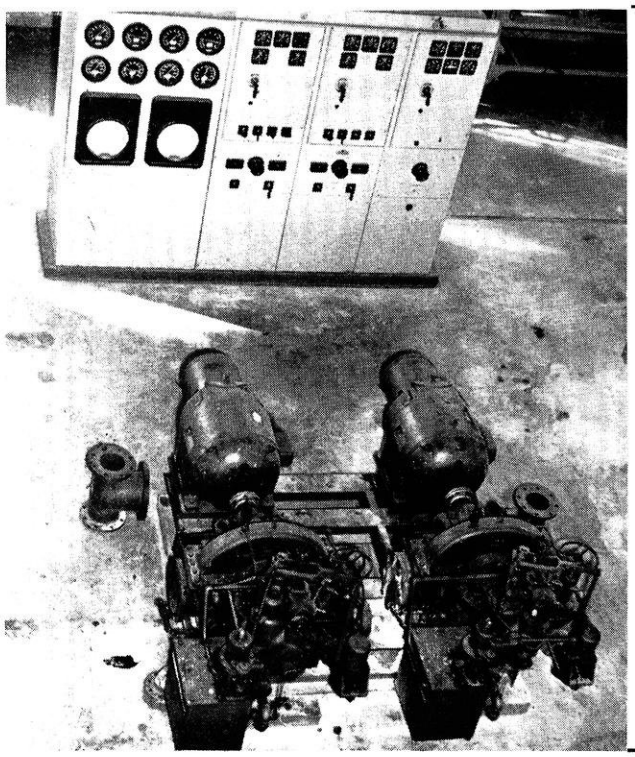

G.E. twin turbine unit with control board for observation of performance and synchronization.

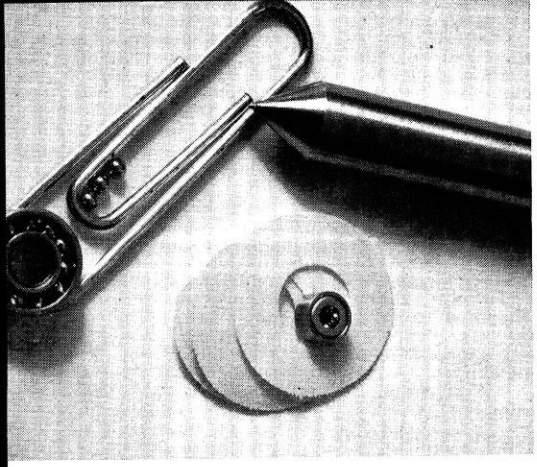

Photo Courtesy N. H. Ball Bearings, Inc.

A Modern Industry

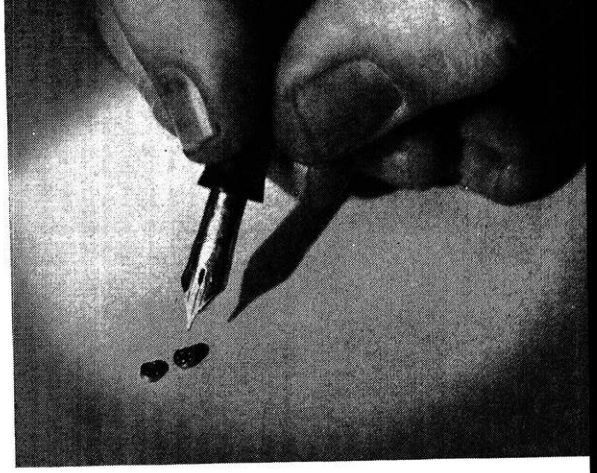

Photo Courtesy Miniature Ball Bearings

Miniature Ball Bearings

by R. W. Hacker e'49

Order: One thimble full of ball bearings. A small order? Not especially so. It could include up to 321 small precision-made bearings produced by the Miniature Precision Bearings, Inc., Keene, N. H., and the New Hampshire Ball Bearings, Inc., Peterborough, N. H. These bearings make possible high speed, compact instruments that can operate continuously at 75,000 rpm and instruments that can be used in extremely low temperatures because no oil is necessary in the specially designed bearings.

The small ball bearing industry started back in 1924 when a bearing of 3/8 inch outside diameter was made. Now bearings of such size are no longer manufactured by the firms that make the truly "miniature" bearings. Between the largest of 5/16 inch O.D. and the smallest, 2 mm. O.D., are about forty different sizes and types.

During the war thousands were turned out for such instruments as the Bendix gyro-fluxgate compass, Polaroid inclinometer, Sperry gyroscope, radar equipment, and fire control instruments for the Navy. Peacetime uses are being found in maritime navigational aids, weather station equipment, small electric motors, cameras, dental tools, and laboratory and testing devices.

In order to insure perfect operation of these bearings, unusually small tolerances are called for. Spherical accuracy is held within twenty-five millionths of an inch, while on the small 1/8 inch radial bearings the tolerance on the inside and outside diameters of the raceways is plus .0000 inch and minus .0002 of an inch. The limit of the total eccentricity is .0003 of an inch. These limits can be compared with the plus and minus limit of .0005 of an inch that was common during the war and which was considered quite small. These small tolerances are called for on parts that themselves are only one-eighth of an inch in diameter. When such small limits are called for, constant and exact inspection must be the byword during the entire manufacturing process.

The first step in this process is the machining of rings from solid chrome alloy steel rods. These rings, which later become the inner and outer races of the bearings, are turned out on specially designed machines.

After inspection the rings are heat treated in an electronically controlled, atmospheric furnace. Next, in order to insure the proper degree of hardness for best performance, the raceways are treated in an annealing furnace.

The next process is the grinding, polishing, and finishing of the outer surfaces. Once again the material is carefully inspected. Finally the rings reach a stage where the inner races are precision ground. Here the grinding is done on machines where the feed readings on the machines are in .00001's of an inch. This gives some idea of the accuracy of the operation involved. *(please turn to page 22)*

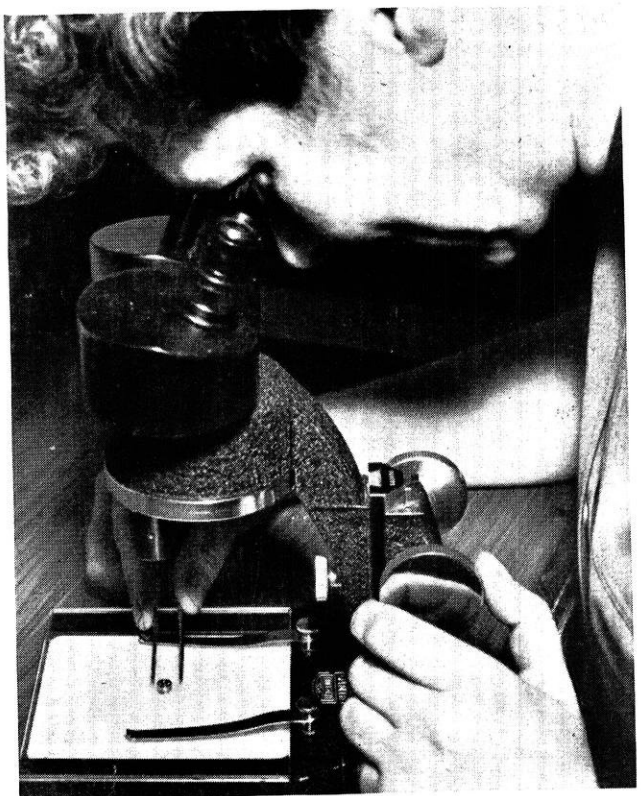

Photo Courtesy Miniature Ball Bearings

A step in the final inspection of the ball bearings.

An Inside Look at WKOW

by James Vasilion e'48

Photographs by Dick McKeon c'51

Wisconsin's youngest radio station makes its debut in Madison, categorically home of "The Oldest Station in the Nation." WKOW, owned and operated by the Monona Broadcasting Company of Madison, recently began broadcasting with a regular schedule of programs from their newly finished studios in the Madison College Building on West Washington Avenue and from the program lines of the Mutual Broadcasting System, their network affiliate.

The Studio Control Room, pictured, is nerve center of the radio station. It is here all programs must pass, whether they be transscribed, network or studio productions. The greatest emphasis therefore, is on flexibility and convenience of operation. The control console used at WKOW is of a type manufactured by the Western Electric Company. The various controls and switches seen in the photograph permit the fading in or out of various studio and network facilities. Transcribed programs and recorded musical selections are broadcast directly from the pair of heavy turntables to the left of the control console. Within easy view of the operator are three studios. Directly facing him is a small studio which is used for station announcements and news commentaries. To the right is a larger studio for programs involving several people, such as group discussions or dramatic skits. A large auditorium studio is located to the left of the control room. All three are acoustically sealed off from the control room by means of double glass viewing panel, so that the only sound heard in the control room comes through the microphones located in the studios.

Programs leaving the control room are carried by telephone lines to the transmitter site about 10 miles south of Madison near Highway 51. At this point, they are fed through a Western Electric limiting amplifier used to offset the possibility of modulating more than 100% in the event of some sudden increase in program loudness. Any modulation greater than 100%, as most radio amateurs know, results in considerable distortion of the signal and undesirable interference on adjacent channel frequencies. Another advantage gained by the use of the limiting amplifier is that the average volume level of programs may be increased noticeably without danger of overmodulation on audio peaks.

The transmitter pictured is the very latest designed and built by RCA for Amplitude Modulation service. It has a power output of 5,000 or 10,000 watts and other outstanding features such as high level modulation and air-cooled tubes in the high power modulator and radio frequency stages. Forced-draft air circulation is provided by a centrifugal blower to carry away heat radiated by the high power tubes. The control console seen in the center of the picture is mainly for the convenience of the transmitter attendant. A number of controls such as those necessary to place the transmitter on the air, start the blower motor, turn on the antenna beacon lights, and monitor the frequency of the transmitter are centralized here. In addition, a volume level meter is provided to keep a double

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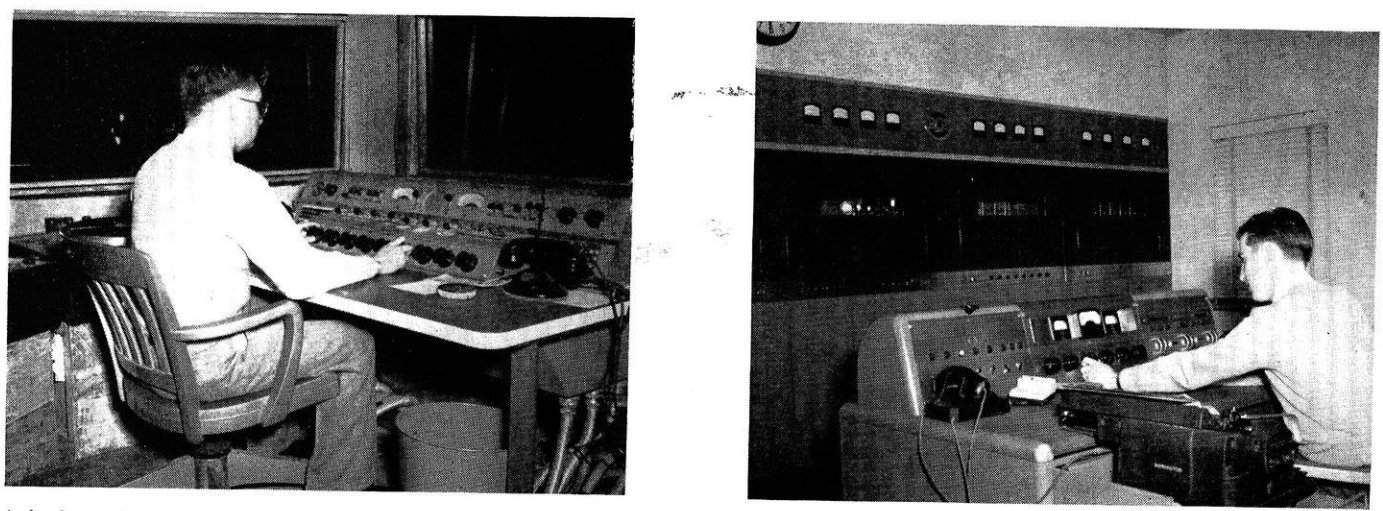


A look at the controls of WKOW. The permanent controls shown on the right are contrasted to the temporary turntables to the left.

Assistant to the Dean

Henry G. Goehring

by Robert Hacker e'49

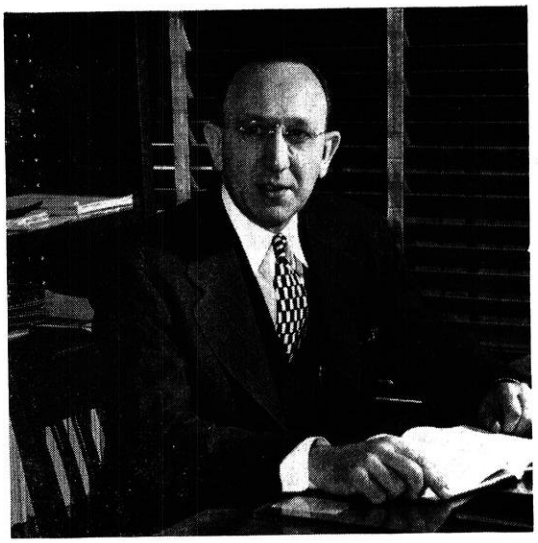


Photo by Wahlin

The coming of the New Year brought Wisconsin something besides a new snowstorm this year. On the first of January, 1948, Professor Henry G. Goehring reported in as Assistant Dean of the College of Engineering. As a somewhat more vital point of interest to many of us, his duties also include placing Badger engineering graduates. Since he will come in close contact with most of us in one capacity or another, it seems that we should get to know him better.

Professor Goehring's major interests outside of work are sports and his basement workshop. His interest in sports is easy to understand, for he spent his first four years after graduation from Bethany College, West Virginia, as a coach of high school athletics. His coaching activities were carried out in the Pittsburgh region near his home town of West Newton where he was born in 1900. During this interval, he became more than interested in a young school teacher named "Katherine". He and Katherine are now happily married and have a future Assistant Dean and a future Football Coach. His personal comment on his athletic prowess was, "If I could reverse my bowling for golf scores, I would be considered an athlete".

After Professor Goehring's coaching career, he returned to college work. He spent the next two years doing graduate study at the Harvard Business School. After this, he went to the steel mills. First, he accepted employment with the American Steel and Wire Corporation in the field of operations and industrial relations. His second position was with the National Refining Corporation where he was Industrial Relations Manager. He left this corporation in 1941 to join the Carnegie-Illinois Steel Corporation. For this company he spent considerable time contacting colleges, primarily for engineering graduates.

Asked about his aims in his present post, Professor Goehring said, "I want to assist the engineering graduates in finding positions in keeping with their abilities and desires, and I hope to personally counsel with the graduating students." In regard to employment trends he had this to say, "It's anyone's guess, but I'm not really pessimistic about there being superfluous engineers. Technical work in industry is increasing, so the demand for engineers will also increase."

In the past few weeks a number of inquiries have been made in regard to summer employment for sophomores and juniors. All information on this subject will be posted on the Placement Department bulletin board as soon as it becomes available. The following is an up-to-date (as of February 26) list of job interviews that are to be held during the following month.

March

10 Goodyear Tire Co.; Shell Co.; Minnesota Mining and Manufacturing Co.
11 Goodyear Tire Co.; Shell Co.; Dr. Paul E. Williams, representing DeVilbiss Co.; General Fire Proofing Co., and Youngstown Sheet and Tube Co.; Bailey Meter Co. (Group meeting at 5 P.M.)
12 Bailey Meter Co.
15 General Electric Co.; Toledo Edison Co.; Phillips Petroleum Co.
17 General Electric Co.; Babcock and Wilcox Co.
18 Peoples Gas, Light, and Coke Co.
19 West Bend Aluminum Co.
22 Infilco Co.; Pennsylvania Railroad.
23 Infilco Co.
24 General Electric Corporation; Wisconsin Telephone and Telegraph Co., also representing American Telephone and Telegraph Co., and Western Electric.
26 Wisconsin Telephone Co.

April

1 Link Belt Co.; Scott Paper Co.
2 Link Belt Co.
5 Corn Products Refining Co.; J. C. Seagrams and Sons, Inc.
6 J. C. Seagrams and Sons, Inc.; Electric Auto-Lite Co.
7 Standard Oil of Ohio.
8 National Advisory Commission for Aeronautics; U. S. Rubber Co.

Don't forget! For last-minute changes on the above information and for new job information, see the Placement Department bulletin board in the lobby of the Mechanical Engineering Building.

ON the Campus

by John Ashenbrucker e'49 & Don Dowling e'49

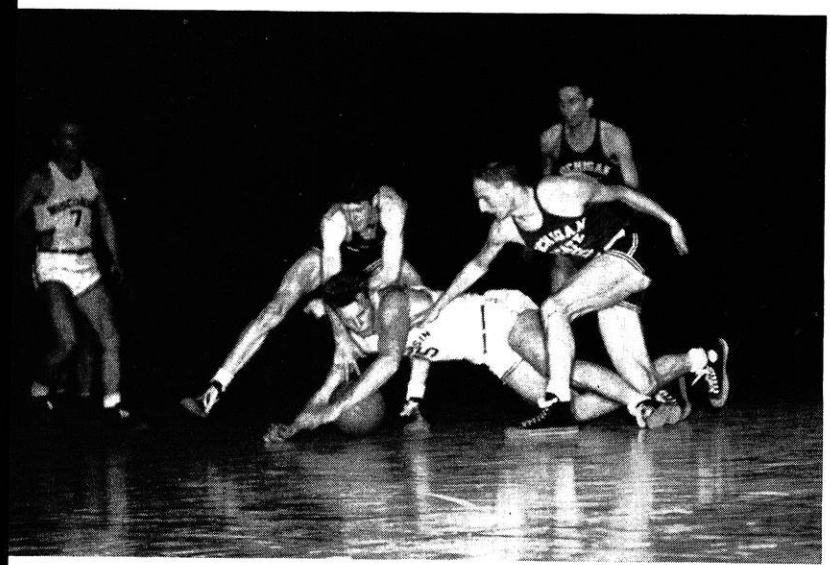
Eta Kappa Nu

Officers elected to head Eta Kappa Nu, electrical engineering honorary fraternity, for the spring semester include: Mel Grieme, President; Gene Fordham, Vice President; R. K. Ausbourne, Recording Secretary; William Kissinger, Treasurer; Dave Fell, Corresponding Secretary; and Robert Sagen, Bridge Correspondent.

Pi Tau Sigma

At its recent business meeting, Pi Tau Sigma, national mechanical engineering honorary fraternity, elected the following officers to serve during the second semester: Richard France, President; Russel Pipkorn, 1st Vice President; Morris Thorson, 2nd Vice President; Robert Reichmann, Corresponding Secretary; Lester Maresh, Recording Secretary; and Clayton Verlo, Treasurer.

Pi Tau Sigma, in response to an invitation by Governor Oscar Rennebohm, and in conjunction with Wisconsin's Centennial Celebration, has voted to hold its 28th annual National Convention on the campus of the University of Wisconsin. The convention date is tentatively scheduled for the last week in October.



One too good to pass up!! Fred Schneider has a hot moment in the Michigan State game.

Tau Beta Pi

Tau Beta Pi, honorary all engineering fraternity, met at the Union on Tuesday evening, February 17, and laid plans for the coming year. Special feature of the evening was the reading of the minutes.

OSCAR IS COMING HOME!!

We received a special delivery letter recently and thought the contents would be of interest to those engineers who are loyal to St. Pat.

Miami, Florida
Feb. 17, 1948

College of Engineering
University of Wisconsin
Madison, Wisconsin

Dear Scholars

Professional duties made it necessary that I spend the winter down here in Florida supervising the installation of air traps in the steam baths of the Miami Hotel. Naturally a trip to the sunny South, the land of bathing beauties, involves more than the installation of air traps. Yes, I've been kept quite busy down here.

I plan to return to Wisconsin early next month and I shall be present at the St. Patrick's Day celebration again this year. My enthalpy increases every time I think about that kindly Irishman and the friendly festivities revolving around his birthday each year.

I am very happy to hear that there are some men on campus with courage enough to defy custom and let their beards grow. My one regret has always been that I was never able to sport a Van Dyke like the other boys.

See you soon.

Sincerely yours,

"Oscar" the Iron Man

Editor's Note: Oscar will, as usual, stay at Triangle Fraternity during his visit.

Scholarships

The James F. Lincoln Arc Welding Foundation of Cleveland is again offering undergraduate engineers the opportunity to compete with other undergraduate engineers for money, scholastic honor, and industrial recognition. Awards will be presented to students submitting papers describing the use of arc welding in design, manufacturing, construction, or maintenance. For details, write the Foundation.

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Wisconsin's IRON MINES

by W. M. Haas c'49

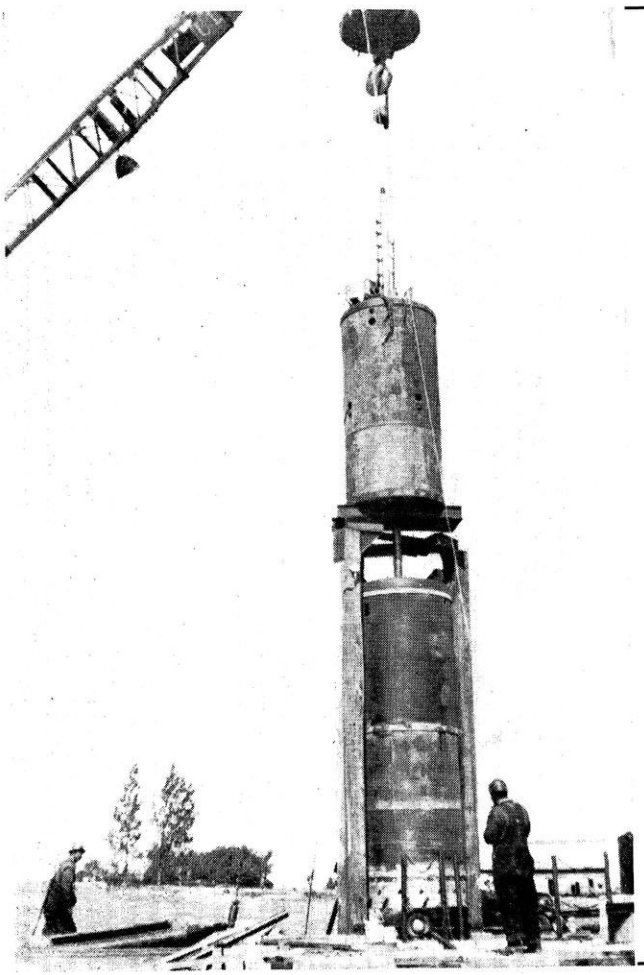
Photos Courtesy Pickands, Mather, and Company

The WISCONSIN ENGINEER wishes to acknowledge the capable and willing assistance of Mr. Ernest Bean, State Geologist, in compiling the information for this, the first in a series of articles on the mining industry in Wisconsin.

—W.M.H.

One usually thinks of Northern Wisconsin as the land of fishing, hunting, and summer resorts; deep snows and pretty little lakes nestled in the woods. Northern Wisconsin is widely advertised as a vacationland; and, indeed, the influx of tourists at the beginning of summer is a veritable migration. The resort business is among the most important in the state.

Therefore it is not strange that in this setting of relaxation and recreation the state's iron ore mining industry frequently escapes notice. While this industry is not large compared with the great Mesabi Range in Northern Minnesota, it is significant that Wisconsin has been mining iron ore up near Lake Superior more or less continuously for 62 years. There are at present two active mines in Wisconsin, both of them near Hurley. There have been other developments from time to time, but their importance is mostly historical. The Montreal and the Cary mines were both opened the same year, and both were originally worked by crude open pit methods. The ore outcrop dips steeply to the north, however, and soon it became impractical to use open pit methods. It became necessary to develop a system of shafts and drifts to remove the ore.



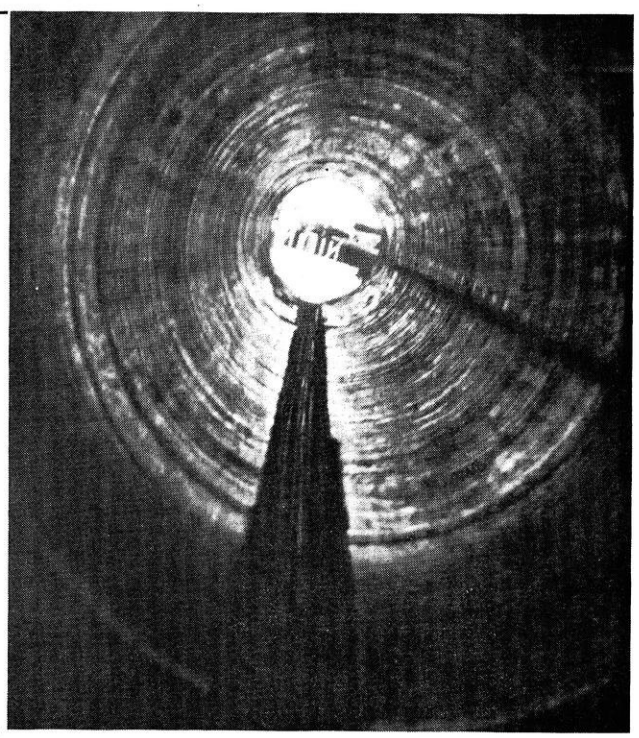
A view of the core drilling machine used to sink the shaft at the Cary Mine.

The Montreal mine, located at the village of that name, is operated presently by Oglebay, Norton, and Company. As the demand for ore has increased, and the ore near the surface has been depleted, the three shafts have been sunk deeper and deeper. The deepest is now 3,354 feet below the surface, or 1,838 feet below mean sea level. The first year the mine was worked, it produced 47,000 tons of ore. By the late nineties, the mine was producing 200,000 tons annually. A production peak was reached in 1915, when 660,000 tons of ore were shipped. In recent years the Montreal mine has averaged a million tons yearly, with a peak during one war year of one and one-quarter million tons.

The production at the Cary mine has always been somewhat smaller. From a start of 25,000 tons during the first year's operation, production has gradually increased up to an average of 310,000 tons annually in recent years. As was the case with the Montreal mine, the increase in production has been due to the development and use of improved machinery and methods, as well as to the rising demand. It should be pointed out that this increase in production has been a general trend. That is, the tonnage shipped

any given year has not always been greater than that of the preceding year. In fact, during some years no ore was shipped at all.

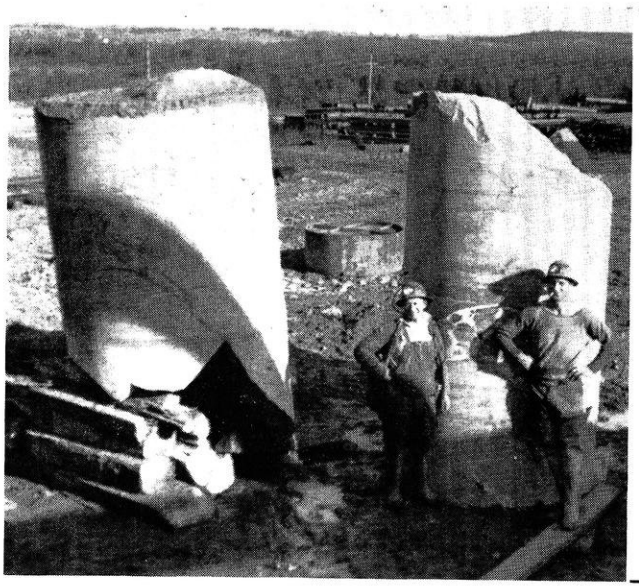
The Cary mine, now operated by Pickands, Mather, and Company, has recently undergone considerable redevelopment work. When this mine was changed from the open pit type, the shaft was sunk on the natural slope of the ore vein. At the time, this was an expedient method. Due to the natural shifting of the rock, however, and the settling caused by the mining operations, this inclined shaft became difficult to maintain. The guides for the skips would get out of alignment. Therefore it was decided to sink a vertical shaft and develop a new system of drifts to reach the ore deposits.



Looking up the bore hole from a depth of 175 feet.

The location of this shaft meant that it would have to be sunk through solid granite. Now, to start from the surface and excavate a shaft (large enough to accommodate air and water lines, and allow for the passage of a skip) is a difficult, slow, and costly undertaking. Holes must be drilled in the rock at the bottom of the excavation, the holes loaded with dynamite, then the miners must leave the excavation while the powder charges are exploded. After the smoke and dust has settled, they must return to the bottom of the excavation and hand load the broken rock into buckets to be hoisted to the surface and disposed of there. The engineers at Cary, however, used an unusual method of mining to reduce the cost of the shaft. They employed a huge core drill to sink a pilot hole to the required depth. This drill was fed with steel shot as it rotated, thus cutting out a cylindrical core. This core was lifted to the surface in convenient lengths as the hole became deeper and deeper.

While the core drilling was being done from the surface, other crews were tunneling from the existing shaft toward an ultimate junction with the new shaft. The excavated material was removed through the existing shaft. When the pilot shaft and the drift at the bottom had been joined, the real work of sinking the new shaft began. Dynamite charges were set around the pilot hole in such a manner that when they were fired, the broken rock fell through the core hole to the tunnel at the bottom. Thus the shaft crew could go to the bottom of the enlarged shaft and immediately start drilling holes for the next charge. In this manner the pilot shaft was enlarged to form a rectangular shaft of the required size. Meanwhile, another crew in the tunnel was loading the broken rock, with the help of machines, into cars for transportation to the old shaft and removal to the surface. This method can only be used in a situation where a shaft already exists, but it certainly was a worth while expedient at the Cary mine.



Two cores removed from the Cary shaft. They exceed 5 feet in diameter.

The new system of shafts and drifts is the most important part of the new developmental work, but improvements have been made on the surface, too. New hoisting equipment has been provided at the shaft

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ENGINEERING SOCIAL REPORT
St. Pat Experiment 36

by C. Strasse e'49

OBJECT:

To prolong the memory of St. Pat, the first engineer, and to show the world that engineers are not dull people, and like their share of fun. At the same time, to enlighten mankind as to the unscrupulousness of so-called lawyers.

THEORY:

According to legend, the country of Ireland was once plagued by two equally bad errors of Mother Nature, snakes and lawyers. It wasn't until St. Pat, then an unknown, came along that the Irish air took on a new and healthier smell. St. Pat accomplished this monstrous feat by inventing the first worm-drive gear, with which he drove the reptiles with their bar stools, walking sticks, and money bags out of the fair land. To make this possible he first surveyed and paved, single-handed, the well known road to Hades. Here his inventive ability came into play, enabling him to design the first left-handed Monkey Wrench, with which he removed the gates to said fiery abode so that the slimy workers of iniquity could slither through. In his spare moments, the great St. Pat also invented calculus and the first ball-point slide rule for calculations under water. The latter was necessary, because the heat created when he worked his slide rule was so intense the iridium hair line threatened to start a chain reaction.

PAST ATTEMPTS:

St. Pat was first recognized at Wisconsin in 1912, when the engineering students of that year paraded the original Blarney Stone around Madison in a carriage drawn by two snow-white horses.

In 1919 the first full-fledged parade was held. It was a peaceful affair.

Everything went well until 1923 when a few shysters, who had hitch-hiked back from purgatory, kidnapped that year's elected St. Pat. This started the annual feud between the Engineering and Law schools, which was brought to a bloody end in 1939, but not before much throwing of eggs, bloodening of noses, and blackening of eyes.

In the following years (1940 and 1941) the fighting—oops! "feuding"—was replaced by engineering expositions, and the creation of OSCAR, the iron man, said to be a brainstorm of the great St. Pat himself.

PROCEDURE:

Now, in these post-war years, the lawyers seem to resign themselves to their respective muck-rakes. The celebration of St. Pat is carried on without outside disturbances. This celebration takes form in choosing an appropriate St. Pat, a beard growing contest, a St. Pat's dance, and a basketball game between the Engineers and the Lawyers.

St. Pat is chosen by the students' purchase of buttons and dance tickets. For each button a candidate sells he gets a certain number of points. The points per button differ for the various engineering courses according to the number of students in each course. Thus if there are twice as many ME's as CE's, the CE's get twice as many points per button as the ME's do. The dance tickets sell for $2.00 and are good for points also. Not everyone can be a St. Pat candidate, of course. Each Engineering Society chooses one man for their hopeful candidate.

Last year the A.I.E.E. candidate Harry McMahon won. This year's hopefuls are:

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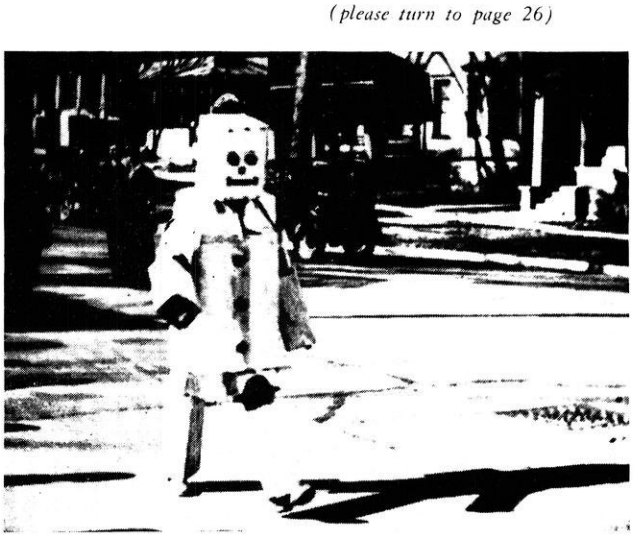

These two cuts (developed from a 35 mm. movie film) show some of the spirit in the 1931 parade. At the right is Oscar's long-lost brother in his last public appearance.

Alumni Notes

by J. J. Kunes e'48
L. Hunholz e'49

— EE —

Roy C. Muir ('05), a company vice president of the General Electric Company, has retired after more than 42 years of service. After graduation from the University of Wisconsin he went to work on "Test" for G.E. and soon graduated to turbine designing. From there he joined the Power and Mining Engineering Department and later served three years as a commercial engineer for the International General Electric Company.

He served for eight years as an assistant engineer in the industrial department of G.E., in 1930 becoming general assistant in charge of administration for the Designing and Engineering Departments and the works laboratories. Since 1934 he has been vice president in charge of engineering.

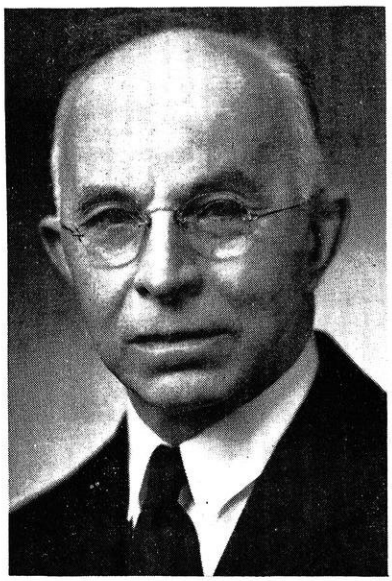

Photo Courtesy G.E. Corp.

Roy C. Muir

In 1939 he was awarded the honorary degree of Doctor of Engineering by the University of Wisconsin and in 1942 a similar honor was conferred by Manhattan College.

Photo Courtesy G.E. Corp.

William Frackelton

William B. Frackelton ('28) was recently appointed district sales manager of the Central District of the General Electric Chemical Department, it was announced by Donald S. McKenzie, general sales manager for the department.

Associated with General Electric since 1928, when he enrolled in the G.E. Test Course, Mr. Frackelton was a sales representative for the Industrial Department in 1930. In 1933 he received a year of special training at G.E. headquarters in Schenectady before returning to Chicago as district specialist in industrial electronic control.

A native of Lead, South Dakota, the new district manager has been with the Arnold Engineering Company for the past two years.

Dr. Ernst Henry Krause ('34) has received the Honorable Mention Eta Kappa Nu recognition award for 1947 "By virtue of his important contributions to American Communication Security and the development of counter - measures against guided bomb attacks in World War II, and his activities for his community . . ."

Having received his BS degree in 1934, he continued on in the graduate school to obtain his MS in 1935 and in 1938 his PhD in Physics. His active interest in photography aided him in his research with rockets when he co-authored, among many other technical articles, "Photography From the V-2 at Altitudes Up to 160 Kilometers".

He began working at the Naval Research Laboratory in Washington, D. C., devoting his time to studies and development work in pulse intelligence systems. Later he was assigned to developing and testing radio control systems which could not be jammed. One system developed is outstanding in its performance today.

When the Germans began using guided missiles in 1943, Krause was put to work supervising the development of counter - measures against this threat. This seemingly impossible task was accomplished very effectively by Doc and his staff; no ship equipped with his jamming equipment was struck by a flying bomb.

After the war he continued his research as head of the Guided Missile Subdivision of the Laboratories, being partly responsible for the Navy's Aerobee rocket and directly responsible for the NRL Neptune sounding rocket.

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Science Highlights

by Robert Johnson e'50

SILICONE RUBBER ADHESIVE

A new adhesive expressly designed for bonding silicone rubber to itself and to glass, metals, and ceramics has been developed by the General Electric Company.

This bonding agent has properties similar to silicone rubber in that it remains resilient and flexible over a temperature range of —70° F. to 520° F. In addition, it may be used in bonding glass to glass, glass to metal, and metal to metal.

METALS COMPARATOR

A new portable metals comparator by G. E. provides a nondestructive test for magnetic or nonmagnetic parts. Comparison of their chemical analysis and heat treatment is used to sort the metals.

Discrimination is based mainly on the permeability of magnetic metals, and on the resistivity of nonmagnetic materials. Its wide range of test frequencies extends from 50 to 10,000 cycles per second. The low test frequencies are used in sorting magnetic parts, and the higher ranges are provided for the nonmagnetic separations.

ELECTRON DIFFRACTION INSTRUMENT

A quick analysis of surfaces and thin layers of materials such as metals, ceramics, and plastics is available with this new research tool. Not more than five seconds are usually required for the exposure of the photographic plate used in the apparatus; and in many cases, this electron diffraction instrument will detect and help identify chemical changes before they are detectable by any other means.

Specimens of from .1 to 4 inches in diameter may be analyzed. The instrument directs an electron beam at the specimen and photographs the resulting diffraction pattern. The pattern consists of rings, the sharpness, intensity, and diameter of which indicate the composition and arrangement of the crystals present in the specimen.

The instrument is valuable in the study of corrosion, metallurgy, lubricants, catalysts, pigments, and surface deposits. It has been used in the study of corrosion resistant alloys to be used in gas turbines.

GEIGER COUNTER—X-RAY DIFFRACTION METAL ANALYSIS UNIT

Rapid quantitative metal analysis is made possible by a new Norelco Geiger Counter Fluorescence Analysis Unit. The new unit determines quantitatively the purity of metals or the percentages of alloying components and quantities of metallic elements dispersed in non-metallic carriers.

The Fluorescence Analysis Unit consists of an X-ray generator, a rotating indexing holder for four specimens, a special collimating system, a goniometer having a scale graduated from 0° to 90°, a crystal, and a Geiger counter. The crystal and the Geiger counter are mounted on and positioned by arms which traverse the goniometer arc.

A rock salt crystal is employed for determinations on elements ranging from atomic numbers 20 to 41, and a calcium fluoride crystal is used for the elements from 42 to 50.

The technique employed with this new apparatus makes an entirely new approach to many of industry's problems of metal analysis and control. By comparing the reflection angles of the unknown alloy with those of standardized samples, a rapid determination of the percentage of a component present in the alloy may be made.

SILENT SWITCHES

Hydrogen gas in the "button" of a new 10 ampere silent light switch cools and quenches the arc and prevents oxidation of the mercury when the circuit is broken.

A metal enclosure consisting of mercury-to-mercury contacts enclosed in two special metal alloy disks glass sealed on a ceramic barrier contains the mercury for these switches.

Recently developed by the General Electric Company, the new mercury switch promises its users smooth, silent operation for a long time. It has been tested for half a million makes and breaks.

CENTRAL HEATING VIA ELECTRICITY

All-electric central heating units for the home have been undergoing tests for the last several years. The Electromode Corporation has announced that the economy and efficiency of these heating plants compare favorably with the conventional type of home heating apparatus.

The experience gained during the war in adapting electrical heating to submarines and trailers has been applied to heating entire houses. These units may be installed in new houses, or they may be installed as replacement units. Two thermostats are used to combine maximum heating flexibility with economical oper-

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Badger FOREIGN STUDENTS

by C. Leyse m'48

Egypt's El Wakil

Belgium's Fischer

A KEEN interest in internal combustion engines brought Mohamed El Wakil from Egypt to the University of Wisconsin. On the campus he is known as "Bill" Wakil and is seen spending a great portion of his time in the Heat-Power Laboratory in the Mechanical Engineering building.

Bill was born in Alexandria, Egypt, in 1921. All of his early years were spent there and it was there that he completed high school. For further study Bill went to Cairo where he attended Fouad I University. Bill graduated from this University in 1940 with a Bachelor of Science in Mechanical Engineering. He immediately went to work for the Egyptian Government on a waterworks project. This project was initiated to supply pure drinking water to nearly a million people of Fayoum Province, 100 miles south of Cairo. For two years Bill served as a resident engineer on the project, during which time he was in charge of the Diesel power plant there.

While working on the waterworks project Bill became interested in coming to the United States for further study and the Egyptian Government awarded him a scholarship to the University of Wisconsin. Arriving on the campus in the spring of 1946, Bill started research on Diesel engines. His specific project is the "Instantaneous Measurement of Temperature of Non-luminous Hot Gases." Bill received his Master of Science degree in January of 1947, for which he submitted a progress report on his research project. At present he is working towards his Doctorate which he expects to obtain next year, and for which he will submit a thesis on his research project.

After completing his schooling Bill intends to spend about two years gaining practical experience in some industrial plants in the United States. Following this he will probably spend a few years working for the Egyptian Government purchasing bureau in Washington, D. C., before returning to his native land.

Bill chose to come to the United States because of what he already knew about it. Since being here he has been particularly impressed by the vast industries and resources, equality of opportunity, extensive research carried on in all fields, the way children are brought up to be

(please turn to page 28)

ROBERT H. FISCHER, born in Brussels, Belgium, in 1922, has traveled rather extensively since the age of fifteen when he went to France to attend a college in the Alps. He returned to Brussels the following year and in 1940 completed his high school education there. Bob was then called to serve his country and did so until the armistice with Germany later that year. Evidently not much pleased with the occupation, he went to France where he spent the remainder of 1940 and part of 1941 in Toulouse and Nice trying to get out of the occupation zone. He succeeded in reaching Morocco and from there went to Trinidad and the United States where he enlisted in the Belgian forces of the British Army. Bob passed through Canada en route to England, and following the invasion in 1944 he fought with the Belgian forces through France, Belgium, Holland and Germany. He then returned to the United States in the fall of 1945 to be discharged, since it was here that he had originally enlisted.

Bob has a sister living in the United States and it was her recommendation that prompted him to

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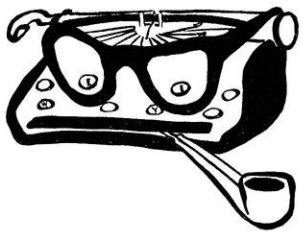


The Way We See It

"Superiority"

It seems to be a basic fact of life that man must be superior to someone else if he is to have any peace of mind. Superiority is a relative thing, so the modes of attaining that superiority are two. Primarily, man can actually better himself by hard work, learning, and good sound thinking. Secondly, he can better his relative standing by suppressing the fellow next to him. When the two are employed simultaneously, the result is quite impressive.

Now, if this plan is to be carried out, the man must decide who he is to suppress. It should be as inconspicuous as possible, since to call much attention to his campaign would mean failure. The best possible person to suppress is someone who has been held down so long that people no longer notice his plight. That accomplished, the next thing to do is to have the government tax the poor devil to help support a good institution of learning. Having done that, deny him the right to attend the school that his money is going to support. From here on the going is pretty easy. Let the generations pile up on the practice, and practically no effort at all is necessary to establish superiority.

All this sounds pretty cynical, but it is not hard to draw a strikingly close parallel from actual cases. If there were a race of people who were all born with a number in the center of their foreheads, those people would probably be chosen to suffer suppression by virtue of their easy identification. As it is, the colored people have been chosen. It has gone on so long that it is accepted by many thinking people. Others recognize the fact that there is such a practice, and that it is not good, but the immensity of its correction leaves them with a feeling of inadequacy to cope with it. Fewer truly intelligent and sensitive people condone discrimination than despise it. It would seem, in the face of this, that hope for the colored race lies in better education—for the whites. The other things will follow.

—RJM

Mud Study Course

Have you reached your twenty-first birthday yet?

With a considerable number of veterans enrolled in the university, many students can answer "yes" to that query. Probably at no other time has there been as large a percentage of "older" students here at Wisconsin. If you have reached your majority, this subject should be of vital interest to you. No, we are not referring to whether or not you can legally enter any of the local gin mills.

The daily papers are currently giving a good deal of space and attention to the coming elections. The political parties, both major and minor, are selecting Grade A timber (politically speaking) as planks for their platforms with one hand. With the other, they are collecting some mighty powerful ammunition to blast their opponents with at the proper time. Yes, they have already fired a few rounds to test their guns and to sound out their foes.

By now it should be quite evident what we are trying to get at when we inquired your age. Yes, you **should** vote in the elections of this country where you **can** vote as you **please.** What is more important, however, is how **do** you please to vote? Are you going to vote for the candidate whose radio voice pleases you most, or who promises to reduce your taxes, or who will vote for a veterans' bonus? Unfortunately, that is how many a voter decides in which square he will mark his "X". He listens to some fine oratory, and reads of the other party's failings or faults without inquiring very deeply into the significance of these remarks.

To vote intelligently, one must be able to see past the fancy phrases and determine how a promise can be made good (if it can) and what the cost will be. A veterans' bonus would be a fine gift, but does it look so attractive when we realize that we may pay higher taxes or sales taxes to finance it? On the other hand, an immediate reduction in taxes would ease the strain on many families' budget, but can we afford to take chances with our security, or dare we falter on our program of feeding the hungry people of the world? And isn't he who slings mud often trying to cover up some mistake of his own? The point is, we must sift fact from fallacy, and genuine action from subterfuge.

This is election year, and probably one of the most critical periods in our history. Certainly what we decide now will have a great effect upon our future lives. Yes, we **should** vote, and know what we are voting **for.**

—WMH

S-T-A-T-I-C

by Chuck Strasse e'49

FLASH FLASH FLASH
NEW CLUB STARTED ON CAMPUS

During the past month a new and unique organization has been started among the engineering students. The name of this club is "OSCULATIONS ANONYMOUS." The charter members of the club formed it because of the frustrations they have suffered due to their present bearded condition. The club will be disbanded on March 14th or shortly thereafter.

* * *

Engineer: "I made my fortune by hard work and strenuous saving."

Former Lawyer: "I sold a used car."

* * *

In philosophy class:

Prof.: "Wise men hesitate; fools are certain."

Student: "Are you sure of that?"

Prof.: "Yes, I'm certain."

* * *

For women with the new look: If the shoe fits, buy a smaller size.

* * *

More about beards: A certain Ch.E. grad. student was offered money, for a shave and a cup of coffee, by a kindly old woman. He can now be seen walking along State street with a tin cup. (Why don't you try the Union steps, Dick?)

* * *

Excuses and more excuses:

"After all, a fellow should sow his wild oats."

"Yes, but don't mix in so much rye."

* * *

Air Corps

"This one is on the house," said the gull as he headed out to sea.

* * *

A rattlesnake is just an eel with a crap game in the back room.

ST. PAT VS. BLACKSTONE
by Cal Culus

The sons of St. Patrick are brave men and bold
And quite unaccustomed to fear,
But the bravest of all was a man, I am told,
Called Abdul, the young engineer.

When they needed a blade to lead the parade
Or to fill all the lawyers with fear,
To remove any doubt, they all set up a shout
For Abdul, the brave engineer.

There are heroes a-plenty, and men known to fame,
In the ranks of the men of the bar;
But most famous of all was a man by the name
Of Ivan, the scheming loy-yar.

He could imitate Crosby, play schafskopf or pool,
Or perform on the Spanish guitar;
In fact, quite the cream of the whole shyster team
Was Ivan, the "smoothie" loy-yar.

One day this bold fellow found an egg freshly laid
And walked down State Street with a sneer.
He seemed unafraid, when he met the parade
Led by Abdul, the proud engineer.

Young man, said Abdul, is the law school so dull
That you're anxious to end your career?
For infidel, know, your egg hit the toe
Of Abdul, the bold engineer.

So take your last look at your "Evidence" book
And send your regrets to the bar.
By this, I imply, you are going to die,
Oh, Ivan, conniving loy-yar.

Like a guard at Old Bailey, he took his shillalah
While the spectators came from afar.
With murderous intent, he most suddenly went
For Ivan, the fighting loy-yar.

The rotten eggs flew for a decade or two,
While the "Sage of Mendota" kept score,
Till they finally said, we're so dog-gone near dead
We'd better not fight any more.

So the dust settled down on this college town,
And left the atmosphere clear.
We now hold a dance, where we get our chance
To hail ST. PATRICK, THE FIRST ENGINEER.

* * *

In a certain cemetery an epitaph reads: "Here lies an atheist. All dressed up and no place to go."

* * *

Prof.: "Are you cheating in this examination?"

Law Student: "No, sir. I was only telling him his nose was dripping on my paper."

* * *

Co-ed to St. Pat candidate: "I don't care if you are a volunteer fireman, keep your hand off my hose!"

* * *

He who laughs last has found a double meaning.

* * *

Never let it be said that the Wisconsin Engineer purposely led anyone astray.

* * *

Lawyer: "I'm a big gun at college."

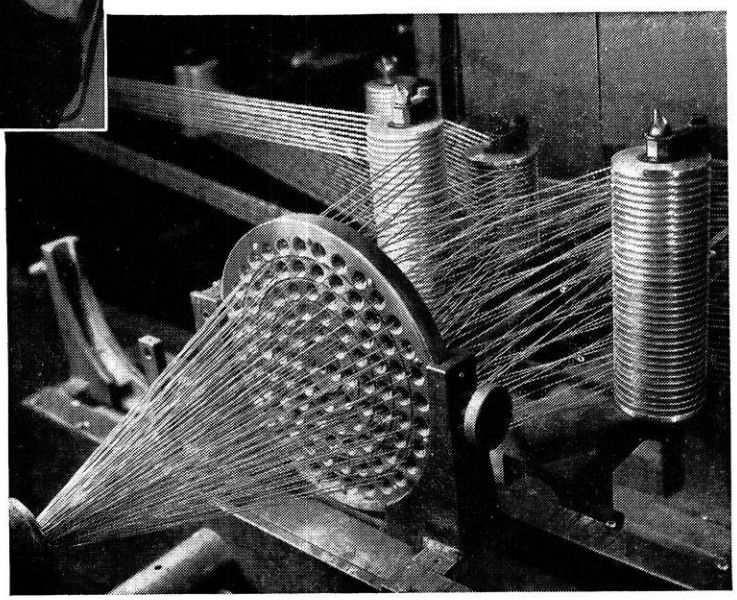
His Father: "Then why don't I hear better reports?"

(please turn to page 26)

Newsworthy Notes for Engineers

"Merry-go-round" speeds telephone dial governors

Most production lines in Western Electric plants follow standard practices, but often it is advantageous to custom-tailor an assembly line to do a specific job better. To control the mass production of delicate telephone dial governors to exacting standards, Western Electric engineers designed this "merry-go-round" conveyor with its ingenious assembly fixtures. It both simplifies the operation and reduces the time of assembly.



Cable at the "Cross Roads"

This "Cross Roads" guide plate through which pulp-insulated wires are rushing, keeps the wires in their proper relative position while being twisted into units of 101 pairs before being fashioned into a telephone cable. The wires passing through the guide plate to the flyer strander are kept at a uniform tension by means of a torque motor and a very sensitive control device at each of the 101 supply reels. Designed by Western Electric engineers, this mechanism prevents defects by keeping the wires from being stretched as they move along.

Engineering problems *are many and varied at Western Electric, where manufacturing telephone and radio apparatus for the Bell System is the primary job. Engineers of many kinds—electrical, mechanical, industrial, chemical, metallurgical—are constantly working to devise and improve machines and processes for mass production of highest quality communications equipment.*

Western Electric

A UNIT OF THE BELL SYSTEM SINCE 1882

Heat Power Lab . . .

(continued from page 8)

of Wisconsin for further study and research purposes.

A little-publicized project being initiated in the Lab's annex, in T-25, is a small-throat, supersonic wind tunnel. This is to be powered by an aircraft engine which drives a supercharger compressing unit.

Another interesting piece of equipment is the G. E. dual turbine unit. It is constructed to run with either or both turbines connected directly to the steam generating unit, or with one turbine feeding the other through a reheater. A complete control board for observation of performance and synchronization of the two generators has been installed.

It is not possible at this time to set a date at which installation of all operating equipment will be complete. The laboratory committee, consisting of Mr. T. J. Schweitzer and Mr. P. S. Myers in addition to Mr. Feiereisen, are stumped by the usual materials-and-manpower shortage. Steam fittings are very hard to get, and work has been hampered by the recent retirement of Mr. Henry W. Woodstock. Mr. Woodstock has been with the heat-power lab since shortly after the present M. E. building was built.

Work is being carried on at present by Mr. W. H. Chamberlin and a squad of ten part-time student helpers. The manpower shortage is expected to be a continued hindrance in the maintenance of the equipment even after installation is complete.

So far three students have volunteered to help set up the exhibits, in response to notices posted on the bulletin boards. Work on the Jumo-004 is to be done by Jan Urdal and the "Engineer's" R. J. Mitchell. G. J. Kamerling is to work on a jet propulsion demonstration, embodying a minijet engine such as is used for model airplanes. The minijet delivers 2½ pounds of thrust.

Other projects for which workers are needed are: 1) construction of an electrolytic loading device for dynamometers, 2) construction of an electronic speed control for internal combustion engine tests, and 3) construction of an air flow measuring system for internal combustion engines.

Ball Bearings . . .

(continued from page 9)

Following this is the assembly operation. Here the inner race is held in a special fixture; the outer race is dropped over it with its filling notch opposite to the notch of the inner race. Through this opening the balls are inserted—the last few slightly springing the tempered races in order to enter. Then the bearings are ready to run the gauntlet of final inspection.

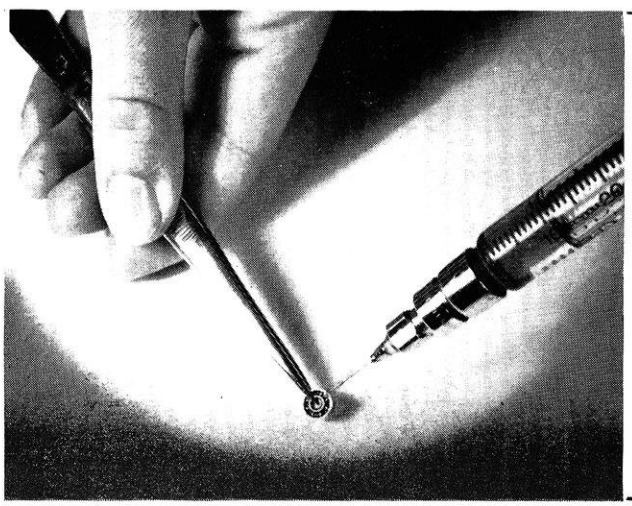
After it has survived this, each bearing is given an individual bath in a special solution that is used but once. Also, during these last operations the bearings aren't touched by hand. All this, plus the plant's modern air conditioning, results in a product that is free from contamination and is true to tolerance. In a product such as this the slightest bit of dust or corrosion can do much to nullify the use of the bearing.

Many uses are being found for these ball bearings in places where the shock that is inherent to the job would break a jewel of the same diameter and where the friction of the jewel would be too great. For these and other properties more and more manufacturers of such articles as impact gages, motion picture cameras, and railway track recorders are turning to miniature ball bearings.

Another item wherein more and more ball bearings are being used is equipment that sees almost continuous operation, such as small motors, chronometers, and barometers.

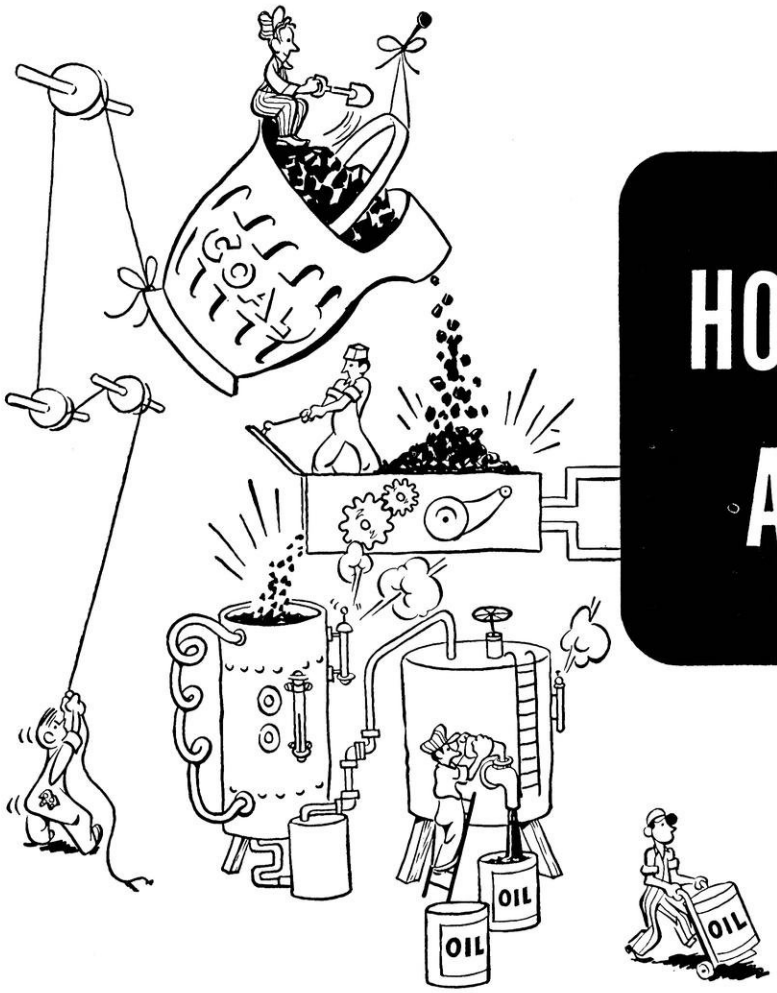
In order to accommodate users that need bearings that are resistant to corrosion or are non-magnetic, special bearings are made of stainless steel or beryllium copper. Also, to anticipate future need for still smaller bearings, recent experimental work has been done on pivot bearings as small as .031 inch in outside diameter. These bearings use balls as small as .011 inch in diameter.

Many new uses are now being studied and tested. Among these are applications in new aircraft and scientific instruments and in aerodynamic research. Because of the constant reduction in the size and bulk of these machines and instruments, no immediate limit is seen to the market for these small precision-made bearings.



Miniature ball bearings being lubricated by hypodermic needle.

Photo Courtesy N.H. Ball Bearings, Inc.



HOW TO GET A PATENT

To be patentable, a technical contribution must be both new and useful. At Standard Oil (Indiana) there exists a stimulating atmosphere in which our technical men continuously contribute to progress with new, useful inventions.

The work of all our research men is reviewed by trained patent advisors. When a researcher conceives a new solution to a problem, he is encouraged to submit it in the form of a disclosure. A careful search is made on his behalf by Standard Oil library research experts and patent attorneys. Their findings and the results of laboratory tests go with the disclosure to an application committee. On the average, one patent application is filed for every seven disclosures submitted.

This procedure gets results for Standard Oil and Standard men. We believe it compares most favorably with the patent practices of other industries—and few indeed can match Standard's record for technological progress.

Standard Oil Company

(INDIANA)

910 S. Michigan Avenue, Chicago, Illinois

STANDARD

STANDARD SERVICE

IRON MINES . . .

(continued from page 14)

A general view of the Cary Mine surface plant.

head, enclosed in new, modern buildings. These buildings were completed in 1946.

The quality of Wisconsin ore compares quite favorably with that of the better known Mesabi Range. As it comes from the mine, Mesabi ore ranges from 47 to 57 per cent pure iron. At the Montreal mine, the Hamilton grade for 1947 was 52.81 per cent iron and 0.056 per cent phosphorus. During the same year, the Montreal grade ran 53.16 per cent iron and 0.038 per cent phosphorus. The analysis of the ore shipped from the Cary mine was quite similar.

Because it costs more to take the ore from deep mines than it does to remove it from open pits, the Wisconsin mines are at somewhat of a disadvantage compared to those in Minnesota. The Wisconsin mines have been able to compete, however, as the general increase in production demonstrates. One factor in favor of the Wisconsin ore is that the royalty is lower than on the Mesabi ore.

The actual work of mining is carried on the year around to provide steady employment for the miners. When the ore is brought to the surface, it is loaded into railroad cars and hauled down to Ashland, on the shore of Lake Superior. There the hopper-bottom cars are run out onto a huge wharf that is high above the water. The ore is released from the railroad cars and falls into chutes that lead to the holds of the ore ships. These craft have been specially developed for shipping iron ore on the Great Lakes.

Because the lake shipping season is limited to about seven or eight months (the Great Lakes are covered by ice during the winter), the ore is stockpiled at the mines during the winter. During the navigation season on the Lakes, the mines generally ship ore from these stockpiles as well as from their summer mining production.

In 1946, iron ore was selling at the lower lake ports for $5.85 per ton. The shipping costs (including the rail charges from the mine to the ship) were $2.46 per ton. This left $3.39 gross income, out of which must be paid the royalties, the miners' wages, the costs of pumping water from the mines, and the other operating costs. The royalty amounts to about $0.37 per ton. This is somewhat lower than the Mesabi Range royalties, but it is in line with the lower profits of the Wisconsin mining operations. The pumping costs are considerable; great enough, in fact, to be considered as a separate item from the other operating costs.

The two mines employ a total of about one thousand men between them. The miners live with their families in communities built by the mining companies. These villages have local government officials just as any others in Wisconsin. The village officials are all employees of various departments of the mining company.

(please turn to page 34)

He wears a Lot of Different Hats

He's a Square D Field Engineer . . . his full-time job is working with industries of every kind and size in finding "a better way to do it." He talks less about theory, more about proven practice. He has a tremendous amount of actual experience to back him up.

Through a staff of such Field Engineers located in more than 50 offices in the United States, Canada and Mexico, Square D does this three-fold job: Designs and builds electrical distribution and control equipment in pace with present needs—provides sound counsel in the selection of the right equipment for any given application—anticipates trends, speeds development of new methods and equipment.

If you have a problem in electrical distribution or control, call in the nearby Square D Field Engineer. He makes a lot of sense in finding **"a better way to do it."**

For many years ADVERTISEMENTS SUCH AS THIS ONE have appeared regularly in leading business magazines. Their primary purpose is to build acceptance for Square D Field Engineers, practically all of whom come to us from leading engineering schools such as yours.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D CANADA, LTD., TORONTO, ONTARIO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

SOCIAL REPORT . . .

(continued from page 15)

E.E. — Tom Smith, sophomore from Evansville, Wisconsin.

M.E.—Ken Koehler, junior from Chicago, Illinois.

C.E. — Ramon Delgado, junior from the Dominican Republic.

M.&M.—Bill Beyer, junior from Milwaukee, Wisconsin.

Ch.E. — Glen Wesenberg, junior from Bloomer, Wisconsin.

The beard growing contest this year promises to be a good one, as many men have started their beards early. The main requirement for the contest is that the contestants must register for the affair, at the announced date, before the dance. Anyone can try for the prizes. There are no picked contestants. The beards will be judged by the Badger Beauties the night of the dance. The beards will be judged as to length, color, and originality of trim. The latest word is that the prizes will be well worth while.

The St. Pat's dance, informal, will be held at 9:00 p.m. on March 13th in the Great Hall of the Union. Music will be furnished by Don Voegeli and his orchestra. During intermission the beard contest will be held and the St. Pat ceremony will take place.

Final plans for the basketball game have not been made at this writing.

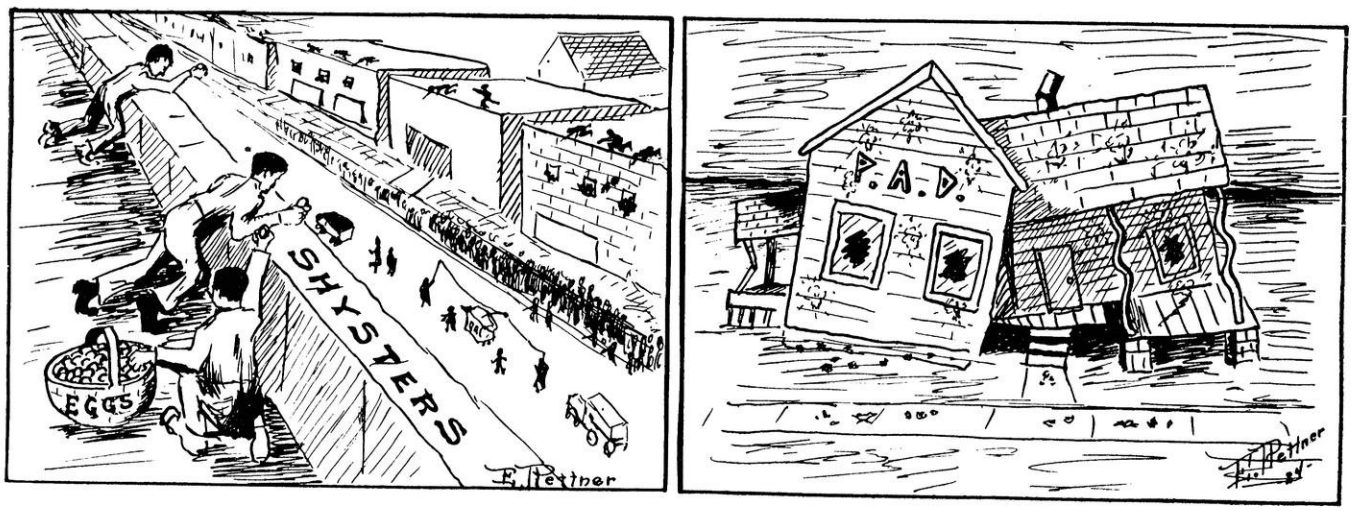
RESULTS:

Due to the fact that this experiment is still in progress, the results will not be announced until the next issue of the Wisconsin Engineer.

ERROR:

It is a well known fact that for a project to succeed, the support of all concerned is required. Fellow slip-stick artists, this is your affair. You alone can make it or break it.

We all appreciate the fact that our own engineering society's representative is on the Polygon Board working to make this event more binding among the engineers than ever before. It cannot be done without you. To miss the dance would be a big error.



Crime and Punishment, 1931 Style

S-T-A-T-I-C . . .

(continued from page 20)

"That's the guy I'm laying for", said the hen as the farmer passed by.

* * *

Wife: "John, you've got a hair!"

Bald-headed husband: "Hurray, that new hair tonic is doing some good!"

Wife: "Maybe for your secretary. The hair is on your lapel!"

* * *

Good Night (In a Taxi)

Kiss me quick,
Kiss me cunning,
Hurry up
The meter's running!

She: "You're so shocking."
He: "I know, I'm an E.E."

* * *

The one who thinks our jokes are poor,
Would straight 'way change his views,
Could he compare the jokes we print,
With those we couldn't use.

* * *

She: "I'm perfect."
He: "I'm practice."

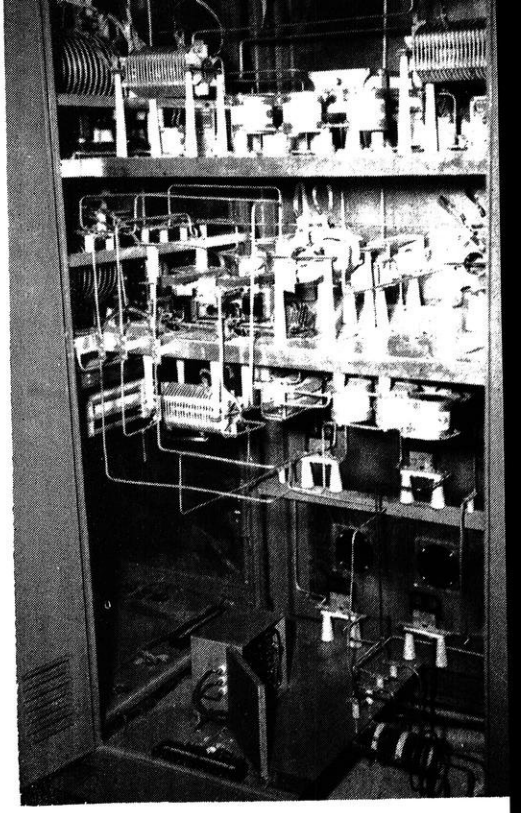
WKOW . . .

(continued from page 10)

check on programs in case the studio operator accidentally slips up.

This brings us down to the radiating system, which is by far the most noteworthy part of the station. The antenna system is made up principally of six steel towers, each insulated at the base and heavily guyed to withstand Wisconsin's winter winds. They are situated in the form of a large rectangle whose broad sides are parallel to a line running east and west. The height of the towers is 250 feet, slightly greater than a quarter wavelength at the operating frequency of 1070 kilocycles. To insure good ground conductivity, 55 miles of copper wire were buried in the form of radials from the bases of the towers out to a distance of 385 feet. In the center of the rectangle, where the radio frequency field is greatest, a heavy mesh made up of ⅜ inch copper rods was used.

During daylight hours, only two of the six towers are used, and a full 10 kilowatts is employed, making WKOW Wisconsin's most powerful radio station. At night, the power is reduced to 5 kilowatts and all six towers are used. The purpose of doing this is to prevent interference with other radio stations to the east and west of Madison sharing the same frequency. The antenna field pattern at night is a beam approximately 40 degrees wide oriented north and south. Radiation to the east and west is negligibly small. Phasing equipment, manufactured by the Andrews Antenna Company, is used to accomplish this pattern by the proper adjustment of phase and magnitudes of the currents of each of the six towers in respect to one reference tower. During daylight hours, radio waves do not skip great distances as they do at night, therefore an approximately circular pattern of radiation is used with no danger of interference. Design work for the antenna system was carried out by a former University of Wisconsin student, Walter F. Kean EE'40, now employed by the Andrews Antenna Company of Chicago.



Antennae-current phase and magnitude regulato

Bill Wakil . . .

(continued from page 18)

quite independent, and the desire of the people to make the most of everything whether it be work or play. In opposition to the above Bill has a dislike for some of the American press and looks unfavorably on the people's lack of knowledge about foreign countries and their citizens.

While the University of Wisconsin was not Bill's choice, but that of his government, he has found it much to his liking. He thinks the campus is wonderful and the facilities for students very good. He especially appreciates the many extra-curricular organizations in which students can receive varied and valuable experience.

While on the University of Wisconsin campus Bill has been active in the International Club. He has served as their Forums Chairman and Tours Chairman at various times and at present is a member of their Board. He is also a member of the Society of Automotive Engineers. His favorite sport is swimming and his hobbies are stamp collecting and traveling. While living in Egypt he made trips to Palestine and Syria, and at one time spent about six months traveling about in Lebanon.

At least there isn't any home work with this independent study course.

"GLASS SURE MAKES BETTER COFFEE!"

Thousands of families say their next coffee-maker will be glass. Why? Because they like their coffee just right! Glass lets you *see* and control the strength of the brew. Glass never alters flavor, even when coffee stands and is reheated throughout the day in your home or in a restaurant. And you can see at a glance when a glass coffee-maker is clean...so your next brew will be as rich and amber-clear as the first.

There are five excellent glass coffee-makers on the market today. And everyone of them uses Pyrex brand glass parts made by Corning. The reason? Because Corning makes these glass parts to close tolerances, with proper sidewall thickness, of uniform high quality. And Corning makes glass that can stand heat and cold without breaking.

Everybody benefits today from Corning's knowledge of glass. You get a better cup of coffee. Better food cooked in Pyrex ware. Better soup processed in Corning glass piping. Better vitamins extracted with Corning laboratory ware. Better light from bulbs and luminous tubes made from Corning's glass.

In all, Corning makes about 37,000 items in glass. Many of them have been applied in fields once held by other materials. Glass gets into new jobs because Corning uses it as a material of unbounded possibilities. Perhaps some day, in the business you select, glass will be able to cut costs, improve processes, or add to the saleability of your product. That's the time to remember us. Corning Glass Works, Corning, N. Y.

IN PYREX WARE AND OTHER CONSUMER, TECHNICAL AND ELECTRICAL PRODUCTS ▶

CORNING
means
Research in Glass

Alumni Notes . . .

(continued from page 16)

L. L. Ludwigsen ('29), 18 years with General Electric X-Ray Corporation and formerly manager of the Merchandise (Supplies) Depart-

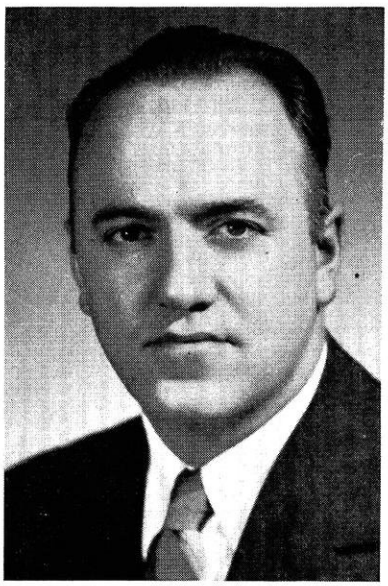


Photo Courtesy G.E. X-Ray Corp.
L. L. Ludwigsen

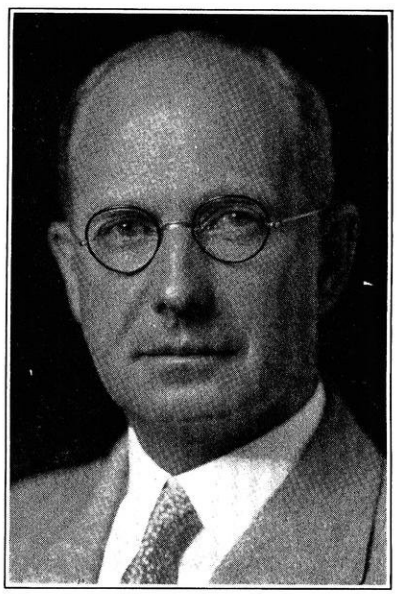
ment, was recently named head of the newly-created Services Department, directing two types of service activities—Engineering Services and Commercial Services.

H. A. Schlintz

Harvey A. Schlintz ('42) is doing television research and construction for the Rauland Corporation in Chicago. He married Iona Weihert, a '42 grad of the School of Education. **Herbert Schwalbach** ('42) and **Henry H. Schmalz** (ChE'42) are also working for Rauland Corp., in the Tube Division.

G. G. Post ('04) retired recently after 41 years of service with the Wisconsin Electric Power Company, Milwaukee.

After his graduation he served as assistant instructor and later as instructor of electrical engineering until 1906, when he accepted a position with the Milwaukee Electric Railway and Light Company (now the Wisconsin Electric Power Company). A series of promotions fol-



G. G. Post

lowed, until in 1929 he was appointed vice president in charge of power, the position he held at the time of his retirement.

He is a member of the Engineers' Society of America and of the National Electric Light Association, and has served on several AIEE committees.

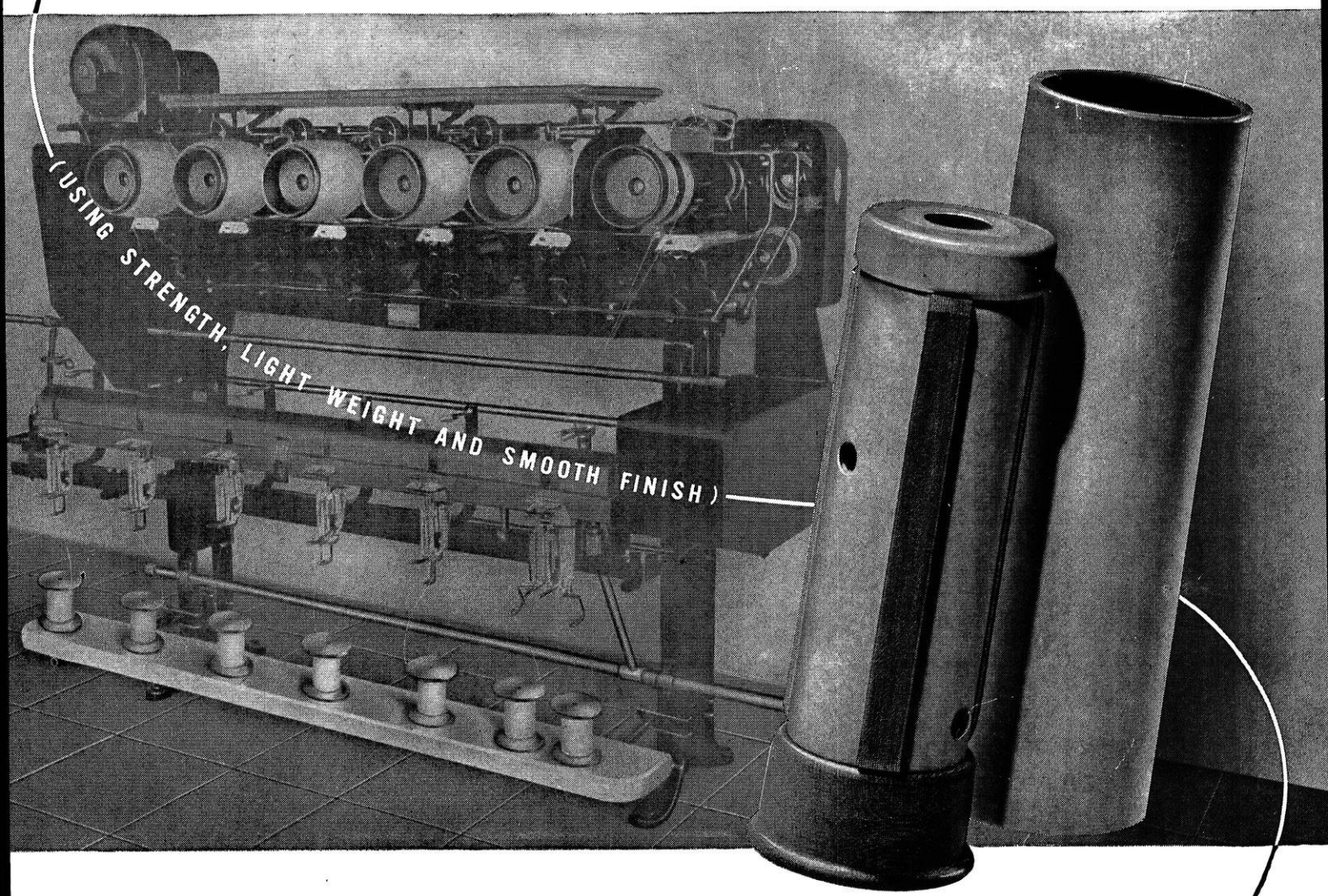
— M.E. —

Arthur Jack ('37) is Superintendent of City Water and Light, a municipal utility in Jefferson, Wis. During the war years he designed the electrical distribution system of Camp McCoy, Wis., and the Illinois Ordnance Plant. He was a field engineer on the "Big Inch" pipeline project. He also worked on the design of Diesel Electric drives for the Navy while employed by Allis-Chalmers.

Plastics where plastics belong

Because of a unique combination of chemical, electrical, and mechanical qualities, Synthane laminated plastics can be applied to an endless number of practical purposes Moisture and corrosion resistant, light-weight and structurally strong, Synthane has many collective advantages not readily found in any other material. One of the best electrical insulators known, Synthane is hard, dense, durable . . . quickly and easily machined.

Among the interesting occupations of our type of technical plastics are the redraw bobbin and chuck (below) used in winding fine denier nylon for women's hosiery.



Fine nylon filaments can be wound without pulling and sticking because of the smoothness of the bobbin. Light weight of bobbin and chuck allows the spindle to be started and stopped faster and with less effort. Greater crushing strength of tube permits larger amounts of nylon to be wound. This is an appropriate job for Synthane, an interesting example of using plastics where plastics belong.

Synthane Corporation, 1 River Road, Oaks, Pa.

SYNTHANE

where Synthane belongs

DESIGN • MATERIALS • FABRICATION • SHEETS • RODS • TUBES
FABRICATED PARTS • MOLDED-MACERATED • MOLDED-LAMINATED

Science Highlights . . . (continued from page 17)

ation. One thermostat is located inside the house, and the other one is attached to some exterior portion of the building that is protected from the weather. Each thermostat controls a heater coil in the central installation which gives more or less heat as is required.

The heater elements in the domestic heating plants are similar to those used in warming the submarines used in the last war. By insulating and enclosing the Nichrome resistance wire in a metal sheath around which a finned aluminum casting is moulded, the company claims to have eliminated the hazards of fire, shock, and explosion.

TINY, ACCURATE THERMOCOUPLE

The rapid response to change in temperature, the unit's size, the ease of sealing it into gas tight construction, and the small amount of temperature necessary to heat the tiny thermocouple characterize the tiny "temperature takers" made by the Precision Tube Company.

Used in small furnaces and pressure chambers, the small thermocouples are made of a thin gauge special alloy wire covered with glass fiber insulation and sheathed in small seamless copper tubing.

An outstanding use of these thermocouples has been in the field of jet propulsion developmental work. They can be sealed into pressure and exhaust chambers of aircraft where the temperature and temperature gradients are measured for various design and fuel combinations.

NIGHT VISION TESTER

Developed by the Eastman Kodak Company's research and development staff, the instrument works through matching of test objects in a darkroom on the ground. It is used to classify army fliers according to their ability to see at night.

The device consists of an enclosed projector and screen, individual recorders, and connecting equipment. The cadets look at a black object known as a Landolt ring and resembling an enlarged letter C. This is viewed against a faintly illuminated background. The cadets match similar C shaped rings against the position of the master ring as the screen is progressively darkened and the master ring changes position.

The students' ability is said to increase as they take successive tests.

HEAT FROM SILENT SOUND

Scientists specializing in a relatively new field of research — "ultrasonics" — are finding countless uses for their new "supersounds". These extremely high-pitched sound waves, inaudible to the human ear, are being used for everything from killing insects and rodents to blending milady's face cream.

Typical of the mechanical silent-sound producers is a "supersiren" now being used experimentally in the Acoustics Laboratory of Pennsylvania State College at State College, Pa. This supersiren is capable of producing inaudible sounds with frequencies up to 34,000 cycles per second—about twice the pitch that can be heard by the human ear.

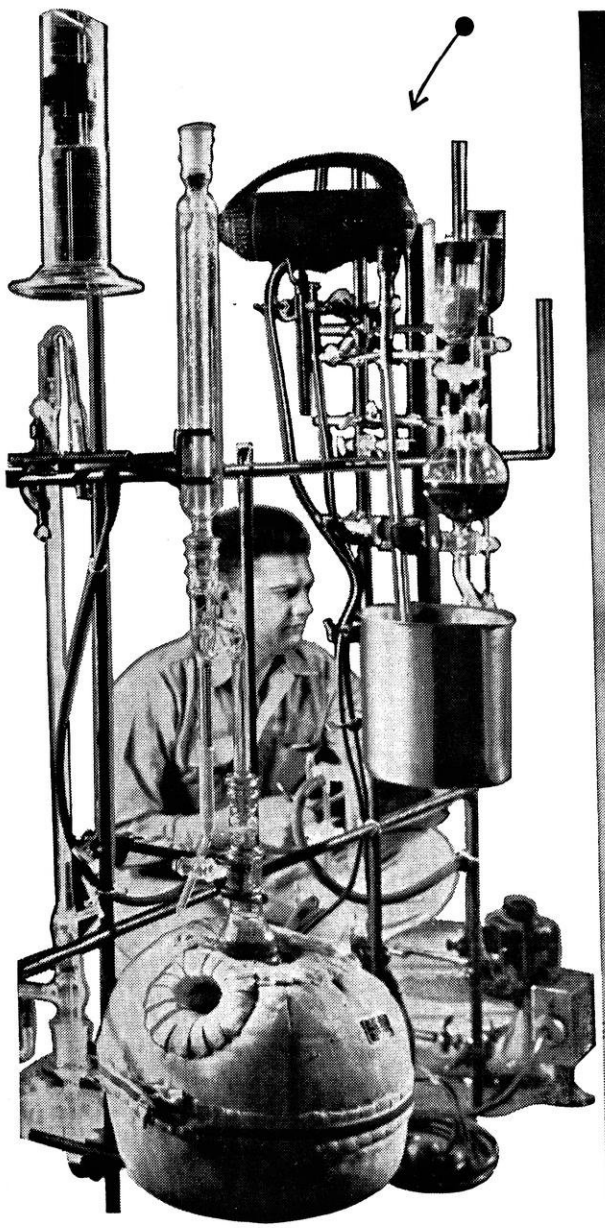
The sounds produced by this supersiren will do an amazing number of things. A piece of cotton held in its throat bursts into flame in a few seconds. Water poured over it will boil in about six minutes. Its sound waves will even pop corn.

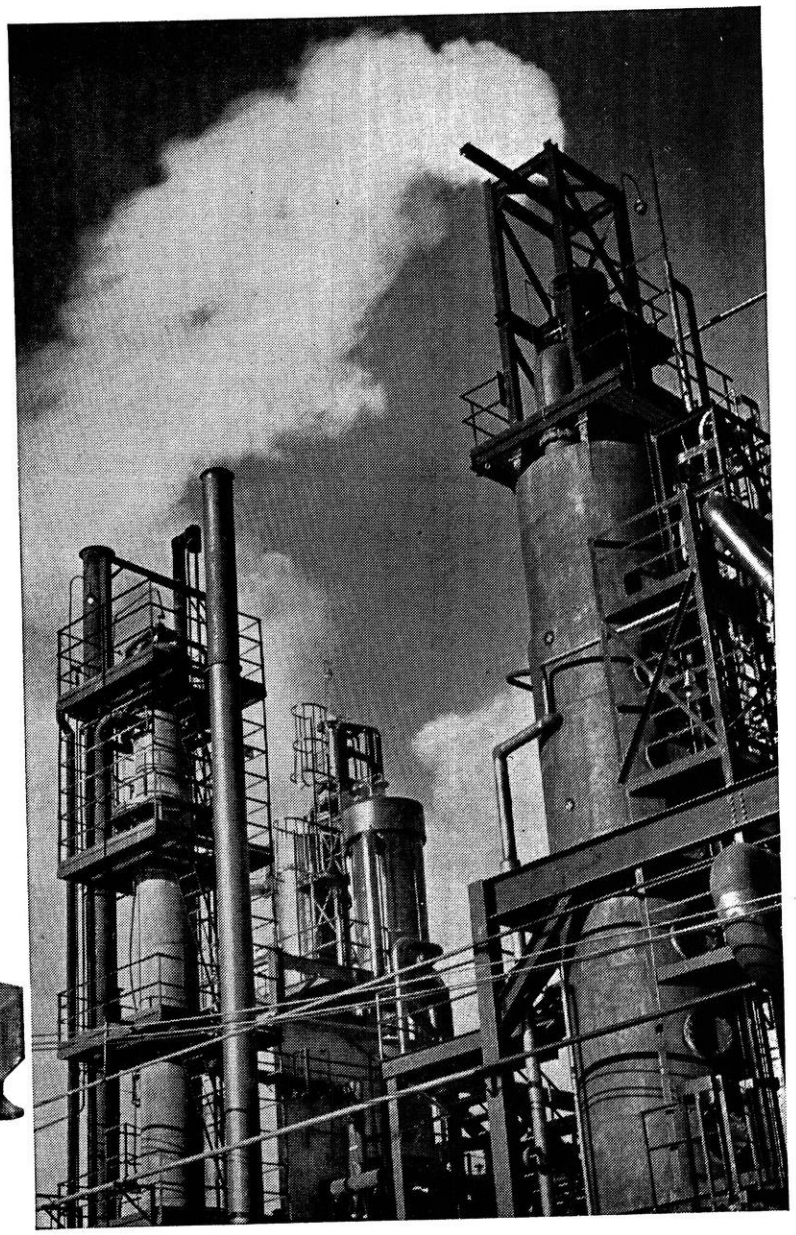
Sound is energy, and the energy coming from the siren's throat is equivalent to about two kilowatts — enough energy to light fifty ordinary 40-watt household electric lamps. The waves can kill germs, bacteria, insects, and rodents by literally cooking them with the sound energy absorbed by their bodies.

If the right frequency, or range of frequencies, is used, sound can scare away birds, insects, and other pests. Dirt and soot can be precipitated from the air of our cities by it. Directed at clothes, it can shake the dirt loose faster and more effectively than any conventional washing machine or vacuum cleaner.

It is hoped that ultrasonics will help solve many industrial and medical problems.

Laboratory curiosity—Now a COLOSSUS





Chemists and Engineers Team Up for Progress at P AND G

From basic chemical research, science moves forward into many different fields at Procter & Gamble. Here's an example:

A major synthetic detergent is made by the sulfation and neutralization of fatty alcohols. These alcohols are prepared by the sodium reduction of long-chain esters.

The picture left shows a reduction of a triglyceride to an alcohol by the classic Bouveault-Blanc process, in one of the research laboratories. For years this was a laboratory curiosity. Recent research, however, increased yields and brought the possibility of commercial use.

The picture right shows the colossus that has grown out of this research. It's a new P AND G plant, now using sodium in tank car lots to produce fatty alcohols.

Between the two lies the whole story of science at P AND G—of chemists and engineers working together to create new products and new processes and to design, build, and operate new equipment and new factories.

This is scientific teamwork at its best—teamwork that leads to progress.

Procter & Gamble

Cincinnati 17, Ohio

Iron Mines . . .

(continued from page 24)

Minor Operations and Ore Deposits

Besides these two active mines, there are several other mines in Wisconsin. These are all inactive, however, and now are only of historical interest. In 1849 an open pit mine was opened by The Swedes Iron Company near Iron Ridge, in Dodge County. This company also operated a charcoal blast furnace at Iron Ridge, and ore from the mine was used in this furnace, as well as in a later furnace at nearby Mayville. The Iron Ridge mine became inactive in 1914 after producing a total of 435,000 tons of ore.

The Mayville mine, also in Dodge County, was opened in 1892, and produced 2,144,000 tons of ore before it was abandoned in 1928. This mine had a shaft 125 feet deep. One reason for abandoning this mine probably was that the hematite ore was relatively poor in iron (40 per cent) and contained 1.4 per cent phosphorus.

The region around Baraboo, in Sauk County, also had a minor iron boom. The "Illinois" shaft was sunk to a depth of 475 feet to produce 300,000 tons of ore between 1904 and 1908. The nearby Cahoon mine was operated from 1915 to 1925, and produced about the same total tonnage of ore. The ore in the Baraboo range was somewhat richer than the Mayville ore, as it contained 47 to 49 per cent iron.

Another group of mines was opened in the North even before the Montreal and Cary mines. The Commonwealth Group, consisting of the Commonwealth, Buckeye, Davidson, and Badger mines, is located in Florence County, on the Michigan border. Opened in 1880, this group produced almost three million tons before operations were discontinued in 1916. The ore was a high-phosphorus hematite containing from 48 to 54 per cent iron. This ore was shipped by rail to Escanaba, Michigan, where it was transferred to lake vessels. The high cost of mining was the predominate reason for ceasing operations, as was the case with all of these minor developments. Low quality ore was also a contributing factor.

The Future

With the approaching depletion of the supply of high grade ores, many mining and steel companies are acquiring and developing reserves of lower grades of ore. They are trying to develop feasible methods of concentrating this ore at or near the mines. In this way they hope to send to the furnaces ore as high as 60 per cent iron. While the cost of concentration, or beneficiation, will boost the cost of ore, it is also true that shipping charges (per unit of pure iron) will be smaller, and less coke and limestone will be required at the furnaces, thus offsetting the cost of beneficiation somewhat.

This is the general nature of Inland Steel's project. Near Black River Falls there is a series of mounds containing iron ore. This ore is of comparatively low quality (30 to 33 per cent iron) but there are some advantages to make up for this. Because the ore is on the surface, it can be easily mined, and the direct, year-around rail haul to the Chicago area is considered as an advantage. By this route, the ore will be handled the minimum amount, as compared to loading and unloading ships. Therefore the shipping costs will compare favorably with those of the Great Lakes route.

The future of iron mining in Wisconsin is a question that no one can have an absolute answer for. Considering the events of the past, and the depletion of the richer ores, it is likely that the mining industry will hold its own, if not gain somewhat.

Successful telecasts of surgical operations show value of television to medical education.

"Step up beside the surgeon—and watch"

Not long ago, a radio beam flashed across the New York sky—and "carried" more than 7000 surgeons into a small operating room . . .

Impossible? It was done by television, when RCA demonstrated—to a congress of surgeons—how effective this medium can be in teaching surgery.

In a New York hospital, above an operating table, a supersensitive RCA Image Orthicon television camera televised a series of operations. Lighting was normal. Images were transmitted on a narrow, line-of-sight beam . . . As the pictures were seen the operating surgeons were heard explaining their techniques . . .

Said a prominent surgeon: "Television as a way of teaching surgery surpasses anything we have ever had . . . I never imagined it could be so effective until I actually saw it . . ."

Use of television in many fields—and surgical education is only one—grows naturally from advanced scientific thinking at RCA Laboratories. Progressive research is part of every instrument bearing the names RCA or RCA Victor.

When in Radio City, New York, be sure to see the radio and electronic wonders on display at RCA Exhibition Hall, 36 West 49th Street. Free admission to all. *Radio Corporation of America, RCA Building, New York 20, N. Y.*

Continue your education with pay—at RCA

Graduate Electrical Engineers: RCA Victor—one of the world's foremost manufacturers of radio and electronic products—offers you opportunity to gain valuable, well-rounded training and experience at a good salary with opportunities for advancement. Here are only five of the many projects which offer unusual promise:

- Development and design of radio receivers (including broadcast, short wave and FM circuits, television, and phonograph combinations).
- Advanced development and design of AM and FM broadcast transmitters, R-F induction heating, mobile communications equipment, relay systems.
- Design of component parts such as coils, loudspeakers, capacitors.
- Development and design of new recording and reproducing methods.
- Design of receiving, power, cathode ray, gas and photo tubes.

Write today to National Recruiting Division, RCA Victor, Camden, New Jersey.

Also many opportunities for Mechanical and Chemical Engineers and Physicists.

RADIO CORPORATION of AMERICA

Bob Fischer . . .

(continued from page 18)

come to the University of Wisconsin for his engineering education. He had done some previous work at the Lycee of Nice, France, and also through the London University Correspondence College while serving in the army in England. He entered the University of Wisconsin in March, 1946, to study mechanical engineering. Bob is interested in specializing in combustion or gas turbines, and after graduation this June he wants to obtain some experience in the training program of some large company before undertaking any further schooling. He has, as yet, no definite plans in regard to returning to Belgium.

For the financing of his schooling Bob is using his own savings. He was awarded sophomore honors and is a student member of the Society of Automotive Engineers. As he is completing the course in mechanical engineering ahead of schedule, he finds little time for outside activities. However, he is interested in art history and music, and has not missed any of the Pro Arte concerts. Bob's favorite sports are hockey, swimming, and skiing.

While at the University of Wisconsin Bob has been impressed by the beauty of the campus, especially in spring. He likes the informal and cordial relationships between professors and students in contrast with the "untouchable" attitude of Belgian professors. He has enjoyed the opportunity to work with good instruments as provided here. Bob heartily approves of the support given to scientific development in the United States.

After five years in the infantry, Bob received 3,500 francs (80 dollars) for clothing, and another 3,500 francs for three months' pay from the Belgian government. At that time, 1945, his 3,500 francs would buy him little more than a pair of pants. Compare this to the benefits received by United States veterans when they are discharged and also under the G. I. Bill!

Campus . . .

(continued from page 12)

Emelity Is New Regent

Lud. A. Emelity was elected Regent of the Xi chapter of Theta Tau Engineering Fraternity at their first meeting of the semester on Tuesday, Feb. 10, in the Mechanical Engineering building.

Other officers elected were Vice-Regent, Norman Stickney; Scribe, Ivan L. Wilson; Treasurer, Joseph R. Vinette; and Corresponding Secretary, Robert St. Clair.

S.A.E.

At the February 11 meeting the following members were elected to the branch offices: Howard F. Traeder, President; George B. Creedle, Vice President; Warren E. Burnham, Secretary; William G. Searles, Treasurer; Paul L. Hatleberg, Field Editor.

A film produced by the American Broadcasting Co. in cooperation with the major automotive corporations provided information concerning the problems confronted by the industry in the process of conversion from war-time to peace-time production. Plant layout, materials expediting methods, and the need of rapid and timely transportation of parts and sub-assemblies to the assembly plant were stressed.

A.S.C.E.

At a meeting of the Student Chapter of the American Society of Civil Engineers, the following officers were elected for the spring semester:

President—William Korbitz
Vice President—Sylvin Lange
Secretary—Sigurd Lokken
Treasurer—Wilbur Haas
Polygon Board—Al Pierce

The new officers were sworn in by Retiring President Art Langdenberg. After the meeting, motion pictures of the Northwestern vs. Wisconsin football game were shown with Sylvin Lange acting as narrator.

Dr. William Lea, new member of the University of Wisconsin Sanitary Engineering faculty, addressed the A.S.C.E. on February 19. Dr. Lea spoke on the subject, "Industrial Hygiene", and told of the significance of the engineer in the field.

Seniors Note:

Seniors expecting to graduate this June should check with their advisors and make application for War Service Credits if necessary. The University allows a maximum of 15 credits, but confidentially, you will be lucky to get 10.

I.R.E.

Plans were laid for a local chapter of the Institute of Radio Engineers at a preliminary organizational meeting in the Mechanical Engineering building on February 12. The new organization expects to work hand in hand with A.I.E.E.

DU PONT Digest
For Students of Science and Engineering

Research simplifies print making with development of "Varigam" Paper

Chemists and physicists make important contributions

Photographic film that has been overexposed or overdeveloped usually means a "hard" or "contrasty" negative—too much silver is deposited on the highlights in comparison with that in the shadows. The opposite effect, a "soft" or "thin" negative, results from underexposure or underdevelopment. At one time photographers had to stock four or five grades of enlarging paper to correct for these conditions and get the right degree of contrast.

To eliminate this expensive, unwieldy situation, scientists developed "Varigam" variable contrast photographic paper. With "Varigam," the whole procedure of getting different degrees of contrast is reversed. Instead of using several grades of paper, the photographer uses only one. He gets variation in contrast by use of filters that control the wave lengths of light reaching the paper, thereby getting finer degrees of contrast than are otherwise possible.

The action of "Varigam" depends on the ability of certain dyes to extend the sensitivity of silver halide emulsions beyond the blue and blue-green regions. This effect was well known to scientists. But "Varigam" has an added feature —it gives high contrast in the blue portion of the spectrum and is also sensitive to light in the green region, *with low contrast.*

"Varigam" the work of many men

The first job was one for the physical chemists. Silver halide emulsions, normally sensitive to blue light, had to be made to give maximum contrast when exposed to light in this region.

It was known that certain dyes would extend the sensitivity of the emulsion over as far as the infra-red. But they were not practical for photographic paper, being affected by the red safety light used in the darkroom. Research by chemists showed that certain dyes such as 1:1'-diethylthiopseudocyanine iodide extended the light sensitivity only to the green region. And, most important, they produced low contrast when used in lower-than-normal concentrations. When such a dye was combined with high-contrast silver halide emulsion, the result was an emulsion that gave high-contrast prints when exposed to blue light, and low-contrast prints when exposed to green light.

Physicists Develop Filters

Physicists made this contrast control a reality by preparing sharp-cutting filters that allow the user to control his printing light selectively. These filters, which are attached to the lens of the enlarger, range from blue for high contrast to yellow, which cuts out the blue almost entirely and gives low contrast. In between are eight grades of filters with intermediate degrees of blue and yellow light transmission. All of the filters are made in such a way that neither light nor printing time needs to be varied as filters are changed, except the last two on the blue end. These require approximately twice the time of the others.

In "Varigam," made by Du Pont, chemical science has given the photographer new economy and convenience in printing, and a degree of contrast control more precise than is possible with any combination of commercial papers.

Normal print (center) can be obtained from either a "soft" negative (left) or a "hard" negative (right), using "Varigam" variable contrast paper.

STANDARDS IN TOOLING

(A Tau Beta Pi Essay)

by R. W. Mickelsen m'48

Production tooling is one of the most specialized phases of modern industry. Consumer goods roll off production lines in a seeming endless march of identical objects. But an inspection of methods used in the manufacture of these goods reveals an array of dissimilar tools. The manufacture of one specific product requires from one to thousands of tools, each different from the others.

Consider the modern airplane. Tools are required for the mass production of the thousands of component parts of any particular airplane, from simple rivets to the most intricate engine parts. And then, beyond the individual parts, the hundreds of sub and main assembly operations require special assembly jigs.

Tooling has, and always will, contribute a large part to the cost of the finished product. Tools require a special machine shop for their construction, high grade materials, special heat treatment, close machining tolerances, and highly skilled labor. Because of these factors, each tool costs many times the retail price of a finished unit product.

It is this high tooling cost which has made it imperative for industry to form standards for as many tool components as possible. These standard components can then be made by high production methods, thereby greatly reducing the cost of the completed tool. Much has been done in standardization of tools by the American Standards Association, various national engineering organizations, and by individual manufacturers.

It is obvious that since products will continue to change in design, tooling can never become completely standardized. However, tool engineering personnel can do much in this direction by adhering to existing standards data whenever possible, and by continued analysis of new tooling methods for possible standardization.

The importance of standardization of tools cannot be over-emphasized. Industry cannot produce low cost goods if tooling costs are high. It has been noted that those members of the engineering profession who come into direct contact with tooling and its problems are constantly striving for low cost tooling. It is unfortunate, however, that the design engineer knows as little as he does about tooling. That classic ode which ends in the design engineer crying: "I have it at last, it can't be cast!" contains more truth than poetry.

It is the common hope of tooling engineers that engineers of all classifications will in the future lend more thought to production methods and tooling as the product design takes shape on their respective drawing boards.

The Brighter Side of the Dumber Sex . . .

Women's rights! Bah!

To heck with the New Look!
We're going to St. Pat's dance!