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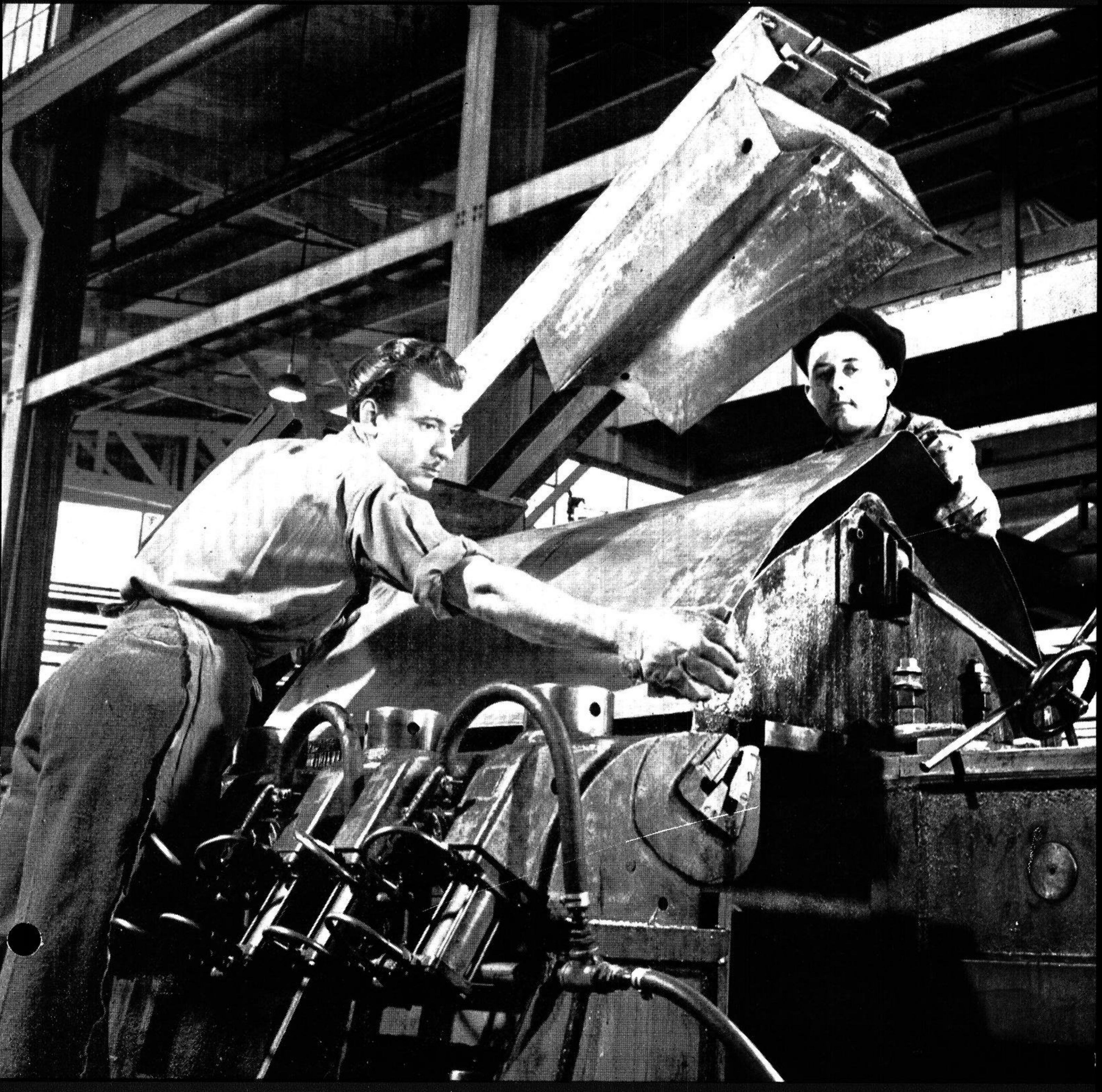
WISCONSIN ENGINEER

November, 1946



MEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED

Wood specimens which show the excellent preservative qualities of Pentachlorphenol. The two pieces on the right were impregnated with this protection against decay. All four pieces were buried underground for six years in a Dow test plot.

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Growing trees can fight their own battles against many common destructive forces. Nature has seen to that. But power poles, fence posts and structural lumber are dead wood and suffer greatly from insect attack and the conditions that create decay. Here's where the chemist steps in and takes over nature's job to give lumber longer life.

During the past decade, notable progress has been made in developing preservative treatments for the protection of wood. Studies undertaken by Dow technicians have resulted in a new preservative known as Pentachlorphenol which is being used successfully without the attendant disadvantages of the older commonly used materials. Pentachlorphenol gives every assurance of greatly extending the useful life of lumber.

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Founded 1896

Volume 51 NOVEMBER, 1946 *Number* [illegible]

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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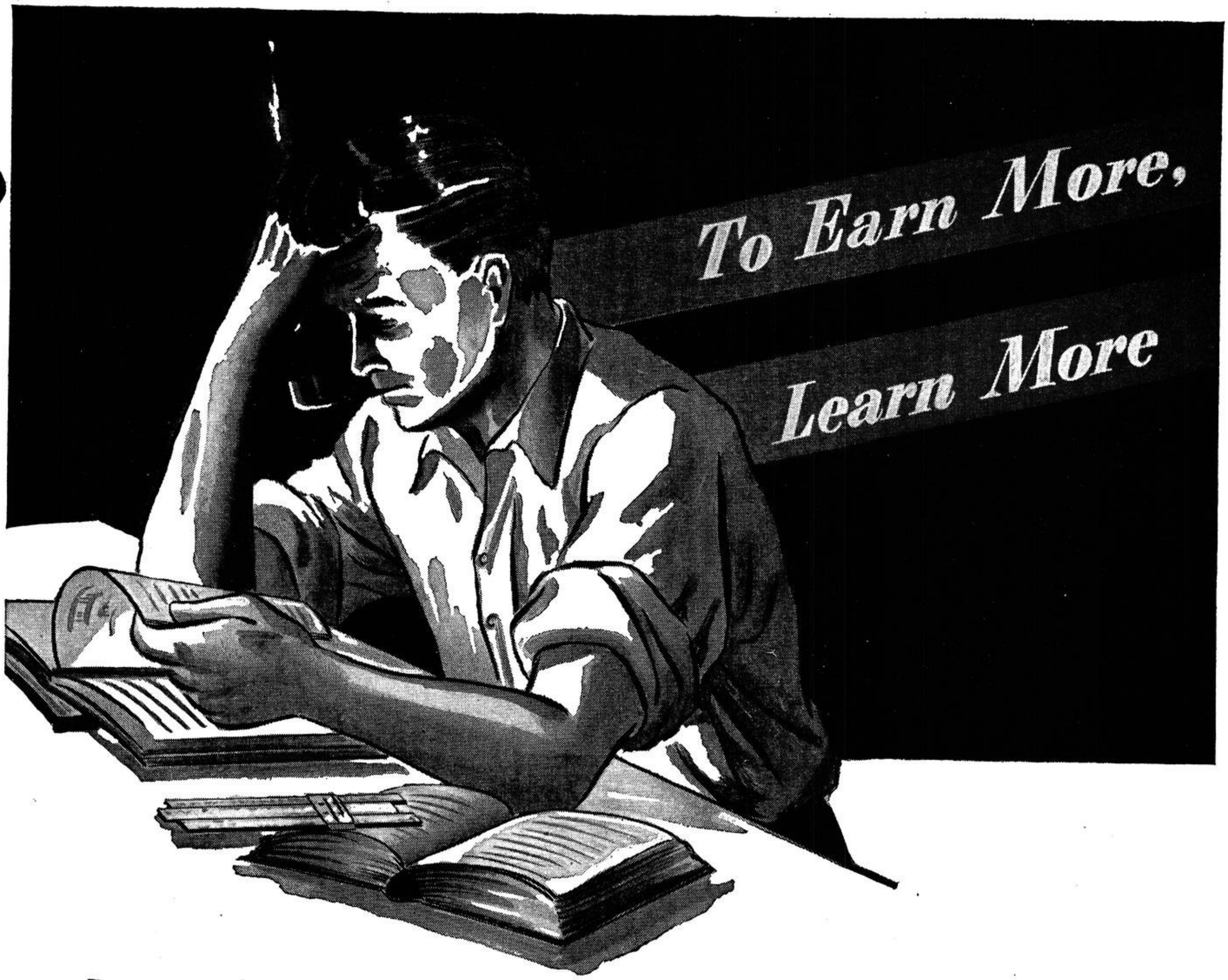
In This Issue . . .

COVER:

A giant clamp holds a sheet of aluminum in place while a powerful air-operated ram shapes it to fit the tail cone of a Republic P-47 Thunderbolt fighter plane. Workers are shown removing the sheet after it has been shaped.

—*Courtesy Westinghouse*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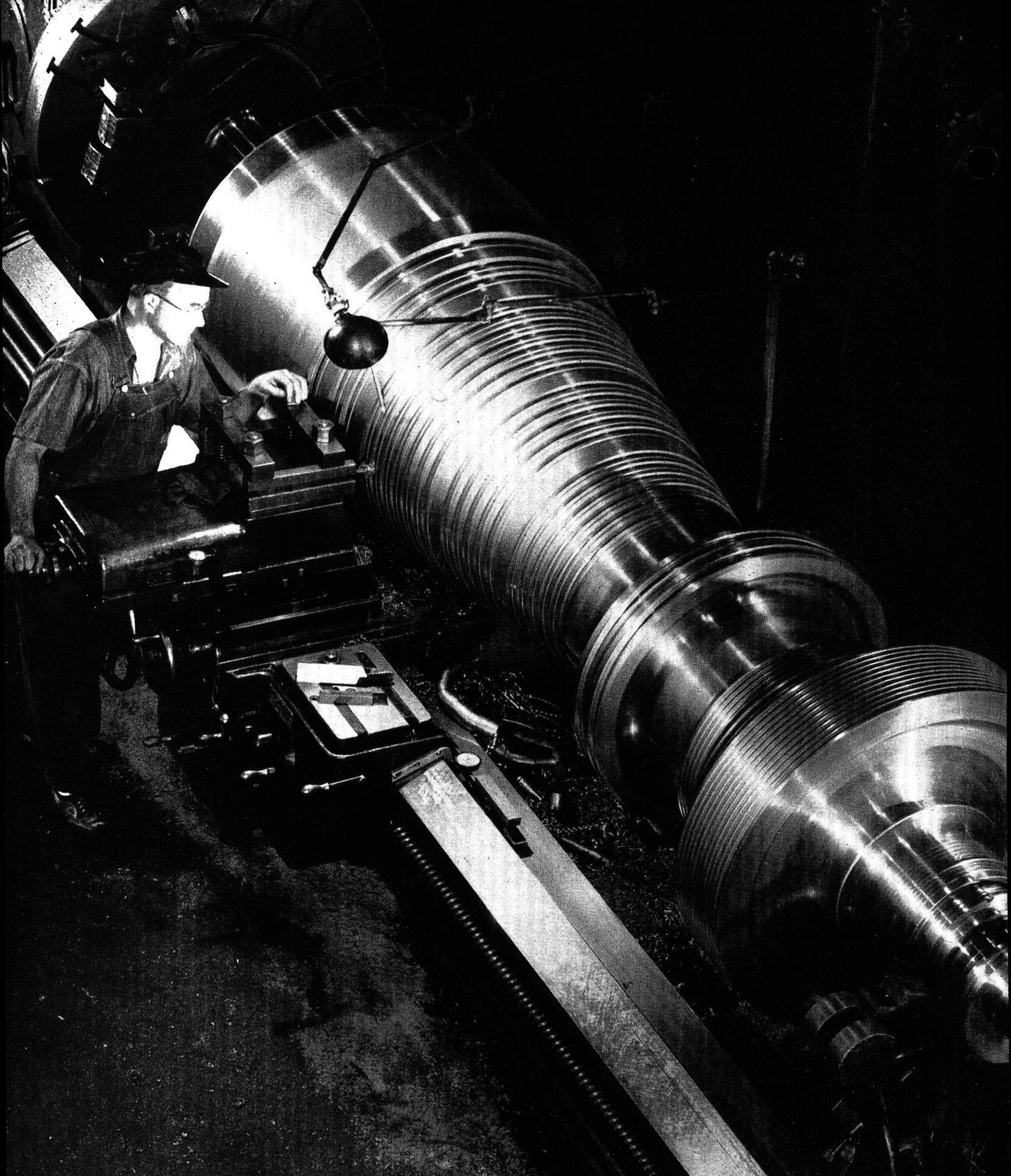


Serrated reaction blade grooves in the spindle of a 20,000 kw, 3600 rpm, single cylinder, impulse reaction steam turbine are machined by a skilled lathe operator.
—Courtesy Allis-Chalmers

HEATING OUR UNIVERSITY

by R. J. Karabinus m'47

A note of appreciation is extended to Mr. J. J. Novotny, U. of W. Power Plant Engineer, for his help in obtaining the information and pictures, for this article.

A VIEW of the southern shore of Lake Mendota from Picnic Point, would reveal the white sandstone structures of the dorms mixed with a green background that appears to be at the foot of the tall, stately chimney of the University Heating Station. This landmark which seems insignificant from a distance, is part of the heating system that has been keeping the halls of the University warm for almost forty years. However, the University hasn't always had a central heating system.

During the first thirty-nine years after the founding of the University, wood cut from the surrounding area and burned in fireplaces, stoves and furnaces provided the heating for each building. It wasn't until 1885 that the first central heating plant was built in back of Science Hall, in what is now Radio Hall. Thirteen years later, the last of the buildings on the east or upper campus were connected to the heating plant.

The first boilers were 50 H.P. units, but in 1906 a 350 H.P. water tube boiler replaced them in order to meet the demands of the steam, electrical and hydraulics laboratories.

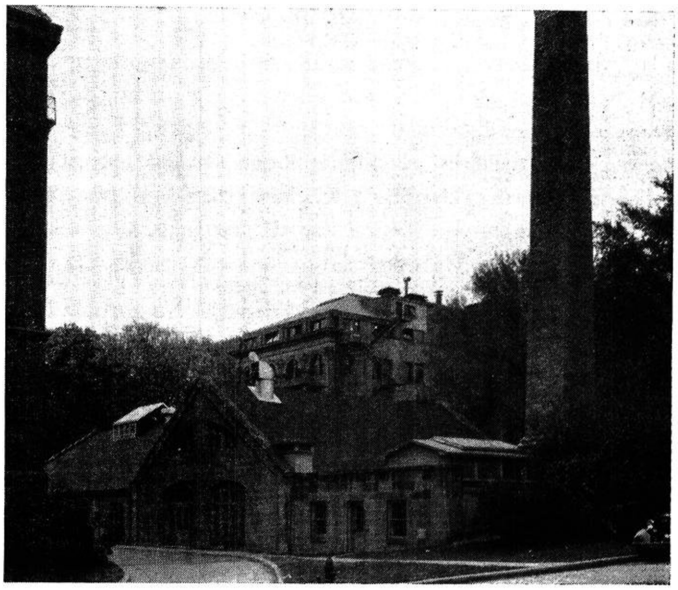
A heating station for the buildings of the Agriculture College was built in 1896 in what is now the Agriculture Bulletin Building.

In 1906, due to the increase in enrollment and the construction of new buildings, funds were appropriated for the construction of a new central heating station. In 1907 and 1908 the plant, designed by Professor Storm Bull and Arthur Peabody, was built and at the same time a series of tunnels were built connecting with the tunnels of the old plants.

Originally the heating plant had only four 350 H.P. high pressure B & W water tube boilers fired by Roney hand stokers. In 1909, the old 350 H.P. high pressure boiler from the old plant was moved to the new station. This boiler was scrapped in 1924.

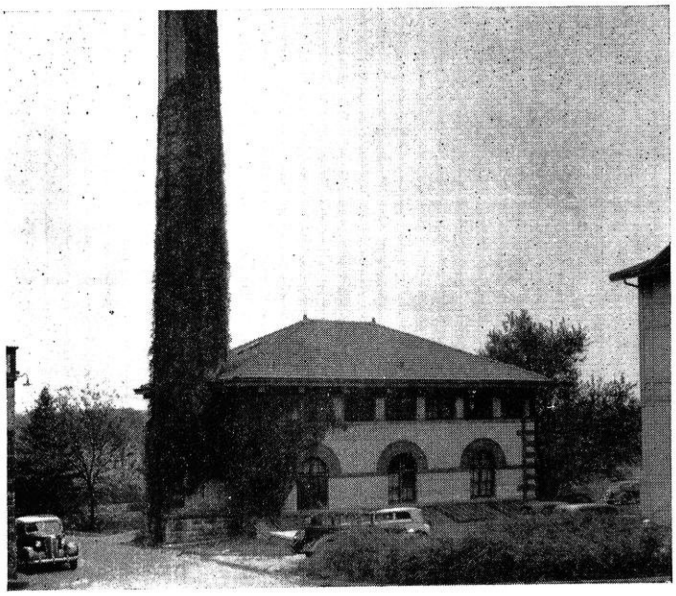
In 1912-1913, two high pressure B & W cross drum type boilers with Roney underfeed stokers using force draft were installed. The following year, two more similar units were added which gave a total of 2450 rated boiler horsepower for the station.

The construction of the State General Hospital in 1924 added 36,000 square feet of hot water radiation and with the addition to the new service building, the load on the plant was greatly increased. To meet this increase, one 350 H.P. high pressure boiler was scrapped and two new 516 H.P. high pressure boilers with improved underfeed stokers were installed. By 1931 only four 350 H.P. high pressure boilers were left and a total of eight 516 H.P. B & W high pressure boilers all of them having improved American Taylor underfeed stokers with force draft.



The first central heating station building now houses station WHA.

The four 350 H.P. units were replaced by four 516 H.P. units in 1939-1940. The four 516 H.P. Springfields have



The present Agricultural Bulletin Building was our second heating station, built in 1896.

rear water walls with two of them equipped with improved underfeed stokers and the other two, spreader type stokers. The latter stokers were installed for student experiment work in connection with the steam and gas laboratory. A pulverized coal unit for one of the boilers was planned for student experiment work, but the lack of space for the pulverizers, and the necessity of increasing the combustion volume of the boiler, prevented its installation.

It is of interest to note that in the entire history of the heating station, not one day of operation has been lost due to the conversion or installation of new units. This, with the fact that the construction and maintenance of all the equipment of the heating plant and distribution system has been done by the station's own crews, is a record the men of the heating station can be and are proud of.

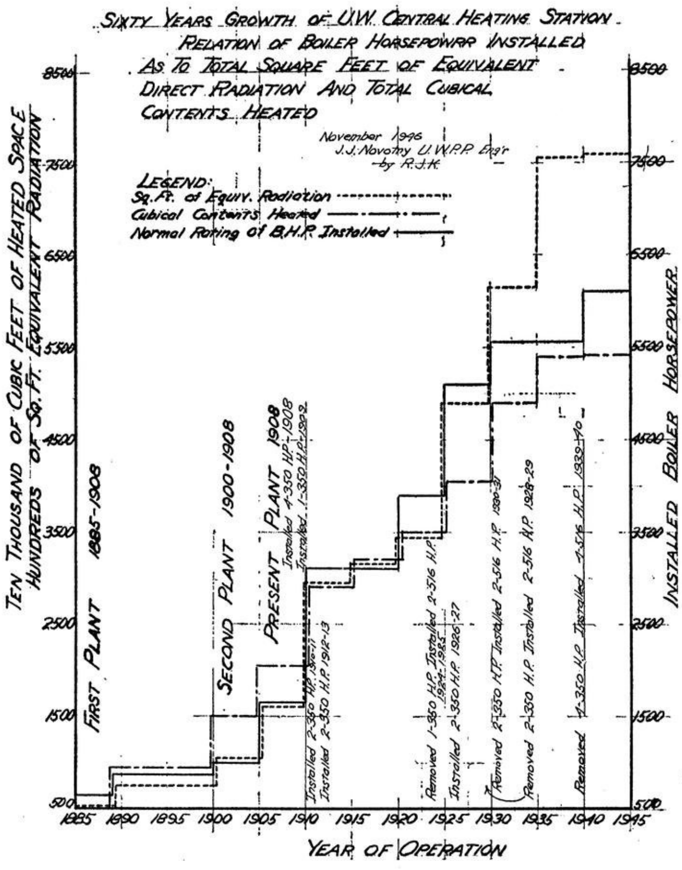
The stack, which is of the Alphonsis Custodis brick construction designed for an ultimate natural draft capacity of 6000 boiler horsepower, is 250 feet high and 19 feet inside diameter at the base tapering to 14 feet inside diameter at the top. With the use of force draft, the capacity of the stack has been increased to over twice its designed capacity.

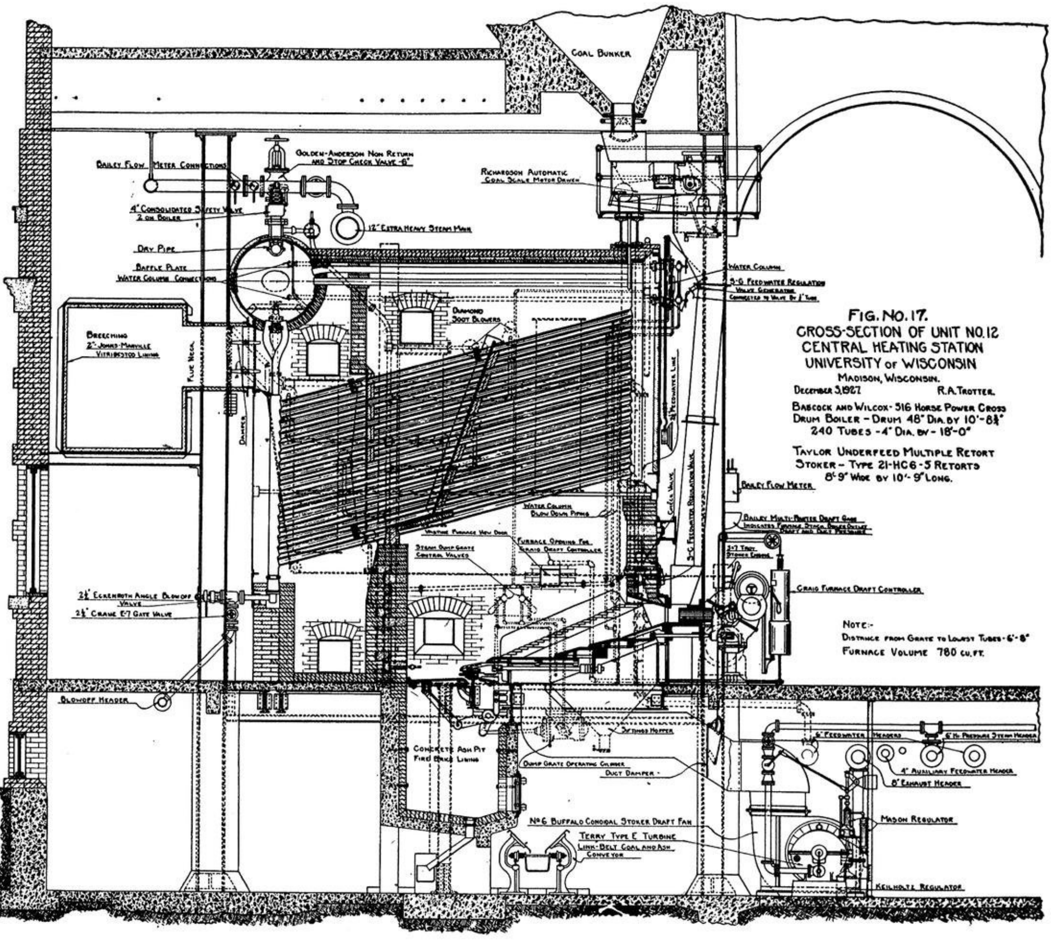
For the distribution of the steam to the buildings the network of tunnels was expanded to meet the increasing demands. Today there are better than nineteen miles of distribution system of which three miles of brick and concrete tunnels are large enough to walk in, with two and one-half miles of concrete conduits. The system is laid out in two loops, the east loop serves the buildings on the upper campus and the men's gym, the west loop serves the Agriculture buildings, hospital, men's dorms and Engineering buildings. Forest Products Laboratory has its own heating plant.

Coal, from the West Kentucky fields, is delivered on the St. Paul side track right to the heating station where the coal cars are weighed before and after dumping. In order to obtain a uniform size of coal, it passes through crushers before being delivered to the conveyors. Apron conveyors carry the coal up to the belt bucket cross conveyors, from the cross conveyors the coal is dumped into the longitudinal conveyors which elevates the coal to the bunkers above the boilers. Each of the six bunkers, three on each side, have a capacity of 500 tons, and serve two boilers. Enough coal passes through the bunkers each year to heat about 4500 domestic dwellings in the Madison area for one year.

The coal is automatically weighed on 200 pound Richardson coal scales before it drops through the Conical coal distributors which spreads the coal evenly across the stoker hopper. The coal is fed from the hopper by one of five retorts into the furnace. Periodically the ash from the grates is dumped into the ash pit, from which it is removed by hand to the link belt conveyors which elevates it to the ash bin. When the bins are to be emptied, a cross conveyor carries the ash to the trucks outside. Turbine driven force draft fans supply the necessary air for combustion up through the fire beds.

The feed water, made up of returned condensate and lake water passed through a lime soda ash water softener, is heated in a deaerating feedwater heater. Centrifugal pumps, driven by turbines, pump the heated water through Venturi meters into the boiler. The steam from each boiler is fed into a twelve inch ring header with take-off points at each end for the East and West tunnels respectively. At





Cross-sectional view of typical 516 H.P. boilers now operating at the central heating station.

each take-off point, reducing valves reduce the pressure from 160 pounds to about 10 pounds per square inch for heating.

In order to maintain a high operating efficiency, the air flow, steam flow, the temperature and CO_2 content of the flue gases are recorded in addition to the coal and feed water rates for each boiler. Thus a permanent record of the efficiency of operation at any one time can be determined. All of the meters and recorders are arranged so that an individual test may be run on one boiler or the whole plant. Eight plant tests are made per year by the students of Chemical, Electrical, and Mechanical Engineering, thus a close check is kept on the efficiency of operation.

The boilers are operated at 150% to 175% of rated load continually and can be operated at 200% of rated load for four hours. All the boilers are not used at one time; in fact it is rare when ten boilers are on the line at one time, which allows for maintenance and emergencies. The peak load comes between 6:00 A.M. and 9:00 A.M. and slacks off for the rest of the day. The Field House has an equivalent radiation of 46,000 square feet, but since it is used only in the evening, after the load has tapered off, it doesn't present a problem in heating.

The present heating station can handle an additional six million cubic feet of heating space or an increase of 10% over the present volume. This could still be increased further by better heating and ventilation regulation, insulation, and weather stripping of the older buildings.

The heating plant also has its own power generation system. A 250 KVA generator is kept ready for immediate operation to provide emergency power for the hospital, Service Building, and Heating Station.

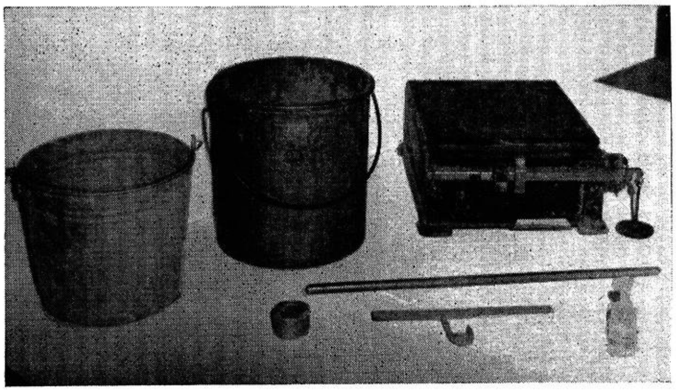
As the University is on the threshold of a great expansion program to fulfill the needs of the increasing enrollment which already is 18,700 and expected to rise well over 20,000 next year, a new heating station will be needed. It is being considered that the new station would not only furnish heat, but power as well for the University. Higher pressure would be used and the exhaust steam from the turbo-generators would be used for heating. However, the present plant will probably serve the University for another five or ten years, before the new plant is a realization and not just a plan on paper as it is at present.

Entraining in

SCALING and disintegration of portland cement concretes, caused by freezing and thawing and applications of ice removing salts, has met with a major setback with the development of the practice of entraining air in concrete. Introducing air voids into concrete paradoxically improves its resistance to freezing and thawing and to scaling, provided the amount of air is carefully controlled.

In 1935 early studies were carried out by various interested agenices, namely, the Portland Cement Association, the federal government, and state highway departments, in search of a means to reduce scaling of concrete due to the use of de-icing salts. Cements then available gave negative results. Research was directed to a study of plasticizing agents to improve workability and thereby reduce the segregation and bleeding which contributed to the scaling of the concrete. Among the materials studied, those which provided the greatest scale resistance were consistently distinguished by an increased slump and a lower weight per cubic foot. Further investigation showed that the results obtained were due to minute air bubbles entrapped or entrained in the concrete, while the concrete was in a plastic state. This air had been entrained as a result of the action of the agents introduced to increase workability and plasticity. Since the time of these early results, continuous studies have been carried on to reap the utmost from the knowledge gained.

Materials which have been used in the laboratory and in field tests for the purpose of entraining air into mortars and concretes include: (1) natural wood resins such as rosin and Vinsol resin, (2) animal or vegetable fats and oils such as tallow and olive oil and their fatty acids such as stearic and oleic acids, (3) a commercial product known as Liqro which consists largely of oleic and resin acids, (4) various wetting agents such as the alkali salts of sulfated and sulfonated organic compounds, (5) water soluble soaps of resin acids and animal and vegetable fatty acids, (6) miscellaneous materials such as the sodium salts of petroleum sulfanic acids, etc. In addition to these air-entraining agents, hydrogen peroxide and aluminum powder have been used to entrain gas (oxygen or hydrogen) in concrete in some supplementary tests in the laboratory. A study of the properties of these materials (neglecting hydrogen peroxide and aluminum powder) will reveal marked differences that are worthy of consideration. These materials can be separated into two distinctly different classes; namely, the water-insoluble fatty or resinous materials, and the water-soluble foaming or wetting agents. Although these two classes of materials have quite different chemical properties and entrain air in concrete by different mechanisms, the final result of the agents is the same. Tiny air bubbles, 1/100 to 1/1000 of an inch are formed by the dissolving of the alkalies in the cement by the mixing water and the combining with the entraining agent to form soap. These minute air bubbles repel each other and do not tend to unite. They act as highly efficient fine aggregates, "ball bearings," which hold apart the aggregates. The aggregates can roll freely on the bubbles but not around or through them. Thus the concrete is more plastic and the workability for a given water content has been improved.



Equipment used for testing air content by the Indiana Highway Department.
—Courtesy Portland Cement Assn.

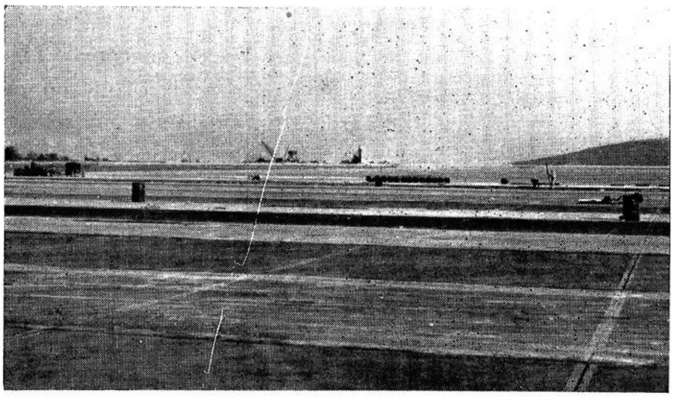
Introduction of the air entraining materials into the concrete can be accomplished in two ways, by grinding with the cement clinker, or by adding directly to the batch of concrete materials, either in powdered or paste form, or in a solution in water or other liquids. For most of the experimental field projects thus far constructed the air entraining materials have been ground with the cement, consequently field experience with adding the materials direct-

Air Concrete

by J. J. Haley

ly to the batch has been limited and practically all the work done using this method has been carried out in the laboratory.

The air content of normal portland cement concrete is about 1½ to 2%. The amount of air entrained by the use of entraining agents in a paving mix should not bring the total air content to more than 5%. This quantity may be varied, either by varying the amount of entraining agent or by varying the gradation of the fine aggregate. For a given percentage of air entraining agent and constant mixing conditions, the quantity of air entrained by the aggregate is a function of the particle size of the aggregate, the optimum range being between the No. 30 and the No. 100 sieve sizes. However, all of the air entrained in concrete is not beneficial, since that entrained in the cement constituent does not contribute to the durability.



121 acres of air entrained concrete are contained in this air strip at Stewart Field, West Point.
—Courtesy Portland Cement Assn.

Until 1938 all of the work carried out was done in the laboratory, but at about this time a number of experimental concrete pavements were constructed by several state highway departments, cities, and others, with the idea of demonstrating the effectiveness of entrained air under field conditions. Several test roads were built by New York State, and experimental street work was carried out by the City of Minneapolis. However, for every field test, many laboratory tests have been carried out, and since field and laboratory results have proven quite similar, they have resulted in the following conclusions.

When an air entraining cement is used in the same mix proportions as regular cement and with the same amount of mixing water, the concrete will be leaner and not so strong. Sand and water should be reduced and the cement content adjusted to the same as that for a regular cement for a given volume. When the mix proportions are adjusted and the same amount of cement used per unit volume with a reduction in the amount of mixing water, air entraining portland cement will develop about the same strengths as regular portland cement. In lean mixes higher strength will result with concrete made with air entraining cement than with that made with regular cement. In rich mixes a slight reduction of strength is noted when using air entraining cement.

Air entraining portland cement and regular portland cement were affected in the same manner by low temperatures.

When calcium chloride was used, the strengths were increased with air entraining portland cement as with regular portland cement and the air entraining cement with or without calcium chloride held its superiority over regular cement in the scaling test.

Little or no improvement in durability resulted from the use of air entraining portland cement.

Workability was greatly increased by the use of air entraining portland cement.

Although air entrained in concrete is unquestionably beneficial, it is advisable to limit the amount of such air. Excessive amounts of air will permit large reductions in the water cement ratio, yet the net reduction in strength may be too great. Furthermore, excessive air produces plasticity, and there is a real danger that the experienced user of air entraining cement may inadvertently reduce the cement content to an undesirable point because of the excellent appearing concrete. Some reduction in strength may be tolerated, but there is a limit beyond which the beneficial effect of entrained air may be outweighed by lack of sufficient strength to withstand the stresses due to wear and applied loads.

Air entrainment in concrete, subject to the limitations of the foregoing paragraph, is a long stride forward in modern concrete construction.

Campus Notes

by John Tanghe e'47

New Style Cigarette Lighters

Prof. L. Larson of the EE department recently told his "Power Distribution" class of a rather ingenious method used by the youthful inmates of one of the state's School for Boys to light cigarettes. Prof. Larson, who does much of the electrical engineering work for state institutions, explained that, in lieu of matches, the boys inserted wires through the knockout holes in the side of safety switch boxes, making contact with the "hot" side of the d.c. feeder and thus drawing an arc suitable for lighting cigarettes.

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BUY AND USE
CHRISTMAS SEALS

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A.S.C.E. Meeting

The second A.S.C.E. meeting of the semester was held on October 24 at the university hydraulics laboratory. Bill Generke and Ed Rein discussed the national convention of A.S.C.E. held in Kansas City on October 16 through 18 at which they represented the Wisconsin student chapter.

Following the business portion of the meeting, Professor G. Rohlich of the Sanitary Engineering Department spoke on "Water Purification and Sewage Treatment at Army Camps During World War II." Prof. Rohlich was associated with the U. S. Engineering Corps during the war and thus was able to present first hand information on the sanitary problems solved by the Engineers. His talk was supplemented with slides showing utility plants of camps throughout the states. Refreshments were served following the meeting.

Oh Brother!!

A major catastrophe developed at Triangle Fraternity when the engineers living there constructed their outdoor display for homecoming. The huge six-foot waterwheel forming the major part of the decoration was built in the basement, and after its completion the members found it wouldn't fit through the doorway. The only remedy to get it out was to remove the entire back stairway. Some engineers!!

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Do your part in fighting Tuberculosis: BUY AND USE CHRISTMAS SEALS.

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Kappa Eta Kappa

Members of the Wisconsin chapter of KHK, national professional electrical engineering fraternity, elected their officers for the current year at the meeting held on October 28. Those elected were: Myron Larson, president; Emil Kasum, vice-president; Harold Boettcher, secretary; Henry Blank, treasurer; and Philip Wanzek, social chairman.

Plans for the year's social and professional activities were also outlined at the meeting. Further arrangements for the Christmas formal being held on December 20 were made. Pledging of prospective new members is expected to begin about the middle of November.

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Polygon Board

The main work of Polygon Board this month has been preparation for the Engineers' Ball, semi-formal dance to be held on November 23 at the Union in Tripp Commons. Master of Ceremonies at the dance is to be Prof. L. H. Rall of the Economics Department. A committee of three, Dean Withey, "Doc" Sorum, and Prof. Rall, will pick a "Sliderule Queen" from the girls at the dance.

The officers of Polygon this semester are: Harlan Skatrud, C.E., president; Ed Ansell, E.E., vice-president; Ed Hillery, M.E., treasurer; and Fred Bosius, ChE., secretary. These officers were elected at the close of the semester last spring.

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BUY AND USE
CHRISTMAS SEALS

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Triangle Fraternity

Proceedings at the national Triangle convention held in Chicago on the 23rd, 24th, and 25th of October were outlined by Jim Price and Bob Miller, representatives from the Wisconsin chapter, at the local chapter meeting on October 26.

Other discussion included the planning of a huge waterwheel for outdoor decoration in front of the chapter house on Homecoming weekend.

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Hungry? Oh Boy!

Virginia Morrick and Mildred Bowar, two of Dean Withey's three secretaries, are attending classes in cooking at Vocational School one night every week. They seem to be specializing in the lighter and fancier things as cream puffs, lemon pies, chocolate cakes, cookies, etc.—hmmm.

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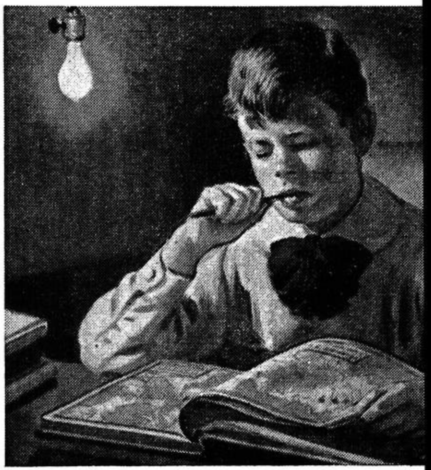
M.E.S.W.

The November meeting of the student branch of the Mechanical Engineering Society of Wisconsin, held

(continued on page 22)

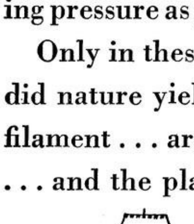
"It is not the finding of a thing, but the making something out of it after it is found, that is of consequence"
—JAMES RUSSELL LOWELL



Why some things get better all the time

TAKE THE MODERN ELECTRIC LIGHT BULB, for example. Its parts were born in heat as high as 6,000° F. . . . in cold as low as 300° below zero . . . under crushing pressure as great as 3,000 pounds per square inch.

Only in these extremes of heat, cold and pressure did nature yield the metal tungsten for the shining filament . . . argon, the colorless gas that fills the bulb . . . and the plastic that permanently seals the glass to the metal stem. And it is because of such materials that light bulbs today are better than ever before.



The steady improvement of the electric light bulb is another instance of history repeating itself. For man has always had to have better materials before he could make better things.

Producing better materials for the use of industry and the benefit of mankind is the work of Union Carbide.

Basic knowledge and persistent research are required, particularly in the fields of science and engineering. Working with extremes of heat and cold, and with vacuums and great pressures, Units of UCC now separate or combine nearly one-half of the many elements of the earth.

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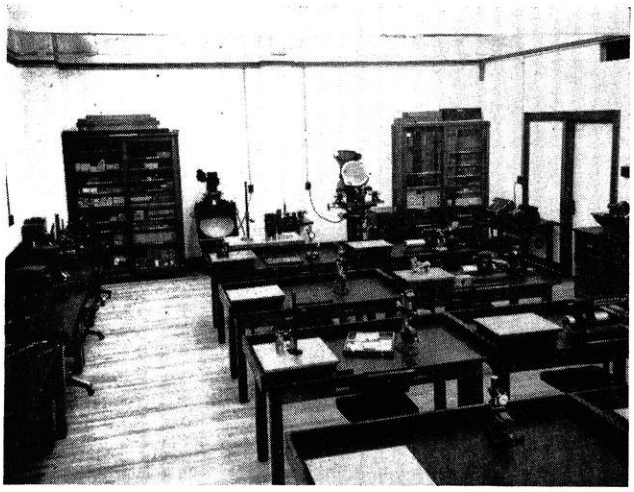
INDUSTRIAL GASES AND CARBIDE

Wisconsin's New Gage Laboratory

by J. Woodburn m'48

IN THE past few years the Ordnance Department of the government has made great strides in the field of precision measuring. Theirs was the task of measuring, calibrating and checking the increasing amounts of ordnance equipment. As this production increased the facilities for gage checking also were increased in the form of sub-laboratories, mobile laboratories, and traveling gage checkers. At the close of the war the volume of ordnance equipment fell way off, and has left the government with



Although small, this laboratory houses much valuable equipment.

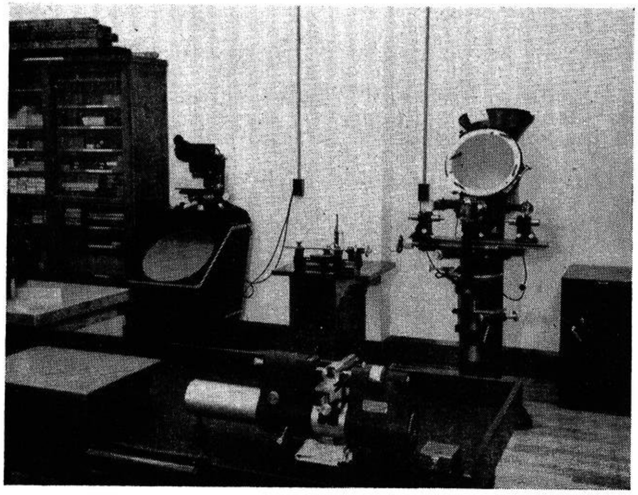
millions of dollars worth of measuring equipment and large numbers of skilled personnel which are being dispersed. The question was, what should be done with the surplus equipment?

The unsatisfactory gage experience of the Ordnance Department during World War I indicated the necessity for available sources for precision measurement known as Gage Laboratories. The laboratories are equipped with precision measuring instruments, and are properly housed and manned by skilled personnel whose responsibility is to provide the necessary care to insure that proper gages and methods are used by ordnance inspectors. To correct the situation the Ordnance Department took steps to provide district gage laboratories through the formation of a cooperative Ordnance and Educational Institution plan. This plan resulted in the establishment of district gage laboratories at the following institutions:

Year	Education Institution	District
1930	Stanford University	San Francisco
1936	University of Michigan	Detroit
1937	New York University	New York
1938	Georgia School of Technology	Birmingham
1939	University of Cincinnati	Cincinnati
1939	Washington University	St. Louis
1940	Armour Research Foundation	Chicago
1940	Carnegie Tech	Pittsburgh
1940	Case School of Applied Science	Cleveland

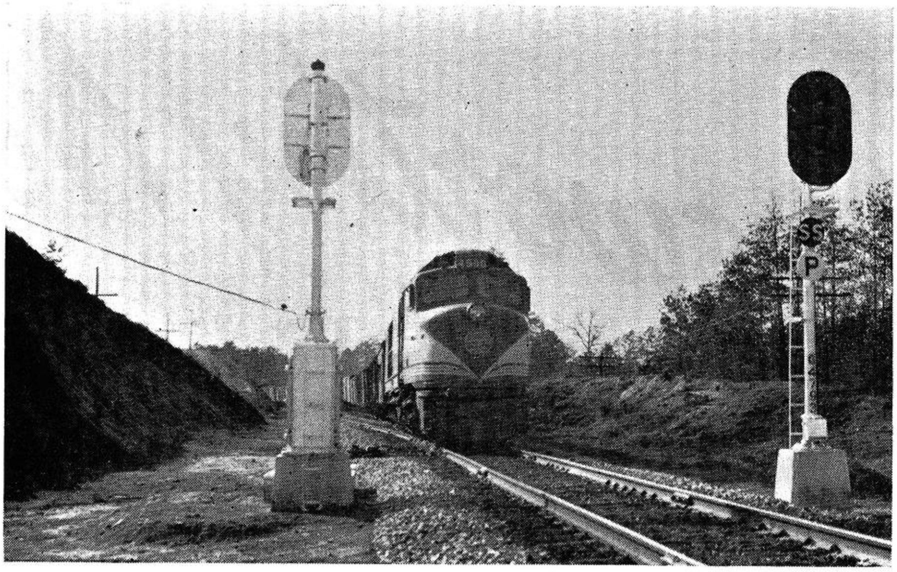
The present availability of surplus precision measuring equipment indicates the advisability of establishing additional district gage laboratories. When the present plans are completed there will be approximately twenty district gage laboratories located in selected districts throughout the United States.

The University of Wisconsin was very fortunate in securing one of these gage laboratories, in competition with several other interested mid-western educational institutions.



Close-up of the Optical Comparitors.

(continued on page 24)



Automatic Signals on Locomotives

by W. E. Marshall e'47

—Cuts courtesy Railway Signaling

AS EARLY as 1872 the automatic block signal system was invented. It was essentially the same system as the one in use today. This system consists of appropriately spaced wayside signals which give the engineman an indication of the condition of the track ahead. As speed and the density of traffic increased, this system was improved upon. Today it has reached a high degree of efficiency and dependability.

The signal system of today has the same drawback it did when it was invented. Signal indications are entirely from wayside signals and the indication to the engineman is not continuous. The engineman is not immediately informed of a release of speed restrictions. This results in unnecessary delay while the train proceeds at restricted speed to the next wayside signal. In addition, it is very easy for an engineman who is not entirely familiar with the location of the wayside signals to pass a signal in foggy weather without observing its indication. While in many localities these may not prove to be serious drawbacks, it presents hazardous conditions in certain densely trafficked areas.

For this reason cab signals have been installed on locomotives which operate over certain routes. These signals replace or supplement the use of wayside signals. They provide the engineman with a continuous, visual indication which is not effected by weather. They also give an audible sound when a change of indication occurs.

In districts where these signals are in operation the track is divided into circuits or sections. These track circuits are approximately equal in length to the maximum braking distance of a train in that locality if two speed signals are used. This distance may be decreased somewhat if three speed signals are in operation. When wayside signals are employed, it is not always possible for these circuits to be equal to the desired distance. These track circuits are isolated from adjacent track circuits by insulated rail joints. The ends of the rails in the track circuit are bonded together to increase their conductance. Coded energy is applied at one end of the track circuit, and a relay is connected at the other end. This relay operates on the coded energy. The train enters the track circuit at the relay end and leaves at the feed end. By this arrangement, when the locomotive enters the track circuit, the track relay is shunted out and the current flows through the front axle of the locomotive instead of the relay.

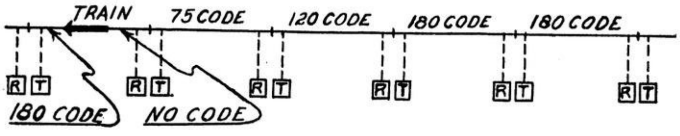
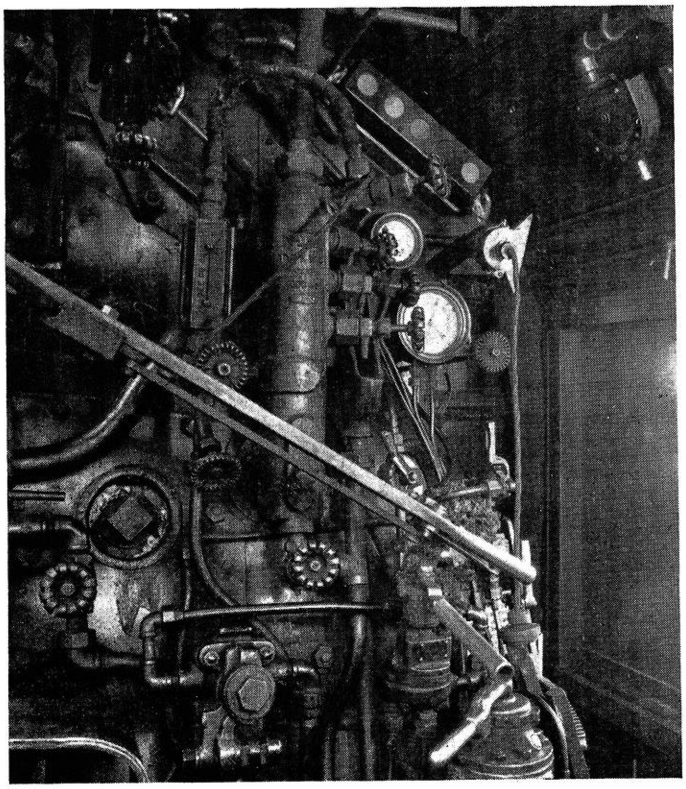


Diagram of track circuits and codes.

The code applied to the track circuit consists of 75, 120, or 180 direct current pulses per minute. 100 cycle per second alternating current is superimposed on these codes. Some installations may use alternating current relays and eliminate the direct current completely. When a train occupies the track circuit, alternating current pulses are received in receiver coils just ahead of the front wheels of the locomotive. These receivers are connected in such a manner that stray fields from parallel tracks will cancel each other out and will not be amplified. The signals from the receiver are tuned, amplified, and rectified forming the corresponding direct current codes. These codes operate relays which are tuned to 75, 120, or 180 pulses per minute. Each relay operates the corresponding cab signal only when it follows its code. If it remains energized or de-energized, the corresponding cab signal fails to respond. If no relays are following code, a stop indication is given by the cab signal. If the 75 code relay is following the proper code, a slow speed signal is given. 120 code authorizes medium speed and 180 code authorizes high speed.

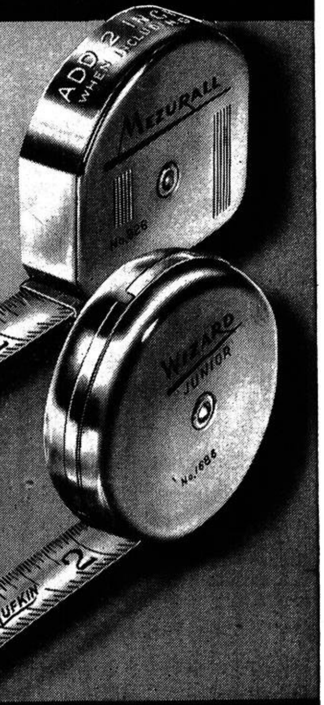
The amplifier is a two stage transformer coupled amplifier with a plate voltage of 425 volts. The power to operate the amplifier is received from a 32 volt turbo generator, and is stepped up to 425 volts by means of a dynamotor. The filaments of the tubes are connected in series with the 32 volt supply and a variable resistor.

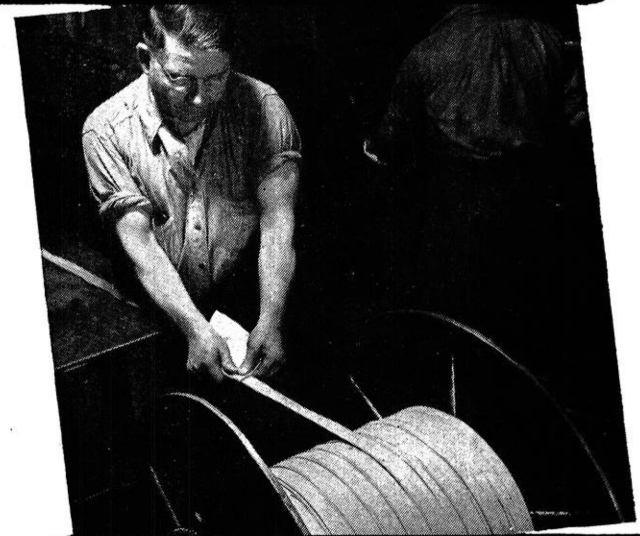


Cab signals furnish the engineman a dependable, continuous indication.

A track circuit relay will receive no code due to a train occupying the circuit, a broken lead wire, bond wire, rail, or land slide detector fence, a failure of power or equipment, or an open switch leading to the side track. Each track circuit relay repeats the code it receives. This code is then fed to tuned, slow acting relays which will connect the proper code transmitter to the adjoining track circuit.

The circuits used may be modified in many ways to fulfill local requirements. Additional equipment is required to permit train operation in either direction over the same track. It is often necessary to divide the function of one long track circuit between two shorter circuits. This is to reduce difficulties caused by leakage currents. Short track circuits may be required for highway crossing bells. Automatic train speed control and braking may be installed.





The Significance of Radar Contact with the Moon

by J. M. Waters

WE HAVE all read about how on January 10, 1946 a group of scientists supervised and directed by the U. S. Army Signal Corps succeeded in radar contact with the moon. To the average reader this meant very little, but to the men working on the project this was the first step in the opening of a new field.

Through past experiences radar specialists knew that the highly electrified outer areas of the earth's atmosphere had deleterious effects on radio waves. This outer area is termed the ionosphere and extends from 38 to 250 miles above the earth's surface, forming a shield through which radio waves emitted by ordinary radar sets are unable to pass. Leading radar men doubted whether sets powerful enough to penetrate this shield could be built to operate satisfactorily.

In order to make an analysis of the effect of the ionosphere on radio waves, it was deemed by the specialists that first there must be proof positive that radar signals could pass through this shield and into the space beyond. Secondly, it was necessary to strike an object such as the moon from which an echo could be received. Then a study could be made of the differences in the strengths of the broadcast impulse and of the return impulse or echo for the purpose of getting the complete details of the effect of the ionosphere on radio waves.

The use of long-range radar sets during the war for warning against air attacks and for submarine warfare played no small part in the allied victory. With the cessation of hostilities radar continues its outstanding work, but now for peaceful purposes in scientific research.

It is the opinion of leading radar scientists that the success of this experiment now makes possible a thorough analysis of the harmful effects of the ionosphere on radio waves. Through the use of the results of a complete analysis of atmospheric characteristics, better radar sets can be built to overcome the present difficulties. Then these improved machines can be used to study the heavenly bodies.

A planet which warrants an exhaustive study is the moon. It is known that the moon has a great effect on our daily lives, since it holds sway over the tides and the weather to such an extent that it affects the crops and indirectly the health of the inhabitants of this planet.

Now it may be possible to dispel some of the age-old mystery that cloaks the moon, the action of which is bound by formulas much too complicated for lay understanding. With the best radar equipment, it should be possible to measure the moon with an electronic ruler for the purpose of getting practical data, which should prove much more enlightening than the abstract data produced by the complicated calculations.

It is also predicted that space ships from earth should be able to roam thousands of miles into the heavens to report astronomical data, electronically computed aboard such vessels. A further proposal includes radar control of jet- or rocket-propelled vessels circling above the earth.

A commercial application of this new use of radar is incorporated in a plan set forth by the International Telephone and Telegraph Corporation. This corporation is considering the use of the moon as a relay station in transoceanic communication. This five-year-old idea was originated by Henri Busignies, French-born scientist, who is now head of the corporation's Federal Communications Laboratory. Since radar waves travel in straight lines, it is necessary to use relay stations when the curvature of the earth forms a shield for the receiving station. Mr. Busignies is firmly convinced that a set one hundred times more powerful than the one used by the Signal Corps and equipped with an adaptation of the U. S. Navy's high frequency direction finder would make it possible to send a Morse signal on a 477,000 mile trip from New York to Paris via the moon in only two and one-half seconds. Such signals travelling in free space would be free from atmospheric interferences which sometime jam standard radio communications.

Freshman Honor Roll

To the students go the honors! Again as we inspect the freshman honor list we see the names which have come to the foreground in their first year in the College of Engineering. Let us hope that the next three years will see the same names and many more on the honor list as these men move toward graduation.

Averages are computed through June 1946, with a grade point of 2.75 or better rating high honors.

HIGH HONOR RATE

C. F. Leyse	2.91
N. R. Bullian	2.79
S. D. Reed	2.79
M. L. Griem	2.76
A. H. Kasberg	2.76

HONOR RATE

M. A. Shampo	2.74
R. E. Benway	2.73
B. R. Strong	2.70
M. H. Thorson	2.65
J. L. Waters	2.65
R. E. Doyle	2.63
R. H. Fillnow	2.63
R. K. Allen	2.62
R. L. Foss	2.56
M. W. Smith	2.55
N. A. Vahldieck	2.54
W. J. Sakowski	2.53
R. G. Rand	2.53
W. J. Anderson	2.53
J. C. Verweil	2.53
R. P. Hoff	2.52
V. Dirienzo	2.50
R. G. Frank	2.50
C. W. Scheid	2.50
J. C. Mandelert	2.48
J. P. Komatz	2.47
W. J. Pollard	2.47
G. R. DeYoung	2.46
H. A. Sorenson	2.45
R. H. Reinsvold	2.44
A. J. Drobka	2.44
J. R. Wolcott	2.42
E. L. Green	2.39
F. B. Davy	2.38
D. O. Ehlers	2.36
J. M. Kroot	2.35
K. W. Thur	2.35
D. Clemetson	2.34
H. D. Hentzen	2.33
R. G. Ries	2.30
R. J. Troller	2.30
W. E. Burnham	2.29
M. M. Stenstrom	2.29
Lois M. Stohr	2.29
O. A. Wedel	2.29
R. J. LaFond	2.27
E. G. Heuser	2.25

STATIC

by J. Hinkley m'47
J. Woodburn m'48

EDITOR'S NOTE: I've seen half these jokes before but half I don't see yet.

•

If she looks old, she's young; if she looks young, she's old; if she looks around, follow her.

•

The major menaces on the highway are drunken driving, uncontrolled thumbing, and indiscriminate spooning.
To put it briefly: Hic, hike, and hug.

•

Man is just a worm in the dust. He comes along, wiggles around awhile, and finally some chick catches him.

•

An American Negro on duty in England had allowed himself to be entangled in a poker game with some British Tommies. On picking up his cards he saw four aces. The Tommy next to him bet one pound. The Negro said, "Ah don't know how you all counts yo money, but I'll raise you one ton."

•

DEDICATED TO THE
MECHANICS DEPARTMENT:

Skidding is the action
When the friction is a fraction
Of the vertical reaction
Which won't result in traction.

•

Statistics show that Vassar graduates have 1.6 children per graduate, while Princeton graduates have 1.3 children per graduate.
This proves conclusively that women have more children than men.

•

A bachelor is a man who has taken advantage of the fact that marriage is not compulsory.

•

Somebody said the jokes last month weren't too sharp, but I threw them in the stove and the fire roared.

•

Ag Engineer: "Why is your hand all bandaged up?"
B. Denniston (Same): "I put my hand in a horse's mouth to count his teeth and the horse bit me to see how many fingers I had."

FRESHMAN DEFINITIONS:
Chlorine—A dancer in a night club.
Carbon—A storage place for street cars.
Barium—What you do to dead people.
Boron—A person of low mentality.
Slide rule—Regulation pertaining to baseball.
Mole—A subterranean fur-bearing animal.
Catalyst—A western ranch owner.
Centimeter—A hundred-legged worm-like animal.
Flask—A measuring vessel carried on the hip graduated in fingers.
Electrolyte—A thing which when it is dark you turn on and it gets light.
Nitrate—Special price on telephone calls and telegrams after dark.

•

Explain the effect of heat and cold and give illustrations.
Heat expands: in summer the days are longer.
Cold contracts: in the winter the days are short.

•

Statistics show that Civil Engineers are the best marriage prospects.—M.S.
Did you ever see a civil engineer?

•

Girls when they went out to swim,
Once dressed like Mother Hubbard.
Now, they have a bolder whim;
They dress more like her cupboard.

•

Prof: "Is there a Stanislav Hinklesacadanstinksi in the room?"
Voice from the rear: "What initial?"

•

Confucious say: "Wash face in morning. Neck at night."

•

"Ah wins."
"What you got?"
"Three aces."
"No you don't. Ah wins."
"What you got?"
"Two eights an' a razor."
"You sho do. How cum you so lucky?"

CAMPUS NOTES

(continued from page 12)

on Tuesday the 5th, featured an address by Mr. B. A. Jones of the Ethyl Corporation on the anti-knock qualities of gasoline. At the meeting an invitation was extended by R. L. Sweitzer, student sponsor of the local S.A.E. society, inviting all M.E.S.W. members to attend the Milwaukee meetings of S.A.E.

•

The Evils of Burlesque

Prof. B. G. Elliott, always ready with a joke or two, was heard telling Dean Withey's secretaries about the little boy whose father said he shouldn't go to burlesque shows because he'd see "things he shouldn't." The little boy went anyhow and did see "things he shouldn't"—his dad.

Of course Prof. Elliott has a serious side too, and has been busy in engineering activities. He and Dean Withey, both active members of the Engineering Society of Milwaukee, were two of the eight engineering faculty members from the university who attended the September Dedication Banquet for the society's new building in Milwaukee. Principal speaker at the dedication ceremonies was Dr. Charles F. Kettering, Vice-President in charge of Research at General Motors Corp.

•

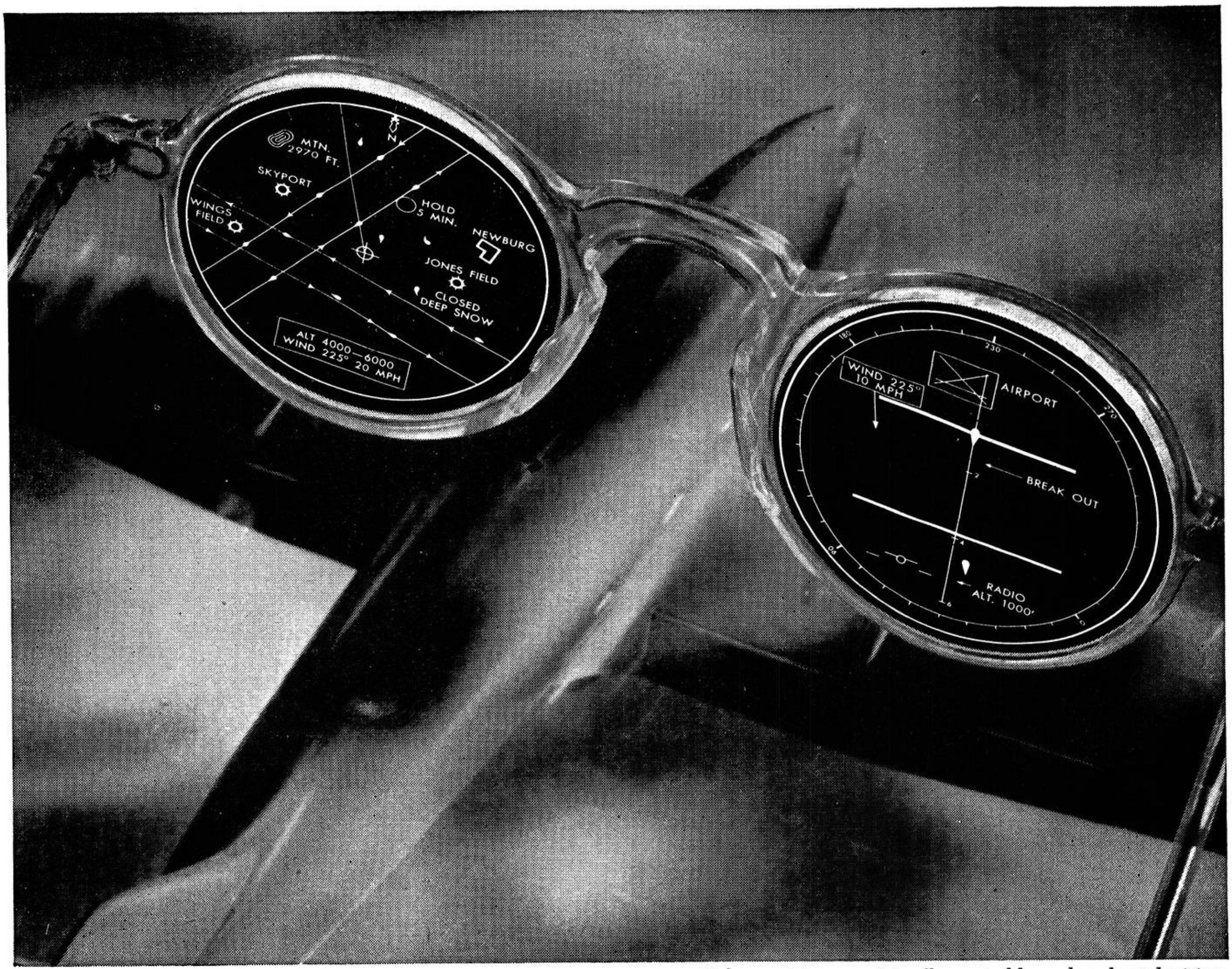
Alpha Chi Sigma

The chemical engineers at Alpha Chi Sigma are turning the fraternity's gears at high speed these days. Rushing smokers, parties, and fraternity football games have highlighted this past month's social activities. A number of professional meetings at which prominent faculty members will speak have been planned.

The results of the election held late in October were: Bob Wentorf, President; Warren Stewart, Vice-President; Bob Axtell, M.C.; A. Harry Martin, Reporter; Don Griffin, Recorder; and Warren Devoe, treasurer.

•

BUY AND USE CHRISTMAS SEALS



Teleran pictures—air traffic control by radar plus television.

Teleran—"radio eyes" for blind flying!

It's a television "information please" between airplane and airport—with the pilot's questions given split-second answers on a television screen mounted in the cockpit.

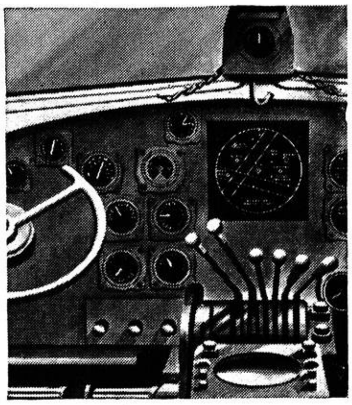
Teleran (a contraction of *TELE*vision—*R*adar *A*ir *N*avigation) collects all of the necessary information on the ground by radar, and then instantly transmits a television picture of the assembled data to the pilot aloft in the airplane.

On his receiver the pilot sees a picture showing the position of his airplane and the position of all other aircraft near his altitude, superimposed upon a terrain map complete with route markings, weather conditions and unmistakable visual instructions. The complex problem of air traffic control is well handled by Teleran.

Teleran—another achievement of RCA—is being developed with Army Air Forces co-operation by RCA Laboratories and RCA Victor, endless sources of history-making developments in radio and electronics. They are also your assurance that *any* product bearing the RCA or RCA Victor monogram, is one of the finest instruments of its kind science has yet achieved.

• • •

Radio Corporation of America, RCA Building, Radio City, New York 20 . . . Listen to The RCA Victor Show, Sundays, 2:00 P. M., Eastern Standard Time, over the NBC Network.



Instrument Panel of the Future. The Teleran indicator, mounted in a cockpit, simplifies the pilot's job by showing his position relative to the airport and to other planes in the vicinity. It promises to become one of the most useful developments in the history of aviation.

RCA

RADIO CORPORATION of AMERICA

WISCONSIN'S NEW GAGE LABORATORY

(continued from page 14)

The basis of this selection was, who would have the suitable laboratory space, and a good industrial location with a large amount of peace time training. The government also wanted a school with which they had cooperative relations, and who would provide for Ordnance R.O.T.C. instruction. Since Wisconsin measured up to all of these requirements the Engineering school is now able to include in its curriculum a course in precision gage work.

This course is now called Industrial Inspection Methods (ME 180) and is given for 2 credits, under the direction of Professor McNaul who has worked on this project since its inception.

It is hoped in the near future to revise the course and call it Statistical Methods and Qualitative Control, which will broaden the field somewhat. The course will then be (ME 82) and will be given for 3-5 credits.

The gage laboratory equipment is owned by the U. S. Government and is loaned to the University on a non-cost basis for purposes of instruction in precision measurements and gage inspection. The equipment was installed by Mr. J. J. Fremer of the Chicago Ordnance District and was released to the University of Wisconsin on August 29, 1946.

These instruments include 647 Ordnance Final Inspection Gages, 639 items of Precision Measuring Equipment, and 89 items of Special Equipment such as furniture, cabinets, etc. The materiel is valued at about $45,000 and is housed in an air conditioned room to be maintained at 68° F. and 45% relative humidity.

The Ordnance Final Inspection Gages include all the gages necessary for final inspection of such items as shells, shot, fuses, standard threads, etc. The precision measuring equipment is made up of the most up-to-date instruments:

Sets of precision gage blocks which are used as standards of measurement in the laboratory and which are accurate within two to four millionths of an inch.

Electrolimit comparators which are set to standard dimension by precision gage blocks and which indicate, to ten-millionths of an inch, the deviation from standard size of the part being measured.

Visual comparators which are accurate to from one ten-thousandths to twenty-millionths of an inch.

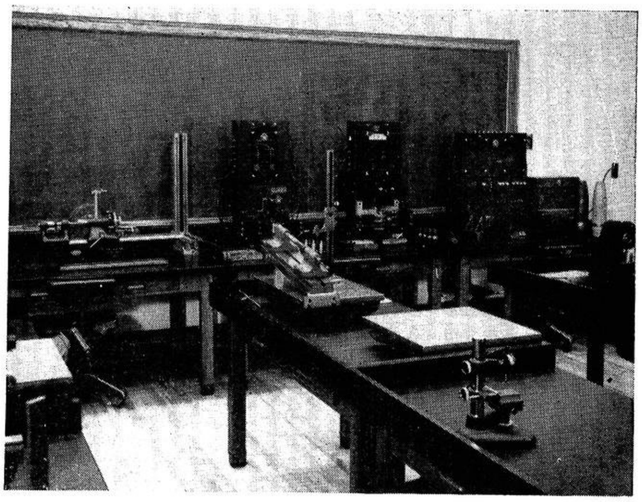
Super micrometers for measurement to one ten-thousandths of an inch.

Electrolimit multicheck gages which measure a number of critical dimensions simultaneously. It will measure objects to the ten-millionths of an inch and lights up like a pinball machine when a dimension is off. Above size is indicated by green lights, below size by red light and within tolerances by amber lights. When all dimensions are within tolerances, a master light goes out and it is not necessary for the inspector to check individual dimension lights.

Precisionaire gage for checking internal tolerances to as low as five millionths of an inch.

Optical comparators for projection profiles of threads and irregular curved surfaces on a ground glass screen at magnifications up to 100 times. Commonly used for measuring threads as to angles, pitch, depth, clearance at bottom, shape, etc.

Optical flats and monochromatic light of known wave length (23.2 millionths of an inch), used for checking flatness of surfaces and in combination with precision gage blocks for checking dimensions.



The three Multi-Check machines in the background check eight dimensions at one time.

Rockwell hardness testers, surface plates, spring checkers, cylindrical squares, dial indicators, and sine bar fixtures.

This new Ordnance gage laboratory will supplement other industrial engineering subjects which are being offered in the College of Engineering and will add to the prestige of Wisconsin through better service to the industries of the State.

Newspapers are like women. They have forms, back numbers are not in demand, they have a great deal of influence, they always have the last word, there's small demand for the boldfaced type, you can't believe everything they say, they are worth looking over, and every man should have one and not borrow his neighbor's.

•

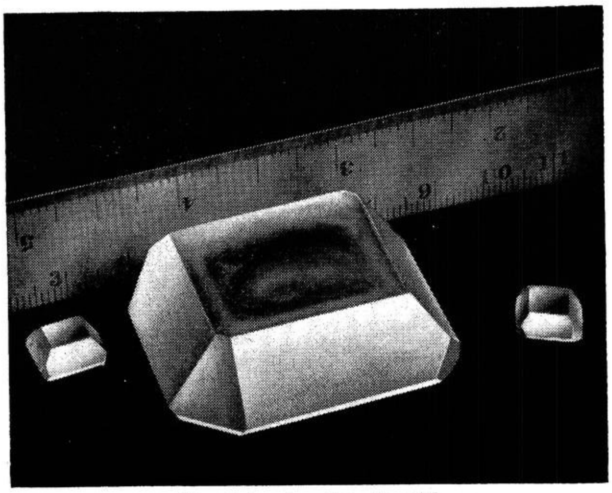
Young artist: "You're the first model I've ever kissed."
Model: "Really? How many have you had?"
Artist: "Four—an apple, a banana, a vase, and you."

Du Pont *Digest*

Items of Interest to Students of Chemistry, Engineering, Physics, and Biology

Low-Cost Sulfamic Acid Was Result of Newly Discovered Process

Once obscure laboratory chemical now finding wide use in industry



Crystals of sulfamic acid

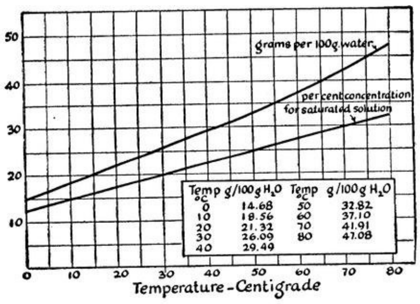
Sulfamic acid, which for years was merely another obscure laboratory chemical, is today being produced in carload quantities for a constantly growing list of uses because of a discovery made by a Du Pont chemist.

Believing that urea could be sulfonated to give a product which might have commercial utility, the chemist treated urea with fuming sulfuric acid. The reaction was exceedingly violent, and it appeared that decomposition had taken place to give ordinary ammonium sulfate. However, the chemist noted that the white precipitate which had formed did not dissolve rapidly in water as ammonium sulfate should, and further investigation proved that he had obtained sulfamic acid.

$$\underset{\text{urea}}{NH_2CONH_2} + SO_3 + H_2SO_4 \longrightarrow \underset{\text{sulfamic acid}}{2NH_2SO_2OH} + CO_2$$

Thus the way was pointed to an inexpensive method of making this scarcely known chemical, and an intensive study of its chemical and physical properties has led to its development for a wide variety of industrial uses.

Solubility of Sulfamic Acid in Water



Temp °C	g/100g H_2O	Temp °C	g/100g H_2O
0	14.68	50	32.82
10	18.56	60	37.10
20	21.32	70	41.91
30	26.09	80	47.08
40	29.49		

First Industrial Applications

The salts of sulfamic acid are being used extensively as flame-proofing agents. Highly compatible with cellulose, ammonium sulfamate is unique among fire retardants in that it does not cause stiffening or otherwise adversely affect the hand or feel of textiles and paper.

Another outstanding use for ammonium sulfamate is as a weed killer for the control of poison ivy, ragweed, and a variety of noxious annuals. Its effect on poison ivy is unmatched by any other product.

One of the most important industrial applications for sulfamic acid is based on the fact that it reacts quantitatively and very rapidly with nitrous acid. This has led to its wide use in eliminating the excess nitrite employed in diazotization reactions for dye and colored pigment manufacture.

Soluble in Water and Non-hygroscopic

Sulfamic acid is a strong acid, and despite the fact that it is exceedingly soluble in water, it is a solid non-hygroscopic, non-volatile material which has found application as a laboratory titrimetric standard. Additional information will be found in the bulletin "Sulfamic Acid and Its Salts." Write to 2521 Nemours Bldg., Wilmington, Delaware.

Understandably, men of Du Pont are proud that their work in the laboratory has created and developed many products like this "chemical curiosity" to help make life safer, more pleasant and comfortable for all Americans.

Questions College Men ask about working with Du Pont

IS THERE A FUTURE FOR ME AT DU PONT?

Every effort is made to initially select graduates for a specific job in line with their training and expressed preferences. Men are advanced as rapidly as their capabilities permit and openings occur. The broad research program and the ever expanding development of new chemical products as well as the growth of old established products offer ample opportunities for the technical graduate to grow in the organization.

More facts about Du Pont—**Listen to "Cavalcade of America," Mondays, 8 P.M. EST, on NBC**

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

E. I. DU PONT DE NEMOURS & CO. (INC.)
WILMINGTON 98, DELAWARE

STATIC

(*So-Called Humor*)

Stolen by—Woodburn and Hinkley

And then there were the three little Chinese girls who never got married—Tu Yung Tu, Tu Dumb Tu, and No Yen Tu.

•

A preacher walked into a saloon, ordered a milk, and by mistake was served a milk punch. After drinking it, the holy man lifted his eyes to heaven and was heard to say: "O Lord, what a cow!"

•

E.E.: "Is my face dirty, or is it my imagination?"

Co-ed: "Your face is clean; I can't tell about your imagination."

•

An optimist is one who thinks his wife has stopped smoking cigarettes when he finds cigar ashes in the house.

•

The difference between a bachelor and a married man: When a bachelor walks the floor with a baby, it's usually the dance floor.

•

Baby Corn: "Where did I come from, mamma?"

Mamma Corn: "Hush, darling. The stalk brought you."

•

Prof.: "What happens when a body is completely immersed in water?"

Frosh: "The telephone rings."

•

The shortest perceptible unit of time is the period between the moment the traffic light changes and the time the boob behind you blows his horn.

•

Breathes there an engineer so abnormal,
That he can't be stirred by a low cut formal?

•

"Lips that touch wine shall never touch mine," said the co-ed in Education, and after she graduated she taught school for years, and years, and years, and years.

•

"I didn't raise my daughter to be fiddled with," said the cat as she rescued her offspring from the violin factory.

•

"Do you know what good clean fun is?"

"No, what good is it?"

A certain professor, discussing the meat situation, was telling of an incident that occurred in a local restaurant this summer. He had ordered a steak, and after jabbing, stabbing, sawing, and swearing at it, he called the waitress and asked her to return it.

"I'm sorry, sir," the waitress replied, "I can't take it back. You've bent it."

•

There once was a girl named Carol,
Who liked to play poker for apparel;
Her partner's royal flush
Made her blush,
And Carol went home in a barrel.

•

Excess: An indulgence that enforces by appropriate penalties under the law of moderation.

•

Wolf: A modern dry cleaner—works fast and leaves no ring.

•

Sweet Adeline: The "Bottle Hymn of the Republic."

•

Pedestrian: A man who has two cars, a wife, and a son.

•

I had sworn to be a bachelor,
She had sworn to be a bride,
But I guess you know the answer,
She had Nature on her side.

•

FRATERNITY HOUSE RULES:

Rule No. 1: No liquor allowed in rooms.

Rule No. 2: Do not throw bottles out the windows.

•

And then there's the girl they call "chocolate," because she nestles.

•

WANTED: To trade, good study lamp for extra soft bed. Have transferred from Engineering to Commerce. Phone—Jacobsen—F. 4057.

•

Why did Mahatma Ghandi leave college?

All the girls wanted his pin.

•

The termite's nightmare: "I dreamt I dwelt in marble halls."