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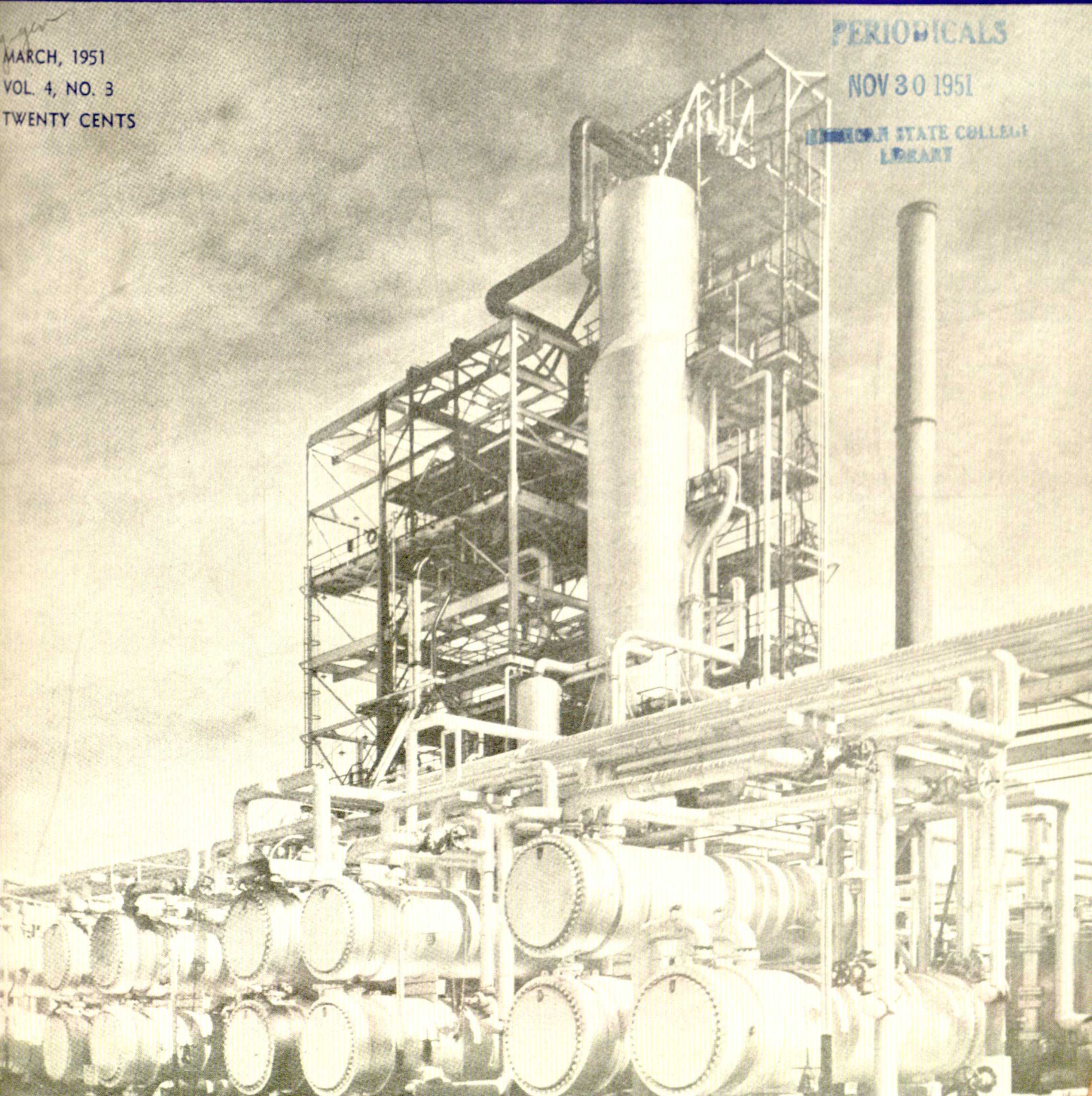
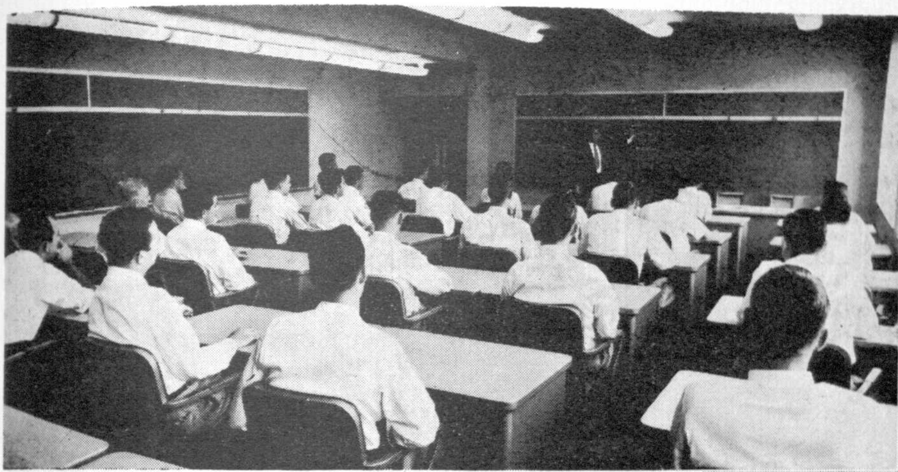
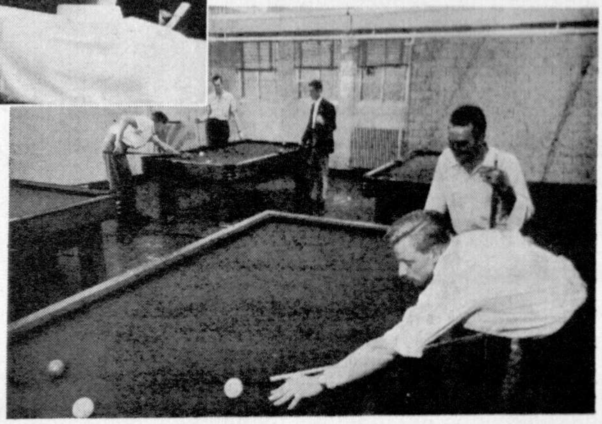
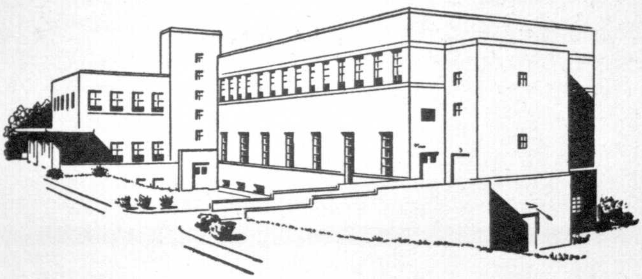




A typical scene in one of the several modern classrooms in the new Educational Center Building.

Below: View of billiard room. Other rooms where hobbies can be pursued and facilities for indoor and outdoor games provide relaxation and set the stage for lifelong friendships.





To Give Men A RUNNING START ON THE WAY TO THE TOP

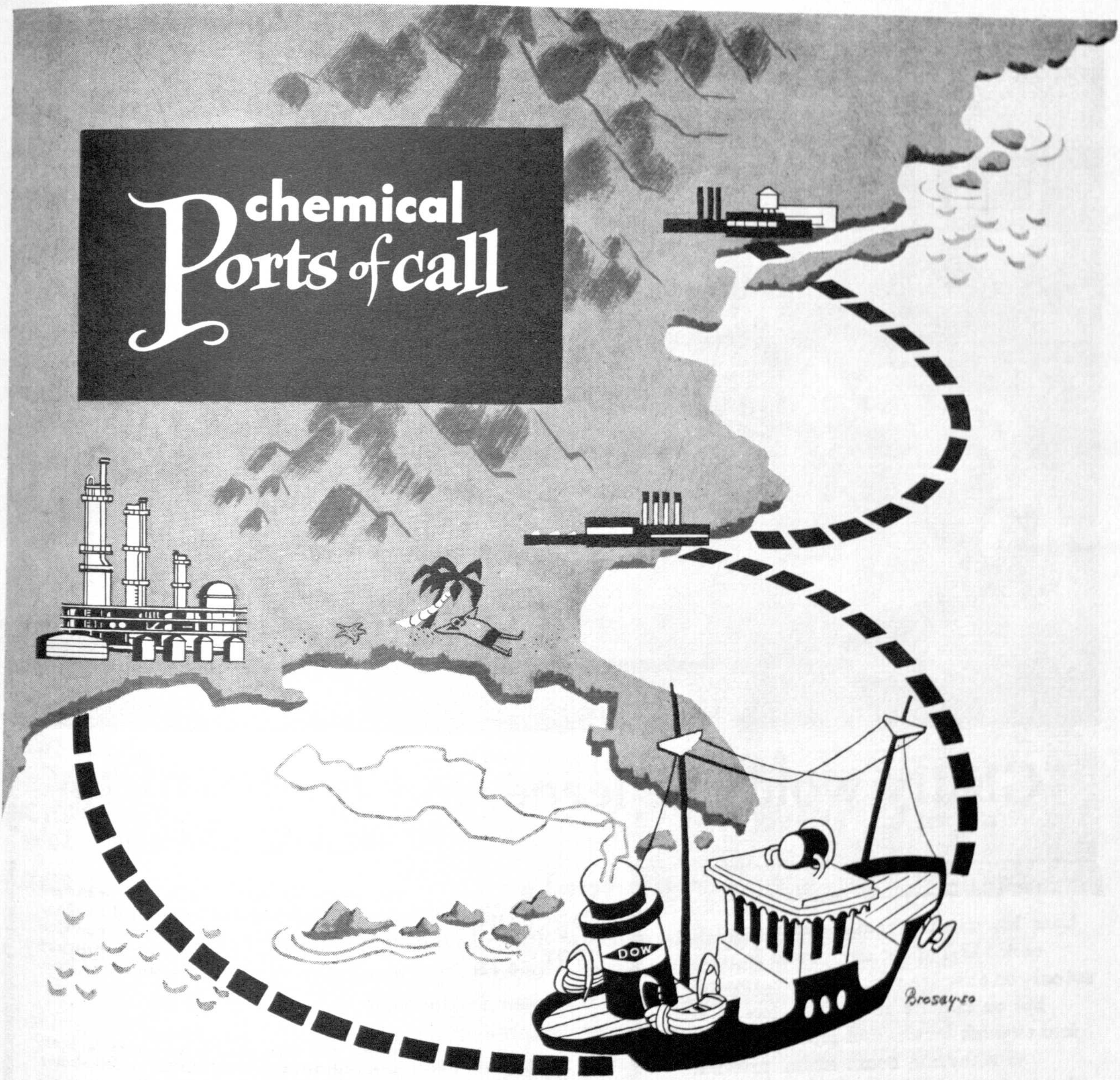
Westinghouse accepts a responsibility to the top-notch men it employs for engineering, manufacturing, research and sales jobs.

Here are the ways Westinghouse helps. Through a comprehensive orientation and training program, we give our new men a panoramic view of the electrical manufacturing industry . . . a broad knowledge of the products of Westinghouse, an appreciation of the research, engineering and manufacturing that go into those products, and an understanding of the marketing that gets them to the ultimate user. Hundreds of experienced professional people help carry out this program . . . through planned conferences and actual work assignments. In this way, new men get a running start in their new work.

To help speed them along their way, a Graduate Study Program is also made available through which advanced degrees may be obtained. This program has been worked out with a number of leading universities in major Westinghouse locations.

Headquarters for these activities is the new Educational Center, where a sizable staff devotes its entire attention to developing future leaders for the company. With this new facility, and the impetus that years of building for the future has given, we look forward with confidence to the years ahead. G-10118

YOU CAN BE SURE.. IF IT'S Westinghouse



Charleston . . . Carteret . . . Paulsboro . . . ports of call for the S. S. Marine Chemist, the newest addition to Dow's constantly expanding distribution system. Unique in its field, this 463 foot tanker is especially "tailored" to carry its chemical cargo. The ten tanks in the vessel have special bottoms to keep the various chemicals free from contact with the "skin" of the ship. Between the tanks, double bulkheads are installed and separate pumps and lines are provided for each product . . . truly a chemical warehouse afloat!

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CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Spartan ENGINEER

Table of Contents

• articles

• features

COVER --
A Single-Stage Crude Distillation Unit used by the Creole Petroleum Corporation in Venezuela.
--Courtesy: Foster-Wheeler Corporation.

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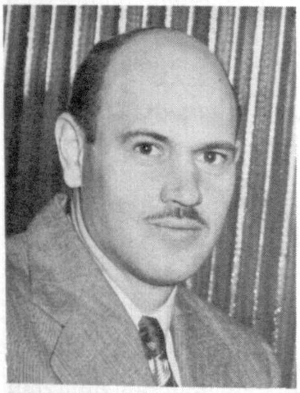
ULTRASONICS



USING THE SCIENCE OF SOUND TO PERFORM

BY
WILLIAM A. LITTLE
SENIOR, E. E.

For many years it has been realized that vibrational waves beyond the range of the human ear are of great importance. However, only in the last few years has this field, "Ultrasonics", had significant advancements toward its development and use.

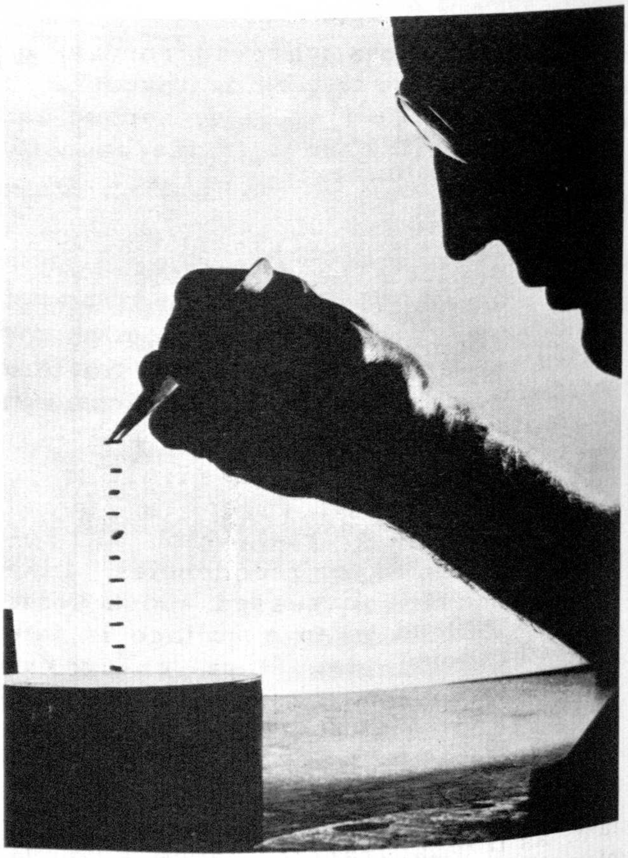
What are "Ultrasonics?" They are vibrational waves which are of a higher frequency than those to which the human ear will respond. Therefore, any vibrational wave above 20,000 cycles per second may be classified as ultrasonic.

In order to understand ultrasonics better one should recognize the definite divisions determined by the frequency, which affect the methods of generation as well as its uses. Therefore many different types of generators are needed.

Everyone has used a tuning fork to produce sound and knows that its physical make-up determines the pitch. This, is then the simplest ultrasonic generator when designed for a pitch we cannot hear. Limitations are placed upon this generator because of the weak field it produces, and the highest frequency it can be designed for is 90,000 cycles per second.

High power output is in most cases a very important factor in ultrasonics, and all generators are built with this in mind. At low frequencies there are several mechanical methods of developing rather effective power output and at a fairly low cost. Prime among these methods is the whistle.

There are several types of whistles now in use, among which are the Galton, Gas Current Generator and Hartmann Generator. As the basic design is the same in all a short explanation of one will cover the operation of all. The



BREAKING UP OF A PARTICLE BY MEANS OF ULTRASONIC WAVES.

Hartmann design was invented in 1927 and using a paint-spray compressor operated by a one-third horsepower motor is able to put out about six watts of power. The idea behind it is rather simple but the design is a bit more difficult. Basically, air under a pressure of 50 to 100 pounds per square inch, is forced from a chamber, with slanted sides, through an orfice and directed into a chamber two diameters deep. The cross over of the air sets the chamber into oscillation and the wave is produced.

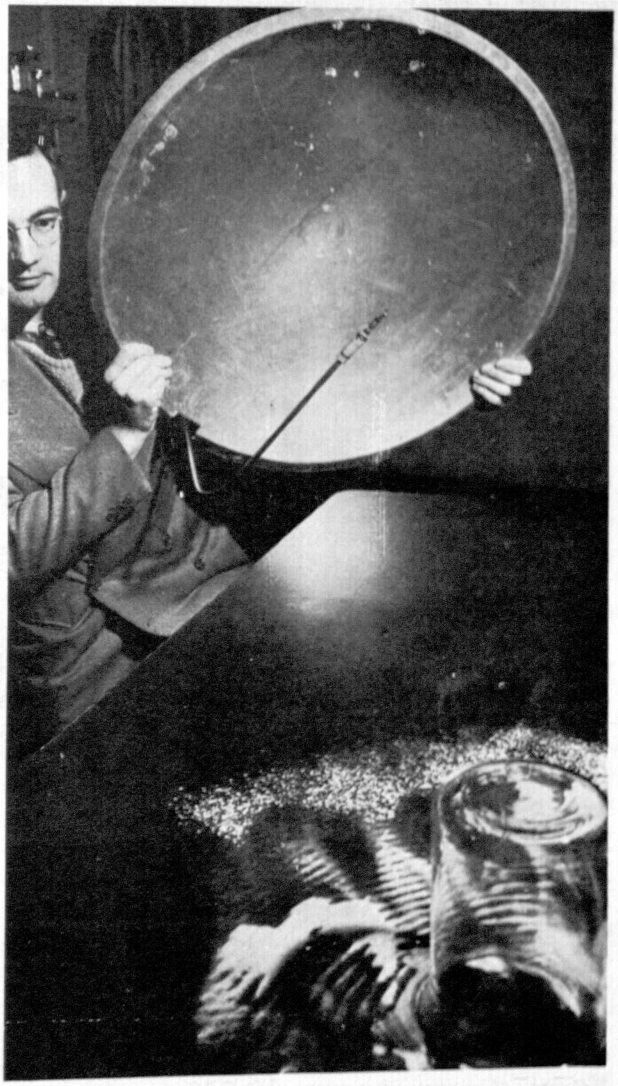
Sirens are another mechanical means of production of ultrasonic waves. It is a means of variable frequency and high power output. The Allen and Rudnick design has an output of about 150 watts, and the air force design will go as high as 6000 watts.

There are many other methods of generation but we will consider only two of the most widely used. Both are operated by a source of electric power. They are magnetostriction and transducers.

The magnetostriction method is dependent upon the magnetostrictive properties of some metals, a few of which are iron, carbon steel, hichrome, monel and invar. These metals will change dimensions when surrounded by a coil with current flowing through. If the current direction is changed the dimensions will change in the opposite direction. The generator is then merely a magnetostrictive material core inside a coil which has the current controlled by an oscillator. The core is then placed against the object to receive the ultrasonic wave. An upper limit of 60,000 cycles per second makes this method unsatisfactory for many applications, and in its place transducers are used.

Transducers are quite similar to magnetostriction except the magnet is replaced by a crystal which will respond to much higher frequencies. Like the material discussed above some crystals expand when a voltage is impressed across them. Rapid changes of voltage will produce vibrational waves. The types of crystals used are Mosaics, Quartz, Rochelle salts, and several artificial crystals developed during the war. The cut of such crystal is important, as it must transfer large amounts of power without shattering.

As stated before the uses of ultrasonics are varied indeed and as yet few



A METHOD OF OBTAINING AN ULTRASONIC WAVE PATTERN.

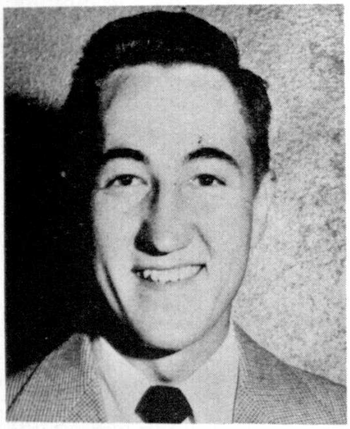
of its possibilities have been discovered. It is quite possible that the next few years will see it as one of medicine's most important tools, as well as the many uses industry will put it to.

The first practical use for ultrasonics was the soundless whistle used to call dogs. From there it has gone a long way. Testing of materials for flaws is an extensive use for ultrasonics. In the steel mills they have men who test materials by striking it with hammers. If the sound rings true the piece passes inspection, if not it is discarded even though the defect may be small enough not to cause any harm. They are unable to determine the seriousness of the defect. Localization by the ultrasonic method will eliminate a large amount of waste in this manner.

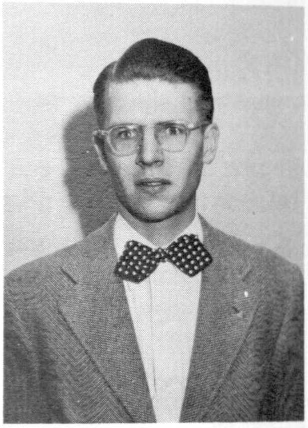
Probably the best known use of ultrasonics is underwater signaling. Its

Continued on page 26

Photogrammetry



BY ANDREW NESTOR
JUNIOR, C. E.
AND
ROBERT V. GAY
JUNIOR, C. E.



As often seems the case, an idea is originated but not until many years have lapsed does it formulate into an integrated, useful practice. Photogrammetry is no exception. Its origin was not one of a quick flash to man's mind, but rather, it evolved through a long and slow process of correlation of mathematical and surveying principles.

Map making is as old as when man first conceived a sense of direction and began to mark specific objects so those who followed might benefit by using them. Later these objects were placed on paper to give an idea of the situation ahead. The process became more and more complex and laborious as each point plotted required many operations to get the correct orientated location. A faster, more efficient method had to be devised.

Although photogrammetric principles were suggested as early as 1759, it was not until 1859 that Colonel Laussedat of the French Army perfected methods which placed the use of photography for mapping on a scientific basis. This method furnished one of the most rapid means for making maps which does not sacrifice accuracy for speed.

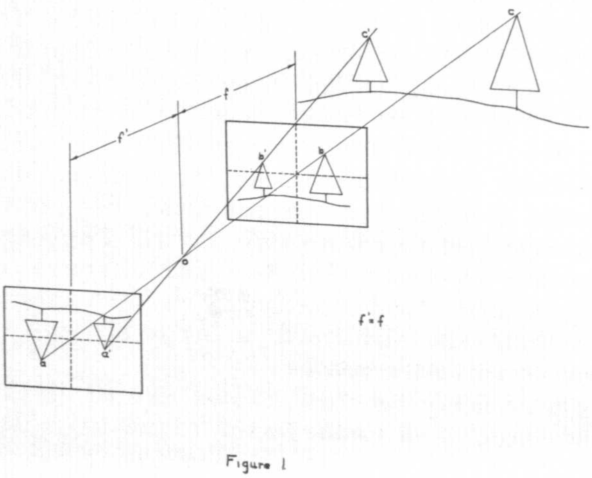


Figure 1

Today, more than ever, this process is most advantageous as the scope of map making has not been confined to merely locating a coast line or plotting the direction to some far distant hidden treasure. The vast network of highways that span our country, definite types of construction, bridge location, etc., all demand as much information as can be obtained in order to give a sound foundation for the solution to many of the modern engineering problems.

There are three types of photogrammetry: ground, aerial, and stereo. The following discussion will deal primarily with ground photogrammetry, although many of the principles are incorporated in all three. It is not feasible to describe ground photogrammetry in detail from the initial step to the completed survey due to the numerous influencing factors that are encountered in running a survey of this nature.

Generally, the essential phases include obtaining controlled photographs from plotted positions of two or more camera stations, the method of locating the points being essentially graphical triangulation. The underlying principles of ground photogrammetry may be visualized from figure 1. Point O represents the optical center of the camera lens. Plane bb' is a distance from the optical center equal to the focal length f, the distance of the negative from O is f', and f = f'.

The center of the print, the center of the negative, and the point O are on the same line, and the negative and print are parallel. The print is the same size as the negative and is erected and placed the distance f in front of the optical center. If the eye were placed at the optical center, the corresponding points on the print and landscape would be superimposed. This condition gives a true representation of the horizontal angle between any two points on the print and the same angle between two corresponding points on the landscape. Vertical angles are also in their true position. Thus, by geometric relationships, we may determine the position and elevation of any points appearing on two photographs taken from different stations.

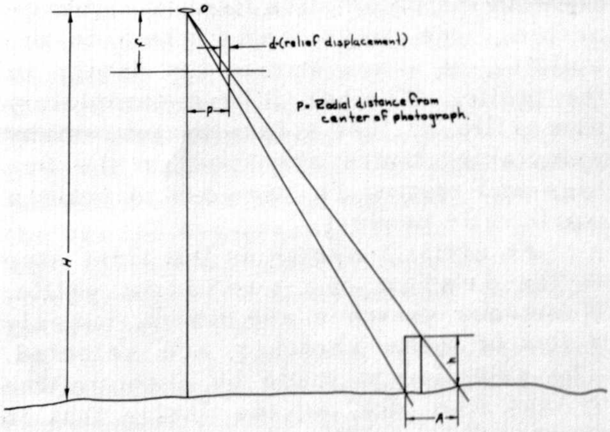
Highly specialized cameras and other types of equipment are necessary for accurate transposition of data. The most commonly used cameras are the surveying and panoramic. The surveying camera is comprised of a combination of plane table and ordinary camera, or theodalite and conventional camera. The panoramic camera is one that takes a continuous picture of the landscape around a vertical axis at the camera station and may cover any sector up to 360 degrees. The panoramic camera does away with the need for matching individual photographs as is required when single pictures are taken at different angles with the ordinary camera.

Ground photogrammetric surveying, although obtaining a high degree of accuracy, is limited because it is frequently difficult to choose stations from which it is possible to obtain an open view of the terrain. This difficulty is avoided with the use of aerial photogrammetry.

A unique process in itself, aerial photogrammetry has opened the way to all types of comprehensive projects. Information obtainable is of great value to the engineer in planning highways, railways, and waterways, for city zoning and planning, traffic studies, parks, factory layouts, and similar projects.

The importance of aerial photography is due to the fact that when the survey is finally completed, all the information is as it actually appears on the ground. Any one type of aerial map cannot be expected to produce all the pertinent information needed. Therefore, the nature of information required for a certain project will determine the type of survey to be employed.

Two types of aerial photographs are the reconnaissance strip map and the topographic map. The former is a highly specialized type of aerial survey planned and executed at any scale. It is for such specific purposes as highway location, right-of-way investigation, preliminary engineering on pipe-line and power-line projects, and mapping of transmission lines or transportation routes.



$$\frac{A}{H} = \frac{d}{f} = \frac{Ph}{fH} \;;\; h = \frac{dH}{P}$$

Figure 2

Topographic maps are used largely for city planning, drainage problems, highway and bridge construction, farm terracing, real estate sub-dividing, and other such projects where topography is of primary importance.

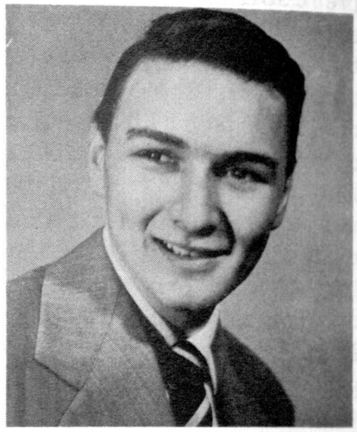
The general procedure in producing information may be understood from figure 2. When viewed from the objective center, points on the picture plane will be superimposed on actual points of the terrain. It will be noted from the figure that low points, in determining relief, will be closer to the center of the picture.

Vertical heights may be computed from the formula, but are generally gotten by the use of a highly specialized machine called the multiplex projector. By the use of color variation, this machine brings out the relief as it actually appears on the ground. The latter

Continued on page 39

GRILLE DESIGN

A BRIEF LOOK AT A FEW PROBLEMS ENCOUNTERED IN NEW CAR DESIGN

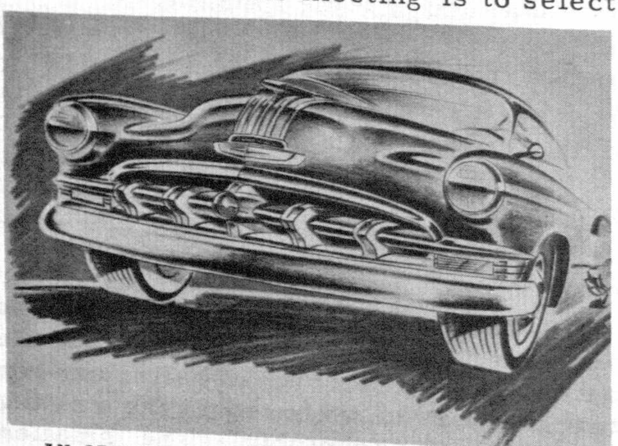


BY ROBERT PRYOR
FRESHMAN, M. E.

Automobile production has grown into one of the largest businesses the world has ever known. The time and money spent on research and new designs in the automotive field is unmeasurable. One important step in the building of a new car is the design of the grille. Whether it be a completely new grille or just a facelift job, many painstaking hours are spent in the design and testing in order to build a worthwhile product.

An artist's sketch is the first step in the design of a radiator grille. Numerous sketches are drawn, but only a few of these sketches are selected. The selection is made by a committee of men who pick out the design that in their opinion will be the most practical and the most stylish. These sketches are then drawn to full scale. The renderings are drawn up to give a third dimensional effect, and are then painted and shaded to give a chrome effect.

When these blackboard renderings are completed a meeting is called. The purpose of this meeting is to select one, or possibly two of these renderings to be modeled in clay. These receive every possible criticism. Nothing is overlooked because a mistake at any one of these stages of development will cost the company time and money.



AN ORIGINAL ARTISTS SKETCH SHOWING THE STYLE OF THE GRILLE. THE PURPOSE IS TO FIT THE DESIGN TO THE REST OF THE CAR.

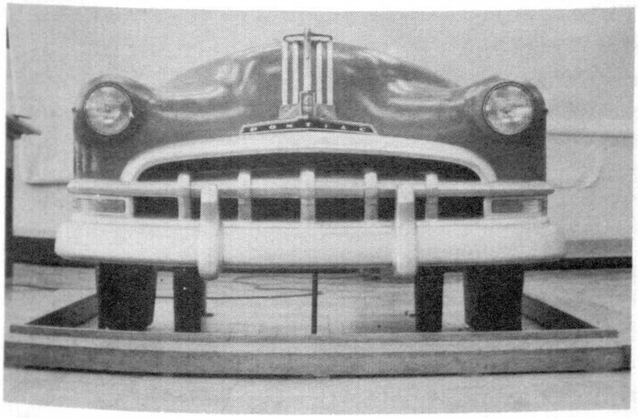
At this point the design engineer, working with the chief designer, will make the design engineering layout. This layout is called the ''working drawing''. The design engineering layout will include all the necessary cross sections views and design lines needed to clay up the complete grille assemble. Not only is the radiator grille designed but also the front and rear bumpers. The front bumper is designed with the grille in order to keep the front of the car uniform. The rear bumper has to be designed with the front bumper because they have to be kept similar in appearance.

The design engineer must be familiar with production requirements. He must prove that the grille will be sound in design, and he must also prove the design from the manufacturing standpoint. Last, and most important, he must be sure that there is adequate ''effective cooling area,'' the openings in the grille must be large enough to permit enough air to flow through to cool the engine.

There are two different cooling areas. The first is the ''design cooling area.'' The design cooling area includes all the air that passes through the grille. This is usually an adequate amount of air, but much of it is useless unless it is re-routed to one specific area. This second area is the ''effective cooling area." This area includes only the air that is effective in cooling the power plant. It will also include the air that is re-routed from the design cooling area. There are definite amounts of air needed to cool the power plant. For example, a car in the low priced range will need approximately 140 sq.in. of cooling area. On the other hand a car in the medium price range will need a cooling area of approximately 100 sq.in. In other words the larger and higher priced car incorporating a large engine will need less design cooling area, but more air to cool the power plant than a lower priced car.

One reason that the larger, and higher priced car doesn't need more design cooling area is the fan. On a larger car, a four or five bladed fan is used. Sometimes a double fan is used. In the lower priced cars a single bladed fan is used. After all these problems are worked out and checked the clay modelers begin the claying up of the grille assembly.

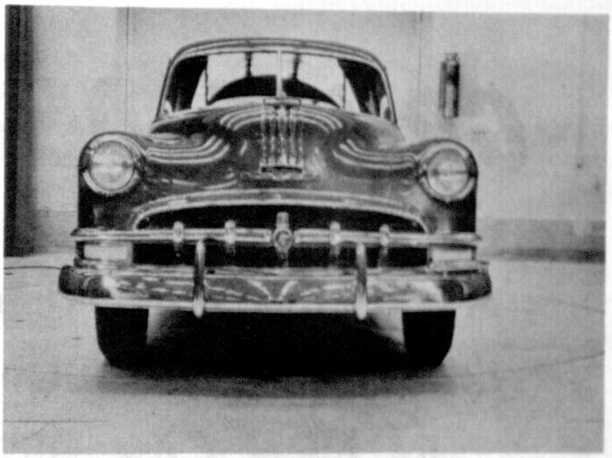
The first step in the clay modeling of the grille assembly is the building of



A CLAY MOCK-UP OF THE RADIATOR GRILLE. CLAYING UP THE GRILLE ASSEMBLY IS TO GET AN IDEA HOW IT IS GOING TO LOOK FULL SIZE.

a platform. This platform is used to gage and check dimensions during the claying up of the grill assembly. This results in a perfectly shaped grille. Also the grille design must be kept as close as possible to the actual dimensions of the engineering drawing, or the whole assembly will look out of proportion.

The next step is to make a full size imitation of the hood and front fenders of the car that will incorporate the grille that is being designed. The imitation is made out of wood or clay; using the most convenient.



HAMMERFORMS
THE BODY IS MADE OF PLASTER AND ALL THE CHROME SURFACES ARE MADE OF EITHER A CASTING OR A HAMMERFORM.

During the claying of the grille, referred to as the mock-up, changes are made to improve the appearance and the design of the grille assembly. Sometimes the sections of the grille assembly are so switched around that the finished clay model does not look like the original artist's sketch, but the original design is kept in mind if at all possible. The design engineer will keep the design engineering layout up to date with all of the changes requested by the chief designer. This is part of "proving" the working drawing.

The final mock-up of the grille assembly is presented to the proper representatives for approval when it is completed to the satisfaction of the chief designer. If the clay model is accepted all the information is turned over to the experimental engineering department where the final engineering drawing is made. This final drawing will provide all the necessary information needed to make a complete model in metal and chrome finishings.

The first step in making the engineering drawing is to make cross-sectional, horizontal, and plan view templates. These templates are made to reproduce the grill assembly as close as possible to the dimensions of the model. If any changes were made the dimensions are taken off the model.

The foundry begins working on the sand cores of the grille assembly as soon as the wood shop completes the patterns. Bronze and kirksite, are the two common alloys used in the casting of the grille assembly. The smaller pieces, such as the hood ornament, are cast in bronze. On the other hand brass

Continued on page 28

The SURPLUS

FACTS CONTRADICTING STATEMENTS MADE IN 1948 ABOUT AN EXCESS OF ENGINEERS IN 1952

BY WILLIAM THROOP
SENIOR, S. E.

Will I be able to get an engineering job when I graduate from MSC? All of the seniors have asked themselves this difficult question at one time or another. From all indications of the needs for engineers in the future, it is safe to assume that there will be more positions for engineers than there will be engineering graduates.

Recently Dean S. C. Hollister, Dean of Engineering at Cornell University presented his paper "Critical Developments in Engineering Enrollment". Dean Hollister conducted a poll of 34 selected institutions, including MSC, whose enrollments represented over half of the total engineering enrollment of the nation. From his findings it was seen that the number of freshmen entering the engineering curriculum this year was 26,500. This is only half of the number of engineering students that were freshmen when the senior class of '50 began college. Freshmen enrollments for the following years are tabulated below; those in the first line are for the selected institutions; those in the second line are for the entire country except for the year 1950 which is arrived at by applying a proportion based on those of previous years.

	1940	1947	1948	1949	1950
Selected Institutions	16,407	27,124	22,735	19,189	14,057
Entire Country	33,175	57,507	47,672	36,508	26,500
Ratio, per cent	49.5	47.2	47.7	52.4	53.0

It will be noted that enrollments decreased 17 percent from the peak year of 1947 to 1948, by 23.4 per cent from 1948 to 1949, and by 27 per cent from 1949 to 1950.

There has been a decrease of 20 per cent from the prewar year of 1940 to the Fall of 1950 when, under the normal rate of growth of engineering enrollments, there should have been an increase of about 20 per cent. Simultaneously with the erroneous belief of a decreased need for engineers, there has also been a decrease in the number of graduates of high school, a trend that will not reverse itself, as predicted on the basis of enrollments of high school and grammar school pupils, until 1958.

In the meantime the rate of industrial production, as judged by the production of electrical energy, is increasing at the rate of nearly ten per cent, bringing with it the need for increased numbers of technical personnel, including engineering graduates.

The contrast of supply that is in sight to fill these needs is striking. Estimates based on the number of engineering students now in college, assuming that students who maintain satisfactory scholastic records will be permitted to graduate, that customary shrinkages due to failure and other causes will occur, and that there will not be an unusual influx of advanced standing admissions or adoption of an accelerated program as in the last war, the number of graduates of the next four years will be approximately as follows:

1951	32,500
1952	21,900
1953	17,000
1954	12,400

The Bureau of Labor Statistics issued a report predicting a surplus of engineers; "Life" magazine used this theme in the form of an article predicting that graduates would not be able to get jobs; Engineers' Joint Council subscribed to the same idea. These statements are so erroneous that industries of the nation are worried and are making an all-out drive to insure the filling of their vacancies. To add to the confusion, enrollments in engineering are still falling and look as if they will continue to do so. This trend may be witnessed here at State. The summary of MSC engineering students as of March 1, 1949 are as follows:

1949	750
1950	608
1951	362
1952	231
1953	176

What was overlooked in all of these predictions was the fact that the number of freshmen engineering students

A SCENE AT AN INTERVIEW ARRANGED BY THE PLACEMENT BUREAU.

had been decreasing for the previous three years and that the number of engineers to be graduated this June and continuing at least until 1954 would not only be far fewer than the record breaking veteran classes of 1949 and 1950 but would even, unless enrollment trends reverse themselves, be fewer than in the "normal" prewar year of 1940. Unless some very unlikely circumstances occur to change present trends, reduced numbers of graduating engineers seems clearly to promise a serious situation in the near future for the engineering profession and for industry.

Under present-day conditions the national welfare has come to depend upon a continuing supply of young engineers to staff industry and the technical division of the government. Just at the time when the needs of the nation for trained personnel promises to be the greatest in history, there will be an unprecedented shortage of engineering graduates.

Why all the publicity about the shortage of engineers? The foregoing statements clearly show the decrease of engineering graduates. To see why all the publicity is needed, it is necessary to see what caused the shortage. First the war's ending enabled many people to come to college through the GI Bill who would not otherwise been able to attend. Many men were semi-technically trained in the service and desired to continue their new-found education, so they took engineering in college. From all appearances, there would be a surplus of graduates when these big classes completed their educations. Actually, industry absorbed the larger number of graduates in their expansion programs and in allied fields. The publicity given to false reports of surplus engineers undoubtedly influenced the freshmen as they registered for college, for no one wants to study four or five years only to find his field overcrowded. The second reason for the shortage is the over-all lower enrollments in colleges and universities. Fewer people are going to college because money is getting harder to get and keep. Coupled with that is the noticible absence of the GI in college. The third cause of the shortage is one involving the future. The demands of the service will drain the forthcoming graduates from college before they complete their training. How many of them will return to college after service is a question that few people will venture to answer.

These are a few reasons why there is a shortage, but what to do about it is another matter. The government is going to need engineers in the service... about 6,000 per year. There is only one answer to the problem at present. More high school graduates must be enrolled in engineering colleges and universities. It is now up to the colleges and universities to encourage incoming students to study engineering in an effort to correct a situation that could well put the nation's industries in an inoperative condition.

NEW DEVELOPMENTS

TELEVISION MICROSCOPE

A new type of light microscope that utilizes electronic eyes instead of the human eye was recently developed at an eastern university. The new technique of televised microscopy gives considerably sharper contrast than has been previously available. Its use to date has been limited to the field of biological research but it has great possibilities in the field of medicine and allied field.

The television-microscope combination has two advantages over the other forms of microscopes. It makes possible first, the study of many of the components of living cells normally visible only after killing and steaming and secondly, the direct observation of the motion of the cells. Even without the specially sensitized tubes, a high degree of contrast can be obtained by means of the variable light level controls on the television screen.

The experimental installation consists of a laboratory microscope mounted beneath an RCA industrial television camera. The televised microscopic scene is transmitted by cable to a standard receiver-monitor placed nearby. Placed in the interior of the television camera is a very small but sensitive pickup tube . . . the Vidicon. For microscopy, the Vidicon can be sensitized with materials which make it receptive to a particular narrow band of wavelengths. For the experimental model a red-sensitive and a violet-sensitive tube were used. Tubes have been developed that will range from the infra-red to the ultra-violet end of the spectrum.

With the red or violet tube it is possible to select a narrow wave length band for study of a particular cellular material whose light absorption lies in that band. The degree of contrast between various chemical components within the cell is much superior to that previously gained by photographing the spectrum through color filters. It is so much superior that some granules in living cells have been brought out for the first time.

It has been pointed out that the new technique enables examination of either slow or rapid motion of material under a microscope at magnifications which formerly could have been "watched" only by motion picture photography.

BACTERIA ALA CARTE

Farmers are saving millions of dollars a year and helping to stretch this country's jute supply by cooking disease germs to death.

Burlap feed bags are being made safe for re-use by heating them in special giant ovens known as dielectric high frequency ovens. Since these bags are durable enough to be re-used an average of five times, costs are cut to about one-fifth and there is less drain on the jute supply available for new bags.

Jute, the raw material from which burlap is made is not native to the U.S., this nation importing nearly all of its supply from India.

After several experiments with steam, ultra-violet light, and cyanide gas, it was found that heating with high frequency electricity was the most practical way to sanitize the feed bags for re-use. Bags in bales of 250 each were conveyed between electrodes in dielectric ovens and the temperature brought up to 230 degrees Fahrenheit, sufficient to kill undesirable disease organisms but not to burn or otherwise harm the bags.

There are two ovens now in use. They are 44 feet long, 9 feet high, and 9 feet wide, and operate at a frequency of 13 megacycles with a power of 120,000 watts.

The cost of sanitizing is one-half cent per bag.

ATOMIC POWER?

BY BRUCE MILLER
JUNIOR, E. E.

These times are often referred to as the atomic age. The chief reason being the atomic bomb and all the talk about atomic power. What about this atomic power? Can it be used to run motors, produce electricity, and do other great things? Some of these things may not be as far in the future as people think.

It is easy to see the value of atomic powered aircraft or naval vessels against those powered by chemical fuels. The space and weight factors of present fuels could be cut down considerably. With the great savings in space, better armored and maneuverable vessels could be built. Other things bearing on the value of such machines are: when it will be available, maintenance problems, and the cost in diversion of fissionable material both for the reactors installed in the equipment and complex reprocessing procedures which are required for atomic fuels.

A suitable means for supplying radioactive substances to an engine has already been found. A strip of suitable supporting material has been coated with radioactive matter. This coating is only one 10-millionth of an inch thick. It consists literally of molecules lying side by side, forming a uniform layer of molecules.

Stepping on the accelerator of the car of the future will send this strip of radioactive ribbon into the engine where it will release its energy in the form of heat and provide the power necessary for propelling the car.

The power packed into uranium can be visualized better if compared to something with which most of us are familiar. For example, an automobile battery provides 6 volts and about 100 ampere-hours, which is approximately equal to 1 horsepower-hour. A piece of uranium of the same weight would be able to provide about 300,000,000 horsepower-hours.

There are two kinds of uranium which are used; U/235, which is fissionable, and U-238 which is not fissionable. U-238 is 139 times as prevalent as U-235, and can be converted to fissionable material as a by-product of U-235 fission processes. The neutrons which are produced in the initial U-235 fission process can be captured - after they have released their energy - by the atoms of unfissionable U-238. These neutrons are the agent which converts U-238 into fissionable material. Thus we can get energy from U-235 and as a by-product build up a stockpile of fissionable material from the U-238.

In order to successfully use atomic power, reactors have been developed. These reactors are machines which control the release of nuclear energy. There are many difficulties in building and operating the reactors which are necessary for the successful use of atomic power. Some of the more important factors are --

1. The temperatures involved are well above those of the conventional engineering range.
2. Heat transfer and conversion of heat into power with the use of liquid metals involve corrosion, erosion, purification, and pumping problems.
3. Materials must withstand high nuclear radiation as well as high temperatures.
4. Material for reactors must not capture neutrons and thus reduce the power and the supply.
5. Fission products poison the reaction. That is, the ashes smother the fire.

The Atomic Energy Commission has four reactors in use in different types of experimental work. The first is used for testing materials which can be used in propelling naval vessels. The second is for testing materials which

Continued on page 30

The Societies

AMERICAN SOCIETY OF CIVIL ENGINEERS

Eight student members attended the Michigan meeting held in Detroit's Rackham Memorial. After dinner the group was addressed by Col. Arthur Morrell, a sanitary engineer with the U. N. Health Organization, just back from a ten year tour of duty in China.

An interesting sound movie on the construction of Boulder Dam was presented at the last meeting in January.

Plans for a get together for the graduating seniors are under way.

PHI LAMBDA TAU

A January meeting of Phi Lambda Tau a membership committee was chosen to select new candidates for admission. A smoker was held this term for the new initiates. The formal banquet will be held spring term in the Union.

ENGINEERING COUNCIL

The Engineering Council is now in the midst of planning for the annual Engineers' Exposition to be held May 11 and 12.

Individual departments will take charge of displays in their building with their council representative supervising.

To provide greater coordination for the exposition as a whole, plans are in process for guided tours of the various buildings and displays. A possible route will be: registration booth in front of Olds Hall, Forge, Foundry, Cannery, Olds Hall, Machine Shop, E.E. Building and finally to the Ag.E. Building.

The council has asked that any ideas or suggestions for displays which are available for the Exposition be turned in at room 101 Olds Hall.

AMERICAN FOUNDRY SOCIETY

In January, members of the student chapter were dinner guests of the Western Michigan College chapter. The featured speaker of the evening was C. A. Sanders of American Colloid Co. who spoke on sand problems relating to excessive metal shrinkage. Profs. C. C. Sigerfoos and H. O. Womochel of MSC followed the speaker with comments on the results of their research on the same general subject.

Also in January the group traveled to Battle Creek for the regular monthly meeting of the Central Michigan Chapter. The dinner speaker was Prof. W. W. Snyder, and the main speaker of the evening was K. W. Robinson of the State Health Dept. who spoke on "Dust Control In The Foundry."

ASAE

At their first meeting this term, the AS. Engineers elected two new officers to take the places of those vacated by President Jerry Richards and Secretary Donald Florence. Don was elected President and Richard Hazle is the new Secretary. The new Agriculture Council representative is Freeman Lytle.

A recent guest at the ASAE meetings was Andrew Olson. He reported on extension work. Mr. Olson has been active in this work for the past nine years, and reports that Ag. Engineers have good opportunities in extension work.

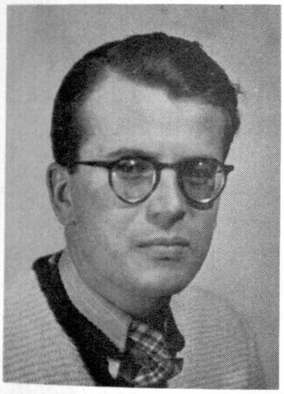
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS INSTITUTE OF RADIO ENGINEERS

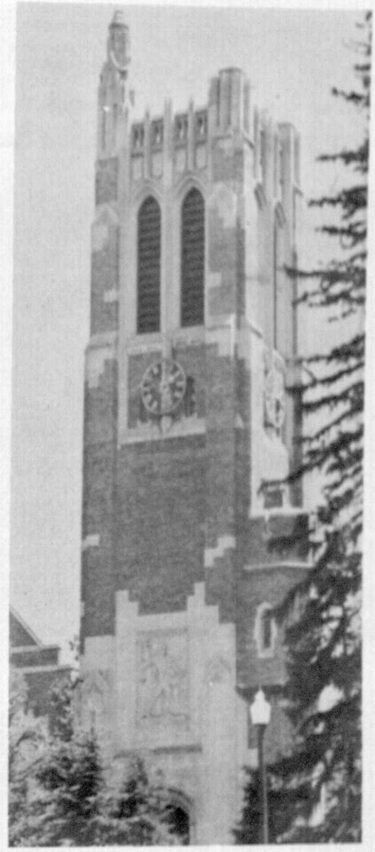
The group has seen several interesting movies on electrical power generation and its distribution. Also during the term there was a tour through Oldsmobile for all EE's.

Mr. Beattie of Consumers Power Company in Jackson gave a very interesting talk on engineer training programs and what the interviewer looks for in the young engineer. At another meeting, the MSC Amateur Radio Club gave a talk and demonstration on amateur radio. The club operates on the amateur radio bands under the call W8SH.

Continued on page 30

M.S.C. IN GERMANY





BY CHRISTOPH BRECHT
SPECIAL STUDENT

"Hello, Mister" said the student, climbing up the stairways to an old man whom he thought was a janitor, "say, Mister, where is Prof. Mueller's office?"

"What do you want him for" asked the man.

"That's none of your business, but I have my oral examination right now in his office."

"Glad to see you, I am Professor Mueller myself" said the supposed "janitor". --

This is an old student gag, but it could happen in Germany where a student legally is entitled to make his examinations about courses which he never attended. He only has to prove that he was enlisted as a regular student. Very often professors do not know their candidates and sometimes even candidates do not know their professors.

There is a great difference between high schools and universities in Germany, which also shows the difference between American colleges and adequate German universities:

In Germany high school teachers check the role every day, in universities nobody cares. Some classrooms used for a certain course, could not even hold the official number of students. While in high school a textbook is the center of the whole course, with the teacher only commenting and explaining. In universities usually different books are recommended but not at all basic of the lectures which are entirely planned and held by the professor. Therefore, there are no assignments. While in high school examinations take place at the end of each term, while the quiz and notebooks play an important part, they only have two examinations during the whole curriculum in the university. Of course these exams are pretty tough and students often get in a mess before them because they cover all the material of two or more years of studying in all courses.

A German Technical University corresponds to one of the "Institutes of Technology" here. Universities themselves are restricted to teach theoretical natural sciences, medicines, law and fine arts etc. while in Technical Universities practical technical sciences and engineering are taught. In western Germany some 90,000 students (out of a population of 48 million) study at 86 universities, institutes and other educational institutions which offer higher

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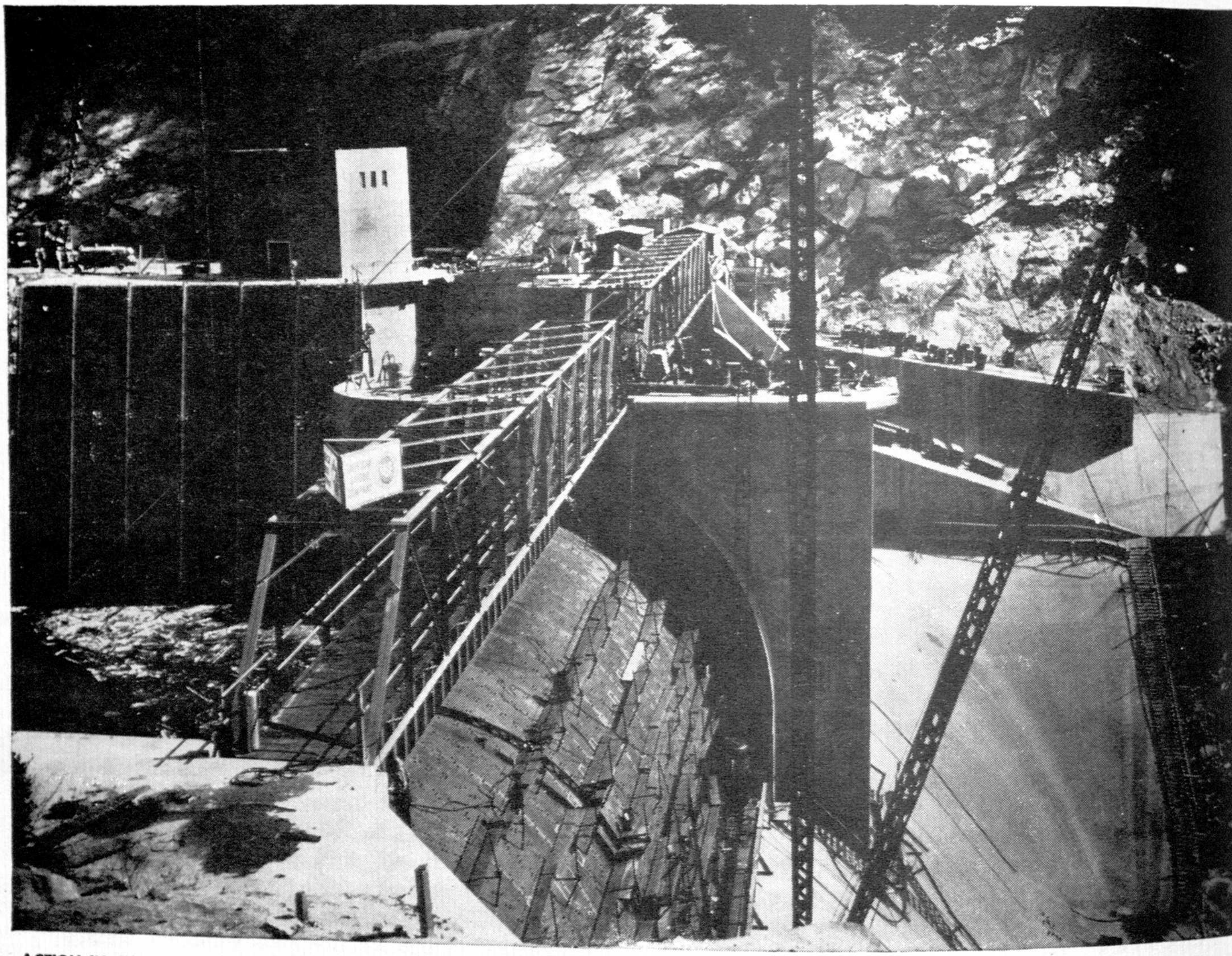
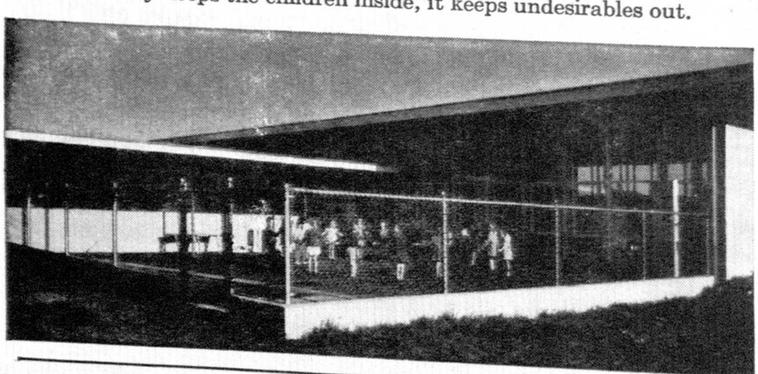
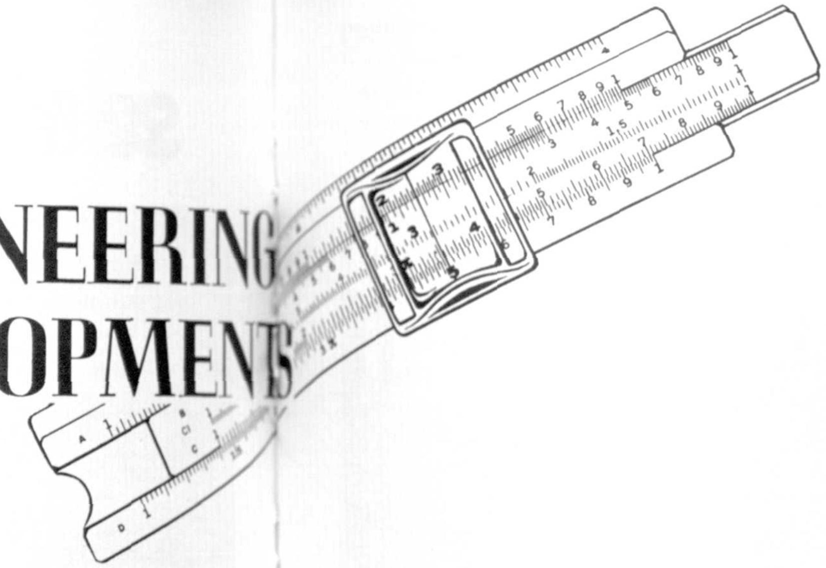
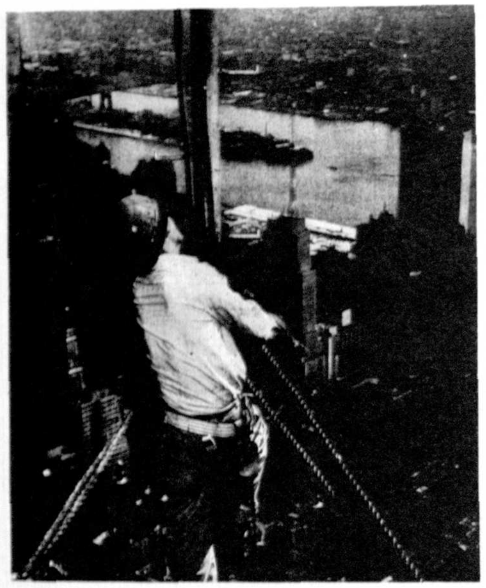




ENGINEERING DEVELOPMENTS

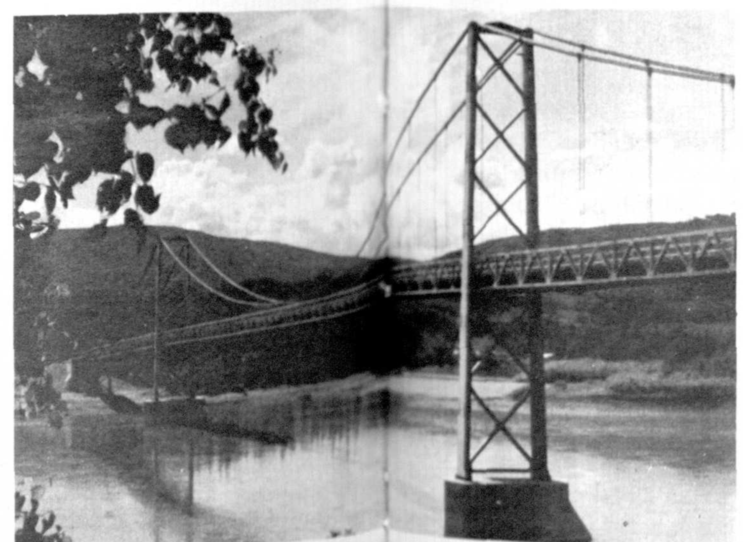




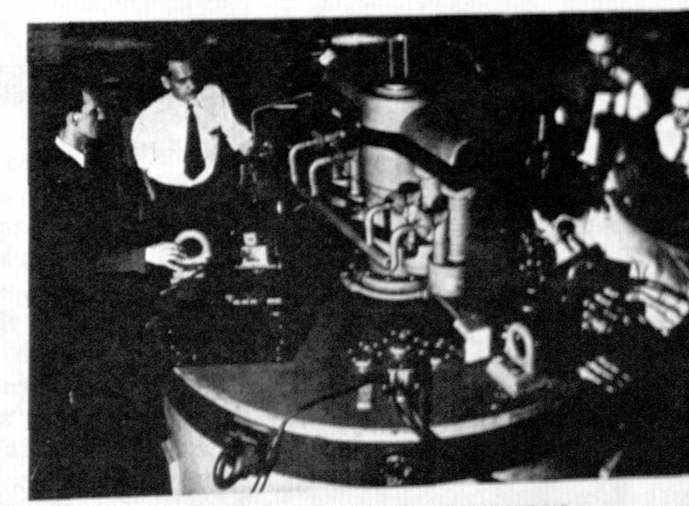
ERECTING A MULTI-ANTENNA TELEVISION TOWER ON THE EMPIRE STATE BUILDING

A SUPER-VOLTAGE INDUSTRIAL X-RAY

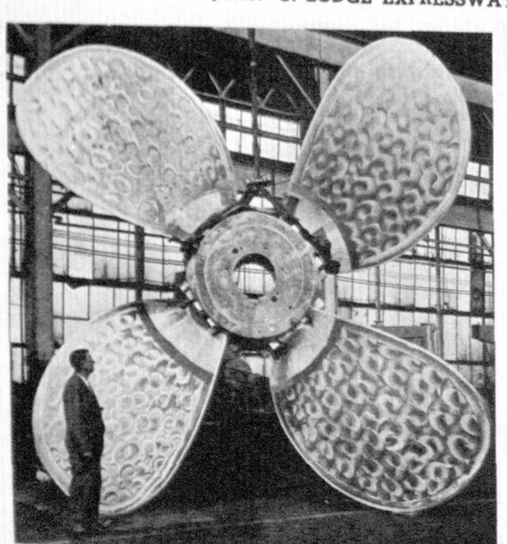
CONDUIT TRENCH BEING CONSTRUCTED AT THE GRAND RIVER CROSSING OF JOHN C. LODGE EXPRESSWAY



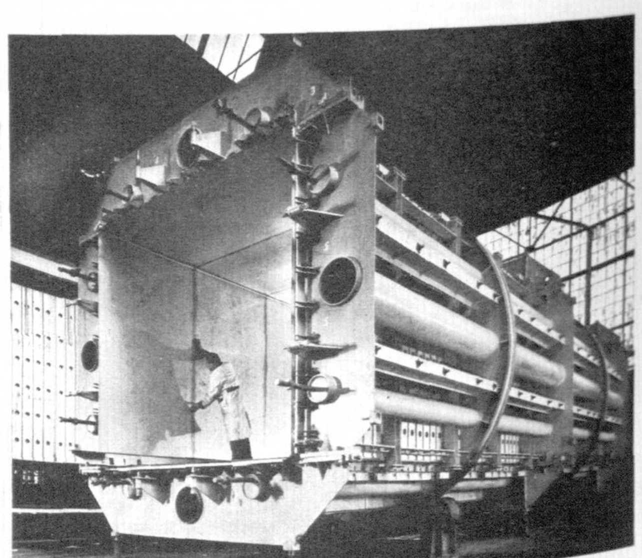
THE PEACE RIVER SUSPENSION BRIDGE—LARGEST ON THE ALASKA HIGHWAY



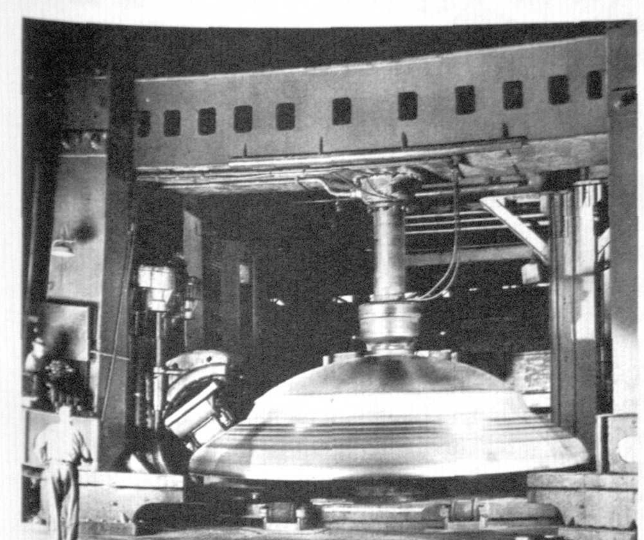
A NEW 300,000,000-VOLT SYNCHROTRON AN EXTREMELY POWERFUL ATOM-SMASHER



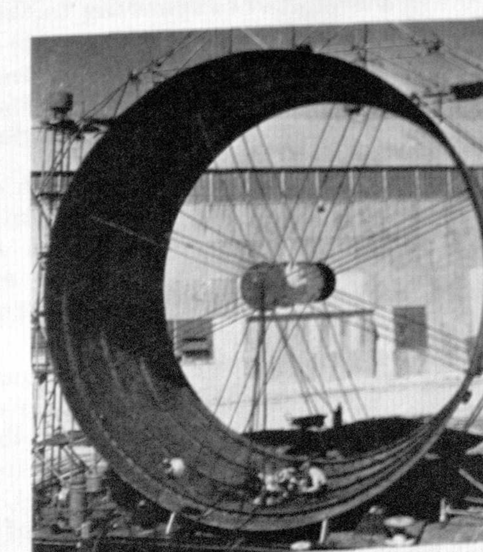
THE LARGEST SHIP PROPELLER EVER BUILT IN THE U. S. — 22 FEET IN DIAMETER AND WEIGHS 71,500 LBS.



LARGE WELDING JIG DESIGNED TO MAKE STAINLESS - STEEL - BEER - FERMENTING TANKS



NEW FLANGING MACHINE — CAN SPIN A FLANGED HEAD UP TO 26-½ FEET IN DIAMETER



THE BEGINNING OF THE BAYTOWN-LA PORTE STEEL TUNNEL

M. S. C. In Germany

Continued from page 22

education. The University of Munich is the largest having 10,000 students, the Technical University in Munich has about 4,000 students. The percentage of "coeds" range from 4% (in technical universities) to 45% in the University of Munich.

Let's follow the life in school of a young boy who wants to become an engineer. A total of eight years in school is required by law for any citizen in Germany. At the age of six the youngster has to go to the basic school (it is called the "people's school" because it is free for everyone). The first day in school usually is a festival and the boy gets a big paper hat, filled with sweets, candies and cookies.

After four years he may change over to high school or stay for four more years in the elementary school. In high school he and his parents have to make their first academic selection. When the boy passes the fourth class there usually is a linguistic or a natural science choice. After 8 classes (currently efforts are being made to add the former 9th year, abandoned during the Nazi regime) and after passing the final examinations, he gets his record from the high school. The grading system is slightly different as is shown below.

1=very good	corresponding to the "A"
2=good	corresponding to the "B"
3=fair	corresponding to the "C"
4=poor	corresponding to the "D"
5=insufficient	corresponding to the "E"

If the boy has not more than one or two "poor's" and no "insufficient's" in his record he has passed. This makes it possible for him to apply for enrollment as a student at the university of his choice.

Colleges, like MSC, are unknown in Germany. Students in Germany live in rented private rooms in the city of their Alma Mater. They come only for classes to the university. Usually the administration runs a kind of cafeteria, "the mensa", which is financially supported in order to serve lunches for students, instructors and employees for reasonable prices. Naturally private life in private rooms has some advantages for students but on the whole -- and especially under postwar conditions in German cities, it involves many additional housekeeping problems and expenses, unknown to students here. Besides, team spirit as it is known and felt in MSC and seen by outsiders during sporting events, is almost unknown. There are athletic events and competitions between the several universities but they fail to attract more than a small number of fans. Life in German universities is much more unpersonal and less familiar than it is here.

As a prerequisite to start as a student in engineering, it is required to have worked 6 to 12 months in a factory or shop. Further, it is required before the final exams that the ME and EE student work another 6 months during his vacations, before he becomes what is called here a "freshman". This system brings the student in close contact with practical methods, machines and institutions in industry, but also broadens his sense for social problems by requiring that he work for this period (without any wage, by the way) as a worker and together with other workmen.

I myself, considered this system to be the most ideal for technical education until I happened to visit the GMI (General Motors Institute) at Flint and got acquainted with the "Co-Op-System" which among others is carried thru in this institute. The alternating two month periods in shop and classroom for four years and the final research work in the fifth year seem to be an ideal way to educate an engineer. Things may be different for theoretical scientific-students and others who need a thoroughly uninterrupted study of sources and books.

Unfortunately a student at a German technical university has to choose his major on the very first day of his curriculum. There is no general basic school which could make him acquainted with the system during the first year. E.g. when he, after two terms, decides to change his major from ME to chemistry, he will have many difficulties to overcome with new courses which require prerequisites unknown to him.

Each year is divided into two semesters. Each of these run for about 3-1/2 months. While the student has to subscribe to a pre-arranged schedule

Alumni News

William H. Cornelius, '17, is Chief Combustion and Lubrication Engineer for the Newport Steel Corporation in Kentucky.

Paul G. Andres, '18, author of a new book, "Survey of Modern Electronics", has been on the staff at Illinois Institute of Technology for the last ten years.

Ralph C. Sweeney, '19, is a regional sanitation engineer for the State Health Department in the New York metropolitan area.

Leon L. Bateman, '20, has been with the Huron County Road Commission for 30 years. He is the County Engineer.

Carleton H. Currie, '20, is a Professor of Sociology at West Virginia Wesleyan College.

J. William Anderson, '20, is an engineer for the City of Los Angeles. He has worked on the Boulder Dam Project, Colorado River Aqueduct, and the basic magnesium plant at Las Vegas.

James R. Wellman, '22, is technical service engineer for American Cyanamid Co. in Kalamazoo, Michigan.

Harry W. Coon, '22, owns and manages a ready-mix concrete company in Corpus Christi, Texas.

Wayne A. Gingrich, '22, is an eye, ear, nose, and throat doctor in Ironwood, Michigan. Wayne graduated as a CE.

Fred H. Passenger, '24, has a general law practice in Ithaca, Michigan.

Herman W. Jennings, '24, is working for the office of the Chief Engineers Department of the Army in Washington, D. C.

Matt Nuttila, '25, superintendent of motor vehicles for the Cities Service Oil Co. in New York. He is vice-president for the Society of Automotive Engineers and chairman of its national transportation and maintenance activity.

Marshall G. Houghton, '26, is Senior Electrical Engineer for Smith, Hinchman and Grylls Inc., architects and engineers in Detroit.

Clyde A. Kitts, '26, is Assistant Manager of the Baton Rouge Plant of Solvay Division, Allied Chemical and Dye Corp. in Louisiana.

Carl Smetka, '40, is now an aircraft design engineer for Commercial Casting Co. of Los Angeles.

George R. Bingham, '41, is doing civil engineering work for the Detroit Water Supply Co.

S. Perry Schlesinger, '41, is an Assistant Professor of Electrical Engineering at the United States Naval Academy, Annapolis, Maryland.

Fred Drilling, '41, is employed as a stress engineer and designer at Gar Wood, Detroit.

Milton Honsowetz, '41, is doing chemical engineering for Wyandotte Chemicals Corp. in Wyandotte, Mich.

Arthur B. Coulter, '41, is doing engineering work for the Arabian American Oil Co. in Saudi Arabia.

Joseph Cdaney, '43, is associate engineer for the California Department of Architecture in Sacramento.

Phil Lenton, '43, is section head in the Chemical Engineering Department of Wyandotte Chemicals research Division in Wyandotte, Michigan.

LeRoy Oehler, '43, is an Assistant Professor of Civil Engineering at The University of Texas.

Marvin Smith, '46, is a sales engineer for the Chicago Branch of the U. S. Radiator Co.

Eugene Justema, '47, is an electrical engineer with the Clement Electric Co. in Grand Rapids.

Edward Gillisse, '48, is an industrial engineer for William Brothers Paper Box Co. of St. Joseph, Michigan.

Robert Smith, '48, is a chemical engineer in the control laboratory of Monsanto's plastics division in Springfield, Mass.

Stanley Riley, '49, is a service representative in chemical specialties for Standard Oil Co.

Harry Hedges, '49, is an electronic engineer at Wright-Patterson Air Force Base near Dayton, Ohio.

Floyd Harwood, '49, is a customer engineer for International Business Machines in Roseville, Michigan.

Y. Y. Huang, '49, is Professor of Civil Engineering at the Institute of Technology in Shanghai, China.

Ultrasonics

Continued from page 7

importance has been shown very extensively in the last two wars. Submarine detection is in reality a thickness measurement similar to that used in metal testing except here the material is water and the thickness is the distance from ship to submarine. Its operation is the same as radar except vibrational waves are used instead of electromagnetic waves. A signal is sent out by the ship and the echo is rebounded from the submarine.

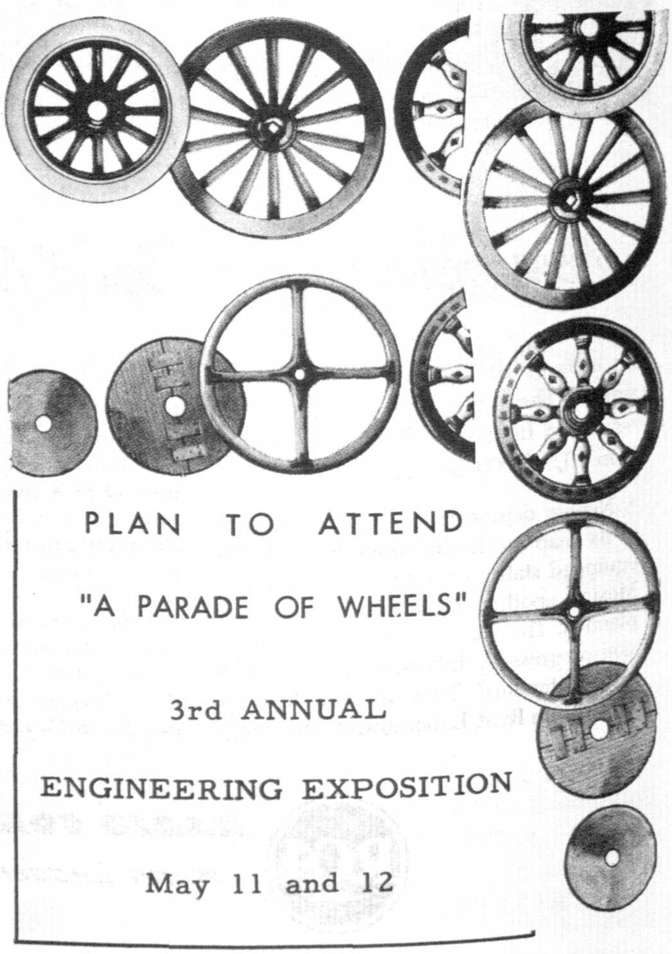
Knowing the speed of vibrational waves in water it is simple to calculate the distance to the submarine. Depth soundings and soundings for obstructions from icebergs are also made in the same manner.

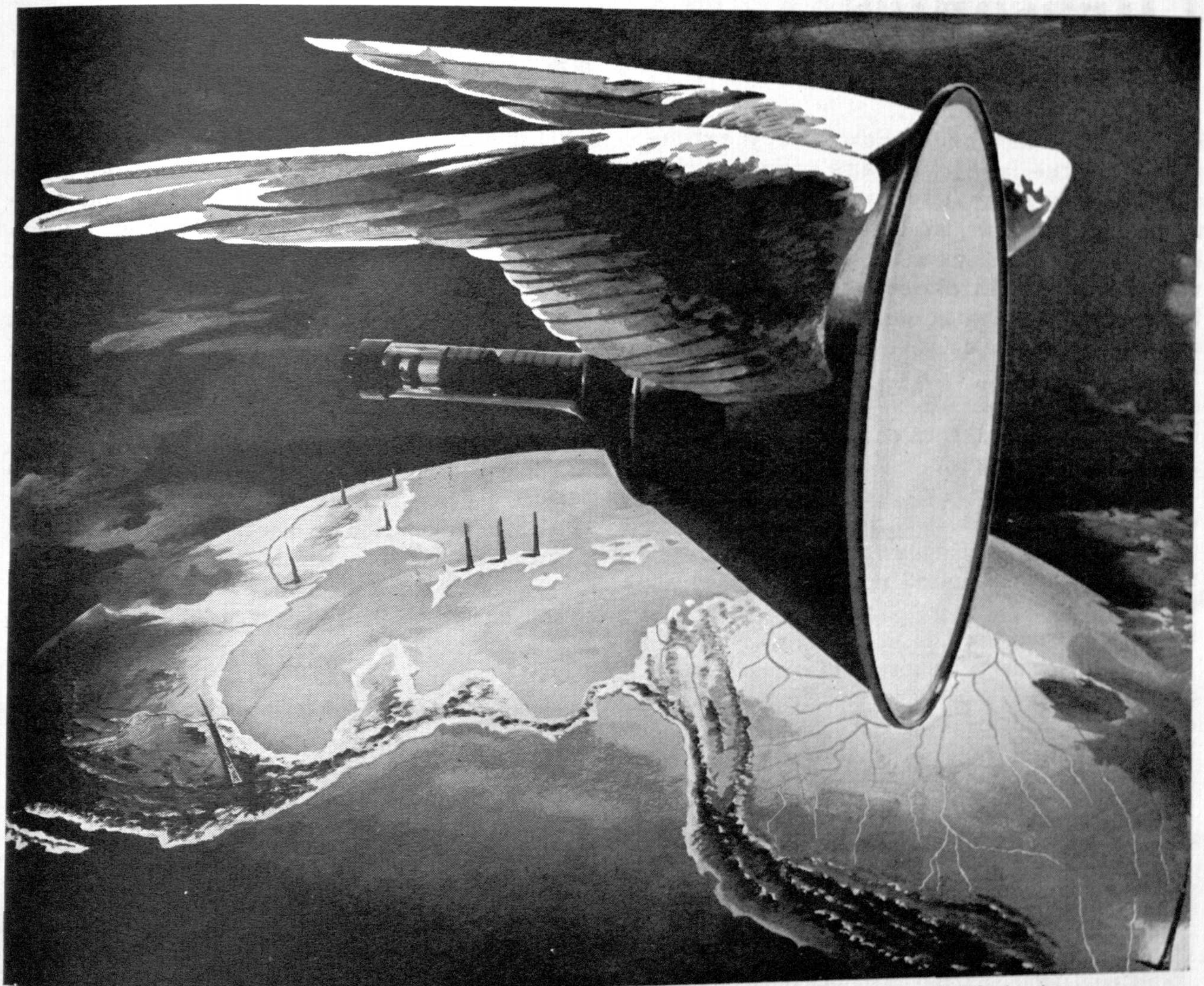
The above descriptions of submarine signaling is sometimes called sonar (sound navigation and ranging). The frequency range is between 10,000 and 40,000 cycles per second with a power output of 600 watts. The transmitter is usually of the magnetostriction type because of its high power output and rugged construction.

Geology has had a big helping hand in the form of ultrasonic seismic signaling. It is no longer necessary to wait until the next earthquake to get additional information about what is under the surface of the earth. Oil wells and mineral deposits are also found by this method. Here is how it works. The receiver is set up at one point and some miles away a blast of dynamite is set off to provide the pulse. This pulse of ultrasonic energy is reflected and refracted by the various layers of which the earth is made up.

Metallurgical application is also becoming an important aspect of ultrasonic future. It has been discovered that a molten pot of metal will, upon being exposed to ultrasonic waves, solidify much more rapidly and will harden with a much smaller grain size.

In conclusion, it is to be said that ultrasonics also has numerous other uses in such fields as biology and medicine. With further developments forth coming in this field, ultrasonics will be as necessary to the average person in the future as the automobile is today.





Five new RCA-equipped stations in Mexico, Brazil, and Cuba, add television to the forces which make Good Neighbors of all the Americas.

Grille Design

Continued from page 11

hammerforms make up the larger pieces.

The first step in making the hammerforms is to make a casting from the wooden patterns made in the wood shop. This casting is made of kirksite, a light, inexpensive alloy. One reason that the kirksite is used is because it makes a very good casting.

After the castings are cleaned up and a final check of the dimensions is made the hammerforms are begun.

The hammerforms are made by shaping a piece of brass over the kirksite casting. If the time alloted to complete the model is running out, the hammerforms are in the desired shape they are assembled and a final check of the dimensions is made. They are then disassembled and turned over to the metal shop. Here the hammerforms undergo their final stages of development.

The first step in the finishing process is to clean up the hammerforms, and then copper plate them. After they are copper-plated they are chrome plated. If the metal is not copper-plated first an inferior chrome plating job results.

The grille assembly is then mounted on a full size facsimilie of the car that will employ this particular grille. This full size model car is made out of plaster. The same paint job is put on the model that is to be put on the consumers car. When the model is finished it has a very close resemblance to metal. Everything is included in this final model. For example; the individual stars, or chrome trimmings, and pieces such as the license plate holder. A meeting is called when the model is completed down to the most minute details. The purpose of this meeting is to review the finished model. Suggestions are made when the case warrants it. Every part of the car is checked. It must be sound in design and it must be economical to produce.

This is only one of the many steps in the production of an automobile. Large companies are working day in and day out on research and testing in order to give the public a safe, beautiful, and practical automobile.

One-ton window for a supersonic wind tunnel

Just exactly how does a jet plane behave when it is roaring through the air at supersonic speed?

Scientists, peering through windows of Corning optical glass such as the one you see here, will soon have a more thorough answer to this question than ever before.

This piece of optical glass, weighing more than a ton, is one of two of the largest pieces of optical glass ever made. They will be used in the six by six-foot supersonic wind tunnel of the Ames Aeronautical Laboratory of The National Advisory Committee for Aeronautics at Moffett Field, California.

This tunnel generates wind velocities up to twice the speed of sound, equivalent to 1500 miles per hour at sea level.

The windows are six inches thick and 52 inches in diameter. They are so clear and free of imperfections that photographs of shock-wave and air-flow patterns can be made through them—to furnish scientific data of great value in the design of future airplanes and missiles for supersonic flight.

Until Corning research and glass-making skill found a way to mass-produce pure optical glass in large shapes, science had no suitable substance for wind-tunnel windows. Perfect optical glass with enough area to permit a full view—and thick enough to withstand the enormous wind-tunnel forces—was unheard-of.

Today, Corning can make lens blanks, directly from the molten glass, ranging in size from tiny camera lenses to these gigantic windows.

This Corning development is not only helping to make this country independent of foreign sources of optical glass; it also promises many new tools for science, paves the way for widespread improvement in products and processes.

Throughout industry, *Corning means research in glass*—research which has continually developed new kinds of glass and new uses for existing ones. As Corning has steadily pushed back the frontiers of glass knowledge, glass has become a material of limitless uses.

So we suggest—if you are thinking in terms of improved products or processes—that you keep glass in mind.

To learn more about Corning optical glass, or the many other glasses Corning makes, simply write us—preferably before your planning reaches the blueprint stage, at *Box S 120. Corning Glass Works, Corning, New York.*

CORNING
means research in glass

Atomic Power

Continued from page 15

can be utilized by aircraft engines. With the third they are attempting to produce significant amounts of electric power at reasonable rates. The fourth is a special "breeder tractor". This is a process which will produce more fissionable material than it consumes, something obviously impossible for gasoline and steam engines to do. A $3,500,000 project begun early in 1949 is completed and undergoing test operations. If it works as well in practice as it does in theory the reactor will operate with a net gain in atomic fuel.

Reactors have been in use since the beginning of the atomic program doing experimental work, but bigger, more complicated machines are needed for new projects. Conceivable reactors can propel guided missiles, provide cheap electric power, and distill water from the sea for irrigation. However, the difficulties are so great that most projects are financially impossible, and it is difficult to obtain sufficient technical manpower to handle them.

These obstacles set a time limit of several years on possible completion of most economic projects. With one project already completed and being tested, it is almost certain that we shall see atomic power put to some economic use in the not too distant future.

Societies

Continued from page 16

ETA KAPPA NU

The Gamma Zeta chapter held its first regular initiation during February. Among those being initiated were one professional man, two graduate students, ten seniors and twelve juniors.

The speaker for the banquet was E. V. Sayles of Consumers Power in Jackson.

The National President, Frank Sanford, attended the initiation and banquet.

Electronics GLAMOUR GIRL—OR PRODUCTION WORKER?

by H. A. BARTLING
Manager, Electronics Section
General Machinery Division
ALLIS-CHALMERS MANUFACTURING COMPANY
(*Graduate Training Course 1927*)

Hardening 2200 trimmer blades per hour, this Allis-Chalmers Induction Heater is stepping up production for a Southern manufacturer of textile machinery.

SO MANY near-miracles, actual, experimental or imaginary, are being attributed to electronics that it's quite the glamour girl of the electrical industry. Working closely with this infant prodigy, we find it is indeed fascinating and astonishingly versatile. We find, too, that it is a terrific worker. Applying electronic principles to tough, matter-of-fact industrial jobs is the work of this section.

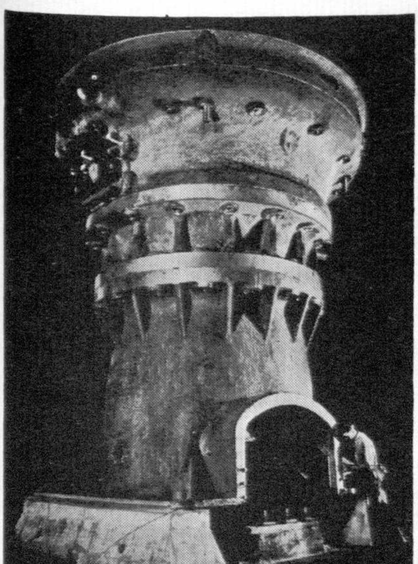
H. A. BARTLING

It rewards us with some really amazing success stories, and with abundant opportunity. The field has hardly been touched.

New Field

This field of industrial electronics was completely unknown, of course, when I received my degree in Electrical Engineering from Illinois and entered the Graduate Training Course at Allis-Chalmers in 1925. During the 2-year course I stuck pretty close to electrical work—and at its completion, I was on the electrical test floor helping run tests on some of the first big blooming mill motors the company ever built.

Next, I worked in the Basic Industries Department on electric mine hoists. In 1931, I moved back to the Electrical Department, doing sales application work for the Motor and Generator Section. I worked, successively, on unit sub-stations, had charge of the Mixed Apparatus Section, was in Industrial Sales, handled contract negotiations and sales liaison work during the war, and in 1947 took charge of the company's growing Electronics Section.



Massive castings for a 60-inch Superior-McCully crusher being assembled in the A-C West Allis plant. Machine will reduce 5-foot boulders to crushed rock—handle 2500 tons of ore per hour!

Here we develop and apply four main classes of industrial electronic equipment: Rectifiers, Induction Heaters, Dielectric Heaters and Metal Detectors. With the exception of Rectifiers, this equipment is relatively new to industry. We're turning up new uses and applications every day. It's an absorbing line of work, and pioneers an entirely new frontier of industrial methods.

Wide Choice of Interests

I've traced this brief personal history to illustrate the widely varied opportunities a young engineer finds at Allis-Chalmers even within a single field such as electricity. I never got far from the Electrical Department, because I found what I wanted right there. But I wouldn't be giving a true picture of Allis-Chalmers if I didn't touch on the other great departments, covering just about every major industry.

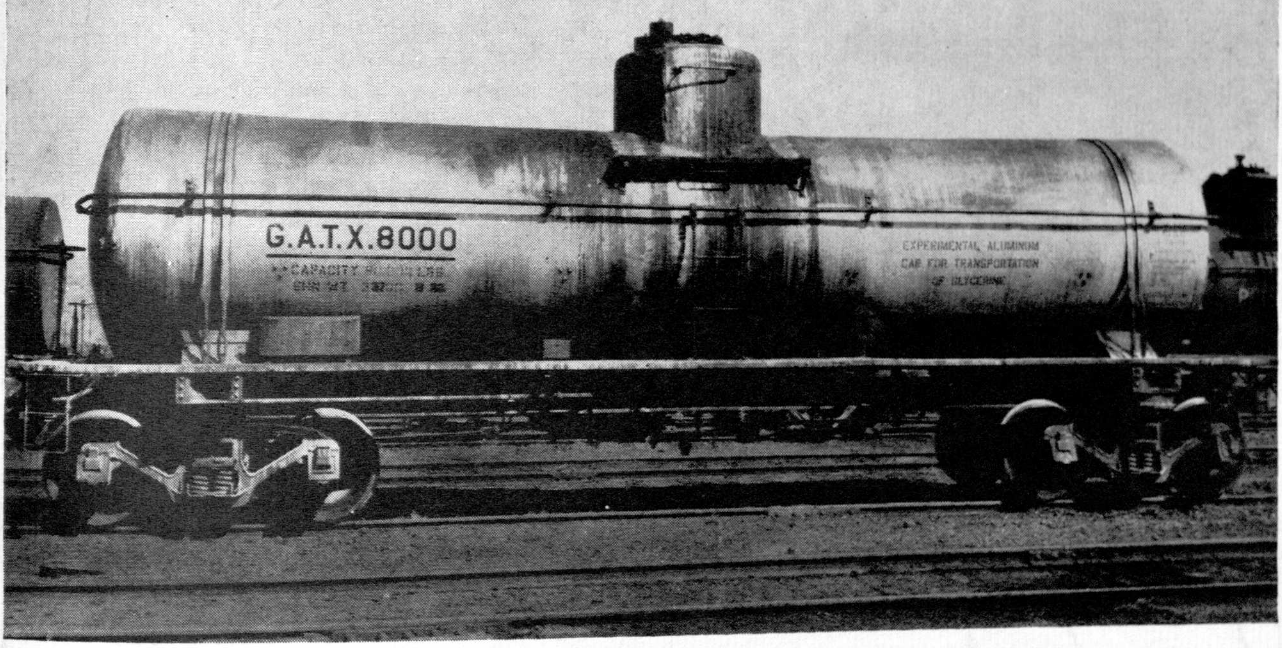
Many GTC students find their greatest interest and opportunity in the Basic Industries Department. There they design, build and install the machinery for mining, smelting, cement making, flour milling, oil extraction, food and chemical processing. Others become interested in hydraulic or steam turbines, the complexities of centrifugal pumps and the engineering problems of small motors or V-belt drives.

Some fit into engineering and design. Some find themselves most interested in manufacturing or in field work such as service and erection. Many like selling, and find their engineering training pays off best in a District Sales Office.

Whatever a man may eventually find most to his liking and advantage, the Allis-Chalmers Graduate Training Course is a wonderful vantage point from which to start. It offers contact with all major industries, and a chance at many types of work: design, manufacture, research, testing, installation, selling, advertising, export. There is no other organization that can offer a graduate engineer such a wide range of activities.

THEY MADE HISTORY!

This car, and the men who designed it



Back in 1928 Alcoa engineers pointed out the advantages that aluminum would bring to railroad tank cars carrying hard to hold chemicals; easily contaminated foods. So Alcoa designed and undertook to pay for the first aluminum tank car. The car builder and a shipper became interested. On completion of the car, the builder assumed the cost and leased it to the shipper for regular service.

Interest in aluminum tank cars increased. Impact recorders and strain gauges gave the designers new data. The aluminum production men rolled the heaviest plate; made the largest rivets produced up to that time. The second car was made from 8 instead of 16 plates. Joining time cut in half!

Today three plates, plus heads, joined by newly developed welding methods make an aluminum tank car. And 1,300 of them, including the first one ever made, are in service. Another instance where Alcoa engineering and co-operation have brought the advantages of aluminum to a new application. Throughout the Alcoa organization, in research, production and sales, similar pioneering jobs are in progress now and others are waiting for the men with the imagineering ability to tackle them.

Aluminum Company of America, 742 Gulf Building, Pittsburgh 19, Pennsylvania.

A business built on co-operation

ALCOA

ALUMINUM COMPANY OF AMERICA

M. S. C. In Germany

Continued from page 17

(covering about 27-34 hours per week) for the first four semesters at the technical university, he can choose about half of his schedule during the last four semesters out of a list of many subjects, all relating to his field. Classes run for 45 minutes. Technical auxiliary equipment (slides with records, models etc.) are, due to the lack of funds, relatively rare.

There are no exams, no term papers and no finals. In some courses however, drawings and calculations have to be made and sometimes will be graded. Occasionally voluntary problems can be turned in and will be corrected by members of the faculty-staff. In spite of this lack of control however, strangely enough, most of the students study hard and use the academic freedom, granted to them, to the best of their own benefit.

The first examinations take place after the fourth or fifth semester and cover the entire material of all the lectures. Each course will have its own exam, either written (2-4 hours) or oral (15 minutes) or both. I never realized how long 15 minutes can be when one has to spend them with an inquisitive professor. Some technical universities make it possible to spread the examinations of up to 18 courses or more at the end of two semesters instead of one. The final examinations (usually after the 7th and 8th semesters) again covers the material of the curriculum and includes the delivery of a special research assignment which has to be completed during the last four months of the last term.

The passing of the final exam entitles the student to accept the title "Diplom-Ingenieur" which may be compared to the masters degree here. If he does not intend to go on for a doctors degree immediately, which involves similar work and examinations as it does here, he is finished.

Unfortunately there is no placement office which arranges interviews with future employers, so the student has to look for his job usually alone and without any help. Sometimes however, recommendations by his professors, based on relations with industry, are given and are very useful.

There are some departments and divisions here in MSC, which are not developed in Germany. The technical university of Munich has the following departments:

Faculty for General Sciences:
1. Mathematics and Natural Sciences Department.
2. Chemistry Department.
3. General Sciences and Languages Department.

Faculty for Civil Engineering:
1. Civil Engineering Department.
2. Architecture Department.

Faculty for ME and EE:
1. Mechanical Engineering Department.
2. Electrical Engineering Department.

Faculty for Agricultural Sciences

Faculty for Brewing Sciences

You will notice that there is no "Industrial Engineering," and no "Chemical Engineering Department". There is the faculty for Brewing which is very famous and of course runs its own brewery. Would you like to enroll?

It is not within the scope of this review to compare your system here with the German educational system. Both have their advantages and disadvantages. The German higher educational system as well as the German universities are known for their scientific values and have a good reputation in this country. However, the system needs a reform towards broadening of education. Studies in German technical universities shall not get lost in specialties and technical practices, but shall train the students to solve technical problems by their own knowledge and ability instead of using a routine-schedule. Due to the enormous technical and scientific progress, specialization has become as necessary as it is dangerous. It is now realized that engineers as creators of technical progress must not be only technical skilled, but should be able to overlook the importance and relationship of their products to political economics and moral ethics. Engineers must feel responsible for their products even after they are shipped out of the plants are in use by the consumer.

Photogrammetry

Continued from page 39

method is a part of stereo-photogrammetry, the science of producing maps from photographs by the application of the principles of stereoscopy.

Although the time element in field work may be relatively short, it must be highly controlled as the entire survey is dependent upon the manner in which the pictures are taken. Flight lines in aerial photogrammetry must be computed and are restricted rigidly by the following factors; type of camera, focal length of lens, scale of photographs, end lap, side lap, size of negative and altitude.

By experimentation the Joint Highway Research Project of Purdue University, which has been doing considerable research on aerial photography, has found that they were able to transfer airphoto data directly to the working drawing. They were able to transfer the data and reduce its size from 3 in. per mile to 1 in. per mile with the use of a reflectoscope. The image of the airphoto is transmitted through the adjustable objective lens of the reflectoscope and a prism to a pane of glass on the transfer table. The actual transfer is made here.

All data are transferred a square mile at a time so any error will be confined within a square mile. Pencil drawings are made on the transfer table and then traced in ink onto a cloth base map.

The relatively small amount of field work necessary compensates for the large amount of office work required, and is one of the top advantages of photogrammetry. It is better suited for surveying inaccessible country, is not limited by the time available for field work, and furnishes a permanent record of the terrain. All these factors are helping photogrammetry rapidly become a wide and useful device to the engineer.

SIDE TRACKED

QUITE A CROWD

Until I heard the doctor tell
"There's danger in a kiss,"
I had considered kissing you
The closest thing to bliss.
But now I know biology
And sit and sigh and moan
Six million mad bacteria
And I thought we were alone!

The bigger the bankroll, the tighter the rubber band.

MUST BE NUTS

The bill collector entered the rather run down office and demanded some payment. The unshaven individual behind the dust laden desk said, "You'll have to see my junior partner--he's down in the park sitting in a tree."

"What's he doing in a tree?"

"Running our branch office."

SERVED HIM RIGHT

"Your daughter has promised to become my wife."

"Well, don't come to me for sympathy. You might know something would happen to you, hanging around here five nights a week."

WHAT A PRIZE!

He: "Who won the prize at the beauty contest last night?"

She: "The judge, I guess. He took her home."

WORTH A CHANCE

The church service was proceeding successfully when an attractive young widow who was seated in the balcony, became so excited that she leaned out too far and fell over the railing. Her dress caught in the chandelier and she was suspended in mid-air.

The minister noticed her undignified position and thundered to his congregation, "Any person who turns to look will be stricken stone blind."

The man at the end of the first row turned to his companion, "I'm going to risk one eye, Ed."

INDUSTRIAL ADVERTISEMENT: For Sale: One high-powered wench in good condition.

He who laughs last has found a double meaning that the censors missed.

OH, HENRY!

A neighbor found the flier's wife in tears. "What's the matter?" she asked.

"I'm worried about Henry," the wife answered. "He's been trying for a week to get rid of our cat. He finally decided to take her up in his plane and drop her over the side."

"Now, that's nothing to worry about," said the neighbor.

"It certainly is," wept the flier's wife. "Henry isn't home yet but the cat is."

"Which is your aunt -- the one on the right or the one on the left of the horsefaced woman?"

"The one in the middle."

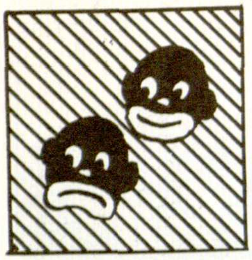
A college student is one who enters his alma mater as a freshman, dressed in green, and emerges as a senior in black. The intermediate process of decay is known as a college education.

A man walked into the tavern and ordered a cocktail. When it arrived he drank it, then devoured the glass, with the exception of the stem, which he threw on the floor. As he turned to leave he noticed the man next to him staring at him in astonishment.

"I bet you think I'm crazy," he said to him.

"Of course I do," replied the astonished one, "the stem is the best part."

--Wisconsin Engineer



SIDE TRACKED

When the motorist who crashed into a telephone pole and brought down the wires recovered consciousness, his hands were clutching the wire. "Thank Heaven," he exclaimed fervently, "It's a harp."

HARD TO CATCH

Bricklayer: What's the big idea? You're tossing those bricks right down as fast as you bring them up.

Helper: That new, loud-mouthed boss keeps passing below.

Bricklayer: Accidents will happen, won't they?

A SURE REMEDY

The elderly lady was visiting her newly-married daughter and immediately began telling her how to keep her spouse under the proverbial thumb. "The only thing in this world you can trust that wears pants is a lamb chop," she warned.

"Mother, don't be ridiculous," said her daughter. "My husband wouldn't start chasing women at his age."

Her mother smiled knowingly. "Age has nothing to do with it." she said. "Look at the way your father went after women. The only way I could slow him down was to take the tires off his wheel chair."

Teacher: "How do you suppose Noah spent his time in the Ark?" There being no response from the class of little tots, she added: "I suppose he did a lot of fishing."

"Fine chance," jeered little Freddie, "with only two worms!"

"Laura, let's lunch together," greeted one girl to another as they met on the street. "A friendship lunch, you know."

"What's a friendship lunch?" asked the other.

"Don't you know, dear. I pay for yours and you pay for mine."

"I avoid girls. They are so biased."

"Biased! What do you mean?"

"It's bias this and bias that until I'm broke."

A man stood on the street corner waiting to cross. After autos whizzed by for a long while, he spied a pedestrian across the street.

"How did you get over there?" he shouted.

The other cupped his hands and yelled back: "I was born over here."

Green paint may be removed from the seat of a pair of white duck tennis trousers with a bottle of ordinary turpentine, a stiff brush and a pair of scissors.

1st ME -- Busy?
2nd ME -- No. You busy?
1st ME -- No.
2nd ME -- Well then, let's go to class.

As Professor Cade says in Mechanics, "Every couple has its moment."

You can lead an engineer to water but why disappoint him.

WENT TO POT

Theirs was a beef stew marriage,
If you don't mind descriptions crude.
His wife is always beefing,
And the husband is always stewed.

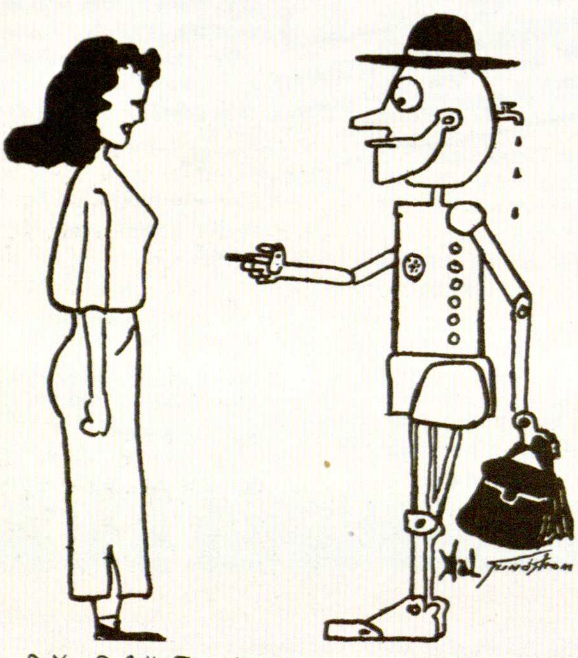
NOT TO BE TRUSTED

A bank president, extremely sensitive about his baldness, wore a hat at *all* times.

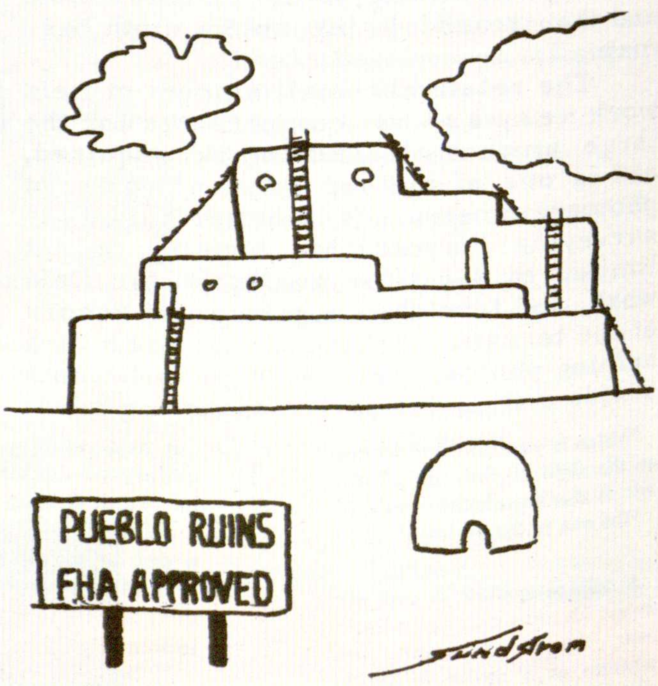
One day while the porter was sweeping up he said to him jokingly, "Why is it that after working here all these years, you don't have an account with us?"

"Because boss," the porter answered, "you always look like you are going somewhere."

When he threatened to drive her over a cliff in a taxi she just laughed . . . She knew the cab was yellow.

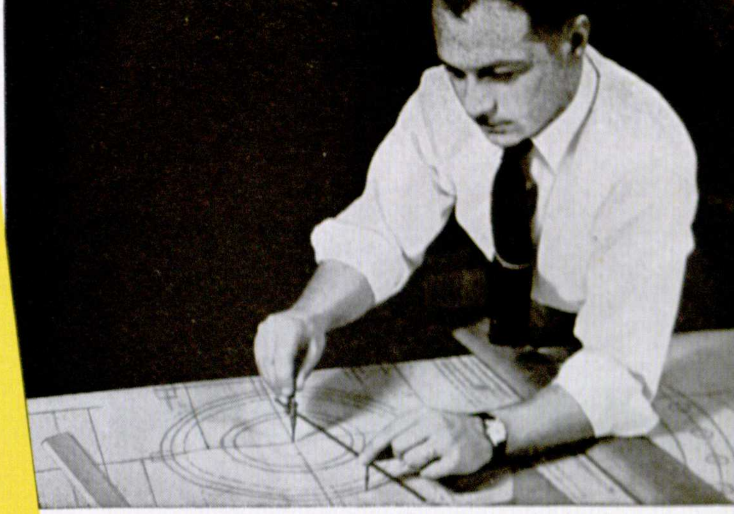


"How Do You Do? I'm The New Mechanical Engineer!"



The Housing Shortage

Extreme accuracy makes photography a matchless engineering tool

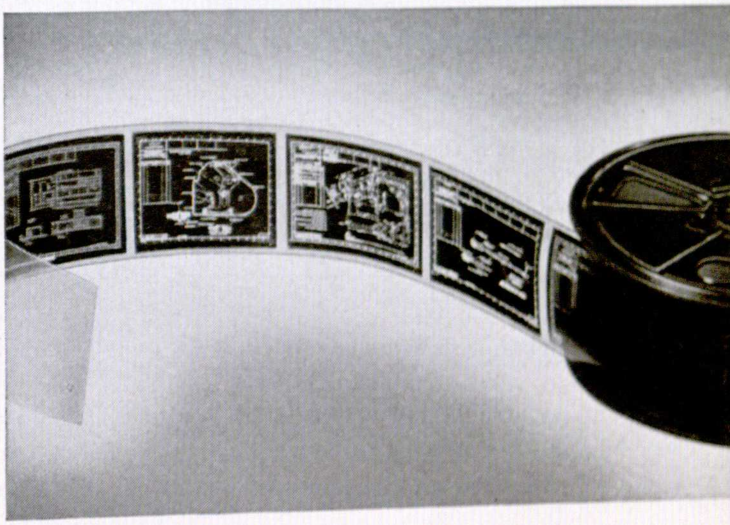


DRAWINGS ARE COPIED FAITHFULLY. Photocopying reproduces engineering drawings, data, specifications, with high speed, utmost accuracy and in any quantity. Bright copies can be made from dimmed material. Originals are saved from wear and tear.

Accuracy is but one of the unusual abilities of photography which are important in engineering and other professions and businesses alike. Through its speed it can provide movies that slow down action which would be far too fast for eyes to follow. Through radiography it checks castings, welds, and assemblies without destroying the part.

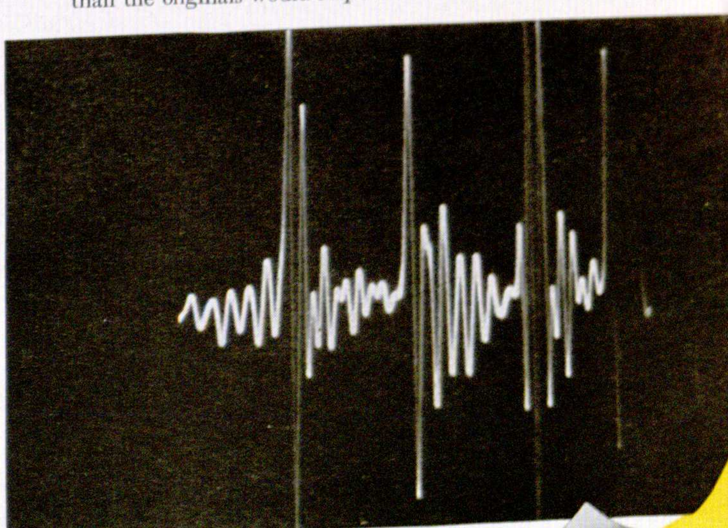
And so it goes all through the profession. You find photography saving time, improving products and procedures, simplifying processes.

Eastman Kodak Company, Rochester 4, N. Y.



IMPORTANT RECORDS PRESERVED. With microfilming, engineering drawings and valuable records can be preserved with every detail intact. The film can be stored for easy reference in 98% less filing space than the originals would require.

College graduates in the physical sciences, engineering, and business administration regularly find employment with Kodak. Interested students should consult their placement office or write direct to Business and Technical Personnel Department, Eastman Kodak Company, 343 State Street, Rochester 4, N. Y.

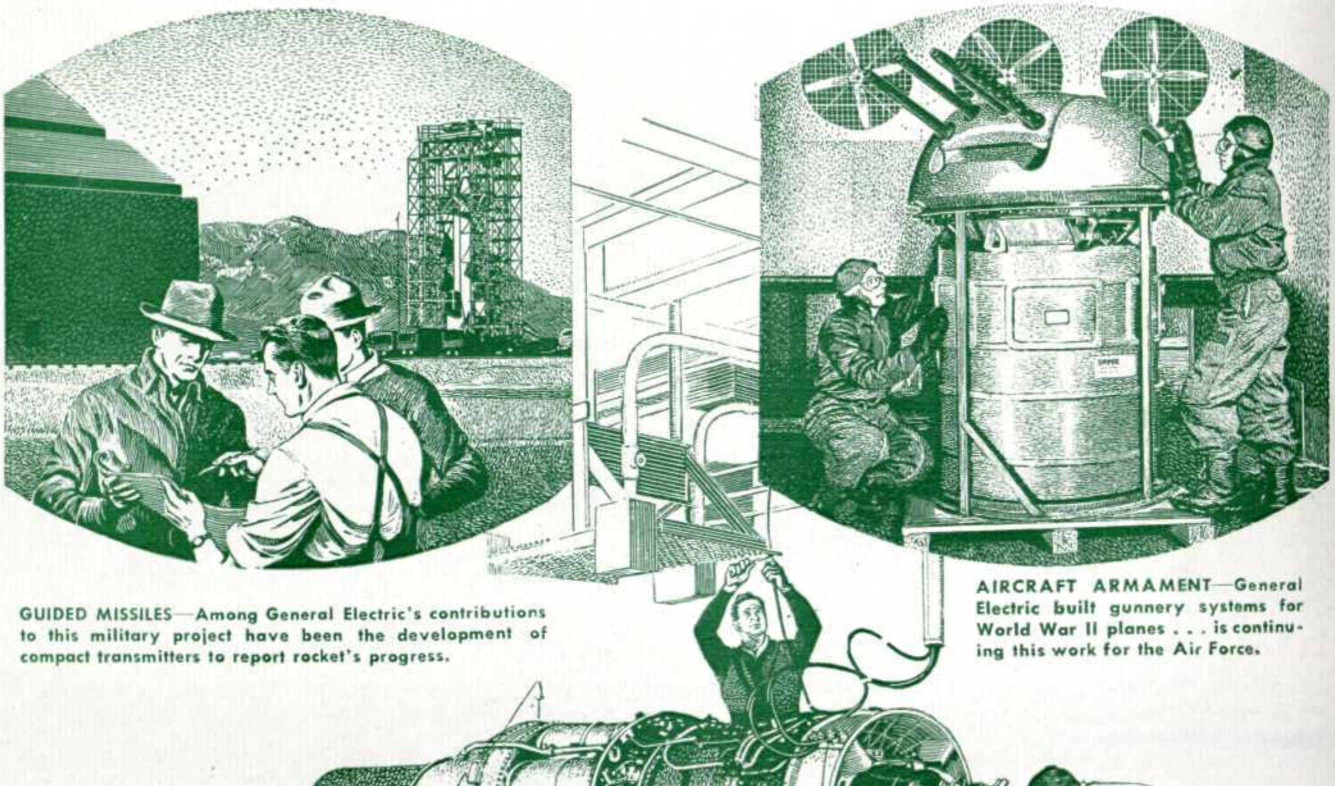


INSTRUMENT READINGS RECORDED. Fleeting traces of the galvanometer mirror or cathode-tube beam can be recorded for study and analysis. Movement too fast for the eye is caught accurately by photography.

Send for this FREE Book

It tells how photography is used to:
Speed production · Cut engineering time
Assure quality maintenance · Train more workers faster · Bring new horizons to research

Kodak
TRADE-MARK



GUIDED MISSILES—Among General Electric's contributions to this military project have been the development of compact transmitters to report rocket's progress.

AIRCRAFT ARMAMENT—General Electric built gunnery systems for World War II planes . . . is continuing this work for the Air Force.

JET ENGINES—In 1941, the Air Force asked General Electric to build the first U.S. jet engine. Today, G-E engines power such fast planes as the F-86 Sabre, holder of world's speed record.

College graduates at General Electric are working on some of the nation's most vital projects

The rocket that rises a hundred miles above White Sands, N. M., contains a wonderfully compact device that reads 28 instruments every one-thirty-fifth of a second and transmits its reports to receivers on the ground. It was developed by G-E engineers . . .

Development of special communications systems for civil defense has been undertaken by G-E electronics engineers . . .

The newest class of Navy heavy cruisers helping to guard our defense line gain their power from 30,000-horsepower propulsion turbines built by General Electric . . .

It is estimated that during 1951 more than 30 per cent of General Electric's production will comprise projects like these . . . the design and construction of equipment to help fill America's military needs.

The hundreds of General Electric engineers, physicists, chemists, and other specialists sharing in these projects work with the assurance that their contributions are meaningful and important. Their talents and skills, further developed through G-E training courses and broadened through rotational job programs, are standing the nation in good stead.

You can put your confidence in—

GENERAL ELECTRIC