Spartan ENGINEER

School of Engineering

☆

Michigan State College

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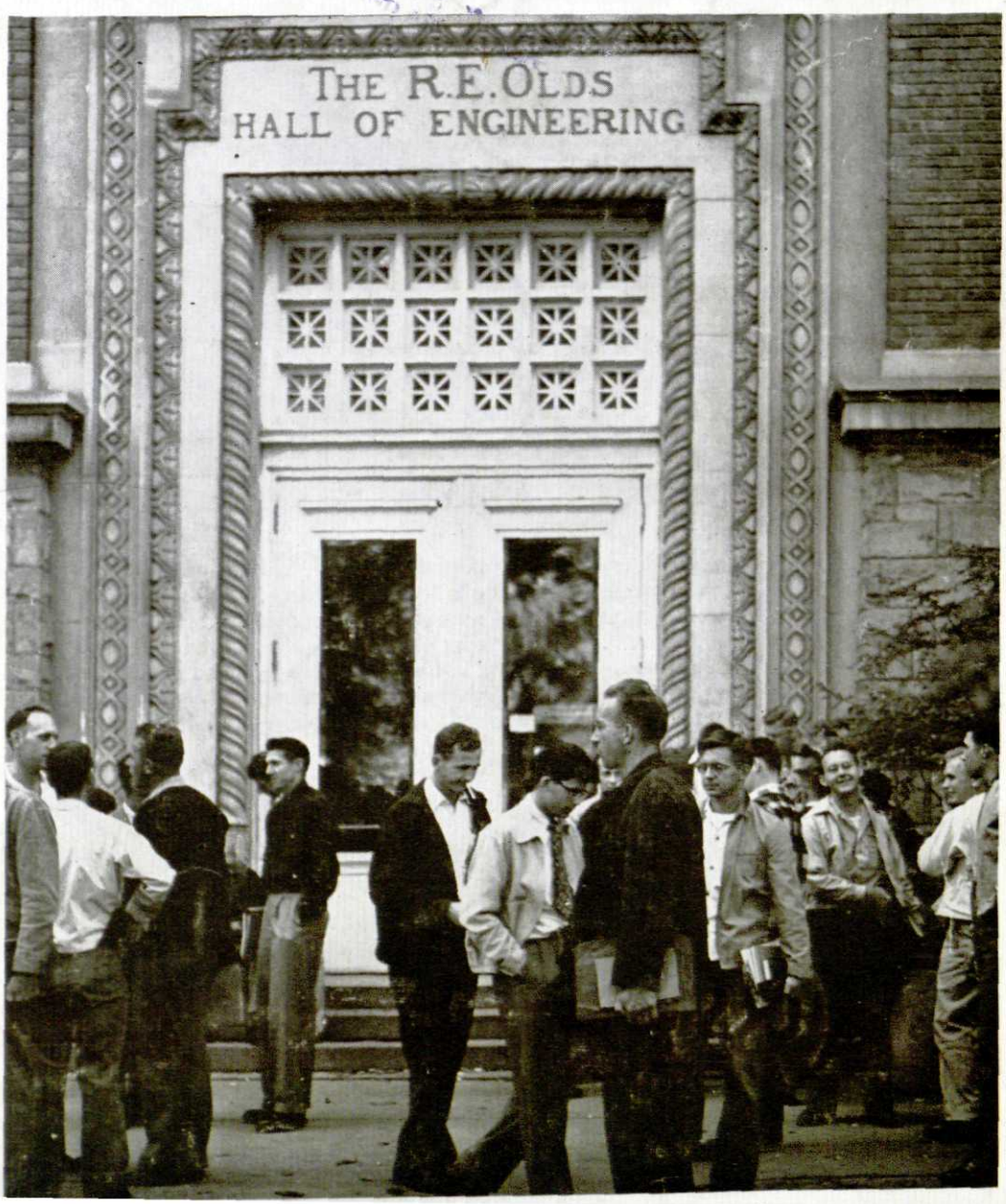

Want to make a river run uphill?

Steel pipe ready for installation at Grand Coulee Dam, Washington

EVERY DAY, America's engineers are performing miracles with water . . . creating vast, crystal lakes where valleys were before . . . transporting entire rivers across mountains in steel pipe. But there's still a big job to be done. For 108 million Americans still lack adequate water supplies, and 17 million acres could be made into fertile farms with proper irrigation.

The jobs at hand and the jobs ahead will require steel in tremendous quantities . . . for pipe of large diameter and small . . . to reinforce massive concrete dams . . . for bridges that carry pipe across broad streams . . . for cables that suspend it across yawning chasms.

It adds up to a tremendous task for America's steelmakers. And it's only one of steel's many tasks that will utilize the services of thousands of trained men, for steelmaking today is a precision operation. Chemical and metallurgical laboratories have assumed an importance equal to that of roaring blast furnaces and open hearths.

Preparing men for key positions in the great steel industry is big business at United States Steel. Today U.S. Steel has more people in training than all but a few of America's greatest universities.

Helping to build a better America, the number one job at United States Steel, offers careers with a real future to men who can qualify.

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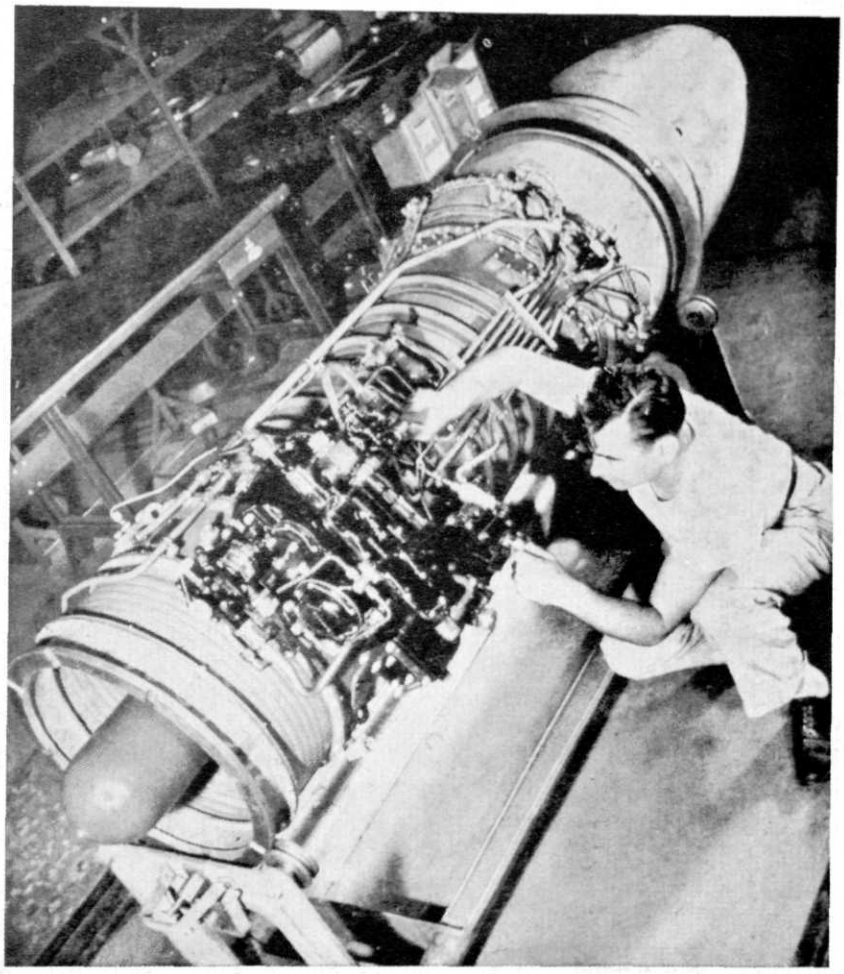
UNITED STATES STEEL

How many Dimensions has a Name?



When you measure a name, there are many "dimensions" to consider, such as: integrity, capacity, vision, strength and skill. These qualities constitute a yardstick for professional and public recognition.

There will be many times in your career when you can increase the "dimensions" of your name by the development of a product, a method or through a decision you make.

Some idea of the dimensions of the name Westinghouse, for example, may be gained by a few facts about one of its many activities . . . building turbines.

In this field is the Westinghouse J-34 jet engine which is setting a new pace in aircraft propulsion in the much-discussed Navy "Banshee" and the Army Lockheed F-90, as well as in many other airplanes of both services—as yet unannounced.

Such developments require a rich background of experience, technical knowledge and creative skill gained through constant search for more efficient, economical sources for power . . . qualifications needed to attain the eminent position the name Westinghouse holds as a leading producer of power equipment for land, sea and air.

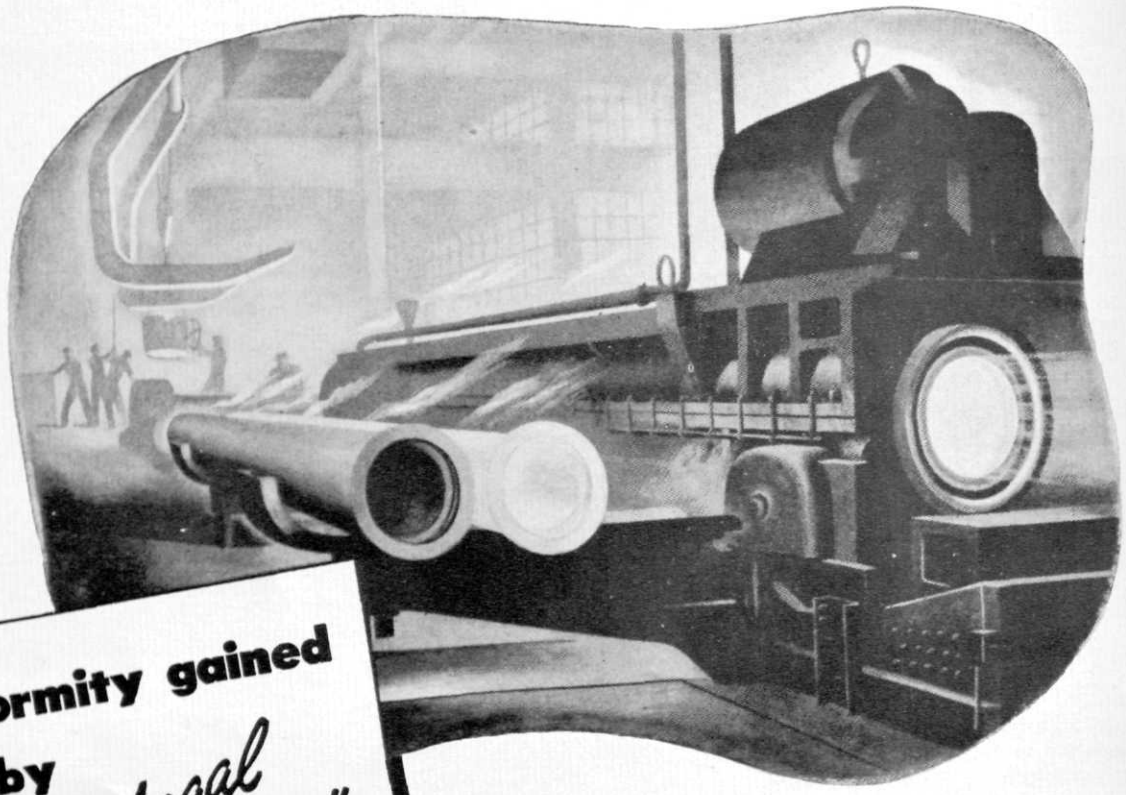
This is but one of many fields in which the name Westinghouse has been indelibly written over the years.

In your career you will measure many names and products in industry. As you do, you will find the name Westinghouse prominently identified with practically every one.

Whether those products are turbines or toasters, locomotives or lamps, electric stairways or x-ray machines, we will welcome the opportunity to share our experience . . . our sureness in designing and manufacturing that adds a new dimension to a name . . .

G-10069

YOU CAN BE SURE . . IF IT'S Westinghouse



Uniformity gained by "Centrifugal Casting"

The great majority of cast iron pressure pipe produced today is cast centrifugally, in metal or sand-lined molds.

When this mechanized process was introduced 27 years ago, its potentialities for improved production controls were evident. For human fallibility was largely replaced by machine accuracy based on scientific principles.

The improved production controls made possible by the centrifugal casting process have long since been realized. Hundreds of millions of feet of centrifugally-cast-iron pressure pipe are now in service. All of this pipe is more uniform in metal structure, in wall thickness, and in concentricity, than pipe not centrifugally cast.

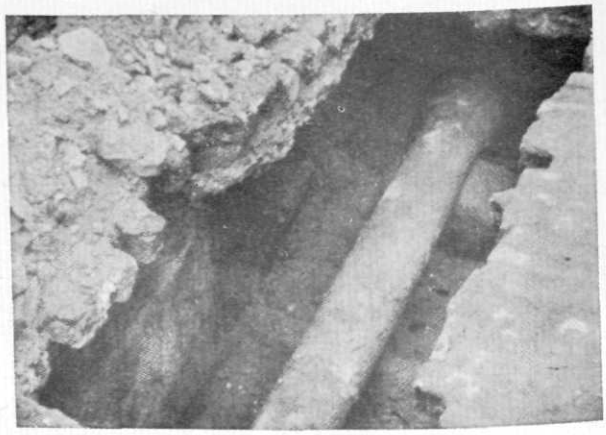
Better production control means better pipe; it results in greater uniformity of quality.

Production controls in cast iron pipe foundries start almost literally from the ground up with inspection, analysis and testing of raw materials; continue with constant control of cupola operation by metal analysis; and end with rigid tests of the finished product.

By metallurgical controls and tests of materials, our members are able to produce cast iron pipe with exact knowledge of the physical characteristics of the iron before it is poured into the mold of a centrifugal casting machine.

Cast iron pipe is the standard material for water and gas mains and is widely used in sewage works construction.

Send for booklet, "Facts About Cast Iron Pipe." Address Dept. C., Cast Iron Pipe Research Association, T. F. Wolfe, Engineer, 122 So. Michigan Avenue, Chicago, 3, Illinois.



Section of 114-year-old cast iron gas main still in service in Baltimore, Md.

CAST IRON PIPE SERVES FOR CENTURIES

DOW

CAUSTIC SODA

All American!

TAKE THIS FOOTBALL PLAYER. From head to toe Caustic Soda is part of his equipment. The plastic in his helmet, the fabric of his jersey and trousers, the leather in his pads and shoes—in the processing of all these, Caustic Soda plays an important part. Back in the locker room, his soap, towels, the trainer's surgical cotton and dressings, all are made with the help of Caustic Soda.

Caustic Soda is truly an All American—the workhorse of the processing industries. Virtually everything we see or touch in our daily living makes use of this chemical.

The Dow Chemical Company is one of the major producers of high quality Caustic Soda. Large plants in Midland, Michigan; Freeport, Texas and Pittsburgh, California are devoted to producing this important chemical. It is transported to industry everywhere in Dow's fleet of specially designed tank cars. Yet for all its importance, Caustic Soda is only one of over 500 essential chemicals produced by Dow—"Chemicals Indispensable To Industry and Agriculture."

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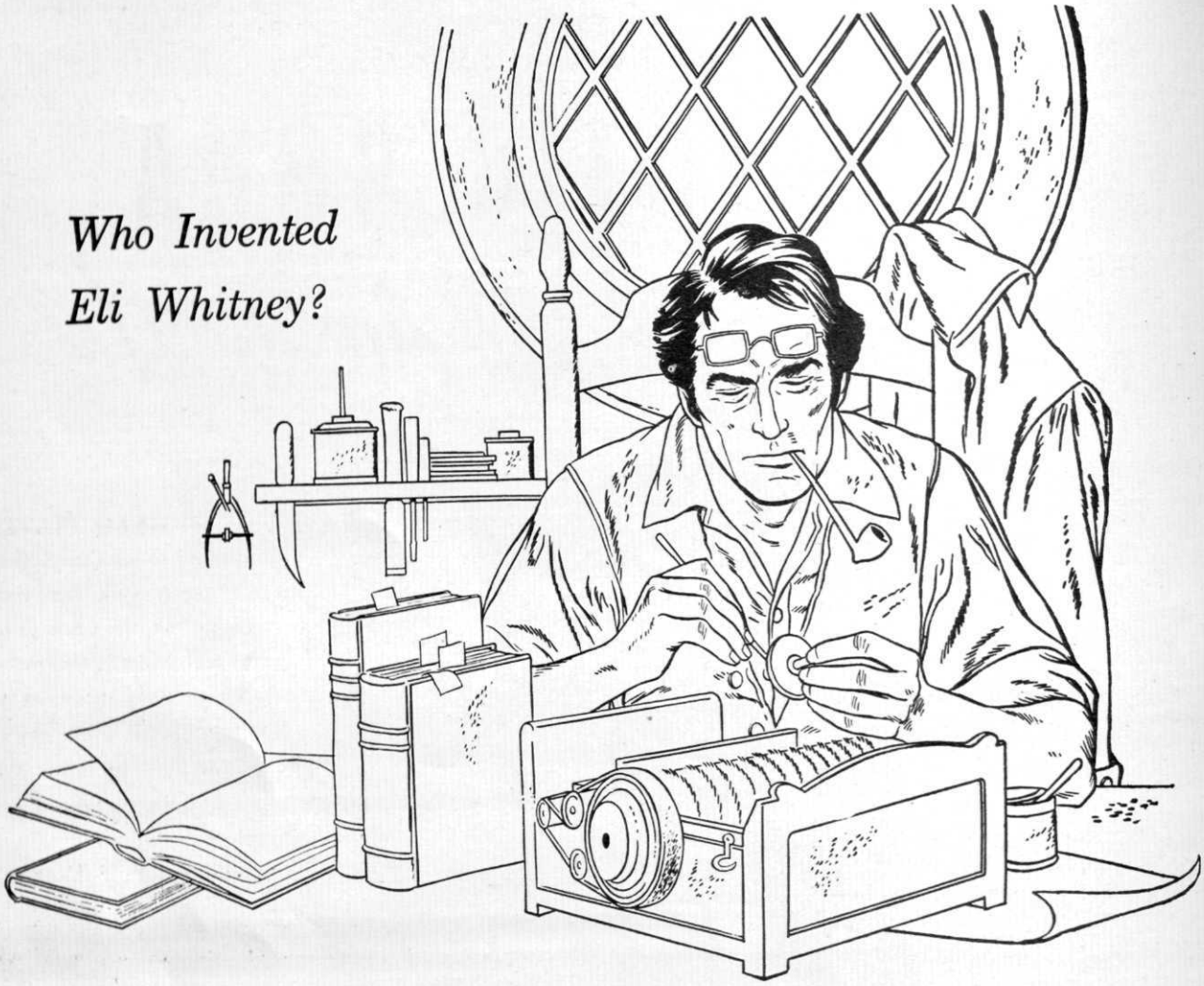
CHEMICALS INDISPENSABLE
TO INDUSTRY AND AGRICULTURE

Who Invented Eli Whitney?



In 1793 Eli Whitney helped a growing nation take another step in the direction of greatness. Inventions like his made and keep America great. But what does the greatness of American inventors and technology prove?

It proves that Americans are better trained than other people in the scientific and technical fundamentals so necessary for the continuing progress that has kept America the world's greatest nation. In America, the finest textbooks are available to all. This is the background for the technological advances that raise one country above all others.

Many of the books from which you learn your fundamentals bear the McGraw-Hill imprint. McGraw-Hill is the world's largest publisher of books for technical reference and instruction as well as for advanced research and study.

The discoveries of today are the fundamentals of tomorrow. When you finish school, you'll find it necessary to keep up with the advances in your specialty. The McGraw-Hill magazine serving your field will report all that is new, necessary and important.

It is not enough to know that a new process exists, or that a new invention has been developed. You must know also how it can be made available to you. You will find the best source for this information in the advertising sections of your McGraw-Hill magazines.

Today in school and tomorrow in business, you will find that your progress depends on your up-to-the-minute knowledge of your field. And, McGraw-Hill will continue to serve with books and magazines designed to provide all that is important and current.

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Engin – Ears

MSC Engineering Moves Ahead – Sad Saga of "The Wall" – Spartan Engineer To Print Letters From Its Readers

BY HERKIE BOWERS
Spartan Engineer Editor

MICHIGAN STATE COLLEGE HAS TAken a big step in the right direction—a step which may mean more jobs available for engineering graduates, as well as increased prestige for the school itself.

We refer to the Industrial Engineering Conference which the Mechanical Engineering department sponsored last September. A total of 71 delegates attended the conference and they represented companies scattered from Finland to Texas.

The effect the conference may have on increased job prospects is twofold. First, most of the delegates were more than satisfied with their personal contact with our engineering department. Second, many of the delegates came to realize the need for more engineers in their ogranization.

How the conference will affect the school's prestige is self evident. These men carried favorable impressions of MSC to many sections of the country.

Most of the credit for planning and carrying out the idea goes to Profs. James M. Apple and George A. Limbocker. They began planning the conference last April and spent most of the summer making the necessary preparations. Their efforts were well rewarded by the enthusiasm of the delegates—most of whom plan to attend again next year.

During the past ten years, the outstanding Industrial Engineering Conference in the midwest has been held at the State University of Iowa each summer. However, this clinic was primarily the work of one man, Ralph M. Barnes, who transferred to the University of California last year. With Professor Barnes no longer on the staff, Iowa discontinued the conferences.

Now, with the field wide open, Michigan State's engineering department would like to take over the top spot. It has already been decided to make the event an annual affair—plans for next year's conference are being made at the present time.

* * * * *

OUR DEEPEST SYMPATHIES GO TO the 15 gallant Spartans who had such mighty plans to wall off a portion of the U of M campus just before the MSC–M

(Continued on Page 28)

MEMORY, JUDGMENT AND LOGIC
IN A MECHANICAL BRAIN

electronic calculator

By William Throop
Junior, E.E.

TIRED? HAVE TROUBLE THINKING? Can't seem to concentrate? An entirely new type of high-speed automatic computing machine with a rudimentary memory organ that has judgement and mathematical logic soon may solve your mental problems.

Automatic computing machines of unprecedented speed and capabilities point to new vistas. The belief has been growing that these computers will have a profound effect on science and engineering. Imagine solving the complex realistic problems of a shell's flight in less time than it takes the actual missile to hurtle from gun to target!

No machine can take the place of the scientist or engineer to do creative thinking, but this machine relieves them of burdensome calculations, no matter how complex or involved they may be, thus leaving the individual more time and energy for creative thinking.

The selective sequence electronic calculator follows in many respects the pattern of man's mind in performing complex sequences of computations. The machine reads numbers involved in the problem and reads the instructions for its solution. It consults reference tables containing the results of past calculations. The memory element of the machine retains the many intermediate results produced in the machine, and recalls them when they are required in the course of the calculation. The calculating element of the machine adds, subtracts, multiplies, and divides the numbers it receives.

Card readers by which problems and instructions are introduced into the calculator.

By means of a "central nervous system" the program devised by the scientist for the problem in hand automatically directs the sequence of operations, selects the proper numbers from the various memory units or from the reference tables, directs them to the calculating unit, guides the calculating processes, and routes the results back to the proper places in the memory unit. When the desired result is obtained, the program directs the machine to record it.

The basic function of the machine can be explained in simple terms. The main operation of counting is performed at very high speed through the use of electronic tube circuits which count rapidly-recurring electronic pulses.

The high speed of calculation in this new machine is attained by the use of electronic circuits for computing and control, thus doing away with ineffective moving parts.

To make this electronic speed effectively available for the solution of today's complex scientific problems, it was necessary to provide in the machine facilities hitherto unavailable:

(1) Adequate means of getting data and procedure instructions into the machine and of getting results out of it.

(2) A gigantic memory capacity for the storing of huge masses of numerical detail that accumulate in the process of calculation.

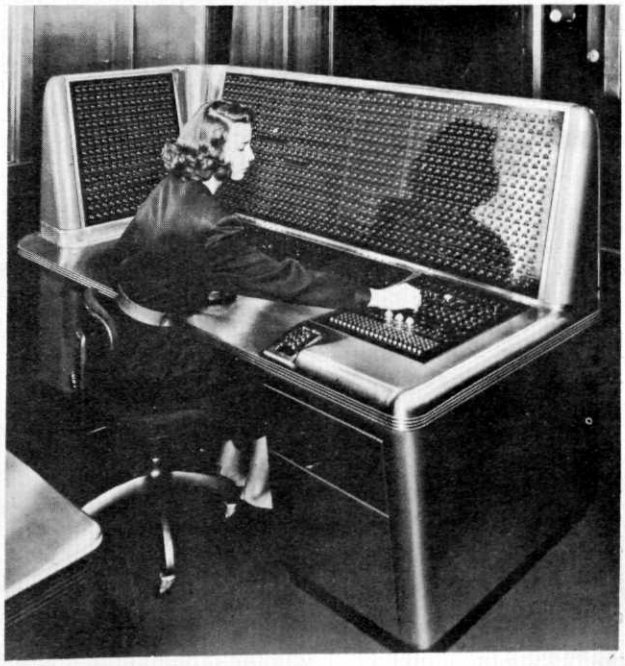
(3) A highly flexible means of guiding the flow of numbers through all phases of the calculation.

The great masses of numerical data and instructions used in complicated problems are fed into the machine automatically at high speed. Facilities are provided for assembling this material automatically from various sources within the machine and for sorting, checking and arranging it in the most efficient order for solution of the problems. Only by such automatic implementation of calculating programs can a small group of technicians keep the vast resources of the calculator usefully employed in exploring the ever-increasing mathematics of modern science.

The memory capacity provided, far exceeds that of any other calculating machine—a total of nearly half a million digits. It can remember this number of digits and recall them automatically as required. Those which must be recalled most quickly are held in electronic circuits, and the remainder, recoverable as rapidly as they are needed, are stored in relays and as holes in continuous card-stock tapes. By using these punched cards as a supplementary medium of storage, the memory capacity is made almost limitless.

A selective sequence electronic calculator, produced by International Business Machines, possesses approximately 250 times the productive capacity of an earlier automatic sequence controlled calculator built by them in 1944.

The calculator is able to record 24,000



This machine is known as the console, or operation indicator and control desk for the IBM calculator.

digits a minute by printing or 16,000 digits a minute in punched cards. In a single second this mechanical brain is able to perform 50 multiplications of 14 digit numbers; 20 divisions of 14 digit numbers; or 3,500 additions or subtractions of 19 digit numbers.

In order to keep this mechanical computer functioning smoothly, programming facilities developed by IBM have been designed to maintain proper operating efficiency. These facilities consisting of card feeding and printing mechanisms and the development of card punches have made it possible for the calculator to assemble, sort, check, and arrange material automatically for quick solu-

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WELDING AWARDS

Turn Your Senior Problem Into Cash Profits

By Wayne Mueller
Senior, M.E.

MICHIGAN STATE COLLEGE ENGINeering students have an opportunity to earn worthwhile amounts of money this year by competing in undergraduate award and scholarship programs. Already the Linclon Arc Welding Foundation and the American Welding Society have announced undergraduate competitions.

The James F. Lincoln Engineering Undergraduate Award and Scholarship Program annually offers $6750 in awards and scholarship funds to undergraduate engineering students and their schools for the best papers on arc welding design, research, fabrication, or maintenance. A total of 77 prizes ranging from $1000 to $25 are awarded to students and $1750 for 7 scholarships are awarded to schools. The awards are as follows:

Awards	Amount	Total
1	$1000	$1000
1	500	500
1	250	250
4	150	600
8	100	800
12	50	600
50	25	1250

Scholarships	Amount	Total
4	$ 250	$1000
2	250	500
1	250	250

Schools or colleges in which the three top awards are made to students will receive scholarships equal to those awards. The program is conducted to encourageengineering students to investigate various phases of arc welding.

Regardless of previous knowledge of arc welding, all resident undergraduate engineering students, including agricultural and architectural, registered in a school or college in the United States may compete. Students may write on a wide variety of subjects, and the papers may be based on study or actual experience. Papers may describe the welded design of a machine or structure or any part of a machine or structure. Maintenance and repair of machinery or farm equipment is another of the many subjects that may be used. Laboratory research and development work also may be described.

Deadline for the competition is May 15, 1950.

Sponsored by the American Welding Society, the A. F. Davis Undergraduate Welding Award Program also is designed to encourage and stimulate interest in welding. This program offers four cash prizes annually to authors and undergraduate publications for the two best articles on welding published in undergraduate magazines or papers during the preceeding year. Any undergraduate of a college or university in the United States or Canada is eligible, but the paper must appear in an undergraduate publication.

The awards are as follows: $200 to the author of the best paper and $200 to the publication: $150 to the author of the second best paper, and $150 to the publication.

Of course, the same paper may be entered in both of these contests. The Spartan Engin-

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WE PRESENT . . .

Claud Erickson

A MAN OF MANY INTERESTS

By Harry Horn
Senior, E. E.

CLAUD ERICKSON, CONSULTING engineer at MSC, believes in living the word ambition out to the final letter. His whole life spells ambition.

While a student at State, he convinced the Dean that he could handle a combination of ME and EE. And if you've tried even a simple schedule change, you can appreciate his accomplishment.

But a heavy schedule was a minor problem, for financial difficulties were rearing their ugly figures—$125 was the figure with which Claud began his college career.

He decided:

1) a job was necessary.
2) a job was hard to find (even then).
3) to take a job at the YMCA for 20¢ an hour.
4) to quit.

CLAUD ERICKSON

An opportunity for a job making blue prints for the Drawing and Design Dept. enticed him away from the YMCA. Two years later he took the part-time job that influenced his later life. In fact, he is still with the Lansing Board of Water and Electric Light Commissioners.

P.S. He graduated with a $905 reserve.

As an outstanding student, he is credited by Prof. Cory, recently retired EE instructor, as having presented some of the best lab reports ever turned in at MSC.

Claud is a member of Tau Beta Pi, engineering honorary, and proud of being the number one charter member of the State chapter of Lambda Chi Alpha.

Following graduation in '22 with a BS in engineering, he remained with his part-time employer on a full-time basis. The following year he was given a leave of absence to convert MSC's power system from DC to AC.

Claud's hobby seems to be collecting post-graduate degrees. In '27 he obtained a professional degree in ME from State. A professional degree requires 5 years of practical experience with marked success together with the passing of a rigid examination. The second trophy in his collection came in '33—an EE

(Continued on Page 32)

Proud Profession

A C.E. Instructor Presents His Views On Engineering

By Carl Shermer
Asst. Prof,, C. E.

ENGINEERS SHOULD BE PROUD OF their profession.

They have played a dominant role in providing for the material needs of mankind. They have harnessed nature and put science to work. They have built highways, railroads, automobiles, tractors, and the airplane.

Engineers have crossed over rivers with great bridges and under them with long tunnels. Giant dams have been constructed to control floods, irrigate land, and provide electric power for whole states.

The telephone, radio, television—every one of the things which twentieth century people take almost for granted are the product of the scientific knowledge and technical skill possessed by engineers.

But the picture is not all bright. Some of the bridges and dams which took years to build have been destroyed overnight by the bomb and bombing airplane which engineers have also made. Great cities, which are the result of centuries of effort, have been levelled in a single hour. Social forces have been at work which have caused men to use the product of the engineer's labor to destroy. It is time for engineers to look around to see what their creations are doing or they may wake up some day to discover that their very existence is threatened by their own inventions.

In the past, engineers have prided themselves on being hard-headed, practical men. They have designed machines to do the work of one hundred men (and no one will question the value of that) but they have had no concern for the men who were displaced. Technical problems were a challenge to them, but they failed to recognize even the existence of the more difficult social problems. It is to their credit that engineers themselves first became conscious of their shortcomings, and engineering educators began to introduce courses in history, economics, psychology, and social science.

The Basic College at M.S.C. is a direct answer to a real need, and engineers should be among the most grateful for it.

Engineers and others who receive highly specialized training must come to understand the broader problems of the society in which they live. They must accept the challenge of social situations which their discoveries and inventions have in a large measure created. If they fail to meet the challenge they may bear a major responsibility for the destruction of our civilization. But if they accept, they can make an indispensible contribution toward a standard of living for all which will be higher than any we can now imagine.

. . . CAMPUS NEWS

THE DEPARTMENT OF CHEMICAL and Metallurgical Engineering was separated into two departments in July. Dr. Austin J. Smith, who joined the State faculty a year ago, was named head of the Department of Metallurgy, and acting head of Chemical Engineering.

Dr. Smith received his degrees from Yale University's Sheffield Scientific School. He has been Assistant Director of Research for The Lunkenhiemer Co. of Cincinnati for the past twelve years.

Dr. C. C. DeWitt was head of the Chem.-Met. Department for nine years. At present he is Director of MSC's Engineering Experiment Station and is a member of the Graduate Council.

* * * * *

THE ANNUAL MEETING OF THE American Society of Agricultural Engineers was held on the Michigan State College campus in June. It was the forty second annual meeting and was hailed as one of the most successful meetings in the history of the society.

The morning programs covered "Power and Machinery", "Rural Electrification", "Farm Structures", and "Soil and Water" and were presented by leading men in industry and education. In the afternoons, general sessions were held covering some of the smaller topics of equal importance. Dr. J. B. Davidson, charter member and first president of the society, reported informally on his recent experiences in China.

Student members of the society held morning meetings to discuss the operation and activity of the various student organizations. Plans for the coming year were discussed and election of officers was held.

Dr. E. G. McKibben, former professor and head of the Ag. Engr. department at MSC, was recipient of the Cyrus Hall McCormick gold medal for 1949. This award was presented for his record of distinction in administration, education, and research. Dr. McKibben is now head of the Ag. Engr. Department of the Pineapple Research Institute, Honolulu, T. H.

The John Deere Medal was awarded to Dr. H. H. Bennett for his extensive work in soils and soil conservation. Although not a member of the society, he was instrumental in the founding of the Soil Conservation Service and was its head for many years.

After the meeting adjourned, the conventioners went to Detroit as guests of Detroit industries. A banquet was given at which Mr. Kettering, President of General Motors Research Corp., was the guest speaker. The following day, the guests toured various industries.

* * * * *

THE MECHANICAL ENGINEERING department underwent many changes during the summer months with new instructors joining the staff, two old ones resigning and the groundwork laid for several new courses.

Norman McClure of the heat treat lab resigned to accept a position as metallurgist with the Dow Chemical Company in Midland. F. L. Spalding was the other loss. He left to join the industrial engineering staff at Bradley Polytechnic Institute, Peoria, Illinois.

To replace these men and round out the staff in general, four new men were added to the MSC faculty this term. Dr. R. T. Hinkle, professor in charge of machine design, came here from Cornell University. Dr. Hinkle earned his bachelor's and master's degrees at Kansas State College and received a Ph.D. at Cornell. He was an associate professor in machine design at Cornell. Here he will have charge of the senior problem for students

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PATENTS PENDING

Here's How To Protect Your Ideas

A Brief Account of How To Obtain A Patent

By Harvey Smith
Senior, E. E.

HOW OFTEN DURING THE COURSE of conversation, do we hear, "You ought to get a patent on that"?

Every year, some fifty thousand people in this country do "get a patent on that." Both in terms of the number of people engaged in it and in respect to its commercial importance, the art of invention may be considered one of the major industries of this country.

But the path of the inventor is beset with obstacles. Of the large number of patents granted annually, only a small proportion are of commercial value. Ignorance of the patent system, inability to gauge industrial needs and poorly drawn-up patent claims are responsible for the heavy mortality in patents.

A patent is a contract between the federal government, representing the public, and the inventor. Under this contract, the inventor discloses to the public his invention with its uses and advantages, and in return the Government grants a 17-year monopoly to the inventor which prevents anyone else from using the invention.

The main provisions for a patent are that the invention is new and useful, has never been patented or published in this or any other country before the date of filing application, and also has not been known or used in this country prior to the date of discovery or in public use or on sale in this country more than two years prior to the date of filing the application.

A patent must be applied for, by, and issued to, the actual inventor or co-inventors of the device, process, or art. It cannot be an agent of the inventor or inventors and in this respect the patent system of the United States differs from those of most other countries.

Many corporations, employing men for the express purposes of invention, development and improvement eliminate all controversy by making an employee obligation a definite part of the employment arrangements. It is a usual practice for the employee to sign a specially prepared agreement in which he expresses his complete willingness to:

(1) Assign to the company any inventions which he may make, relating to the products or service of the Company.

(2) Assist the company to obtain patents covering these inventions, including the prosecution or defense of any interferences which may be declared.

(3) To do these things without charge to the company, as long as he may remain employed by it.

An employee who is not hired to invent or to make improvements for a specified pur-

pose, may independently invent or make improvements in the machines or processes or products with which he is connected. Upon these independent inventions or improvements, he may obtain patents as his own, to which his employer has no rights.

One word of caution which must be added for the protection of such employee-inventors is that to receive the full and complete rights to his invention the inventor must be careful to proceed in such a way that the invention is actually independent.

In case more than one inventor claims the same subject matter, an interference is initiated by the Patent Office. This is a procedure to determine which of the inventors is the originator and to decide which party has the right to a patent. Therefore, it is extremely important that every inventor take precautions to attest and preserve records of every step of his work.

Also, it is an excellent idea to save all bills, vouchers, and checks issued in payment for materials having to do with the invention. Every inventor should make a practice of writing down a complete description of his idea and accompany it by rough sketches which are dated. The inventor should have the records witnessed by two or three person (who sign it and date it as a matter of record) who can testify that they saw and understood it on the date specified. This is to protect the idea in its early stages.

During the subsequent development of the idea, similar records should be kept of every important step. It is often possible to keep a photographic record of the progress, with each photograph witnessed and dated.

Since, to be patented, an idea must meet such rigid tests, it is advisable, in the early stages of the development of any idea, to make a preliminary search for other similar ideas. Too much emphasis cannot be stressed here, for it is one of the most important steps in the chain of events between the idea and

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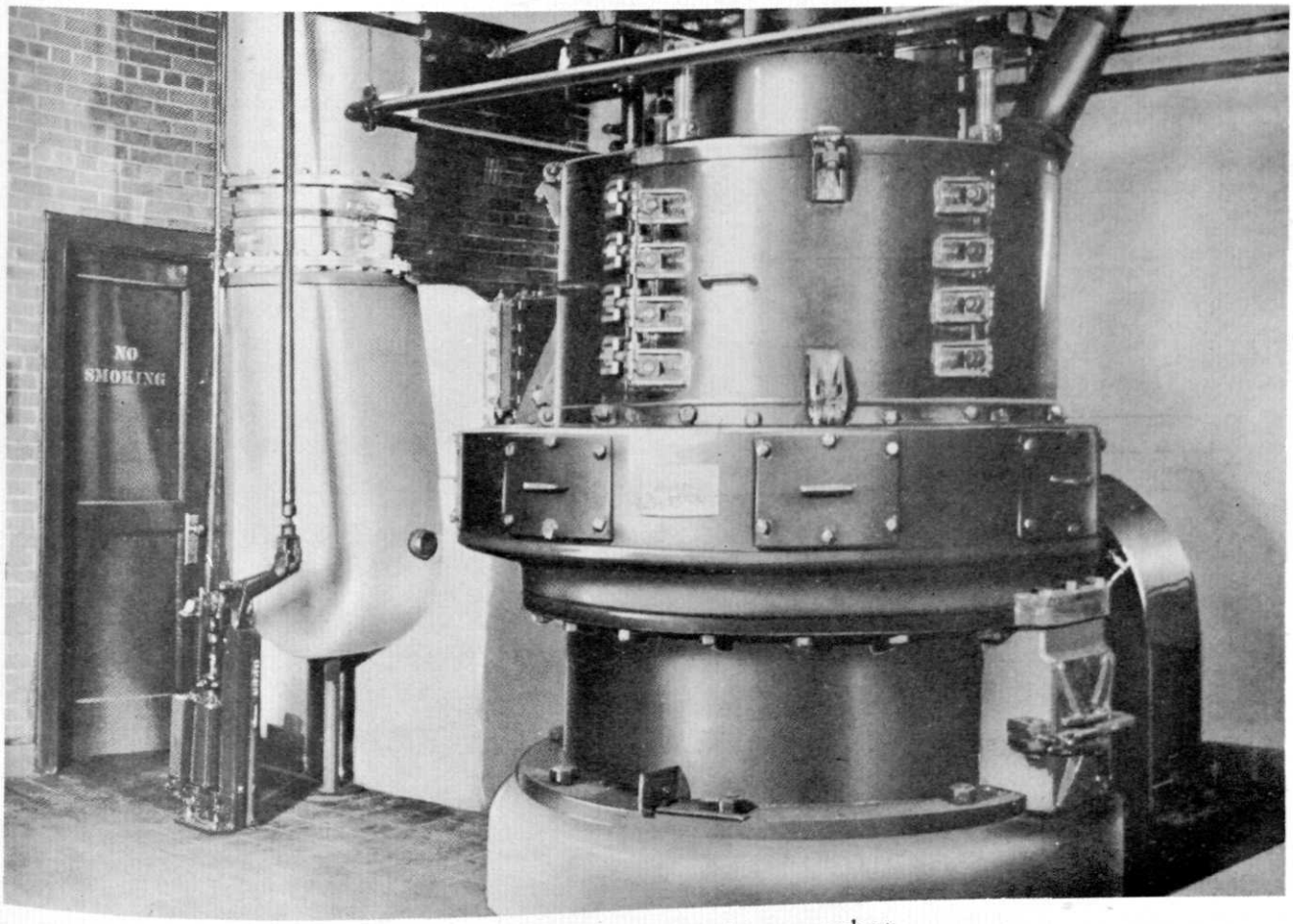


Coal pulverizer at the Lansing power plant.

Patents Pending

the filing of the patent application.

A search also is one of the best ways to become familiar with what already has been done in the field and often will save many hours and much money during the developmental stages. Such a search may show the way around some small difficulty which in itself is not the patentable feature of the idea, but which may retard progress of the work.

A search rarely can be carried out by the inventor himself, unless he has had experience along this line and has access to a large library where patent records are on file. The publications which are necessary consist of three different series, The Index of Patents, The Official Gazette, and The Specifications and Drawings of Patents. Most patent attorneys maintain Washington contacts through which these searches can be made at a cost of $15 to $30.

Under the methods of patent procedure which are in force in this country, it may be said that the final value of a patent depends as much upon the skillful presentation of its specifications and claims as it does upon the merits of the invention itself.

Therefore, the services of a patent attorney are essential to the average inventor. A patent application never should be filed without the aid and assistance of such a person.

Patent attorneys are specialists in this work—the good ones have devoted years of study to it—and can prepare a better application than the inventor could prepare by himself. It should be remembered that the important thing is not just "to get a patent", but to obtain one which is representative and gives adequate protection to the invention.

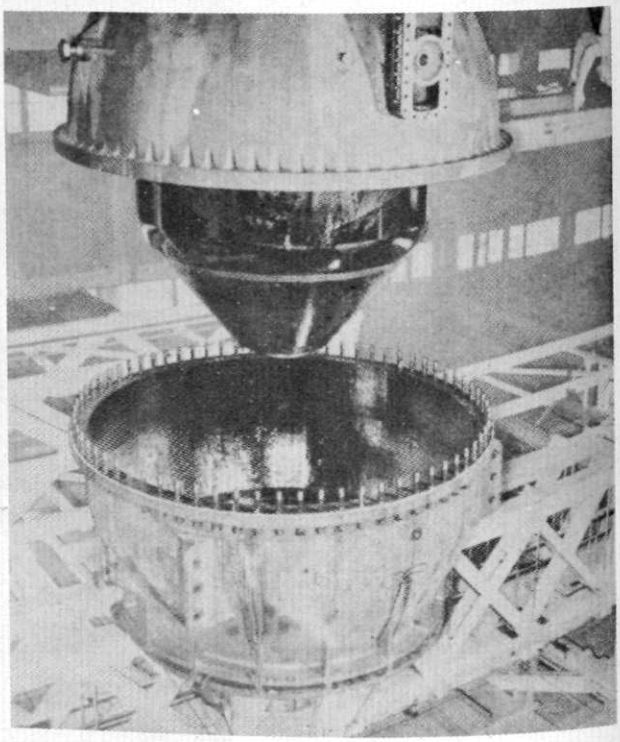
What is the cost of a patent application?

So much depends upon the nature of the patent needed, and upon the other factors which have been mentioned, that definite costs cannot be stated for individual cases. In general, the minimum cost of a simple patent probably will be about $125. The maximum cost may be several hundred dollars, or even more.

The cost is divided into three general groups. First, the total Government charges for filing of a patent application is $60. Second, the cost of preparing the patent drawing varies from $10 to $50. Third, the fees of the attorney. A word of caution at this point; the inventor must beware of the patent attorney who will not quote any price at all, or only a minimum fee.

A reputable attorney will nearly always be willing to quote a maximum fee. Also the inventor should be on his guard against the "flat-rate" and the "no patent—no pay" types of attorney. With regard to the first, as long as some kind of a patent can be obtained he is content—whether its specifications and claims are adequate or not. As for the "no patent—no pay" type of attorney, remember some sort of patent may be obtained on almost any kind of idea. The patent may be worthless to the inventor, but it is "a patent", and the attorney can collect his fee.

When the work of preparing the patent application begins, the task of the inventor is nearly finished, and the burden of obtaining the patent must be carried the rest of the way principally by the attorney. He will file the application with the Patent Office, in the name of the inventor, and will attend to all of the details.



King-sized needle valve used to regulate water flow at the Bureau of Reclamation's Friant Dam in California.

DON'T MISS

A Story To Start The New Year Right

"THE FAIR SEX"

The Inside Story of MSC's Coed Engineers, Past And Present

"Please Herbert, not my new log-log-duplex."
—*Cornell Widow*

In The January SPARTAN ENGINEER

ultrafax

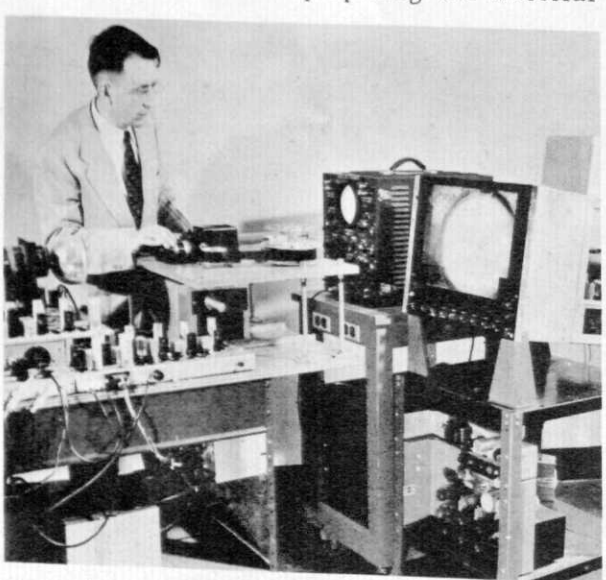
A MILLION WORDS PER MINUTE

By Charles E. Paul
Junior, E.E.

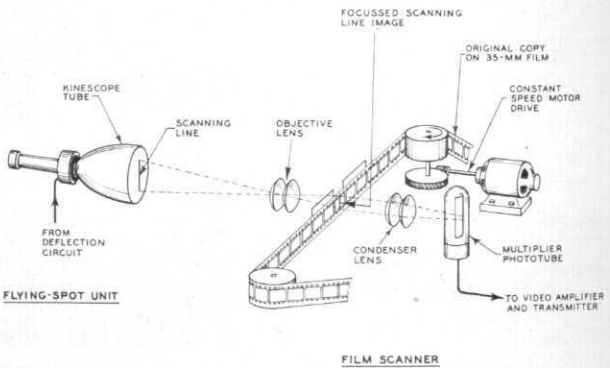
ON THE MORNING OF OCTOBER 21, 1948, at Washington, D. C., the Radio Corporation of America transmitted intelligence at the rate of a million words per minute. The successful completion of this feat marks a milestone in radio communications history.

The phenomenal high speed of the new Ultrafax system is produced by a combination of three features. These features are the speed of radio waves (186,999 miles per second), television's ability to transform images of information for transmission at the rate of 30 pictures per second, and high speed film processing which delivers a single frame of film ready for printing or projecting in 40 seconds.

The principle steps in transmitting and receiving Ultrafax are preparing the material to be sent to assure a continuous flow at high speed, scanning of this material by using the television "flying-spot" scanner, transmission of the television image over a microwave relay system, reception on a television kinescope (picture tube) and recording the incoming images on motion picture film.



Principle elements of the sending terminal of the Ultrafax system.



ULTRAFAX SENDING TERMINAL

At the transmitting end of the Ultrafax system a projection kinescope tube is used as a source of light. On the screen of this tube a spot continuously scans a vertical line. The light emmitted from this spot passes through the film upon which the material is to be transmitted.

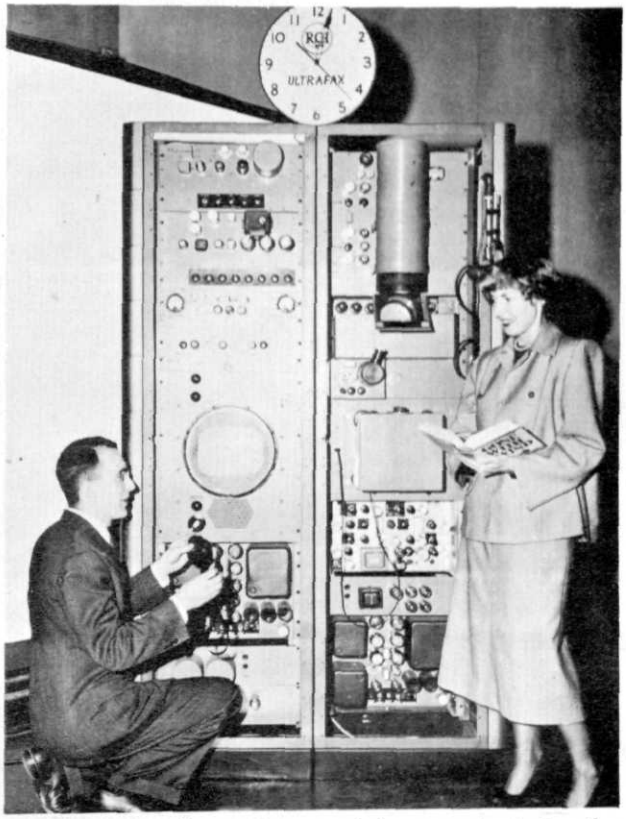
The light, after being modulated by passing through the film, then strikes a photoelectric cell. This photocell converts the change in light intensity into an electrical response. This response is then amplified

through a series of electronic circuits and the output, which is a video signal, is transmitted over a microwave system.

Approximately the reverse procedure of the transmitter is used at the receiving terminal. The microwave signal is picked up by the antenna and amplified. This signal is then placed on the screen of a projecting kinescope. A recording camera then records a picture of the screen of the kinescope. The whole Ultrafax system is synchronized so that the exact duplicate of the transmitted material is recorded on film at the receiving terminal.

The recording machine develops, fixes, washes, and dries film continuously with a total elapsed time of less than 45 seconds. The film is then ready for projecting or to be printed.

Ultrafax can handle all kinds of information including handwritten material, foreign languages, maps, graphs, technical designs, chemical and mathematical equations, fingerprints, line drawings, and documents of all kinds.

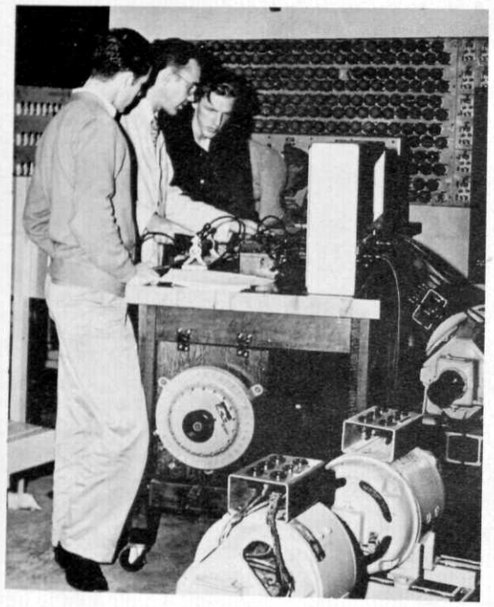


Apparatus used at the receiving terminal in the Ultrafax system.

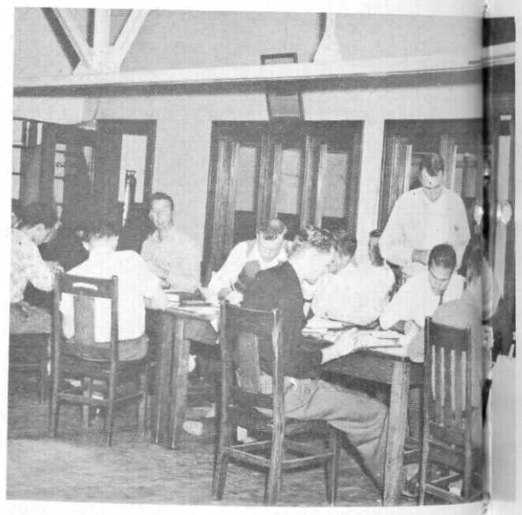
...VIEWS OF FALL TERM

CONSIDERING THE VARIOUS FALL TERM influences which act upon the engineer's use of time as vectors, we can determine the resultant by observing only the forces as we know the directions of the vectors. For example, one points toward Macklin Field and third half coaching duties while others point toward a myriad of pep rallys, dances, society meetings and even study sessions.

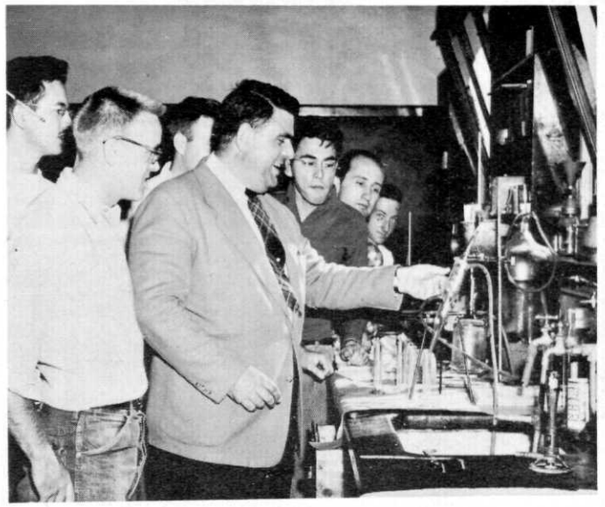
Although the football vector appears dominant at the present time, experienced researchers report that the vector diagram changes considerably between mid-terms and finals.



Above: Performance sheets again are in order at the E. E. motor lab.

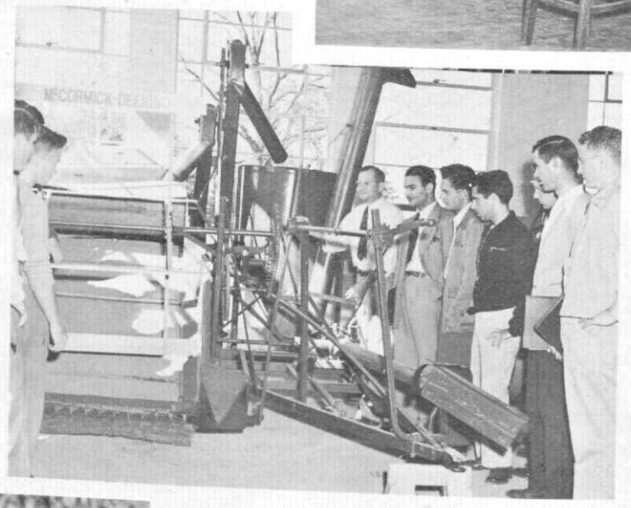


Above: Course, cooperation at 110 Old's Hall not a seasonal thing.



Above: Road oils, not odds on the next game, is the subject for discussion in the bituminous lab.

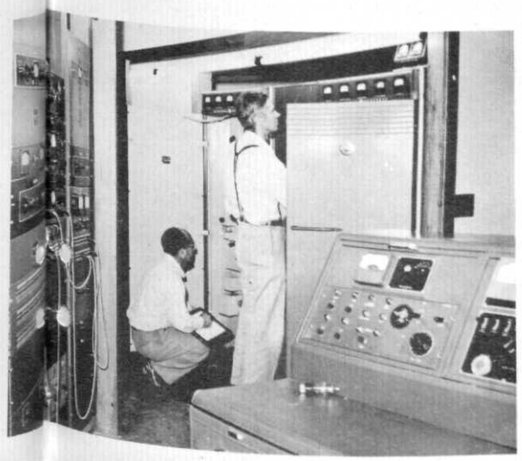
Right: A combine poses for fledging Ag Engineers.



Right: Joe Thomas streaks around end as Stouts Marquette.

Left: Chandnois snarls as he carries the ball against Michigan.

Right: Some of the more unfortunate listened to the game via W.K.A.R.'s new FM radio station.



Below: Trial batches are fall term standbys in the concrete lab.

A Reprint

statistical thermodynamics

A New Slant On M.E. 495

IN A HIGHLY SCIENTIFIC ARTICLE recently published in the prominent German Scientific Magazine, *Vos 1st Los In Der Welt Schientific,** the most eminent German authority on Humidity Control and Air Conditioning, Herr Doktor Buntzenboiner von Bowerskrugenmiller, stated that night clubs and dancing should be kaput.

This amazing article was accompanied by the pertinent poop** to bear out Dr. Bowerskrugenmiller's astounding statements. The good doctor discovered the following among other things. The loss of body heat is accomplished in several different ways, namely:

Evaporation. 15%
Skin Radiation. 30%
Conduction & Convection. 35%
Heated Expired Air. 10%
Heating Other Expired Substances. . . . 5%
Heat Given Off as Body Odor(B.O. to you) 4%
Undetermined Heat Losses 1%

The above test was compiled from tests made on a young man of 23.07 years sitting in a cane bottomed chair sipping vodka and eating banana peelings. Although tests were made only on this one young man, they can be used as significant for a whole variety of cases, so says Dr. Bowerskrugenmiller.

This young man was then taken to the popular German night club, Der Hoffbrau, and the same scientific analysis made while he was dancing and drinking vodka at intermittent intervals. The following heat loss chart was then compiled:

Conduction. & Convection. 5%
Evaporation 5%
Skin Radiation. 5%
Heating Expired Air 1%
Heating Other Expired Substances . .20%
Heating Off as B.O. (Body Odor yet). 30%
(P.S. This character needs a bath.)
Undetermined Heat Losses 35%

It was these last two items that led the good Doktor to make his unparalleled statement. The B. O. heat loss had increased by 26%; the undetermined heat loss by 34%. The

What's Up in the Scientific World
**Highly Technical Secret Data*

cost of Oderen Hat Sich Aufgehalten Nicht** in order to alleviate the increased B. O. had increased by 52.063 millimarks per evening of dancing – a drastic amount. The undetermined heat losses, though not definitely known, were thought to have consisted of the following, according to Dr. Bowerskrugenmiller . .

Vaporization of Ethyl Alcohol. . .31.0%
Vaporization of Methyl Alcohol. . 3.0%
Vaporization of Isopropyl Alcohol. 0.2%
Vaporization of 2, 4, 6, trimethyl –
1, 3, 5, *trisuccinyl* – 8 – *Ureidoctanol* 0.8%
Total 35.0%

The big reason, however, that caused Dr. Bowerskrugenmiller to make this statement was his very scientific theory as to the composition of the undetermined heat losses. Because of the vaporization of alcohol, the amount of vodka consumed went up by ONE HUNDRED AND THREE PER CENT. This caused the cost of the vodka consumed while dancing at Der Hoffbrau to increase by 499.93 kilomarks per evening over that consumed while sitting in a cane bottomed chair eating banana peelings.

Prominent American scientists have checked the good Doktor's results and have generally reached the conclusion that his experiments are invalid; consequently the bottom has dropped out of the cane bottom chair industry and the price of banana peels has slipped considerably.

***Mum.*

The Societies

The Michigan State College chapter of the ASME held its initial meeting of the year September 28, in the new Physics building.

Two new officers were elected to round out the executive staff. Robert Easter was chosen vice-president and Lloyd Fraser secretary. Other officers are Michael McInerney, president, and Lester Smith, treasurer. Philip Lang was named junior representative on the Engineering Council. William Graham is the senior representative.

Members of the Radio Club manage to keep busy in their mecca, the "ham shack" atop the EE bldg.

Professor L. C. Price delivered a short speech to the group in which he stated, "It is almost a must for an engineer to belong to a professional society in his field if he expects to advance in his profession." The character of ASME members and the variety and excellence of the society magazine "Mechanical Engineer" were also stressed by him.

President McInerney gave an account of the activities of the society for the coming year. The activities include a picnic, the engineering exposition, activities carnival and an outline of the type of programs for future meetings.

* * * * *

At their last spring term meeting, the Chemical Engineers elected Donald Tuscher, Detroit Senior to head the organization for this school year. Bernard Yemc will be assisting him as Vice-President and Program Committee

Chairman.

The financial situation was put in the care of Bob Kinney and Jim Keller as Secretary will be in charge of keeping a record of all meetings. Two men, Russ Cummings and George Westerfeld were elected to represent the Chem. E's at the Engineering Counsel. R. W. Ludt will again be guiding the society in the capacity of Faculty Advisor.

The following committees were named to assist the President in his duties:

Program Committee—Bernard Yemc, Chairman; Thomas Rohrer; Willis Thompson.

Membership Committee—Jack Marsh, Chairman; Ken Turbin; Ed Sczesny.

Nominating Committee—Don Tuscher, Chairman; Woody Armstrong.

* * * * *

Radio Club

The MSC Radio Club had a meeting on October 6. The main purpose of this meeting was to elect officers. The officers elected were: Ken Kortge, W8AHT, president; Art Craig, W8AGJ, secretary; and Jerry Vincent, treasurer.

Plans were made for conducting code classes for persons interested in obtaining an amateur radio license. A schedule of these classes is posted at the ham shack, 6th floor, Electrical Engineering Building.

* * * * *

The first ASCE meeting of the year was held September 27. There was a large turnout of members from last year and many new members.

The speakers of the evening, Dr. C. O. Harris, head of the Civil Engineering Department, and Harry Conrad, President of Christman Construction Company, pointed out the advantages and privileges of belonging to the ASCE. The motion was made and carried that future meetings would be held every other Thursday.

* * * * *

Engineering Council

The first meeting of the Engineering Council for the fall term was held Wednesday, October 5, 1949.

A vote was taken on the type of key to be selected for presentation to engineering students serving on the council for one year or more. The date was set for the Engineer's Ball. It is to be held January 14, at the Union Building.

An ammendment was made to the constitution to approve the American Foundryman's Society which is to take effect as soon as official notice has been received from the Student Council.

(Continued on Page 32)

The Engineering Council discusses plans for the Engineer's Ball to be held January 14th in the Union.

NEW DEVELOPMENTS

IMPROVED ATOMIC HEAT EXCHANGER

The removal of the heat from a nuclear reactor is one of the problems slowing down the development of atomic energy for commercial use. Intense heat is produced by the chain reaction of a fissionable material. The problem is to utilize this heat efficiently.

Previously the heat was removed by circulating air or water throughout the reactor; however, a large part of the heat was wasted by using these as the heat transfering agent.

The new proposed heat exchanger will be liquid metal. The liquid metal will carry the heat away from the reactor to a place where it can produce steam. In turn, this steam will be used to drive turbine generators.

It is hoped that by using liquid metal as the heat transfering agent, a greater efficiency may be achieved.

STANDARDIZING SURFACE FINISHING

Surface finishes are of engineering importance in design and manufacture of bearings, screws, and other mechanical sliding parts. A finely machined surface, appearing absolutely smooth to the eye, is disclosed under high magnification as a series of peaks and valleys with still finer peaks and valleys on the flanks of the major ones. In grinding processes this roughness depends on the depth of the cut; rate of feed; the relative speed between the cutting wheel and the material; the grit size, hardness, bonding material; and the state of dress of the wheel;

the type and quality of the lubricant at the point of cutting and the physical properties of the material being cut.

In the past, the American Standards Association has provided a written standard for surface designations; however, this written standard allows for four different roughness height ratings. Any one of these ratings may be satisfactory if both the designer and shop are sure that the other is using the same rating, but the use of all four ratings throughout the country could lead to confusion. Even though one system of units is agreed on and designation of roughness is therefore standardized, the problem of measuring accurately the unknown surface still exists.

General Motors and Chrysler are cooperating in an effort to produce a set of accurately ruled geometric surface finish specifications which are to act as gauge blocks for surface finish measurement. All sets of the specimens will be replicas of one master set, so that complete uniformity will be assured.

METAL FRACTURE THEORY

New theories as to why and how metals break were announced recently by leading scientists. Their investigations show that the fracture of metals begins with extremely small cracks, which act as nuclei and grow into a large split when enough tension is applied.

Prior to this investigation, it was usually assumed that the break in the metal occurred simultaneously throughout the sample.

The nuclei, which may result in fracture,

(Continued on Page 34)

Engin-Ears

game last September. As we see it, nothing but the ill-timed paint brush act earlier in the evening loused up their plans.

Seems to us, some sort of suitable award is in order—a citation at the very least. Had their carefully laid plan succeeded, it would have gone down in history as a clever climax to a long-standing rivalry.

Of course it's only a wild idea, but maybe next year one of our more capable C. E. majors could rig up something similar for his senior problem.

* * * * *

WE ARE PLANNING TO ADD A NEW feature to the Spartan Engineer, effective with the next issue—a "Letters to the Editor" column. We want to know what *you* think of the magazine and what kind of articles you want us to print.

We want to know what you don't like about the magazine and what features you would like included that aren't there now.

All letters received will be published, if possible, provided they are not slanderous, pointless, or too long. Letters over 150 words will be subject to editing.

Your letters *do not* have to be about the Spartan Engineer. They may deal with comments or criticisms of the engineering department or the school, one of the societies, something you think should be done, compliments or congratulations to a person or group —any topic you wish to write about.

Here's your chance to get some of those gripes off your chest. Your letter might be the one that brings results. Let us hear from you.

All letters must be signed. However, the name of the sender will be withheld upon request.

Welding Awards

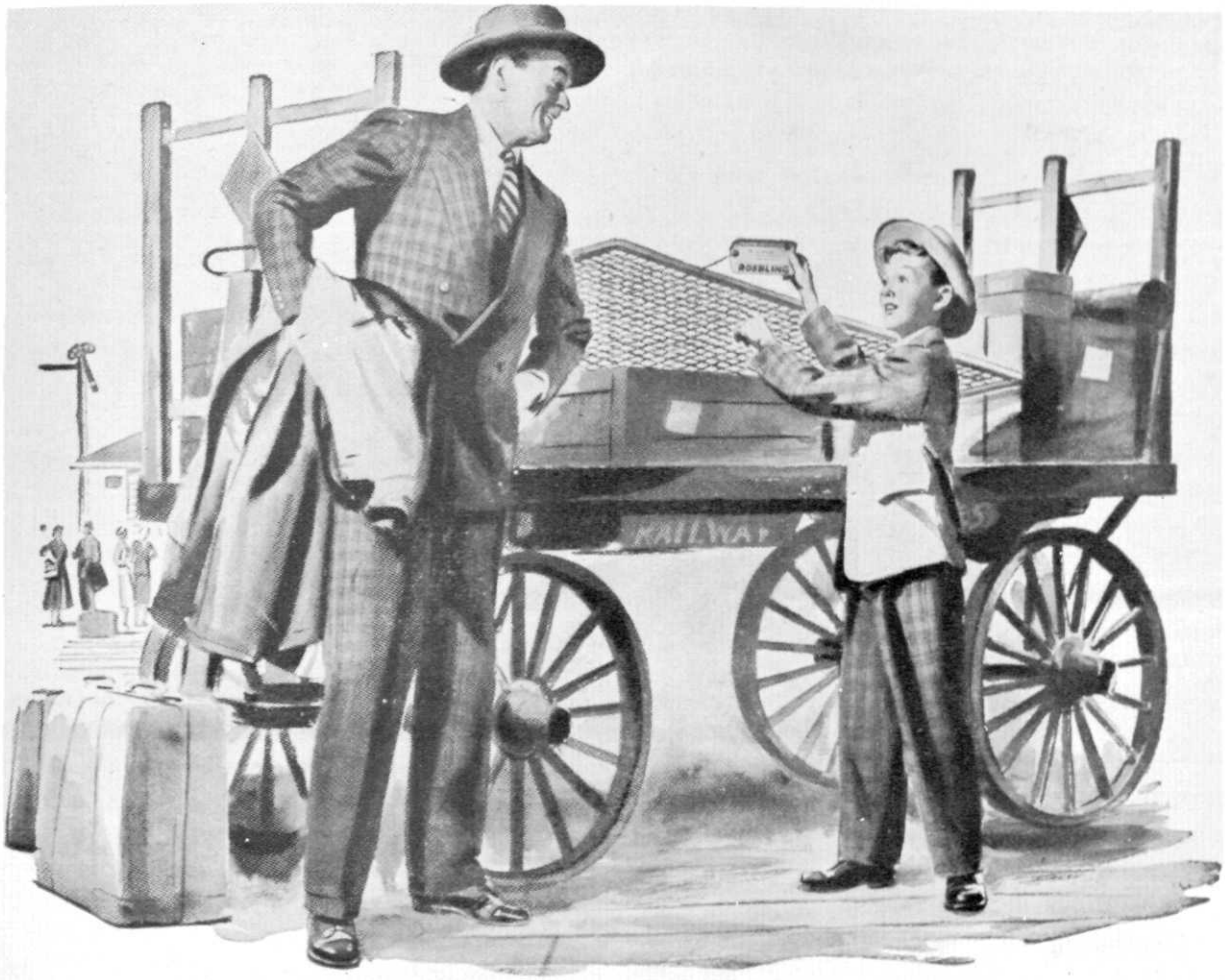
eer will accept papers for the Davis Program. However, only the best papers will be published. A copy of the rules and conditions of both contests may be obtained by writing The James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.

Arrangements often can be made for those students entering the competitions to receive credit for their papers in engineering seminar. The student should see his seminar instructor and department head.

Here is an opportunity for you engineering students to earn part of your college expenses and at the same time show others that the MSC Engineering School is among the best in the nation.

Papers presented for publication in the Spartan Engineer should be typewritten, double spaced, and 1000 to 2500 words in length. All articles will be subject to minor editing by the Spartan Engineer staff.

If the article can utilize pictures, this magazine will be glad to publish them with the the paper. Prints should be standard black and white. If advance arrangements are made, the Spartan Engineer photography staff will do the photo work.



"Is this the same ROEBLING that helped you build the Golden Gate Bridge?"

"Well, Ted, that's one way to put it! And this sure is the same Roebling. Besides making wire and huge cables for suspension bridges, Roebling weaves wire screens. I've seen screens like this in quarries and mines all over the country."

☆ ☆ ☆

The fact is, its Bridge Division is only one of Roebling's seven major divisions, each producing a distinctive line of wire or wire products of wide and essential service in industry. Importantly too, at the big Roebling plants in and near Trenton, New Jersey, developments are made constantly that bring new efficiency and economy to a vast range of industrial operations.

WIRE ROPE. Roebling wire rope is made in a large range of types to assure topflight performance in every application. Roebling Preformed "Blue Center" Wire Rope is unsurpassed for ease of handling, smooth operation and long life.

ELECTRICAL WIRE—CABLE—MAGNET WIRE. Roebling makes more than 60 standard types of electrical wire and cable—meets practically every transmission, distribution and service requirement. Roevar Magnet Wire is a leading specification for high-speed winding.

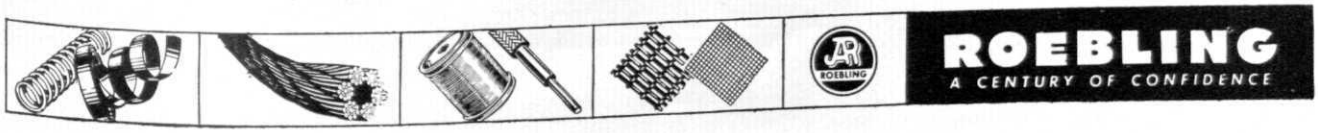
WOVEN WIRE FABRIC. From the largest, most rugged Aggregate Screens to the most finely woven Filter Cloths, there's a full line of Roebling industrial screens. Wires made of special steels and non-ferrous metals assure longer wear and corrosion resistance.

ROUND—FLAT—SHAPED—WIRE. Roebling high carbon wire is a quality product and dependably uniform in gauge, grain structure and finish. This, of course, means that machine stoppages and rejects are cut to a minimum, and production costs pulled down.

☆ ☆ ☆

Whatever career you are studying for, when you get on the job you will find one or more types of Roebling products serving there, dependably and at low cost. John A. Roebling's Sons Company, Trenton 2, New Jersey.

BRANCH OFFICES: *Atlanta,* 934 Avon Ave. ★ *Boston,* 51 Sleeper St. ★ *Chicago,* 5525 W. Roosevelt Rd. ★ *Cleveland,* 701 St. Clair Ave., N. E. ★ *Denver,* 1635 17th St. ★ *Houston,* 6216 Navigation Blvd. ★ *Los Angeles,* 216 S. Alameda St. ★ *New York,* 19 Rector St. ★ *Philadelphia,* 12 S. 12th St. ★ *Pittsburgh,* 855 W. North Ave. ★ *Portland, Ore.,* 1032 N. W. 14th Ave. ★ *San Francisco,* 1740 17th St. ★ *Seattle,* 900 First Ave. So.



Campus News

taking the design option.

Fritz B. Harris joined the staff as an associate professor in industrial engineering. He graduated from Louisiana State University, and has a master's degree from the Chrysler Institute of Engineering. He later worked for the Oldsmobile division of General Motors Corporation. Ralph Rotty, a graduate of the University of Iowa with a degree in electrical engineering, has a master's in meteorology from California Tech, a master's in engineering from the same school and is a candidate for a Ph.D. in mechanical engineering at State. G. E. Berndt moved from graduate assistant to instructor in mechanical engineering. He will be in automotive work under Professor Hobbs. Mr. Berndt is a State grad, class of '41, and is working on his master's.

Authorization has been granted and plans are being formulated for two new courses to be opened to undergraduates in the spring of 1951 or sooner. Equipment has been ordered for a course in experimental stress analysis. Pending arrival date the course may be offered as an elective in the spring of 1950.

Dr. Charles O. Harris was installed this fall term as the new head of the C. E. department. Dr. Harris came here from the University of North Dakota where he headed the engineering mechanics department.

He received his B. S. from the University of Illinois in 1932 and his M. S. from there in 1934. After two years in industry, Dr. Harris joined the faculty of the Armour Institute where he later headed the engineering mechanics department until 1941. After receiving his doctor's degree from the University of Michigan, he went to the Illinois Institute of Technology and from there to Notre Dame.

Dr. Harris said he has been greatly impressed by the cooperative spirit of the faculty.

THIS IS HARRY WORKHOVEN (*arrow*), at the time he retired from Standard Oil. His sons—a dentist and a radio announcer—are on either side of him. The others at the table are two Standard Oil employees and one retired employee.

A good place to stay is a good place to start

Mr. Workhoven worked 41 years for Standard Oil—a long time, but in this company, not an unusually long time. Each month, dozens among Standard Oil's 48,000 employees receive 20-, 30-, or 40-year service pins. The men and women who wear them have reason to know that Standard Oil is a good place to work.

Among the things that make it so is Standard Oil's employee benefit program, one of the finest and broadest in any industry. This program includes group hospital and surgical operation insurance, covering employees and members of their immediate families. It includes sickness and disability benefits, group life insurance and vacations. Our employee retirement plan sends monthly checks to retired Standard Oilers.

Peace of mind and pride of accomplishment are the common properties of Standard Oil employees. That is why so many of them stay with us through the years. Their long service is an endorsement of Standard Oil, for in this country an employee is free to choose his employer.

A company that is chosen by many people as a good place to stay is also a good place to start.

Standard Oil Company

(INDIANA)

STANDARD

STANDARD SERVICE

We Present

degree. He couldn't ignore Civil Engineering, and that degree was added in '34.

After a tedious study of law, he took, and passed, the State Bar Examination in '36.

An ambitious schedule still is his. Besides the position as Mechanical Engineer in Lansing, he finds time evenings to act as consulting engineer for his Alma Mater.

He is a member and past president of both the Michigan Engineering Society and the Lansing Engineers. A list of his other affiliations reads like that of a politician.

The theory and operation of the heat pump interests him, and he has presented papers on the topic before several engineering societies. The heat pump is an advanced method of heating and cooling, based on the refrigeration cycle, utilizing heat in the ground or in well water.

Interesting heating possibilities have so caught Claud's fancy, that he has equipped his new home in Lansing with radiant electrical heating. It is the first house in Lansing to use this method.

It can truly be said, that for Claud Erickson, ambition is more than a printed word.

The Societies

A. S. M.

Two years ago saw the formation of the "Michigan State Metallurgical Engineering Society" by students interested in Metallurgy. This local group has since grown to be an active addition to the other engineering societies on campus.

This fall marks the re-birth of the local society into a student branch of the "American Society for Metals" which is the outstanding professional group in the field of metallurgy.

"The Michigan State Group of Western Michigan Branch of the American Society for Metals", as the new organization is called, hopes that with its new sponsorship it will be able to assume a more active and complete participation in engineering activities. Students who are interested in the study of metals are cordially invited to attend meetings.

BUILD the basic machines of an industrial world!

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

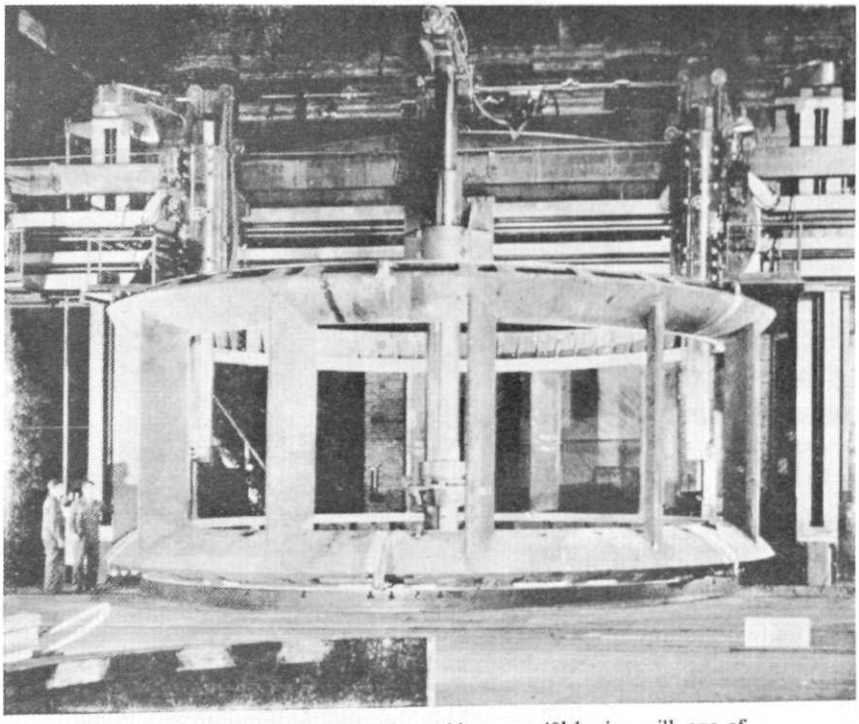
PRODUCTION METHODS have become a good deal more technical and complicated in the last few years. There is a big difference between the way we do things now and the way we did them when I left the Allis-Chalmers Graduate Training Course to work in the machine shop in 1930. That is why there are more and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

CARL MALMBERG

Close Coordination

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

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



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

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

Opportunities Everywhere

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

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

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

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

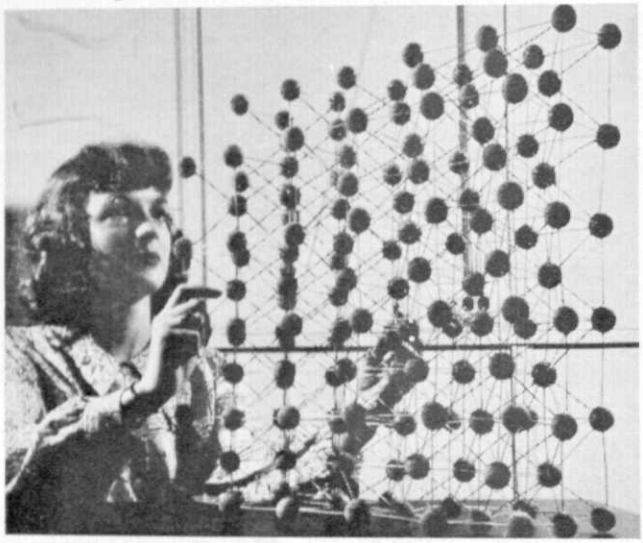
Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin

A-C ALLIS CHALMERS

ALLIS-CHALMERS

New Developments

form along the boundaries between the grains or crystals of metal where the atoms in the grains are most active. The minute cracks tend to grow under tension, and if a nucleus reaches a certain critical size, it will form a complete split between grains. Enough rapidly growing nuclei in a sample will eventually cause the sample to break. However, nothing will happen if only nuclei smaller than the critical size are present. The smaller the nucleus, the bigger the force needed to expand it into a break.

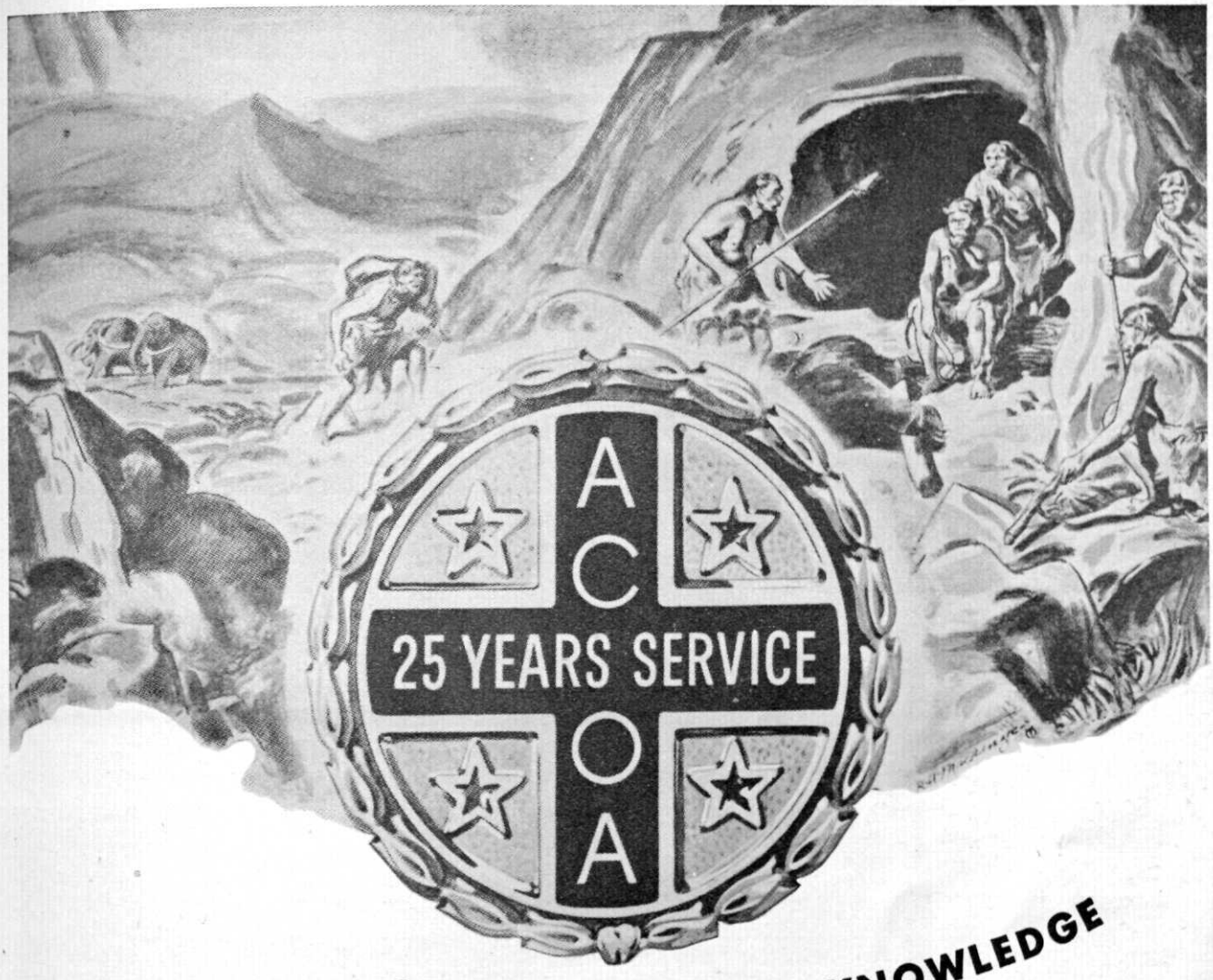


A prediction that metals five to ten times stronger than they are at the present time can be produced. "If we can find ways of preventing crack formation along the boundaries, and make the only possible break occur through the much stronger grains, we can increase the metals' strength at high temperatures."

BETA-RAY THICKNESS GAGE

A new instrument which uses radio-activity to measure the thickness of sheet materials moving along a conveyor has been developed by General Electric.

(Continued on Page 36)



SYMBOL OF 85,000 YEARS OF KNOWLEDGE

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

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

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

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

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

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

ALCOA FIRST IN **ALUMINUM**

ALCOA
A C
ALUMINUM
O A

Electronic Calculator

tion of the problems. Only by such automatic devices can a small group of technicians control the vast amount of material necessary for the solution of the ever-increasing mathematics of modern science. The calculator has been made so automatic that the attendant need give no more than a few general instructions to complete a comparatively long sequence of operations.

Could it be that the social consequences of machines that can perform the functions of the human brain are incalculable, and may be disastrous? This seems unlikely according to one expert who states: "The more I deal with these machines, the more impressed I am how dumb they are compared to the human brain."

Because of their similarity to the human brain and their potential ability to fit into complicated control mechanisms, it is thought that these new machines may be the beginning of a second industrial revolution. Science, government, and industry will benefit from the exceptional versatility and efficciency of this new calculator. Instead of spending whole lifetimes on single problems as many of the world's greatest scientists have been obliged to do, only a few days or months may be required with the help of this electronic brain. Problems heretofore avoided as being hopelessly time consuming can now be undertaken.

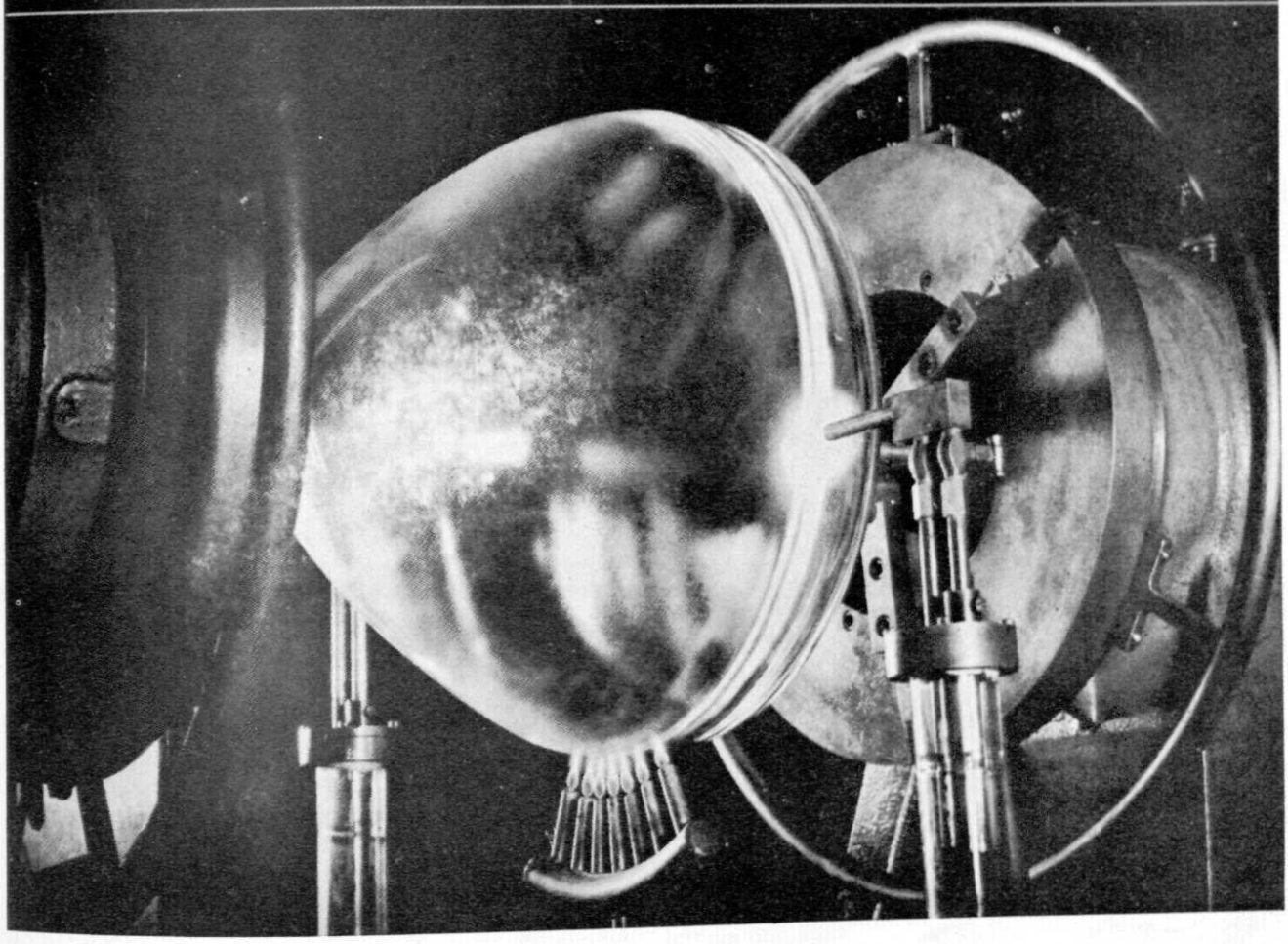
New Developments

This gage, known as the "Beta-Ray Thickness Gage," bombards the material with beta-rays. Source of the rays used in the gage is radioactive "strontium 90." The instrument measures the number of high-speed electrons passing through the sheet material being checked. This measurement is translated, by means of an electronic circuit, into terms of how much the sheet being checked varies from the desired thickness.

The strontium-90 beta-ray source has a surface of about one-half inch, and is enclosed in a brass cartridge is an opening through which the rays pass. The cartridge wall is thick enough to stop the radiation, and the opening can be closed when the instrument

(Continued on Page 38)

CORNING... DOES THE UNBELIEVABLE WITH GLASS



Electricity Welds Glass To Glass To Bring You Arthur Godfrey

The heart of your television set is the big glass picture tube which you see being worked on above.

The glass bulb for this tube, which brings you Arthur Godfrey and other television stars, is made of two pieces of special Corning glass—one, the face, shaped somewhat like a pie plate, and the other, the funnel.

The problem is to weld these 10- to 20-inch pie plates and funnels together permanently, without breaking the glass or distorting its shape.

This is done by preheating the edges of the face and funnel, then further heating these edges until they are soft by shooting a high-frequency electrical current through them.

Then they are pressed together and permanently welded at 2000° Fahrenheit into a single piece of glass.

Today, sealing glass by means of electricity —a process developed by Corning Glass Works—permits production of glass shapes never before thought possible.

For example, rectangular panels of heat-resistant glass are welded together to form hermetically sealed windows for oven doors on kitchen ranges. These windows—Pyrex brand Aircells—can always be seen through because they won't fog up.

By this method of electric sealing, heat- and acid-resistant glass tubing is formed into pipe lines for processing food and chemicals.

Even pieces of hard-to-melt glass can be joined to form shapes with greater strength and size than can be attained by conventional methods, such as blowing or pressing.

Electric sealing is but one of the many products of Corning research that have helped make glass one of the most versatile engineering materials.

That's why we invite you—when you've finished school and started work—to call in Corning before your product or process planning reaches the blueprint stage. *Corning Glass Works, Corning, New York.*

CORNING
means research in glass

is not in use, so that persons handling it are in no danger. Beta-rays have a very low penetration and the radiation from the strontium-90 is slight.

The thickness gage is capable of checking metal strips moving along conveyors as fast as one thousand feet per minute and is accurate within two percent.

ABSOLUTE FREEZING POINTS?

General Electric Research Laboratory scientists have cooled four substances far below their so-called "freezing points" without having them freeze. They have "supercooled" water 71 degrees Fahrenheit below its freezing point; mercury, 72 degrees below its freezing point; tin, 198 degrees; and gallium, 125 degrees.

Not only must the temperature and pressure be right for a substance to freeze, but particles about which material freezes called "nuclei", must also be present. They have been able to super-cool water, mercury, tin and gallium by ridding their samples of nuclei, which are usually present in most fluids. If there are nuclei in a given material, then the commonly accepted freezing point is valid.

Water below its freezing point is often found in nature, particularly in the form of clouds. The water in super-cooled clouds is without nuclei, so it does not turn to ice. Discoveries of methods to produce snow from super-cooled clouds are based on putting nuclei into such clouds, resulting in transformation of water droplets in the cloud to snow crystals.

Research laboratory metallurgists have made "clouds" of super-cooled gallium, tin and mercury, by dispersing those metals in their fluid form as minute droplets suspended in oil. Some of the droplets may contain nuclei, but the freezing that begins in them cannot spread to the others through the oil, so that those without nuclei can be reduced in temperature far below their freezing point without freezing.

SUPERSONIC PARACHUTE

The pilot of the future may safely escape his disabled supersonic craft at high altitudes where an ordinary parachute would be useless. He would be enclosed in a bullet-shaped metal "capsule" with a propeller on its tip.

This parachute is designed for use in rocket research and is capable of gently lowering delicate research instruments to the ground from rockets flying at altitudes as high as 100 miles. Released from a rocket, the device slows gradually from supersonic speeds to about 27 miles per hour by means of its whirling propeller or "vanes" which act as an air brake.

Although not intended now for use by humans, the rotochute might be redesigned so that it could carry a pilot and could be fired by an explosive charge from a rocket. The pilot then could guide the course of the rotochute by controlling the pitch of its vanes and land with greater accuracy than is possible with an ordinary parachute.

AUTOMATIC STEERING RECORDER

A new instrument, which automatically and continuously records a ship's course, has been developed by General Electric. This device, called "Ship Steering Recorder," marks the ship's rudder position, compass direction, and calculates any deviation from the set course on a moving roll of paper. An error in course as slight as two-tenths of a degree can be detected.

The steering recorder takes up no more room than a table-model radio-phonograph. The record is kept on a 12-inch-wide roll of waxed paper, passing beneath metal points which are connected electrically with the ship's rudder and compass. Running at low speed, the instrument can make a continuous eight-day record without attention.

SIDE TRACKED . . . .

Mary has a little car,
She drives it very brisk,
For Mary doesn't care, you know,
She only has her *.

* * * *

Barber: "You say you've been here before? I don't remember your face."
Student: "Probably not. It's healed up now."

* * * *

"The last issue of the humor magazine must have been good."
"How do you know? I thought you never read it."
"I don't, but the editor's been kicked out of school."

* * * *

"I would like some alligator shoes."
"What size does your alligator wear?"

* * * *

Coach: "What's his name?"
Manager: "Gussfurbnocklefortzener."
Coach: " Put him on the first team! I never did like the State News anyway."

* * * *

Several years after the breakup of their love affair, the man met his old flame at a dance.
"Let me see," she said coldly, "was it you or your brother who used to be an admirer of mine?"
"I really don't remember," replied the man. "Probably my father."

* * * *

"Mother, are there any skyscrapers in Heaven?"
"No, son, Engineers build skyscrapers."

"Why does Mable let all the boys kiss her?"
"She once slapped a guy who was chewing tobacco."

* * * *

A cute little dog stopped at a fire plug. There was a sign on the plug, "WET PAINT". So he did.

"One pint of fluid and check the flint."

A student had been in the hospital for several weeks and had been well looked after by his pretty nurse.
"Nurse," said the student, one morning, "I'm in love with you. I don't want to get well."
"Don't worry," replied the nurse, "You won't. Your doctor's in love with me, too."

* * * *

Frosh: "What was all that racket?"
Soph: "Some M.E. just fell down the stairs with a quart of whiskey."
Frosh: "Did he spill it?"
Soph: "No, he kept his mouth closed."

"I told him that he mustn't see me any more."
"What did he do?"
"Turned out the lights."

* * * *

Coed (pouring a drink for the boy friend): Say when."
Boy friend: "Any time after the first drink is all right with me."

* * * *

A woman's best asset is a man's imagination.

* * * *

A dumb girl may count on her fingers, but a smart one counts on her legs.

* * * *

"Wait, George, this isn't our baby. In fact, this is the wrong carriage."
"Aw, shut up, this is a better carriage."

* * * *

And then there was the Egyptian princess who was laid in her coffin and became a mummy.

* * * *

Engineer: "I can't see what keeps you from freezing."
Coed: "You aren't supposed to, big boy."

SIDE TRACKED . . . .

Grandmother (looking at her granddaughter's new bathing suit): "If I could have dressed like that when I was a girl, you'd be six years older today."

* * * *

"Have you ever awakened with a jerk?"

"Heavens, no. I'm not even married."

* * * *

And then there was the widow who told the bachelor: "Take it from me.... don't get married."

* * * *

Beneath this stone lies Murphy.
They buried him today.
He lived the life of Riley,
While Riley was away.

* * * *

"I think when Tom and I are married, we'll go to Hawaii and see what it's like."

"Don't be silly, it's the same everywhere."

* * * *

A young engineer's wife was always antagonized by her husband's going out at night. His departing words, which especially angered her, were always, "Good night, little mother of three."

But one night she could stand it no longer. When he took his hat, started for the door and called out cheerily, "Good night, little mother of three," she answered, just as cheerfully, "Good night, father of one."

"Was your friend shocked over the death of his mother-in-law?"

"Shocked hell, he was electrocuted."

* * * *

We have a friend who just got a soft job. He's working in a bloomer factory and pulling down about 400 a month.

* * * *

Papa Robin returned to his nest and proudly announced that he had made a deposit on a new Buick.

* * * *

Well-dressed man, cigar in hand, falling through the air from an airplane: "Gad! That wasn't the washroom after all!"

* * * *

It was Prom time. Fifty couples were dancing.

It began to rain. Two hundred and fifty couples were dancing.

* * * *

Bore: "When I was in Africa, a lion crossed my path. I had no gun in my hand, so I took a pail of water and poured it over his head and he ran away."

Bored Listener: "I can vouch for that. I was in Africa at the same time and the lion ran into me and when I stroked his mane it was still quite damp."

* * * *

"I'll take a honeymoon sandwich."
"What's that?"
"Hot chicken and no dressing."

A boy who wants to make the news,
Aspires to fill his father's shoes.
His sister aims for something better,
She hopes to fill her mother's sweater.

* * * *

Coed: "I'll never marry a man who snores."

Housemother: "Yes, but be careful how you find out."

* * * *

Prof: "Well, young man, I suppose that as usual, they've sent the fool of the family to college."

Frosh: "Oh, no sir. They've changed all that since your time."

* * * *

Coed: "I'll stand on my head or bust."

Phys. ed. instructor: "Just stand on your head. We don't expect too much."

* * * *

Arriving at a strange hotel, a fussy woman thought she'd better know where the fire escape was. She began exploring, and during the tour she opened a door and found herself in a bathroom occupied by a gentleman.

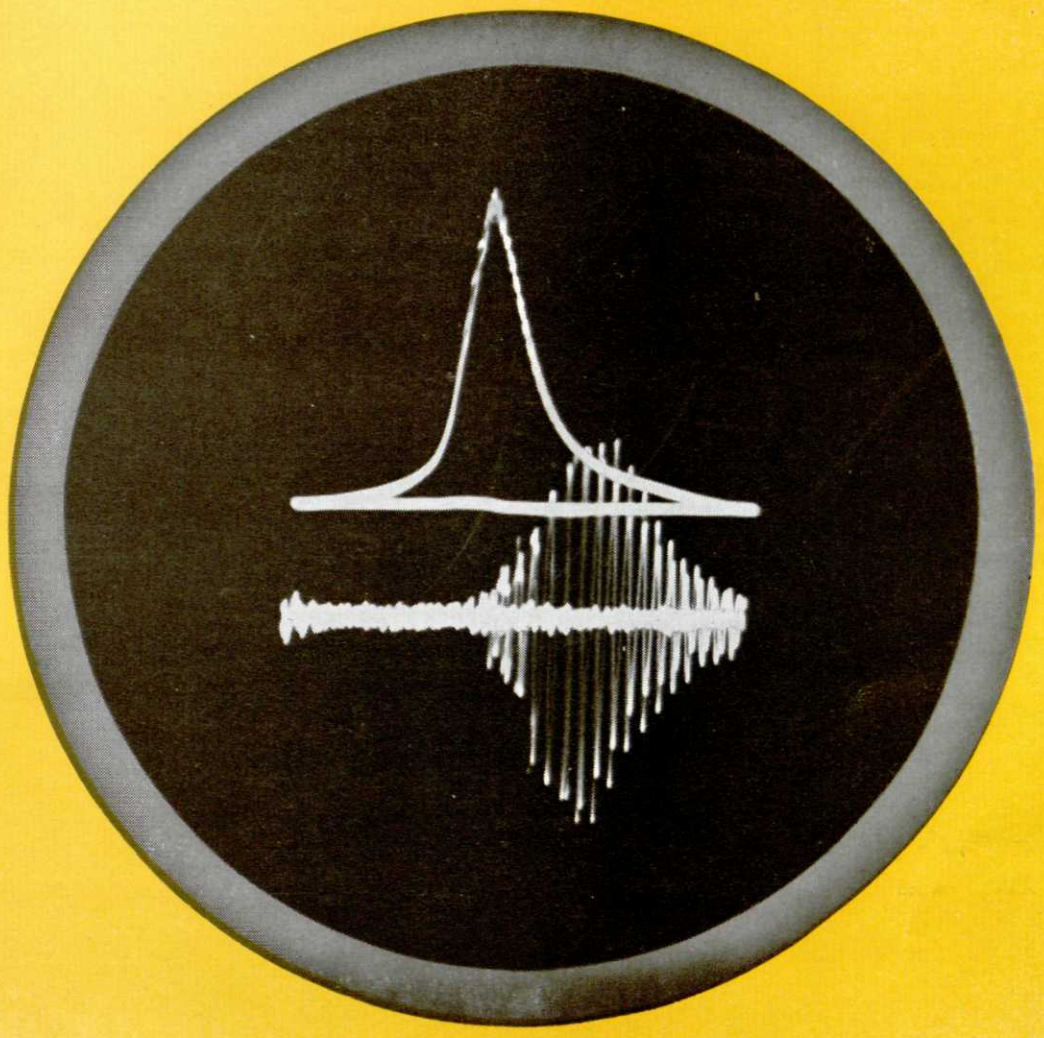
"Oh, I'm sorry," she twittered. "I was looking for the fire escape."

As she continued her search, she heard the pad of bare feet behind her and a shout made her turn. It was the gentleman, clad in nothing but a bath towel.

"Wait a minute!" he gasped. "Where's the fire?"

* * * *

They parted at the doorstep,
And she whispered with a sigh,
"I'll be home tomorrow night, dear."
And he answered, "So will I."



This is a picture of "PING"

It's a picture that gives automotive engineers clear-cut facts on performance—a picture that suggests how photography with its ability to record, its accuracy and its speed, can play important roles in all modern business and industry.

No, this is not the "doodling" of a man on the telephone. Far from it. It's the photographic record of an oscilloscope trace that shows, and times, detonation in a "knocking" engine. It all happens in a few hundred-thousandths of a second—yet photography gets it clearly and accurately as nothing else can.

Oscillograph recording is but one of countless functional uses of photography in bettering products and improving manufacturing methods. High speed "stills" can freeze fast action at just the crucial moment—and the design or operation of a part can be adjusted to best advantage.

And high speed movies can expand a second of action into several minutes so that fast motion can be slowed down for observation—and products be made more dependable, more durable.

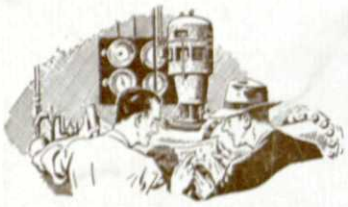
Such uses of photography—and many more—can help you improve your product, your tools, your production methods. For every day, functional photography is proving a valuable and important adjunct in more and more modern enterprises.

Eastman Kodak Company, Rochester 4, N. Y.

Functional Photography

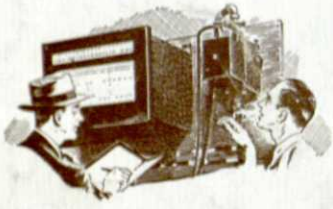
. . . is advancing business and industrial technics

Kodak



THE MAIN JOB *of one entire laboratory at General Electric is to keep guesswork out of G-E products.*

ITS STAFF *specializes in giving help on tough measurement problems.*



TYPICAL SOLUTION *was development of first "turbidimeter," advancing work on water-purification equipment.*

1000 Specialists tell us "When you can measure . . ."

Lord Kelvin, writing in 1883, summed up once and for all the importance of measurement.

"When you can measure what you are speaking about," he said, "and express it in numbers, you know something about it, but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind."

The need for detailed and accurate "numbers" is as great today as it ever was. Recently, for example, General Electric engineers working on water-purification equipment were hindered by the lack of any accurate way to measure water's turbidity. Another group needed data on the vibrations in their equipment.

But at General Electric any group up against tough measurement problems does not have to be stymied for long. It can "appeal" its case, can seek the aid of men who make a specialty of measurement and allied problems—the more than 1000 staff members of the G-E General Engineering and Consulting Laboratory. GE & C serves the entire company, and is also frequently called on by other industries and government agencies.

It solved the two problems above by developing the first "turbidimeter" and a "recording vibrometer" now finding applications throughout industry—two out of thousands of similar problems handled by the laboratory each year.

The work of GE & C illustrates again how General Electric backs up research and creative thinking, implements new projects with the best available facilities, and so remains in the forefront of scientific and engineering development.

You can put your confidence in—

GENERAL ELECTRIC