Winter 1-1953

Volume 64 - Issue 4 - January, 1953

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Rose-Hulman Institute of Technology

Rose Technic

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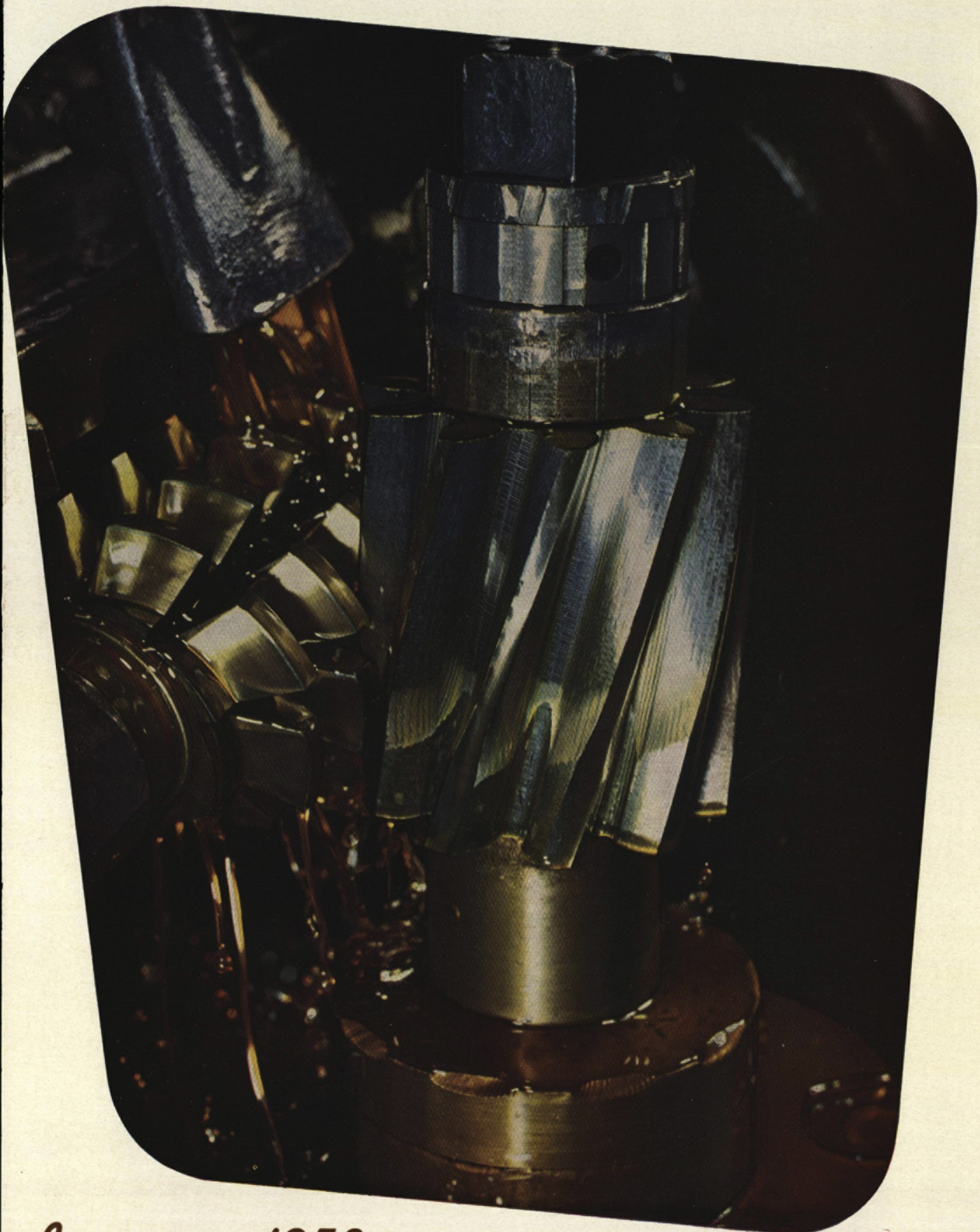


January 1953

How two inches of steel made a yardstick

HERE is one of the busiest machines in our research laboratories. It is a *constant-pressure* test lathe that quickly provides an indication of how fast a steel can be machined.

This unique testing device consists of a standard lathe fitted with special control equipment by which the horizontal pressure on the cutting tool is kept constant during the machining operation. By actually machining a test bar on this lathe and measuring the number of revolutions necessary to advance the cutting tool exactly two inches, we obtain—in a matter of minutes—a precise record of the steel's machinability.

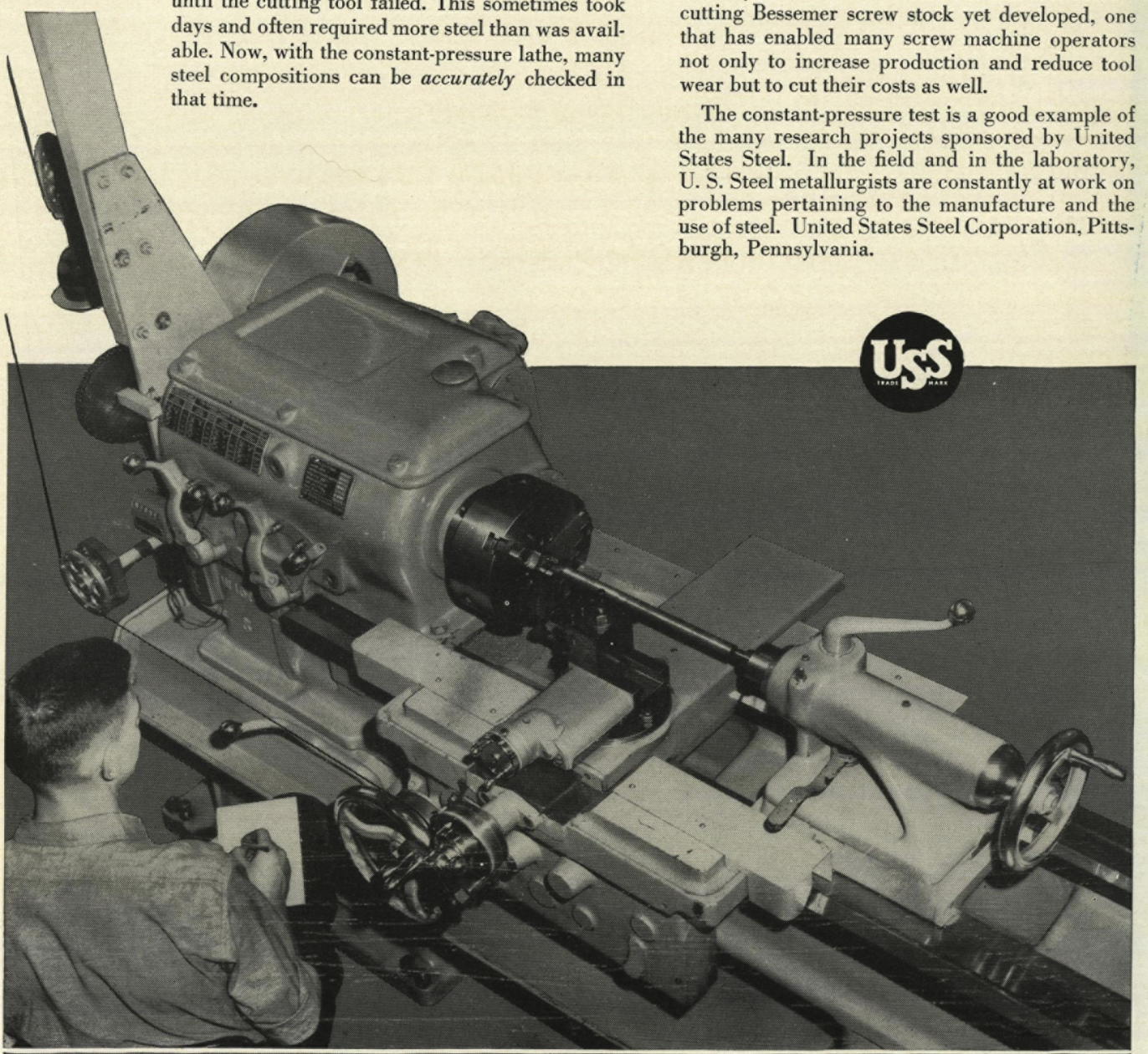
Before this development, the normal way to test machinability was to machine a sample of steel until the cutting tool failed. This sometimes took days and often required more steel than was available. Now, with the constant-pressure lathe, many steel compositions can be *accurately* checked in that time.

Typical of what this has meant to steel users is our development of MX Free-machining Bar Stock.

Bar stock is used in producing the millions of machine parts that are made on screw machines—those high-speed automatic machines that can simultaneously perform many operations such as drilling, forming, threading, chamfering and tapping at a rate of 1000 or more parts per hour. Here, machinability is of first importance, and often spells the difference between profit and loss.

So when we set out to give the screw machine industry steels that would have the utmost in machinability, we called on the constant-pressure test lathe to speed up this research. With its help, hundreds of compositions were quickly and accurately screened. The result was MX—the fastest-cutting Bessemer screw stock yet developed, one that has enabled many screw machine operators not only to increase production and reduce tool wear but to cut their costs as well.

The constant-pressure test is a good example of the many research projects sponsored by United States Steel. In the field and in the laboratory, U. S. Steel metallurgists are constantly at work on problems pertaining to the manufacture and the use of steel. United States Steel Corporation, Pittsburgh, Pennsylvania.



UNITED STATES STEEL

Rose Technic

VOLUME LXIV, NO. 4 JANUARY, 1953

In This Issue

The Cover

The gear being cut in a hobbing machine was photographed at 1/5000 of a second using stroboscopic lights. With such a short duration of light on the subject, it is possible not only to "stop" the machine but the cutting oil as well, thus enabling you to see how the oil distributes itself during the cutting operation. Courtesy of STANDARD OIL BULLETIN.

The Frontispiece

The backbone of modern defense—the industrial assembly line. These tailcones for the famous J-47 jet engines are lined up in the receiving and inspecting area, awaiting the call to become part of the jet engines which power some of America's fastest bombers and fighters. This engine was used to power the North American F-86 Sabrejet, holder of the official world's speed record of 670.981 mph. Courtesy of GENERAL ELECTRIC.

PHOTO CREDITS: Page 8, General Radio Company, Cambridge 39, Mass.; Pages 9 and 16, Westinghouse.

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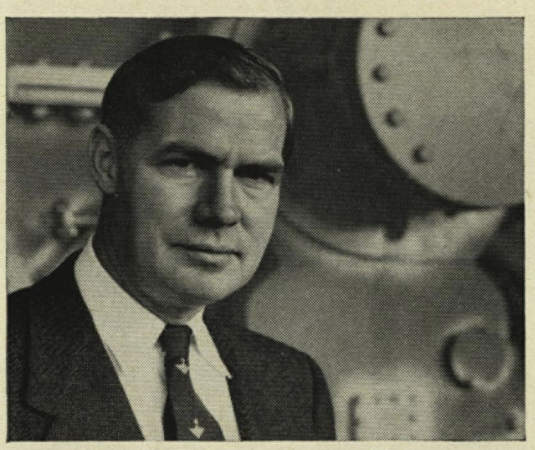
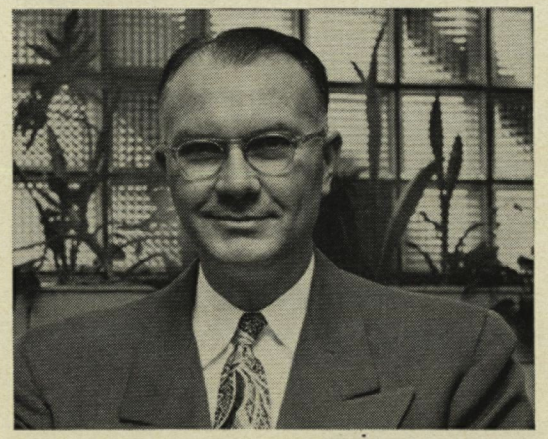


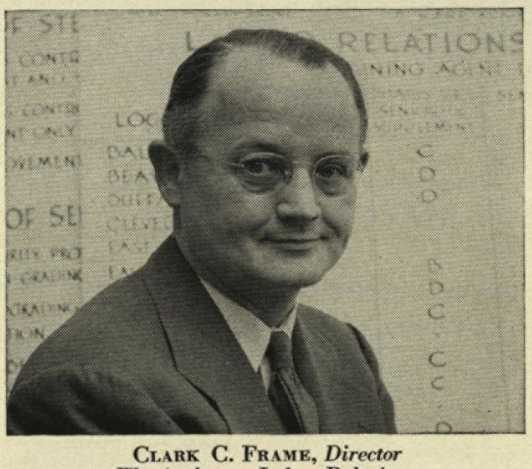
LEE A. KILGORE, *Assistant Manager*
Westinghouse Generator Engineering

A graduate of the University of Nebraska, he enrolled in the Westinghouse Graduate Student Training Course in 1927. He has contributed much to the design and development of large generators, motors and rectifiers and has authored many technical articles on these subjects.



W. H. DICKINSON, *Director*
Westinghouse Headquarters Manufacturing Engineering

Enrolled in Westinghouse Graduate Student Training Course after graduation from Texas A & M in 1930. He came up through a variety of manufacturing positions in the company and was appointed to his present post in 1951.



CLARK C. FRAME, *Director*
Westinghouse Labor Relations

Enrolled in the Westinghouse Graduate Student Training Course after graduation from Penn State in 1930. Prior to appointment to his present post, he was Manager of Industrial Relations for Westinghouse East Pittsburgh divisions.

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Westinghouse offers you a double-barreled opportunity for building a successful future: the Graduate Student Training Program which gets you off to a sure start . . . and the Graduate Study Program which enables you to continue your education toward M.S. and Ph.D. degrees while on the job. When you join the Westinghouse team, you get the training you need to forge ahead in the field of your choice.

For information on opportunities at Westinghouse in engineering, research, manufacturing, sales and business administration, send for our 34-page book, "Finding Your Place in Industry".

G-10251

EDUCATIONAL DEPARTMENT

YOU CAN BE SURE... IF IT'S

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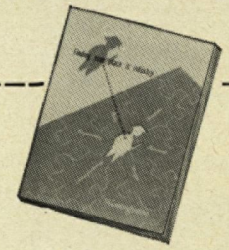

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HIGH SCHOOL GRADUATES OF 1953

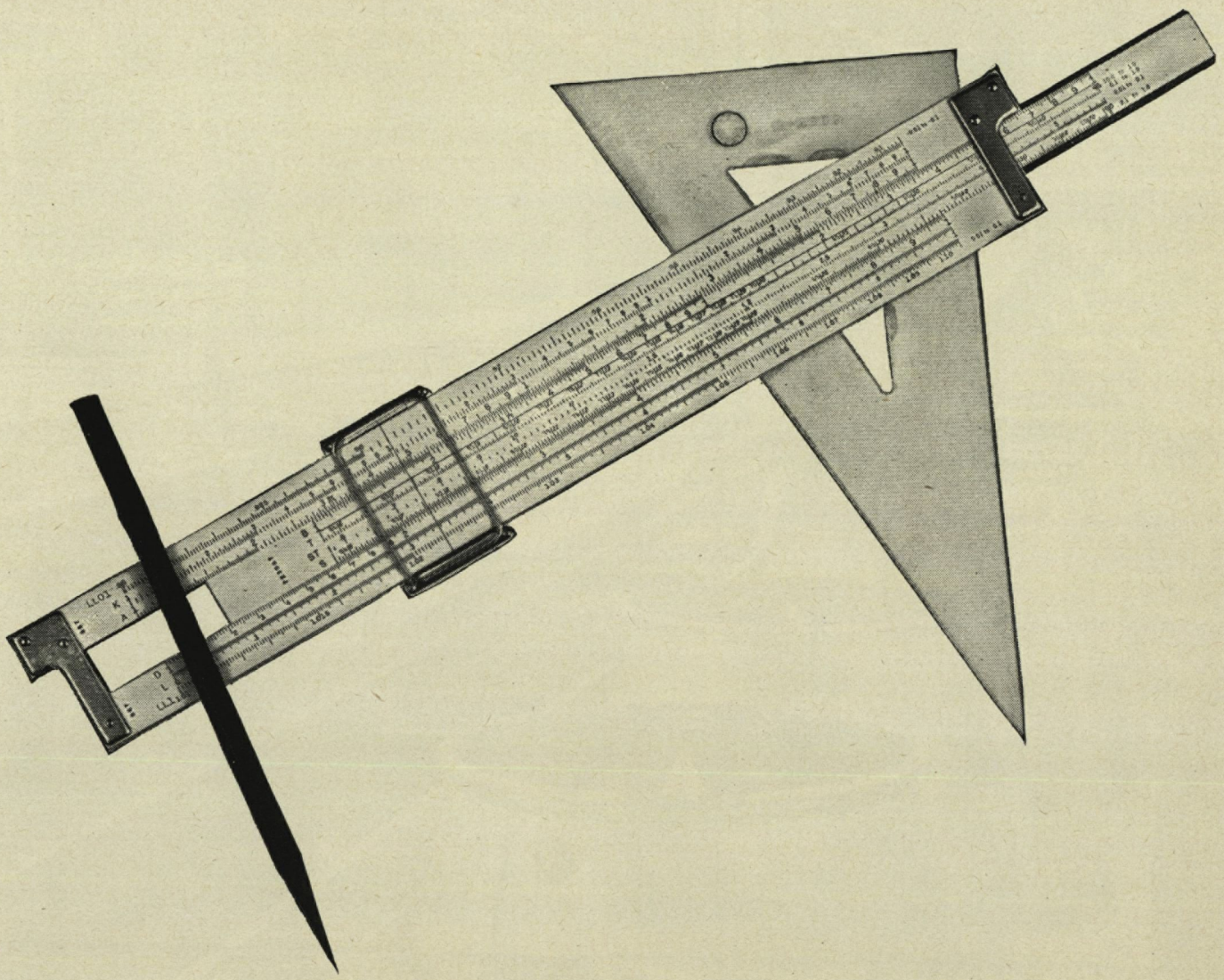
You are cordially invited to visit Rose Polytechnic Institute during the present school year to learn more about your college entrance and the engineering courses available to you at Rose. The next freshman class will be admitted September 8, 1953.

NOBLE C. BLAIR

Admissions Counselor

ROSE POLYTECHNIC INSTITUTE

TERRE HAUTE, INDIANA



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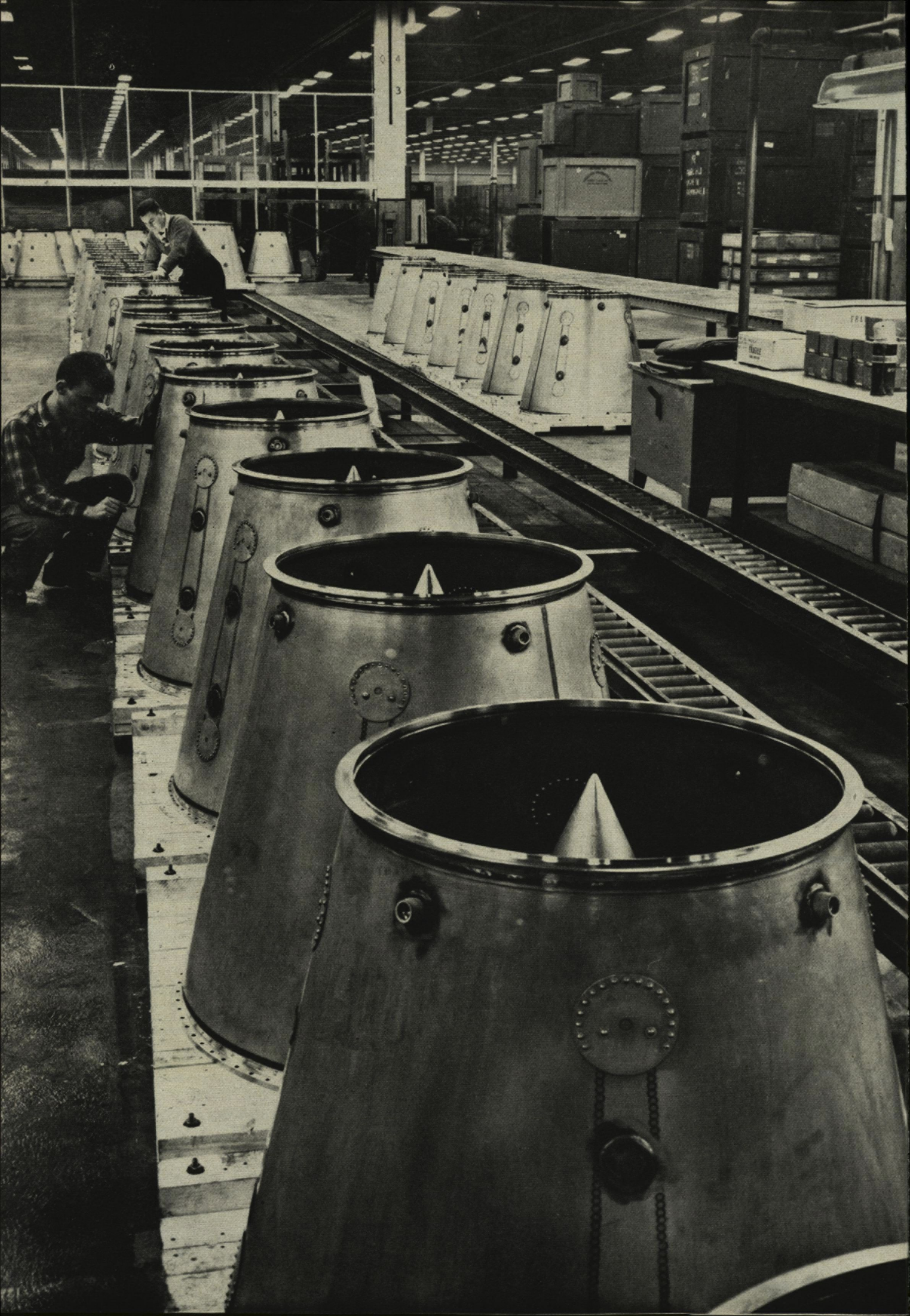


A Note To The Frosh

For you freshmen at Rose, the next five months will be the most critical ones in your college career. During these coming months, you will have to make many decisions which will have a great influence on your success in your chosen profession.

Now that you have completed your first semester at Rose, you have become an integral part of the school. You have made many friends, learned much about the traditions of the school, and have organized as a class by the recent election of your class officers. By this time, you have learned what type of work is expected of you, and most of you have accustomed yourselves to doing work of the type required.

Now is the time to stop to take a look at yourself. Have you been taking the maximum advantage of your opportunities? Has your work been of the quality you are capable of doing? Each individual has to answer these questions for himself. If you find improvements can be made, now is the easiest time to make them.

Also, now is the time to begin thinking about the many decisions you will be called upon to make in the near future.

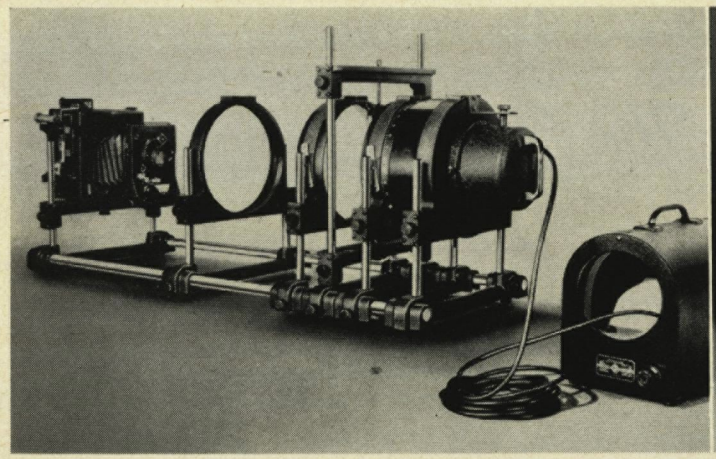
Soon you will have to decide about the advisability of your joining one of the four fraternities at Rose. Make this decision only after careful consideration. Do a little investigation on your own by talking to your advisor and to the upperclassmen. With the results of these consultations in mind — make your own decision.

You should begin to think about taking an active part in extracurricular activities. Of course, many of you have already begun work in various school service and recreational activities, but to those of you who have not—think seriously about entering extracurricular work. If you feel that you have the time and capabilities, undoubtedly you should join one or more of the many organizations of this type. Whether your choice is Technic or Modulus, Radio or Camera Club, I'm sure you will derive many benefits from your association.

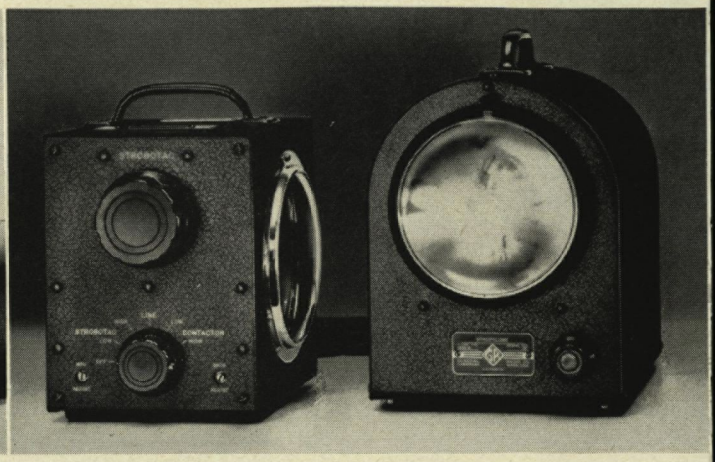
Last, and most important, you will soon be deciding which of the engineering fields will be your future profession. Although this decision is several months away, decide now which field you would prefer. Talk to upperclassmen of the various fields and ask them what types of work lie ahead in their particular field. Also, take advantage of your opportunity and see the Dean and professors of the various departments. A friendly visit to one of these men may be quite valuable in helping you make the right decision. Visit the meetings of the various engineering societies. The time and place of the meetings are posted on the bulletin board, and I'm sure you would be a most welcome visitor at these meetings. By use of these methods, you can be confident you have made the proper choice, and avoid the confusion and loss of time incurred by a change of program at a later date.

So, freshmen, be smart! Plot your course now. Decide what your goal at Rose is, and then take advantage of every opportunity in an effort to achieve it. I am sure that in this way you will realize much more value and enjoyment from your remaining years at Rose.

P. C. E.



Typical stroboscopic photography setup for observing strain in test specimen.



Strobolume light source and strobotac timing mechanism.

Stroboscopic Photography

By William J. Toeppe, senior, e.e.

Engineers have, on occasion, designed machine parts which, once they have been put into use, have failed under what was supposed to be less than the theoretical maximum load. The danger of this is greater when the engineer is working on a new development on which the accepted practice has not yet been set down and in which the engineer must rely solely on his own judgment in the design.

In many of these cases, careful examination of the motion which causes the loads to be applied to the members in question would help solve the problem and make it clear where a correction in the design is needed. If the motion is slow and simple, examination with the naked eye will often suffice, but if the motion becames too rapid or too complicated for the eye to follow and for the brain to comprehend, some other means of observing the motion of the machine parts must be found.

Stroboscopic photography is one of these other means. Stoboscopic photography is a method of photographing the successive phases of a motion. The process consists of repeatedly allowing short flashes of light, reflected from the object to be photographed, to fall on the focal plane of a camera; thus the camera is able to record the motion of the machine as if it were in slow motion.

Let us consider the isolated system consisting of (1) a light source, (2) an object to be photographed, and (3) a camera. The repeated flashes of light might be effected by several methods: (a) turning the light on and off repeatedly at the light source (b) placing a shutter between the light source and the object; the shutter would periodically allow a short "pulse" of light to strike the object. A revolving disk which has a sector or slit cut out of it would serve quite well. (c) placing shutter between object and camera.

Originally, the shutter method was used with the shutter placed between the object and the camera. The shutter was not ordinarily placed between the light source and the object since the diameter of the light beam would be much greater than the diameter of the camera lens. Also the equipment required would be much larger and would require greater driving power but would have no additional operating advantages. Secondly, the object-camera shutter is efficient enough that the shutter can be supplimentary to the camera apparatus; but since light has the characteristic of leaking unless special precautions are taken, the source-object shutter might have to be incorporated into the lamp housing.

Combinations of rotating shutters, mirrors, and prisms have been made to increase the frequency of flashing but generally the accuracy of the

(*Concluded on page* 22)

Atomic Power In Industry

Edited by Robert D. Miller, jr., e.e.

Atomic Submarine Engine

During the last 18 months, 3,028 sub-contractors and suppliers in 23 states have had a hand in the manufacture of the "atomic engine" for the U. S. S. Nautilus, the nation's first atomic-powered submarine. The engine, both the nuclear reactor and propulsion equipment, is being built by the Westinghouse Electric Corporation's Atomic Power Division under contract to the Atomic Energy Commission and the Navy.

"During the last 18 months," explained Charles H. Weaver, manager of the division, "Westinghouse purchased parts and materials for the atomic submarine power plant project from suppliers in 122 different cities throughout the United States.

Industry in five different states has received more than one million dollars worth of sub-contracts and purchase orders per state from the Westinghouse Atomic Power Division. These states are Pennsylvania, Connecticut, Ohio, Illinois and California. Close to the million dollar mark are Maryland and Michigan.

Finding firms that are equipped to handle sub-contracts on the atomic engine is not easy. Unlike many production assignments, this work requires complex tools, great accuracy, unusual materials, and greater necessity for safety precautions.

"Although the developmental work on the first nuclear powered submarine engine has been completed, there is a continuing need for even more extensive 'development' subcontracting of the continuing work of the Atomic Power Division. In some cases existing devices such as pumps and valves have to be re-engineered, manufactured, and extensively tested to meet conditions never before required. In other cases entirely new areas of science and engineering must be explored and put to use in producing new devices.

"These are not small problems; and there are not just a few of them. Hence, in the interest of utilizing existing development, further knowledge, manpower, and facilities, there is a denite need for sub-contracting help in this field."

A dry land working model of the atomic engine, is being constructed at the National Reactor Testing Station near Arco, Idaho. On June 14, 1952, President Truman presided at the laying of the keel-plate for the submarine hull. These ceremonies were held at Groton, Connecticut, where the hull is being built.

Atomic Power Plant

This plastic model of an atomic power plant was shown recently in New York City.

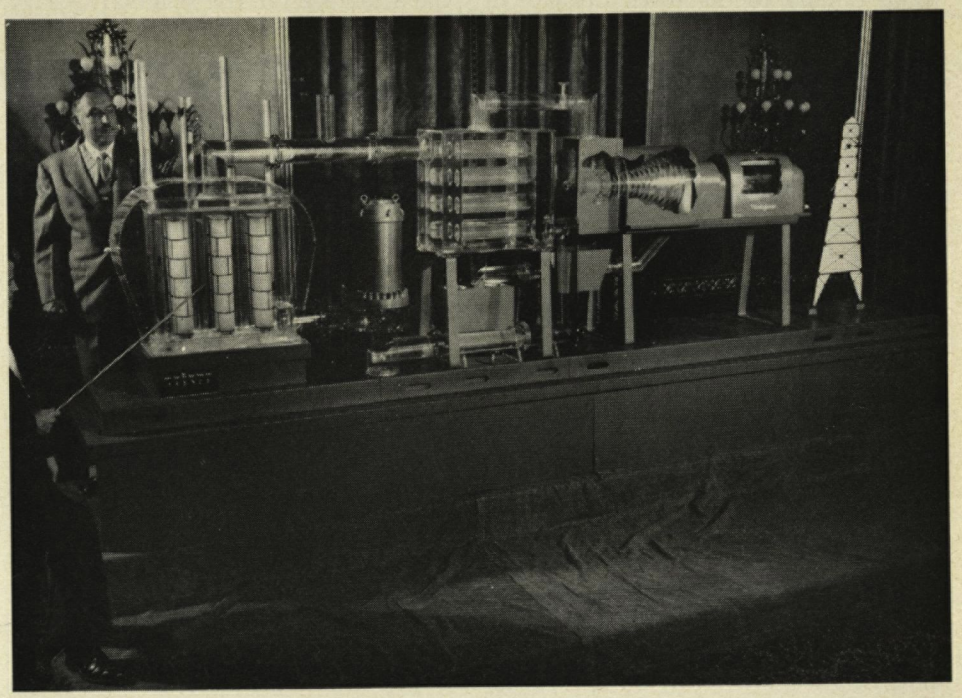
In this picture, Charles H. Weaver (front left), and Dr. W. E. Shoupp (rear), are studying the simulated nuclear reactor. Mr. Weaver is pointing to one of the rectangular columns used to represent the atomic pile; Dr. Shoupp is positioning one of the control rods.

The atomic pile generates heat through nuclear fission. To keep the pile cool, a suitable heat transfer liquid is pumped through the reactor to the rectangular boiler or heat exchanger and then back to the reactor again. Heat from the primary coolant is transferred to water in the secondary system in the boiler and steam results. This steam is used to drive the turbine-generator at the right.

Atomic Energy Electric Power

An atomic energy-electric power industry cannot be placed on a sound basis so long as it requires a government-supported market for atomic weapons to make it economically

(*Concluded on page* 22)



Model Atomic Power Plant.

THE HISTORY O
1874

Condensed by Charles R. Hayward,

The first library

Chauncey Rose settled in Terre Haute in 1818, and when he and a group of his friends founded Rose Polytechnic Institute, they laid plans for a fine library.

Mr. Rose's interest in and concern for libraries is borne out by the fact that after the death of his mother in the old home town of Wethersfield, Connecticut, he gave two thousand dollars to the town library. In addition he gave twelve thousand dollars to endow an academy. Before the establishment of Rose Polytechnic he gave substantial gifts of money to the library at Indiana State Normal College, the Indiana State Teachers College, and Wabash College at Crawfordsville also received very substantial aid from his funds.

The first building of the Institute at Thirteenth and Locust streets provided space for a library containing engineering books and periodicals.

Early accounts of the library stated that it was already supplied with five thousand volumes selected in response to the special requirements for the reading and instruction of pupils in technological studies and practice. The original collection was not, however, destitute of the works of standard literature. Also it was further stated that the library should be increased as the occasion demanded.

Professor Clarence A. Waldo, instructor in mathematics, was the first of a long list of instructors who were placed in charge of the library in addition to his classroom duties.

Professor Waldo was not only the first librarian but he also designed the shelving for the original library. The early purchases of the Board, along with the library of Dr. John Bacon of Harvard College, were catalogued by the Secretary. Charles O. Thompson, the first president of the Institute, made large additions to the library.

In 1887 an Assistant Librarian, Miss Annie W. Allen was appointed. At this time the idea of having classroom collections was started. These books belonged to the faculty members but were made accessible to all of the students.

After Miss Allen had served for only two years, Miss Hannah F. Smith became Assistant Librarian in 1889. She served in the capacity until she died September 30, 1895. Miss Smith was very efficient in her work and immensely popular with students and faculty.

At this time such reference sets as Rees's Encyclopedia, 1816 (this set is still in excellent condition and available in the library), Bayles Dictionary and Spons Engineering Dictionary were acquired.

Professor Waldo resigned his position at the Institute in 1891, taking a position at DePauw University. His successor, Professor William H. Kirschner, had come to Rose in 1887 as a specialist in Drawing and Design. He was a graduate of Worcester Polytechnic Institute and brought an excellent reputation with him.

An article in the Rose Technic of February 1892 states that the seven thousand volumes in the library have been classified and arranged on the shelves according to the Dewey Decimal Classification System. At this time fifty-two different periodicals were being received, three in the French language, six in German, and ten from Great Britain and thirty-three American ones.

In May 1893 the Rose Technic started a practice which it continued for almost forty years. This was the practice of including in each month's issue, reviews of outstanding technical books and periodical articles.

Professor R. R. C. Simon served for a very short time as Librarian in 1894-1895. He was the third librarian of the Institute.

At the beginning of the academic year of 1895 Rose had a new librarian. Mr. Arnold Tschudy, Instructor in German as well as librarian. Mr. Tschudy was a native of Switzerland and he studied at the Polytechnic School in Basle, Switzerland. After coming to the United States he entered Indiana University and was granted a degree in 1894. Professor Tschudy met an untimely death in Rochester, Indiana in 1896.

HE ROSE LIBRARY

953

a report by Carson W. Bennett, Librarian

Professor Albert A. Faurot assumed the duties of librarian in December 1896. He was also an instructor in foreign languages. Professor Faurot was a native of Michigan, but received both his Bachelor's and Master's degrees from the University of Nebraska. He also studied in Germany.

Librarian Faurot inaugurated a column in the Technic early in his administration called Library Notes. He expressed an opinion which is still appropriate fifty-five years later —many students do not know how to use the library.

The books in the library at this time were divided into three large groups, (1) Reference books, (2) One week or restricted use books, and (3) Regular two week loan books. The library hours at this time are interesting: 8:30 a.m. to 11:10 a.m. and 2:00 p.m. to 4:10 p.m. each school day. These hours were about as inadequate for good service then as they would be today.

The Library Notes column often contained lists of books and periodicals or book or periodical reviews.

Some of the student complaints against the early library are worth noting. The hours did not suit the convenience of the students, it should be open earlier in the morning and stay open later in the afternoon. Doors of the library should not be closed while the librarian, who is also an instructor, is having a recitation. The library is not used as much as it should be. This latter comment is certainly valid even today. The hours recommended are 8:00 a.m. until 6:00 p.m. each school day.

In 1899 the library had about nine thousand bound volumes, two thousand pamphlets, and new books were being constantly added. The Rose Library has always been extremely liberal in allowing the students free access to the stacks. Fifty years ago this was almost unheard of in a college library. This was certainly a most helpful and far-sighted policy. The student was encouraged to help himself but the librarian was always available in case help was needed.

In 1902 Professor Edmund J. Hirschler assumed the duties of librarian along with his duties as instructor in German. He was born in Iowa in 1876 and was graduated from the University of Kansas with a Bachelors degree in 1901.

Professor Fred F. Wasleigh served as librarian during the academic year of 1903-1904. He was succeeded in September 1904 by Professor Frank W. Bennett. Both of these gentlemen were language instructors. Bennett had gone to Bradley Polytechnic Institute and was graduated from the University of Chicago.

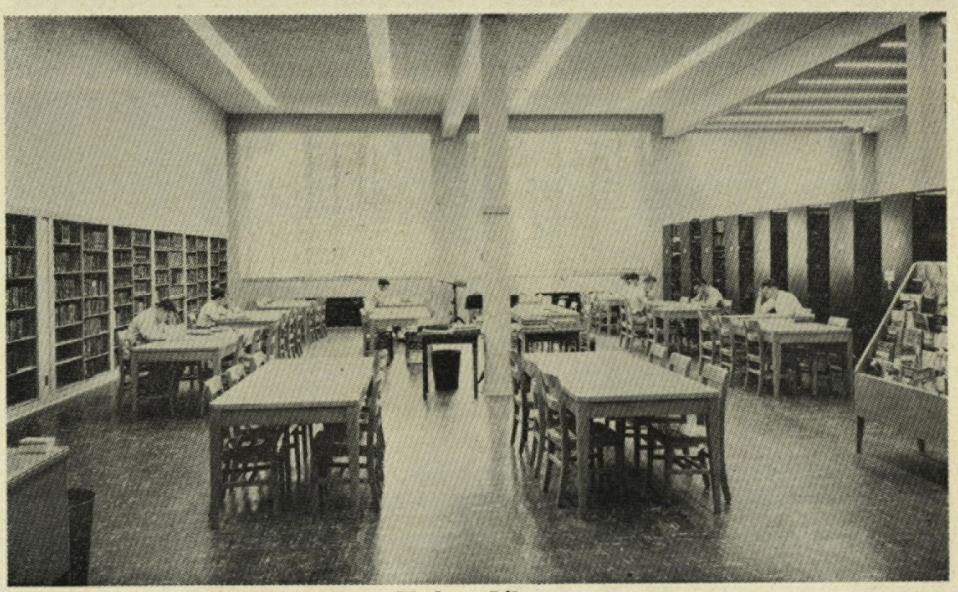
Professor Bennett's administration of the library seems to have been comparatively uneventful. He was not well liked by the students. In fact he was criticized with an extremely vitriolic pen.

It was in 1919 that Professor Albert A. Faurot returned to the Institute as an instructor in languages and librarian. Also at this time alumni purchased and presented to the Institute the valuable scientific library of the late Dr. Thomas Gray who had been a Professor of Dynamic Engineering in the Institute. The library at this time contained over twelve thousand volumes.

It is an interesting sidelight to note that the alumni commencement address of 1909 was delivered by librarian Harrison W. Craver '95, of the Carnegie library of Pittsburgh. His subject was the "Reading of an Engineer". He made some excellent points on reading for information and pleasure.

The College Catalog of 1912-1913 stated that the library had grown to nearly fifteen thousand volumes and two thousand pamphlets.

In 1916 librarian Faurot was fortunate to get an assistant, Miss Mary Fishback. Miss Fishback had some training and experience in library work. (*Concluded on page* 34)

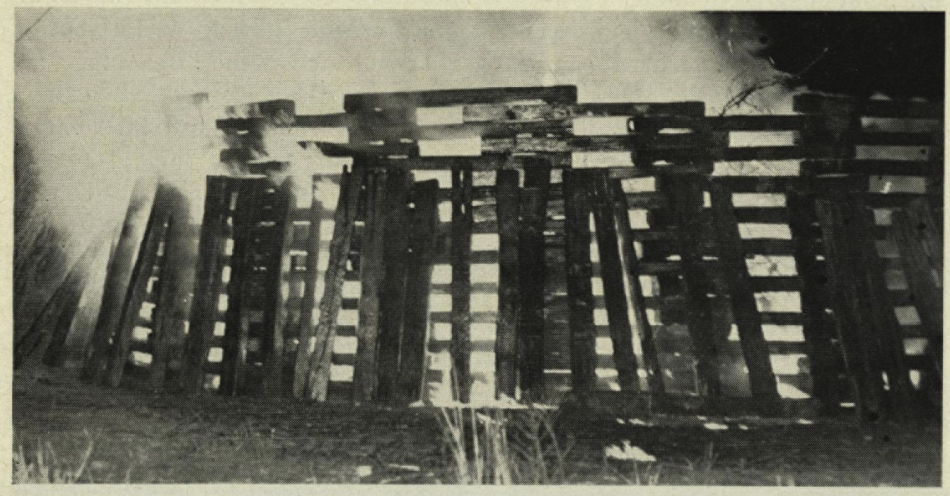


Modern Library

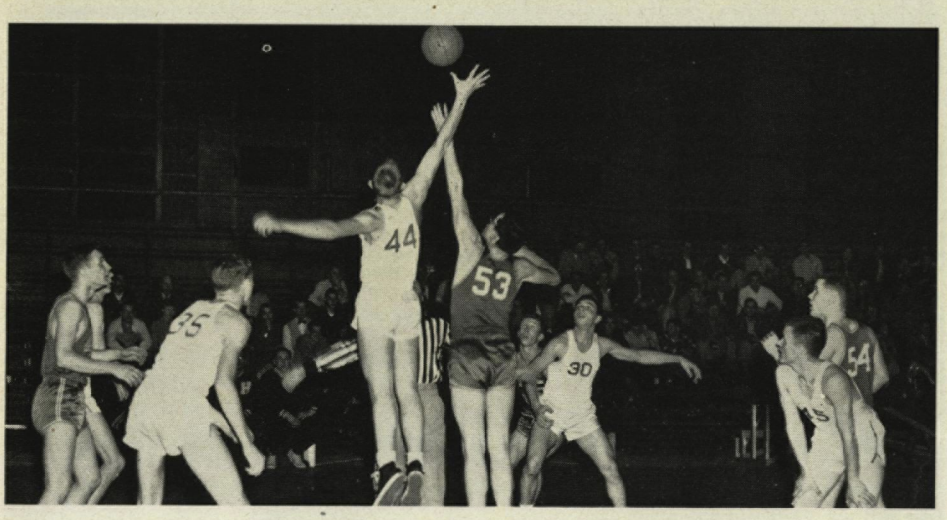
Camp

By Jack Farell, jr., ch.e.; Jack F

The freshies first engineering accomplishment.



Better late than never!



The Fightin' Engineers in action.

The Bonfire

After the first basketball game on December 5, 1952, the freshmen tried to set off their bonfire. The fire did not do too well. The frosh overlooked the fact that the rain and snow which we had had since the fire was built did not help it burn. Since they are only freshmen the omission is understandable. The fire that resulted might have been suitable for roasting marshmellows for some dainty coeds, but was far from the roaring bonfire of previous years. The worst part was that the outhouse did not burn.

However, the following night, at the second basketball game, the frosh came through in true Rose fashion by setting off a repaired bonfire. Thus, after much delay, the Homecoming bonfire was burnt. Here is hoping our luck is better next year.

Scheduled as a climax to a full evening, a sock dance followed the bonfire after the first basketball game. This event was sponsored by the interfraternity council and the whole student body was invited. This dance was further extension of the plan to better acquaint the students with the fraternities.

Rose Downs Huntington

Rose started the net season with a bang by defeating Huntington College 79 to 57. The individual scoring was well balanced, with Harry Zorman netting seventeen points for high honors. The Engineers got off to a fast start and were in full command of the situation all the way. The halftime score was 39-25.

Concordia Falls

Rose Poly's Fighting Engineers chalked up their second victory in as many starts by lowering the boom on Concordia of Fort Wayne 72 to 60. The Preachers were breathing

urvey

.; and Herbert Smith, soph., e.e.

down the Engineers' necks during the first quarter, with Rose holding a slim 13 to 12 lead when that period ended. Rose went to work to build up a 37 to 29 margin by the half and stayed well in the lead for the rest of the game.

Harry Zorman and Harry Badger led the individual scoring with eighteen and seventeen points respectively.

Another Concordia Falls

The Engineers kept right on rolling to their third victory as they downed Concordia of Springfield 58 to 48. Rose got off to a good start with a 12 to 3 first period lead but Concordia went on a scoring binge to trail only 28 to 26 at the half. Concordia grabbed the lead at the start of the third period and a nip and tuck battle followed. Field goals by Snape and Badger put the lead back where it belonged and it stayed there for the rest of the game.

Green led the scoring with fourteen points, followed by Zorman and Snape with eleven and ten points respectively.

Uppercrust

The following students have been nominated for listing in *Who's Who Among Students in American Universities and Colleges*: David H. Badger, Robert Bosshardt, James Burgett, Richard Grubaugh, Al Klaus, Robert Ray, Glen Rout, and Lynn York. Students were selected by the faculty from a group chosen for consideration by the student council. The qualities considered in selecting the nominees were excellence and sincerity in scholarship, leadership and participation in extra-curricular and academic activities, citizenship and service to the school, and promise of future usefulness to business and society.

Juniors vs. Seniors; to the great enjoyment of the underclassmen.

As usual, the frosh get it in the end.

Winter Sports, Rose style.

Great Men of Science

Friendrich A. Kekulé

By John Chinn, fresh.

In the middle of the nineteenth century a revolutionary theory of organic chemistry came into being. This theory which has simplified organic chemistry a great deal, came to a man, Friendrich August Kekulé, as a mere dream.

Kekulé was born on September 7, 1829 in Danstdt, Germany. His early education began in the gymnasium of the town, where he was outstanding in mathematics and drawing. During his early years at the gymnasium he became engrossed in the study of the butterflies and flora of the surrounding district, thus building an interest in making observations.

After Kekulé finished his schooling at the gymnasium, he fulfilled his father's wishes by attending the University of Giessen where he studied architecture. Although he did not ultimately become an architect, Kekulé always felt that his study in architecture was definitely an advantage to his scientific career which, after all, really became a study in the architecture of molecules.

During Kekulé's early stay at the University, Libig was there lecturing on chemistry. Kekulé, after attending some of the lectures, became so interested in the subject that he decided to change his career and devote the rest of his life to studying chemistry. Libig told him that to become a good chemist he would probably ruin his health, and so it was with Kekulé. At times he rested only three or four hours a day, devoting the rest of his time to study. As a result Kekulé grew old and physically weak long before he normally would have.

Kekulé's first research, later made into a publication, was on amyl sulfuric acid and its salts. Soon after this, Libig offered him a position as assistant, but Kekulé declined the offer and continued his studies in Paris.

There he attended the lectures of Dumas and met with such men as Würtz, Cahours, and Regnault, but the most outstanding acquaintance in Paris was that of Gerhardt. Gerhardt was quite influential upon Kekulé's ideas of organic chemistry.

Upon his graduation as a Doctor of Philosophy from Giessen, Kekulé returned to Germany as an assistant to von Planta. His research with von Planta was on reaction of ethylic iodide on nicotine and coniine.

His next year was spent in London, where he became an assistant to Stenhouse. In London Kekulé became acquainted with Williamson, Franklin, and Okling, all three being influential in developing Kekulé's ideas.

Kekulé had quite a variety of men working with him in his early career and also quite a variety of theories as well. Had Kekulé remained with Libig as an assistant, he might well have gone on through life producing work of a single type, thus robbing science of much important research and theory.

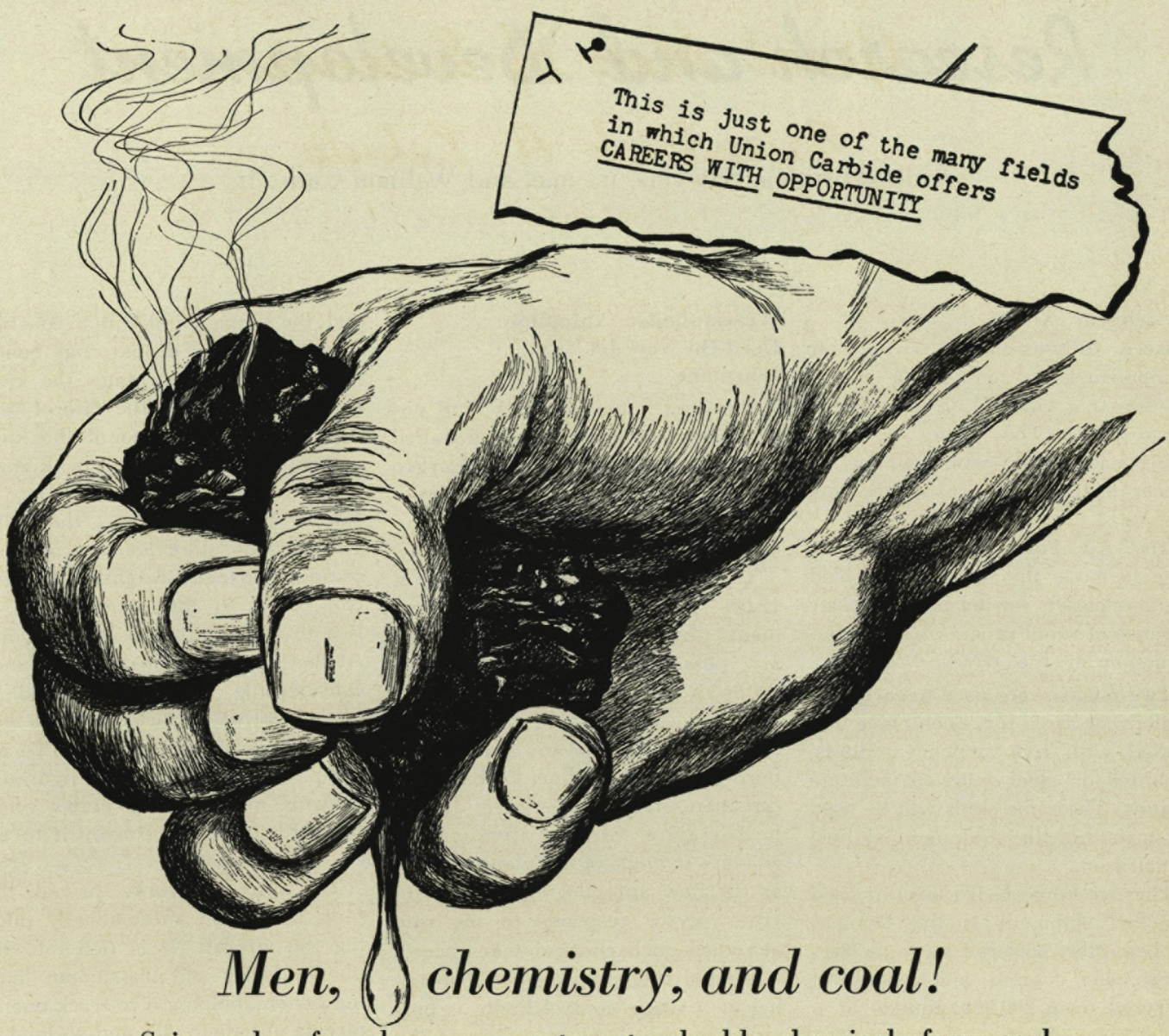
Kekulé had been elaborating on the ideas of Gerhardt for some time. He began to compile this material, which had to do with his recent ideas on v alence of organic compounds, during his early stay in London. Shortly after this material had been published, Kekulé left London and went back to Germany, this time to Heidleberg. Here he established himself as a privadocent in a small laboratory adjoining a kitchen. It was the years he spent as a privadocent that were the most productive of his life.

The outstanding articles he produced at this time had to do with valence. When this work was begun with what was known as the marsh gas type, it was fairly simple, but, like most things, as it progressed on to multiple types and mixed types, it became more complicated. The task consisted of taking certain compounds and putting them in types; thus substituting radicals and elements in place of elements that were in a compound, it was possible to determine the holding power of the elements and radicals involved.

Kekulé's next work had to do with the valence of carbon. Carbon valence had some peculiar properties about it, but they do not seem so puzzling after they are explained. A single atom of carbon has a holding power of four, that is, it can combine with four monatomic atoms or two diatomic atoms, therefore, carbon is said to be quadrivalent. Since this was found to be true it seemed that two carbon atoms in one molecule of a compound would have twice the holding power of one atom of carbon —that would be a holding power of eight. Actually the two carbon atoms use up two units of holding power on each other, thus leaving them with a holding power of only six. These facts established by Kekulé provided him with a complete solution as to the molecular structure of compounds.

To illustrate these conclusions, Kekulé revived a graphic method which Dalton had used to explain the characteristics of atoms. One theory seemed to lead to another and finally to Kekulé's most outstanding achievement — the Benzene Theory. Organic chemistry has consisted greatly of the search for

(*Concluded on page* 26)



Men, chemistry, and coal!

Science has found a new way to get valuable chemicals from coal

Science has at last found a practical way to convert coal into the host of valuable chemicals that nature locked into it.

The people of Union Carbide have developed a way to bring coal and hydrogen gas together under carefully controlled heat and pressure. In minutes, this revolutionary process—called *coal hydrogenation*—converts the coal into a mixture of gases and liquids that are rich in useful chemicals.

A WEALTH OF RAW MATERIALS—Among them are hitherto scarce, and even completely new, chemicals. Some are raw materials for plastics and synthetic rubber, or are vital to medicine and vitamins. Some are valuable in rocket propulsion. Others are necessary in insecticides, surface coatings, and many other important uses.

A NEW SOURCE OF SUPPLY—Today, Union Carbide's coal-hydrogenation process promises steady and vastly increased production of chemicals for these needed materials. What's more, it will provide a host of chemicals that may become the basis of many new products.

A UCC ACHIEVEMENT—With the first coal-to-chemicals plant of its kind in operation, the people of Union Carbide are now well on the way to making abundant coal a source of chemicals important to us all.

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Research and Development

Edited by John Sawyers, jr., m.e. and William Cade, fr.

Switchgear Airlift

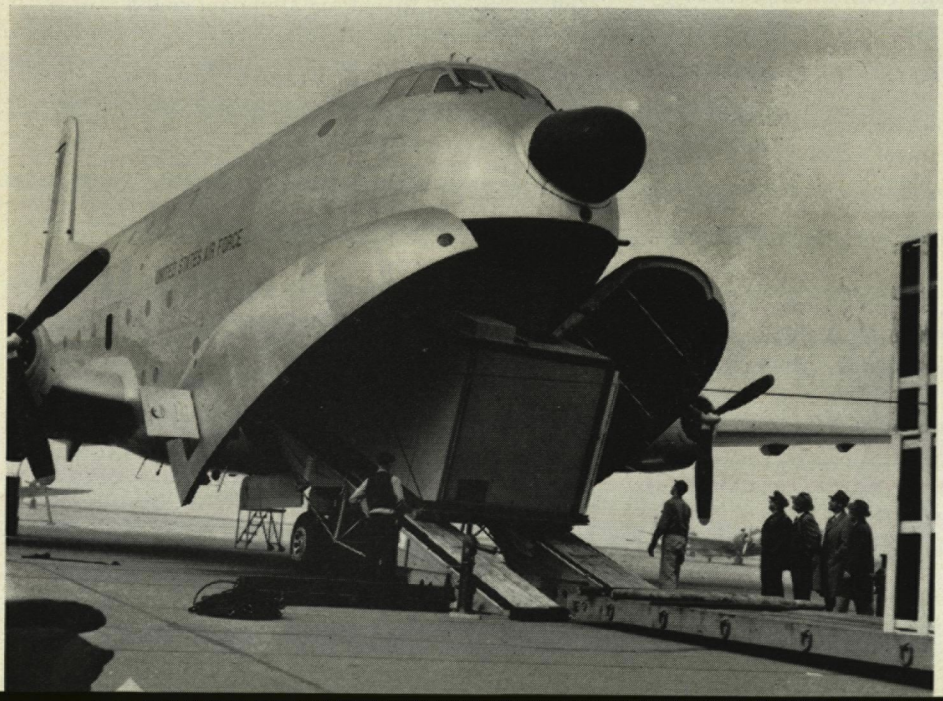
Even fully-assembled switchgear equipment is not too great a mouthful for this giant U. S. Air Force cargo plane. The plane shown is being loaded with switchgear for the power house at Fort Richardson, Alaska.

The Air Force found it necessary to move the factory-assembled metal-enclosed switchgear by air because of rapid progress in the construction of the power house.

Two planes were used to carry the switchgear assembly. Each plane was loaded with five switchgear units, mounted on steel skids to facilitate loading. The same skids will be used for installing the equipment at Fort Richardson.

The Air Force C-124 aircraft used for this shipment is the Douglas Globemaster, powered by four 3250-horsepower engines, and capable of carrying over 200,000 pounds at a speed over 300 miles per hour. The airplane was specifically designed to carry heavy Army equipment such as the switchgear for Fort Richardson.

Giant Cargo Plane



Westinghouse Autopilot Used On New Jet Warplane

The first automatic pilot with unlimited maneuverability is installed in the new Lockheed F-94C Starfire jet warplane. The automatic pilot utilizes three "non-tumbling" gyroscopes that are locked to the plane.

These gyroscopes, spinning at 12,000 rpm, follow the plane's movements during all maneuvers without any possibility of tumbling. They differ in this respect from the ordinary "position" gyro that is not locked to the plane and hence stubbornly resists any effort to change its direction of motion. As a result, former gyros were sensitive only to changes in angle of the plane, whereas the new autopilot equipped with "rate" gyros responds to the rate at which such changes take place.

Virtual finger-tip control, consisting of a single control knob, is provided by the flight controller of the autopilot. For normal flying, the autopilot is arranged for completely coordinated flight. To climb, the pilot simply pulls the knob back and the plane climbs at a constant rate, regardless of external conditions. To turn, he rotates the knob either right or left, the rate of turn depending on the amount the knob is turned, and the correct bank angle being automatically set.

For combat tactics, the pilot switches the autopilot to a stage of complete maneuverability. The control reacts to the pilot's signal in less than one-fifteenth of a second. At the high speed of modern planes, considerable force is required to move control surfaces such as elevators, ailerons, and rudder. To aid the pilot in manual flight, hydraulic controls multiply the pilot's effort some 15 times and convey it to the control surfaces.

The autopilot works through this same system in automatically piloting the aircraft. It is tied into the plane's radar and instrument landing system, helping it to track enemy targets automatically and to land in bad weather.

The autopilot is suitable not only for military aircraft, but also for large and small commercial planes. Radio-controlled, it can also serve to direct the flight of guided missiles and pilotless aircraft.

The F-94C jet plane, now being produced by Lockheed for the U. S. Air Force, has a top speed of "more than 600 miles per hour," and is the first U. S. fighting plane ever to have all-rocket armament. It carries 24 2.75-inch rockets.

New Locomotive Wheels Move Sideways

A new gas turbine locomotive has wheels that not only turn to negotiate curves, but also move from

(*Concluded on page* 30)

MEET YOURSELF— 10 YEARS FROM NOW

Ever wonder what you'll be like when the class of '53 holds its 10th reunion? If you started to work for one of the Bell System telephone companies after graduation, we can give you a pretty good idea.

POSITION IN THE WORLD: On the way up! A Development Engineer with the Bell Laboratories. Perhaps exploring the application of fundamental new electronic inventions to telephone communications. A Transmission Engineer, helping to provide the telephone needs of an entire state. A Supervisor in the Traffic Department, responsible for the speed and quality of local and long distance service in several cities and for the personnel relations of a large number of employees. In the telephone company, jobs such as these are held by relatively young men and women.

FUTURE: Unlimited! The Bell System continually progresses and expands and its personnel grows with it. In the past 25 years, the number of telephones has almost tripled. In the past 5 years, telephone companies have introduced such things as network television transmission, radio-telephone service and dialing of Long Distance calls. And the best is yet to come.

FRAME OF MIND: Confident and proud! You'll be satisfied because you have a rewarding job . . . not only in pay and security . . . but in service. You'll be proud of your share in helping provide and develop a telephone service vital to the country's social and economic life.

Like the picture? For further information see your Placement Officer. He will be glad to give you details regarding the opportunities for employment in the Bell System.

BELL TELEPHONE SYSTEM

Fraternity Notes

Theta Xi

Kappa Chapter recently held election of officers for the second semester. The brothers elected Jim Mook for president, Erv Ulbrich for vice-president, Gene Sovereign for treasurer, Bob Rader and Lincoln Lai for house manager and assistant house manager respectively, and Bill Ennis to the post of corresponding secretary.

We wish to extend our congratulations to brothers Stoker, Scharpenberg, Sovereign, and Lai (Mgr.) for winning their football letters. Also to brothers Mook, Rader, Ulbrich, and Verdeyen for winning their football jackets. We would like to wish brothers Bob Rader and Erv Ulbrich, who were elected co-captains for '53, a very successful season next fall.

After our annual Christmas Dance which was held Dec. 13th, Kappa had a party for the brothers and their guests. We were honored to have with us 2nd Lt. Tom "Rock" Grinslade who is at present stationed at Ft. Knox. All in all a very enjoyable evening was had by everyone.

The following afternoon, Kappa entertained some orphans from the Glenn Home. Rudy York took the role of Santa while the rest of the brothers did their best to show the children an enjoyable afternoon.

Lambda Chi Alpha

A very good time was had by all on December 6, for on this date the Lambda Chi's held their annual Holly Ball. The boys were surprised, and a swell surprise it was, to see Carl and Mary Bals, Tom and Delores Norman, and Gunther Thiel and Norma O'Rear. We hope to see more of you alumni and your wives (or gals) in the future. The snowman favors and the gaily decorated tree added the final touches to the merry-making. Buford C. and Company are to be commended for their fine job of decorating.

Another good man, Roy A.. Moody, bit the dust. Just before he left, on Sunday, December 14, he instructed "Lambie Pie" to purchase a container of "El Ropo's," for he and Roberta Ward are now engaged.

Alpha Tau Omega

Jolly ole St. Nicholas, otherwise known as Santa Klaus, paid a visit to 63 Gilbert on the afternoon of Sunday, December 14. He was there with his bag full of toys for fifteen orphan children, ages two to five, from the Glenn Orphan Home. All actives present showed their fatherly instincts when each member took personal charge of at least one child.

The first week back from school brought "help week" for five pledges of ATO who were then activated into the chapter.

Congratulations are in store for three "Taus." Jim Matthews surprised Miss Dottie Lou Miller, an ISTC Chi Omega, with a diamond recently. Don McCune made a similar presentation to Miss Joan Wyatt at Christmas time. Joan is a student at St. Mary's. Last, but evidently not least, Don Latham is stepping off the deep end into "wedded" bliss this month. Don's new bride will be Miss Marjorie Yesley. Many happy returns of the day (anniversaries, that is).

Theta Xi's Christmas Fling

Sigma Nu's & Alpha Tau's join together for VMI dance.

Using an electron tube developed by RCA, automotive engineers have perfected an instrument which automatically controls automobile headlights.

Out of the stars – a cure for headlight glare!

When RCA scientists developed an electron tube so sensitive that it could respond to flickering starlight, astronomers promptly put it to work in their studies of the Universe.

Called a *multiplier phototube*, RCA's invention now "takes to the road" in an instrument which will add to your safety when driving at night. The multiplier phototube is now being used in an *automatic control for automobile headlights.*

Here's how it works. RCA's tube, in a new system, sits behind your windshield where it can "see" approaching headlights. A car comes, and the multiplier phototube activates a system which shifts your headlights to low beam—returns them to high when the other car has passed. It's simple. It's completely automatic. And what's most important, it lets you keep your undivided attention where it belongs... *on driving your car.*

Development of the multiplier phototube is another example of how RCA research benefits you. RCA research assures you finer performance from any product or service of RCA and RCA Victor.

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Alumni News

By William Sharpenburg, Soph., c.e.

'03 Mr. Carl J. Kiefer, E.E., was named vice chairman of the board of Schenley Industries, Inc. He was executive vice president of said corporation. Under Mr. Kiefer's direction Schenley Industries, Inc. has enlarged to the point where they are ranked among the largest and most modern in the industry.

'11 Mr. David W. Jones, E.E., died of a heart attack while waiting for a train to Alabama. He died in Carbondale, Ill., on Nov. 28, 1952. Mr. Jones was superintendent at the Dering Coal Co.

'27 Mr. Robert E. Wade, E.E., formerly District Traffic Supt. for Illinois Bell Telephone Co., has recently been promoted to the position of Division Supervisor of Force.

'33 Lt. Col. Charles E. Grogan, E.E., is Chief of Operations and Programs at Flight Test and All Weather Flying division at Wright-Patterson Air Base, Dayton, Ohio.

'35 Lt. Col. Earle B. Butler, C.E., is now attending the Army Command and General Staff College at Fort Leavenworth, Kansas. He is a veteran of 11 years army service.

'35 Mr. John J. Hager, Ch.E., formerly with the B. F. Goodrich Company in Akron, Ohio, is now the manager of Automotive Product Sales for the Pioneer Latex and Chemical Company of Westfield, New Jersey.

'35 Lt. Col. Francis H. Richardson, C.E., of 736 North DeQuincy Street, Indianapolis, Indiana, was awarded the Bronze Star with 1st Oak Leaf cluster for meritorious service in Korea. Mr. Richardson is now a civil engineer for the State Highway Commission of Indiana.

D '47 1st Lt. Francis A. Heinz, M.E., has completed his 100th combat mission in the present conflict in Korea. Lt. Heinz is a jet pilot of the 49th Fighter Bomber Group of the U. S. Air Force.

D '47 Mr. Wallace L. Steuerwald, C.E., was released from active service with the U. S. Army where he held a commission of 1st Lt. He is now the Design Engineer for the Oliver Iron Mining Company, Duluth, Minn.

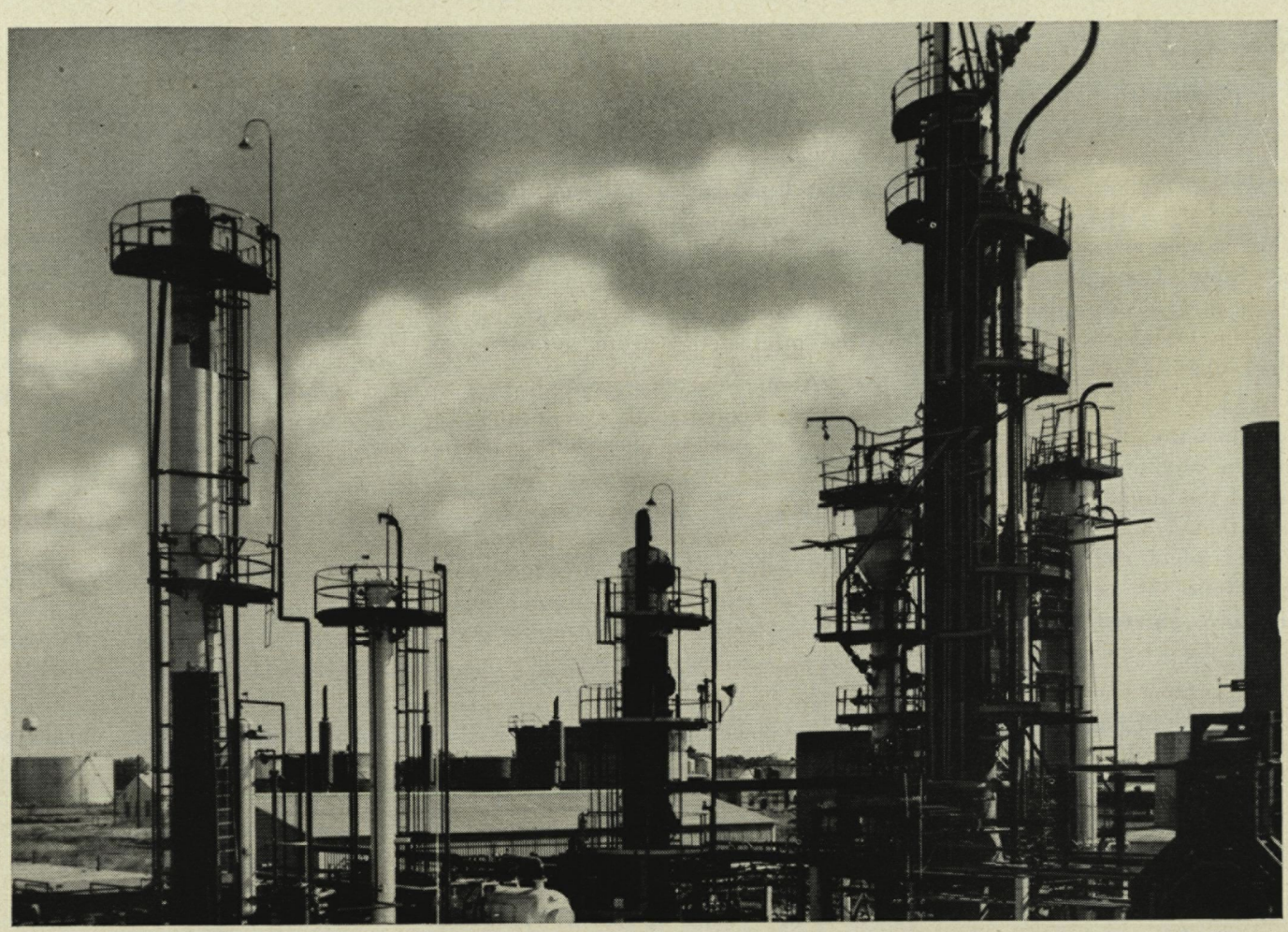
Oct. '48 Mr. Robert J. Nash, C.E., died suddenly last September. He passed away six hours after he was admitted to the Memorial Hospital from bulbar poliomyelitis. Mr. Nash was employed by the Ball-Band plant in Mishawaka. He was the supervising product engineer on the fuel cell products. Mr. Nash is survived by his wife, Mrs. Joyce Nash, a daughter, Judith Ann, and a son, Terry Michael.

Nov. '49 Mr. Robert W. Schwier, E.E., of Indianapolis, Indiana, is now on duty as an ensign aboard the U.S.S. Vhvert M. Moore.

Nov. '49 Mr. A. Donald Stolzy, E.E., has received an LL.B. degree from the George Washington University law school at Washington, D.C. He has been admitted to the bar of the U. S. district court for the District of Columbia. He is now employed as a patent adviser for the Office of Naval Research.

WRITE YOUR OWN ALUMNI NEWS

Your fellow alumni are interested in news about you. The Technic welcomes all contributions by alumni to this page. Address all news items to: Alumni News, Rose Technic.



THE WORLD'S FIRST fluid hydroformer went into operation in November at Destrehan, Louisiana — an important event in the history of civilian and military fuels. It produces high-octane aviation gasoline blending stock.

A Marriage of Engineering Techniques

ENGINEERING INGENUITY has been, and will be, a key to American industrial progress. In the petroleum industry, a specially shining example of such ingenuity is the recent marriage of two already successful techniques.

Issue of this union is a rewarding off-spring —the fluid hydroforming process.

Fluid hydroforming's genealogy stems from two processes with long-established success in refinery use:

FLUID CATALYSIS—First applied to catalytic cracking. The uniform bed temperature inherent in the fluidized-solids technique permits selection of just the right reaction conditions.

HYDROFORMING—Used to upgrade virgin naphtha by converting naphthenes and other low-octane materials into high-octane aromatics. Has always employed catalyst in fixed beds.

It wasn't easy to combine these two processes, with their widely different histories. But eventually petroleum chemists and engineers perfected fluid hydroforming, a new process with the advantages of both its ancestors. It produces large yields of high-octane gasoline.

Since Standard Oil helped pioneer the two parent techniques, it is fitting that a company subsidiary, the Pan-Am Southern Corporation, should be the first to put the combined method to commercial use.

Fluid hydroforming is another example of the many opportunities for the company's research and development staff to apply their technical training—and to gain a sense of real accomplishment from their work.

Standard Oil Company

910 South Michigan Avenue
Chicago 80, Illinois

Atomic Energy . . . .

(Concluded from page 9)

feasible, an atomic energy expert warned here today.

Mr. Winne was also a member of the State Department committee which, in 1946, formulated the U. S. program for atomic energy control, later submitted to the United Nations by Bernard Baruch.

"It is unfortunate that our entry into the atomic energy era was by way of the atomic bomb—and when I say that, I am not thinking at all of the use of the bomb," declared Mr. Winne. "It seems to me that we may have entered the development path at the wrong end."

"To go from there to our present stage, it would have been necessary to work back down the path of development," he added. "We would undoubtedly have engendered groundless fears, which would need to be dissipated. We would have developed a lot of outlandish factors of safety. We would probably have been somewhat unduly appreciative of our success and overwhelmed by our seemingly great store of knowledge."

Perhaps we are in a similar situation today in the atomic energy field, Mr. Winne suggested.

"Most people undoubtedly feel that atomic energy development is so vastly expensive that it would not have come about unless the government undertook it," said Mr. Winne.

"We certainly would not have had the atomic bomb, at the present time, nor submarine atomic power plants scheduled for the near future without government financing," he said, "but I am not at all sure that we shall have a sound atomic-electric power industry sooner than we would have had if this development had taken a more normal course in the interested private industries."

"Atomic-electric power will be really economically sound only when it can compete with conventional electric power without requiring a government-supported weapons market. It could not do that today — unless in some very peculiar and unusual circumstances — nor, in my opinion, for a good many years to come."

"To achieve really economical atomic power," he added, "we need a favorable 'climate.' This," he explained, "involves a number of factors, not alone scientific and engineering knowledge of materials and physical phenomena. It includes experience, built up as we progress from one step to another. It includes scientific engineering and manufacturing tools, some developed in this project, some in projects far afield. It includes the attitude and receptivity of the public."

"Only thus," he said, "can we learn to build better and less costly atomic power plants which, I believe, in the long-term future, perhaps several decades from now, will make atomic energy a significant contributor to our industrial activity."

Stroboscopic Photography

(Concluded from page 8)

frequency of all the shutter mechanisms suffers because of small changes in the speed of the motor and from today's literature, it would seem that the electronic strobie flash has completely replaced the shutter type mechanism.

Incandescent lamps and other sources of artificial light available when the shutter strobie was used were not easily operated as repeating flashes in the frequency ranges where they would be most useful. However, the development of the electronic flash has greatly increased the frequency of operation.

Basically, the electronic flash consists of a gas filled tube which is placed across a charged capacitor. The capacitor discharges through the tube, ionizing the gas and causing it to emit high intensity light energy in the visible spectrum. The time of discharge is quite short—in the order of microseconds.

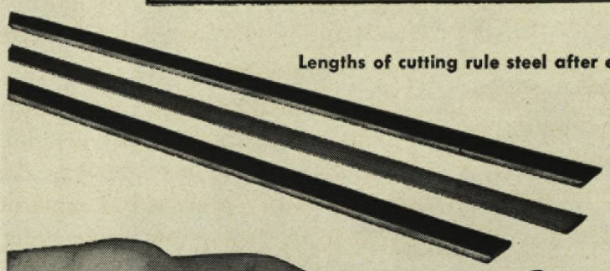
If desired, the successive images need not be made on the same frame of film. A motion picture film may be used, provided the flash is syncronized with the film speed.

Typical of the equipment available for stroboscopic photography is the General Radio's strobotac, strobolume, and strobolux. The strobolume and strobolux are high intensity light sources used with the strobotac which provides the timing of the light flashes. The strobolum flashing speed is in the range of 45 flashes per minute; the strobolux extends to a range of 6000 flashes per minute or, in other words, about 100 per second.

It has been said that, in the last ten years, the stroboscope has exerted more influence on the mechanical and electrical industries than any other single instrument. From the textile to the automotive industry, stroboscopic photography is, and will continue to be, an outstanding research weapon.

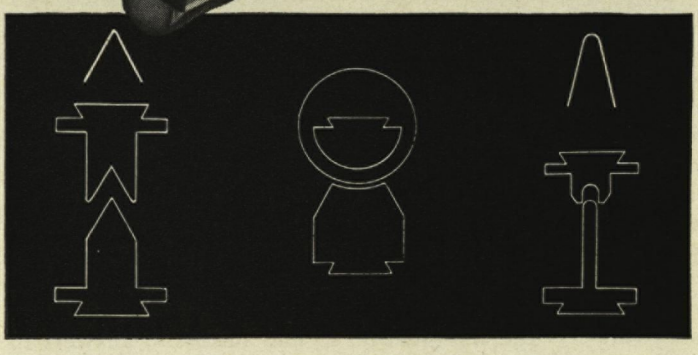
What's Happening at CRUCIBLE

about scoring and cutting rule steel



Lengths of cutting rule steel after edging

Shaped to cut wallet section (note bends, and form-holding method)



Some examples of the many shapes of bends needed

Scoring and cutting rule steel is a cold-rolled specialty steel for use in preparing dies for cutting paper, leather, rubber and other materials.

It is a pre-tempered product manufactured by skilled workmen, using precision rolling and hardening equipment, to close limits for chemistry, grain size and hardness. This product must also be capable of meeting intricate bend requirements in the hardened and tempered condition.

This specialty is furnished with round edges and in coil form to the rule manufacturer who grinds the edges — the one edge square and the other to a knife edge as well as cutting the material into desired lengths. This is sold to a die-maker who bends the rule to the required shape. This is then the nucleus of a pre-hardened die, which when properly brazed and supported is used to cut out material for display cards — aircraft parts — pocketbooks — wallets — gloves — gaskets — washers.

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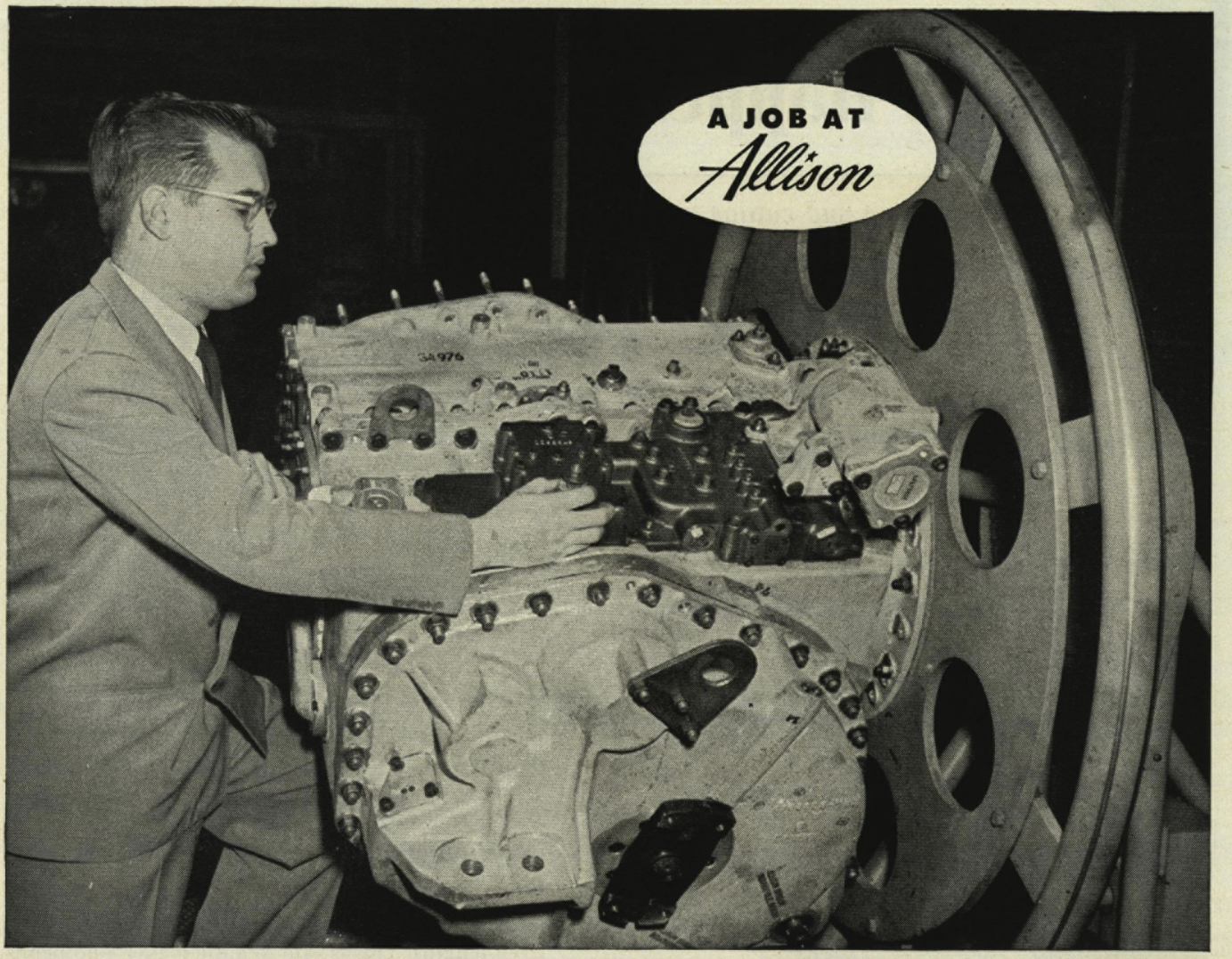
National Drawn Works, East Liverpool, Ohio • Sanderson-Halcomb Works, Syracuse, N. Y. • Trent Tube Company, East Troy, Wisconsin



● Robert F. Karcher, a 1951 Mechanical Engineering graduate from Purdue University, is another Allison engineer who is pioneering in an advanced field of mechanics. He is playing an important role in the Research and Development group of the Transmission Engineering Section.

Allison is the world's largest manufacturer of torqmatic drives for heavy-duty Ordnance and commercial vehicles and equipment. These transmissions serve a purpose far broader than a unit in the power train. All the steering and braking of the vehicle also are accomplished in the transmission. These operations are controlled by hydraulic circuits which consist of clutches, pumps, governors and necessary valving to make them operate in the proper sequence. The assembly of the valving system is often termed the "brain box" of the transmission since it determines how the transmission will operate to provide maximum performance and maneuverability with finger-tip control.

Bob, shown above examining a CD-500 transmission, is involved in developing a new improved system of governing automatic control systems of many Ordnance and commercial transmissions. This involves basic analysis, design and testing of pilot samples. These hydraulic controls provide proper sequence for clutch operation to determine speed range, convertor or lock-up operation. They also provide steering control for the vehicle when this function is included in the transmission.

Bob and other Allison engineers are continually applying their knowledge, experience and imagination to find successful answers in the never-ending search for product improvement. There is a real engineering challenge at Allison and lifetime opportunities for engineers.

Allison DIVISION, GENERAL MOTORS CORPORATION • Indianapolis, Ind.

Design, development and production—high power TURBINE ENGINES for modern aircraft . . . heavy duty TRANSMISSIONS for Ordnance and Commercial vehicles . . . DIESEL LOCOMOTIVE PARTS . . . PRECISION BEARINGS for aircraft, Diesel locomotives and special application.

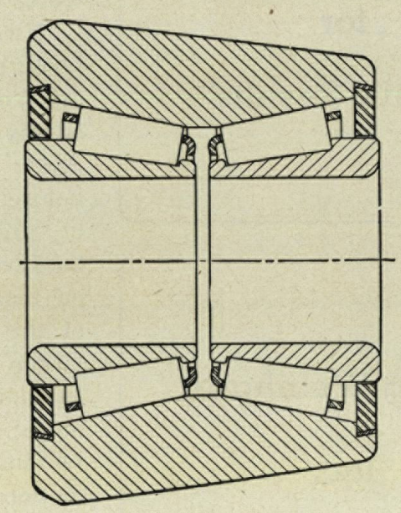
Another page for **YOUR BEARING NOTEBOOK**

Makes short work of tall timber

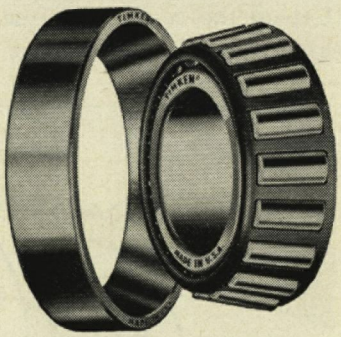
Motorized log-loaders speed their way over rough terrain to get to a cutting site. Once there, they load cut timber in a hurry, then head for the next place they're needed. To keep them on the go without costly interruptions, designers specify Timken® tapered roller bearings in the wheels, cone rollers, swing drums, steering pivot and other vital moving parts. Timken bearings have extra load-carrying capacity. They prevent wear, reduce maintenance. Assure continuous, trouble-free operation.

How to mount log-loader cone rollers on TIMKEN® bearings

This special roller bearing assembly has two single-row extended bearing cones mounted directly into the roller. The outer race of the bearing is actually the roller itself with the tapers ground to the proper angle for the bearing cone and roller assemblies. Closures are pressed into each end of the roller with running clearance at the extended cone rib.



TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



Want to learn more about bearings?

Some of the engineering problems you'll face after graduation will involve bearing applications. If you'd like to learn more about this phase of engineering, we'll be glad to help. Clip this page for future reference, and for a free copy of the 270-page General Information Manual on Timken bearings, write today to The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⊖ AND THRUST —⊖— LOADS OR ANY COMBINATION ✳

Great Men of Science

(Concluded from page 14)

structural formulas of complicated compounds. Up until this time complex structural formulas such as benzene (C_6H_8) had been represented by "open chains." It finally occurred to Kekulé that the carbons of benzene were in a ring held together by alternate double and single bonds. Many complicated compounds whose structure resembles that of benzene have been understood more fully thanks to this remarkable theory.

Kekulé arrived at this theory by a very unusual means. It came to him as a dream, described in his own words below.

"I was sitting, writing in my textbook; but the work did not progress; my thoughts were elsewhere. I turned my chair to the fire and dozed. Again the atoms were gambolling before my eyes. This time the smaller groups kept modestly in the background. My mental eye, rendered more acute by repeated visions of the kind, could now distinguish larger structures, of manifold conformation: long rows, sometimes more closely fitted together; all twining and twisting in snake-like motion. But look! What was that? One of the snakes had seized hold of its own tail, and the form whirled mockingly before my eyes. As if by a flash of lightning I awoke; and this time also I spent the rest of the night in working out the consequences of the hypothesis.

"Let us learn to dream, gentlemen; then perhaps we shall find the truth . . . but let us beware of publishing our dreams before they have been put to the proof by the waking understanding."

Of course this mere dream would have had no value if he had not had the chemistry background to create it.

In the later years of his life Kekulé became physically weak due to the strenuous work he did in starting his career. Although he became physically ill, he remained in good mental condition up to his death. His laboratory work was slowed down considerably, and most of his last work consisted of checking experiments of people who thought they had disproven some of his work. Such work generally ended by establishing the truths of Kekulé's laws even stronger than before.

Kekulé's research in chemistry seemed uninteresting and unimportant to many in his day. His achievements in the theories of molecular structure, organic compounds, and valence have certainly filled a big gap in chemistry today. These theories laid the foundation of our many complex formulas. Such theories could have been developed only by a truly brilliant, devoted scientist with a vivid imagination as Kekulé.

Let's keep the record straight

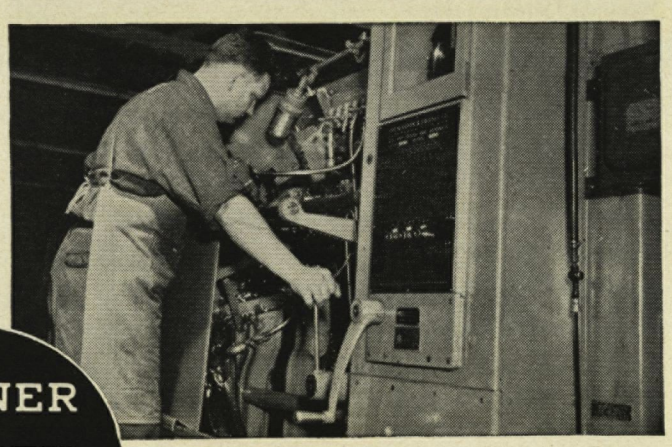
There has been too much loose talk about prices, wages, dividends, taxes. Let's see.

Compare 1939 (the last normal year before the war) to 1951 (the last year for which there are figures).

Prices have gone	**up**	**86%**
Weekly earnings of production workers	**up**	**172%**
Dividends of corporations	**up**	**148%**
Federal Taxes	**up**	**843%**

By the use of more efficient machines, industry has been able to increase wages twice as much as prices have risen, and has increased dividends to its millions of owners. If you don't feel that much better off, put the blame where it belongs . . . on taxes. Authorities say 10 billion dollars could be cut out of those taxes without affecting government safety or service a particle.

Remember the figures. Just for the record.



WARNER & SWASEY
Cleveland
Machine Tools
Textile
Machinery

Sources: Tax Foundation; U. S. Department of Labor; Annual Report of the Secretary of the Treasury and The Budget for the Fiscal Year, 1953.

Hughes cooperative plan for

MASTER OF SCIENCE DEGREES

Purpose **TO ASSIST** outstanding graduates in obtaining their Master of Science Degrees while employed in industry and making significant contributions to important military work.

Eligibility June 1953 college graduates and members of the armed services being honorably discharged prior to September, 1953, holding degrees in the following fields:

ELECTRICAL ENGINEERING
PHYSICS
MECHANICAL ENGINEERING

Those chosen to participate in this plan will be from the upper portion of their graduating classes and will have evidenced outstanding ability. They must also have displayed some degree of creative ability and possess personality traits enabling them to work well with others.

Citizenship Applicants must be United States citizens, and awards will be contingent upon obtaining appropriate security clearance, as work at the Hughes Research and Development Laboratories may be related to National Defense projects.

Universities Candidates for Master of Science Degrees must meet the entrance requirements for advanced study at the University of California at Los Angeles or the University of Southern California.

Program Under this Cooperative Plan, commencing June 1953, participants will follow this schedule of employment at Hughes:

FULL TIME—from June, 1953 to Sept., 1953.
HALF TIME—from Sept., 1953 to June, 1954.
FULL TIME—from June, 1954 to Sept., 1954.
HALF TIME—from Sept., 1954 to June, 1955.

Recipients will earn five-eighths of a normal salary each year and attend a university half time during regular sessions working on their Master's Degree.

Salaries The salary will be commensurate with the individual's ability and experience, and will reflect the average in the electronics industry. Salary growth will be on the same basis as for full-time members of the engineering staff. In addition, the individuals will be eligible for health, accident, and life insurance benefits, as well as other benefits accruing to full-time members.

Travel and Moving Expenses For those residing outside of the Southern California area, actual travel and moving expenses will be allowed up to ten per cent of the full starting annual salary.

Sponsorship Tuition, admission fee, and required books at either the University of California at Los Angeles or the University of Southern California, covering the required number of units necessary to obtain a Master's Degree, will be provided by Hughes Research and Development Laboratories.

Number of Awards Approximately one hundred Cooperative Awards are made each year, if sufficient qualified candidates present themselves.

Selection of Candidates Candidates will be selected by the Committee for Graduate Study of the Hughes Research and Development Laboratories.

Application Procedure Application forms should be obtained prior to February 15, 1953. Completed applications accompanied by up-to-date grade transcripts must be returned not later than February 28, 1953. Selections will be made during the month of March.

Address correspondence to

COMMITTEE FOR GRADUATE STUDY

HUGHES
RESEARCH
AND DEVELOPMENT
LABORATORIES

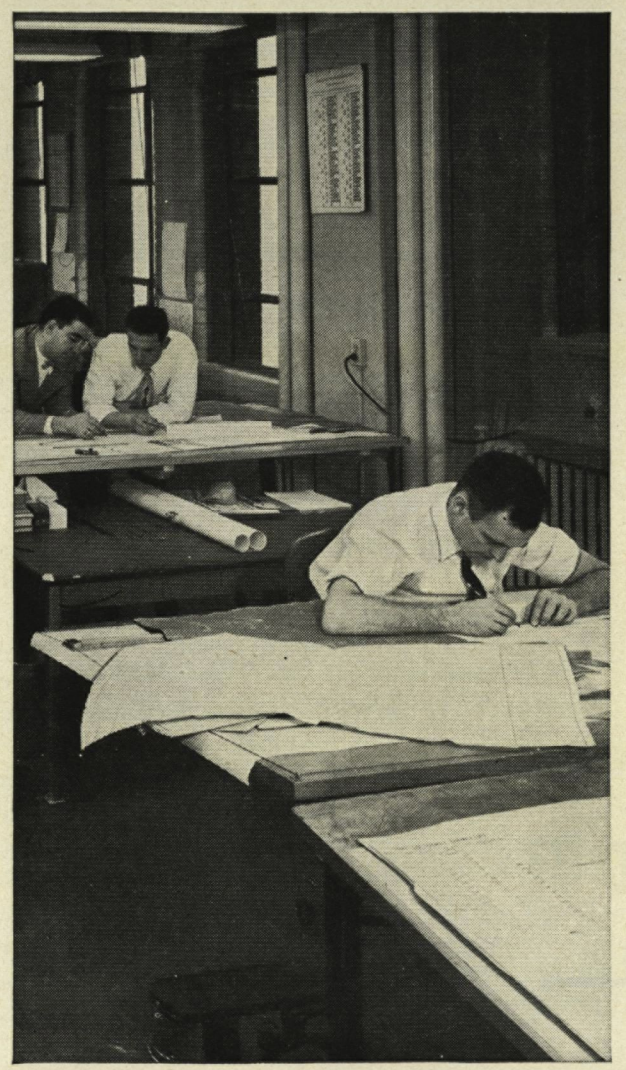
Culver City, Los Angeles County, California

Board and room to grow!

"Sure. I realize there are opportunities at General Motors. But how long will I be stuck on a drafting board before I can take advantage of them?"

This is a very familiar question to our College Representatives at their job conferences with engineering seniors.

And—in the individual case—frankly it's a hard question to answer. For often first jobs for graduates in certain phases of engineering work are at a drafting board. And the length of time the individual stays at a drafting board depends on many variables—most important being the individual's own talents and his ability to develop them.



But there is one general answer that can be made. And it's a very recent one. At a large gathering of General Motors engineers—many of them in top management—others in important divisional positions—this question was asked:

"How many of you started your GM careers on a drafting board?" The answer: practically everyone said "I did!"

So perhaps the best reply to your query about the duration of your drafting board experience is to say — "there are drafting boards and drafting boards." And a GM drafting board has this advantage—it can lead to a secure and satisfying life work in a company headed, in many cases, by engineers and with a record of supplying engineers with the equipment and the associations and the opportunities they ask to make the most of their particular training.

May we suggest you ask any such questions of our College Representative. Your College Placement Office can arrange a meeting with him on his next visit to your campus. Or drop us a line.

GM POSITIONS NOW AVAILABLE IN THESE FIELDS:

Mechanical Engineering
Electrical Engineering
Metallurgical Engineering
Industrial Engineering
Chemical Engineering

GENERAL MOTORS

Personnel Staff
Detroit 2, Michigan

Research & Development

(*Concluded from page* 16)

side to side under the cab for smoother riding.

The experimental locomotive, which has completed more than 60,000 miles of operation on six railroads, was described in a paper presented before the American Society of Mechanical Engineers by Charles Kerr, Jr., consulting transportation engineer for Westinghouse at East Pittsburgh, Pa.

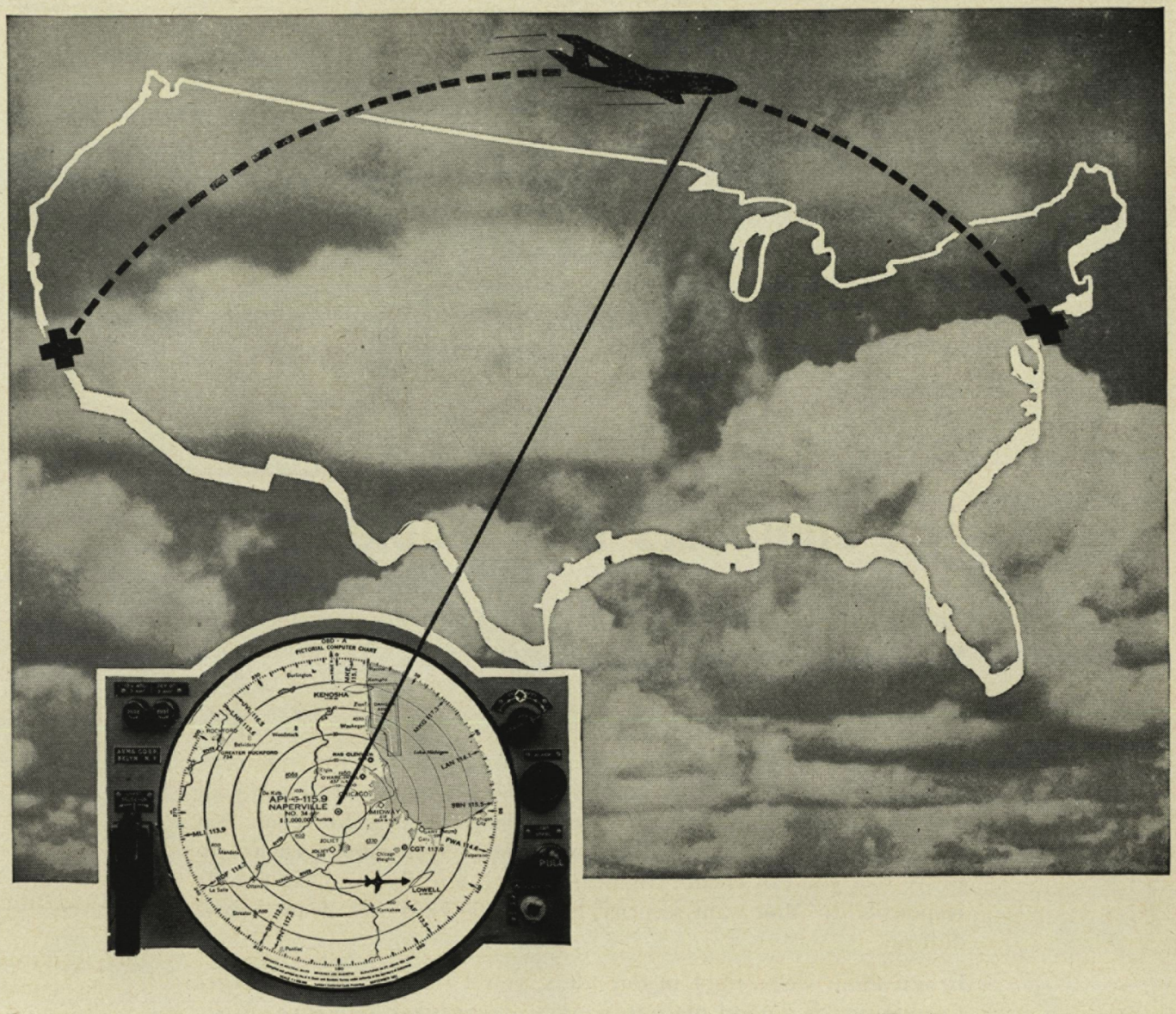
"This locomotive is the first gas turbine passenger unit to be operated in the United States." "It is an eight-axle, single-unit locomotive, weighing 247 tons, powered by two 2,000-horsepower gas turbines with an electric transmission."

The radically new type of locomotive running gear consists of four two-axle trucks. Each of these trucks not only swivels in the usual fashion when rounding a curve, but also moves laterally under the cab of the locomotive. A roller carriage is attached to each truck and the cab of the engine rests on the rollers of the four carriages, thus permitting lateral motion.

Universally favorable comment has been received on the smooth riding and good tracking features of the locomotive. Except for one minor change in the stiffness of a spring, no troubles with the novel running gear have been experienced.

Fuel consumption in gallons, has been approximately twice that of diesel locomotives in the same service. But the price paid for residual oils has varied from 3.5 cents per gallon up, depending upon location, against diesel oil prices of 8.6 cents per gallon up. Lubricating oil consumption has been practically nil.

This locomotive is the product of an extensive development program which includes first the design, construction and test of a gas turbine power plant suitable for locomotive service, followed by the construction of the locomotive, and finally road service to determine the adequacy of the design.



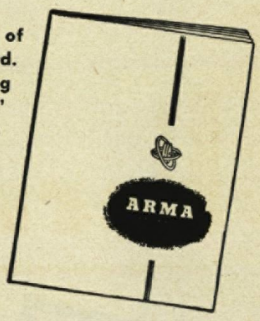
Now! Arma puts the plane on the map...

Arma's new Pictorial Computer tells a pilot his exact location and heading, continuously on a luminous screen—throughout a given flight. Here's how it works:

A film strip shows the various OMNI stations over which the aircraft will pass. During flight, the Arma Computer automatically indicates position and heading of the plane on a TV-like screen. In other words, the Computer shows continuously and exactly where the plane is, in respect to the ground, at every moment of flight—regardless of weather, altitude or speed.

Arma has worked closely with the Air Navigation Development Board and the Civil Aeronautics Administration in developing this pictorial computer for use in proposed advanced systems of air traffic control. For over 34 years Arma has cooperated with the Army, Navy and Air Force in developing important military equipment — and recently with the Atomic Energy Commission. *Arma Corporation, Brooklyn, N. Y.; Mineola, N. Y. Subsidiary of American Bosch Corporation.*

If you would like a detailed description of Arma's Pictorial Computer, just drop us a card. We will send you further information, along with the booklet "Engineering at Arma," which describes the opportunities of an engineering career with this outstanding leader in electronics. Write to Engineering Division, Arma Corporation, 254 36th Street, Brooklyn 32, N. Y.



ARMA ADVANCED ELECTRONICS FOR CONTROL

We think engineers are people . . .

That may be an odd statement, but you'll find there's a tendency in some companies to treat engineers like engines . . . You're so much high-priced machinery, just another highly-polished cog in a big gear.

Not to us, though.

For nearly 70 years now we've been working with and for engineers, and by this time we feel we know something about them — and you. For example, we know that you're probably looking for a job that will let you and help you learn and grow. You want a chance to prove that you can *create,* engineering-wise, and that you can handle responsibility. You want security, but not the kind that means a safe, dull rut.

If you think we're right in our ideas, you'll find the Harnischfeger Corporation is a good place to work — for a good long time. Write our Training Director today, for a free booklet describing the opportunities for engineers with Harnischfeger.

We want — Engineers
. . . electrical, mechanical, civil, mining, general or industrial

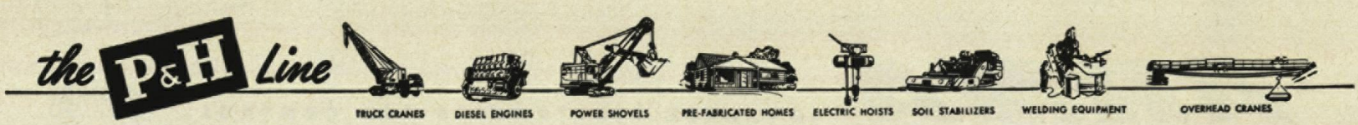
***For* — Sales, design and industrial engineering positions.**

***We make* — *Industrial Products:* P&H Overhead Cranes, Electrical Hoists, Welding Equipment, Welding Electrodes, Truck and Crawler Cranes.**

Construction Equipment:* P&H Power Shovels, Excavators, Truck Cranes, Mining Shovels, Soil Stabilizers. *Pre-Fabricated Homes. Diesel Engines.

HARNISCHFEGER CORPORATION

Headquarters in Milwaukee, Wis.; 9 plants in 5 states; 18 district sales offices plus export offices. Established 1884. Over 4,000 employees.



Takes a lot to lay a carpet in the jungle

The scene is "darkest Africa".

But Africa is lightening. Man's quest for minerals, for new areas for agriculture and trade, is slashing ultra-modern, glaring-white air strips in once impenetrable jungle.

Those pavers, portable air compressors, pumps and air tools—such as you might see working a city street—are Worthington Blue Brutes going to "lay a carpet" in that hole in the jungle.

Thus, Worthington, a major producer of equipment for public works, industry and farm, brings the fruits of American technical genius to the strange places of the world.

And illustrates, too, how the unique American talent of *diversification* helps public, employees and stockholders. For Worthington makes many things—not just construction equipment and pumps, but also engines, water works machinery, power transmission, petroleum equipment, air conditioning and refrigeration, many others.

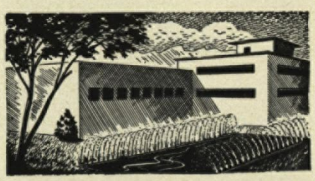
Such diversification builds *stability* . . . makes Worthington, 112 years old, a strong link in the chain of American business.

Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Harrison, New Jersey.

WORTHINGTON

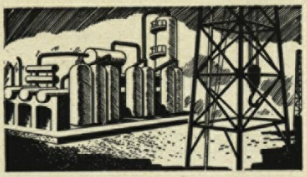
The Sign of Value Around the World

1.14



Good Water and Sanitation—engines pumps • water treatment • comminutors air compressors • air tools

Lower-Cost Manufacturing—pumps compressors • steam turbines • motors power transmission • air conditioning



Petroleum Products—compressors engines • pumps • chilling equipment refrigeration • decoking systems

More Abundant Food—compressors fertilizer mixers • air conditioning refrigeration • pumps

History of Library

(*Concluded from page* 11)

Rose Polytechnic Institute had by the year 1923 moved to its new location about four miles east of town on national road 40. The library had somewhat better housing in the new building, but did not have a separate building as originally planned.

Miss Edna L. Neukom was appointed to the position of assistant librarian in 1928. Also about this same time a set of the Industrial Arts Index was acquired. These books are invaluable in the type of reference work done at the Institute.

Miss Mary E. King became the assistant librarian in 1929 and remained in that position for two years. Miss King is now the cataloger in the library at Indiana State Teachers College.

Miss Helen G. Roedel succeeded Miss King as assistant librarian in 1931. The library at this time contained sixteen thousand volumes and two thousand pamphlets.

In the school year of 1934, Professor John L. Bloxsome, head of the Humanities Department, took over the duties of the librarian after Professor Faurot had retired.

In the latter part of 1949 the necessary remodeling to make a greater library for Rose Polytechnic was started. The old machine design room was remodeled to make the new reading room. A partition was removed from the stack section in order to make it an integral part of the new library. The stack section remained in the same relative position but was considerably enlarged. The old library was changed into expanded administrative offices.

The new library was ready for occupancy on March 23, 1950. Although the library wasn't quite finished, it was still open for business. At this same time Rose also acquired a new librarian, Carson W. Bennett, who received his library training at George Peabody College for Teachers.

On May 1, 1950, Mrs. Elizabeth Bevington came to Rose as an assistant librarian. She received her library training at the University of Wisconsin. She was replaced by Miss Nina J. Mahaffey, who is the present assistant librarian.

As a part of its new and expanded program, the library has been getting more general works and more fiction. Alony with this expansion it certainly has kept up well with the most important of its purposes—the acquisition of the best technical and engineering literature. Since March 1950, the library has acquired three thousand bound volumes and many additional periodicals and pamphlets. This growth in the library is unprecedented.

With its present budget and gifts the library hopes to continue to make long strides forward in meeting the needs of the faculty and the students for both technical and recreational material.

THE DU PONT DIGEST

THE TECHNICAL MAN IN Production Supervision

Scientists who know both people and processes are needed to keep Du Pont's 71 plants humming

H. D. Tallman, *B. S. in Industrial Administration, Yale '37, checks on product loading methods in Du Pont's Belle, West Va., synthetic urea plant.*

Keeping production rolling in a modern industrial plant is a job that appeals to men trained in many branches of science and engineering. If you are looking for opportunities in this field, you won't have to look far at Du Pont, where nearly half the entire technical force is assigned to production supervision.

To qualify, a man must have the ability to understand both the mechanical and chemical phases of production. In addition, he should be a good planner and, above all, have a knack for handling people.

The production supervisor—there are several levels at Du Pont—has three important areas of responsibility. The first is to the men working for him. He must be able to appraise them skillfully and assign duties accordingly. He must train them not only in the efficient operation of equipment but in safe working practices as well.

A second responsibility is to the customer. He must get the product out on time and provide uniformly high quality at the lowest possible cost. When demand for a product is subject to rapid fluctuations, he must be prepared to make quick readjustments in the scheduling of both manpower and materials.

William Chelgren, *B.S. in M.E., Armour Institute of Technology '38, explains quality control methods to a group of Du Pont production supervisors.*

The supervisor's third responsibility is to the higher management. Here, again, quality and cost are important factors. He is expected to prepare forecasts, to justify unusual expenditures, and to suggest process improvements leading to greater yield and better quality at lower costs.

One of the toughest nuts a production supervisor has to crack is the scheduling of preventive maintenance for minimum interference with production. In some companies where products are turned out in small-unit operations, a program of breakdown maintenance suffices. At Du Pont, however, where large-unit operations are the rule, unscheduled downtime is costly and something to be avoided whenever possible.

Since it makes over 1200 products and product lines, Du Pont can offer to men interested in production supervision opportunities in many types of operations. In the next issue of the *Digest*, we will describe a specific production operation in one of our 71 plants.

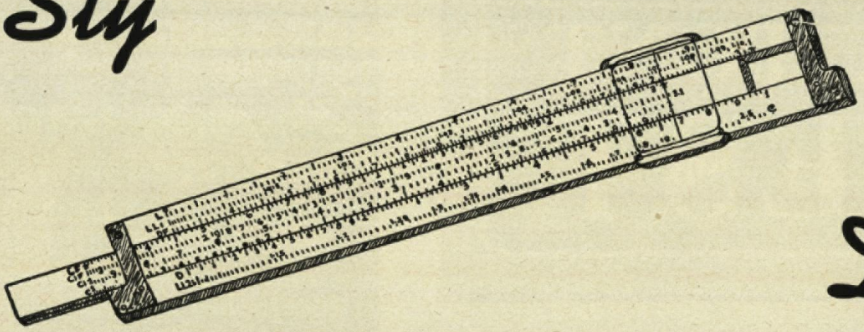
36-PAGE BOOK, "The Du Pont Company and the College Graduate," describes opportunities for men and women with many types of scientific training. For copy, write: 2521 Nemours Building, Wilmington, Delaware.

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

BETTER THINGS FOR BETTER LIVING
. . . *THROUGH CHEMISTRY*

Listen to "Cavalcade of America," Tuesday Nights on NBC—See It Every Other Wednesday on NBC TV

Sly



Droolings

Stolen by Dick Bosshardt, soph., m.e.

June (a bride) was showing her uncle over their new home.

"This is my room, Uncle. You see we have twin beds; they are so much more hygienic. That is Harry's and this is mine."

"Then the uncle noticed a blue china clock on the mantle and remarked, "What a charming clock."

"Yes," replied June, "it's a wedding present from dear Grandma."

A few weeks later the uncle received a note from June telling how the blue clock had disappeared the very afternoon he was there. Could he throw any light on the subject?

The uncle answered by return mail. "Dear June, look in Harry's bed."

* * * * *

(Overheard in dressing room)

Coach: You're out of condition, Badger. Whatcha been doin' — studyin'.

* * * * *

Engineer (pouring a bottle of beer): "Say when, honey."

Co-ed: "Oh—right after the next drink."

* * * * *

Sue: "Yes, I wrote a confession story, once."

Helen: "Did they publish it?"

Sue: "No, but the editor came all the way from New York to see me."

* * * * *

She was a hula dancer
He was a guy from the fleet—
He forgot the sugar he left at home
When she shook her shredded wheat.

During the last war, two G.I.'s found themselves surrounded by the enemy in a German countryside. Desperate for a means of escape, they waited 'til nightfall, skinned a dead cow that was found, and started across the pasture inside the hide.

Halfway across, Pat, up front hollers back, "How're ya doin', Mike?"

"O.K., Pat, why?"

"Just thought you better know, Mike. Here comes the bull!"

"How?"

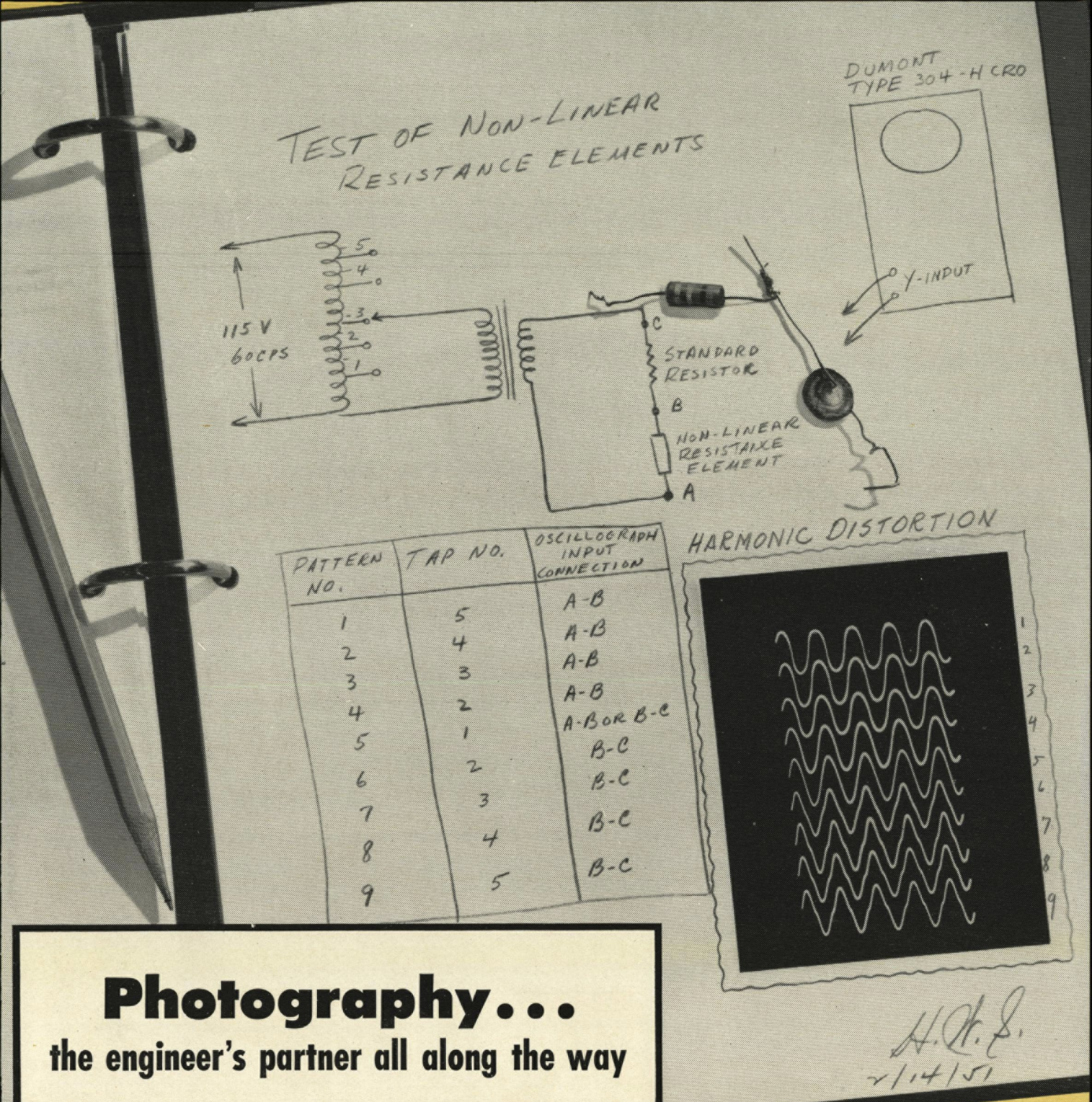
"I'm going to have a little one,"
Said the girl friend, gay and frisky;
But the boy friend up and fainted
Not knowing she meant whiskey!

* * * * *

A sorority girl wrote home: ". . . and I am gaining on this awful food that they serve, too. I weigh 120 stripped, but I don't know whether the scale in front of the drug store is right."

* * * * *

Then there was the nervous June bride who didn't know whether to say, "I do", "I have", or "I will".



Photography...

the engineer's partner all along the way

● Photography proves itself an important and valuable ally all through engineering.

Its speed in copying and reproducing data saves valuable time. Its use in radiography and instrument recording improves manufacturing processes and finished products. High speed movies help solve design problems.

Applications of photography in science and industry are steadily multiplying. This has attracted graduates in the physical sciences and engineering to find positions with the Eastman Kodak Company. If you are interested, write to Business and Technical Personnel Department, Eastman Kodak Company, Rochester 4, N. Y.

FUNCTIONAL PHOTOGRAPHY

serves industrial, commercial, and scientific progress

Here photographic oscillograph traces become an indisputable part of an engineer's notes, recording the effect of a new electronic circuit element on wave form. This record of performance stands ready for new evaluation at any time.

Kodak
TRADE-MARK

MY QUESTION TO THE G-E STUDENT INFORMATION PANEL:

"What qualities do I need for a successful career with a company like General Electric?"

...HARRY K. LEADER, Lafayette College, 1954

Two answers to this question, given at a student information meeting held in July, 1952, between G-E personnel and representative college students, are printed below. If you have a question you would like answered, or seek further information about General Electric, mail your request to College Editor, Dept. 221-6, General Electric Co., Schenectady, N. Y.

G. C. HOUSTON, *Manufacturing Services Division* . . . While this is a rather broad question, I am sure it is one of real importance to any young man starting out in industry and looking forward to a position of responsibility in any of our successful industrial enterprises.

The mere asking of this question indicates that the individual has a definite goal or objective. This is important since progress can be made only if we attempt to reach a well-defined objective—even though it may be modified to some extent in the light of later experience. In G.E. we are looking for young men who have not only determined their objective but who are ready to work for it—who accept responsibility and have ability to get things done—who work well with others—to be a part of the team.

This calls for other qualities essential to long range success. We look for the enthusiastic individual, one not easily discouraged, and who can inspire the confidence of his co-workers. We desire individuals who show imagination and good judgment—particularly the ability to look ahead and maintain perspective beyond the immediate situation. Finally, we cannot overlook the qualities of loyalty and dependability since these are important in steering the individual through periods of discouragement which occur in every career.

When you decide on your business affiliation, make sure you associate yourself with a company that is soundly managed, that has a good business future, and that is the kind of company you would like to be a part of for the long pull.

E. S. WILLIS, *Corporate Services Division* . . . A successful career with a company like General Electric is built on the same qualities that contribute to success in any endeavor. However, in G.E., there is additional opportunity to develop these qualities because of the wide variety of training sources and openings which are available.

Basic qualities needed for any successful career include an open mind, willingness to accept responsibility, persistence, adaptability, co-operativeness, and common sense intelligence. Others such as physical well-being, ability of expression, and sound inquisitiveness also go to make up a truly qualified individual.

Most important is the fact that General Electric offers a wealth of opportunity to develop special capabilities and talents. The broad selection of training courses, in any chosen field, gives you a chance to sharpen your basic training and abilities. By decentralizing operations into about 70 different businesses, there is opportunity to see—in comprehendable dimensions—the full operation of the business. It means, too, that senior managers and young employees are more closely associated—a real advantage for the young man on his way up.

Also, our business requires specialists as well as managers. Thus, there are equal chances for success for those who concentrate in particular fields such as research, design, accounting, and planning.

So set your cap for a goal. And capitalize on your native qualities, which fortunately are different with each of us.

You can put your confidence in—

GENERAL ELECTRIC