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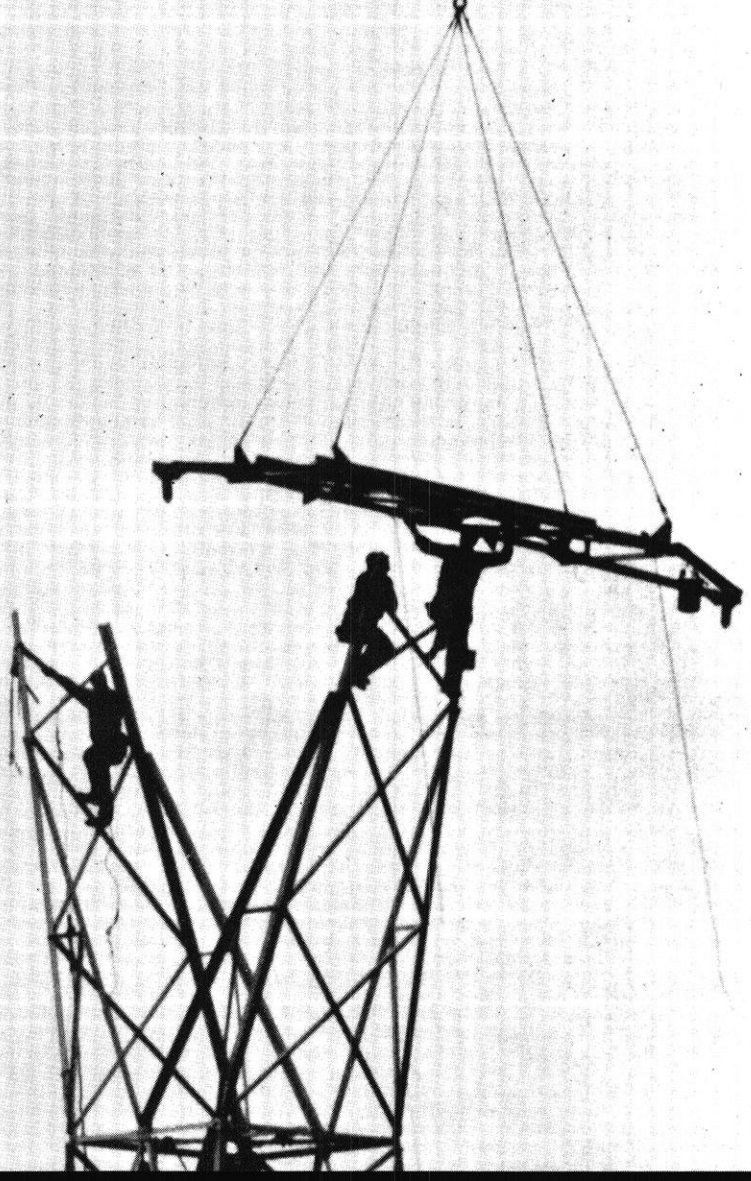
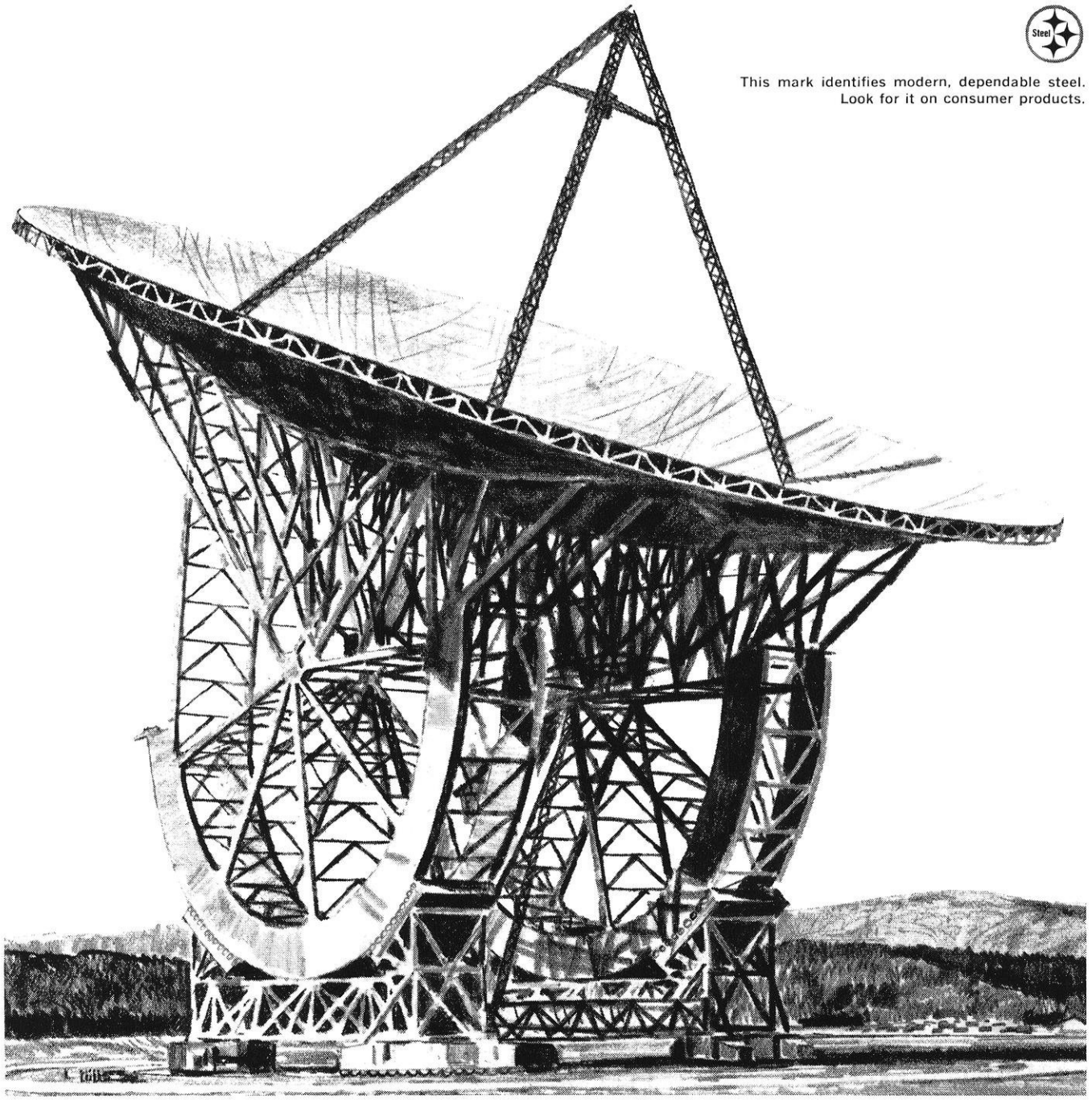
APRIL, 1961 • 25 CENTS
MEMBER E. C. M. A.

THE WISCONSIN ENGINEER





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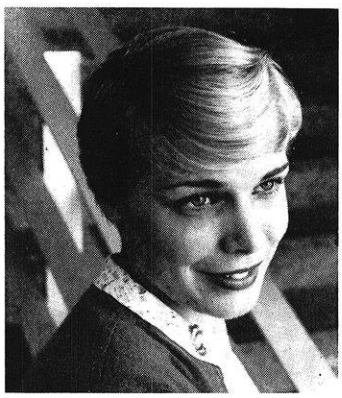

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APRIL, 1961

THE WISCONSIN ENGINEER

The Student Engineer's Magazine Founded in 1896

VOLUME 65, NUMBER 7

THIS MONTH'S COVER: 1,700-lb. sky hook kept as many as four riggers busy bolting assemblies in place. 305 hp Hiller 12E made more than 30 trips to complete upper 93 feet of 200-ft. tower in slightly more than four hours. Conventional gin pole method would have taken five days for same section.

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MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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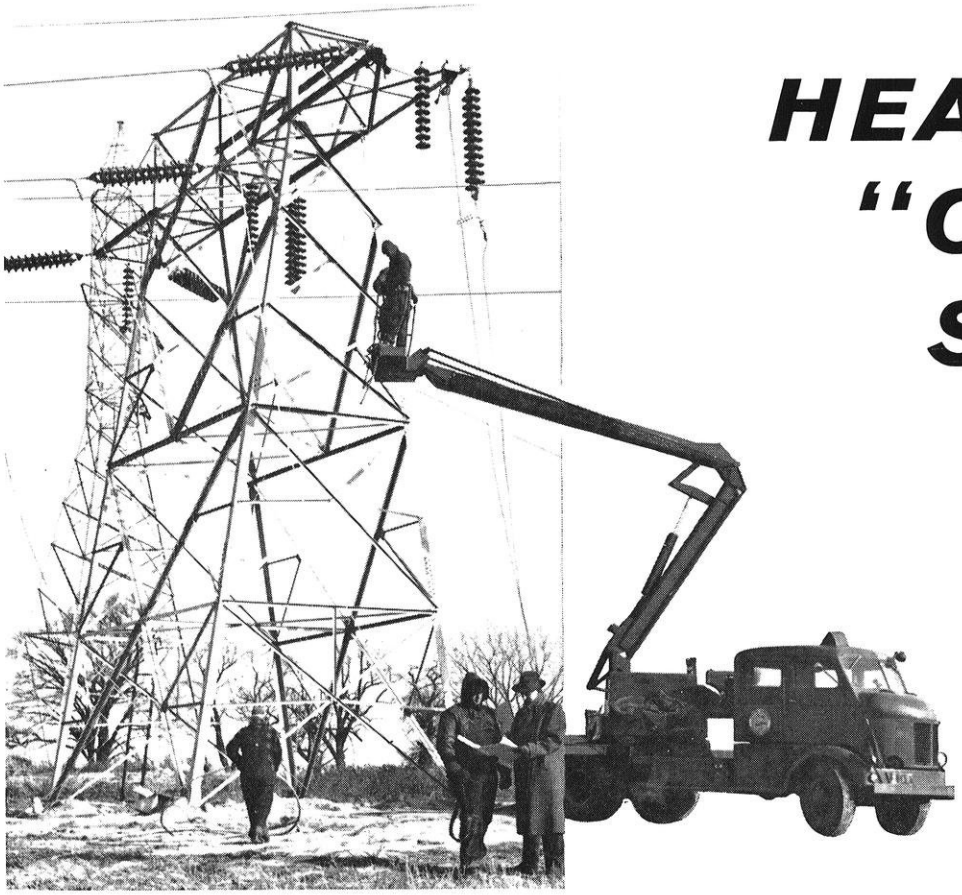


HEATING "OUTER SPACE"

ENGINEERS REDUCE TRANSMISSION LOSS

Although it may seem far-fetched, Wisconsin Electric Power Company engineers are concerned with heating "outer space." Our engineers recognize that the economics of heat loss from conductors to the atmosphere affects design decisions. For instance, while designing a new 138,000 volt circuit scheduled to replace an existing line in three years, they computed operating costs for the three-year period and decided immediate replacement was best. The old line has been of adequate size and has provided reliable service for more than 35 years. But consideration of recent system load increases which affected this old line showed that the heat loss could be substantially reduced by replacement three years ahead of schedule. This will result in a six-figure saving in fuel costs over three years and will about pay for the cost of replacing present conductors.

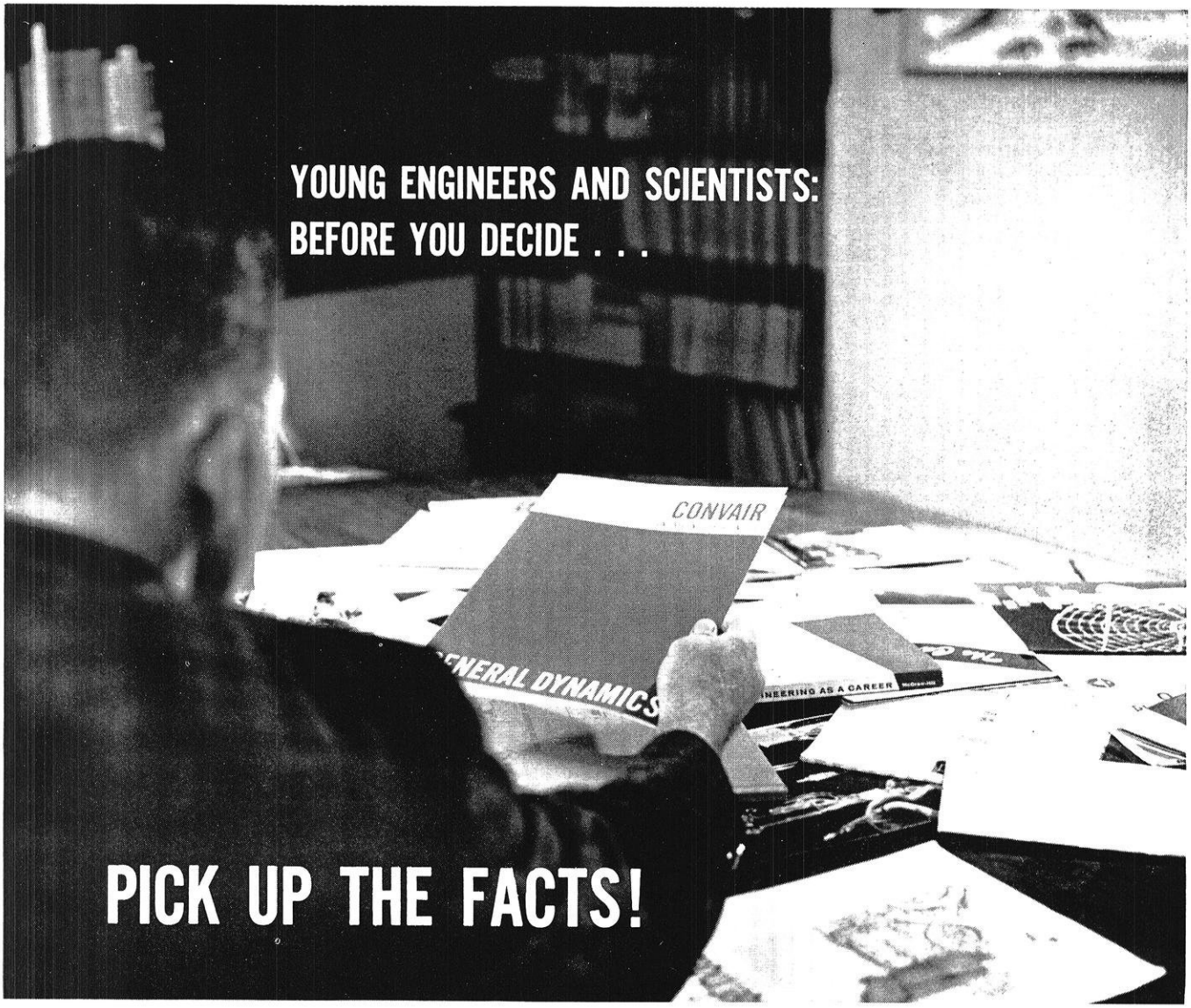
This is typical of problems involving both transmission line design and system planning which are assigned to Company engineers. System and transmission engineers are now using analog and digital computers to develop new concepts for future power transmission and distribution. Investigate our employment opportunities in all fields of engineering — complete with well-rounded training programs for cadet engineers and offering excellent employe benefits.

WISCONSIN ELECTRIC POWER COMPANY SYSTEM

Wisconsin Electric Power Co. MILWAUKEE, WIS.

Wisconsin Michigan Power Co. APPLETON, WIS.

Wisconsin Natural Gas Co. RACINE, WIS.



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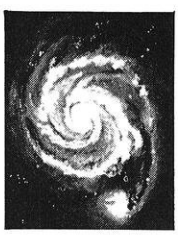
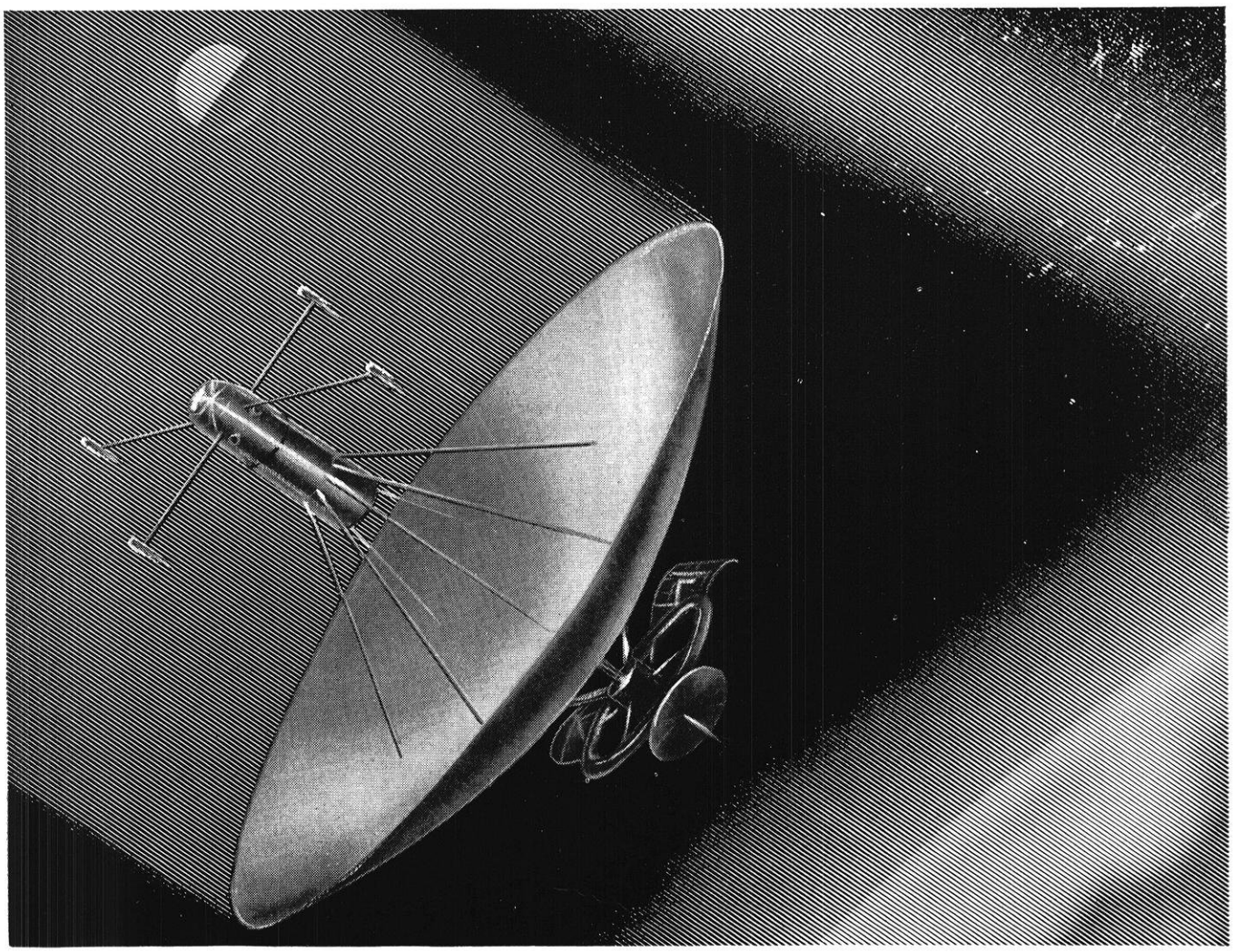
CONVAIR  A DIVISION OF GENERAL DYNAMICS



Advanced power conversion systems for space vehicles utilizing energy of the sun or heat from a nuclear reactor are now being developed by Garrett's AiResearch divisions. Under evaluation are dynamic and static systems which convert heat into a continuous electrical power supply for space flight missions of extended duration. Component and material developments for these systems are being advanced in the fields of liquid metals, heat transfer, nonmechanical and turboelectric energy conversion, turbomachinery, alternators and controls.

Besides solar and nuclear power systems for space applications, other product areas at Garrett include small gas turbine engines, environmental systems for advanced flight vehicles, cryogenic fluid systems and controls, pneumatic valves and controls and missile accessory power units.

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Things We Know About Tomorrow

EYES MADE FOR DARKNESS Westinghouse scientists expect that airplane pilots are going to be able to see the ground clearly on a cloudy, moonless night. Astronomers will be able to see vastly beyond the present range of their telescopes, perhaps to the final boundary of the universe, if there is one. Policemen will peer into dark alleys and see through special binoculars. Scientists at Westinghouse are working on the proposition that no matter how dark it looks to us, there is plenty of "light" everywhere: on a black night, in a coal mine, in a sealed room. We just have the wrong kind of eyes to see it all. So they have developed a device that "sees" infrared light which we can sense only as heat...another device that "sees" ultraviolet light, which we can detect only when it gives us sunburn...still another that picks up a single "packet" of light, the smallest amount that can exist, and multiplies it into a visible flash. You can be sure...if it's **Westinghouse**

ENGINEERS: For full information on rewarding career opportunities at Westinghouse write to L. H. Noggle, Westinghouse Educational Department, Ardmore & Brinton Roads, Pittsburgh 21, Pa.

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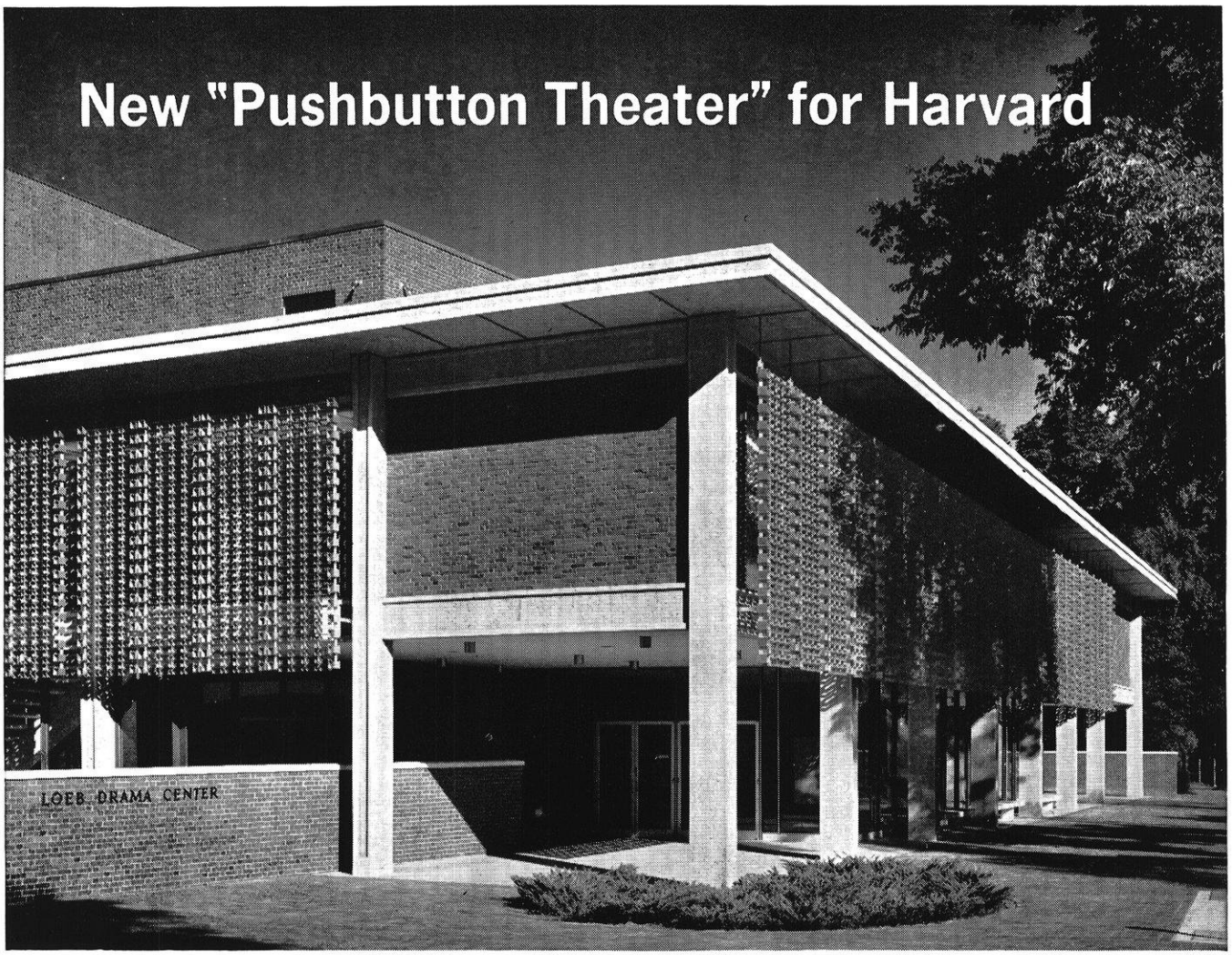

LOEB DRAMA CENTER, Harvard University, Cambridge, Mass.

Architect: HUGH A. STUBBINS & ASSOCIATES, CAMBRIDGE, MASS. *Plumbing & Heating Engineer:* DELBROOK ENGINEERING, INC., CAMBRIDGE, MASS. *General Contractor:* GEORGE A. FULLER CO., NEW YORK, N. Y. *Plumbing & Sprinkler Contractor:* C. H. CRONIN, INC., BOSTON, MASS. *Heating, Ventilating & Air Conditioning Contractor:* THOMAS G. GALLAGHER, INC., SOMERVILLE, MASS.

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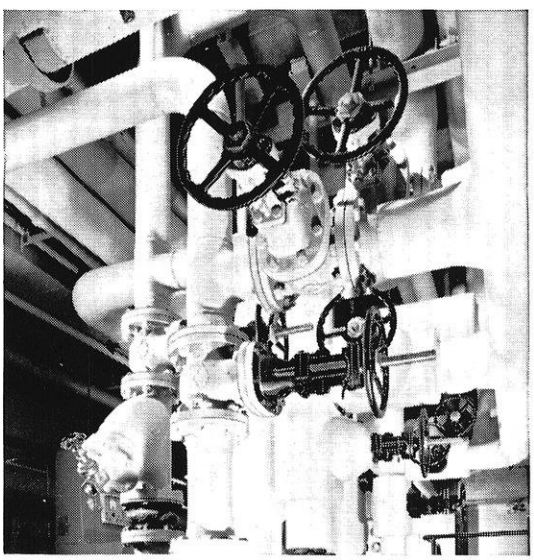

Jenkins Iron Body Gate Valves in the theater's piping system

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LOOK FOR THE JENKINS DIAMOND

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Rambling With The Editor

This column will truly live up to its name this month.

Most of the engineers who are nearing graduation and their first jobs are doing so with quite a bit of apprehension. If you fit into this category, (and if you don't, you soon will) be sure to read the article on page 14 entitled First Years in Industry. It may help to put your mind at ease.

We have tried this year to give you articles that will ready you for work in your chosen field. With our graduate issue, we tried to show you the advantages of graduate school and what the different engineering departments of the University have to offer. Our high school issue may not help you much, but it may help some of the people who follow you. We hope that our efforts have been of some good to you and may help you in later life.

Since this is the last issue put out by the two of us, we would like to express our gratitude at this time for the job done by this year's staff. They worked hard and stuck with us although at times conditions were without exaggeration, sheer chaos.

Next month the new staff headed by Roger Nehrbass, Editor and Jim Pellegrino, Business Manager, will take over. They still could use additions to their staffs, so don't be bashful about letting them know if you're interested in working next semester. It can be very good experience for you.

JOHN C. SCHUBERT
WILLIAM S. HUEBNER

The 135-degree heat of the test chamber shown here quickly melts a stick of butter, but does not affect the comfort of the man holding it. He is wearing an experimental air-conditioned suit, developed by the Navy and Westinghouse, that keeps him comfortable at a temperature of about 80 degrees F. A thermoelectric heating and cooling unit is fitted into the back of the suit; the battery pack in front provides power to make the suit completely portable.
—Photo Courtesy of Westinghouse Electric

Automotive Safety Devices

by Jack C. Rockwood me'61

CAUSE OF INJURY IN AUTOMOBILE ACCIDENTS

THE main cause of injury when a car crashes is the rapid decelerations and forces developed therefrom. When the human body is stopped against the front of the passenger compartment, it undergoes rapidly onset and concentrated forces which are beyond the range of human tolerances. Another cause of injury occurs because of ejection from the auto as when a door flies open upon impact.

Decelerations Involved in Car Crashes

The decelerations developed in a car crash at highway speeds set up very great forces on the passengers. It is these forces, if left uncontrolled, that cause the injury to the passengers. If it were practical to build a car so that it could absorb deceleration and acceleration forces, or keep them within the range of human tolerance limits, practically any type of collision could occur without injuring the passengers.

Present day cars can, however, attentuate these collision forces somewhat, as for example, when the front end of a car collapses upon hitting an object. Structural bending and yielding forward of the driving compartment may reduce the deceleration forces acting on the part of the car near the driver to less than one tenth the forces at the bumper. Fig. 1 below demonstrates how effective the structure of the modern car is in reducing the impact reaction to the vehicle occupants in a collision. The decelerative force is seen to decline rapidly as the distance from the front bumper increases.

It has been found that the passenger who decelerates with the car—as he will if he is restrained by a safety belt—will receive less injury than the passenger who is thrown forward onto the dashboard or out of the car onto the street. The decelerative forces involved in sudden stops will result in bodily injury to the occupants if they are thrown forward against the windshield, dashboard, or other structures or projections. Some means of restraint then is the answer for preventing these forces from causing injury.

While restraint with belts can decrease the chance of a fatality in a crash, the chances of minor or severe injuries from striking the interior of the car are still present. Protrusions, sharp edges, and knobs are lethal items when contacted by the human body at impact speed. The dangers from these can be overcome somewhat by dash padding, recessing the knobs, and designing for smooth contours around the forward part of the passenger compartment.

Injuries Caused by Ejection from Auto

Another factor revealed from studies of auto accidents is that in approximately 50 per cent of injury-producing accidents, the front doors opened and one or more occupants was ejected. Complete ejection of occupants through opened doors approximately doubled the risk of sustaining moderate through fatal injuries. The problem of doors opening in a crash is another problem the safety research program has found an answer for. Safety door latches have been designed to prevent opening of doors as the body is distorted from impact.

Human Tolerances

The human body is capable of withstanding great forces if they are of short duration and spread out over the body. Since the body is soft and flexible, it is easily punctured by a concentrated force. This fact is important to the driver of an auto which crashes. The ordinary steering wheel rim folds away with very little force and the driver's chest impacts the steering post with practically undiminished force. This can cause serious injury to the driver's chest and upper torso. The problem here is one of spreading the forces out and decreasing them to within the range of human tolerance. The recessed hub steering wheel which has been

developed from studies of this problem provides a good measure of safety for the driver in a head-on crash. It provides a built-in collapsible distance with which to decelerate the driver more slowly and prevent the sudden impact on the steering column.

WHAT HAPPENS WHEN A CAR CRASHES

In order to fully analyze the happenings of an auto accident, it must be observed while it happens. For this purpose, auto manufacturers have set up testing grounds and facilities where deliberate crashes can be staged and analyzed.

Deliberate Auto Crashes

At the auto manufacturers proving grounds, remotely controlled cars are crashed into barriers at various speeds and the results tabulated and analyzed. Car frame and body deflections, safety belt loading, subject responses to collision, and effect upon the human form dummies in a collision are some of the factors which are determined. Two moving vehicles can be used but it was found that crashing an auto into a fixed barrier produces similar injury-producing situations, and a more accurate photo/time study can be made of the crash since the location of the point of collision is fixed.

The Use of Dummy Subjects

The use of wired dummies facilitates determination of decelerations and reactions to deceleration. The car is driven by remote control into a barrier and high-speed motion pictures are taken of the car and its "occupants" just before and during the sudden deceleration upon impact.

In one type of test, an "adult" and a "child" dummy are seated in the front seat of the auto to be crashed into the barrier. It was found that collision deceleration is seldom unidirectional because impact is seldom perfectly head-on. Therefore, rotational as well as translational accelerations occur during collision. Decelerations are, however, predominately longitudinal.

The initial motion of the dummies consisted of a torso rotation about the hip joints, accompanied by an acceleration forward and upward relative to the car, at an angle of about 45 degrees. This movement continued until the dummies struck some part of the interior of the car.

The dummy in the driver's seat invariably sustained a chest blow from the steering wheel and a head blow from the upper part of the windshield or car roof. An adult dummy in the front passenger seat usually struck the upper part of the windshield or the car roof with the head, followed by a head blow on the lower part of the windshield or upper part of the instrument panel.

The small dummy in the front passenger seat first hit the lower part of the windshield or upper part of the instrument panel with the head and then struck the vertical face of the dash with the torso.

MEASURES USED TO PREVENT INJURY AND FATALITY IN CRASHES

The results of the crash research conducted by leading car manufacturers have been the development of the now common safety devices. The safety belt, recessed hub steering wheels, safety door latches, and dash padding are discussed here.

Seat Belts

There is no doubt that some form of restraining device will keep the motorist decelerating at the same rate as the car and prevent him from being thrown out or against the car body. Also, if restrained, the driver will be less likely to lose control of the vehicle during a minor accident, and be injured because the vehicle subsequently went out of control.

Experiments show that a belt, by restraining the torso, can prevent or greatly reduce the magnitude of a head blow on parts of the vehicle structure. A human head weighs about 10 lb and if it suffers a deceleration of say, 20 g's, the head would be capable of exerting a force of 200 lb. But the head is not able to move entirely on its own and the "equivalent mass" may be much greater than 10 lb because of the added effects of parts or the whole of the torso. If, however, the head hits a solid structure which will not dent or break easily, the deceleration will be much greater than 20g and, in consequence, the impact forces will be great enough to cause the head to yield, and injuries to the skull and face will be unavoidable. It is essential that a safety belt should be able to restrain the upper part of the torso and should be strong enough to withstand the appreciable forces arising from the decelerations produced in vehicle crashes. Some belts now supplied by car manufacturers do not restrain the upper part of the torso and, although they may keep a person in his seat, they do not prevent violent motion of the head.

The use of a shoulder harness overcomes this fault of the lap belt. Experiment on the relative efficiency of lap belts and shoulder harness in vehicle collisions at 25-mph have shown that shoulder-loop belts are more effective than

(Continued on page 29)

Jack Rockwood, a senior in mechanical engineering, chose this subject because of his interest in automotive research. Jack is from Wisconsin Rapids and is a member of ASME.

The Universe

The Whole and Its Parts

by Karl F. Mohr

Star Birth

IN ORDER for star birth to occur, there must be hydrogen and cosmic dust available. This cosmic dust may be any or all of the elements, and both it and the hydrogen rush through space until a huge cloud has collected. As the amount of hydrogen and dust increases, the cloud condenses and increases in density. When the matter which composes the cloud is packed into an ever increasingly smaller space, energy is released from the gravitational fields of the individual atoms resulting in a heating of the whole mass. After the cloud's initial volume has shrunk about a billion billion times, the temperature and density are great enough to start collisions between individual hydrogen atoms, which is the start of nuclear reactions and the birth of a star. The forces causing the atoms to fly apart, due to the heat of the nuclear reaction, are directly counteracted by the gravitational attraction of the whole mass. The pressure inside a star is due to the temperature and gravitational attraction which are dependent on the mass. The greater the mass of a star the higher the temperature must be to counteract the gravitational attraction. Also the higher the temperature, the greater the energy production will be, because nuclear reactions depend directly on temperature. Considering these qualities, a star with a large mass will be brighter and its surface temperature will be higher than a star of smaller mass. The radius of a star depends on the pressure inside and pressure correspondingly depends on the mass so that a star of large mass will have greater pressure and a larger radius than a star of smaller mass.

Star Life

Stars burn by continuing the nuclear reactions which were started at their birth. Four atoms of hydrogen with the atomic mass of 4.032 are changed into one atom of helium with an atomic mass of 4.003. This is a loss in mass of .029. This mass loss is turned completely into energy according to Einstein's equation, $E = MC^2$. In our sun, 560 million tons of helium are produced every second which means four million tons of mass are turned completely into energy in the form of light and heat.

Star Placement

Stars which have not used up ten to twelve per cent of their fuel fall along a curve known as the Main Sequence. This curve is made by plotting the stars according to their surface temperature and absolute brightness. The higher the surface temperature the brighter the star. A star appears blue when it is the hottest, then white, yellow, orange, and red when it is the coolest. However, there are stars which do not fall on this curve. After a star uses up 12% of its fuel, it expands giving a larger surface area with more light, but with a lower surface temperature. This type of star is known as a red giant. It expands up to a certain point, explodes, begins to contract until the surface temperature and brightness again fit the Main Sequence. Then it continues to shrink thereby increasing its surface temperature but causing it to appear dimmer. When a star reaches this point it is called a white dwarf and does not fit the Main Sequence. White dwarfs continue burning becoming red and then black as they use up their hydrogen. A dwarf star becomes so dense that a handful of its mass would weigh several hundred tons on the earth's surface.

Stars are also divided into two groups: Population I; and, Population II. Younger stars which are in Population I are blue because they are being formed continuously from the gas and dust clouds in space, and are hundreds of thousands times brighter than our sun. Because they are new stars they are found in regions of gas and dust such as the spiral arms of galaxies or nebular dust clouds.

Population II stars are older and hundreds of times brighter than our sun. They are the red giants and white dwarfs found in the center of galaxies, in satellite or elliptical nebulas, and in globular clusters where there is no gas or dust because it has been used up in the formation of these stars. Huge numbers of Population II stars are in the center of galaxies making the centers show very bright, almost as if the center were composed of a solid mass of burning gas and dust.

Population I stars after millions of years move into the Population II division. As Population II stars burn and become older, they expand because of a build up in their helium core. When this core begins to shrink under its own weight and the weight of the hydrogen burning around it, the star may leak or blow off some of its surface. This is called a nova. In the pre-nova stage the internal pressure of the star is greater than the external pressure due to the weight of the helium, which is approximately four times heavier than hydrogen. Then in the nova stage, the star eliminates some of its mass and again equalizes the internal and external pressures.

(Continued on page 26)

Karl Mohr, a junior in Civil Engineering, calls Green Bay home. Before coming to Madison he attended the extension in Green Bay. Karl chose this topic because of his strong interest in astronomy. He has written several articles and given a few talks on creation theories of the universe. Karl has taken part in Mock Political Convention and dorm skits and dances.

First Years in Industry

by John Schubert che'61

"What will I be doing?"
"Am I prepared to do it?"

ASK any engineering graduate as he moves into his first job what's foremost in his mind, and you'll find these two questions in one form or other.

It was to learn the answers firsthand that I recently went to Cincinnati (Ohio) to talk with two University of Wisconsin graduates —Alan Dahl, BSME '60, and Bob Hentges, BSCHE '56.

Both men are employed in the Engineering Division of The Procter & Gamble Company. Their Division is headquartered in the Ivorydale Technical Center and is responsible for the development, design and construction of about $20 million worth of new plants and facilities a year. This is in essence "tooling for production" of the Company's more than 300 products (which, I learned, include synthetic detergents, soaps, toilet goods, food products, paper products, chemical cellulose and chemical specialties).

I first talked with Alan, who is in the Heat and Power Department, to find out something about what the training period is like. He started at P & G last June and is now a little more than halfway through his one-year training program.

Since the company believes in on-the-job-training, with direct job placement and practice in immediate responsibility, Alan was given his first assignment as soon as he received a brief general orientation.

He was sent to the company's nearby St. Bernard (Ohio) plant—to find the answers to a steam distribution problem involving new process requirements. Flow capacity to the installed equipment was of basic importance, but just as important was the terminal pressure available at the process site. Alan's job was to see that the best results were realized for both factors.

Working closely with plant personnel he determined the existing flows and pipe sizes from the boiler house to the process site. With pressure drop calculations made from this data, he then was able to meet the new process demands. By weighing these changes with costs and future demand increases he came up with the solution to the steam problem.

In passing on this information to the construction site the co-ordinated his work with that of the Production Engineering Department. To the draftsman assigned to him he furnished the information that led to the drawing of the piping alterations. After he had reviewed the drawing, the design phase of the project was completed. Later he inspected the finished installation to see his designed system in operation.

Throughout this period Alan was becoming increasingly familiar with P & G 's operations and his role in the Engineering Division through his personalized training program. One facet of his program that especially impressed him was a semi-weekly meeting of all the company's new engineers. At first these hour and a half meetings were devoted to employee plans and policies, management techniques and other general information, but they gradually become more technical with discussions of the development of projects, the administration of projects, and new engineering materials.

I asked Alan, from his experience of the last half year, how he would answer the new engineering graduate who asked him, "Am I capable of doing the work?"

His answer was straightforward: "I would tell him that the fact that he's a graduate of an accredited engineering school and that companies are anxious to hire him is more than enough proof that he's capable of doing the work.

"I can tell you only about what I've found at P&G, but I think you'll find similar situations in other companies. At P&G assignments are geared to your ability, becoming more complex as you progress and become more familiar with your job.

"You work closely with *your* group leader—whose thorough

engineering experience helps you develop your own skills as you face increased responsibilities in your projects. He meets with you regularly once a week, at a set time, to discuss your project, but he's available anytime if you need an extra measure of professional help.

"Another kind of meeting that you attend at P&G are qualification sessions. At these meetings you get together with experienced leaders in the Division to discuss everything you have learned thus far in your training period. The meetings are informal question-and-answer type; they give both you and the people you're working for a chance to see how you are progressing.

"There's a bi-weekly report that you do, too, that furnishes a good guide to your development. It's about a page long and gives you the opportunity to put down your thoughts on the project you're working on or a new discovery or a Company policy or anything else that's important to you. Incidentally, these reports help you learn to write clearly and concisely, important skills for any engineer."

One of Alans latest projects was focused on the up-grading of safety protection equipment for process furnaces. He first had to review each installation and its operations to see what improvemnts were needed. Once the scope had been developed, he could then design a control system to meet the sequence of operations for each installation.

Since he has a limited knowledge of electrical control equipment, Alan went to the Electrical Section of the Technical Service Department for detailed information. With this data, he was able to specify the necessary equipment and to instruct a draftsman in preparing construction drawings. After the new safety equipment had been installed, he instructed the furnace operators in its operation. When the operators had been trained, he supervised the initial light-off of the furnaces.

Talking with Alan gave me a good picture of what happens to a new engineer on the job. For a rundown on what can happen over a longer period of time I talked with Bob Hentges. Bob, who was an editor of the *Wisconsin Engineer* in his senior year, has been with P&G for almost five years.

Bob said, "My first year was like Alan's except that my training and project assignments were chemical engineering-oriented. One of my major projects was designing centralized unloading, storage and pumping systems for these major raw materials used in detergent and soap making at P&G's Baltimore (Md.) plant. The total cost of the installed equipment and piping was about $80,000."

In his second year Bob was given the assignment of increasing the capacity of the company's St. Louis (Mo.) plant's spray-drying unit, which produces P&G's Tide and other detergents. After completing this work, he was shifted to another project in the Cincinnati Tide-making unit, which involved the tesing and starting-up of a highly automated new process. This work gave Bob experience in equipment operation and start-up and in working out the bugs in the control system under actual plant operating conditions

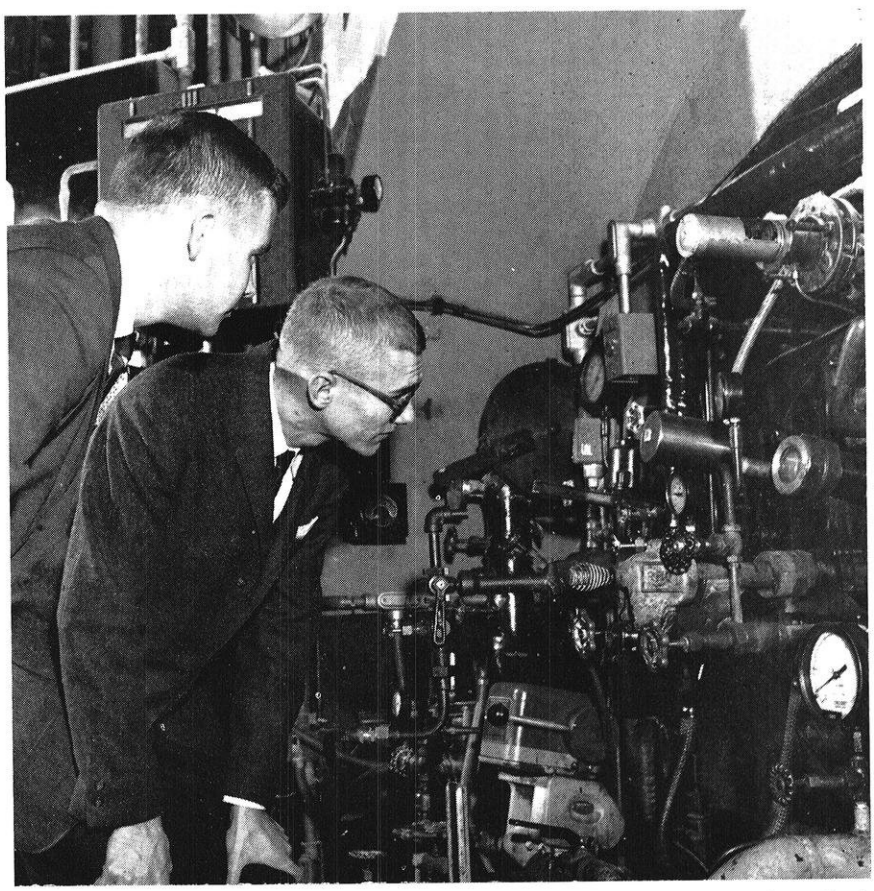
In 1957, after 15 months of work experience, Bob was assigned to study the layout and preliminary design of a new fatty alcohol plant —a $3½ million project. The nine-month study included fundamental design of such unit operations as distillation, filtration, high-pressure reactions and centrifugation The alcohol plant was not built because further study showed that increasing the capaciy of two existing plants was practical and more economical.

Bob then spent three months designing and starting-up a fatty alcohol fractionation process. Later he went to P&G's Port Ivory (Staten Island, N.Y.) plant to start-up a hydrolyzer process used in continuous soap making.

For several of these assignments he made trips to various plants to gain a knowledge of the plants and equipment and then to direct start-up procedures.

In October, 1959, Bob was transferred to P&G's Dallas (Texas)

(Continued on page 28)



Allen Dahl (left) and the author (right) looking at the furnace safety device installation designed by Allen.

ENGINE EARS

by Larry Hyde ce'62

UNIVERSITY OF WISCONSIN INSTALLS CONTROL DATA COMPUTER SYSTEM

Frank C. Mullaney, Vice President and General Manager of Control Data's Computer Division, today announced the installation of a Control Data two-computer system at the University of Wisconsin in Madison. Mulaney said the new system has been installed at the Numerical Analysis Laboratory on the Wisconsin campus.

The main elements in the system, called by Control Data the Satellite Computer System, are the large-scale 1604 Computer and the desk-size, high speed 160 Computer. Both computers make use of a magnetic tape system, Control Data's 1607, to communicate bi-directionally, to store information, and to buffer data to a 1000-line-a-minute high-speed printer. A card reader and punch unit round out the installation.

The Control Data 1604 can handle 100,000 instructions a second, can store 1½ million bits of information in its large magnetic core memory, and recall any one of those information bits in approximately two-millionths of a second. Yet, the all-transistorized Control Data system, including the 160 Computer and peripheral equipment, takes up only two-thirds the space required by the computer that was replaced.

The new computer system will be available to all academic departments of the University. In the past, as many as 300 projects have been computer-aided in a single year, involving some 400 faculty members and 700 students. An even greater magnitude of work will be possible with the advanced capabilities of the new 1604–160 Computer installation.

Dr. Preston Hammer, Professor of Mathematics and Director of the Numerical Analysis Laboratory, will have responsibility for the computer operation. The Numerical Analysis Laboratory performs its own calculations and monitors calculations from all departments of the University. In addition, Dr. Hammer said the Laboratory conducts classes in the use of computers and carries out research in numerical methods in which computers are used.

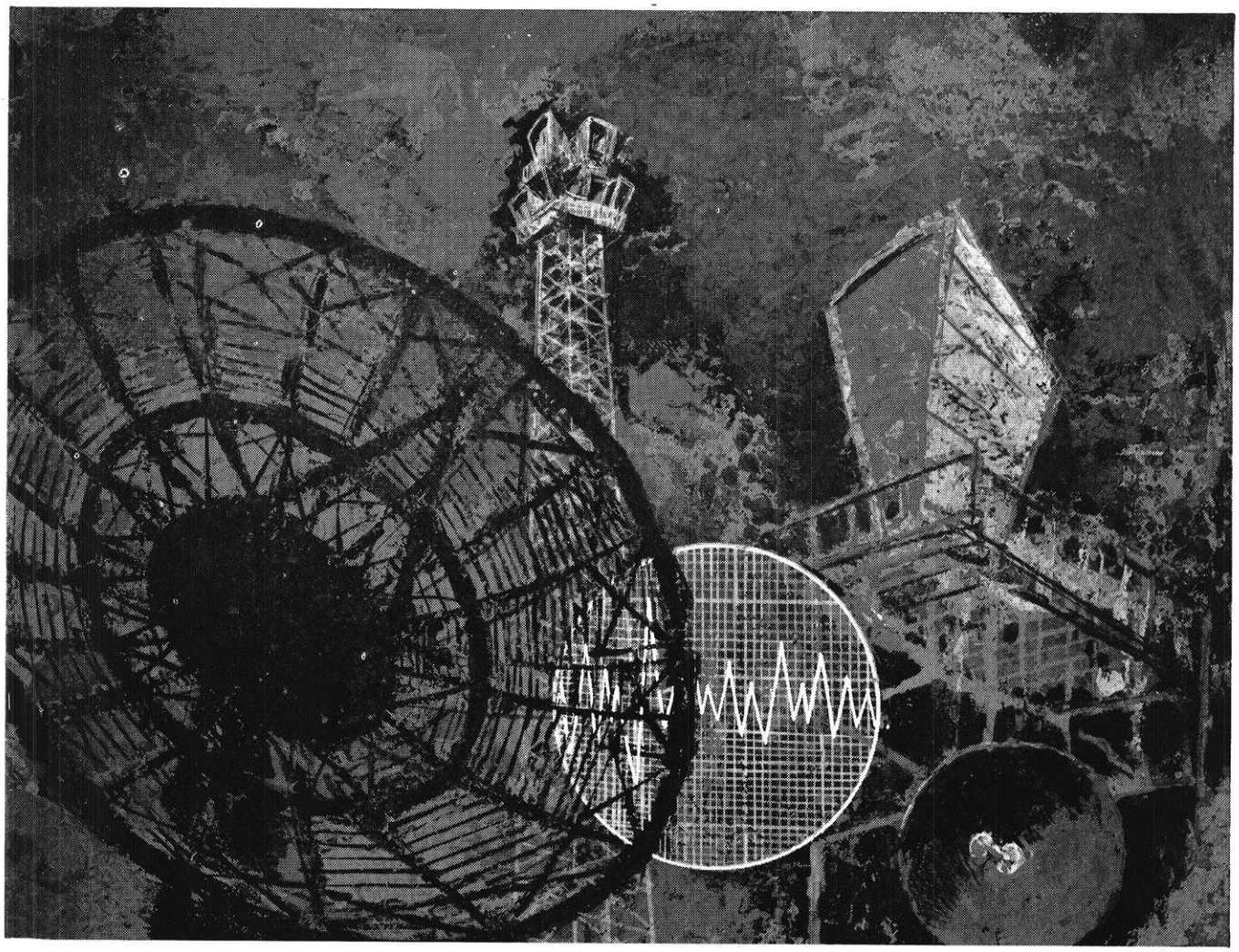
Dr. Hammer, a group leader of the Computing and Applied Mathematics Section at the Los Alamos Scientfic Laboratory before joining the staff at Wisconsin, indicated that the new computer system would enable his department and all University departments to carry out many more calculations more rapidly. Some general computer uses will be in the preparation of advanced problems and in experience to prove theorms in the area of what Dr. Hammer refers to as "artificial intelligence."

More specifically, Dr. Hammer used the University's Meteorology and Astronomy Departments as examples. Professor Verner Suomi is involved in a project in which a satellite measures the net radiation from the earth—to determine how much heat comes in from the sun and how much leaves the earth through radiation. The satellite returns signals on request from the earth by radio transmission. The signals are recorded directly on magnetic tape, then edited, and finally run on the 1604 Computer to calculate the connections of these recordings with various meteorological data. This amounts to a meteorological weather station in the sky. Professor Suomi's investigations started in this field in 1953 with experiments on a cornfield's heat budget—i.e., absorption and then release of the sun's heat. The satellite investigations to date have been extensions of those experiments, not of a single cornfield but of the entire earth.

In astronomy, Dr. Arthur Code, an astrophysicist, will work on theoretical astrophysics problems using the 1604 system. Dr. Code said he expects the 1604 to be able to "program more realistic evaluations" on such problems as star movement, deflections, astral collisions, and the rapidly evolving structure of stars. In a large class of problems, involving great input and the necessity to store large tables of data, the 1604's large memory will be very valuable, Dr. Code said.

Dr. Hammer, editor of the book "The Computing Laboratory in the University," termed "the definitive work in its field," made it clear that practically every University Department would employ the new computer system in equally important work. Physical and Social Scientists and Engineers will probably do the most work with the machine. The Department of Economics, Psychology, History, Education and others plan to advance their own research capabilities

(Continued on page 30)



Is your future up in the air?

As the communications needs of our nation become steadily greater and more complex, the Bell Telephone System is continuing its pioneer work in microwave by "taking to the air" more and more to get the word across.

To this end, Western Electric – the manufacturing arm of the Bell System – has the monumental task of producing a large part of the microwave transmission equipment that knits our country together by shrinking thousands of miles into mere seconds.

In spite of its great technological strides, the science of radio relay is a rapidly-changing one. And new breakthroughs and advances are common occurrences. A case in point: our Bell System "TH" Microwave Radio Relay. This newest development in long-distance telephone transmission will eventually triple the present message-carrying capacity of existing long-haul radio relay installations. A full-scale system of 6 working and 2 protection channels can handle 11,000 telephone messages at the same time.

To make microwave work takes a host of special equipment and components: relay towers, antennae, waveguides, traveling wavetubes, transistors, etc. But just as important, it takes top-caliber *people* to help us broaden our horizons into such exciting new areas as communication by satellites!

And microwave is only part of Western Electric's opportunity story. We have—right now—hundreds of challenging and rewarding positions in virtually all areas of telephony, as well as in development and building of defense communications and missile guidance systems for the Government.

So, if your future is "up in the air," you owe it to your career to see "what's up" for you at Western Electric.

Opportunities exist for electrical, mechanical, industrial, civil and chemical engineers, as well as physical science, liberal arts, and business majors. For more information, get your copy of "Western Electric and Your Career" from your Placement Officer. Or write College Relations, Room 6105, Western Electric Company, 195 Broadway, New York 7, N. Y. And be sure to arrange for a Western Electric interview when the Bell System recruiting team visits your campus.

Western Electric

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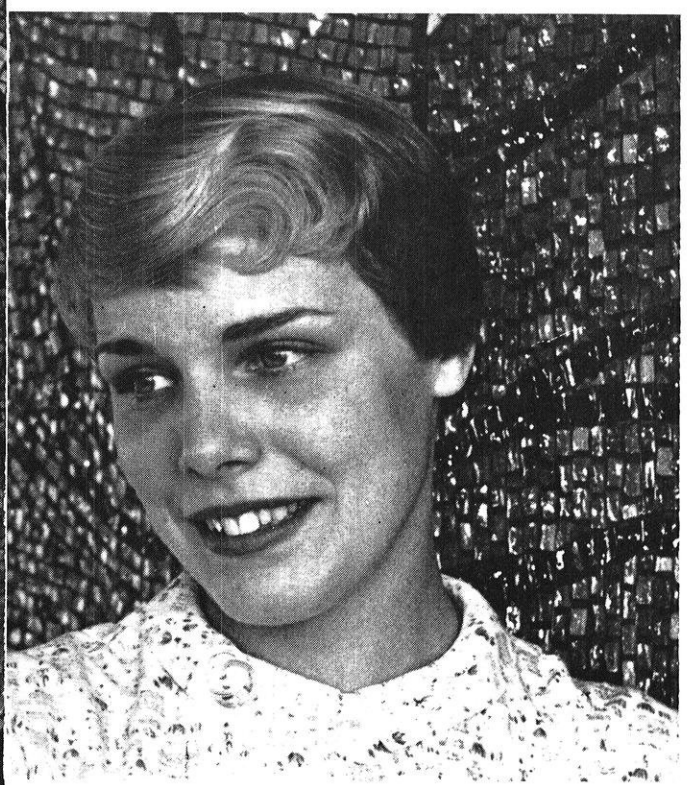
Girl of the Month

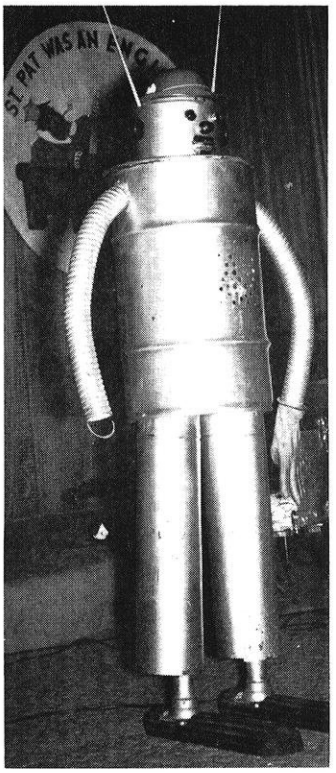
JANE SUTTON



International relations are due for an interesting upturn, for Jane will be on the job promoting our country. Presently she represents the Delta Gammas and does a fine job of promoting her sorority.

She has a class this semester on the "engine" campus so look for her near the EE building. And if you wonder about her 5'4" height remember that great things come in small packages. Her other dimensions speak for themselves.

W. Martin Schultze receiving his trophy for the most Lincoln-like beard.



Typical barrel-chested engineer.

The judges.

The crowning of St. Pat.

St. Patrick WAS an Engineer

The Smith Brothers.

The most devilish beard: Werner Stettler.

SCIENCE HIGHLIGHTS

by Dave Cress me'63

210 FOOT CRAWLER CRANES FEATURE TUBULAR CONSTRUCTION

When engineers undertake the design of crawler cranes for extraordinarly high work, one of the first problems they encounter is that of boom weight. That is, how to build a boom, 200 feet or more in length, that is light enough to be supported by a crane platform of reasonable size, but still strong enough to lift a substantial work load.

Built in the conventional manner, that is, steel angle lattice construction, a 210 foot boom of the strength required would have more weight than could be counterbalanced by a mobile platform of any practical size.

One alternative would be to reduce boom weight by use of thinner, or fewer, structural members. However, this would result in a reduction of strength, which would defeat the purpose of the boom.

As a second alternative, substantially increasing the size and weight of the crane platform would serve to counterbalance the high boom weight. However, the larger platform would not only significantly increase the cost, but would seriously restrict the mobility of the unit.

Therefore, to be satisfactory the answer must involve reducing boom strength. Such an answer can be found by taking advantage of the unique properties possessed by a tube.

The outstanding features of tubular construction are demonstrated again and again by the greatest engineer of them all—Mother Nature. The bones of animals, fish and birds—hollow by Nature's choice—provide maximum strength for load bearing members while holding weight to a minimum.

In the fabrication of extremely long members such as the crane boom, the structural characteristics of steel tubes provide an advantage in addition to their high strength-low weight property. Their relatively large cross sections provide a boom stability not present in a comparable boom of angular construction.

When the Bucyrus-Erie Company of South Milwaukee, Wisconsin was preparing plans for a long boom for their Model 71-B, they considered many different materials and construction techniques before deciding on tubular construction. Working closely with the Bucyrus-Erie engineers, the Babcock & Wilcox Company recommended the use of seamless mechanical tubing of one of the high strength alloy steels as being best suited for boom construction. To withstand the anticipated stress forces, the material was tested for 70,000 psi minimum yield with 15% minimum elongation in 2″.

These suggestions were adopted and the first of the 71-B cranes with tubular booms were built. Close to 4000 feet of job-matched tubing went into the largest unit, a 210 foot boom, 40 foot jib combination.

The completed crane extends more than twenty stories in the air. The 210 foot tubular boom has a maximum working radius of 170 feet, and the 40 foot tubular jib can be attached to further extend its reach.

RUBBER REPLACEMENT FOR ROLLER BRIDGE BEARINGS PROVIDE DRAMATIC MAINTENANCE SAVINGS

Maintenance of the rollers used in bridge expansion bearings has long been one of the headaches of keeping bridges in good repair. A recently developed and most effective remedy is the replacement of these bearings with rubber expansion pads.

Modern bridges using rollers, have encased them in an oil bath

from which dirt is kept out by a dust trap. The majority of existing bridges however date well back; in these, reliance has been placed on regular cleaning and oiling of the machined surfaces. This operation entails removal of the frame and a good deal of handling of the scrapers and other parts in the confined spaces between the rollers. This is such a time-consuming and tiresome job that, human nature being what it is, it is frequently put off, resulting in roller seizure—which in turn can cause distorted girder work and even ruptured piers and abutments.

Once rust or dirt clogging keep the rollers from turning, they quickly develop flats, grooves are worn in the knuckle casting on top of the rollers and in the surface of the bedplate as the girder slides back and forth on the bearings. This sets up on the job of removing and re-turning the rollers; relatively simple—and machining the surfacing of the castings; tough because the bedplate is usually dowelled into the bedstone. Putting a seized up bridge roller bearing back into working shape can be somewhat of a tall order.

A number of bridge superintendents have found that by directly substituting rubber pads for the faulty rollers, they have a simple and economical solution. Not only does this avoid the remachining of castings and bedplates, but it reduces the maintenance to visual inspection and the painting of a small amount of extra steelwork which is easily accessible.

Actually, the rubber pads are sandwiches of steel plates interleaved with rubber and having a minimum cover of ¼ inch of rubber around the edges so there is no possibility of the plates rusting. The pads often can be of the same depth as the rollers which they displace, greatly simplifying the job of substitution.

A BETTER CORROSION RESISTANT STAINLESS STEEL

A new and even more corrosion resistant stainless steel has been developed by Allegheny Ludlum Steel Corporation after two years of intensive development work. It is expected that the new alloy will be used initially in the automotive industry for which it was developed.

It is expected that while the automotive industry will be the first to utilize this new corrosion resistant stainless steel, other industries, notably in the architectural field and the furniture and appliance fields, will also be interested in the new material.

The new alloy is called type 433 and has additions of molybdenum and copper to the automotive standard stainless steel of type 430. Patents have been applied for on this new grade.

With this announcement, of 433, it brings to three the major developments Allegheny Ludlum has made within the past four months of either new materials or processes for use in the automotive industry.

Last November, the steel firm announced that it was then producing in commercial tonnages new bright annealed stainless steel with a mirror-like finish and improved corrosion resistant qualities. In bright annealing, stainless steel strip is annealed in a controlled atmosphere and under rigidly-controlled temperature conditions while moving between high-purity refractories. Where conventional annealing dulls the surface of the mental, requiring further pickling to restore brightness, the new annealing process actually brightens the surface and gives added corrosion resistance to the metal.

Two months later, in January of this year, the steel firm announced a new stainless steel called MF–1 for use in mufflers in the automotive field. This new muffler steel is being used on today's Thunderbird.

The third development was announced today with the new 433 stainless steel.

The new alloy—433—will be available in the same gages and widths as the standard 430. The material is rolled on the same equipment and can be bright annealed as is 430.

No increase in price for the new type 433 is now anticipated over prices charged for type 430.

The big advantage of the new product is the added corrosion resistance. Corrosion resistance has become an ever increasing problem to the automotive manufacturers because of the additional use of salt and other road de-icing and road-clearing materials. Many more municipalities across the country are using these metal-eating chemicals and materials; and highway departments are using more of these materials. It was because of this problem that Allegheny Ludlum accentuated its research and development programs a few years back. The steel firm wished to develop an even greater corrosion resistant stainless steel, but without increasing the price of the metal.

Stainless steel for 30 years has been the quality material—the standard of the industry—used to measure the corrosion resistance of any material.

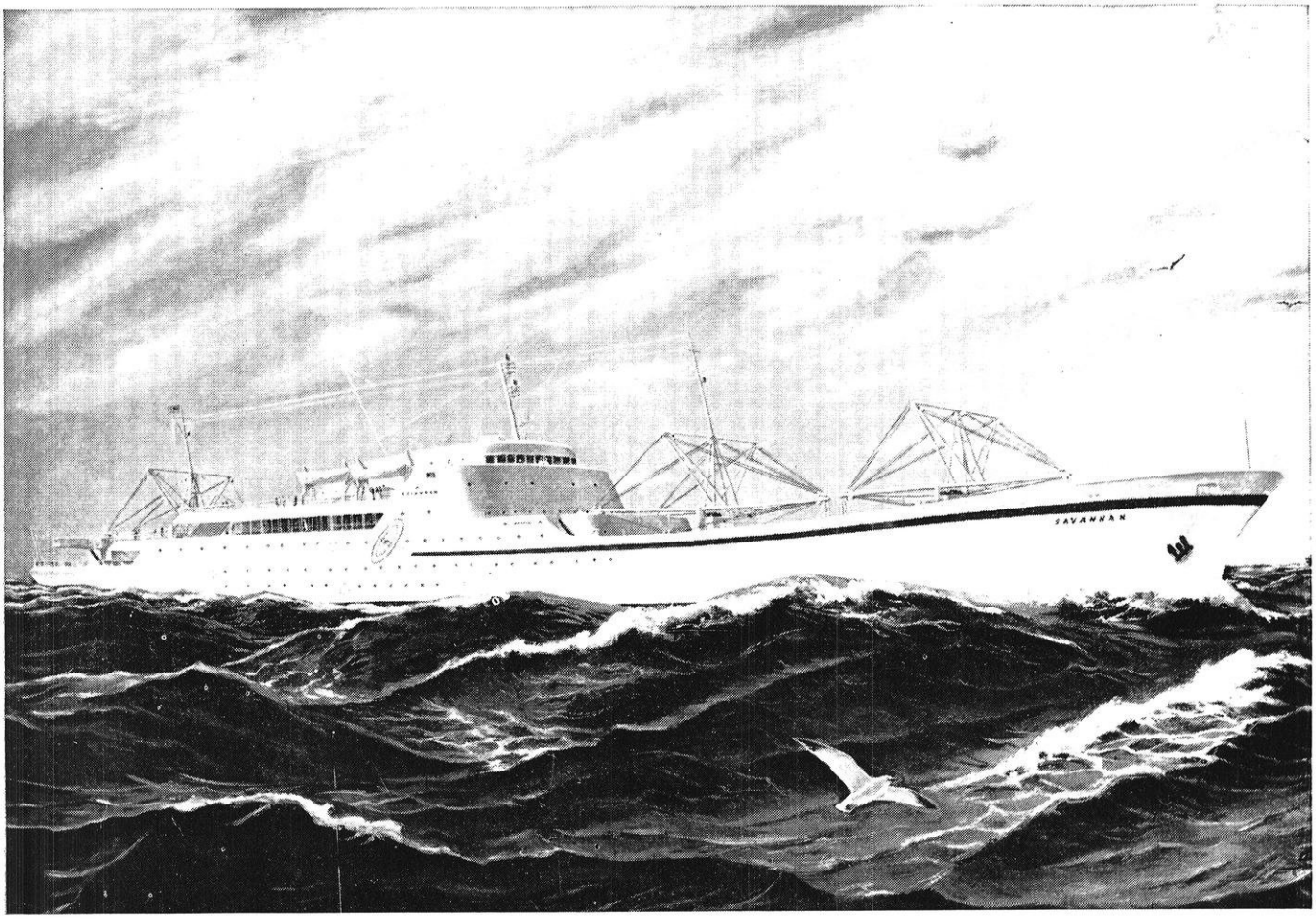
The automotive industry subjects stainless steel to some of the most severe tests. Among these tests are the Cass test, the crevice tests, the salt spray tests, the salt slag alternate immersion test, and service tests. Allegheny Ludlum's new stainless steel—Type 433—passed all of these tests unusually well. The service tests by automotive producers are still continuing, and final reports on these will not be in for six to eight more months.

CANS FOR KIDS

Old five-quart oil cans have been put to good use at some Summer camps where children are taught to swim. Camp instructors rig up the cans with a webbing harness and use them to keep children afloat while learning.

SIBERIAN HEAT WAVE?

A Russian engineer proposes to change the climate of a section of Siberia near the Nevelskiy Strait. He believes the severe winters would be reduced if a five-mile dam were built across the strait and the warm tides of the Sea of Japan were let in through special one-way gates to prevent them from flowing back out. The water, in turn, would warm the air in the surrounding region and never let the temperature drop below 30 degrees Fahrenheit, the Russian claims.



The Nuclear Ship Savannah is capable of sailing 350,000 nautical miles without refueling. Her uranium oxide fuel is packaged in tubes of Nickel Stainless Steel, more than 5,000 of them. In all, engineers specified 200,000 pounds of Nickel Stainless Steel for use in the ship's reactor... to meet the demands of high operating pressures and temperatures, and to provide much-needed strength and corrosion resistance in this critical application.

How Inco Nickel helps engineers make new designs possible and practical

When you design equipment, you'll have to select materials to meet given service conditions – materials that might have to resist corrosion, wear, high temperatures, or fatigue. Over the years, Inco has developed new alloys and gathered information on the performance of materials under these and many other service conditions. Inco will be glad to put this data at your disposal to help solve your future metal problems.

Inco's List "A" contains descriptions of 200 Inco publications which are available to you, covering applications and properties of Nickel and its alloys. For List "A", write Educational Services.

The International Nickel Company, Inc.
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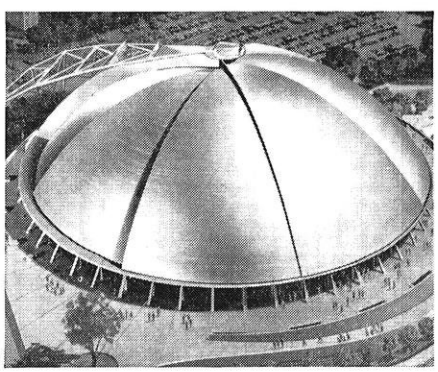
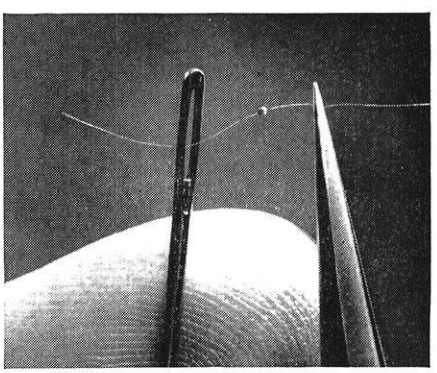


New push-button roof of Nickel Stainless Steel turns a weatherproof auditorium into an open-air stadium in a matter of seconds. The dome will provide years of carefree beauty. That's because stainless steel with Nickel in it is one of the most durable of metals. It's corrosion-resisting all the way through.



Needle's eye reveals relative size of a Thermistor, a tiny bead made with Nickel oxide—used to measure temperatures in and beyond the earth's atmosphere. The Nickel oxide helps develop electrical properties for the accurate recording of temperature changes as small as 1/50th of a degree!

INCO TRADE MARK

INTERNATIONAL NICKEL

The International Nickel Company, Inc., is the U.S. affiliate of The International Nickel Company of Canada, Limited (Inco-Canada) —producer of Inco Nickel, Copper, Cobalt, Iron Ore, Tellurium, Selenium, Sulfur and Platinum, Palladium and Other Precious Metals.

The Universe

(Continued from page 13)

Star Death-Nova

A nova throws out hydrogen, helium and other elements formed by the immense heat, but a star in the supernova stages goes through much greater change in order to remain stable. Super-nova occurs only in giant stars which have a mass thousands of times greater than our sun. As a giant star burns, it builds up a larger and larger core of helium, until 12% of the star's hydrogen has been used up. At this point Chandraseklar's limit is reached which is the amount of hydrogen turned into helium if 1.44 times the mass of our sun were turned into helium. The star then must eliminate mass in order to remain below this critical limit.

Supernova

When a massive star approaches the above limit, elements are formed in the following manner. The huge core of helium creates a tremendous pressure which causes the temperature to climb from normal—.30 million degrees C—to 130 million degrees. Helium begins to burn at this temperature forming carbon, oxygen, and neon which are added to the core causing it to grow denser and hotter reaching 600 million degrees. The neon burns and produces magnesium. The core then reaches 1,500 million degrees. The oxygen reactions form aluminum, silicon, phosphorous, sulfur, chlorine, oxygen, and potassium which are also added to the core. The radiation at this point is gamma rays which knock and mangle protons from the formed elements. At 2,000 million degrees the fragments of the mangled elements form the heavier elements: litanium, vanadium, chromium, manganese, iron, cobalt, nickel, and zinc. The star at this point is radiating energy at a tremendous speed causing more contractions which increase pressure and temperature. When the star reaches 5,000 million degrees, iron breaks down under the gamma ray bombardment and forms helium. Approximately one second after this occurs the helium pressure squeezes the huge amount of helium into an ever increasingly smaller one. However, as quickly as the collapse occurs, the star explodes because of the tremendous rate at which the hydrogen atoms are fusing. The star throws out into space all the layers of the core until Chandraseklar's limit is again reached. The star then progresses into the white dwarf stage. The whole process takes from one hundred to one thousand seconds. Elements which are thrown into space combine with the dust and hydrogen of space to form radioactive and other elements which, after millions of years, form new stars. It is a proven fact that newer stars contain more radioactive and heavier elements than older stars.

Creation Theories

Today there are three theories, none of which can yet be definitely proven, that try to explain the origin of the universe. They are: the Evolution or Explosion Theory, the Expansion Contraction Theory, and the Steady State Theory.

The Evolution or Explosion Theory states that there was a primeval atom which was composed of all the mass in the universe, and had a density of about two billion tons per square inch. This mass appeared for only a few minutes, and then expanded rapidly for about a billion years. After this time the density decreased enough so that clusters of galaxies could form. Today these galaxies are still hurtling through space at an ever increasing rate. The theory also states that finally space will be empty, the galaxies will be dead, and all energy will have been expended so that the universe will be completely dead. However, this theory does not explain how the primeval atom came about.

The Expansion-Contraction Theory differs from the Evolutionary Theory only in that the initial explosion of the superdense mass did not provide enough kinetic energy to keep the galaxies speeding through space. As a consequence gravitational attraction will take over in time and the galaxies will begin rushing toward each other until the complex atoms break up into hydrogen and again form a superdense mass. One complete cycle of expansion and contraction would take thirty billion years.

Cosmographer, George Gamon, of the University of Colorado, sums up the Primeval atom by saying that it was merely a state of maximum contraction of a universe that had previously existed for an eternity of time. This statement implies that space and time began with the primeval atom, and asking what came before would be pointless.

The third theory states that matter is continually being created in the form of hydrogen. This means that there is future matter which is not in existence today, and some of today's matter was not in existence in the past. The hydrogen is created by the force fields of atomic-nuclear particles and electro-magnetic fields. The average rate at which the creation of matter takes place is a few atoms per year in every cubic mile of space. This, the Steady State Theory, as will be seen, provides an excellent explanation of the expanding universe.

These then, are the dominant hypotheses concerning the structure of the universe. The decision among them rests with observation. As an example, it would be of great interest to know whether new galaxies are being formed at the present time. If new galaxies are being formed the Explosion Theory and the Expansion Theory would be suspected because they do not provide for such creation. If new galaxies are not being formed, the Steady State Theory becomes untenable.

Raisin Analogy

Every galaxy in space seems to be hurtling away from one common center. As they go farther from this center, they travel at an increasing rate with the farthest galaxies, which we can see, traveling near the speed of light. It therefore seems as if the universe is expanding, but that the galaxies themselves remain together. One professor likens this to raisins in an infinite cake. The cake as a whole expands, but the individual raisins do not. To a person inside a raisin it seems as if the raisins the farthest away are traveling the fastest. It also seems to the person that all the other raisins are speeding away from him as if his raisin were in the center of the cake. But if he were placed in any raisin, the illusion would remain the same. This illusion appears to us in our galaxy, for at

first when astronomers realized the universe was expanding it seemed as if all the galaxies were speeding away from us. However, today it is definitely known that our galaxy, the Milky Way, is also speeding away from other galaxies, and that we are not at the center of the universe.

Doppler's Principle

When light from distant galaxies reaches us, it can be broken down into the spectrum. In the spectrum certain element lines tend toward the red end of the spectrum. This is defined as the "red shift" in spectroscopy. Doppler's Principle states that if element lines tend toward the violet end of the spectrum, the light source is traveling toward the observer; but if the lines tend toward red end, the light source is traveling away from the observer. Therefore, it is assumed that the galaxies are moving away from us and that the universe is expanding. However, this assumption is based on the correctness of the Doppler Principle when applied to light.

Explosion Theory

The Explosion Theory, which explained the creation of the universe, explains the expansion of the universe by stating that the primeval atom exploded giving enough kinetic energy to the mass to keep it hurtling away from its origin for an eternity of time. However, another theory, Neutron creation, explains the expansion by using the continuous creation of matter as its base.

Neutron Creation

Newly created matter which first appears in the form of neutrons is the basis for the Neutron Creation Theory. The neutrons split up into an electron and proton releasing about one billion degrees K of heat energy. This "cosmological material" which is in the form of a gas is scattered throughout the universe at approximately ten atoms per cubic yard of space. It therefore has no heat effect on matter immersed in it. However, the heat energy does make the gas expand and because the gas is throughout the universe, the universe as a whole expands. After billions of years great clouds of the gas radiate their heat away until finally gravitational attraction between their tendency to fly apart making the clouds condense and form the individual star system of a galaxy. The galaxies then move with the expanding gas, but within their limits gravitation is supreme and the huge systems hold together.

Anti-Matter

In a California laboratory an unusual particle was discovered which acted as a positive electron. This particle was named a positron. With more research negative protons along with neutrons composed of negative protons and positive electrons were made in a becatron. These particles were exactly opposite to any previously known particle and the question arose, "Could there be anti-matter?" If antimatter does exist it cannot come in contact with matter as we know it, for the instant matter and anti-

(Continued on page 28)

The Universe

(Continued from page 28)

matter come in contact, they annihilate each other completely releasing energy in the form of gamma rays, neutrinos, and high speed electrons and positrons according to Einstein's energy equation. It is not definitely known as yet if stars or whole universes exist entirely out of anti-matter, but there is strong evidence of anti-matter in the universe. When electrons and positrons are accelerated by a magnetic field they produce a type of radiation called synchrotron radiation which can take the form of radio waves. A galaxy known as M87, which looks unusually bright but normally shaped, is presently giving off huge amounts of synchrotron radiation in the form of radio waves and even light waves which can be observed as a visible jet of light protruding from the galaxy. It is possible to believe that M87 captured a glob of anti-matter from an entire galaxy composed of this type of substance. At present this is the only way in which the radiation can be expanded. "Outside our galaxy other galaxies in remote parts of the universe may consist entirely of anti-matter. The nearest approach to direct proof of the existence of such bodies is the presence of strong radio sources whose energy is difficult to explain by any known process but might be explained by the annihilation of anti-matter."

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First Year

(Continued from page 15)

plant for four months to train for the job of plant engineer at the company's Macon (Ga.) plant.

"At Macon," Bob said, "I supervised all equipment and building maintenance, power generation, construction and plant security. I had 24 men in my department and controlled an annual plant maintenance budget of $250,000. I acquired a background in budgeting, personnel administration, maintenance and production scheduling, cost control and other management activities. I also had my first opportunity to train other men. I conducted the first-year training of a chemical engineer from the University of Florida, as well as training for a new welder-pipefitter and an instrument mechanic in my department."

Recently Bob returned to the Engineering Division in Cincinnati. He is now a group leader, responsible for detergent intermediates process design, and is currently responsible for the design of two new processes which will be started-up this year.

Bob was quick to point out the fact that his engineering horizons had been broadened considerably in the 4½ years since he was graduated. His training has continued far beyond his first year in industry. Apparently P&G believes in continuing to train a man for increased responsibilities for as long as he shows capacity for growth.

When I left to visit with the two Wisconsin engineering graduates in Cincinnati, I took with me the doubts that any engineer going into industry has about his own training and abilities. But I know now after talking with Alan Dahl and Bob Hentges at Procter & Gamble that although it's only natural to wonder what lies ahead for you as an engineer after graduation, there's no need to doubt your own training and abilities—or the use industry will make of them.

Exactly what you will be doing after graduation depends largely on you. But my visit with Alan and Bob convinced me that industry has a good awareness of your formal professional training and is ready to make use of it immediately—even while your interests and skills are being given time to develop through experience.

From what I saw at P&G, it seems that industry recognizes that there is a mutual advantage in making sure the new engineer gets a challenging initial assignment and in keeping him moving ahead as fast as his capabilities permit.

* * *

A Scotchman walked up to a friend at a bar and began telling him about a hunting trip. "We got a couple of bears, but the biggest thrill was tracking "Yuers."

"What's Yuers?" asked his friend.

"I'll have a beer, thanks," said the Scotchman.

Just as they reached the bottoms of their glasses the friend said, "Well, I'll have to go home and do my chores."

"What chores?" asked the Scotchman.

"Beer, please," replied the friend.

Safety Devices

(Continued from page 11)

lap belts and that the best combination is a shoulder-loop belt and a lap belt. Since it is difficult to install and because of the additional cost, the car manufacturers have chosen to offer only lap belts to car buyers.

Another point which is often overlooked is that the attachment of the belt to the seat or floor and of the seat to the car frame must be able to withstand considerable forces. Laboratory tests using a tension-testing machine and a body block have assisted in the qualification of belts and hardware. Pull tests on the body floor have established the structural requirements for adequate seat-belt installation. In short, investigations have broadly determined the physical conditions which the seat-belt installation must meet to withstand the forces developed during collisions.

The SAE Technical Board has approved a Recommended Practice that sets up procedures for testing motor vehicle lap belt assemblies. The tests specify that a seat belt assembly should be able to withstand at least 1500 pounds in tension and loop strength should be at least 3000 pounds. These values are in agreement with Civil Aeronautic Authority requirements for seat belts currently used in civil aircraft. A loop strength of 3000 pounds is about the load a 150 lb passenger would place on the belt when a car going 20-mph crashes into a rigid barrier. Specifications for webbing, testing the belt assembly, and testing the release mechanism after being subjected to load are laid down by the board and adherred to in testing auto safety belts.

Door Latches

Along with restraint of occupants by belts, the use of safety type door latches further minimizes the chances of injuries sustained from ejection in an accident situation. Since the chances of injury are half if the occupant stays in the car, as against being ejected, a door latch has been devised which resists the tendency of the body to deform and unlatch the door. Instead of just holding the door closed, the new type latch secures the door to the jamb by means of an interlock incorporated in the latch. This feature is now used on all standard American production cars, and from results of accident studies, has been very effective in preventing ejection of occupants.

Padding in Passenger Compartment

The idea of properly "packaging" the passengers and drivers of cars was applied with respect to delethalizing interiors of vehicles. Specific attention was given to any object which could cause injury if impacted by the occupants. Padding is useful in this respect, as it covers the hard, impact resistant surfaces of the front part of the passenger compartment which is most likely to be struck by the passengers in an accident situation. Padding is a useful feature provided the padding used is effective. If, for example, soft sponge rubber is employed, there is a tendency for the part of the body that hits it to crash straight through the rubber and strike the hard backing with practically undiminished force. The firmer materials, such as cork or the harder mixes of rubber, are more suitable for this purpose. In the design of a crash pad, an important consideration is which part of the body will hit it; obviously, a softer padding is desirable for protecting the face than for most other parts of the body.

Research on this problem has brought about the development of a foam plastic which provides the best combination of energy absorbing ability, softness, and minimum rebound. It is employed in the dash padding offered in the "safety package" of some car makers. A demonstration conducted to attest to these features was the dropping of a fresh egg from a 10 ft height on the padding equivalent to that on car dashboard padding. The egg came through the test unscathed, proving the material's extraordinary energy absorbing ability.

Recessed Hub Steering Wheels

An important factor to the driver of an auto which is involved in a collision is the design of the steering wheel and the steering post. These must be such that impact forces are absorbed through deformation and dissipated over relatively large areas of the body, so that serious injury is prevented. This is accomplished by recessing the steering wheel hub back 3 to 4 in. from the rim and providing the spokes with proper design to provide a controlled, energy absorbing collapse, to prevent too rapid an impact of the driver's chest with the hub. This will help bring the decelerative forces experienced within the range of human tolerance. The safety hub steering wheel is perhaps the most important advancement in safety measures for cars that has resulted from crash research. Its effect on injury reduction has been considerable since its invention.

LOOK TO THE FUTURE

Safety in travel on our streets and highways now commands a greater share of the public's interest and alarm. Fortunately, the auto manufacturers have also increased their interest in injury producing accidents and measures which can be used to reduce the growing injury and fatality rate in our country. It is to be expected that they will continue to improve the protection offered to occupants of cars, should accidents happen, both through the structure itself and through an ever increasing number of inherent features and accessories designed primarily for passenger protection and safety. The complexity of the safety problem is realized by everyone seriously participating in crash injury research.

With the number of improvements in safety features increasing, it remains for the car buyer to see that he gets the benefits of all the research and development which have gone into them. Everyone buys insurance, why not safety?

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Engine Ears

(Continued from page 16)

using the 1604 and 160 Computers. It was indicated that the Department of Linguistics, under the chairmanship of Dr. Murray Fowler, would perform analyses and research in languages with the aid of the computer system.

Total cost of the Control Data Computer system is in excess of $1 million. University President Conrad A. Elvehjem credited grants from the National Science Foundation, the Wisconsin Alumni Research Foundation, and Control Data Corporation for making possible the computer purchase.

EVOLUTIONARY OPERATIONS

An experimental industrial chemical plant that will automatically improve the quality of its product will be set up at the University of Wisconsin.

A National Science Foundation grant of $97,000 will finance the research, which will be a joint project of the University's new statistics department and Engineering Experiment Station.

The model plant will automatically improve its product by continuously making slight changes in its operating conditions and seeking those which produce the highest quality.

The plant is an outgrowth of statistical theories. Dr. George E. P. Box, director of the UW statistics department, compared many industrial chemical processes to cake baking, the basic ingredients are known, but the right combination, the right temperature and time, are found only by guesswork.

The UW's experimental plant won't make any changes in basic recipes, but it will take the guess work out of finding the right conditions for production.

The automatic improvement plant is an outgrowth of evolutionary operation which was originated by Dr. Box and has been widely adopted in British and American chemical industries during the past five years.

Evolutionary improvement can be compared to a blind man trying to climb a mountain. If he takes one step in each of the four compass directions, he will know which direction is the steepest. He can climb to the summit if he steps in the direction of steepest rise, and starts the process over again.

In evolutionary improvement of industrial production, the summit sought is the best yield or highest quality.

Evolutionary improvement is a manual operation in which men make changes in the operating conditions and note the effects on the production. In the UW experimental plant, the machinery will do both itself.

The principal investigators for the project will be Dr. Box and Dr. Olaf A. Hougen, of the chemical engineering department.

A unique course in Solar Energy Technology is now being taught at the University of Wisconsin. It is the first of its kind, as far as is known, to be offered as a regular academic credit course in any college or university.

The course is being given for seniors and graduate students in chemical and mechanical engineering by Prof. John A. Duffie of the UW College of Engineering's Engineering Experiment Station and director of the UW's Solar Energy Laboratory.

The course covers three broad phases of the subject, including a study of basic concepts of availability and collection of solar radiation.

It also includes studies of application of solar radiation to house heating and cooling, to distillation of sea water, and other problems, as well as application of solar energy in space vehicles such as its auxiliary power possibilities.

The new course is partly based on research in the UW's Solar Energy Laboratory as well as making extensive use of current research and literature in the field.

* * *

A man went to the bar and ordered a Martini, drank it, chewed up the bowl of the glass and threw the stem over his shoulder. He continued this for six Martinis and noticed that the bartender was staring at him.

"I guess you think I'm crazy, don't you?" he asked.

"I sure do," the bartender replied, "the stems are the best part."

Compromise

A new Englander and his wife had taken up a homestead in Okla'homa. The soil was kindly and their thrift was so great that they prospered. At last age came heavily upon the wife and knowing that her time was not long, she called her husband to her side.

"Dear," she said, "I want you to send me back to Vermont after I've passed away."

"That would cost a lot, Mary," replied her husband. "I could buy that windmill for what that would cost."

"But I couldn't lie still in a grave this far away from the old folks," protested the wife.

"Well now, don't fret," compromised the man. "I'll tell you what I'll do. Suppose we try you here and if you don't lie still, then I'll ship you back to Old Vermont."

* * *

ME: I got a letter from Marjory accepting my proposal.

EE: Then you should be all smiles!

ME: Yeah, but who in hell is Marjory?

* * *

A Fairy Tale

Once upon a time a beautiful girl was walking through the woods when she came upon a poor little frog who spoke as follows:

"Lady, once upon a time I was a handsome prince, but a big black witch turned me into a frog."

"Oh, that's too bad," said the beautiful girl, "Is there anything I can do to help you?"

"Yes indeed," replied the frog. "If you will take me home with you and put me on your pillow I will be saved."

So the beautiful girl took the poor little frog home with her, and the next morning when she awoke there beside her was a handsome prince. And, do you know, to this day her mother still doesn't believe this story.

* * *

The "New Army" hitch-hiker is the fellow who holds up a thumb and when a motorist stops asks: "Do you have a radio in your car?"

STRIPPED GEARS

edited by William S. Huebner

Dames are pushovers for gay caballeros. Caballeros are athletes in Spain. Athletes in Spain throw the bull for diversion. Therefore dames are pushovers for bull throwers.

* * *

Two lunatics, each firm in the belief that he was a lifeguard, had escaped from an asylum and were trudging along the road in search of an ocean. Presently they came upon a large field of wheat which was rippling in the breeze much like the waves of the sea. Shedding their clothes, they scrambled up a telephone pole and the first goofy one dove off. A moment later his head dazedly emerged from the wheat.

"Dive to the left," he cautioned his companion, "I struck a sand bar."

* * *

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

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

Now he stays home.

A farmer and a professor were sharing a seat on a train. It was getting lonesome so the farmer started a conversation and they soon became a friendly pair.

"Let's have a game of riddles to pass the time," said the professor, "If I have a riddle that you can't guess you give me one dollar or vice versa."

"All right," replied the farmer, "but since you are better educated than I am, do you mind if I only give fifty cents?"

"OK," replied the professor, "You go first."

"Well, what animal has three legs walking and two legs flying?"

"I don't know. Here's your dollar. What's the answer?"

"I don't know either. Here's your fifty cents," answered the farmer.

* * *

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

Little Freddie (jeering): "Fine chance, with only two worms."

* * *

Demure Young Thing: "Oh, what kind of an officer are you?"

Officer: "I'm a naval surgeon."

Demure Young Thing: "Dear, dear, how you doctors do specialize!"

A group of local college boys were coming home from a party one night plastered to the gills. They stood in front of the house of one of their number and called for the father. "Will you please do ush a favor?" one said.

"What do you want?" asked the father.

"Will you please come out here and pick out Sam so the rest of ush can go home?"

* * *

A fat lady stepped on the scales not knowing they were out of order. The indicator stopped at 25 pounds.

"Holy smokes," exclaimed a drunk who watched her, "she's hollow!"

* * *

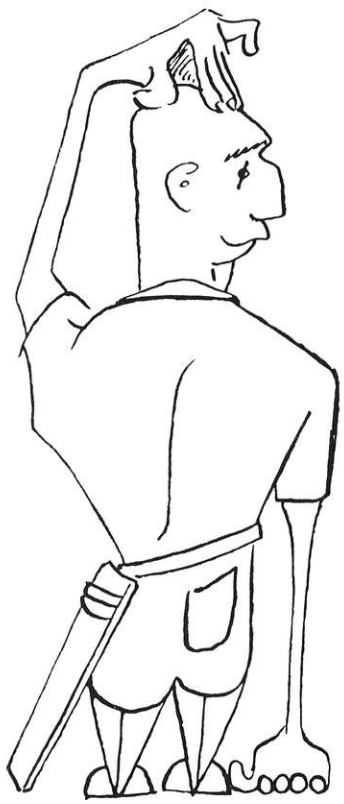
A colored preacher was hearing a confession. In the middle of it he stopped the young sinner, saying, "Young man, you ain't confessing, you's braggin'."

* * *

Two Engineers were sitting in the Library, one deeply interested in a book he was holding. "What's that you're reading?" asked the other.

"It's called *'What Millions of Women Want'*" was the reply.

"Lemme see that," said the questioner, "I wanna see if they spelled my name right."



So You Think You're SMART!

by Sneedly, Law'66

THE winner of the March contest was John C. Weber, Associate Professor of electrical engineering. At last we are getting some class in this column. Incidentally, he won by only one-half hour. The correct answers were: problem one, 1,3,9,27, problem two, 51.7°, and problem three, 64 minutes 20 seconds and quarter to nine.

We're still on our stick kick which we started last month. Figure out the probability that a stick, being broken into three chance pieces, may be arranged in the form of a triangle. Realize that if a 12″ stick is broken into two pieces 2″ long and one piece 8″ long, no triangle can be made.

Here's a slight variation on a very old problem. From what two locations in the world is it possible to walk one mile south, one mile east, and one mile north and arrive at the place from which you started. One place is easy to find, but old Sneedly wagers that you'll have to think to find the second.

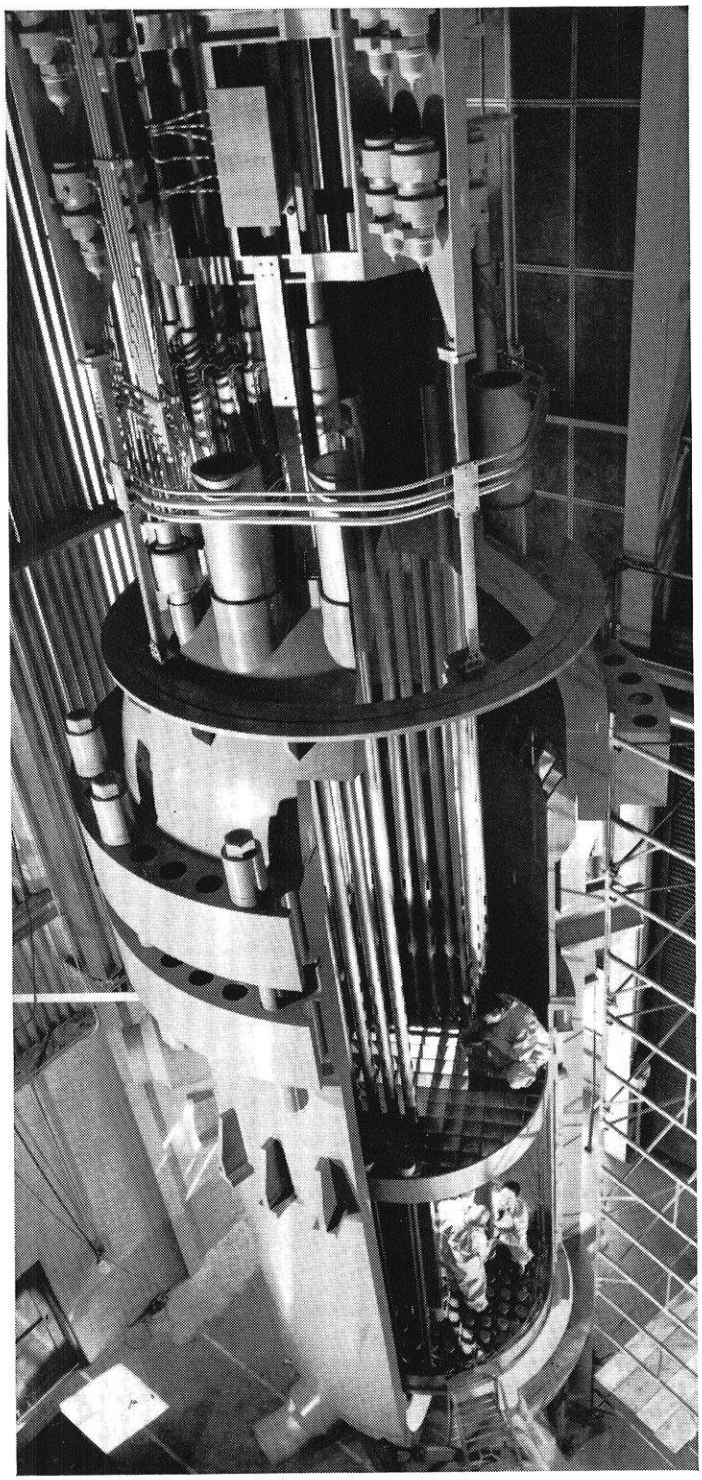
Finally, a little problem in geometry. A large circular table is pushed into a corner of a room so that it touches both walls. An inkspot on the very edge of the table, on the side nearest the corner, is known to be exactly 8″ from one wall and 9″ from the other. What is the diameter of the table?

Send your answers with your own name and address to:

SNEEDLY
c/o The Wisconsin Engineer
333 Mechanical Engineering Building
Madison 6, Wisconsin

All answers must be sent in the mail and only letters with the correct answers having the earliest postmark will be considered the winner(s). In case of ties, the Ten dollar prize will be divided equally among the winners.

If your sights are set  on nuclear power–



Mock-up of the Shippingport (Pa.) Atomic Power Station reactor which was designed and developed by the Westinghouse Electric Corporation under the direction of and in technical cooperation with the Naval Reactors Branch, U.S. Atomic Energy Commission.

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TRADE MARK

One of a series*

Interview with General Electric's Charles F. Savage Consultant—Engineering Professional Relations

How Professional Societies Help Develop Young Engineers

Q. Mr. Savage, should young engineers join professional engineering societies?

A. By all means. Once engineers have graduated from college they are immediately "on the outside looking in," so to speak, of a new social circle to which they must earn their right to belong. Joining a professional or technical society represents a good entree.

Q. How do these societies help young engineers?

A. The members of these societies —mature, knowledgeable men— have an obligation to instruct those who follow after them. Engineers and scientists—as professional people—are custodians of a specialized body or fund of knowledge to which they have three definite responsibilities. The first is to *generate* new knowledge and add to this total fund. The second is to *utilize* this fund of knowledge in service to society. The third is to *teach* this knowledge to others, including young engineers.

Q. Specifically, what benefits accrue from belonging to these groups?

A. There are many. For the young engineer, affiliation serves the practical purpose of exposing his work to appraisal by other scientists and engineers. Most important, however, technical societies enable young engineers to learn of work crucial to their own. These organizations are a prime source of ideas — meeting colleagues and talking with them, reading reports, attending meetings and lectures. And, for the young engineer, recognition of his accomplishments by associates and organizations generally heads the list of his aspirations. He derives satisfaction from knowing that he has been identified in his field.

Q. What contribution is the young engineer expected to make as an active member of technical and professional societies?

A. First of all, he should become active in helping promote the objectives of a society by preparing and presenting timely, well-conceived technical papers. He should also become active in organizational administration. This is self-development at work, for such efforts can enhance the personal stature and reputation of the individual. And, I might add that professional development is a continuous process, starting prior to entering college and progressing beyond retirement. Professional aspirations may change but learning covers a person's entire life span. And, of course, there are dues to be paid. The amount is graduated in terms of professional stature gained and should always be considered as a personal investment in his future.

Q. How do you go about joining professional groups?

A. While still in school, join student chapters of societies right on campus. Once an engineer is out working in industry, he should contact local chapters of technical and professional societies, or find out about them from fellow engineers.

Q. Does General Electric encourage participation in technical and professional societies?

A. It certainly does. General Electric progress is built upon creative ideas and innovations. The Company goes to great lengths to establish a climate and incentive to yield these results. One way to get ideas is to encourage employees to join professional societies. Why? Because General Electric shares in recognition accorded any of its individual employees, as well as the common pool of knowledge that these engineers build up. It can't help but profit by encouraging such association, which sparks and stimulates contributions.

Right now, sizeable numbers of General Electric employees, at all levels in the Company, belong to engineering societies, hold responsible offices, serve on working committees and handle important assignments. Many are recognized for their outstanding contributions by honor and medal awards.

These general observations emphasize that General Electric does encourage participation. In indication of the importance of this view, the Company usually defrays a portion of the expense accrued by the men involved in supporting the activities of these various organizations. Remember, our goal is to see every man advance to the full limit of his capabilities. Encouraging him to join Professional Societies is one way to help him do so.

Mr. Savage has copies of the booklet "Your First 5 Years" published by the Engineers' Council for Professional Development which you may have for the asking. Simply write to Mr. C. F. Savage, Section 959-12, General Electric Co., Schenectady 5, N. Y.

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