The Wisconsin engineer. Volume 60, Number 5 February 1956

Madison, Wisconsin: Wisconsin Engineering Journal Association, [s.d.]

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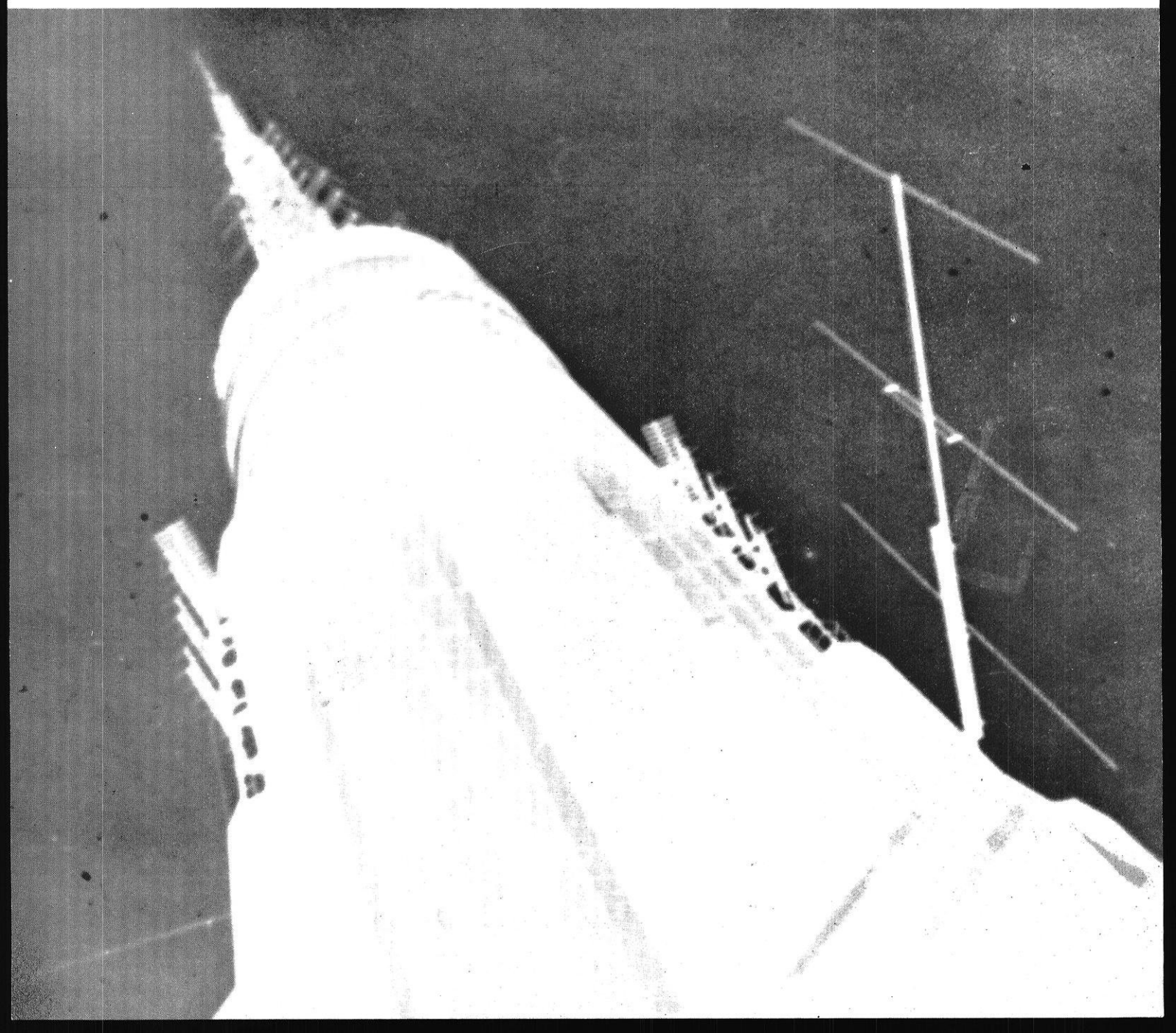
The Wisconsin **engineer**

FEBRUARY, 1956 **25¢**



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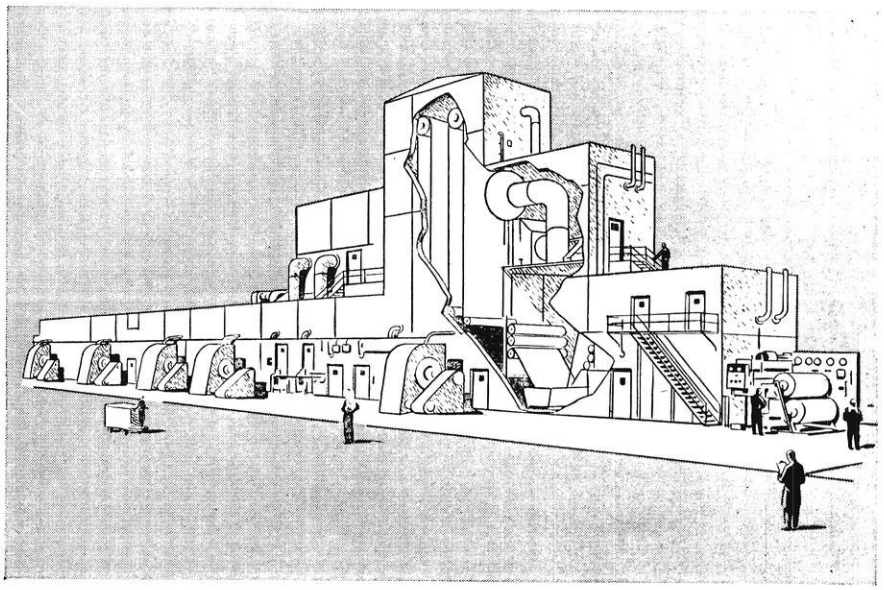

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The Student Engineer's Magazine

FOUNDED 1896

Volume 60 **FEBRUARY, 1956** **Number 5**

Articles

Features

Cover

A great maze of television, radio, radar, and other electronic equipment surrounds the top of the Empire State Building. The cover shot is the negative of a photo taken from the observation platform.

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ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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Publishers' Representative:
LITTELL–MURRAY–BARNHILL, INC.
101 Park Ave., New York
605 N. Michigan Ave., Chicago

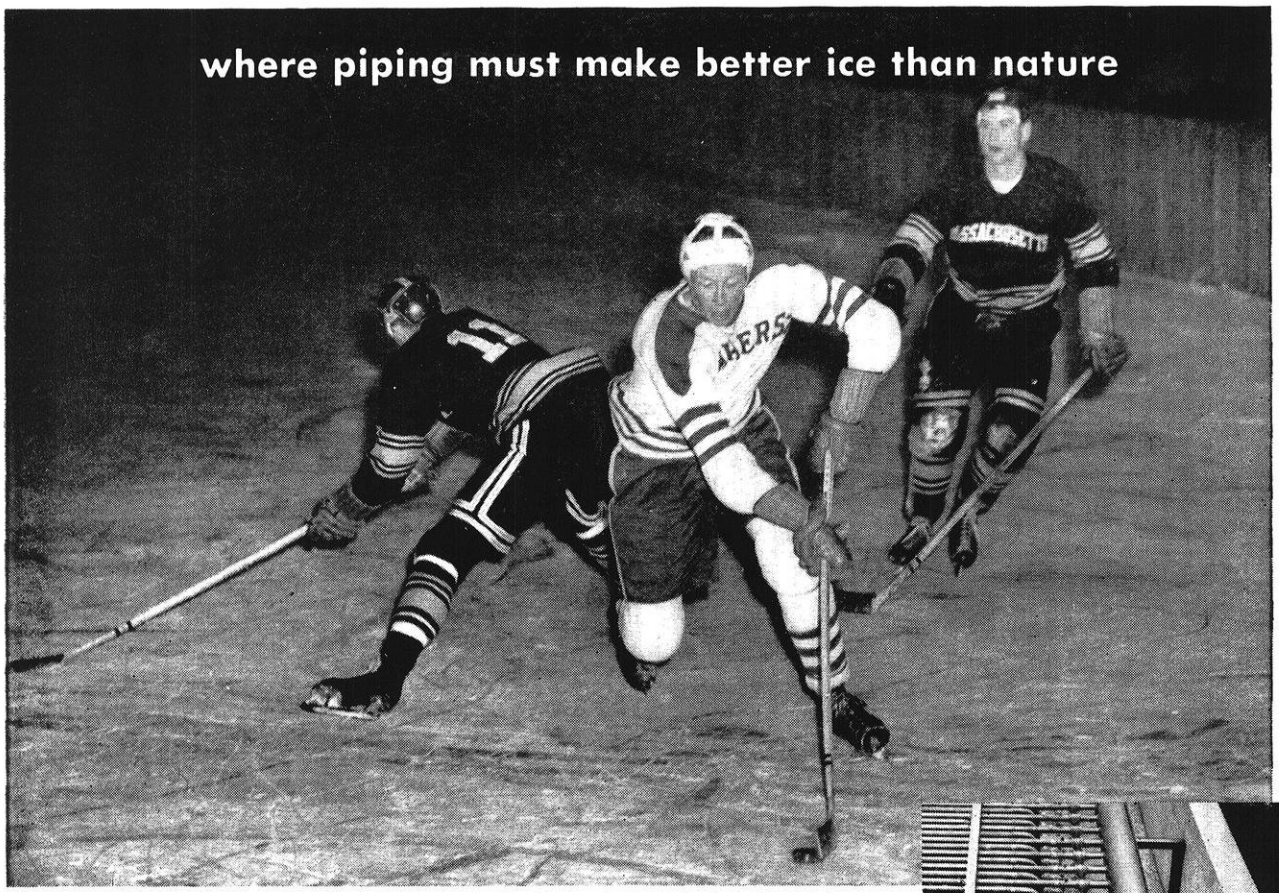
Entered as second class matter September 26, 1910, at the Post Office at Madison, Wisconsin, under the Act of March 3, 1879. Acceptance for mailing at a special rate of postage provided for in Section 1103, Act of Oct. 3, 1917, authorized Oct. 21, 1918.

Published monthly from October to May inclusive by the Wisconsin Engineering Journal Association, 331 Mechanical Engineering Building, Madison 6, Wisconsin.

Subscription Price

$1.25 PER YEAR . SINGLE COPY 25¢

Spires of industry rise above the woods and fields of Kershaw County, South Carolina, where E. I. du Pont de Nemours & Company has built a plant for the production of "Orlon" acyrilic fiber. Below are units for recovery by essential materials for re-use in the process.



A dependable surface for the flashing speed of hockey at the Jarvis-built Amherst rink

Rink builders rely on JENKINS VALVES

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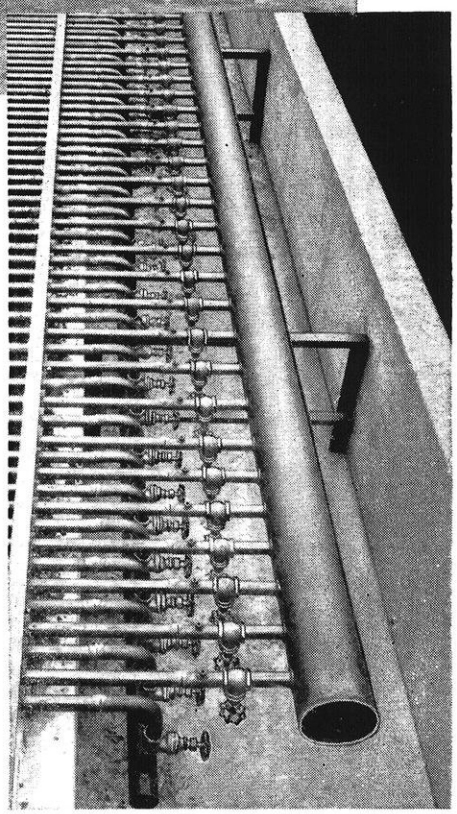

The JENKINS VALVES controlling each loop from the brine header in the St. Paul's School rink at Concord, N. H., are Fig. 1273 Bronze Gates with socket ends for silver brazing. These and other Jenkins Valves on lines to compressors, condensers, and pumps assure the critical control essential to efficient rink operation.

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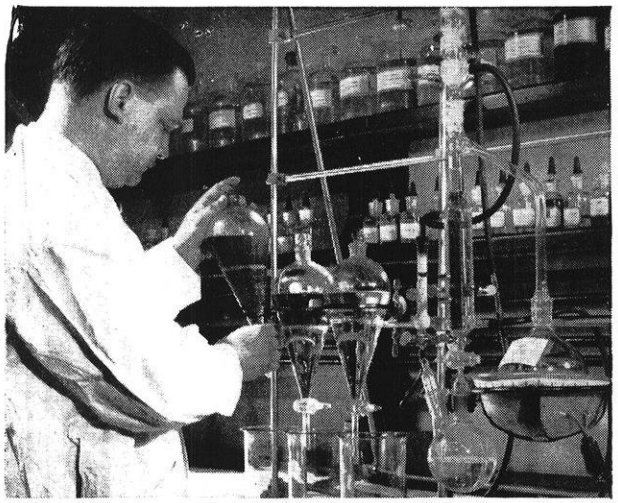
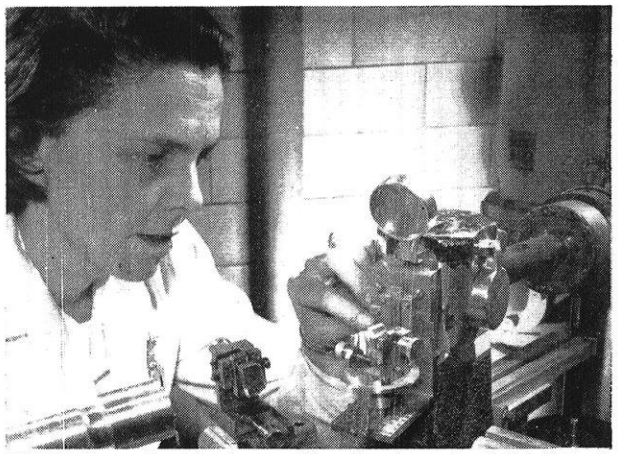
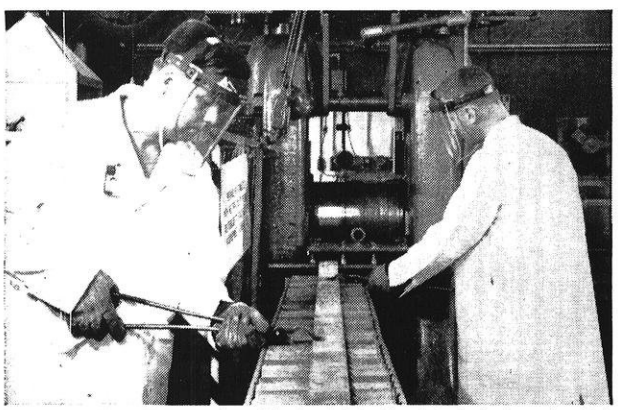


CHEMISTRY: Radioactive tracers determine effectiveness of solvent extraction in purification of germanium tetrachloride... later processed into metal.



PHYSICS: X-rays of metals show specific pattern for each material. They are used to identify impurities. Here a sample is positioned for careful analysis.



METALLURGY: Rolling uranium strip for fabrication into fuel elements. Strip will be cut to length and further processed before going to reactive coolant.

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ZIRCONIUM—

Suddenly Strategic

NUCLEAR REACTOR TECHNOLOGY HAS TRANSFORMED A LABORATORY CURIOSITY INTO A STRATEGIC ELEMENT IN THE METALLURGY FIELD

by Dick Kott, ch '57

The coming of the atomic age has necessitated the exploration of fascinating chemistry of the less known elements. These elements, thought twenty years ago to be useless contaminants of more desirable elements, are now important, and, perhaps, in the future, indispensable to each human being.

A typical example of this is the explosive development of zirconium, ten years ago a relatively unimportant, unheard of metal. In 1945 the total United States production of zirconium was twenty pounds per year, and it retailed at 300 dollars per pound. Its chief use was as a "getter" in small scale electronic devices. In 1948 Dr. Kaufmann, Massachusetts Institute of Technology, and Dr. Wigner, Atomic Energy Commission, discovered that zirconium would make an excellent structural material for long range thermal nuclear reactors. This discovery led to much research on purification and economic production of zirconium; so that the present rate of production is seventy-five tons per year and the cost is ten to fifteen dollars per pound. The technology of this former laboratory curiosity has skyrocketed until now it is more advanced than that of many of the common metals known and used for centuries.

To see why zirconium is an attractive structural material for long range thermal power reactors, an outline of the fundamental components of a reactor, its operation, and purpose is presented.

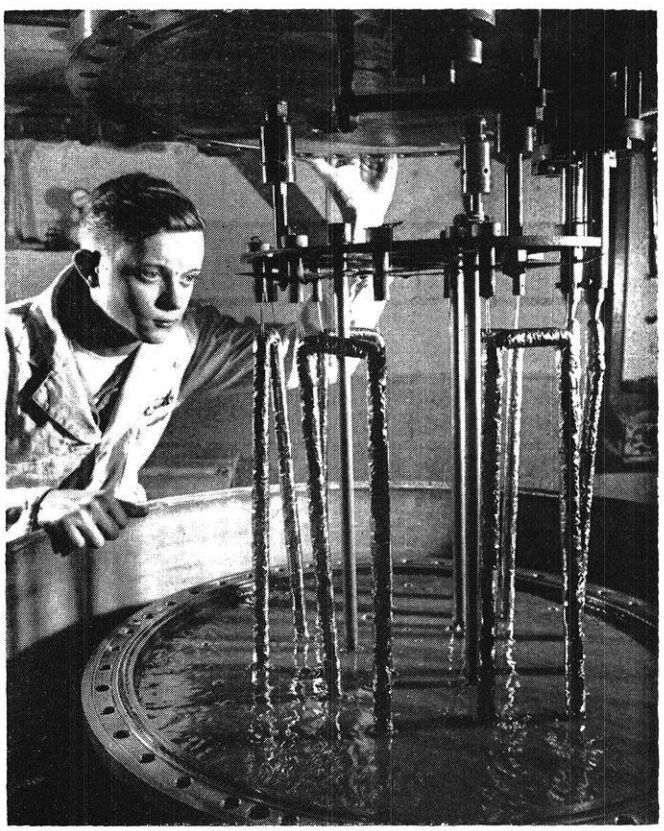
The purpose of the power reactor is to liberate energy as heat resulting from the fission of nuclear fuel. Nuclear fissions produce neutrons, and the rate of producing power is proportional to the rate of fissioning.

Let us see just how a reactor works. The naturally occurring U^{235} contained in aluminum cans, is inserted in rod form into a core of graphite blocks along with a source material like U^{238}. This core is surrounded by a structural material like zirconium which acts as a mirror to reflect escaping neutrons into the core where they can be used again to produce more fissions and thus increase the efficiency of the reactor. Around this neutron "mirror" is a thick protecting shield of lead and concrete to shield operating personnel from dangerous radiations. The rate of producting power is controlled by inserting neutron absorbing cadmium rods.

There are several stringent demands placed on the structural material used for nuclear reactors, and zirconium satisfies most of these demands.

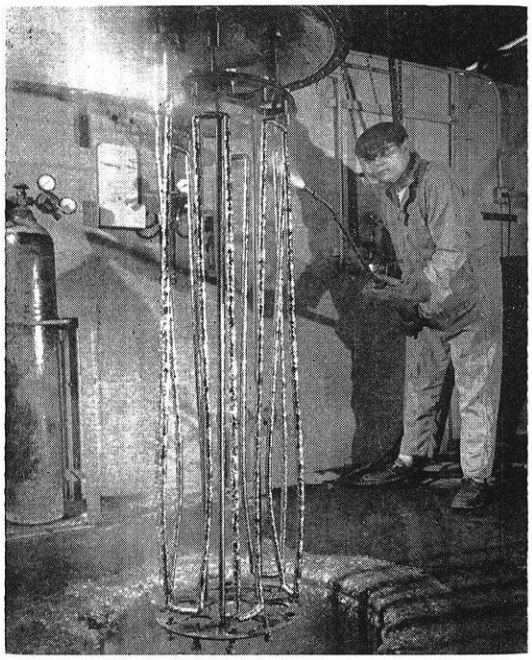
Zirconium is relatively transparent to neutrons; that is, it doesnt' readily absorb neutrons for fissionable processes. In the language of the nuclear engineer, zirconium is said to have a low thermal neutron cross section. The unit of nuclear cross section measurement is the barn, $1x10^{-24}$ square centimeters. Zirconium has a low cross section vaue of 0.18 barns as contrasted with a rate of 18-8 stainless steel, 3 barns.

One can see why this low cross section value is important by looking at an example of a large scale, long range power reactor which utilizes plutonium as a fuel. Assume that ninety-five neutrons are produced for



—Courtesy Westinghouse Engineer

Zirconium bars in the process of formation.



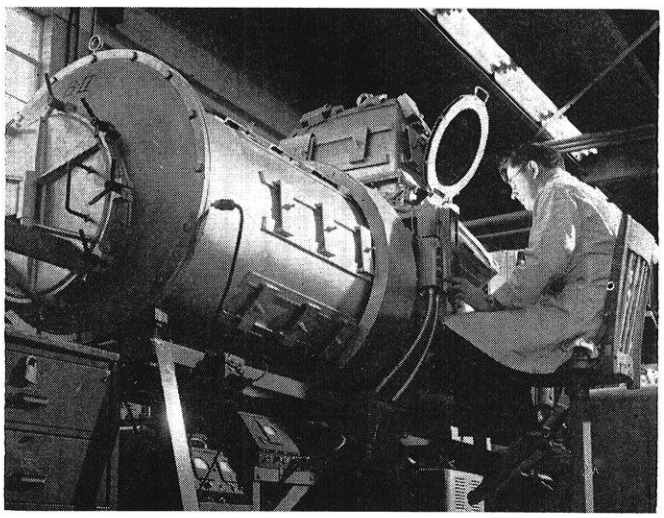
—Photos courtesy Westinghouse Engineer

Newly made Zirconium bars bet a steam cleaning (top). In the giant vacuum tank (left) Zirconium parts are welded for use in atomic reactors.

each 100 atoms fissioned. Suppose that the structural material like zirconium has a low neutron cross section of about 0.2 barns so that it parasitically absorbs one neutron. This leaves ninety-four neutrons for effecting new fissions; hence $\frac{94}{100} = 0.94$ is the regenerative efficiency of this reactor. Now suppose that this same reactor is construed with 18–8 stainless steel having a cross section of 3.0 barns which corresponds to an absorption of fifteen neutrons to give a regenerative efficiency of 0.80. From the regenerative efficiencies the utilization of the atomic fuel was calculated to be twelve per cent and three and one half per cent respectively for the above cases. For a long range power reactor the saving of eight and one half per cent in nuclear fuel costs is evident and can be seen to depend solely upon the cross section of the structural material.

If low cross section materials like zirconium weren't used, enrichment of the reactor fuel would be needed to attain a given power level. In addition, parasitic absorption by metals of higher cross sections results in the formation fo radioactive isotopes and transmuted elements. In some cases these transmuted elements may produce undesirable alloying effects on the structural material. This may result in corrosion and fouling of the equipment. Parasitic absorption also increases the danger of radiation from members when they are removed from the reactor for repair. This necessitates shielding and increases the waiting time before repairs can be safely undertaken. These troubles can be minimized by the use of low cross section materials like zirconium.

Structural materials must also be able to withstand the severe mechanical stresses and temperatures created by thermal reactors. Zirconium also suffices here. It has a very high melting point of 3325°F. However, its high melting point is deceptive since zirconium undergoes a structural transformation at 1600°F which results in less desirable mechanical properties. Even though zirconium has a hexagonal crystal structure which usually indicates low ductility, it is very tough and ductile and can be reduced 99% by cold rolling. It retains this ductility down to the temperature of liquid nitrogen. This ductility makes zirconium a favorable material to use where there is a high temperature differential as is the case in many sections of thermal reactors. The modulus of elasticity of zirconium is slightly higher than that of aluminum, and in the pure, soft condition, zirconium's tensile strength approaches that of brass alloys. Zirconium has a strength to weight ratio better than that of normalized



medium carbon steel but less than those of titanium, magnesium, and aluminum alloys.

As a result of high velocity, liquid metal coolants and high temperatures in nuclear reactors, structural materials must be extremely corrosion resistant if maintenance and radiation danger from leaks are to be minimized. Pure zirconium is extremely corrosion resistant and is affected only by hydrofluoric, concentrated sulfuric, and phosphoric acids. Zirconium's resistance to bases, salts, and liquid alkali metals at high temperatures is amazing, and in most cases where there is corrosion it is usually limited to tarnishing and surface embrittlement. In overall resistance to acids, bases, and salts, zirconium is matched only by the precious metals.

The problems of the metallurgy of this atomic age metal center around its production, refinement, and purification, not its supply. Zirconium is obtained from the silicate, zircon, which is present in weathered granite beds, beach sands, and stream beds. Zirconium is the eleventh most plentiful element in the earth's crust, and its natural sources are non-strategically located. The abundant sands of the Florida Peninsula and Ore-

gon coast along with the gold placer gravels of California and Idaho are the chief sources in the United States and show no signs of depletion. The rest of the world obtains their raw materials from the placer-tin sands of Malaya and Japan, and from the Baddelyte obtained from the diamond bearing sands of Brazil and Australia.

The first step in separation is the concentration of the ore which is usually done by various methods of gravity screening, flotation, and electrostatic separation. This process brings the concentration of the zirconium bearing minerals up to 65%.

The concentrate is intimately mixed with graphite and heated in a resistor furnace to produce the carbide which in turn is heated with an excess of chlorine to form the zirconium tetrachloride gas along with silicon tetrachloride. This mixture of gases is passed through a condenser where the zirconium tetrachloride solidifies while the more volatile silicon tetrachloride is vented. The zirconium tetrachloride containing ferric chloride and some unreacted zircon along with Al, Mn, Mg, Cu, Ca, and Hf is purified from everything except hafnium, by sublimation in a hydrogen-atmosphere furnace. The removal of hafnium will be discussed later.

Previously the pure metal had been produced by the deBoer process in which the crude metal was refined by thermal decomposition of zirconium tetraiodide, resulting in the deposition of pure zirconium on a fine filament of zirconium wire. This produces a very pure metal called "crystal bar" zirconium which is extremely expensive and previously was the only type used for reactor construction. However, the more efficient, cheaper Kroll process, developed by W. J. Kroll and his associates at the United States Bureau of Mines, has been perfected and is now used for almost all commercial production of zirconium. In the Kroll process, the purified zirconium tetrachloride in vapor form, is passed over a bath of molten magnesium resulting in the formation of pure zirconium metal and magnesium chloride. The excess magnesium and magnesium chloride are removed in a vacuum furnace leaving the sponge zirconium metal.

Like any other newly developing product, zirconium has had its problems. These problems clearly showed up in the use and development of this wonder metal in the power reactor of the atomic submarine, Nautilus. The largest source of trouble proved to be minute amounts of impurities.

For example, the true thermal neutron cross section of pure zirconium wasn't always known. During the winter of 1947, Pomerance and Feldman at Oak Ridge discovered that the neutron cross section value was 0.18 barns instead of 3.5 barns. This discrepancy was caused by the presence of a 1.5% to 3% impurity of hafnium which has a cross section of 115 barns. Removal of this hafnium proved to be as difficult as the separation of isotopes, but a process was finally developed, and is still classified information.

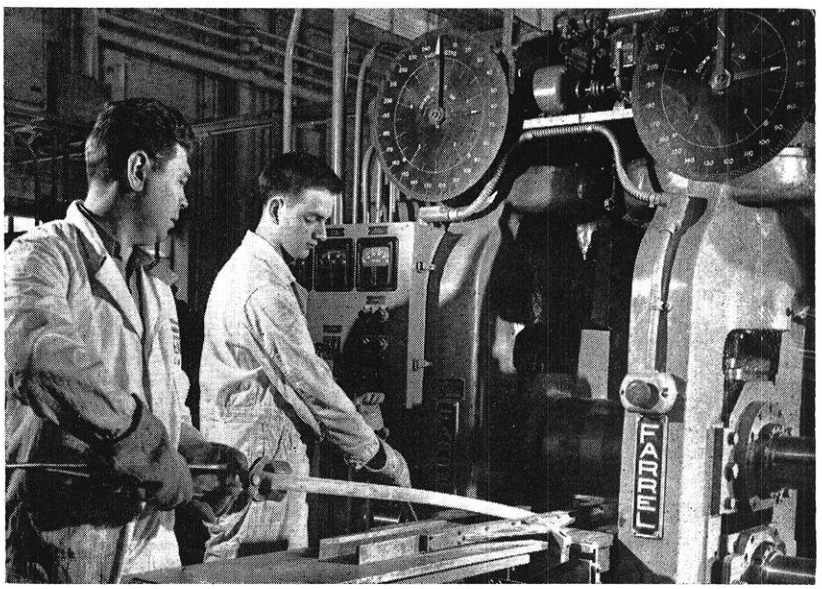
Before the atomic age, the huge affinity of zirconium for gases was put to use in vacuum tubes as a "getter" to secure a good vacuum and increase the tube life. Little was it suspected that this property would prove to be such a nuisance in the development of the Mark I. It was discovered that as little as 0.05% nitrogen, oxygen, or hydrogen seriously damaged the corrosion resistance of zirconium thus making it a necessity to keep these three to a minimum. Nitrogen is probably the worst impurity; hence any fabrication process which raises the temperature of the zirconium above 300°C such as welding or heat treating must be done in a vacuum or inert atmosphere to prevent this absorption of nitrogen. Later it was discovered that the nitrogen present in steam caused serious corrosion problems with the Mark I reactor; hence very thorough de-aerating procedures were developed.

Gaseous impurities also affect the mechanical and metallurgical properties of zirconium. Traces of oxygen drastically decrease its ductility and therefore have to be removed along with nitrogen and other gaseous impurities. Heat treatment affects the ductility of zirconium to some extent. When the metal is cooled in air from 600°F, it gets brittle, but when it is quenched, it remains ductile. This is the result of the absorption of minute amounts of hydrogen and can be corrected by vacuum annealing.

Even with corrosion producing materials absent, corrosion of zirconium still continued. After much research it was concluded that this corrosion was caused by the machining stresses produced in the surface layers of the metal, but high temperature annealing was out

(Continued on page 48)

Ingots of zirconium are rolled in the precision mill pictured.
—Courtesy Westinghouse Engineer



HI-FI for the Beginner

INTERESTED IN BUILDING YOUR OWN HI-FIDELITY PHONOGRAPH? HERE'S A GOOD BACKGROUND ARTICLE FOR YOU

by Bob Nichols, e'58

There has been a tremendous growth in the interest in hi-fidelity in recent years. This increased interest in hi-fi, as it is popularly called, has resulted in some controversy as to exactly what constitutes hi-fi. Some people insist that a whole array of equipment is necessary for the true reproduction of sound; others claim that the equipment included in the popular portable hi-fi sets is all that is necessary for top-notch reproduction of sound; and still others insist that any equipment better than a child's record player is good enough to play records on.

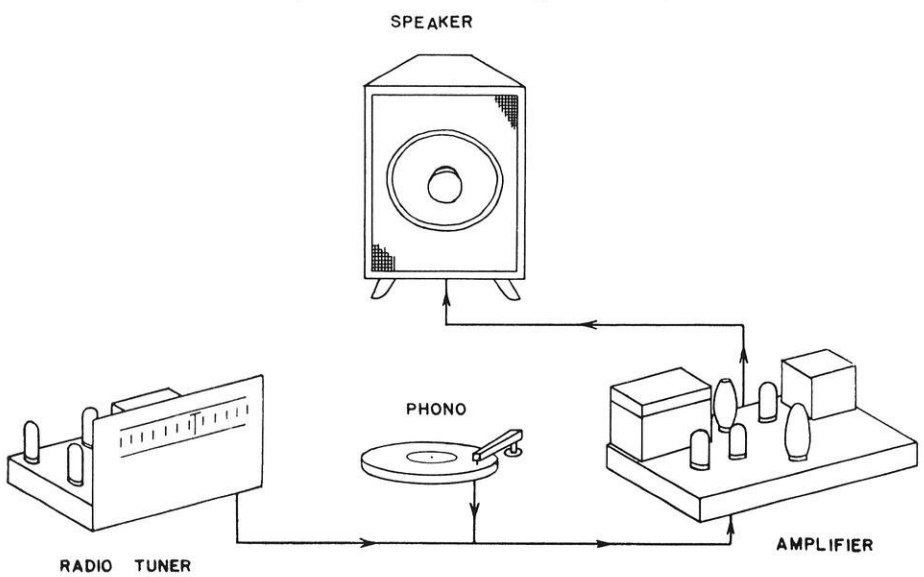
The question of what constitutes a good hi-fi system can't be answered in one simple statement. The main difference between hi-fi sets and other systems is the quality of the components; the big question being whether or not the added cost of higher quality components is worth the better fidelity and tone. Certainly there is a point beyond which the added cost is not justified, at least to most people. For example, mounting a turntable on a 100 pound block of wood and then mounting the block on a shock mount in order that a few vibrations will not distort the final sound would seem unnecessary and extravagant under most conditions.

An analysis of the basic components of a hi-fi system will enable one to judge better the quality of any given system. The typical hi-fi system may be broken down into three major sections—the signal sources, the amplifier, and the speaker.

The signal sources may consist of an FM tuner, tape recorder, microphone, or a record player. The most common in the hi-fi systems are the FM tuner and the record player, although the tape recorder is gaining in popularity because it can be adapted to many different uses. The FM tuner is especially well suited to use in hi-fi sets because it reproduces sound much more accurately than the usual AM receiver. The hi-fi set should have a range of almost ten octaves and the tuner will handle this range, providing the transmitting FM station delivers a signal carrying 10 octaves, while an AM receiver can handle only the lower five to seven octaves of this range. Of course, another well known advantage of the FM set is that it is free from static. The FM tuner, which needs an amplifier and a speaker to make the sound audible, is nearly always better in the reproduction of sound than is the common AM–FM receiver.

The other signal producer which is common in hi-fi sets is the phonograph or record changer. Unless a good record changer is chosen, unpleasant noises may arise in this piece of equipment. The heart of the changer is the motor driving the turntable upon which the record is played. Cheaper, two pole induction motors receive an impulse every half revolution. This alternating pulsation and coasting can cause a wowing sound. Four pole induction type motors receive an impulse every 90 degrees and this higher pulsing frequency helps to smooth out the running of the turntable. Another difficulty met in the using of any induction type motor is that the power company is not always able to keep the voltage constant, which means that the speed of the motor will vary somewhat. The best motors are of the hysteresis synchronous type which depends upon the frequency of the current to control its speed. Also, a heavy turntable acts as a flywheel to help smooth out the running. Most turntables are made of stamped sheet metal, which might be weighted, while the high class turntables are of cast metal which has been machined accurately. Incidentally, the turntable should be of some

A schematic layout of the minimum requirements for a hi-fi set.



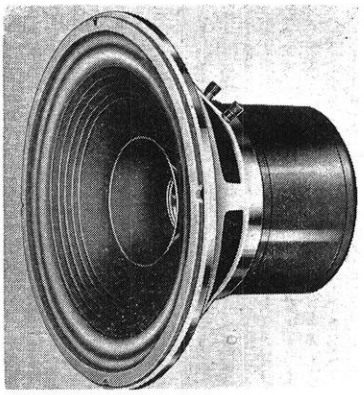
anti-magnetic material if a magnetic cartridge is to be used.

Good records deserve special care. One of the easiest ways to ruin a good record is to use a cheap, worn-out needle; it is much less expensive in the long run to buy a good needle. Of these, the diamond needle is by far the best with the sapphire and osmium needles running a poor second and third respectively. A good diamond needle will pay for itself by the care given to your records and the time that they last. If records of all three speeds are to be played, a dual needle will be needed as the 78 RPM record has a groove three times as wide as the 45 and 33⅓ RPM records.

As the needle vibrates, it imposes stresses upon a cartridge in the record player tone arm. This cartridge can be one of several types, the most common form being the crystal. The crystal produces a small voltage in proportion to the magnitude of the stress on the crystal. The crystal cartridges are good, but each crystal is different and they are affected by extreme conditions of temperature and humidity. The ceramic cartridge is similar to the crystal except that it is not affected by extreme conditions of temperature and humidity. A more recently perfected development is the magnetic cartridge. In this cartridge, the vibrations of the needle cut magnetic lines of force to produce a small voltage. Since the voltage generated by the magnetic cartridge is too low to be used in regular amplifiers, a preamplifier is required. The magnetic cartridge is able to handle all of the frequencies necessary for good hi-fi reproduction with less distortion than most other cartridges.

Many people become confused by the different types and speeds of records on the market and wonder if all can be used on a hi-fi changer. The older 78 RPM records are not suitable for hi-fi systems as they are the source of much scratching. The phonographs made for these records eliminate the scratching noise by cutting out all frequencies above about 8000 cycles per second (cps). Most of the truly hi-fidelity records are recorded at 33⅓ RPM on the "long play" albums. There are also some good quality 45's out, but the 78's are rapidly becoming obsolete. (This is not because 78 RPM is no good for hi-fi, but is true because of the economy achieved by recording at 33⅓ RPM). It is important to shop carefully for records as a hi-fi set cannot perform without hi-fi records.

The second major part of the hi-fi system is the amplifier. The amplifier is the heart of the hi-fi system. The job of the amplifier is to take the low voltage input of the cartridge and build it up so that it may be fed into a speaker. The amplifier must do this without distorting the original sound and without adding any extraneous noise. For example, two of the more common types of distortion are intermodulation and phase distortion. Intermodulation is the addition of two or more signals to produce a sound different from the original. Phase distortion results when two signals enter the amplifier at the same time, but one signal gets



A double cone, single coil speaker that is used widely in medium priced hi-fi installations.

behind the other. A common fault of many radios is that they are not capable of reproducing the entire audio range. This means a cutting off of the higher and lower frequencies so necessary if the sound is to be complete. Amplifiers, in addition to being able to reproduce the entire audio range, should be able to reproduce sounds of a much higher frequency than the human ear can detect. This is necessary in order that these higher frequencies may combine to produce pleasing overtones which are in the range of the human ear. Also, an amplifier should have plenty of power. While only a few watts of power are necessary most of the time, a larger amount is required when sudden strains are put on the amplifier such as during a loud clash of drums or other percussion instruments. In such instances, the power of the amplifier may be exceeded and the amplifier will be blocked for an instant. This blocking is difficult to detect, but after a time it will cause listening fatigue due to ear strain caused by listening for a sound which doesn't exist.

The preamplifier also deserves some mention since it must be used with the commonly used low output magnetic cartridge. The magnetic cartridges have an output of only a few milli-volts, which is not enough to actuate an amplifier. Another function of the preamplifier is that of a compensator. Since the width of the record groove is constant below 500 cps in order not to break into the next groove, some of the lower frequencies are not reproduced. The constant width of the groove below 500 cps is achieved by reducing the amplitude of the signal in proportion to the decrease in frequency when the record is recorded. The preamplifier compensates for the bass response by boosting low frequencies at a rate exactly opposite to the way they were recorded.

The final major part of the hi-fi system is the speaker. Many times the speaker is the weakest link in the hi-fi system. A good speaker system should be able to reproduce the entire audio range with a minimum of distortion. The best way to judge a speaker is to listen to it yourself, as there are many differences between speakers which do not appear in the information compiled in the manufacturer's specifications. The permanent

(Continued on page 50)

YES THERE'S A WATER SHORTAGE

BUT SOLAR DISTILLATION AND ELECTRODIALYSIS OF SEAWATER ARE POSSIBLE SOLUTIONS TO THE PROBLEM

by Phil Noth, ch'57

Water is undoubtedly the most abundant natural resource in the world. The mighty oceans cover 70 percent of the earth's surface and have an average depth of more than two miles, making the supply of water virtually inexhaustible. Yet, from the beginning of time, man has been plagued by shortages of this vital compound and has had to dig wells, build reservoirs and catch rain on the roof of his home in order to have water which he could drink.

Over vast areas of the world today, water is the key to man's prosperity or his poverty—his comfort or his misery, and the United States is no exception. In spite of being liberally blessed with lakes and streams, and an annual average rainfall of 30 inches, our country also is confronted with fresh water problems, because this 30 inch rainfall is not evenly distributed. For example, along the Pacific northwest coast, precipitation runs to about 120 inches, while parts of the arid Southwest get less than five.

Until World War II, water shortages were chiefly the problem of our western states. But since then, the problem has become more universal and shortages have struck in all directions, parching both coasts and vast areas in between. All over, cities pleaded with their citizens to cut down on their water use—cities like New York, Philadelphia, Norfolk, Tampa and New Orleans where an adequate water supply had been taken for granted. Out on the farms, crops and animals were sacrificed to the drought; the most unfortunate of the sufferers saw the rich top-soil of their farms blow away to leave desert.

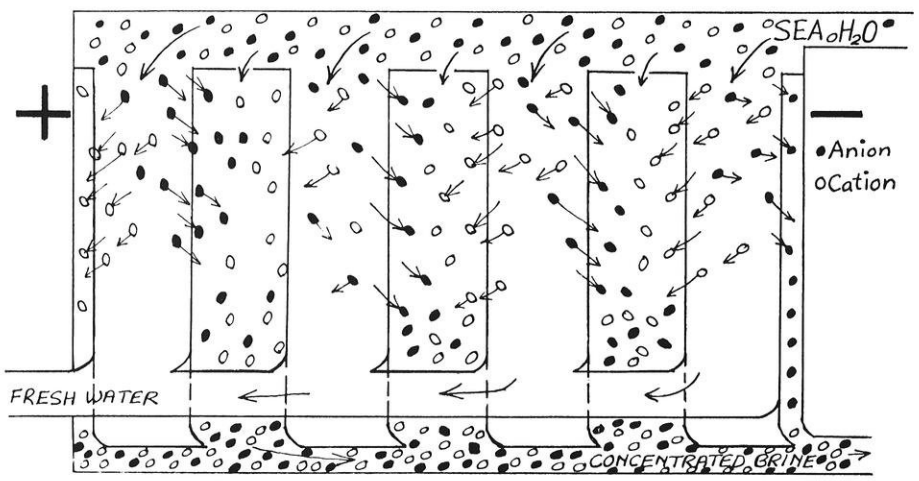
There is good cause to be concerned about our water supply: the nation's water consumption has increased at an alarming rate. The ten years around World War II, 1935–1945, saw our water use doubled and since then consumption has continued to increase rapidly. In fact, estimates of the United States Government forecast that it will again be doubled by 1975 over what it is now.

What are the reasons for this increasing water consumption and the resultant shortage?

As indicated above, World War II definitely played an important role. It caused a gigantic increase in our industrial machine—and industry has an unquenchable thirst. Some domestic industries require a yearly water supply measured in the trillions of gallons. One ton of steel alone requires 65,000 gallons, a ton of aluminum, 320,000 gallons, and a ton of synthetic rubber calls for 600,000 gallons of water. One paper mill in Texas uses about 22,000,000 gallons of water a day, compared with Austin, the state capital, whose 135,000 persons use about 15,000,000 gallons daily, and the Baton Rouge oil refinery consumes more water than Cleveland's 915,000 population.

A tremendous population increase also has contributed to the shortage. And, of course, more people means more food and, consequently, the farmers need more water for irrigation.

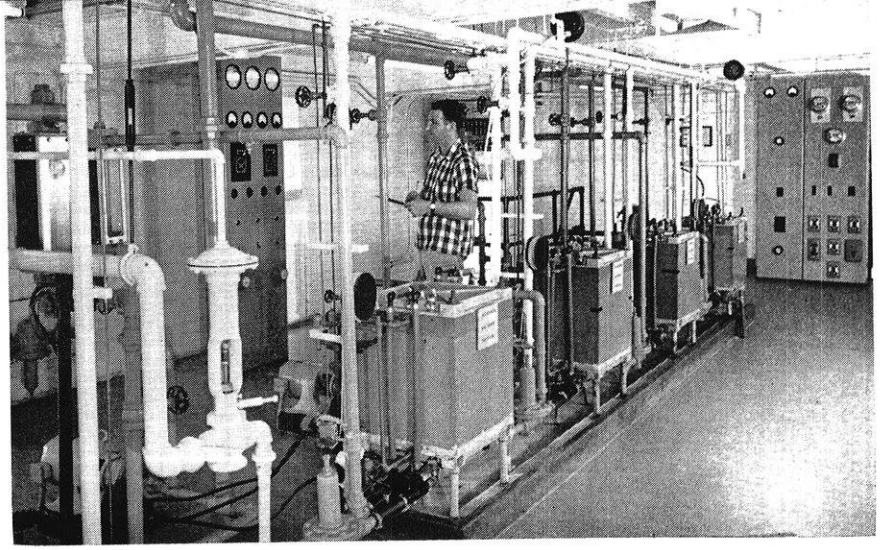
Still another reason for our recent water shortages is the fact that since the war, Americans have grown accustomed to a higher standard of living, and many of their conveniences, such as automatic washing ma-



Electrodialysis employs unlike plastic membranes in pairs which screen out anions (Cl^-) or cations (Na^+). Migration of the ions is induced by oppositely charged poles on the opposite sides of the tank, but is interrupted by membranes which refuse passage to ions of one or the other electrical charge. The membranes are thus placed so that half of the cells become purified while the other half becomes concentrated with salt.

chines and dish-washers, require more water. Perhaps the greatest consumer of water among our twentieth century "luxuries" is the air-conditioning unit which can increase a person's water needs four times.

Finally, as if these reasons weren't enough to create a real problem, industry, agriculture and people complicated matters be concentrating in areas where water supplies are far from adequate!



Pictured is electrodialysis equipment represented by the scematic diagram on the opposite page. It is manufactured and built by Ionics, Inc., of Cambridge, Mass.

Although most people have heard or read of the probable coal or oil shortage sometimes in the future, the idea that there could be a serious water shortage undoubtedly comes to some as a surprise. The fact is, our own country's water supply is not too ample, and it is rapidly becoming less! Different methods to help alleviate the situation have been tried, such as buildings dams to save water for dry periods or seeding clouds with dry ice; it is generally recognized, however, that these measures cannot be sufficient for the future if our present rate of water usage continues. Therefore, the earth's vast water-hole—the briny ocean—is the place to which men are looking with increasing expectancy.

Actually, the ocean is where we get most of our fresh water anyway, for it serves as a big receptacle whose brine is distilled into pure water by solar energy. All we have to do is go nature one better, by turning the water of the ocean into fresh water and putting it where it is needed. And this in itself isn't hard to do.

One obvious method, that of distillation, has been used for centuries on ships for drinking purposes—in fact, today almost all ocean-going liners distill their own drinking water from the sea water; some of the larger vessels are capable of producing 40,000 gallons of fresh water daily. Yet, distillation is only one of many different ways of producing fresh water from sea water. The primary problem is not to discover ways of making fresh water out of salt but, rather, to find out how to do it cheaply! For it *is* possible today to satisfy all our water needs using ocean water, but it is the price which is foreboding.

In 1952, Congress authorized the Department of the Interior to get a saline water conversion program under way, and various research laboratories all over the country were given different contracts to work on a method or part of a method for producing fresh water from salt. Last summer, Congress appropriated more money ($10,000,000) to keep the program from expiring in 1957, and extended it until 1963.

At present there are two processes that seem most likely to get the first large scale commercial application. They are the electric membrane process or electrodialysis, and vapor-compression distillation. However, four other processes are in the running, and actual dozens of others are distinct possibilities.

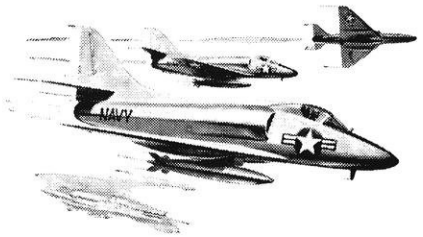
Electrodialysis, a process which is being developed largely by Ionics, Inc. of Cambridge, Massachusetts, depends on the property of certain plastic membranes to pass only electrically positive particles (cations) and other membranes to pass only electrically negative particles (aninos). The membrane sheets of the two kinds of material are arranged alternately so as to enclose narrow channels for the flow of water. Salt water is fed into every second passage, where-upon the applied electrical potential causes the positive ions to move out through the negatively charged sheet on one side, and the negative ions to move out through the positively charged sheet on the other side of the salt-water channel. The ions of both types then appear in the second set of water channels and recombine to form salt. The net result is that the water in one set of water channels becomes depleted of salt and purified, while the salt concentration increases in the other set of water channels.

One procedure used to make these membrane sheets involves preparation of a suitable polyelectrolyte (which is primarily responsible for the ion-selective or ion-specific behavior) and incorporation of this polyelectrolyte into an insoluble film matrix. This is accomplished by finding a suitable solvent system which will dissolve the polyelectrolyte and the film-forming plastic, casting this solution onto a thin film on a plate or drum, and evaporating the solvent to insolubilize the polyelectrolyte.

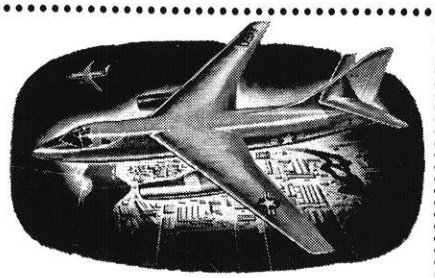
One of the reasons that the electric membrane process may be economically feasible is that both power and equipment costs seem to be theoretically lower than those of other processes. This can partly be traced to the following characteristics: 1) The water is not heated or vaporized, thereby eliminating thermodynamic losses. 2) Action is taken against the impurity ions rather than the water. Since these are in lower concentration, it would seen to require less energy to remove the ions from the water than vice versa. 3) It is not necessary to raise the pressure in the system, therefore avoiding pumping equipment and power cost for process pressures. It also permits lighter construction of equipment with the attending saving. 4) As concen-

(Continued on page 54)

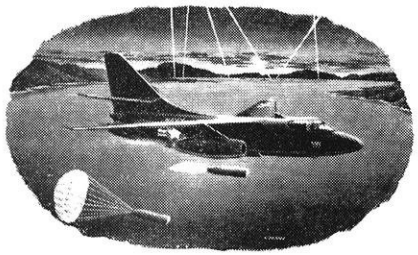
F4D, "SKYRAY"— only carrier plane to hold official world's speed record



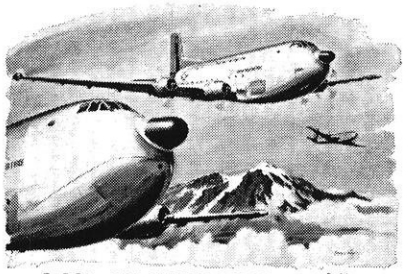
A4D, "SKYHAWK"— smallest, lightest atom-bomb carrier



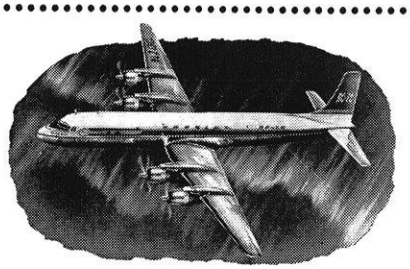
RB-66 — speedy, versatile jet bomber



A3D, "SKYWARRIOR"— largest carrier-based bomber

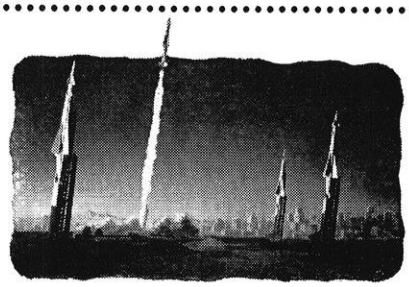


C-124, "GLOBEMASTER"— world's largest production transport

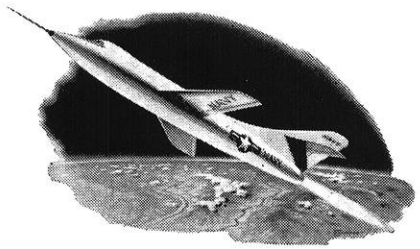


DC-7 "SEVEN SEAS"— America's finest, fastest airliner

Engineers: join this winning team!



"NIKE"— supersonic missile selected to protect our cities



D558-2, "SKYROCKET"— first airplane to fly twice the speed of sound

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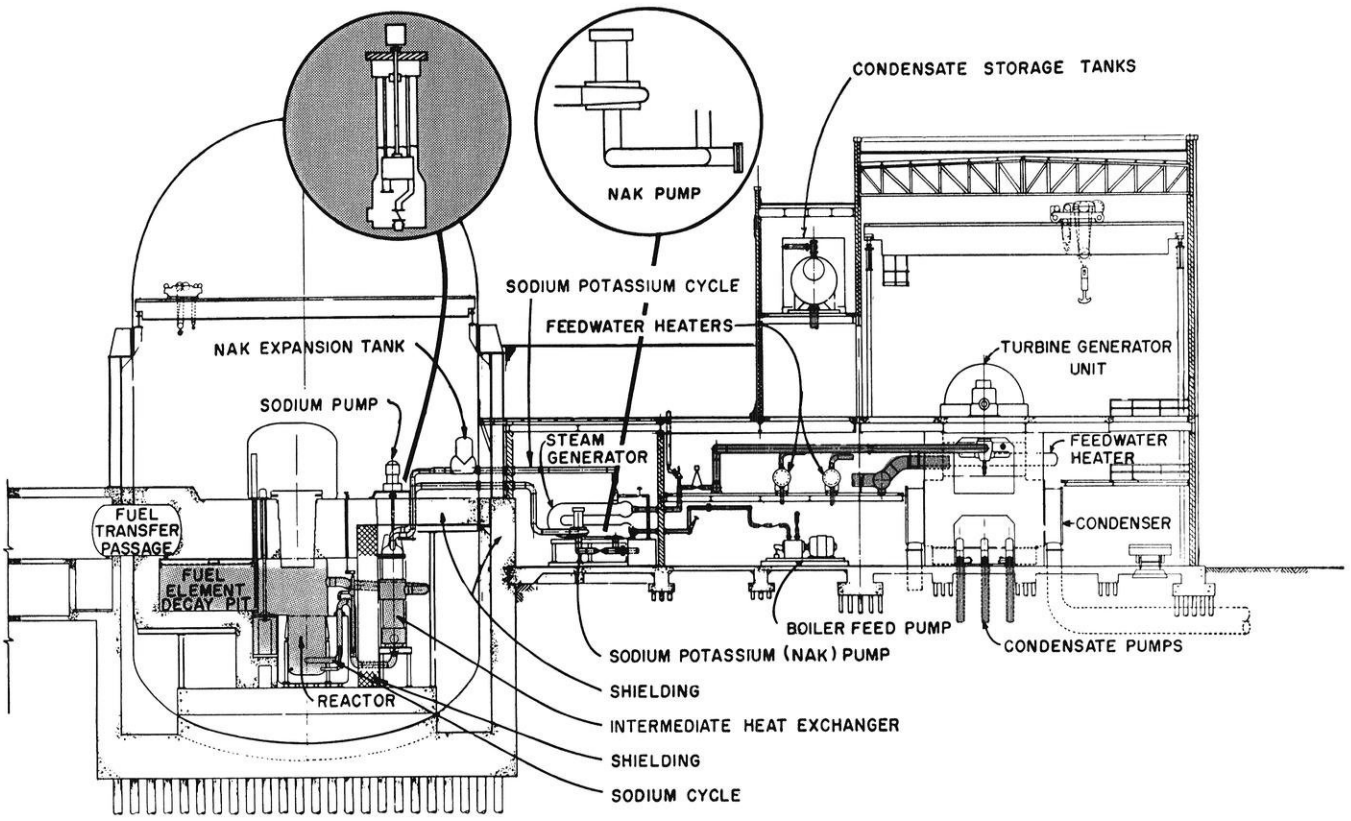

DIAGRAM OF STEAM POWER PLANT UTILIZING NUCLEAR ENERGY IN A FAST NEUTRON BREEDER REACTOR

PUMPS FOR ATOMS?

With the wonders of atomic power will come new and challenging problems for Detroit Edison's mechanical engineers. Today's combustion space in a typical boiler 15 stories high will be replaced by a reactor core scarcely larger than a rain barrel. In these reactors, sodium and sodium potassium alloy will be used as heat exchange agents.

One of the primary problems concerns the design of pumps and piping suitable for handling these liquid metals. You should remember that these pumps must be rugged yet simple, they must require minimum maintenance yet be able to handle large quantities of 950° F. sodium which will become highly radioactive. How and with what materials would you design these pumps?

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THE DETROIT EDISON COMPANY

2000 Second Avenue, Detroit 26, Michigan

DESIGN FOR A WELDED FIFTH WHEEL CRANE

AN ENTRY IN THE A. F. DAVIS AMERICAN WELDING SOCIETY AWARD CONTEST

by Roger W. Sackett, m'57

In many instances when a tractor drawn semi-trailer unit becomes stalled or damaged on the highway and can only be repaired in a shop, a wrecker truck must be dispatched to the scene to retrieve the disabled vehicle and another tractor has to be sent out to haul the loaded semi-trailer on to its destination. The retrieving operation is further complicated if the disabled tractor's running gear is damaged in such a way that it must be towed with one of its axles off the ground. Then the wrecker truck must be more than a towing unit, it must be equipped with some form of lifting device.

It is expensive for a truck operator to own a wrecker truck because it is not used often and must remain idle much of the time. Also it is a single purpose vehicle and cannot be used for other types of jobs. Therefore, when a trucking concern wants a disabled tractor retrieved, they must pay a towing company to do the job. Additional expense is also incurred because a replacement tractor must be driven to the location of the stalled unit.

A fifth-wheel crane is a possible solution to this problem facing trucking companies and other concerns that operate truck tractors and semi-trailers. With it any truck tractor can be turned into a wrecker truck in a short time and with a minimum of effort. No investment in a separate truck is necessary because any tractor not coupled to a semi-trailer can be used for the conversion. In addition to being able to retrieve stalled tractors, a unit equipped with a fifth-wheel crane can tow the replacement tractor to the scene with its front wheels off the ground so that the towed tractor requires no one to drive or steer it.

To make this conversion, the crane is attached to the tractor's fifth-wheel coupling plate in the same manner a semi-trailer is coupled to the tractor: by the use of a flanged king pin. The fiifth-wheel has a rocking action and rotates about a shaft that has its axis perpendicular to the centerline of the tractor frame. This rotation of the fifth-wheel provides the base-hinge action for the crane. The tendency for the tractor to tip when a load is applied to the crane is lessened because the axis of rotation is located ahead of the tractor's rear axle. The crane has no lateral motion but is raised and lowered by a hand operated hydraulic hoist which is a heavy-duty truck jack with several modifications. The piston end of the hoist is pinned to a bracket which attaches it to the tractor frame. The cylinder end is secured to the pivot bar on the crane frame by means of a bushing and plate assembly. A stop block on the under side of the crane fits into the coupling slot of the fifth-wheel to restrict the lateral motion of the crane.

The weight of the crane frame is approximately 180 pounds so that it can be easily and quickly attached to the tractor by two men. In the mounting of the unit, the king pin on the crane frame is slid into the coupling slot of the fifth-wheel and locked in place with the locking mechanism of the coupling plate. The channel and plate making up the cylinder mounting bracket are bolted to the last cross-member of the tractor frame with two ½ inch bolt assemblies. The base of the hydraulic hoist is then bolted to the bushing and plate assembly on the crane's pivot bar. To complete the installation, the hinge block on the piston head of the hoist is placed between the two hinge plated on the mounting bracket and pinned in place with a one inch diameter round-headed pin. With a chain or cable attached to the eye on the end of the crane boom, the unit is ready to operate as a wrecker truck.

The service to which a fifth-wheel crane will be subjected requires that the unit be strong, flexible, and light. For these reasons and many others, arc welding is by far the best method of construction. Because it is desirable to mount the crane on a tractor without the use of any additional equipment, it must be light enough for two men to do the job. Steel stock can be welded up to give a very strong but light weight unit. Riveting or casting, of course, would increase the weight of the unit considerably and would give no additional strength. Furthermore because the crane is to be used in a mobile application and must undergo a flexing action, it is imperative that welded construction be used rather than riveting or casting. Cast construction will not suffice for a flexing action because it is too stiff and a riveted design would subject the rivets in the unit to a large amount of shear. Another favorable feature of arc welding in this application is that it allows a considerable time saving in construction because the joints are easier to fit-up and require little preparation. With a riveted design, however, more time is required because holes must be drilled and the joints are more difficult to fit-up. Because appearance of the finished crane is not of prime importance, it is not necessary to grind down any of the weld beads.

Besides allowing savings in time and material, arc welded design requires only a minimum of equipment for the construction of a fifth-wheel crane. The equipment needed to build an arc welded fifth-wheel crane includes: an arc welder, either A.C. or D.C.; a torch or saw to cut and shape the steel parts; and a grinder to put the proper edge contours on some of the parts. Most companies that maintain their own trucks have these pieces of equipment in their repair shops. Also, the use of a hand operated hydraulic truck jack for the lifting device eliminates the need for special hydraulic cylinders, pumps, hoses, connections, and reservoirs. These factors make the construction of a fifth-wheel crane by truck operators very economical and practical.

After all parts have been cut to size or shape, the fabrication process proceeds in the following manner. The numbers following the part names refer to the various parts of the crane which are shown in the accompanying drawings. These parts are also listed in the included tables, 1 and 2. E6010 or E6013 electrodes can be used in this fabrication depending upon which type of welding current is used. The selection of materials for the various parts was determined from the design calculations shown on pages 8, 9 and 10.

1. Grind the bottom edge of the forward end of the frame rails (6) to fit the curved interior surface of the frame and angle (7).

2. Fit-up the two frame rails (6) and the frame end (7) and tack in position. Using the weld types and sizes represented by the AWS symbols on the drawings, weld these three parts together in the places indicated on Plate 1.

3. Weld the two gusset plates (18) to the top and bottom of the rear end of the crane.

4. Center the king pin (1) on the 6 inch bottom surface of the frame end (7) and clamp in place. Weld the king pin to the frame end angle by making three passes around the base end of the pin thereby building up a ½ inch fillet. This procedure for attaching the king pin is recommended by a manufacturer of commercial semi-trailers.

5. Assemble the cylinder hinge plate (15), the cylinder hinge bushing (16), and the four hinge plate gussets (17) as shown in the drawing on Plate 3 and weld together.

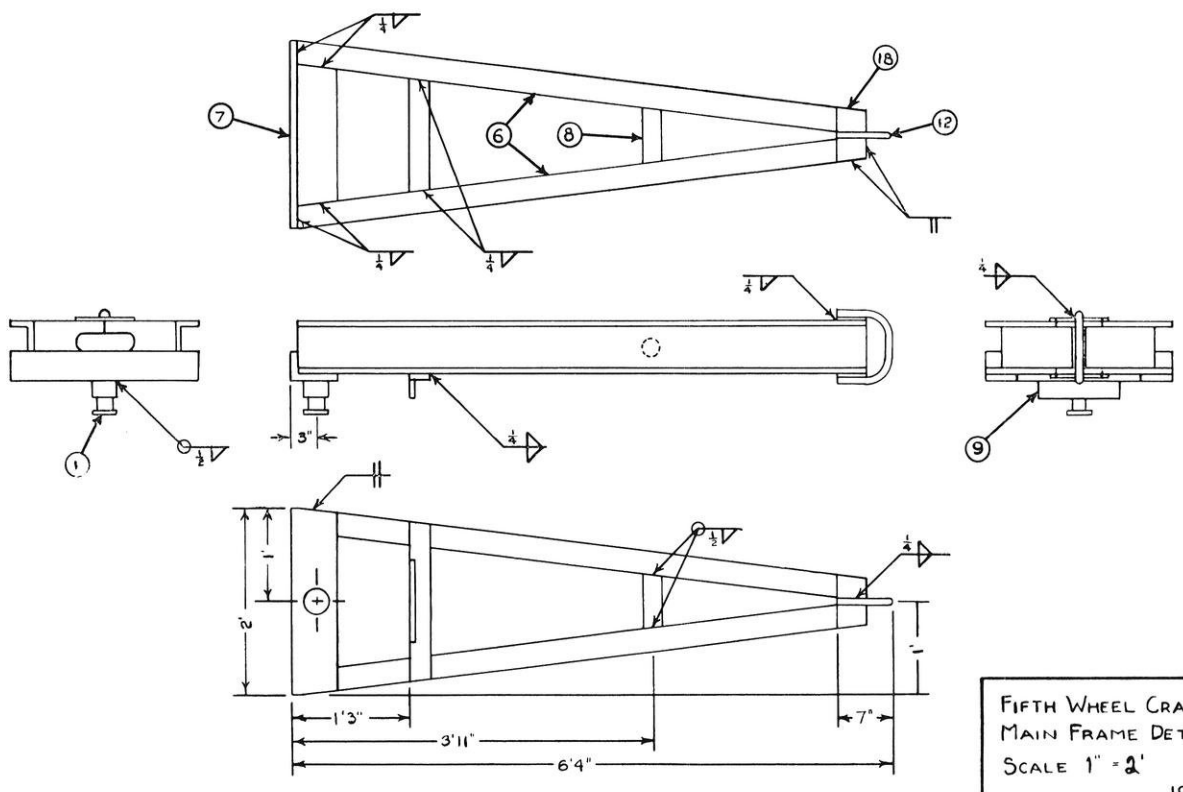
6. Grind the ends of the 2½ inch round bar (8) to an angle equal to one half the included angle between the frame rails (6) at the rear end of the crane.

7. Slip the bushing of the cylinder hinge assembly over the pivot bar (8) and position the pivot bar between the frame rails (6). With the pivot bar temporarily held in place, move the cylinder hinge assembly bushing (16) one end of the pivot bar and weld the other end to the frame rail. Then move the bushing to the end opposite its original position and weld the other end of the pivot bar to the opposite frame rail. Alternately make two more weld passes around each end of the pivot bar.

8. Cut out portions of one leg of the stop block angle (9) as shown in the drawing on Plate 2. Position

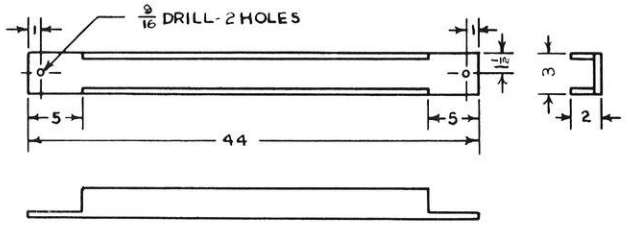
(Continued on next page)

PLATE No. 1

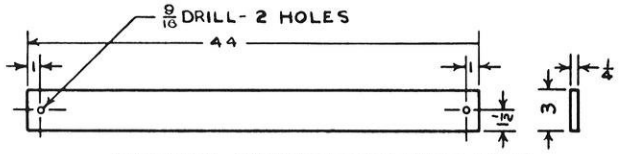


FIFTH WHEEL CRANE
MAIN FRAME DETAIL
SCALE 1" = 2'
1955

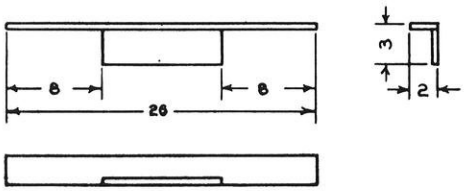
PLATE No 2



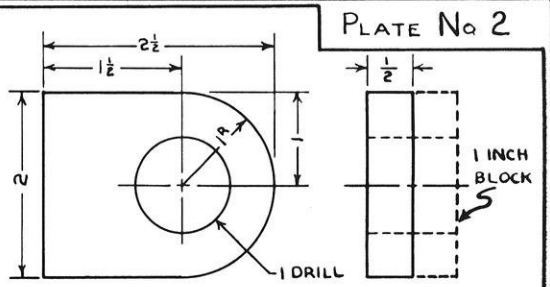
MOUNTING BRACKET - PART NO. 10
ONE REQ'D. 3L41 CHANNEL



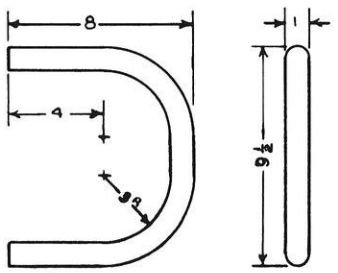
MOUNTING BRACKET PLATE - PART NO. 11
ONE REQ'D. 1/4 INCH PLATE



STOP BLOCK - PART NO. 9
ONE REQ'D. 3X2X1/4 ANGLE



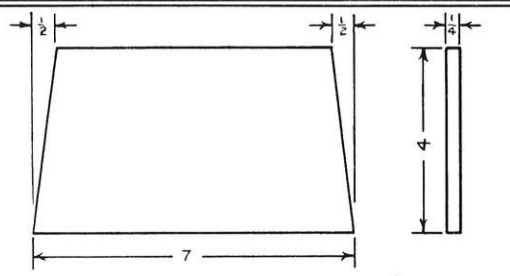
PISTON HINGE PLATES & BLOCK - PARTS NO. 13 & 14
ONE REQ'D. 1 INCH THICK - TWO REQ'D. 1/2 INCH THICK



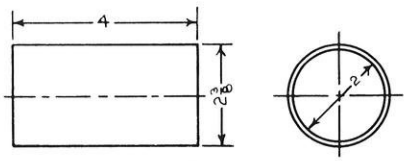
EYE - PART NO. 12
ONE REQ'D. - 1" DIA. BAR

FIFTH-WHEEL CRANE
PART NOS. 9,10,11,12,13,19
DETAIL 1955

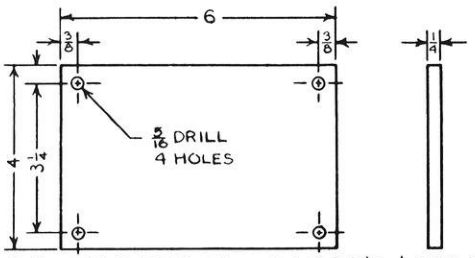
PLATE No 3



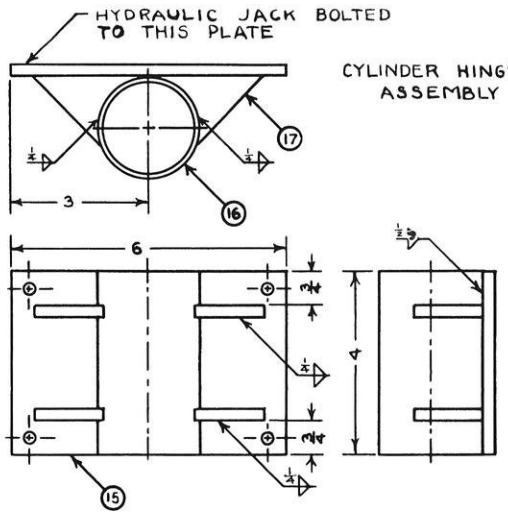
MAIN FRAME GUSSET - PART NO. 18 - ONE REQ'D - 1/4 INCH PLATE

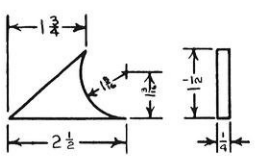


CYLINDER HINGE BUSHING - PART NO 16
ONE REQ'D 2 INCH I.D PIPE



CYLINDER HINGE PLATE - PART NO. 15 - ONE REQ'D - 1/4 INCH PLATE





FIFTH-WHEEL CRANE
CYLINDER HINGE ASSEMBLY
PART NOS. 15,16,17,18
DETAIL 1955

the stop block on the bottom side of the frame rails (6) and weld in place.

9. Bend the 1 inch diameter bar (12) around a 4 inch radius to the shape shown in the drawing on Plate 2. Weld the eye (12) to the two gusset plates (18) at the rear end of the frame.

10. Cut out portions of the mounting bracket channel (10) as shown in the drawing on Plate 2. Position the two hinge plates (13) on the flat surface of the mounting bracket (10) and weld in place.

11. Weld the piston hinge block (14) to the piston head cap of the hydraulic hoist piston (2).

12. Assemble the unit by bolting the hydraulic jack (2) to the cylinder hinge plate (15) with the jack mounting bolts (5). Place the piston hinge block (14) on the jack between the piston hinge plates (13) on the mounting bracket (10) and pass the hinge pin (3) through the holes in these three parts. Secure the pin (3) with a cotter pin and a washer.

13. Connect the mounting bracket plate (11) to the mounting bracket (10) with the two ½ inch bolt assemblies (4). (The mounting bracket and the mounting bracket plate are disconnected each time the crane is mounted on a truck tractor).

A fifth-wheel crane can be of great use to trucking companies or other concerns operating tractor and semi-trailer combinations. The unit is efficient and convenient; it requires no special vehicle for mounting and

(Continued on page 50)

FACTS ABOUT A. F. DAVIS AWARD

Its Purposes —

To stimulate interest in welding among college students through the preparation and publication of articles on the subject of welding in undergraduate publication.

The Awards —

First Prize—$200 to the author of the best paper and $200 to the publication in which it appears. Second Prize—$150 to the author of the next best paper and $150 to the publication.

Who Is Eligible —

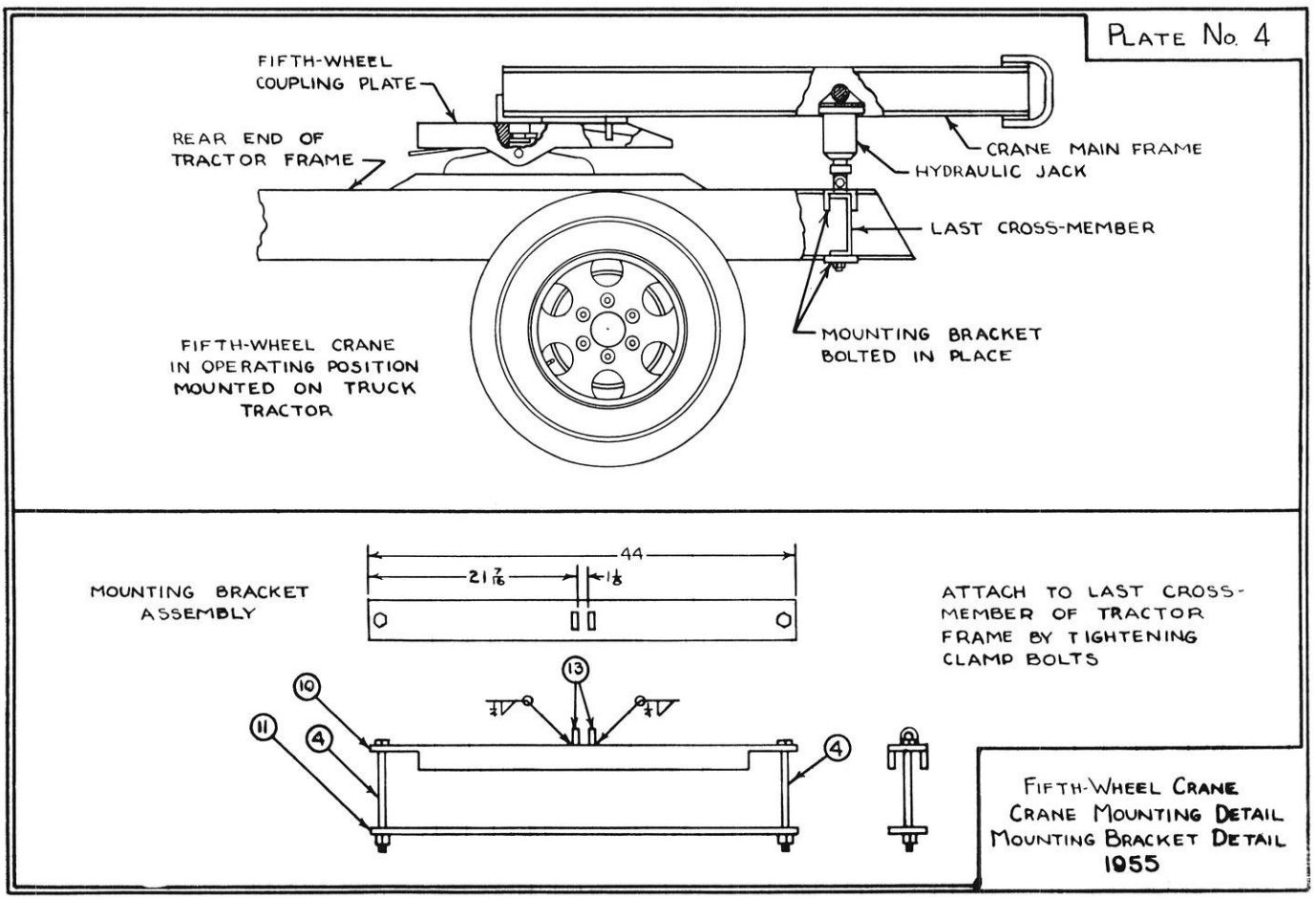
Any undergraduate enrolled in any college or university, in United States, its possessions, or Canada.

Dates of Contest —

An Article, to be eligible, must be published between April 1, 1955 and June 1, 1956, and the manuscript must be accepted for publication no nater than April 1, 1956.

How to Enter —

Prepare an article on welding for your undergraduate publication. The article may be on any phase or type of welding or its application to design and construction. Send six copies of the publication in which your article appeared to the American Welding Society, 33 West 39th Street, New York 18, N. Y., attention Chairman, Educational Committee.



WOOL—STILL NUMBER ONE

WHAT ARE THE SYNTHETICS DOING TO THE OLD STANDARDS IN THE TEXTILE INDUSTRY? READ THIS FOR THE ANSWERS

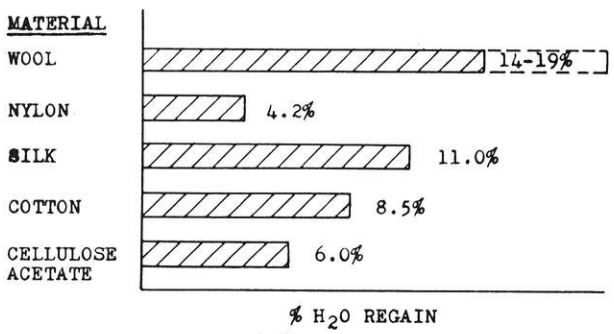
by Paul Kitze, ch'57

Three common articles of clothing might be used by many of you on a cold winter day. It wouldn't be too unlikely that you wear a pair of wool–nylon reinforced socks, some wool flannel trousers, and a heavy wool overcoat. Put on some other essential items of wear and you'd be ready to face that cold winter wind.

We all put on clothes everyday. And wool quite often makes up the major share of our dress. Why are certain garments made of one fiber and not another? What properties of a fiber make it suitable for use as fabric for an overcoat and not for undergarments? Just what functions do certain fiber properties provide for in a textile? Why is wool in so common use? Much research has been done by the textile industry to get answers to these questions in order to put out better quality and more functional textiles. This article will try to consider only a few of the many fiber properties which determine the uses that have evolved for textiles, with special reference to wool.

As a start, let us consider those wool socks with the nylon reinforcement. Why wool and nylon? First, what properties of wool make it useful for a covering for feet? We know wool socks are warm. Warmth is determined mostly by the air entrapped in the fabric; this in turn is determined by the thickness of the fabric. The advantage of wool is that it takes less material to get the desired thickness because of the low bulk density of its aggregates. And, too, the wool fabric, if compressed, has the ability to recover from the compression and retain the thickness.

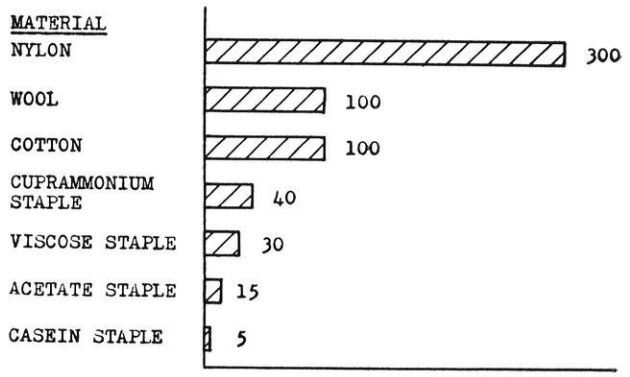
Wool socks also absorb moisture, a very desirable property to those of us whose feet perspire freely. We can show its relative absorption of moisture as compared to other fibers:



—Journal of the Textile Institute

It can be seen that socks made of nylon, for example, would have very poor absorbency properties; of silk, cotton, and cellulose-acetate intermediate absorbency.

Now how about the durability, the wearing ability of our socks? Here, too, comparisons can be made with other fabrics. Actual service tests have been made on similarly constructed men's socks of different materials. These results are approximate.



—Textile Research Journal

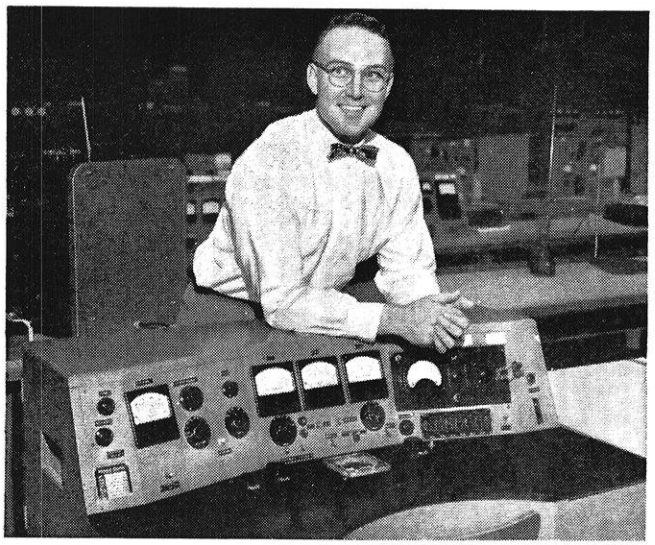
The answer to why nylon is used as reinforcement in our socks can be easily comprehended from the above tests on wear. Often the nylon is introduced into only the heel and toe, the places of maximum wear; the effectiveness is apparent. We get the warmth and moisture absorption of wool and the wearing ability of nylon in a single textile.

Another thing we consider in buying a pair of socks is shrinkage. Will our wool socks shrink, and how will we wash them to keep shrinkage at a minimum if they do? Wool is a hydrophilic fiber; it readily absorbs water. Shrinkage occurs because of changes in the weave of a fabric. Water causes swelling and release of strains that produce an internal rearrangement that can result in external shortening. The new synthetic fibers (nylon, "Orlon", "Dacron", "Dynel") are hydrophobic; they don't absorb water. Therefore, the synthetics don't have the shrinkage problem of hydrophilic wool, cotton, rayon, and silk fibers.

But our socks are mostly wool. However, we don't have to worry if the manufacturer chemically treated the fabric for shrinkage. Some methods used are oxidation, hydrolysis, and resin application. If the socks were

(Continued on page 62)

Young engineers making news at Western Electric

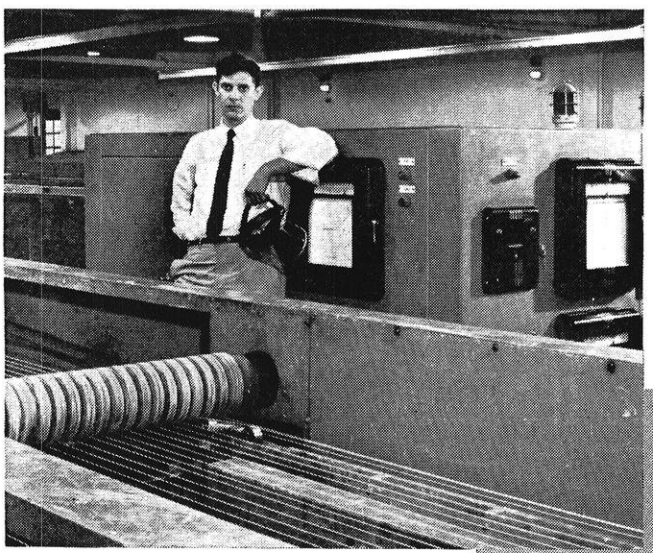


Richard C. Shafer, B.S. in mechanical engineering at Lehigh, was one of 16 engineers assigned to one of Western Electric's toughest post-war projects — developing manufacturing techniques for mass-producing *(with great precision!)* the tiny but amazing transistors which are already causing a revolution in electronics.

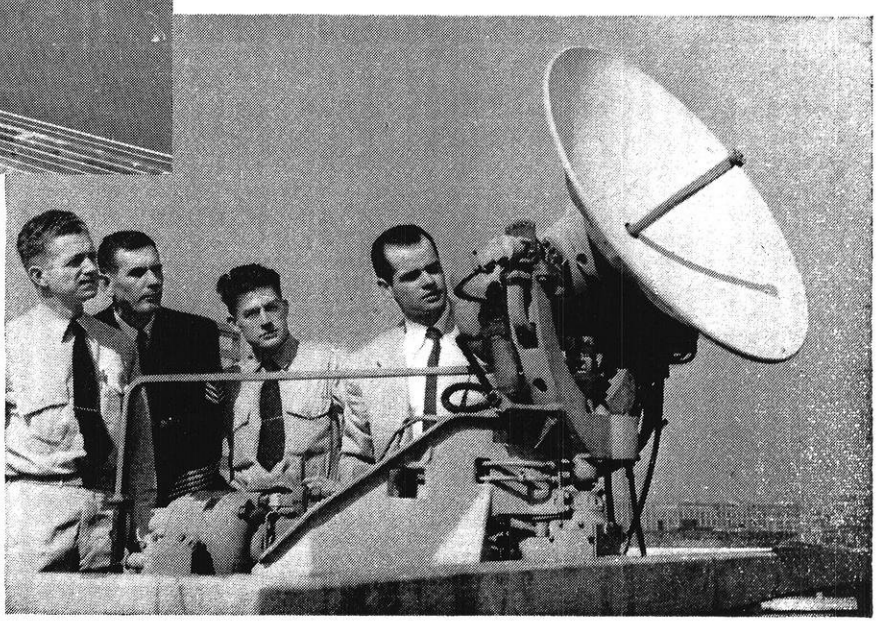
Western Electric's primary job — which goes 'way back to 1882 — is to make good telephone equipment that helps Bell telephone companies provide good service. It's a very big job — and a very important one — which calls for the pooling of varied types of engineering skills.

New manufacturing processes and methods are constantly required to produce better telephones, better central office equipment, better wires and cables, new types of electronic equipment to keep pace with the nation's ever-growing need for more and better telephone service at low cost.

In addition to doing our job as manufacturing unit of the Bell Telephone System, Western Electric is busy producing many types of electronic equipment for the Armed Forces. Here again, young engineers of varied training are doing important work in connection with the manufacture of radar fire control systems, guided missile systems and special military communications systems.

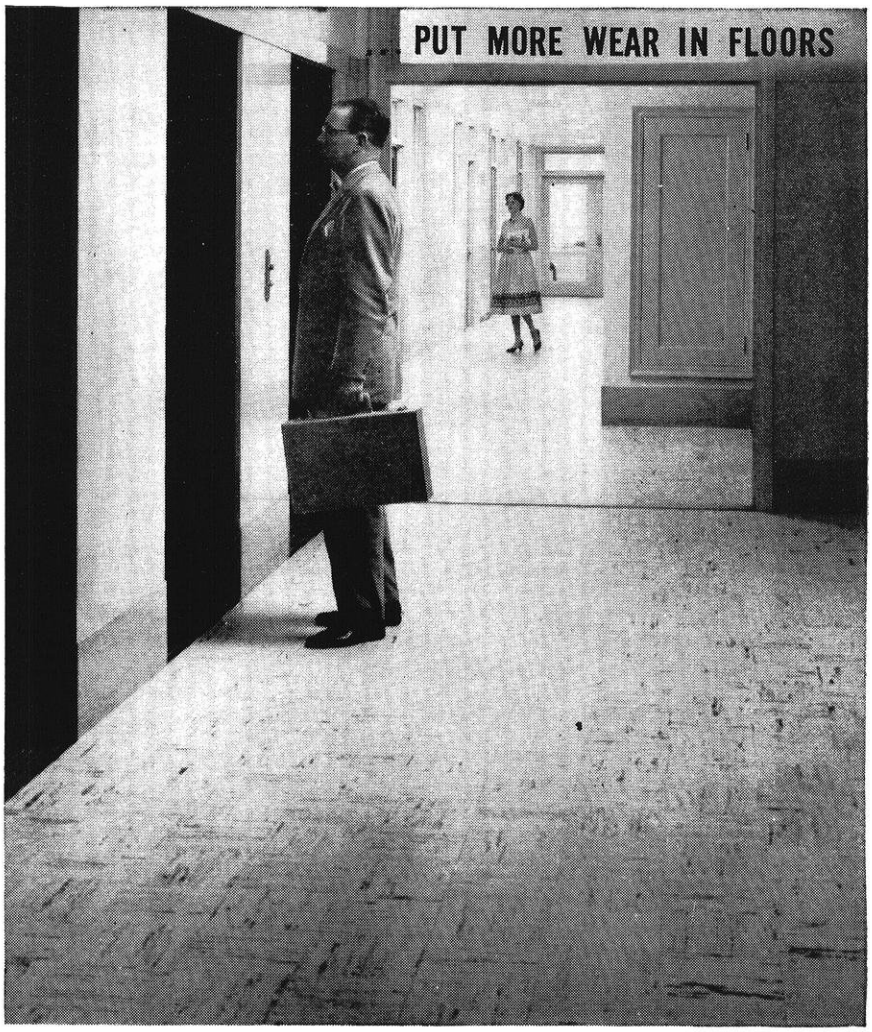


Paul J. Gebhard, B.S. M.E. at the University of Maryland, was one of a team that helped develop Western's new electroforming process for coating steel telephone wire with copper, lead and brass in one continuous operation. His job: to develop conductor resistance-annealing equipment and electrolyte filtration and circulating systems.

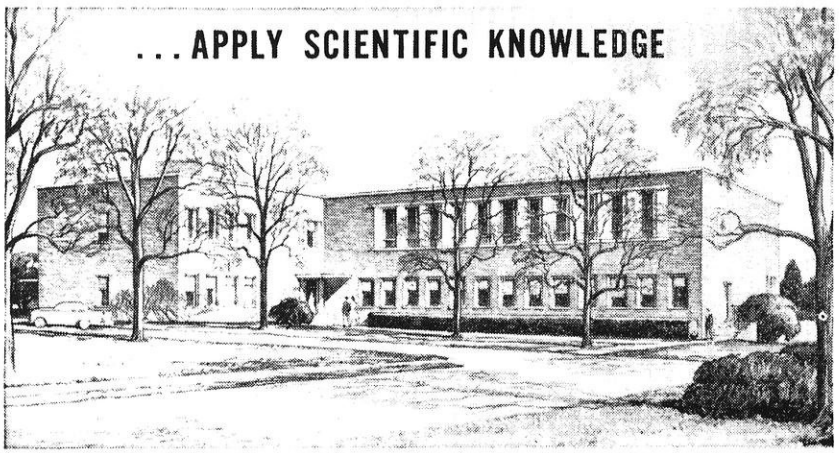


Bobby L. Pettit (at right), an E.E. from Texas A. & M., is one of several hundred members of Western Electric's Field Engineering Force. These F.E.F. men can be found all over the world — working most closely with the Army, Navy and Air Force — advising on the installation, operation and maintenance of complex electronic equipment made by W.E.

HOW *HERCULES* HELPS...

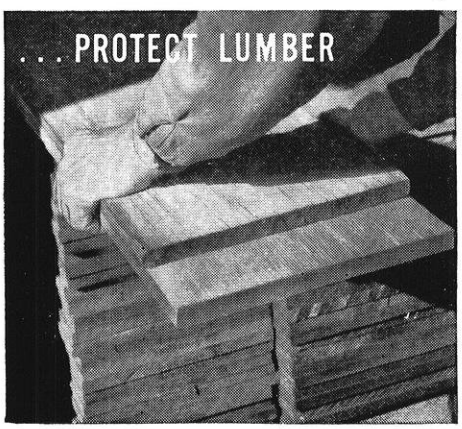


IN HEAVY TRAFFIC AREAS like this, floor tiles must be built to take a beating. Whether the tiles are of the rigid, mastic type or flexible flooring based on rubber or vinyl, Hercules Neolyn®, Mastolyn® or Staybelite® resin can contribute to lower processing costs and better wearing qualities. The wide variety of properties offered by these resins assures that there is one best suited for every floor tile formulation.



MORE THAN 17,000 VOLUMES of scientific literature and tens of thousands of company research reports will be housed in this new $1,000,000 Technical Information Center at the Hercules Experiment Station near Wilmington. In addition, the structure will provide quarters for the many technical specialists who serve the scientific information needs of the Hercules research staff—making the Center one of the nation's most complete information services to an industrial research organization.

WHICH HAD THE TREATMENT? The clean, unsplintered piece has been treated with Hercules Paracol® wax emulsion, making it possible to use every inch of lumber that has been pre-cut at the mill. The untreated piece (top) is badly "checked" and a portion of the end must be discarded before it will be suitable for use.



G55-13

HERCULES POWDER COMPANY
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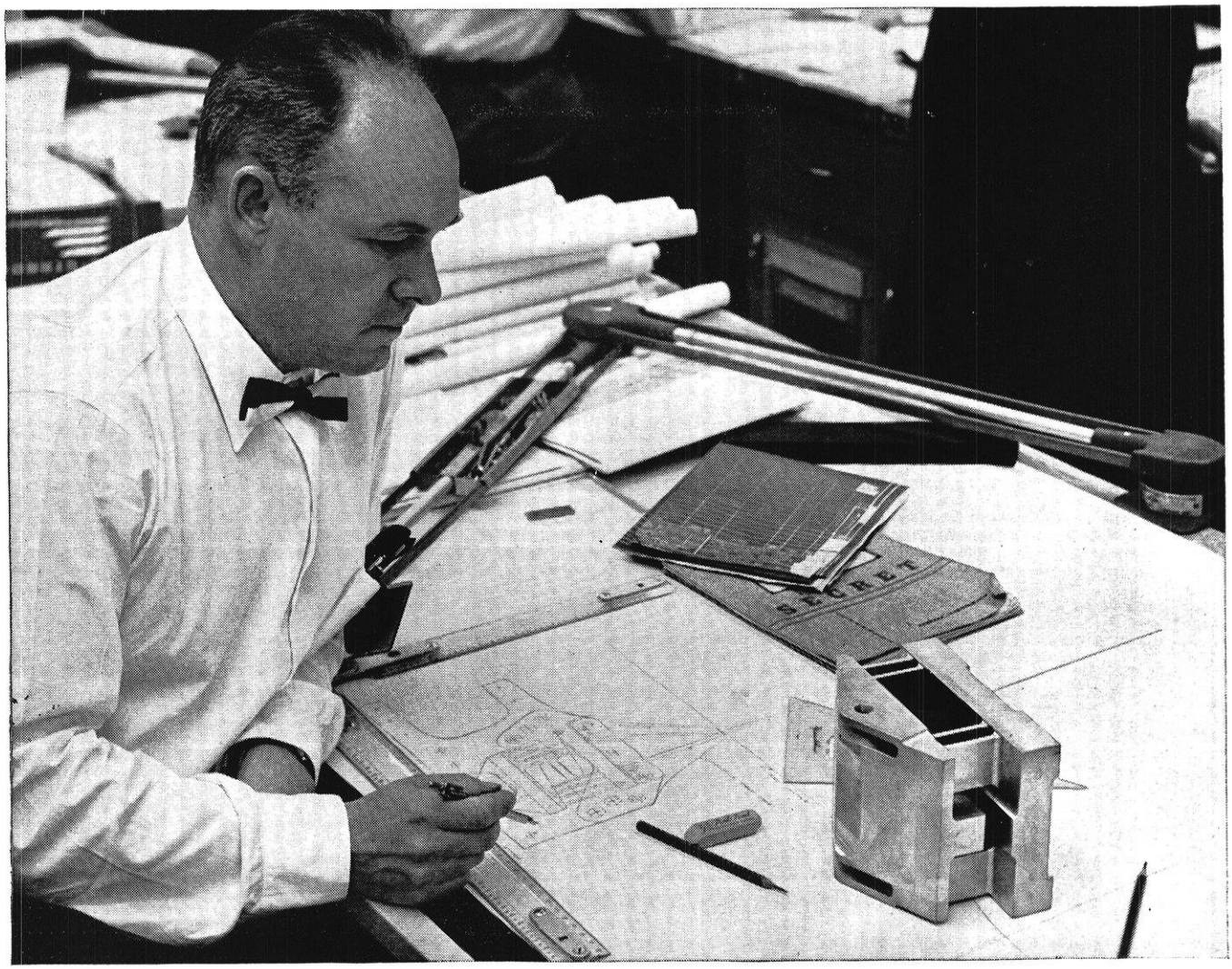
SYNTHETIC RESINS, CELLULOSE PRODUCTS, CHEMICAL COTTON, TERPENE CHEMICALS, ROSIN AND ROSIN DERIVATIVES, CHLORINATED PRODUCTS, OXYCHEMICALS, EXPLOSIVES, AND OTHER CHEMICAL PROCESSING MATERIALS.

HERCULES

CHEMICAL MATERIALS FOR INDUSTRY



Thrust gage design is this Boeing engineer's "baby"

From layout to missile firing, this project is a Boeing engineer's responsibility. His assignment: to design an engine mount that will isolate from other loads and measure within ½ of 1% accuracy the tremendous in-flight thrust of a guided missile.

The mount, called a thrust gage, must fit engine and airframe without modification of them, and must "grow" equally in all directions during a temperature rise of several hundred degrees in less than a minute. The object is a stronger missile engine mount with less than half the weight of the present one.

This is typical of the challenging and creative assignments given Boeing engineers. There are more than 6,000 of them—mechanical, civil, electrical, aeronautical and nuclear engineers, and mathematicians and physicists. And more engineers of all kinds are needed.

This engineer is finishing his layout, with the preliminary mockup before him. Next, he will supervise draftsmen and engineering aides in final drawings. Then he will work closely with other engineers in production, structural testing, instrumentation and telemetering. Creating this thrust gage gives him responsibility, career growth, and a real sense of professional achievement.

Boeing engineers have career stability in a soundly growing company that now employs more than twice as many engineers than at the peak of World War II. Living is pleasant for them in the progressive, comfortable-size communities of Seattle and Wichita.

These men take satisfaction in knowing they're on a winning team that has created such aviation milestones as the new 707 jet tanker-transport, the giant B-52, and the Boeing B-47, "backbone" of Strategic Air Command. There's a rewarding job awaiting you now at Boeing in design, research or production.

For further Boeing career information consult your Placement Office or write to either:

JOHN C. SANDERS, Staff Engineer—Personnel
Boeing Airplane Company, Seattle 14, Wash.

RAYMOND J. B. HOFFMAN, Admin. Engineer
Boeing Airplane Company, Wichita, Kansas

BOEING

Aviation leadership since 1916

SEATTLE, WASHINGTON WICHITA, KANSAS

W. S. P. E.

WISCONSIN SOCIETY OF PROFESSIONAL ENGINEERS

ENGINEERS' CREED

As a professional engineer, I dedicate my professional knowledge and skill to the advancement and betterment of human welfare.

I PLEDGE

To give the utmost of performance, to participate in none but honest enterprise, to live and work according to the laws of and the highest standards of professional conduct. To place service before profit, the honor and standing of the profession before personal advantage, and the public welfare above all other considerations. In humility and with need for Divine Guidance, I make this pledge.

Membership

Progress Report No. 4

Since the last membership report President Ayres and Bill Baumgartner, Membership Committee Chairman have met with most of the WSPE chapters. All chapters have apparently increased their membership committees which should bring the results hoped for. Now if every chapter member will make a New Year's resolution to "Get a New Member", we would soon get back in the running in this year's campaign. Let's take it up at your next chapter meeting if held soon, if not, then write your membership.

At the December 3 meeting five new members were added—three PEs and two EITs. Since then I have received copies of letters indicating that more than that number have applications sent in for action by the Board at January 7, 1955 meeting. I hope the number will exceed the total of new members to date.

The Board of Directors decided at the last meeting to advise the Chapter Presidents to have all membership applications referred to and approved by the local membership committee chairman before submitting same to the State Secretary or Board of Directors. It is suggested that each chapter chairman initial the membership application in the lower right corner. The above is a directive from the Board and I believe that it is a good one as it will enable our committee to keep abreast of our progress. When sending in the new application may I suggest that you send me a copy of your letter which should give the following information: Name, Registration Number and Sponsor's Name.

1955–1956 HONOR ROLL OF SPONSORS

A. H. Graettinger	4
M. R. Charlson	2
G. A. Sievers	2
F. L. Carlson	1
A. P. Neumann	1
Lee Hammer	1
John Hoeppner	1
John Crook	1
W. A. Piper	1
Howard Buer	1

Chapter	Prospects PEs	Prospects EITs	Membership 7-9-55 PEs	Membership 7-9-55 EITs	Quota	Sponsors for New Members 7-9 to 12-29 PEs	Sponsors for New Members 7-9 to 12-29 EITs	Percent of Quota
Western	20	---	63	5	10	0	2	20.0
Northwest	40	---	62	8	20	3	0	15.0
Wis. Valley	60	---	44	3	15	2	0	13.3
Milwaukee	1300	---	450	42	175	10	4	8.0
Southwest	300	---	239	12	60	3	1	6.6
Fox River Valley	225	---	170	19	50	3	0	6.0
Southeast	255	---	73	11	30	0	0	0.0
Out of State	100	100	32	10	5	0	0	0.0
Total	3000	970	*1133	*110	365	21	7	8.0

(*) These figures received from State Secretary on August 20, 1955.

COMPARISON BY YEARS

	1953–54 New Members	1954–55 New Members	1955–56 New Members
July	---	---	--
August	---	2	10
September	---	24	15
October	---	38	23
November	---	---	--
December	22	71	28
January	44	123	--
February	92	---	--
March	128	187	--
April	208	---	--
May	---	227	--
June	214	252	--

(Continued on page 30)

Meet the President

DONALD C. BENGS
President Southeast Chapter

Donald C. Bengs, President of the Southeast Chapter, is the Assistant City Engineer of Waukesha, a position he has held since 1946.

Mr. Bengs was born in Milwaukee in 1905 and attended the University of Wisconsin where he received a BS degree in Civil Engineering. He has spent all of his professional career in the field of municipal engineering, even having worked for three years for the City Engineer of Milwaukee before attending the university. After his graduation in 1931, he returned to his native city and spent some time in the Water Distribution Division and with WPA crews. Mr. Bengs left Milwaukee to accept the position of Engineer with the Federal Housing Authority at Greendale, Wisconsin. After 5 years in this capacity he moved to Waukesha to accept the position he now holds.

Mr. Bengs was secretary of Chi Epsilon, honorary civil engineering fraternity, when attending the university. He is active in and a past director of the Waukesha Club of Optimists and was a member of the old Engineering Society of Wisconsin, now WSPE.

He was married in 1933 to Alice Winn.

When he takes time off from his duties Mr. Bengs has a wide variety of hobbies to keep him busy including woodworking, gardening, travel and photography.

W.S.P.E.

(Continued from page 28)

M. A. Ecklund	1
Waynar Bryan	1
Paul Fisher	1
T. E. Weiner	1
S. B. Margules	1
W. C. Lallier	1
Joseph Mundhot	1
Ray Leary	1
Frank Henry	1
Page Johnson	1
Don Johnson	1
Oscar Egger	1
E. C. Vanderwell	1

PRESIDENT'S REPORT ON ACTIVITIES

A. Owen Ayres, *President*

A summary of WSPE activities over the past five-six months follows:

1. The major project was the effort made by the society, with the help of all other engineers in Wisconsin, to amend the Registration Act covered by Bill 688 A. This bill passed the assembly early in June and was concurred in by the Senate and signed by the Governor in October. The engineering profession of Wisconsin can congratulate itself for the fine team work displayed in accomplishing this objective.

2. Committees on state level were formed and functioning during the months of July, August and early September. Many of the committees were not able to report on definite accomplishments, since results are more or less continuing and the work overlaps from year to year.

3. The Function Groups—Consulting, Education, Industrial and Public Employment—convened at the mid-year meeting and will convene at the annual meeting. Their prerogative covers the preparation of agenda delegating leaders for discussions at the two above mentioned meetings. Preparation has already been accomplished. The leaders are preparing their part in the discussion which are expected to take place at the convention.

With reference to other committees, the following require no explanation as to their activities as their functions are obvious from month to month on a state-wide basis.

Legislative and Inter-professional —(Bill 688A and Interprofessional Code of Ethics accomplished).

Membership – (Continuing program through State Chairman).

Program—(Preparation for mid-year and annual meeting).

Publications—(News Letter and WSPE Section of Wisconsin Engineer).

Nominating—(Action completed).

Budget—(1955–56 budget submitted and approved).

By-Laws and Constitution—(Action pending). This is on amendment to constitution covering remission of dues for retiring members.

Special Committee – (On subdivision of present chapter areas). Action pending in connection with Southeast Chapter area. Definite recommendations will come in after a poll now being made by the chapter is completed.

Other Committees

University Cooperating – (This committee is combined with the Educational part of the functional group). Your president attended both of the meetings held in Milwaukee.

Their main project for the past few years has been to advise with the University of Wisconsin Engineering School on the adoption of new engineering course or a revision of the present curricula for the purpose of widening the basis for an engineering education. The work of the committee is now in its final stages, and while it might not be completed for the annual meeting it is hoped a definite recommendation can be made at that time.

Ethics and Practice—(The committee has considered one or two questions of possible infractions, with no definite results to date. The main accomplishment is now in securing cooperation by the telephone interests in Milwaukee for the proper directory listings for the engineering professional in the classified and other sections.)

Fees and Salaries—(The very excellent work done by former committee is being brought up to date).

Public Relations—(Arrangements are under way for channeling the Engineers' Week projects in the various chapters through the State Chairman. The State Chairman has arranged for Governor's Proclamation of Engineers' Week).

Awards—(Final decision on awards is receiving study and the decisions will be made prior to the annual meeting).

STATE AIRPORT ENGINEERS NEEDED

The Wisconsin State Aeronautics Commission will hire two airport engineers in the near future. The men will assist in state services to local leaders in airport planning and construction. The jobs will involve helping with airport surveys, technical service in review of proposed airport plans, inspection during construction and aid in planning airport maintenance.

Engineers will start as Engineers II in the Wisconsin state career service. The desirable qualifications include graduation in civil engineering experience. The Commission prefers men who have a pilot's license or show interest in obtaining one. The salary range is from $406 to about $475 a month with a good expectation of advancement. The salary range for the Engineer III level is about $460 to $545. The Commission believes that their men should become registered engineers before promotion to responsibility as Engineers III.

Engineers are welcome to write to Mr. T. K. Jordan, Director of Aeronautics, State Office Building, Madison.

Chapter News

SOUTHWEST CHAPTER

CHAS. M. PERLMAN

The Southwest Chapter held its monthly meeting on Tuesday, December 13 at the Cuba Club at Madison. About 70 members and guests heard E. J. Kallevang, the

(Continued on page 32)

Let The Man With The Facts tell you about careers with Westinghouse

You have a tough decision to make . . . about that all-important first job. Which company offers you your best future?

Let The Man With The Facts discuss with you the varied and challenging opportunities at Westinghouse.

He is a man with broad personal experience who can tell you the specific things you want to know . . . the many kinds of careers . . . training program . . . further education . . . advancement . . . how you can grow with Westinghouse.

Westinghouse is one of the fastest growing companies in America. It is expanding rapidly into challenging new fields like atomic power, semiconductors, director systems, automation. Let The Man With The Facts tell you about these and many other fields that offer almost unlimited opportunities . . . at Westinghouse.

It's your decision, but before you make it, ask your Placement Officer to make a date with the Westinghouse Man With The Facts. In the meantime, ask for your copy of our 48-page book, *Finding Your Place in Industry.*

G-10291

YOU CAN BE SURE...IF IT'S

Westinghouse

Ask your Placement Officer about career opportunities at Westinghouse, or write for these two booklets: *Continued Education at Westinghouse* (describing our Graduate Study Program) and *Finding Your Place in Industry.*

Write: Mr. C. W. Mills, Regional Educational Co-ordinator, Westinghouse Electric Corporation, Merchandise Mart Plaza, Chicago 90, Illinois.

W.S.P.E.

(Continued from page 30)

retired vice president of the Wisconsin Power & Light Company, present a factual and convincing report on the 1954 nation wide "Professional Engineers' Income and Salary Survey." Mr. Kallevang, a member of the local chapter, served on the National Committee which made the survey. He was introduced by Chas. Statton, a member of the program committee. The report was well illustrated with statistical charts and graphs classifying engineers' salaries in groups, source of employment and classifications. The study was made from data received from nearly 15,000 questionnaires which were answered by professional engineers from the entire nation. The results showed low pay among engineers as compared to other professions. This information is being used by the society as a basis for activity to bear upon employers in industry, public service, municipal, federal and state government and in teaching in order to improve the existing situation.

Willard Warzyn, the local chapter president introduced State Society President A. O. Ayers as a visiting guest. Mr. Ayers spoke briefly emphasizing membership campaign and praising the work done by the legislative committee on the passage of Bill 688–A by the State Legislature.

President Warzyn also presented membership pins to the following new members: William Folts, State Highway Commission, District 1; John Freeman, State Engineers Office; Roger Krempel, Assistant City Engineer of Janesville and Chet Harrison, Director of Public Works, Wisconsin Dells.

Leo Kosak, chairman of registration promotion, reported plans for a meeting in February at which senior engineering students will be invited to hear speakers representing the various fields of engineering with a social hour and refreshments to follow.

The Southwest Chapter of WSPE is planning to have the members of the June graduating class of the College of Engineering as guests at their regular dinner meeting during their Engineers' Week activities. The event is scheduled for February 22 in the Great Hall of the Memorial Union. The program will be in keeping with the theme of Engineers' Week, "Engineering —Builder of a Brighter Future."

MILWAUKEE CHAPTER

R. M. LYALL

At the General Meeting held December 13, we received a fine report from Harry Brockel, Municipal Port Director. He spoke on the St. Lawrence Seaway and its Engineering problems.

A suggestion as to the magnitude of the Seaway is gained from the amount of concrete required—5,500,000 cu. yards. 180,000,000 tons of earth must be moved and 100,000,000 cu. yards of dredging must be completed. Approximately 2,250,000 Kw of generating capacity will be installed.

Brockel believes that Milwaukee and Chicago will be the principal ports on Lake Michigan with Milwaukee continuing as the only port with heavy-lift facilities. The Milwaukee port requires an expenditure of four to six million dollars to prepare it for the larger ocean vessels which can enter the Great Lakes via the seaway. Because substantial facilities are already in place and the harbor requires only minor dredging, Milwaukee will need to spend much less than other cities in order to compete favorably for maritime trade.

A vacation trip to the seaway area should prove quite spectacular for the Engineer. Such a trip would be most timely in 1956 or especially 1957. The area near Ogdensberg, N. Y. provides best access to the construction sites.

Ed. Hanley, Chairman of Civic Affairs, read a proposal in which the Committee recommended mailing over the President's signature. The letter was addressed to the Citizens Governmental Research Bureau and suggested that several Civic groups and County officials be asked to comment on the Report resulting from the survey of Engineering Services in Milwaukee County. The letter offered the cooperation of WSPE in studying the report and suggested the formation of a Citizens Committee to study and report on the survey.

The letter was approved in principal by a unanimous vote of those attending the meeting.

WESTERN CHAPTER

M. L. HAGLUND

The Western Chapter has had four interesting meetings this fall—one in October, November, December and January. Our first meeting was a joint meeting with the local ASME group. At this meeting we had probably the outstanding speaker to address our Western Chapter over the last few years. He was Dr. George H. Brown, Director of RCA Research Laboratories, Princeton, New Jersey. Dr. Brown talked to us on the subject of television, and particularly color television, with all of the problems that have confronted the development people in this industry.

At the next meeting Owen Ayres, State President, discussed the recent legislative problems and the "Code of Inter-Professional Practice." He also called attention to the efforts being made by the Society to encourage more young men to study engineering.

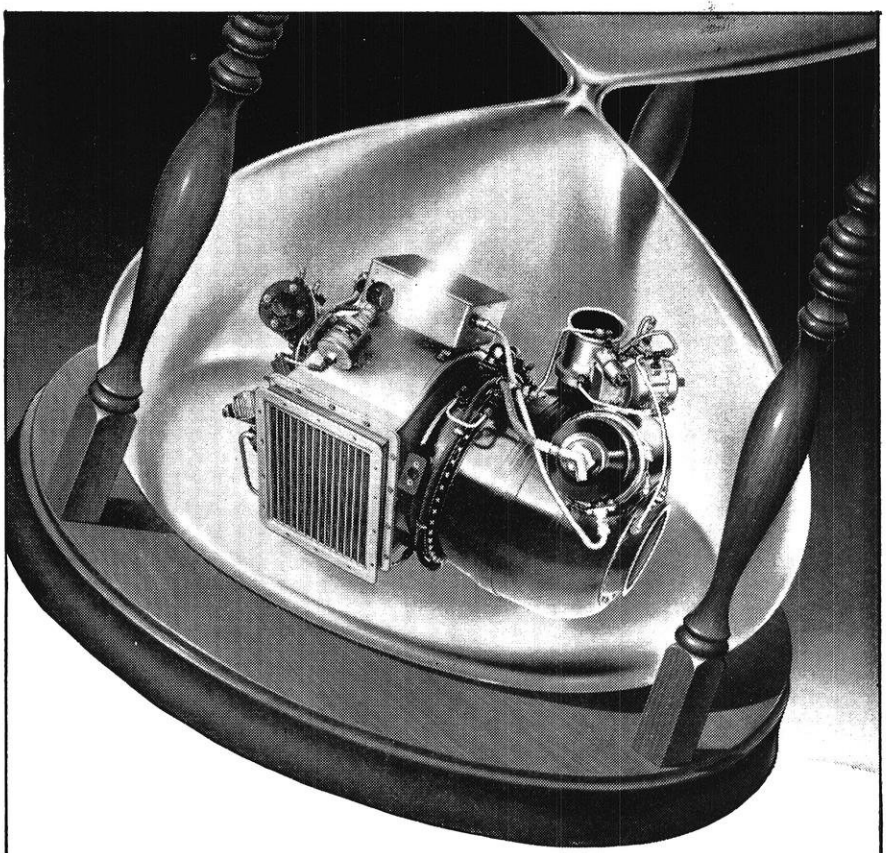
The final meeting of 1955 was a social meeting with the wives of the members in attendance.

In the January meeting one of our own members, V. L. Fiedler, presented an illustrated talk entitled, "The National System of Highways and How It Affects Wisconsin." We believe this was a particularly interesting session because of the great national interest in the highway program that we now are experiencing.

Arthur M. G. Moody is our Engineers' Week chairman. Art is a particularly apt choice for this job

(Continued on page 34)

To the engineer with a bent for research...



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W.S.P.E.

(Continued from page 32)

since he is an outstanding engineer, having been awarded the ASME 75-year medal for advancement in engineering. At the same time he is president of the local chapter of Rotary.

"The National System of Highways and How It Affects Wisconsin" was the subject of a talk by V. L. Fiedler, P.E., to the Western Chapter, Wisconsin Society of Professional Engineers, at Hanks Supper Club, Thursday Evening, January 12. The announcement was made by E. Ted Neubauer, program chairman.

Fiedler, a La Crosse resident since November 1954, is District Engineer, District 5, State Highway Commission, with offices in La Crosse. He first joined the Highway Department in 1926, being located in Green Bay of District 3 at that time. He is a registered Professional Engineer and a member of the local chapter.

In his talk Fiedler discussed the National Highway system and pointed out how the 2100 mile Wisconsin State arterial system is integrated into the national system. Slides were used to illustrate his presentation.

NORTHWEST CHAPTER

WM. ROSENKRANZ

The Northwest Chapter of the Wisconsin Society of Professional Engineers held its monthly meeting at Scott's Steak House in Eau Claire, Wednesday evening, January 4.

After an excellent meal the 46 members and wives in attendance were provided delightful entertainment by Mr. Harry Lea, owner of the Sally Ann Bakery in Chippewa Falls. Mr. Lea took the audience on a canoe trip to the forest wilderness of Ontario, Canada by means of beautiful colored slides and a tape recorded narrative of the trip.

The main item of business for the evening was the election of officers for the coming year. Retiring president R. F. Bott of Chippewa Falls turned over his office to Mr. Virgil Dufeck, Manager of the Eau Claire Electric Cooperative. Mr. Walter Hestekin, heating and ventilating engineer for Hovland Sheet Metal in Eau Claire was elected Vice President. Dale Gordon and Louis Schmidt, engineers with the State Highway Commission were elected Secretary-Treasurer and assistant Secretary-Treasurer, respectively. Mr. R. G. Cooper, Consulting Engineer from Rice Lake was elected Board Member for a 3-year term.

Bill Rosenkranz, Engineers' Week Chairman, reported that the Eau Claire Technical Society will cooperate with the Chapter in this endeavor. Radio and TV stations in Eau Claire and Chippewa Falls have been contacted and will provide time for the Chapter during Engineers' Week. Promotional materials have been ordered from Washington. Committee assignments such as publicity, radio and TV, Speakers' Bureau and Special projects have been made. Some progress in developing the various programs has been reported. A prominent engineer has been invited to appear as guest speaker at the banquet being planned on Washington's Birthday.

Pat Boyd announced an organizational meeting to be held at his office the evening of January 9 for the proposed refresher course for EIT candidates.

The *Northwest Chapter* of the Wisconsin Society of Professional Engineers held its monthly meeting at Stafne's Sunset Cafe in Eau Claire Wednesday evening, December 14. Forty members and wives enjoyed a family style chicken dinner.

Professor Lawrence Wahlstrom, professor of mathematics and head of the mathematics department at Eau Claire State College was the guest speaker. He presented an extremely interesting talk, illustrated with colored slides, concerning the trip he and his family took to Scandinavia this past Summer. The Wahlstrom family left Eau Claire on May 25th and left Montreal for

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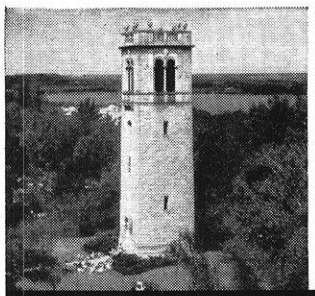
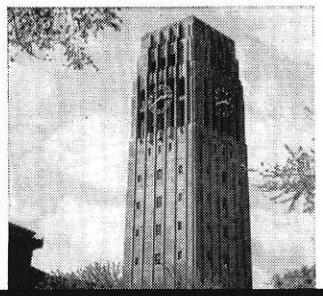
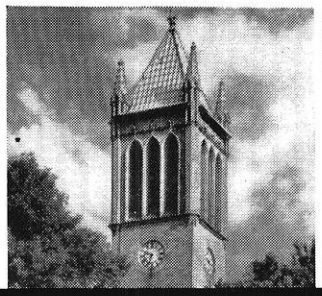


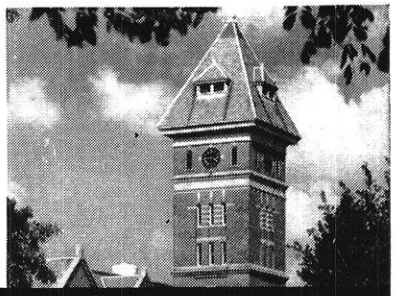
WISCONSIN



MICHIGAN



IOWA STATE



PURDUE

TEXAS A&M

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PENN STATE

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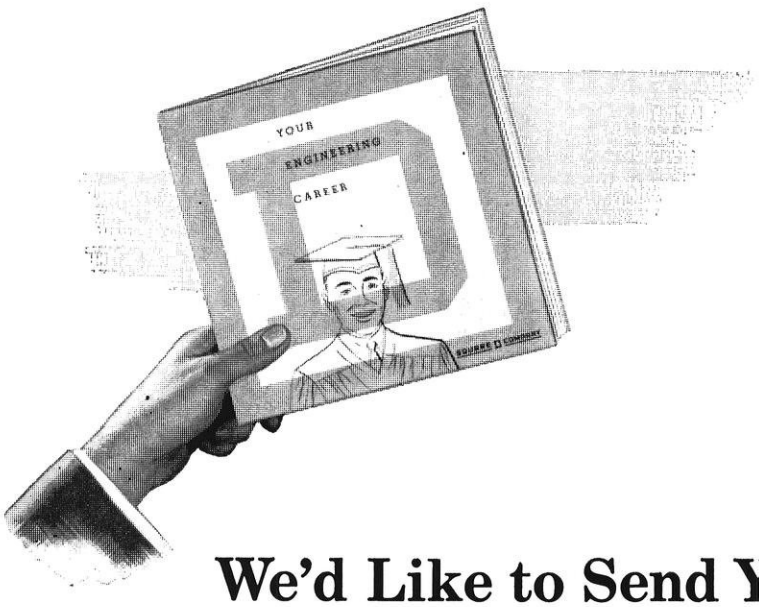

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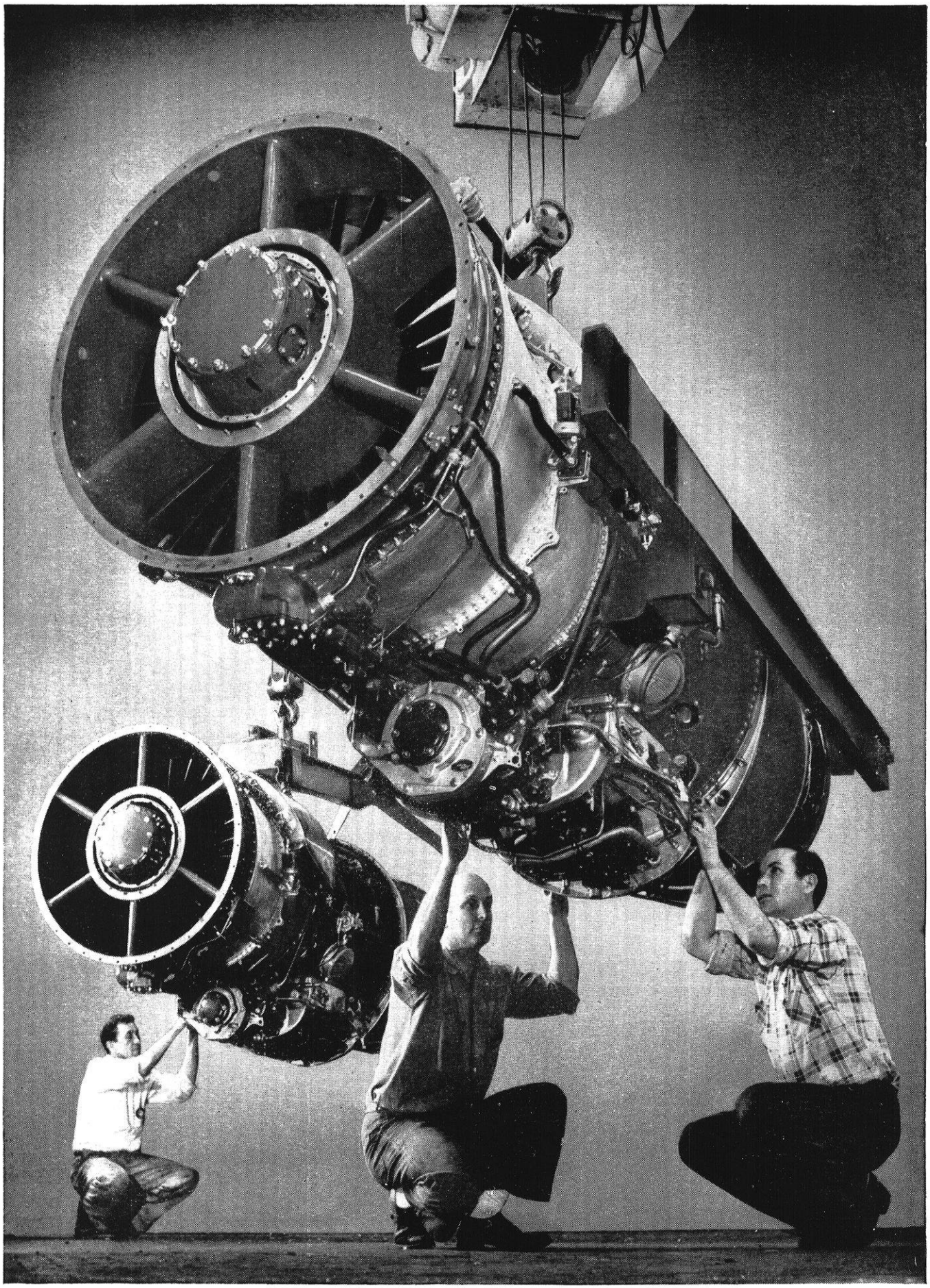
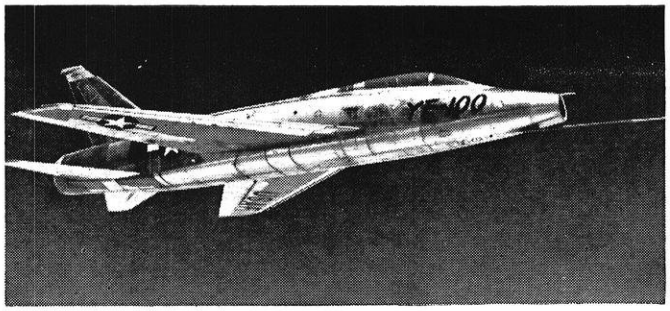
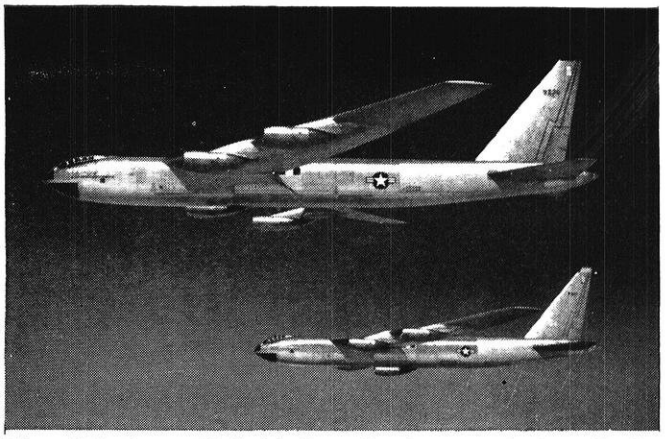


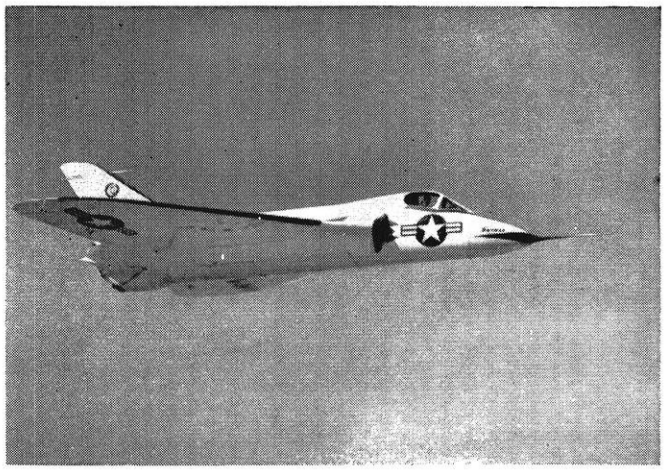
The J-57, in the 10,000-pound thrust class, is the most powerful turbojet engine now in production. A new generation of U. S. air power has been designed around this mighty new Pratt & Whitney Aircraft engine.



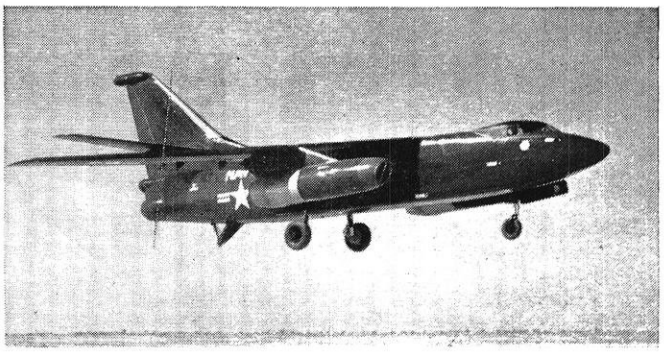
North American's F-100 Super Sabre, fastest Air Force jet fighter, is powered by Pratt & Whitney Aircraft's J-57 engine.



First all-jet heavy U. S. Air Force bombers are the huge Boeing B-52s, powered by eight J-57s mounted in pairs.



The Douglas F4D Skyray, fastest Navy jet fighter, will be powered with the big J-57 engine.



The Douglas A3D, the Navy's most powerful carrier-based attack airplane, has two J-57 engines.

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The most powerful turbojet engine in production is blazing the way for a whole new generation of American aircraft.

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The importance of the J-57 in America's air power program is clearly shown by the fact that it is the power plant for three of the new "century series" fighters for the U. S. Air Force—North American's F-100, McDonnell's F-101 and Convair's F-102—as well as Boeing's B-52 heavy bomber. The Navy, too, has chosen the J-57 for its most powerful attack aircraft, the Douglas A3D, the Douglas F4D fighter and for the Chance Vought F8U day fighter. And the J-57 will power the Boeing 707 jet transport.

The J-57 is fully justifying the long years and intensive effort required for its development, providing pace-setting performance for a new generation of American aircraft.

Engineering graduates who can see the challenge in this new generation, might well consider a career with the world's foremost designer and builder of aircraft engines.

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Habits of Tolerance and Patience in Human Engineering Should Come to You Easily If You Apply the Principles of Scientific Reasoning and Problem Solving

W. R. Marshall, Jr., Associate Dean

An engineer is noted for his integrity, his ability to think in concrete terms, and his reliance on facts to base his conclusions. These characteristics or attributes should not be forsaken when dealing with problems in human relations. It is true that problems involving people are often more complex and uncertain than engineering problems such as those dealing with strength of materials, fluid mechanics, or thermodynamics where the well-established underlying principles and laws of behavior are obeyed and known to the engineer. Nevertheless, it is possible to apply engineering principles to human relations, and this should be kept in mind as you enter your first job in industry.

You can use your engineering training in dealing with other people by adhering to the following well-established principles of problem-solving in engineering:

1. Be sure your problem can be clearly defined. No solution can be made of an unknown problem.

2. Obtain all the available data pertinent to the problem; i.e., be sure you understand the other person's viewpoint, his responsibilities, and some of the problems he himself is faced with.

3. *Draw no conclusions* on a problem of human relations until pertinent facts and data have been obtained on all phases of the problem, both pro and con.

4. Having determined the pertinent facts, establish a plan of action designed to reach a solution to the problem. Many times in human relations, the best plan of action is *no action*, especially if the proper facts have not been ascertained. However, many times the facts themselves will dictate no action.

5. When facts and data are difficult to interpret, or unavailable, seek the assistance of a person capable of giving objective advice.

Re-phrased, these principles advise you not to jump to conclusions about any person or any personal problem until sufficient thought and time have been devoted to the available facts or to obtaining additional information. Do not become the victim of your own prejudices or impatience. Do not send that letter or memorandum written in anger and in haste. (It may be well to write the letter, but let it "cool" before sending, then read it again and—in most instances—you will tear it up.) Be tolerant of other peoples' short comings, their lack of sympathy for your views, or their slowness of comprehension. In all your dealings with other people, above-all be patient, willing to listen, slow to judge or condemn, ready to help and forgive, and willing to change your mind. These rules apply equally to human relations in your work, your home and your community. The engineer should find these habits easy to form for they are the essence of the modes of thought and action which underlie engineering training and practice.

—W. R. M.

CAMPUS NEWS

compiled by Dick Peterson, m'57 Carl Burnard, c'57, and Larry Barr, m'57

EXPOSITION NEWS

LARRY BARR, *Publicity Manager*

Hear ye! Hear ye! The 1956 Engineering Exposition is becoming more than mere talk. Plans that were once tentative are now approved and tangible signs of future festivity are to be found.

Student exhibits, once a source of much concern are now a source of pride. Perhaps, part of this can be attributed to the spontaneous speeches given by the various chairmen whenever student exhibits were mentioned. Pi Tau Sigma members will long remember one such speech and Polygon board received another fiery outburst just afterward by the same man, who was then apparently warmed to his subject. The credit for exhibit activity, however, belongs to you fellows now in the process of building your various displays. Keep it up, and if you haven't started yet, don't wait much longer. Fame, wealth, and satisfaction await you!

Industrial exhibits are also doing well. At last count, over twenty were committed and more coming in all the time. About forty "industrials" are planned, but space may be needed for more. Some of these exhibits will require two or three ordinary booths.

An opening day program booklet has been approved and formed. It will contain exhibit descriptions, a map of the engineering campus for the "out-of-towners", a welcome from Dean Wendt, Credits to all who work on the exposition, and, of course, much more. It will be distributed free at the exposition.

Publicity for the exposition is due to appear soon. Highlights are radio and television time, bumper sticker campaign, newspaper releases, and a poster campaign. The exposition will draw 10,000 people and we are about to let them know when to come.

All in all, the exposition is taking shape nicely, thanks to the help of many dozen undergraduates and faculty members. It looks like a great exposition, let's make sure of it.

ASCE

The American Society of Civil Engineers held their last meeting of the fall semester Wednesday, Jan. 11, at 7:30 P.M. The speaker for the evening was M. John F. Yardley, Chief Structural Engineer for McDonnell Aircraft Corp. of St. Louis, Missouri. He gave an interesting and informative talk, outlining the procedure for running a stress analysis of the wing of a mach-plus airplane.

Elections were held for the next semester also. The new officers are: President—Richard Cook; Vice-President—Keith Johnson; Secretary—Joe Steffes; Treasurer—Joe Cannestra. Ken Renard was elected as the new Junior member of Polygon. No date has been set for the first meeting of the first semester.

SAE–ASME

SAE and ASME combined and held a meeting on Wednesday, Jan. 11. David Rex was elected as a new Polygon member. Milo Swanson, of ASME has been selected as the new Chairman of Polygon.

AIChE

RICHARD TOMLIN, *President*

The last meeting of the AIChE was held Wed. Evening, Jan. 11 in the Top Flight Room of the Memorial Union. The main speaker for this meeting was Mr. W. S. Borns of the Research & Development Dept. of Socony Mobil Laboratories. The title of his talk was The Chemical Engineer's Part in the Discovery & Development of Catalytic Reforming. The talk included slides and was both informative and interesting.

A new Polygon board member was elected to replace Gene Kremar, who graduated in February. The man elected to the position was Phil Noth, a junior. The Badger year book pictures were taken and refreshments were served at the conclusion of the meeting.

POLYGON BOARD ELECTION HELD

Polygon Board, representing all professional engineering fraternities on campus, held its new semester elections on January 3, 1956. The new officers will hold office for one semester and are:

President—Milo Swanson, ME4
Secretary—Kenneth Stahl, EE3
Treasurer—James Price, ME2

Polygon Board is made up of representatives from each profes-

sional fraternity, such as ASME or AIEE, and is active in many engineering campus activities. The most notable of which, at present, is the sponsorship of the 1956 Engineering Exposition. In short, Polygon Board usually does or helps with most of the projects concerning the engineering student body. Our congratulations to the retiring officers and best wishes to the new officers.

PI TAU SIGMA ELECTIONS

The Mechanical Engineering honorary fraternity, Pi Tau Sigma, held regular elections at the business meeting January 10, 1956. The new officers are:

President—Wallace Yeskie, ME4
1st Vice President—Jose Villalobos, ME4
2nd Vice President—Robert Kruse, ME3
Corresponding Secretary—Richard Sholts, ME3
Recording Secretary—Richard Stieg, ME4

Plans were discussed for the second semester and new member initiation dates set. Our congratulations to the new officers, and for the old; it was a job well done.

HYDRAULIC ENGINEERS TO MEET HERE

The 1956 annual meeting of the national hydraulics division of the American Society of Civil Engineers (ASCE) will be held at the University of Wisconsin Aug. 22–24, Prof. Arno T. Lenz of the UW College of Engineering and president of the Wisconsin section of ASCE, announced today.

The annual meeting will bring to the UW campus several hundred hydraulic engineers, including some sanitary, irrigation, and power engineers, from all parts of the United States and Canada.

UNIVERSITY RECEIVES GRANT

The University of Wisconsin has received a grant of $249,700 from the National Science Foundation to inaugurate an experimental program to train high school teachers to teach science and mathematics more effectively, it was announced Thursday.

The program will begin next fall with 50 high school science and mathematics teachers, chiefly from Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin. Prof. Harvey Sorum of the University of Wisconsin's chemistry faculty will direct the program at Wisconsin.

The program is first being tried at the University of Wisconsin and Oklahoma Agricultural and Mechanical College. If successful, it will be expanded to a total of eight schools in the academic year 1957–58 with the idea that advance teacher-training in the field of science would become a continuing program in which science teachers in all parts of the United States could participate.

Each teacher will receive $3,000 with an additional allowance of $300 for each dependent, plus tuition fees and travel allowances, the Foundation announced.

The Foundation said the purpose of the grant is to launch an experimental program designed to assist colleges and universities in their effort to improve science training for high school teachers.

Each teacher selected to participate in the program will pursue studies designed to increase individual effectiveness as a teacher, and each will be able to take refresher courses in the fundamentals of biology, chemistry, mathematics, or physics, seminars in teaching methods, regular university science courses, and university courses devoted to the influence of science upon modern life.

Sorum was selected to head the program because of his long and distinguished record of teaching in the field of chemistry. He joined the University chemistry faculty in 1927, after having received his bachelor's degree from St. Olaf College and his doctorate from Wisconsin in 1927. He has taught the freshman chemistry course at Wisconsin since that time.

Among his other scientific duties, he is a member of the American Association for the Advancement of Science's Cooperative Committee on Teaching of Science and Mathematics, and represents the American Chemical Society on that committee. The American Chemical Society is the largest scientific society in the world.

To be eligible for selection to participate in the program a teacher must have a bachelor's degree, have taught for three or more years, be teaching science or mathematics, show scholastic and teaching ability, and be under 46 years of age, the Foundation said.

A typical pattern in all but our largest high schools is for the science teacher to teach in more than one field. Often he teaches science or mathematics in addition to some non-science field which is his primary interest. It is toward teachers in these categories that the program is aimed particularly, Sorum pointed out.

The University of Wisconsin will draw most of its students from Wisconsin and adjoining states. Oklahoma A&M will draw its teachers largely from the south central area states. **END**

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"I'm a metallurgical engineer, Class of '51. I wanted to get into development work, so I started with Electro Metallurgical Company in their Metals Research Laboratories in Niagara Falls. Three years' research work in steels and titanium gave me the technical background I needed. Now I'm working on applications of titanium as a development engineer."

"I'm a mechanical engineer, Class of '49. I started in the Tonawanda, N. Y., laboratories of Linde Air Products Company. In a few months I was doing research in low-temperature rectification and heat transfer equipment. Now I'm a Section Engineer, responsible for a group of research and development engineers—a member of LINDE's management team."

"I'm a chemical engineer, Class of '50. I started with Bakelite Company, in their training program for production. Now I'm Assistant Department Head at the main plant in Bound Brook, N. J. The group I direct handles resin quality control and technical service. BAKELITE gave me the chance to rise to a significant position in management."

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RADIO CORPORATION OF AMERICA

ELECTRONICS FOR LIVING

ALUMNI NOTES

by John M. Albrecht, c'56

Lester C. Rogers, a 1915 civil engineering graduate of the University of Wisconsin, was recently elected to the Board of Directors of the Metal and Thermit Corporation.

Mr. Rogers, a native of Elgin, Illinois, is president of Bates and Rogers Construction Corporation and vice president elect of the Associated General Contractors of America, Inc. He is also a member of the American Society of Civil Engineers and the Western Society of Engineers, president of the Chicago City Missionary Society of the Congregational Churches, and a trustee of George Williams College.

Lester C. Rogers

Professor Philip Morgan, an alumnus of the University of Wisconsin, was recently elected to the City Council of Iowa City, Iowa. He has the distinction of being the first engineer elected to this position in Iowa City. Professor Morgan is Professor of Sanitary Engineering in the Civil Engineering Department at the State University of Iowa. He received his B.S. degree in 1933, and his M.S. degree in 1935, both from the University of Wisconsin.

Richard V. Rhode, a 1925 graduate (B.S.) of the University of Wisconsin, was accorded special honors recently upon completing 30 years of continuous service with the National Advisory Committee for Aeronautics. He was awarded a diamond-studded gold emblem for his long service with the Government research agency.

Since March 1, 1950, Rhode has been assistant director for research (aircraft construction) at the NACA headquarters in Washington, D. C. He joined the agency's Langley Aeronautical Laboratory, Langley Field, Virginia, shortly after graduation from the University and continued on the laboratory staff until his promotion to Washington.

Author of scores of ANCA technical reports, he has made many scientific contributions to aeronautics, especially in the fields of aerodynamic loads and of fatigue of structural materials for aircraft. With Dr. Henry J. E. Reid, director of the laboratory, he invented the V-G recorder, an instrument for recording airspeeds and structural loads on airplanes in flight.

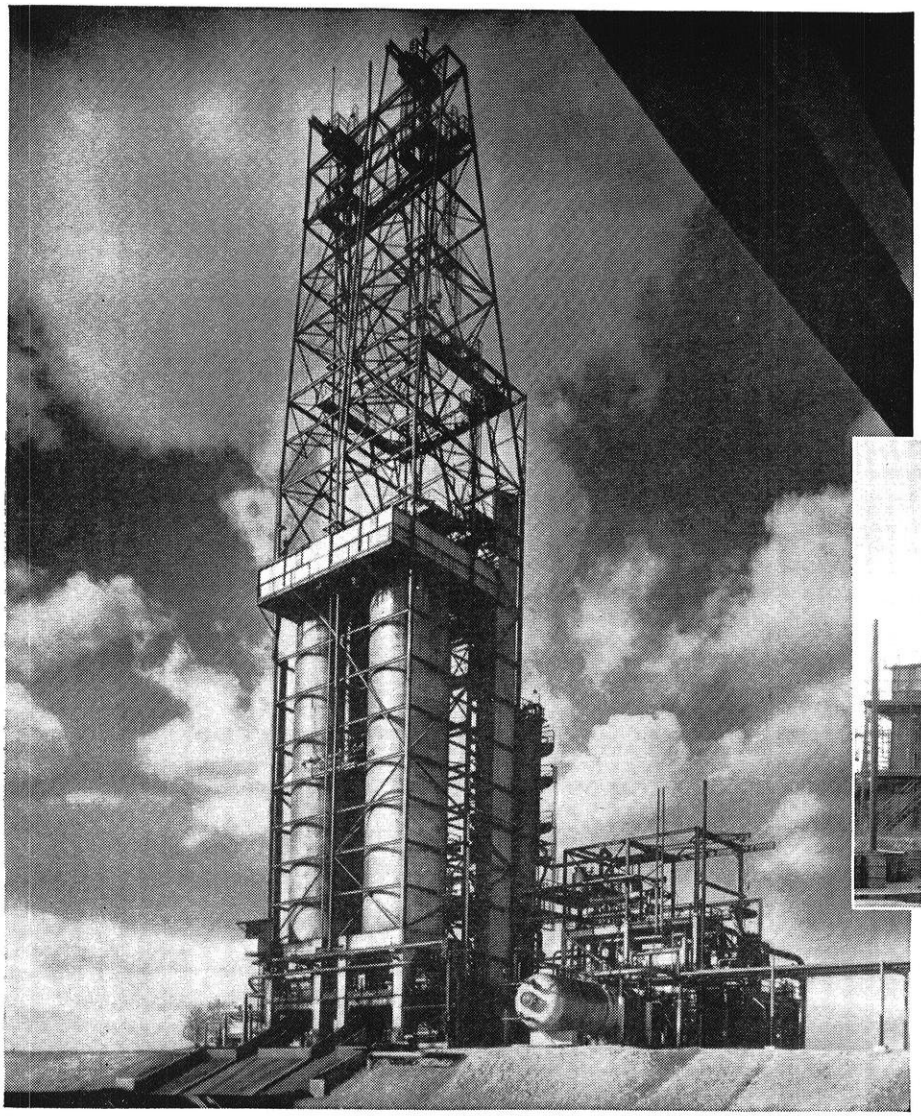
Mr. Rhode was awarded the Wilbur Wright Medal of the Society of Automotive Engineers in 1937.

David G. Soergel, a graduate of the University of Wisconsin with a B.S. degree in electrical engineering in 1943, has been appointed manager of the newly created Applications Department of Autonetics, a division of North America Aviation in Downey, Los Angeles county, California.

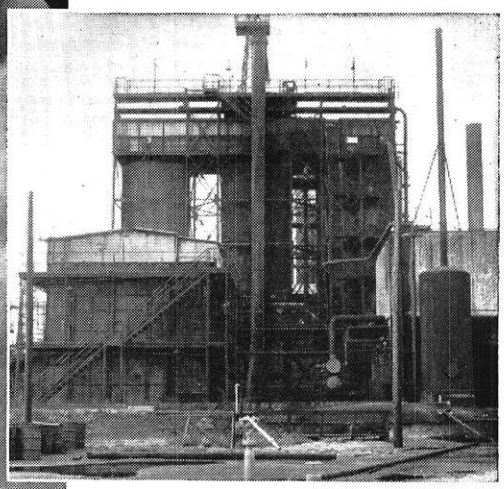
In his new position, Soergel is concerned with customer relations, market analysis and the promotion of applications for Autonetics products. Autonetics is engaged principally in the development, engineering and manufacture of automatic navigation and control equipment for aircraft and missiles.

Soergel joined North American in 1949 and served as staff representative in electro-mechanical engineering, as an assistant to the vice president in charge of the Missile and Control Equipment organization, and, in 1954, as manager of the Electro-Mechanical Products Department recently integrated into Autonetics.

He received an M.S. degree in applied mechanics from Washington University in St. Louis, Mo., in 1949, and was an assistant professor of mechanics there. He was associated with General Electric Co. in its advanced engineering program and its Industrial Control Division.



This towering modern unit at the El Dorado, Ark., refinery of Pan-Am Southern Corporation, a Standard Oil subsidiary, produces 700 tons of coke daily.



Standard's original delayed coking unit at Whiting recently celebrated its 25th birthday "on stream" and going strong.

How to make an exception prove a rule

TECHNOLOGICAL PROGRESS is rapid in the petroleum industry. Few processes have a chance to "grow old" on the job. Most are killed off through the combined efforts of thousands of scientists working constantly to improve everything we do, make or use in our business.

Every now and then, though, we experience a happy exception to this rule. That occurs when a new development not only meets the immediate need but also provides the right answer to situations yet unforeseen.

Twenty-five years ago last August a process known as "delayed coking" was invented. The new process made a quicker, cleaner job of converting heavy residual oil into gasoline, gas oil, and coke. It paid off spectacularly when catalytic cracking was invented and these giant new units began calling for feed. It paid off again when the diesel locomotive came along to put the heavy oil burning steam locomotive out of business.

Dr. Robert E. Wilson, chairman of the board of Standard Oil today, was the inventor of delayed coking. Almost all of the young scientists who worked with him in its development are still with Standard too, in responsible positions requiring their special skills.

Young scientists in research and engineering at Standard Oil today find it satisfying to see their creative efforts translated into valuable product and process improvements.

Standard Oil Company

910 South Michigan Avenue, Chicago 80, Illinois

STANDARD

W.S.P.E.

(Continued from page 34)

Europe on a Dutch vessel on May 30th. They left the vessel at Rotterdam, Holland and Mr. Wahlstrom travelled to Bremen, Germany to pick up a Volkswagen station wagon which he had previously ordered and which was used for transportation while the family was in Europe. The family camped out on most of the trip and found camping sites very economical, usualy costing about thirty cents per day for the family of four. A total of only eighteen dollars was spent for camping in the three and one-half months. Sweden, Denmark and Finland were included in the Scandinavian portion of the trip and the people were found to be very friendly. They found some antgonism, however, because of the Volkswagen and German license plates—until it was discovered that they were Americans. As a precaution they travelled with an American flag in the rear window of the car. Mr. Wahlstrom visited his mother's birthplace, which was easy to find because of the excellent family records kept in Sweden.

Mr. Glen Toy, a Chippewa Falls High School and University of Wisconsin graduate was a guest. Mr. Toy is now a construction engineer for the Morrison–Knutson Company in Seattle, Washington. His family is vacationing in Eau Claire at the present time.

SOUTHEAST CHAPTER

C. E. MATHEIS

In order to determine how best to serve the registered engineers in this area, the Southeast Chapter sent out questionnaires to all registered engineers in the Southeast Chapter area.

The plan met with favorable response as 42 out of 90 members and 42 out of 250 registered engineers and EIT's returned the forms.

As expected, a number of those dissatisfied with the present arrangements desired to meet with the Milwaukee Chapter. Twelve registered engineers complained of the number of organizations to which they belonged, the cost of belonging, and of the many meetings to attend. An unexpected result was that 16 expressed a definite interest in joining the WSPE while 4 said they were undecided. The answers did reveal a definite desire for small group meetings close to home with possibly smaller chapters. Another benefit of the survey was the revision of our mailing lists.

Following are the summarized answers to the questionnaires:

42 members returned questionnaires.

Poll of Members in the Southeast Chapter Area

1. Are you a registered engineer? 37. E. I. T.? 5.
2. Do you prefer the present system of having meetings at:
   Elkhorn or Burlington in September
   Waukesha in December
   Milwaukee in January—State Meeting
   Racine in March
   Kenosha in June
   Yes 24. No 14.
3. Would you prefer meeting with the
   Southwest Chapter? 2.
   Fox River Valley Chapter? 0
   Milwaukee Chapter? 9
   New Chapter? 1
4. Or would you prefer Monthly meetings of a smaller Chapter
   Near your home? 9
   Near your work? 1
   Either? 4
5. List counties that should be included in new Chapter areas: Racine–Kenosha 4, Walworth–Racine–Kenosha 4, Jefferson–Waukesha 3, Racine–Kenosha–Walworth–Waukesha 3. Milwaukee absorb SE Chapter 2. Ozaukee–Washington–Milwaukee 1. rest scattered.
6. What city other than where you live is most convenient for you? Milwaukee 17, Kenosha 9, Racine 5. Burlington 4, Waukesha 2, Madison 2.
7. Would you consider monthly dinner meetings closing at about 7:30 P.M. to permit you to attend other engagements? Yes 20. No 16.
8. In connection with smaller Chapters, would you consider an arrangement whereby you would be notified of adjacent Chapter meetings? Yes 26. No 10.
9. Do you feel that members should be assigned to Chapters:
   a. according to their residence address? 10
   b. according to their business address? 4
   c. be permitted to join any chapter? 25

END

ALCOA WANTS YOU

Here's a book that tells about exciting career opportunities in every branch of engineering

The opportunities at Alcoa are so many, so promising, so rich in recognition it took a book to tell the story. And Alcoa wants *you* to have a copy.

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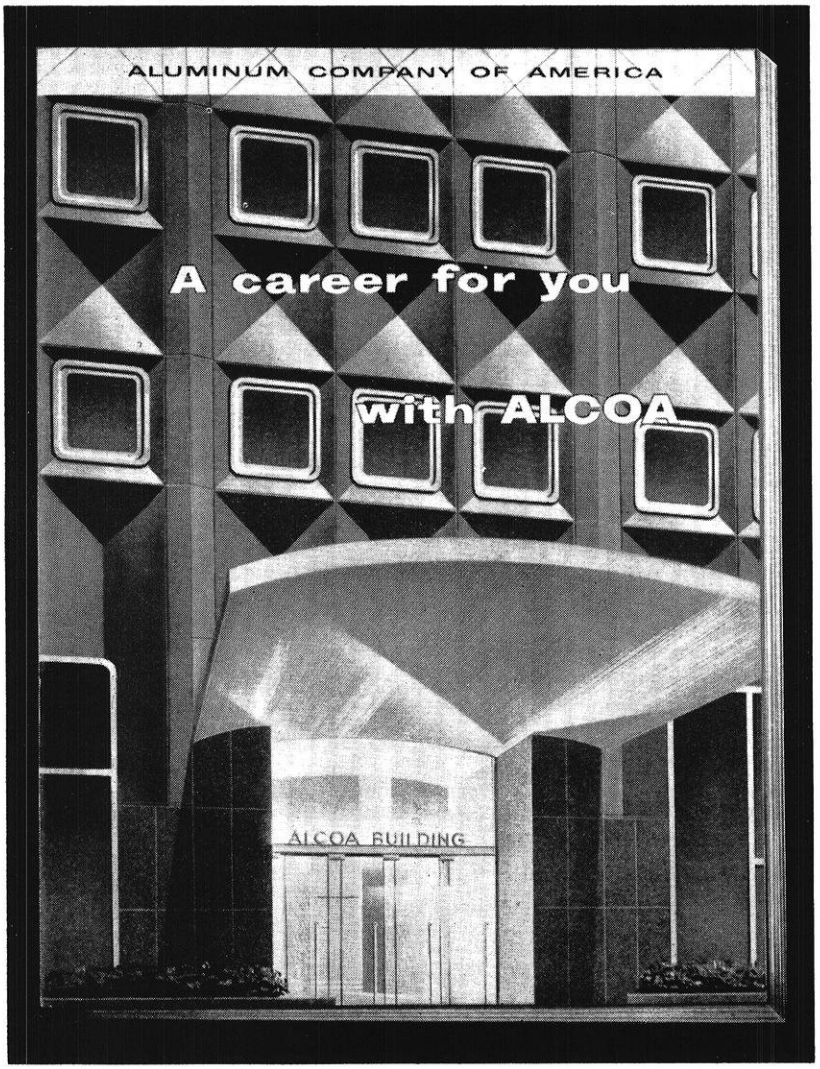

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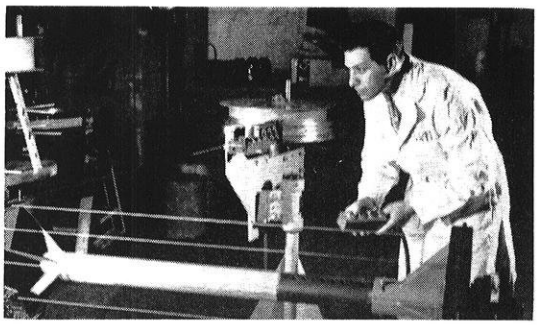


Zirconium

(Continued from page 13)

of the picture since it might introduce contaminations. So an etching process was devised to remove surface layers. This process had to be carried out with great care to prevent contamination by the etchant.

As the technology of zirconium progressed, problems in fabrication arose and were solved. The first problem was that of making ingots. Since zirconium reacts with every known crucible material, a unique way of producing ingots had to be devised. At first a carbon crucible was postulated, but it was found that a 0.15% pickup of carbon was too large and greatly affected the corrosion resistance of the zirconium. Therefore, a water cooled copper crucible was developed. Here an arc method of melting is employed with an inert tungsteel rod as the cathode. The metal is melted by an arc between the cathode and the molten pool of metal. In this manner an ingot of sound metallurgical structure is built up by a continuous welding process. Of course this process must be carried out in an inert gas atmosphere to prevent contamination.

Many parts of the atomic submarine reactor had to be fabricated by rolling and extruding; this also posed new problems. Zirconium can readily be hot worked at temperatures above 1110°F but must be clad with iron or copper to prevent contamination by the atmosphere. At 1400°F zirconium has been extruded at ratios up to fourteen to one, resulting in a weaker but more ductile product. Often the larger billets are hot formed in conventional steel mill equipment with the minimum surface contamination being removed by sand blasting and pickling.

As a result of zirconium's high ductility, it can readily be cold worked. Fine zirconium wire and small seamless tubes are often produced by cold drawing and extrusion tube reducing. Care must be taken in cold drawing however, because of the tendency of the metal to seize in the dies. In order to obliterate this possibility, the zirconium is sometimes sheathed with copper or nickel, or else the zirconium is heated slightly before drawing to produce an oxide film which will serve as a lubricant. However, the zirconium oxide scale is extremely hard on the dies. In either case, the oxide film or the metal casing is removed by pickling after the fabrication operation.

The metallurgical properties of zirconium lend it very well to fabrication by many types of joining and machining. These techniques were also developed along with the Nautilus.

Zirconium can successfully be arc welded, to produce strong joints, by a special inert gas, remote controlled, arc-welding process. However extreme care must be taken to purify the inert gas atmosphere lest impurities cause embrittlement of the weldment. Large tanks that can be evacuated to very low pressures and filled with helium have been developed for this purpose. The welder remotely controls the arc and the material to be welded. Welding stresses are removed by heat treatment in large evacuated furnaces. Torch brazing and furnace brazing have been made economical by the use of a flux developed for brazing titanium. Since zirconium has a unique property of being able to dissolve surface oxide and surface nitride films, it is possible to form high integrity bonds by pressure welding. Joints that show no traces of the original surface lines have been produced by this method.

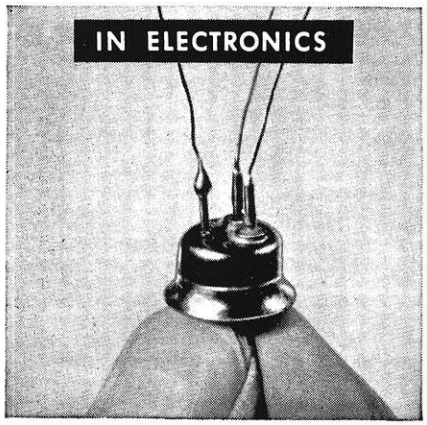
Zirconium is also applicable to powder metallurgy fabrication. The powder is usually a hydride form of the metal produced by reacting the zirconium with hydrogen. This powder is then compacted by the usual methods to form a green compact which can be sintered in a vacuum at 2300°F to produce the desired product.

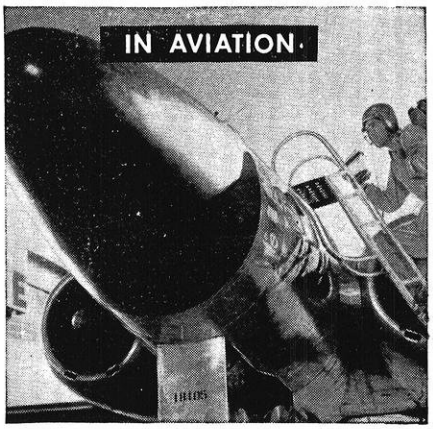
Zirconium can satisfactorily be machined by the usual methods applicable to iron and steel, but care must be taken because the abrasive nature of the oxide scale tends to dull the cutting tool. Also light cuts must be taken and the thin chips immediately removed to reduce the fire hazard caused by their pyroforic nature.

From the above discussion it seems that since zirconium products are so difficult to obtain in the pure form, and so expensive, some other metal could serve as a substitute, but an exhaustive search of the properties of materials required for nuclear construction shows that zirconium is the most favorable except for price. The future here isn't as dim as one might expect. The present price of zirconium in rod or plate form is twenty-five to thirty dollars per pound, but with mass production of zirconium this cost will be reduced many fold.

The use of zirconium is not limited to atomic energy, however. Its marked corrosion resistance in quickly making it a favorite with surgeons for use in surgical instruments, internal pins, screws, and plates. It is also becoming a popular material for pipe and tank linings and is slowly replacing tantalum. Another practical use for zirconium is because of its alloying properties. The strength of copper is doubled by the addition of 7% of the wonder metal. Nickel containing 10% zirconium produces a hard alloy which requires no tempering and is useful in high speed machine tools.

Zirconium is a young atomic age metal, already with numerous uses. The unending possibilities and development of this metal of the future are left to you, the engineer of the future. **END**





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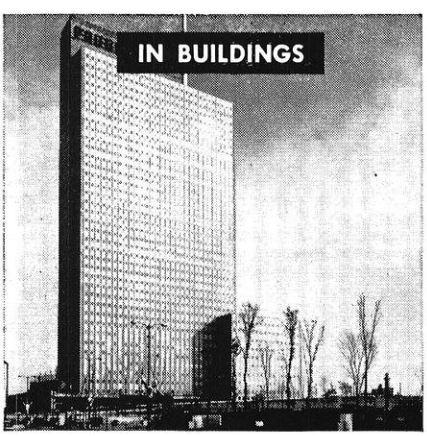
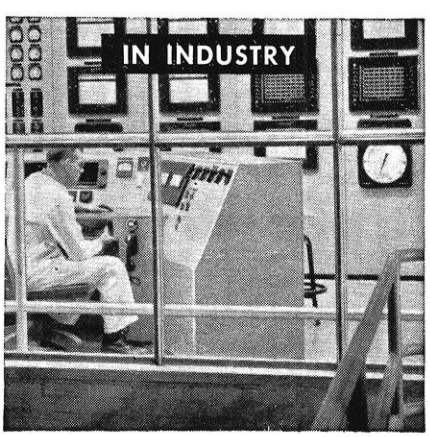
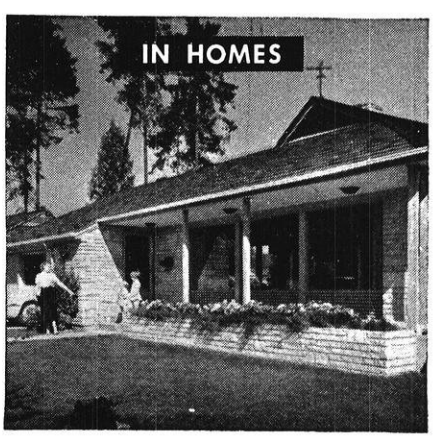






A popular type of speaker system for true living room hi-fidelity listening pleasure.

Hi-Fi

(Continued from page 15)

magnet type is usually used and the size of the magnet is one indication of its quality. If only a single speaker is desired, it is imperative to get a speaker which will cover most of the frequencies up to 15,000 cps. The diameter of this speaker should be at least 12 inches. More elaborate systems may have two or three speakers, one of the speakers covering the lower frequencies while the others cover the higher frequencies. A cross-over network is used to feed the various frequencies to the proper speakers.

Almost as important as the speaker itself is the enclosure for the speaker. This may be emphasized by placing the speaker in a well designed cabinet and then taking it out of the cabinet; the difference in sound quality will be very noticeable. The speaker cabinet should be made for the individual speaker system; it should be large enough to hold the entire system with ease. A very suitable type of cabinet is shaped like a triangle, fitting into the corner of the room with the face of the speakers facing toward the middle of the room. The corner of the room is a good place for the speaker as the corner tends to reinforce the sound of the orchestra. Also, when the speaker is in the corner, the high frequencies may be heard better over a larger area of the room.

Now that some of the more important characteristics of a good hi-fi system have been pointed out, it is up to each individual to decide how far he wants to go into hi-fi. There are many systems which can be partially assembled by hand and are very efficient reproducers of sound. Also, these home made kits reduce the cost substantially, and the builder learns quite a bit about electronics too. Some systems involve a rather large investment, but reproduce the original almost to perfection. Whatever your decision is concerning your hi-fi equipment, remember that your system is only as good as its weakest link. **END**

Welding

(Continued from page 23)

it can handle all retrieving operations satisfactorily. Installation of the crane on a tractor is a simple operation and requires a minimum of manpower and time.

By allowing savings in time and material, arc welded construction not only gives the builder of a fifth-wheel crane a considerable cost saving, but provides a strong, flexible, and light weight unit. The need for only a few pieces of equipment in the construction of the crane, and the use of a simple hydraulic jack for the hoist adds to the practicability and economy of building a welded fifth-wheel crane.

TABLE NUMBER ONE

The following manufactured items are to be used in the construction of a fifth-wheel crane.

No. Used	Part No.	Name of Part	Specifications (Dimensions in inches)
1	1	King Pin	SAE Standard king pin
1	2	Hydraulic Jack	10 ton capacity; 9″ high
1	3	Hinge Pin	1 dia., 2″ long; with cotter pin hole
2	4	Bolt Assemblies	½″ x 10″ with nuts and washers
4	5	Jack Mounting Bolts	¼″ x 1″ with nuts and lock washers

TABLE NUMBER TWO

The following steel sections are to be used in the construction of a fifth-wheel crane and should be cut to the specified length.

No. Used	Part No.	Name of Part	Length (inches)	Shape of Section
2	6	Frame Rail	72	7 □ 9.8 channel
1	7	Frame End	24	6 x 4 x ⅜ angle
1	8	Pivot Bar	8	2½ diameter bar
1	9	Stop Block	26	3 x 2 x ¼ angle
1	10	Mounting Bracket	44	3 □ 4.1 channel
1	12	Eye	22	1 diameter bar
1	16	Cylinder Hinge Bushing	4	2½ I.D. pipe

TABLE NUMBER THREE

The following parts for the construction of a fifth-wheel crane are to be cut from mild steel plate of the indicated thickness.

No. Used	Part No.	Name of Part	Rough Size, in.	Thickness of Plate, in.
1	11	Mounting Bracket Plate	44 x 3	¼
2	13	Piston Hinge Plate	2½ x 2	½
1	14	Piston Hinge Block	2½ x 2	1
1	15	Cylinder Hinge Plate	6 x 4	¼
4	17	Hinge Plate Gusset	2½ x 1½	¼
2	18	Main Frame Gusset	7 x 4	¼

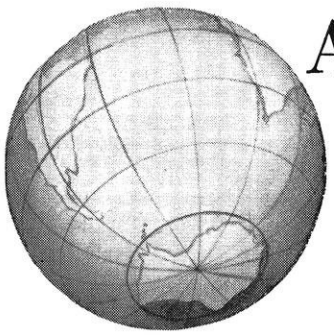
TABLE NUMBER FOUR

Cost Analysis

The weight of steel stock used in this crane amounts to approximately 175 pounds. The current local price for steel in quantities of less than 1000 pounds is 13¢ per pound. The cost of the king pin is $13.86 and the jack $15.00. Allowing $10.00 for welding electrodes, bolts, and miscellaneous expenses, the total cost of materials for a fifth-wheel crane is tabulated as follows:

Steel (175 lb. @ 13c per lb.)	$22.75
King pin	13.86
Jack	15.00
Miscellaneous	10.00
Total Cost of Materials	$61.61

END



Another Antarctic Expedition calls on COLLINS for communication

U.S. Navy Task Force 43 is establishing several bases in Antarctica in conjunction with the International Geophysical Year activities. Two bases will be built next year, one of them at the South Pole. The expedition, appropriately entitled "Operation Deepfreeze," is under the direction of Rear Admiral Richard E. Byrd and commanded by Rear Admiral George Dufek. For radio contact between bases and the outside world, the commercial and amateur communication equipment will be Collins.

The name Collins has figured prominently in polar expeditions since 1925. During Admiral Byrd's expedition of the early 30's, Collins transmitters were used in the first Arctic/Antarctic communication link—from the Byrd Expedition (Antarctic) to a CBS station in Northern Alaska. The Collins equipment is specially packaged for air drop and long sledge journeys. Superior performance and reliability, proven time and again, make Collins the logical choice when the need for radio communication is vital.

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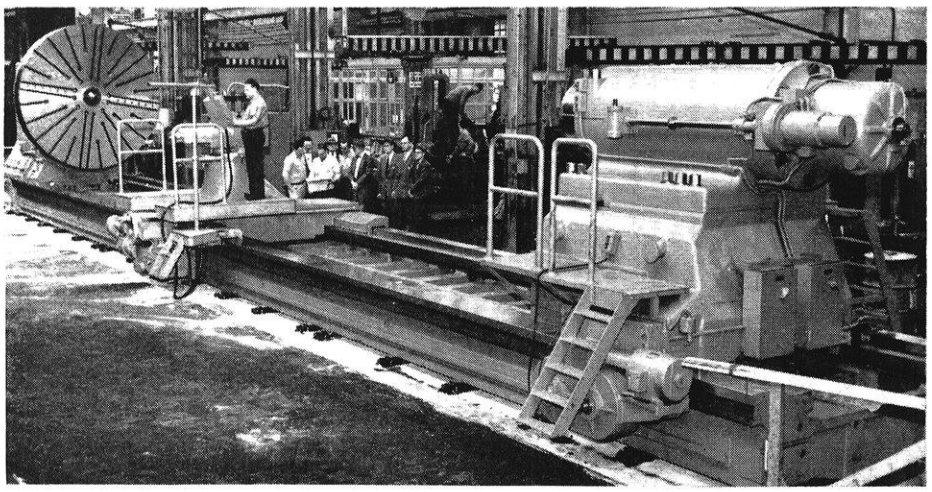
A Collins' representative will be on the campus March 1 and 2. See your placement officer for an interview appointment.

SCIENCE HIGHLIGHTS

edited by Dick Tomlin, Ch'56 and Ted Witzel, EE'57



This half-million dollar lathe, having a 144-inch swing and a center-to-center length of 55 feet, is the world's largest.

WORLD'S LARGEST LATHE

Looking to the future, G.E. ordered a lathe bigger than needed for any job now under way, foreseeing a demand for ever bigger hydraulic turbine-driven generators, direct-current motors, flywheels and other rotating equipment for utilities and industry.

The lathe was built by the Consolidated Machine Tool Corporation of Rochester, N. Y., and cost about half a million dollars.

Feature of the new tool that will be needed soonest is the 144" swing. G-E design engineers were previously limited by the 120" swing of the shop's largest lathe. Center-to-center length of the new tool, 55 feet, is expected to be ample for some time, but provision has been made for increasing the length by adding new sections to the bedways.

The live tailstock quill center is accurate to a total indicated runout of .0005". All-electronic longitudinal and cross feeds permit feed settings at any increment from .002" to .75" per spindle revolution. The machine can carry jobs weighing up to 200 tons at speeds ranging from one-half to 40 RPM. Centers alone will carry 200-ton loads at slow speed while steadyrests are being positioned.

The cast iron faceplate, 10 feet in diameter and weighing (with its shaft) about 20 tons, is so finely balanced and lubricated that a man can turn it by hand.

NUCLEAR REACTOR SIMULATORS TO BE MARKETED FOR TRAINING

Engineers soon may be learning how to operate nuclear energy reactors, not on actual units but on simulators that faithfully imitate behavior of the real thing.

With the swing toward large-scale use of nuclear power, a whole new generation of operating men, schooled in fission process and control, will be needed. Since costly reactors are not readily available for instructional purposes, one answer to the training problem is the less expensive simulators, which respond like actual units in producing, maintaining and controlling nuclear chain reactions.

One device, believed by its manufacturers to be the first commercial nuclear reactor simulator, features an electronic "brain." When the trainee manipulates the controls, the "brain" instantly figures out how a particular real reactor would respond and sends signals to the instruments and control gear. At the same time the trainee can see the action of working control rods in a dummy fuel core. The electronic brain can be adjusted to imitate a variety of actual reactor types and can even be set to simulate emergency conditions or accidents.

LONG LIFE TREAD

A blowout-proof tire for trucks and buses that will outlast the vehicle is now a reality.

A high tensile, specially stranded wire for reinforcing cord has been introduced into the tire. One of the nation's leading tire manufacturers has started a widespread promotion of its 300,000-mile tire made with the new wire cord and is predicting that the next two years will see a 500,000-mile tire on the market.

Not to be confused with bead wire, which for years has been used in the core of the bead to hold the tire on the rim, the new cord wire is built into the plies, two to four of which are formed in the carcass of the tire.

With a tensile strength of 375,000 to 425,000 pounds per square inch, far in excess of any available fabric cord, wire makes possible a safer, stronger tire with a thinner cross section. This in turn provides greater resiliency and reduces accumulation of heat. The metal-core ply also eliminates casing stretch.

Cord wire is made of high carbon steel and is supplied in coils to the processing line as a hard drawn process wire .033 inches in diameter.

A-HEAT

For the first time in U. S. history, tremendous quantities of waste heat generated by atomic reactors are being used for large-scale space heating.

Engineers at the Atomic Energy Commission's Hanford, Washington atomic plant are transferring heat —from water used to cool atomic reactors—to air conditioners in various Hanford buildings.

The new heating system works like this:

Water from the Columbia River is pumped through Hanford reactors used in producing plutonium. In cooling these reactors, the water absorbs immense amounts of heat and picks up slight amounts of radio-activity, both derived when atoms of uranium fission or become plutonium.

The reactor cooling water is pumped to a heat exchanger, where it gives up its heat to an ethylene glycol water solution, which transmits the heat to air conditioning systems in various Hanford buildings. The reactor cooling water is held until its radio-activity level has decreased to a point where it can safely be discharged to the river.

Ethylene glycol is used to prevent freezing in the outside bank of air conditioner coils during sub-zero weather.

The heat exchanger can be safely approached for short periods. A high fence with a locked gate keeps people 50 feet away from it except for maintenance or other necessary work.

The new system is an important milestone in the development of peacetime uses of atomic energy.

RADIO–STOP LIGHTS

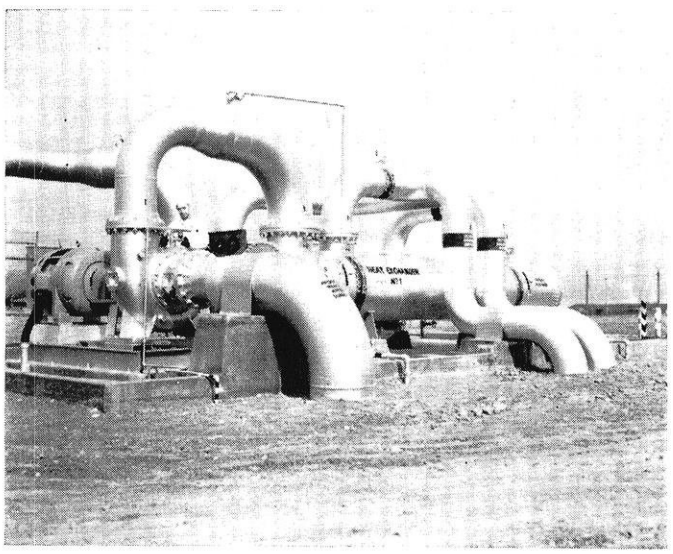
Recently Mayor Richard J. Daley of Chicago, pushed a button throwing radio controlled, electronically mechanized traffic signals into operation at 13 busy street intersections.

The City's request to the Federal Communications Commission in Washington for a station license to transmit radio signals to co-ordinate traffic signals was so unusual that special authorization by the Commission was necessary before the City was granted permission to install the pilot system.

Vehicle movements and direction of travel on certain streets vary in volume from hour to hour and day to day. Traffic control signals, without interconnecting cable cannot possibly cope with these changing traffic conditions and costly and bothersome delays result. Radio co-ordination from a Central Station will provide traffic signal timing changes necessary to meet variable traffic conditions.

The system includes a Central Control Station located at City Hall and a transmitter and antenna on the roof of the Board of Trade Building. The control station is linked to the antenna by existing underground cable.

By sending out coded radio tone signals, the transmitter will provide remote control of electronically equipped stop-and-go signals at all intersections along North La Salle Street and two others at outlying locations. END



Hot water from an atomic reactor gives up its heat to an ethylene glycol solution which is circulated through the heating system of buildings at Hanford, Washington.

Water Shortage

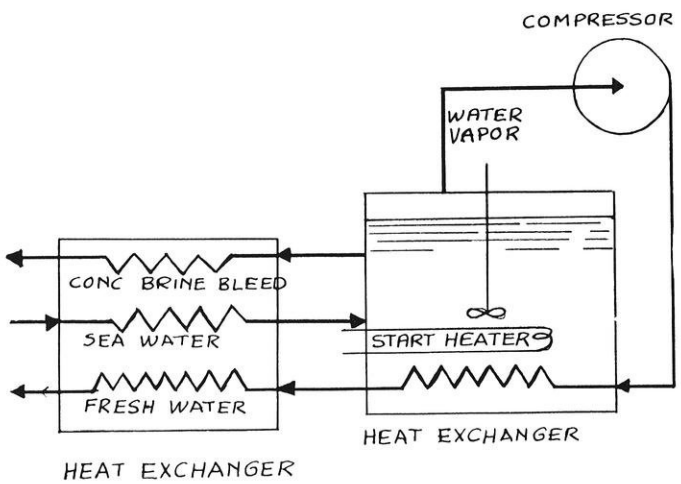
(Continued from page 17)

trations in the water are decreased, the power requirement decreases.

This latter characteristic makes electrodialysis especially valuable for the purification of water with higher initial purity because of the close relationship of power requirements to the number of ions to be removed. Thus it is generally believed that the Ionics method will find its first and most profitable use in purfying the brackish water of such arid regions as Arizona, South Dakota and many Great Plains localities. These waters contain from 885 to 10,000 parts per million of salt compared with 38,000 parts per million of sea water.

There are certain problems connected with the electric membrane process. One of these is the disposal of the high quantities of waste brine which constitutes about one third of the effluent from an electrodialysis plant. If 75,000,000 gallons of sea water are processed each day, 25,000,000 gallons of concentrated waste brine must be disposed of. Near the coast and the boundless ability of the sea to absorb and dilute, this would cause no concern. But inland, that high polution must go somewhere, perhaps deep underground. Other problems involve the availability of electric power near the raw-water supply, and the quality and durability of the plastic membranes.

Here at the University of Wisconsin, Karl–Axel Melkersson, a research assistant in the Department of Chemical Engineering who came from Sweden several years ago to learn "American know-how," has been doing some special work in the study of ion-exchange membranes. By carrying out certain experiments, Karl has been able to determine the "transfer numbers" for various membranes. With these numbers and with the correct mathematical equations, he can then determine the amount of water and ions which will pass through a given membrane per faraday of electricity.



In a vapor compression distillation, a small amount of initial heat is necessary to generate the initial steam. This steam is mechanically compressed and returned to the chamber, giving up its latent heat, which is used to evaporate more of the water in the still.

In viewing the electric membrane process as a practical method for obtaining fresh water from the sea, Karl recognizes that, since electrodialysis has never been tried on a large industrial scale, there are many difficulties that must be yet worked out; for example, how to avoid the accumulation of magnesium in the membranes. "Furthermore," he explained, "the power cost will be large with so high a concentration as in sea water. The economical optimum will also require a very low flow rate which means that, for sea water, the equipment costs will be considerably larger than for slightly brackish water. Therefore I don't believe the iron multiple-cell process will be competitive economically for sea water, but it will very likely be good for the brackish water out in the West."

It is difficult to get comparative costs on a universal basis. There are many variables that have to be taken into consideration: climate, availability of unskilled labor, availability and price of energy, etc. Keeping this in mind, it has been optimistically estimated by Ionics on the basis of present lab-scale equipment that sea water can be converted into fresh water for $1.25–$1.50 per 1,000 gallons. On the other hand, costs for brackish water are estimated to be considerably less: $0.125 per 1,000 gallons for water containing 10,000 parts per million of dissolved solids, and $0.0125 for 885 parts per million water.

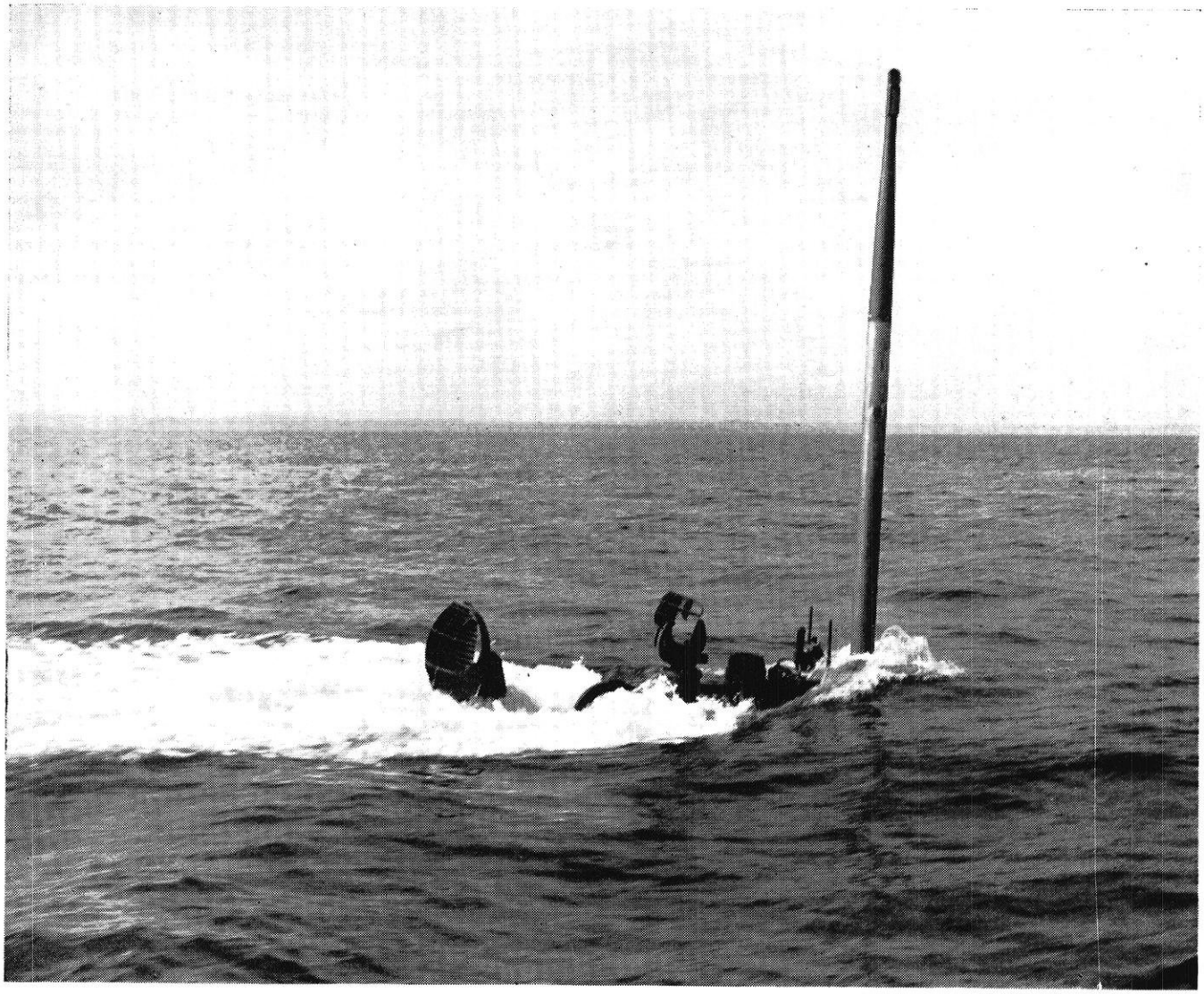
Vapor-compression distillation is based on the heat-pump principle. Here, a little preliminary heat—equivalent to the "starter" on an automobile—is used to get a small amount of steam from an evaporator shell. This steam is mechanically compressed to raise its condensation temperature a few degrees and is then returned to a heat exchanger inside the shell where the latent heat given off when it condenses is used to evaporate more of the water in the still. The "starter" can then be turned off, and, as long as the pressure is kept up, the process is continuous. Fuel is used to provide the mechanical pressure, but not to heat the water as in ordinary distillation.

The Badger Manufacturing Company, also of Cambridge, Massachusetts, has received a contract from the Interior Department to work on the vapor-compression distillation process. They introduced a new version of the process by agitating the liquid violently at its boiling point; this greatly reduced the energy requirements for producing steam.

The Army's Engineer Research and Development Laboratories in Fort Belvoir, Virginia, also recently made a significant contribution to the technology of vapor-compression equipment. One of the draw-backs of the system had been the build-up of scale on evaporator tube surfaces as the steam condensed to form pure, salt-free distillate. This scale formation had increased the cost of distillation due to lost capacity and efficiency, and to the additional labor and materials required to remove it. The Army Engineers found that equipment can be descaled simply by the addition of

(Continued on page 56)

Here's a picture of some SPECIAL ALLOY STEEL



—and there's much more to it than appears on the surface

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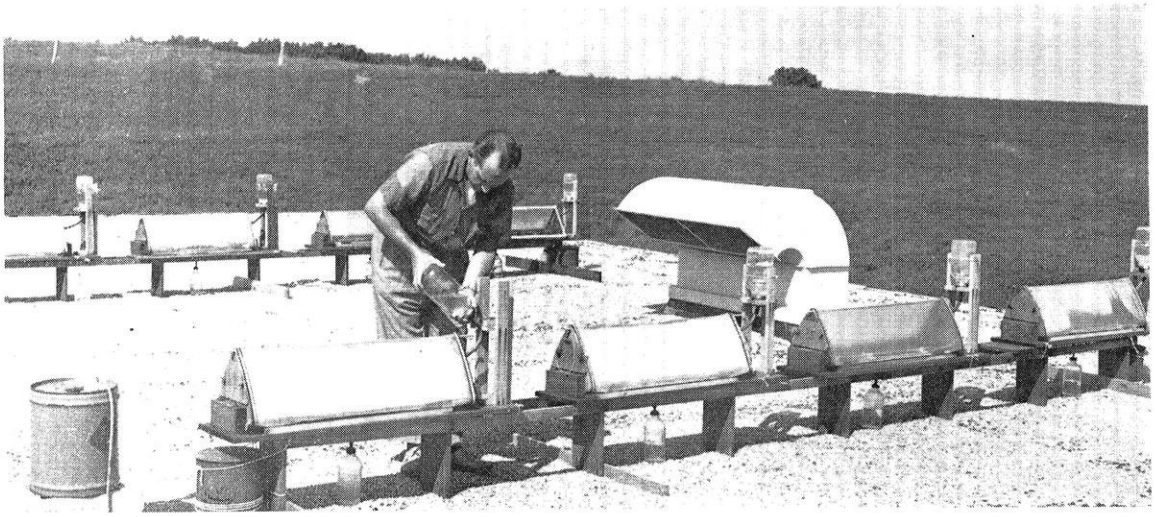


Pictured are various experimental solar stills being used to determine the relative performance of various plastic materials. This project is located at the Bjorksten Research Laboratories in Madison.

Water Shortage

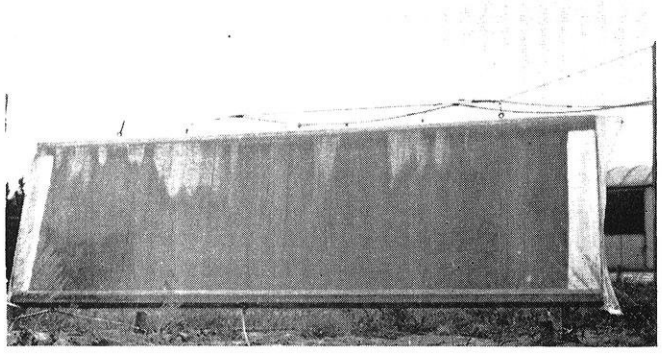
(Continued from page 54)

citric acid while distillation is in progress. They've devised a simple procedure that minimizes corrosion hazards of the acid, time out for cleaning and other interferences.

Vapor-compression distillation has the advantage over electro-dialysis of having been already developed on a large scale—thereby giving us a truer picture of the economical and technical problems involved. During the war stills of this type were built in such number as to fulfill the daily water needs of nearly 1,000,000 men, and the practicality of the device is well proven. (Of course, these stills were minus the boiling-point agitator and the citric acid descaler.)

Presently developed equipment can provide fresh water at a cost of $1.25–$1.50 per 1,000 gallons. However, it is generally felt that the afore mentioned "energy-savers" can reduce the cost about one-half, or to $0.60–$0.75 per 1,000 gallons.

Of the lesser "contestants" for the conversion of saline water into fresh, perhaps the most interesting is solar distillation. Much of the work being done today in this field is based on the work done by Dr. Maria Telkes of the Massachusetts Institute of Technology. The solar still she designed consists essentially of glass plates inverted to form a roof over a black tray containing sea water. When visible sunlight passes through the glass roof, solar radiation is absorbed by the black trays and is re-emitted as warming radiation. This infra-red radiation cannot pass back through the glass, and is trapped in the still, thus raising the water temperature and evaporating the sea water. The vapor condenses when it strikes the roof of the still, cooled by air circulating around the apparatus, and the distilled water droplets trickle down the sides of the glass roof and are passed into wooden drain troughs. Minerals remain in the tray.



Pictured is an experimental still being used to determine the effect of the angle of the condensing surface. It was found that yields were increased as the angle of certain plastic membranes was increased, due to faster run-off of condensate.

Since in most processes, distillation is expensive in terms of the energy required, solar energy would appear to be just the thing. The less rain, the more sun and, therefore, the more water. In reality, the process requires no fuel and little mechanical power. However, a great amount of glass and space is required—so much, in fact, that many people believe that equipment costs will prevent the method from becoming economically attractive until other fuel costs rise appreciably.

Present research is directed toward reducing equipment costs. One of the companies awarded an Interior Department contract for this purpose is the Bjorksten Research Laboratories, which is located just a few miles south of Madison. This company is primarily concerned with the application of plastic membranes instead of glass for the solar still, in order to obtain low-cost production, and one of their problems is finding plastics that provide a wetable film similar to that of glass.

Following is a quote from the report of Risto Lappala and Johan Bjorksten to the World Symposium on Applied Solar Energy which met in Tuscon, Arizona this last fall, telling of the requirements for a good plastic still: "For optimum utility a plastic solar still

(Continued on page 58)

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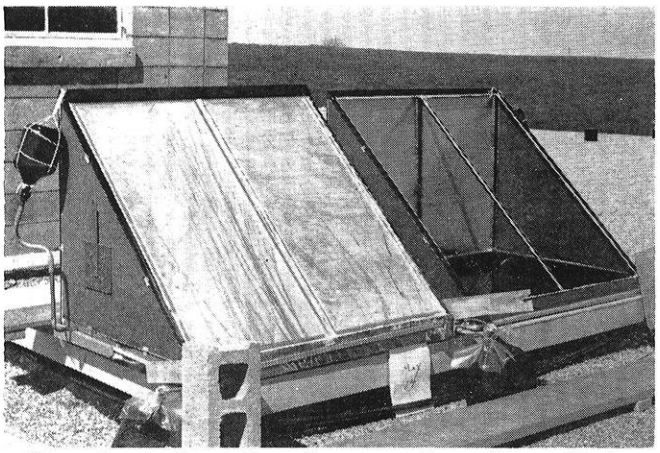

Pictured are "green-house" type solar stills at Bjorksten Research Laboratories. The performance of membranes are compared with glass (left).

Water Shortage

(Continued from page 56)

should be low in cost, easily fabricated and installed; it should present a profile with minimum wind resistance, have good weathering properties, that is, good resistance to direct sunlight and sand or dust abrasion, and have good resistance to tearing or puncturing. Tears or punctures should be easily repaired."

Solar stills made of various plastic materials were compared with a glass solar still on the basis of yields of potable water. Stills constructed with treated polyvinyl chloride film were about 88%–92% as efficient in the yield of fresh water as were similar stills made of glass.

Solar distillation has been tested on something more than a pilot-plant scale, for it is of course nature's porcess of evaporation from the oceans to produce fresh rain water. Man has produced crude salt by solar evaporation of sea water for a very long time. Back in the 1800's, a mining company in Chile installed a solar distillation unit which produced fresh drinking water for their pack animals. During World War II, Maria Telkes developed a small inflatable plastic ballon used on life rafts to produce drinking water at sea. Weighing about one pound, this device could be folded into a package of 60 cubic inches, but in use was inflated and floated on a towline attached to the raft. This still utilized about 60 percent of the incident solar energy for the production of potable water.

Problems of solar distillation are size and cost of equipment, design of trays that absorb incoming light energy and that re-radiate very little light of long wave length, plus difficulties of condensation in hot climates where the method might otherwise be practical theoretically. If cheap solar distillation processes can be worked out, they could be used to obtain drinking or irrigation water in many places in this country where only brackish water is available, in countries in the Mediterranean area, or on tropical islands with limited fresh water sources.

Right now, the government feels that cost for this method would be about $2.00 per 1,000 gallons. However, Lappala and Bjorksten estimate that it might be "feasible to produce fresh water from sea water by means of plastic solar stills for less than $1.00/1000 gallons, provided plastic film or sheeting which will withstand outdoor weathering for extensive periods of time is developed. If the demand is created, we feel certain that such a material will be available soon."

Multiple effect evaporation is a familiar chemical engineering technique in which the steam formed in one evaporator is condensed to heat the liquid in a second evaporator, whose condensed vapor in turn is used to heat the liquid in a third evaporator, etc. This continuous process for evaporating more and more water is used in such locations as Kuwait in the Middle East.

Compared with vapor-compression distillation, multiple-effect evaporation requires larger physical equipment and is less efficient; therefore, in this country, its costs seem too high for any serious consideration. Most experts have felt that the cost for this process would be around $3.00 per 1,000 gallons; however, one operator has estimated that it can be done for as little as $1.50 to $2.00 per 1,000 gallons.

The Claude process or thremal difference process depends on having two sources of salt water—one warmer than the other by about at least 16° F. The warmer one is evaporated under vaccuum, with water vapor condensed by the cooler liquid. Such a plant could be located where an industrial plant used seawater for cooling, or might be used where colder than normal sea water is pumped from a deep part of the ocean.

The University of California (Berkeley) has built a small unit, which operates on the thermal differences principle, in order to further investigate this method. The French are building a similar plant at Abidjan on the coast of French West Africa.

Problems of the process involve size and cost of equipment, and a restricted number of practical locations. In time, they may be resolved by the right situation in which waste heat from other activities can be utilized. For special locations where water with 16° F. difference is available, it is estimated that fresh water may be produced for $0.70–$0.80 per 1,000 gallons. These figures are based on a small-scale unit.

Super-critical distillation is a process proposed by Nuclear Development Associates, White Plains, New York, which would use temperatures near 700° F. and 3,200 psi pressures. At such temperatures, pure water can't exist—there is no distinction between plain water and steam—but salt water can exist and can be distilled into fresh with greater efficiency in this high range.

This company estimates an eventual cost of $0.30 to $0.80 per 1,000 gallons, but before it can be realized, some mighty big problems have to be solved. They are the corrosiveness of high-pressure, high-temperature water (titanium may be the answer), a large amount of scale formation, and uncertain equipment cost.

(Continued on page 60)

Precision, high-speed winding equipment for IRC elements

BASIC TECHNIQUE

Wire element is uniformly and tightly wound on an insulated core. Axial leads or other terminations are secured to element by automatic machinery. Insulated housing may be used or omitted.

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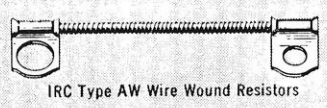

IRC Type AW Wire Wound Resistors

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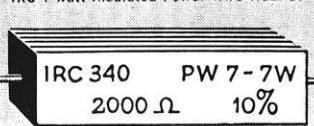
IRC 4-watt Insulated Power Wire Wounds



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Water Shortage

(Continued from page 58)

These six methods, then, look the most promising and are consequently getting the most attention from the Ineterior Department. However, it was learned long ago not to discredit ideas too hastily, for a factor making one solution impractical today may be resolved tomorrow by research or accidental discovery. Among the many systems which may develop favorably through such activities are the following:

Freezing, which is based on the fact that it takes less energy to freeze water at 32° F. than to boil water at 212° F. The catch is that high temperature is cheaper than low temperature, although operation at low temperatures would reduce problems arising from the corrosive effects of sea water and resulting brines.

Electrogravitation, which involves using an electric current to concentrate minerals in one place, making this water heavier. The purer, lighter water then rises.

Osmotic membrane, a plastic membrane which might be developed, through which water, but not minerals, could pass. A variation of this would be to use a molecular oil film as the membrane. At the present time, however, little is known about the large-scale application of either method.

Thermo–osmosis, which depends on the development of a material which will absorb only water—no salt, and from which the water can later be removed by heating.

Ion exchange process, which has been used for many years in softening water in homes. The disadvantages are that the units must be regenerated periodically and, when dealing with water that has a heavy mineral content such as salt water, the cost of the regenerants is prohibitive. Furthermore, some of the fresh water produced must be re-employed in the regeneration.

Solvent extraction, which is based on the real possibility of a solvent to take up fresh water from salt water, and then giving up the water by being cooled or heated 20° F. or so.

It can be seen that, while much progress has been made on the problem of sea water extraction, there is a lot of work that yet needs to be done. Cost rears its head each time a "practical" solution is reached. When power economy is attained, equipment costs soar. The fact is that engineers have found more ways to desalt ocean water than they have found ways to pay for it.

(It has been suggested that sea water purification could be partly financed through the sale of mineral by-products, but detailed studies by competent engineers and economists indicate that such plans are not likely to prove practical. The very large quantities involved would be a detriment, since minerals comprise a skittish market at best. Also, dumping high additional tonnages of low-production minerals would depress the market badly.)

But while the perfect solution to all requirements of public water supply would be a method which could produce fresh water in terms of millions of gallons per day, at a cost of less than $0.40 per 1,000 gallons for cities, and at less than $0.06 per 1,000 gallons for irrigation, the Interior Department's goal is not to develop conversion methods that could compete on a cost basis with natural water supplies. In its research program, the Department is acting on the theory that economic forces, as well as scientific research, will make conversion practical. If underground water supplies continue to drop and United States' population and industry continues to rise, the demand for water may eventually make even the most expensive conversion method "practical."

For example, right now the energy from nuclear fission isn't even being considered in official reports because of its present cost. However, at some future time, atomic power may give us all the water we need for personal use, to grow the things we eat and to make the things we require.

END

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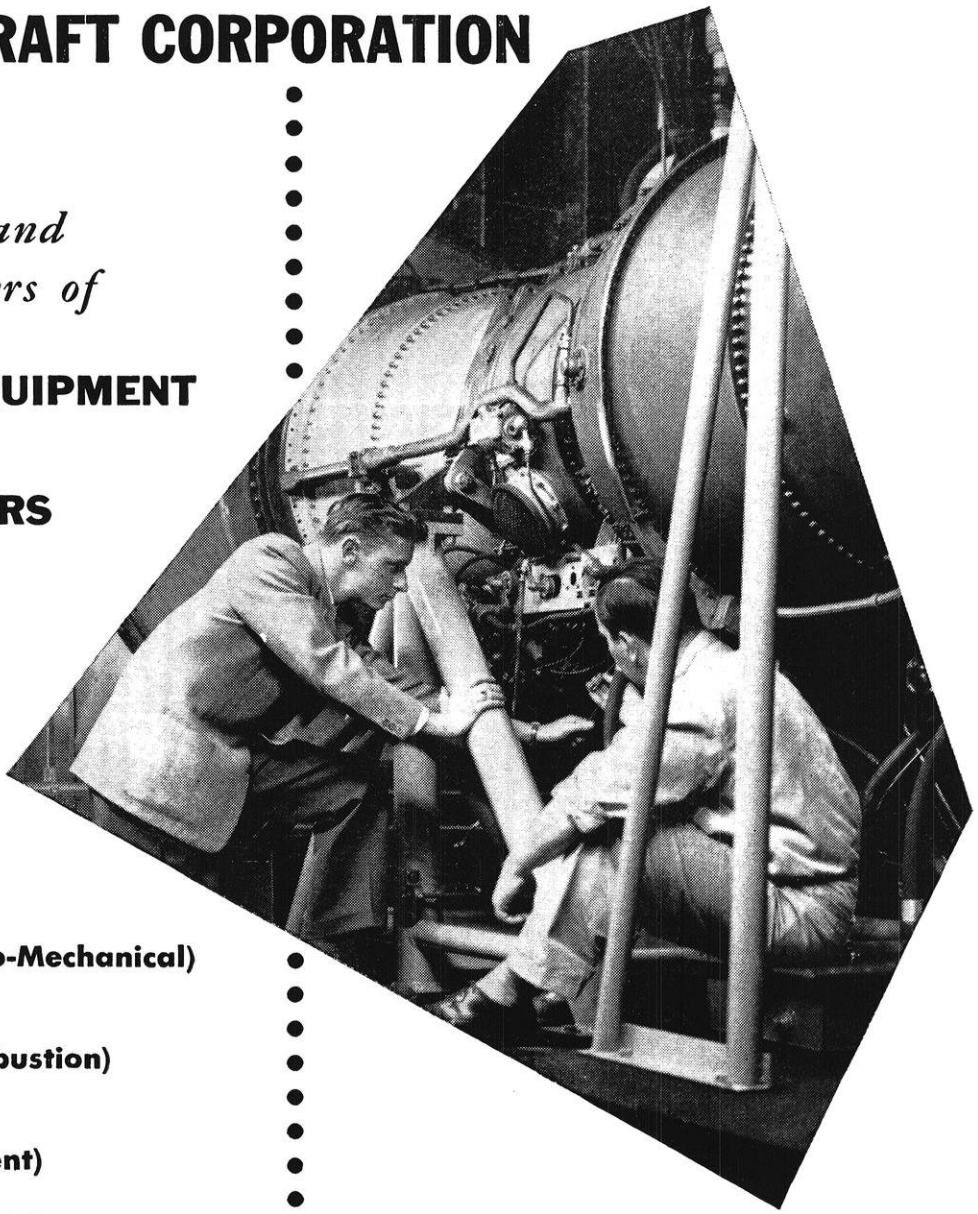

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WINDSOR LOCKS, CONNECTICUT

Wool

(Continued from page 24)

made shrink resistant by one of the methods and were firmly constructed, the automatic washing machine could even be used, though it is the harshest of laundering methods. Generally, hand laundering will reduce shrinkage and is sometimes specified by the maker. Anyhow, we'll assume negligible shrinkage with our socks, and move onto our next item of clothing.

Now let us consider our flannel trousers. What properties should they have that are desirable with reference to fabric makeup and fiber use? Trousers generally are kept clean and neat looking. If a fabric doesn't soil easily and can be cleaned it might be suitable for this use if warm enough for our cold winter day. Warmth has already been discussed to a limited extent and since most trousers such as these are dry cleaned, the problem of cleaning will not be considered here. However, two very important fabric properties, wrinkle resistance and crease retention, are more applicable to this clothing item than to any other. We differentiate between the two:

> "The crease and the wrinkle, there isn't much doubt,
> Are alike in a number of ways,
> But the crease is the one that so quickly comes out,
> While the wrinkle's the one that stays."

Let's take a look at wrinkle resistance of a fabric, how and why it wrinkles. Wrinkles are formed in a fabric when the material is creased in an undesirable place. Whether or not a fabric is wrinkle resistant to some extent depends on the inherent ability of fibers to recover from strain and the state of fiber aggregation in yarn, and yarn in fabric which control the amount of fiber and yarn movement relative to fiber and yarn strain.

By use of a Wrinklometer, a device for measuring wrinkle resistance and recovery data, fabrics of different chemical types have been tested. Indices for these fabrics properties have been derived from the data. High values of either index are favorable.

Fabric Composition	Wrinkle resistance Index	Wrinkle recovery Index
Wool	29	91
Experimental polyester fiber	21	75
Experimental Polyacrylic Fiber	11	95
Acetate/Viscose (Crease resistant finish)	5	82

Getting back to those wool flannel trousers, why do we consider the wool fabric used desirable in regard to wrinkles? As seen above, wool not only resists wrinkles well but also recovers favorably from them. If our flannels were made from the acetate-viscose mixture and even given a crease resisting finish, they would probably be wrinkled quite easily. Wool has a definite advantage over many fibers in regard to wrinkle resistance.

How about crease retention? If we press our trousers we want them to keep their press, permanently if possible. Here again wool is very well suited. The wool fiber has ability to hold a crease because of long range elasticity of the fiber. It can assume a "set" which maintains a strained position by intermolecular attractions such as ionic, polar, and van der Waal's forces. The "set" can be destroyed by introduction of water which neutralizes the forces of intermolecular attraction and allows the fiber to assume its original makeup.

Other fibers are also used for trousers. Ours could have been made from "Dacron", a synthetic which has even better wrinkle resistance and crease retention than wool. Here, however, other properties play a factor in determining use of fabrics, such as comfort and overall appearance. Acceptance of new fabrics and fibers by the public of course also determines the extent of use. The tendency now is to blend fibers, natural and synthetic, or synthetic and synthetic to get desired properties like wrinkle resistance and crease retention from a fiber with many desirable properties but which is poor in respect to wrinkle and creases.

Since we don't have to spend too much time pressing those trousers, we should have a little left to consider our heavy wool overcoat. Just what makes us want such a heavy coat, and why is the fiber that is used wool? Obviously, the coat is used only in cold weather and our basic need is warmth. The warmth is supplied in part by the insulation qualities of the fabric, especially due to the great thickness which gives us entrapped air which thermally insulates. The coat is heavy; it contains quite a lot of wool. Now another source of heat that is often overlooked comes very much into the picture.

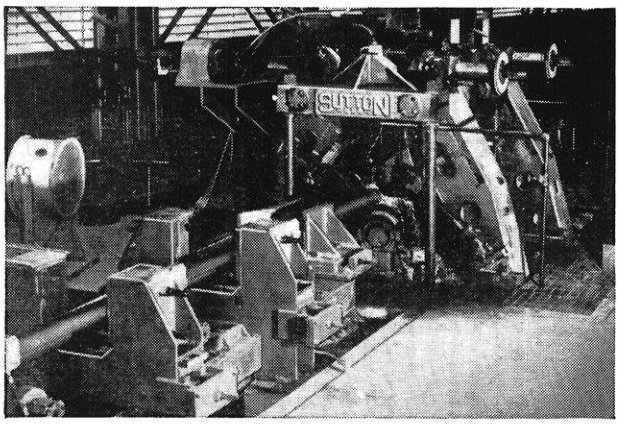
Wool has very high hygroscopicity, that is, wool will absorb water to a fairly high degree; its moisture regain is high. Absorption of water has already been discussed relative to a number of fibers as a property of our socks. Here, however, we use the moisture regain as a source of heat. When moisture condenses from a vapor to a liquid, the latent heat of vaporization (the heat needed to change water to water vapor) is given off to the surroundings. Because here we get the condensation within the coat, on the fibers themselves, the heat is utilized for body comfort.

During the winter the relative humidity indoors is always less than it is outdoors, sometimes the difference being as much as fifty percent. Because of this difference, when a heavy woolen coat is taken outdoors it can absorb ultimately almost 15% of its weight of water from the atmosphere. If the coat weighs roughly five pounds, the water gain will be about three quarters of a pound going from indoors to outdoors. The wool thus generates heat which will oppose a drop in the temperature of the air surrounding the skin. This heat is not liberated rapidly, but because the vapor pressure-temperature relationship of water can oppose temperature change inside the coat for several hours. Of course the limit to moisture absorption is reached

(Continued on page 64)

Another page for **YOUR BEARING NOTEBOOK**

How to make a tube straightener true



The engineers who designed this tube straightener were faced with the problem of building a machine that could withstand the constant stresses of handling 16½" O.D. tubes of standard thickness and yet provide the necessary precision. Their answer was to mount the two driven rolls and the five idler rolls on Timken® tapered roller bearings. Timken bearings take both radial and thrust loads in any combination and have the extra load-carrying capacity to keep the rolls in rigid alignment.

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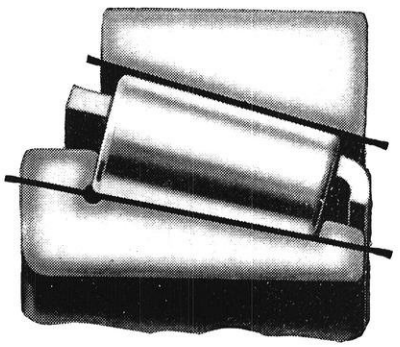
This cross-section of a Timken tapered roller bearing shows one reason why Timken bearings stand up under heavy load conditions. There is full line contact between the rollers and races. It's this full line contact that distributes the load over a wider area, giving Timken bearings their extra load-carrying capacity.



Want to learn more about bearings or job opportunities?

Many of the engineering problems you'll face after graduation will involve bearing applications. For help in learning more about bearings, write for the 270-page General Information Manual on Timken Bearings. And for information about the excellent job opportunities at the Timken Company write for a copy of "This Is Timken". The Timken Roller Bearing Company, Canton 6, O.

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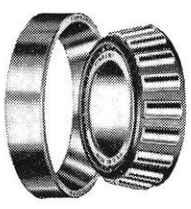


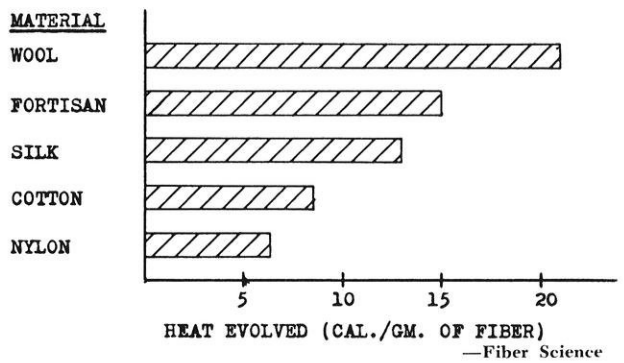
NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭
BEARING TAKES RADIAL ⊕ AND THRUST ⊣⊙⊢ LOADS OR ANY COMBINATION ✳

Wool

(Continued from page 62)

in time, but the body is accustomed to the cold by this time.

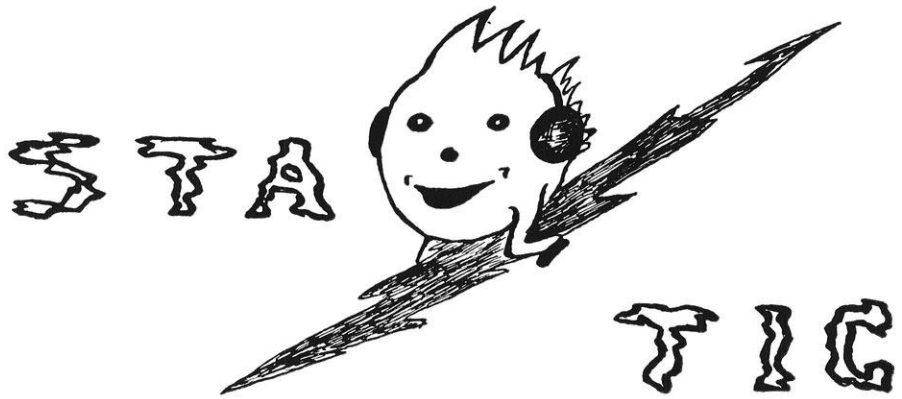
Our overcoat, therefore, makes use of a property of wool that makes wool outstanding. We can compare other fibers in regard to moisture absorption. Almost all the synthetics are hydrophobic; thus little heat of wetting is available from their fabrics. Other fibers do have fair heats of wetting and this is generally advantageous. A chart readily shows this characteristic of a number of textile fibers:



—Fiber Science

A pair of socks, trousers, and a heavy overcoat are common items of clothing that are made of wool. Wool is a natural fiber with a great many desirable properties; it has been used as clothing since very soon after

(Continued on page 68)



I. R. Drops, II

Breathe on this space
for one minute
If it turns brown,
BRUSH YOUR TEETH.

* * *

"Honey, did that kiss I gave you make you long for another?"

"It sure did, but he is out of town."

* * *

ME: "How did you puncture that tire?"
EE: "Ran over a milk bottle."
ME: "Didn't you see it."
EE: "No, the kid had it under his coat."

* * *

A ChE we know broke his arm fighting for a woman's honor. It seemed that she wanted to keep it.

* * *

Boy: "Teacher, I don't have an eraser."
Teacher: "Use the little girl's behind."

* * *

Some jokes we couldn't print we threw in the fire—and it just roared.

* * *

A prominent St. Paul automotive dealer met a charming young English girl who was visiting here in America for the first time. It seems he was demonstrating to her with a great deal of pride all the marvelous mechanical gadgets for which his new car is so notable, and she cooed with amazement and admiration as he raised and lowered the top merely by pressing a button on the dash board. Enthused by her appreciation he next caused the doors to open and close by similar automatic contrivance. Then he pressed a third button and the motor roared into action. Finally as they sped down the highway he flicked a gadget which opened the super air vents and the resulting gusts of wind whipped the startled English visitor's skirts up over her face. "I say, she gasped, struggling to lower her dress. "Don't you Americans ever do anything by hand?"

* * *

Don't be afraid to use your brain, its the little things that count.

The devil sends the blessed winds
To raise the skirts on high;
But God is just—he sends the dust
To blind the wicked eye!

* * *

A young Western Kansas lass was milking her cow down the road a piece when she saw a young man approaching. She called to her father, "Oh, father, there is a boy coming up the road."

Her father retorted with, "Get in the house."

She called back, "But he looks like one of them Engineers."

"Then take the damn cow in too," answered the old gentleman.

* * *

At the stroke of twelve the irate father stopped to the head of the stairs and shouted, "Young man, haven't you a self-starter?"

"Don't need one," answered the young suitor, "as long as there's a crank in the house."

* * *

A salesman making a week's stay in town bought some limburger cheese to eat in his room. When he got ready to leave, he still had part of it left. Not wanting to pack it or leave it lying open in the room, he went to the window-sill, carefully removed a plant from the pot, buried the cheese, and replaced the plant.

A few days later he got a telegram from the hotel: "O.K., we give up. Where in hell did you hide it?"

* * *

The Tridelt, excited about having been pinned by a fraternity man the night before, dressed hurriedly and was walking towards the cathedral when she came upon a group of male friends bound for Bascom Hall. Stopping in front of them, the girl proudly thrust out her chest and commanded happily, "Look!"

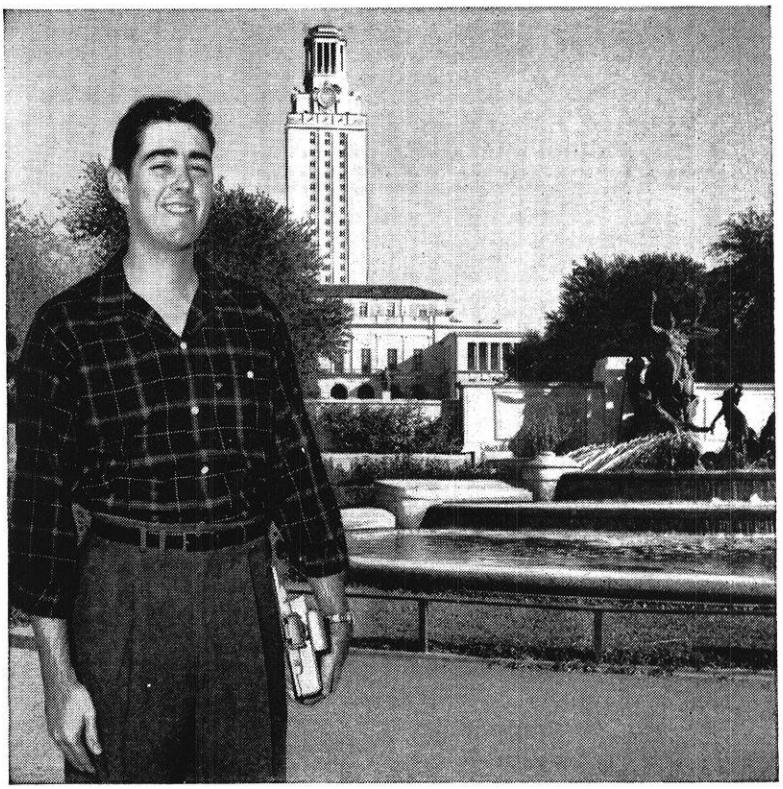
But in the excitement, she had forgotten to wear the pin.

* * *

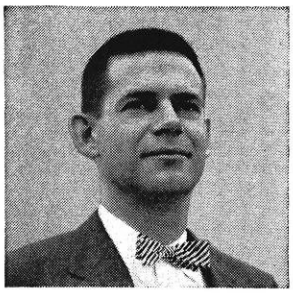
Today's greatest labor saver: Tomorrow.

Dave McGinnis asks:

Does Du Pont Have Summer Jobs for College Students?



C. David McGinnis will receive his B.S. degree in mechanical engineering from the University of Texas in June 1957. Currently, he's senior manager of men's intramural sports and a member of the Delta Upsilon and Phi Eta Sigma fraternities at Texas.



Ivar A. Lundgaard obtained two degrees, B.S. in Ch.E. and A.B. in economics, from the University of Rochester, and joined Du Pont's Photo Products plant at Parlin, N. J., in 1942. Later that year he became a shift supervisor and was promoted steadily thereafter. By 1951 he was Production Superintendent at Du Pont's Rochester plant. Today Ivar is Polyester Department Superintendent at Parlin, well able to speak about Du Pont employment policies out of his own experience and observation.

Ivar Lundgaard answers:

Yes, Dave, the Du Pont Company regularly employs students of science and engineering in its *Summer Technical Training Program*. The chief purpose is to provide good technical training under industrial conditions. And we learn about the students while they learn about us.

Students selected for the program after campus interviews include candidates for the B.S., M.S., and Ph.D. degrees. Assignments are related to their academic interests. Last summer 270 students from 93 institutions participated in the program. In this way, ties are often established which can lead to permanent employment after graduation.

In addition, many other students are hired directly by individual Company units to help out during vacation periods of our regular employees. For this "vacation relief work," assignments are likely to be varied; but these students also gain valuable insights into industrial practice, and many acquire experience related to their fields of study.

Altogether, about 750 college students, from both technical and nontechnical fields and at all levels of training, obtained experience with us during the summer of 1955. So you can readily see, Dave, that the Du Pont Company attaches a lot of importance to summer jobs for college students.

Wool

(Continued from page 64)

man started wearing cloth for apparel. Especially recently, in the last decade, new fabrics have been developed and synthetic fibers have been invented and produced on large scale. How has wool consumption been affected? Will wool be replaced in the future by man-made fibers?

The way things have turned out so far wool will probably never lose its place as a textile fiber. Synthetics and other natural fibers may well and already do have certain physical properties of wool beaten, but wool's collective properties will be hard to reach. The future points toward a relatively new field in textiles, the blending of different fibers to gain desired properties in a fabric. Our socks were a good example of this. But wool will be an integral part of many blends because our socks, trousers, and overcoats need those properties that wool can supply. **END**

A FEW YEARS AGO, HE WAS ON CAMPUS AT PURDUE UNIVERSITY, AND NOW . . .

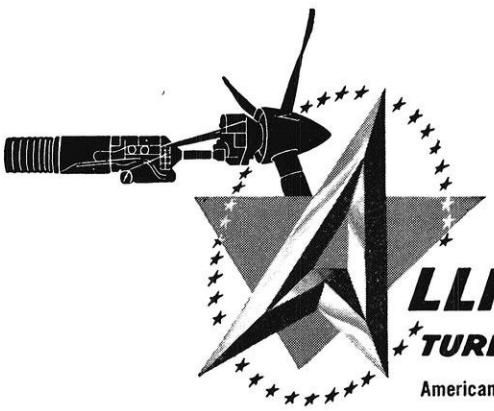
FLOYD D. (Doug) WALLACE, JR., above, is a senior project engineer at Allison.

He left Purdue in 1947 with his AE degree and came to Allison the same year. Presently, he is in charge of instrumentation and automatic process controls at Allison's new Research & Development test center.

With Allison now in the midst of a $75 million engineering expansion and building program, much of his time is spent in vendor contact work, studying and selecting equipment most adequate to do the job; observing, and helping with installation. He is shown above checking a control valve positioning amplifier on the instrument panel for controlling air pressures and temperatures of four electric motor-driven, axial flow compressors. This new facility is part of the new Research and Development test center, which—when completed—will enable testing of individual combustion components for turbo-prop and turbo-jet engines, compressor and turbine components.

Doug's work is "cut out" for him for some time to come, for only recently, Allison broke ground for the engineering building which is to be the center of expanded Research and Development facilities for advanced types of aircraft engines for commercial and military use.

With this long-range expansion program, Allison needs more engineering personnel, and opportunity for young graduate engineers is unlimited. Arrange now for an early interview with our representative on your campus, or write for information about the possibilities of YOUR engineering career at Allison: Personnel Dept., Engineering College Contact, Allison Division, General Motors Corporation, Indianapolis 6, Indiana.



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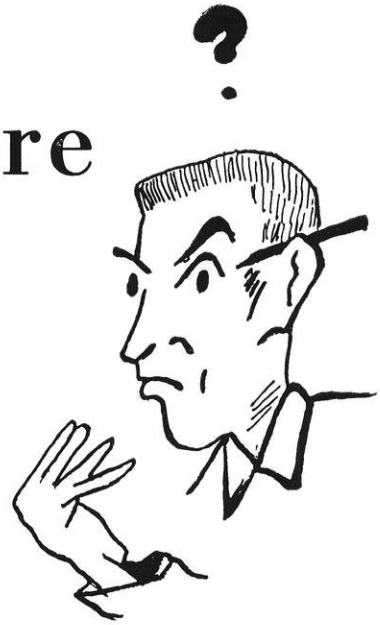


by Sneedly, bs'60

Have any of your friends' facial characteristics changed lately? One of Sneedly's fraternity brothers' appearance is being changed by a growth on the lower part of his face. This growth is not caused by anything serious like cancer; rather, it is caused by a sudden allergy to razor blades. Engineering beard-growing time is here for 1956 and as Sneedly is writing this feature many "stubble fields" are appearing all over campus. Sneedly thinks that some of these St. Pat's Day beard-growers must cheat for in a few instances they have more whiskers in two days than Sneedly has in two months.

* * * * *

Six pairs of twins belong to five families. The twins' names are Jim and Bob, Ruth and Naomi, Henry and Harold, Frank and Jean, Martha and Mary, and Charles and Leslie. Their parents are the Merritts, the Nelsons, the Stearns, the Stuarts, and Mrs. Morgan. For a change, Sneedly needs help in solving this problem. From the following clues tell which twins belong to which parents.

1. Frank and Jean, and Charles and Leslie are fraternal twins.
2. Mrs. Morgan has taught second grade since Mr. Morgan died 15 years ago. Among her pupils is Merritts' youngest boy and also Jim and Bob whom she cannot tell apart.
3. Ruth and Mary are sisters.
4. The Stearn twins date the Stuart twins for movies and dances. The twins are the Stearns' only children.
5. One of the Merritt twins looks like an older brother and the other one like a younger sister.
6. Frank is annoyed by all the attention his new baby brother receives.
7. Martha wears a gold bracelet and Mary wears a silver one to distinguish them.
8. Henry and Harold are Cub Scouts.

* * * * *

In a recent campus misdemeanor 36 persons were involved. The dean wanted to punish only 6 of these 36 for they were the ringleaders. He wanted to punish these six and free the rest if it could be done with an appearance of impartiality. He arranged all 36 in a circle and punished every tenth. In what places did he put the wanted six?

A man was fatally injured in an automobile accident on his way to the hospital where his wife was about to give birth to a baby. Before he dies he makes a will which stipulates that his estate is to be divided in the folowing manner:

If the child is a boy, he is to receive two thirds of the estate and the widow shall receive one third.

If the child is a girl, she will receive one third of the estate and the widow shall receive two thirds.

Contrary as most women are and just to complicate matters, the wife gave birth to twins shortly after the man died. One twin a boy and the other a girl. How should the estate now be divided among the widow and her two children in order to carry out the provisions of the will?

Twins certainly are complicating this feature this month. Sneedly promises not to let it happen again. See you next month.

* * * * *

All other things being equal Sneedly wants to know which will cause the greatest racket, two gossiping girls at a distance of 4 feet or three gossiping girls at a distance of 6 feet?

* * * * *

Sneedly's answers to last month's problems are:

The lot has an area of zero for it is a straight line of no width.

The number of coconuts in the original pile is the solution of integers in the equation:

$$512x - 15625y = 4202$$

Integral values are given by the equations:

$$x = 3121 + 15625t$$

and

$$y = 102 + 512t$$

where $t = 0, 1, 2, 3$.

A perfect score of 100 could be obtained by placing 2 shots in 16 and 4 shots in 17. **END**

which do you want?

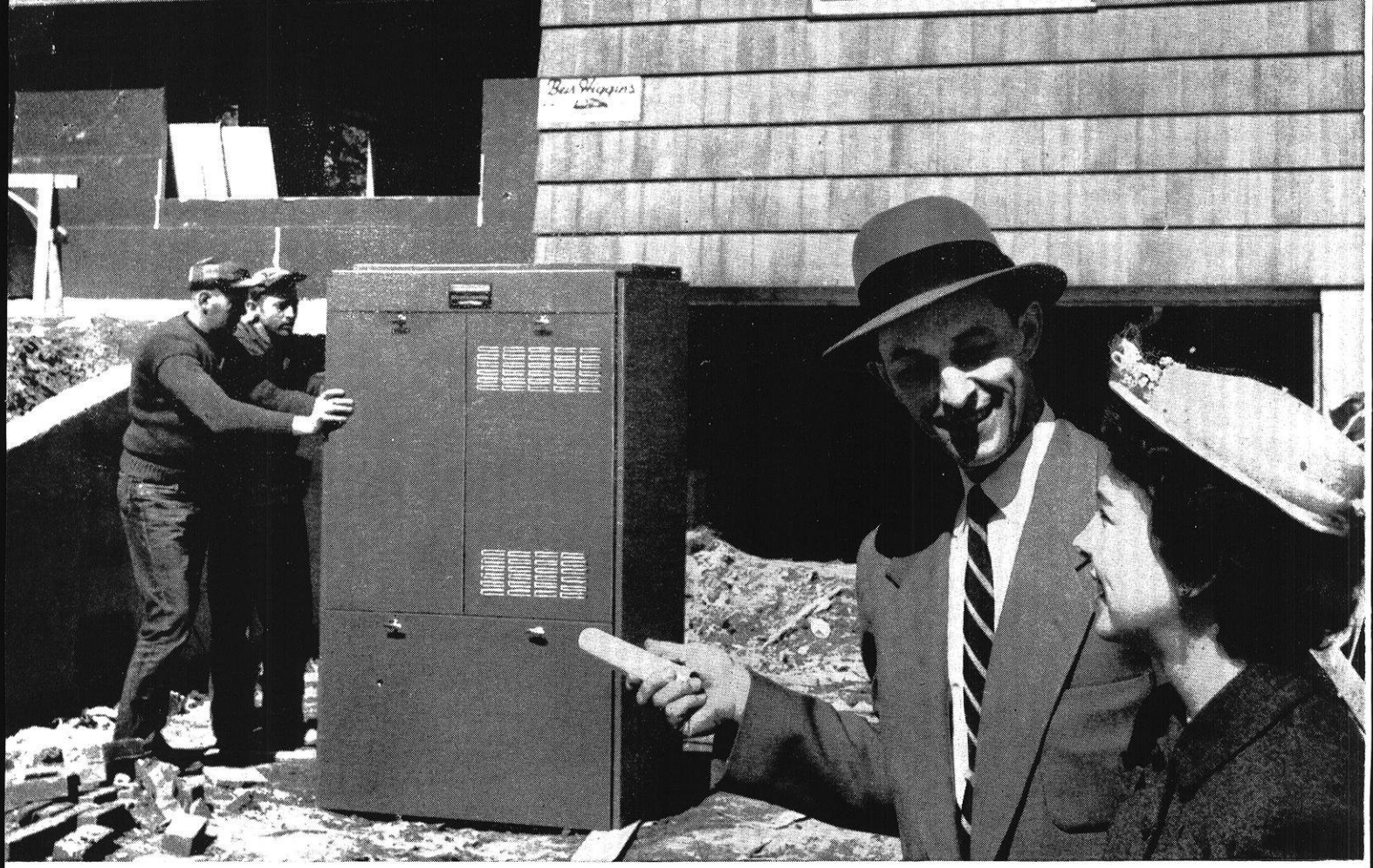
Money or the moon?

It was reaching for the moon which resulted in the development at Martin of one of the most dynamic engineering team operations in the whole new world of flight systems development.

Most of the people on that team are young and moving ahead fast. Do *you* know what's happening today at Martin... and what tomorrow may hold for you here in the fields of aircraft, missiles, rocketry, nuclear power and space vehicle development?

Contact your placement officer or J. M. Hollyday, The Martin Company, Baltimore 3, Maryland.

MARTIN
BALTIMORE



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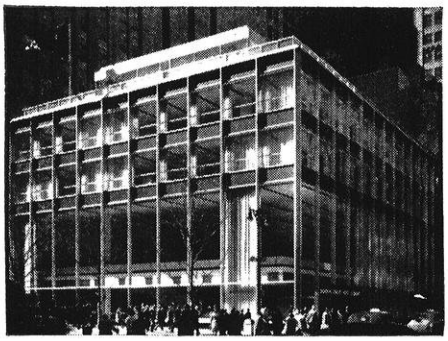

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