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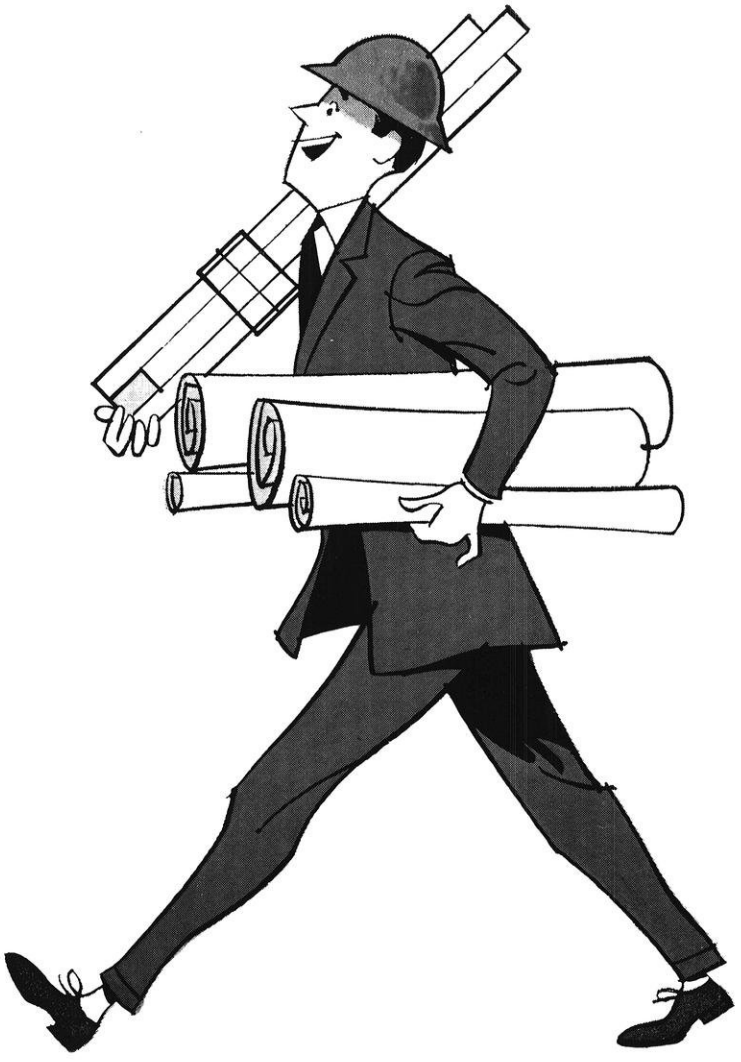
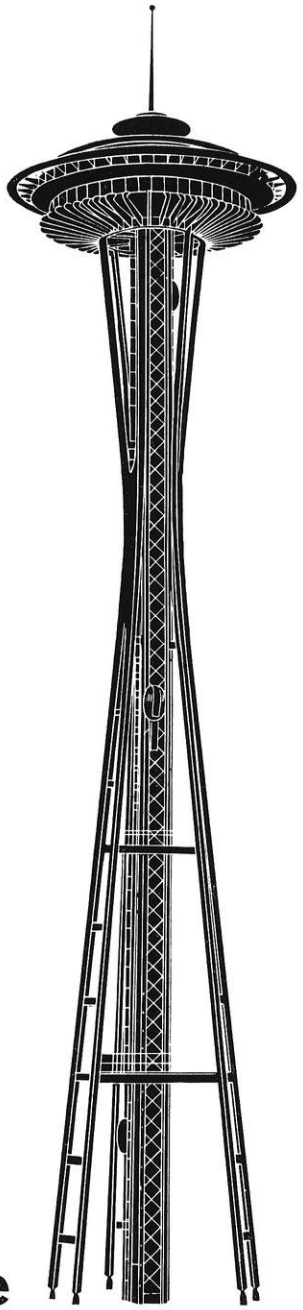
MAY, 1962 • 25 CENTS
MEMBER E. C. M. A.

THE WISCONSIN
ENGINEER



GOOD LUCK GRADUATES



revolution in space

This amazing structure symbolizes the outer space theme for this year's Century 21 International Exposition in Seattle, Washington. Called the Space Needle, it soars 600 feet into the air on three steel legs, tapers to a slim waist at the 373-ft. mark, then flares out slightly to the 500-ft. level, and is crowned by a mezzanine, observation deck, and a 260-seat restaurant that *revolves* slowly (one complete revolution an hour) while patrons enjoy their meals.

The Space Needle is a combination of sheer audacity and imagination with 3,500 tons of steel. Steel was chosen because it would be faster to erect, stronger per unit area, quickly available. A relatively new type of structural carbon steel called A36 was used because its greater strength (about 10%) permits higher design stresses, at the same time maintaining factors of safety, and because it could be easily welded. This is an example of the exciting materials and challenging projects engineers will find at United States Steel.

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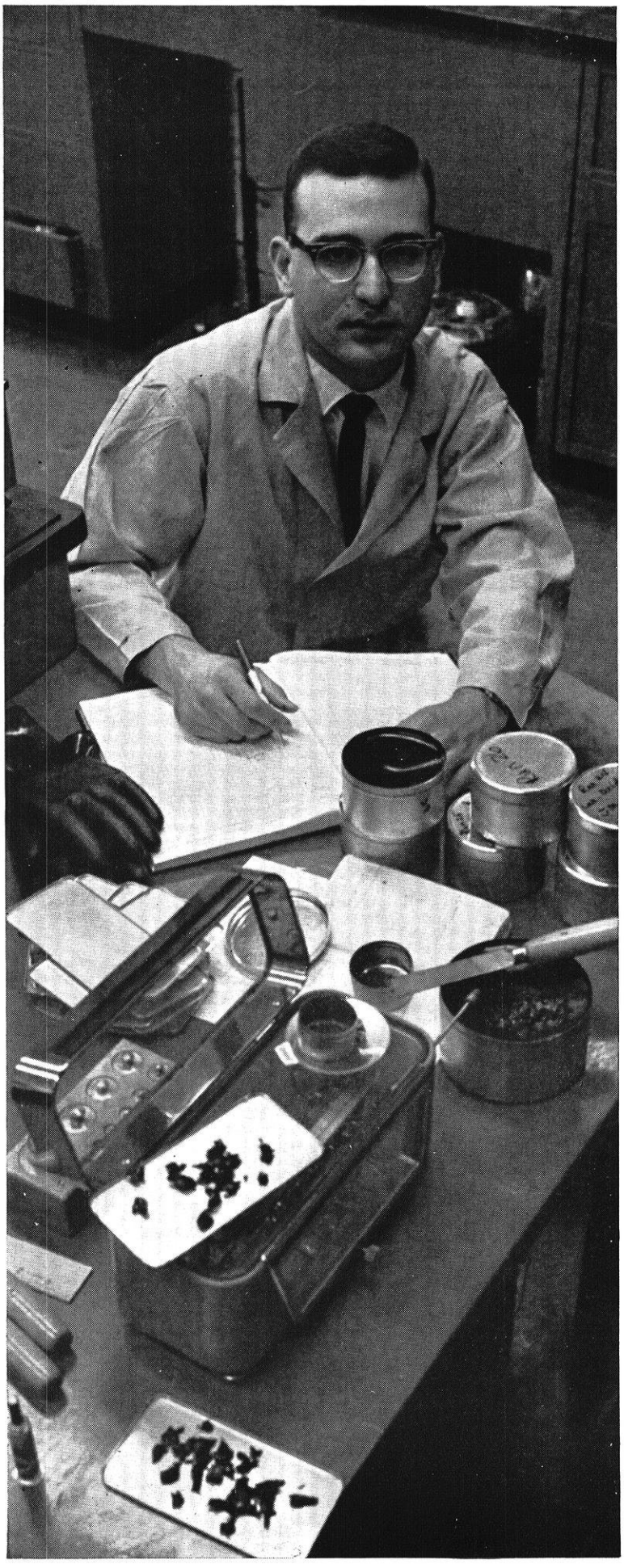

I chose a career, not a job!

by Pete Vossos

"I found a satisfying job right from the beginning —and more important, American Oil is diversified enough to offer varied opportunities for the future."

Peter Vossos earned his Master of Science degree at Iowa State, '58. As a physical chemist, Pete's immediate project is studying fundamental properties of asphalts with the objective of improving their performance in roofing and industrial applications. About his 2½ years at American Oil, Pete adds, "This is a company that's big enough and dynamic enough to be doing important work, but not so mammoth that you get lost in the crowd."

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VOLUME 66, NUMBER 8 MAY, 1962

Substance is sorely short in this issue. Why not include some readability material in addition such as alumni profiles by prominent alumni, letters to the editor, The Wisconsin Engineer of 25 years ago.

THE WISCONSIN ENGINEER

The Student Engineer's Magazine Founded in 1896

Why not run articles on the 1896 issues, etc.?

U. of Kentucky did a delightful spread on their Class of 1912 by running letters from surviving members of the Class.

ARTICLES

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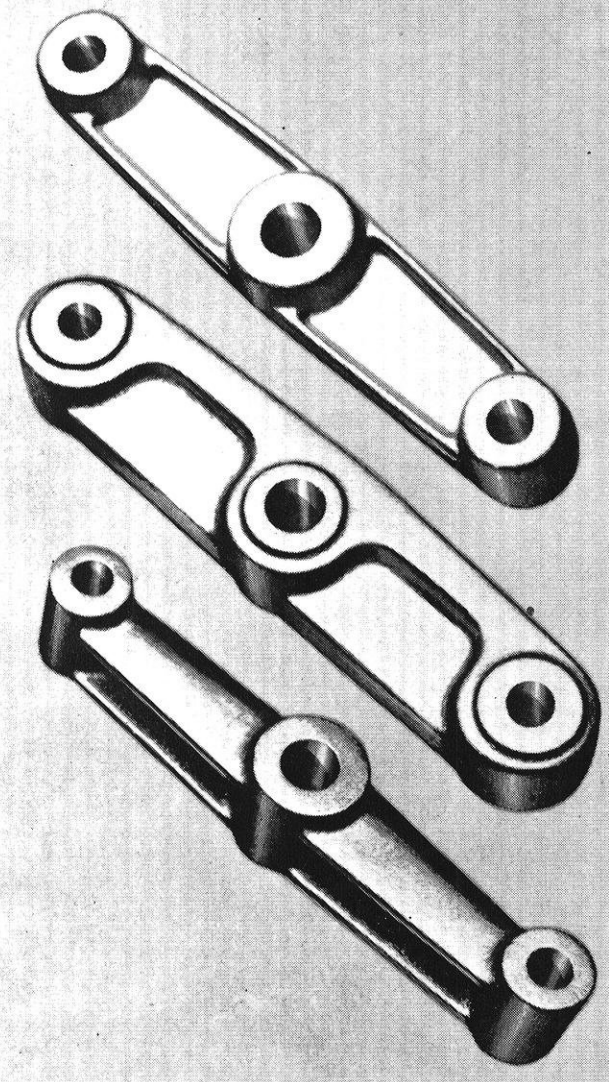
Snappy cover. Zest, zing to this cover. Clean and sweeping in appearance.

Combine Modern Design With Malleable Iron For Lighter, Stronger Parts

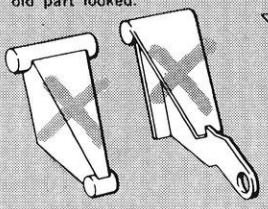


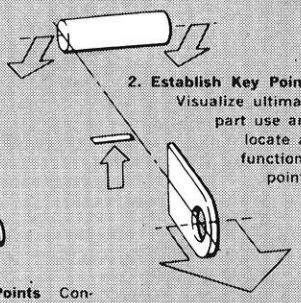
Maximum utilization of different metals is classically illustrated by these three designs for an equalizer bar for tandem trailer springs. This part evolved through several design changes as the user sought the best combination of low cost, high strength, minimum weight. The two parts at the top performed satisfactorily and were well designed for their respective production methods. A Malleable castings designer, taking advantage of the high tensile strength of pearlitic Malleable, originated the "U" section design, shown at the bottom, which results in least weight, lowest cost and greatest strength.

Six Steps In Designing Minimum Weight Malleable Castings

By following these basic steps, designers can take advantage of Malleable's high strength and excellent thin-section castability to produce rugged, lightweight Malleable castings. Early consultation with your Malleable producer can be of real assistance.

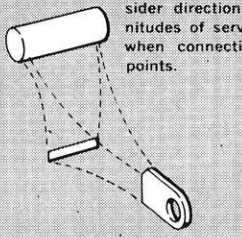
1. Start Fresh Forget how the old part looked.

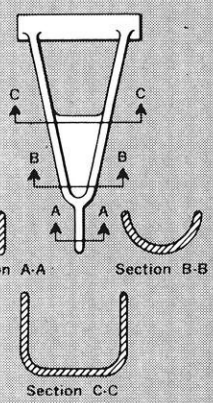


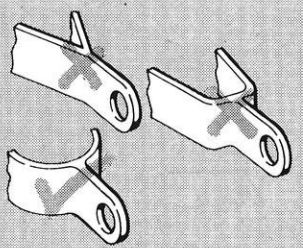


2. Establish Key Points Visualize ultimate part use and locate all functional points.

3. Connect Key Points Consider directions and magnitudes of service stresses when connecting terminal points.

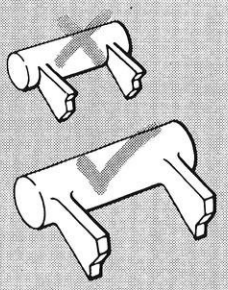




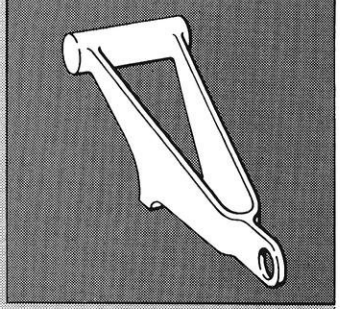


4. Check Critical Stress Areas Your Malleable supplier can assist with design suggestions and experimental stress analysis techniques.

5. Make Sections Uniform Sections should be designed to promote directional solidification toward the feeding head. This insures proper cooling and heat transfer.



6. Reduce High Stress Points Add ribs, corrugations, fillets and radii as needed.



Following these steps results in a good final design.

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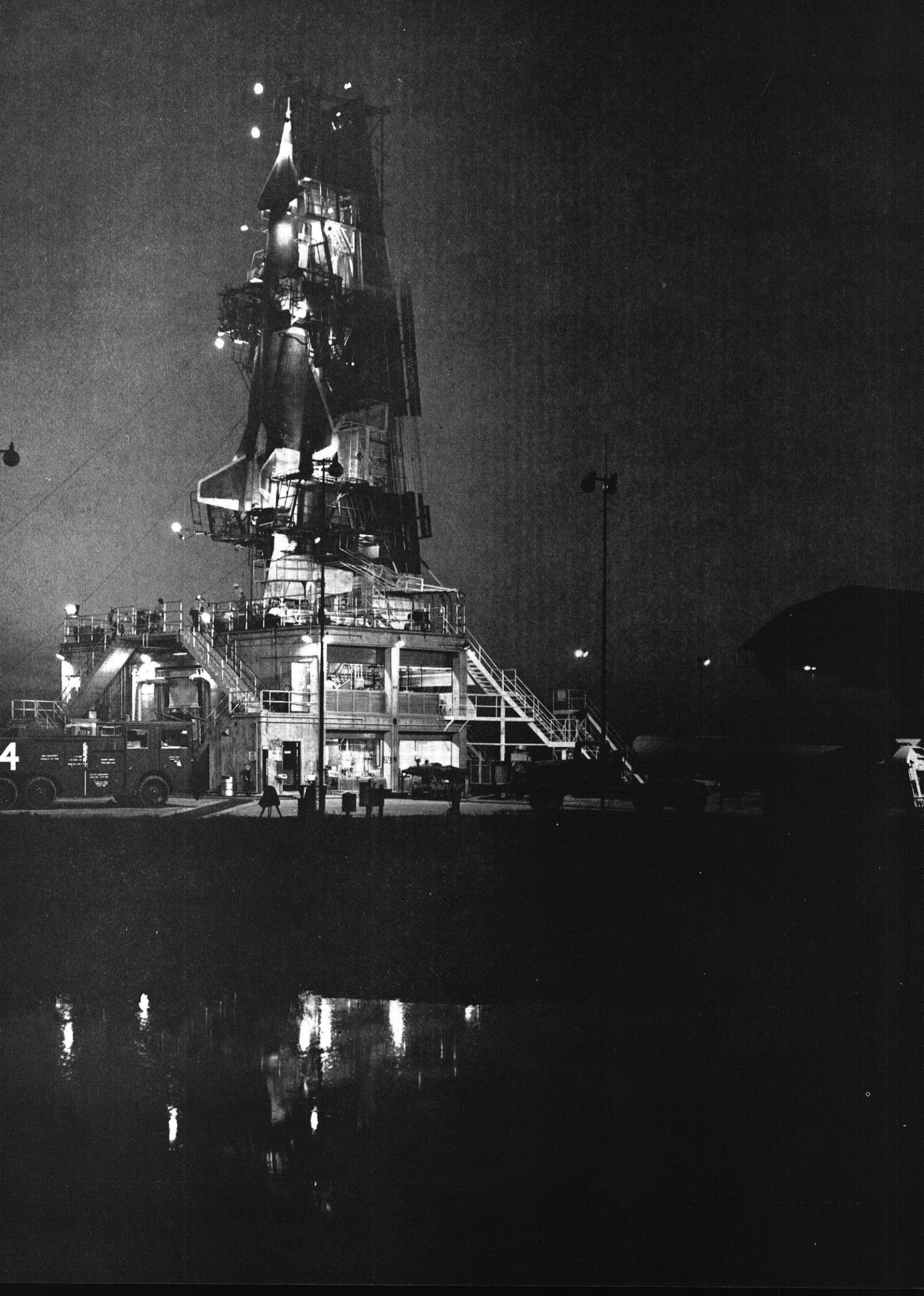


Rambling With The Editor

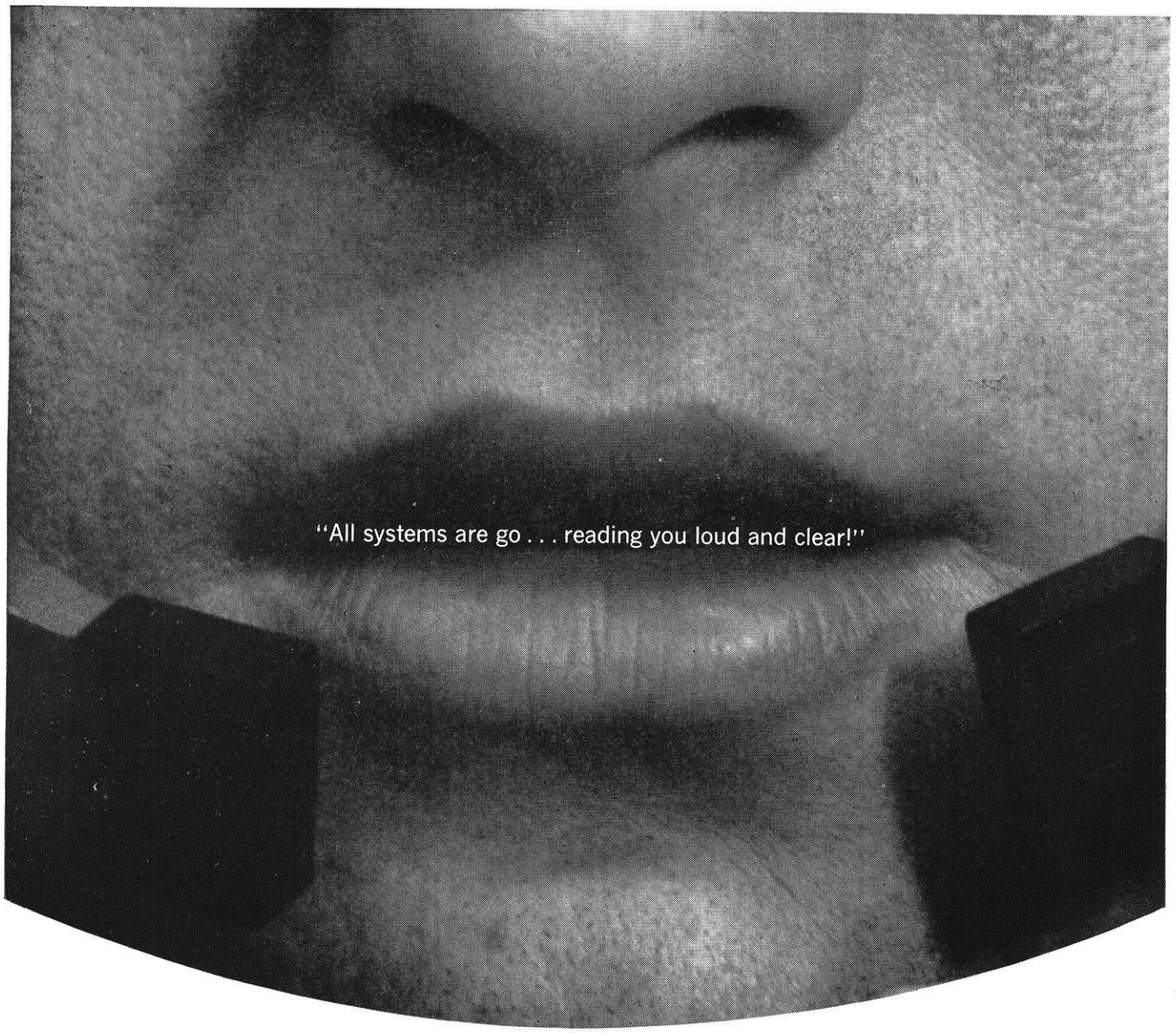
Good make-up.
Need to put more punch in your rambling.
Point out the splendid experience to be gained by working on an engineering publication.

It is traditional for the new editor to publish this issue so he can become familiar with the work involved in organizing and getting the magazine printed. With the past editor serving as guide, any problems that require experience can be solved. However your suggestions concerning contents of the magazine will enable us to do a better job during the next year. What would you like to see in the WISCONSIN ENGINEER, more or less articles, more puzzles, more jokes, more campus news, or what? If you have any ideas or criticism (good or bad) about the magazine, send them to me or drop them in our mailbox in the lobby of the Mechanical Engineering Building.

Since most of the staff will be graduating this year, we need Engineering students to work on the magazine next year. This is a great opportunity to get some experience in editing and finding out just how a magazine is published. No journalism or other previous magazine experience is necessary. The work is easy and will take very little of your time. If you are interested in working on the editorial staff, please leave your name and telephone number in the WISCONSIN ENGINEER mailbox.

D. R. C.

North American Aviation's XSM-64 NAVAHO guided missile, developed by the company's Missile Division in Downey, California, was used to gather high speed high altitude data for SAC's newest weapon, the B-70 Mach 3 intercontinental bomber. This program was known as project RISE (Research in Supersonic Environment).



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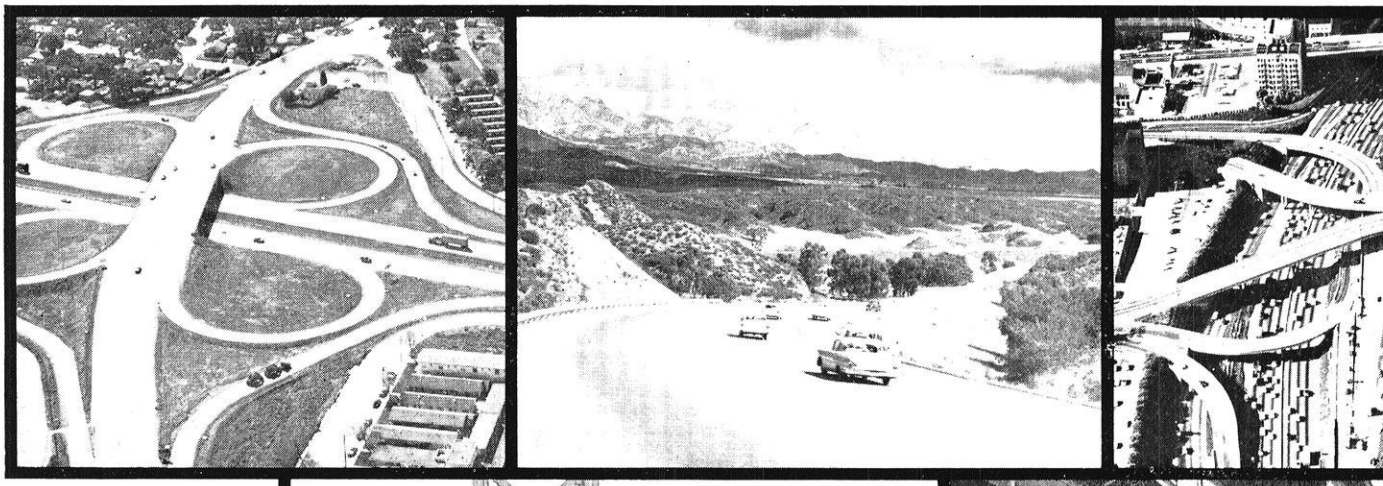

highways

bridges

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sanitary

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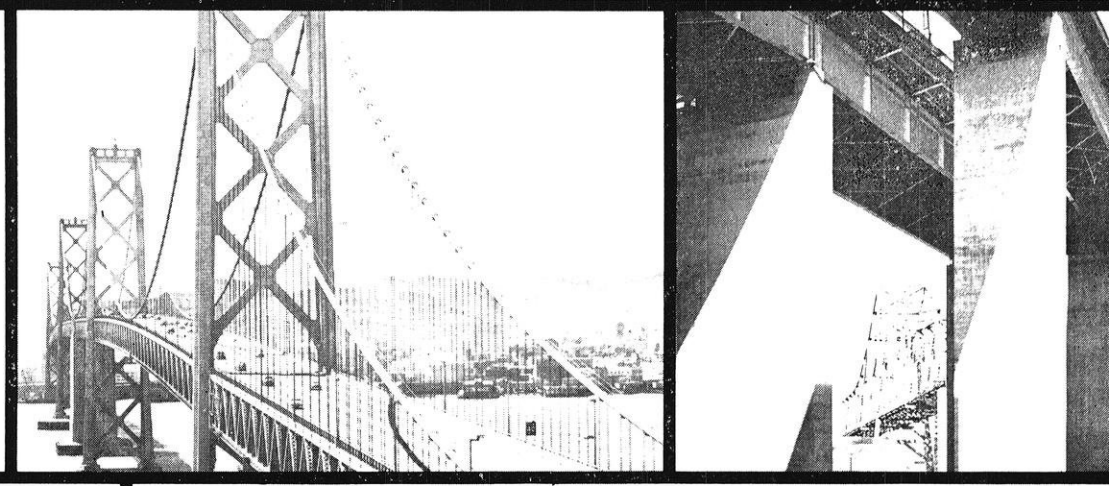

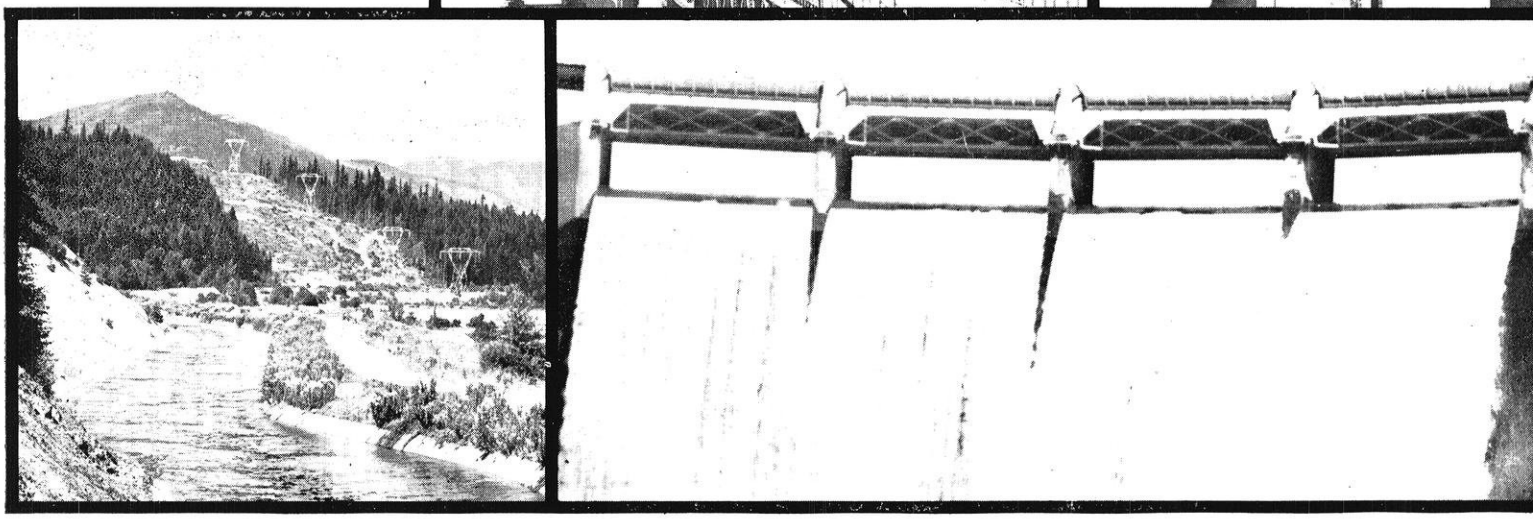

CIVIL ENGINEERING JUNIORS: A few months from now, when you return to school as a Senior, we will have an announcement for you in this space which could launch you on your way to rapid advancement. It will tell you when we will be on your campus to talk with you about well-paying jobs in California's long-range state projects in highway, bridge, structural, sanitary, and hydraulic engineering. Watch for this announcement: CHALLENGE IN CALIFORNIA!

Nuclear Power Plants For Ships

by Wendell O. Seif

Identify Mr. Seif.

Good lead paragraph

THE demands of the nuclear age do not by-pass the 20-knot surface ship of today's Navy. The Naval ship has only one purpose, the defense of the country. It is doubtful whether the surface fleet can meet this purpose. Since World War II, many improvements have been made in the ship's weapons, such as long range sonar, automatic rapid-fire guns, radar fire control, guided missiles, and homing torpedoes. However, no significant advancements have been made in the power plant to supplement these weapons. Ninety-nine per cent of the fleet still operates on World War II design power plants.

The nuclear power plant has demonstrated its potential on board the submarine. Construction of a nuclear cruiser (Los Angeles) and carrier has been authorized and started. It is certain, however, the new nuclear ship construction will not provide a nuclear fleet for many years. At present new ship construction is almost at a standstill due to lack of money. To bring our fleet up to date, the oil burning boilers (conventional) could be replaced by nuclear reactors.

I. APPLICATION OF NUCLEAR POWER PLANT

Type and Number

All ships of the Navy (destroyers and larger) have essentially the same engineering design. They differ only in size of the power plant and arrangement of facilities. The alteration of the engineering plant is therefore basically the same problem in any ship, differing only in scale of operation.

The present challenge to the U.S. Navy is the estimated Russian fleet of 500 submarines. The Navy's main defense against this threat is the destroyer. The modern naval destroyer is no more than a World War II destroyer equipped with present day weapons.

Installation of a nuclear reactor in the forward fireroom of a DD700 to DD900 class destroyer would provide a ship with a power plant to match its weapons. Fleet operations would be affected greatly if fifty to one hundred destroyers could be converted.

Logistics

With a nuclear powered destroyer fleet, the science and economy of logistics would be greatly altered.

The destroyer carries fuel for about four days operation. Normally they are refueled every two days to keep the fuel tanks above one-half full. This is done for two reasons: First, the ship is prepared for any emergency operation which may occur; Second, the ship has greater stability, less pitch and roll. Stability is absolutely essential in rough weather. A few years ago, two destroyers were sunk by rough weather because they were low on fuel. Also, an increase in pitch and roll will decrease the accuracy of the gunfire control system. The Oilers (ships which travel with the fleet for refueling) have an operational speed under 20 knots. The fast carrier task force whose destroyers depend upon fuel from the Oilers is greatly hindered by having to proceed at the speed of the Oiler. If the Oiler does not accompany the task force, the fighting force risks having to retire from action to refuel. Many battles in World War II ended as they did because of refueling operations. With nuclear-powered destroyers, refueling problems would be ended. The slow Oilers could proceed at their speed to refuel non-combatant ships or large combatant ships which can operate weeks without refueling. A major portion of the refueling fleet could be retired from service. Their operational cost could be subtracted from the expense of installing reactors in the destroyers. The destroyers could flood fuel tanks with water to provide maximum stability at *all times*. Thus, the effect of refueling operations on combat effectiveness could be removed completely.

Armament and Anti-Submarine Capabilities

The real advantage of the nuclear-powered destroyer lies in its

I must state this article is well organized and developed. Perhaps some of the subheading becomes a little too excessive.

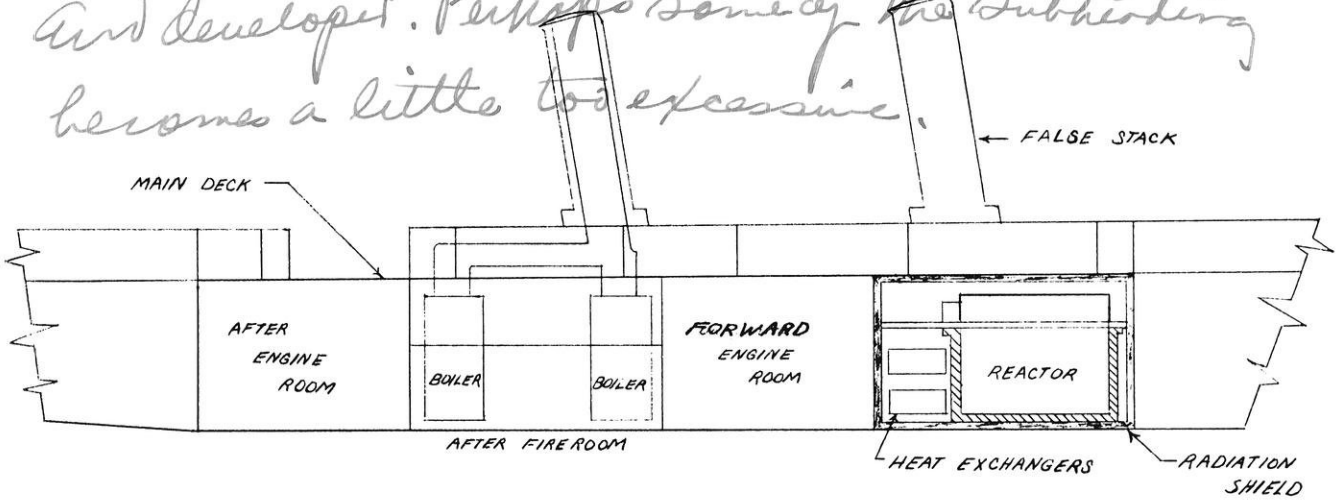

Figure 1

ability to fight the submarine. Protection of the aircraft carrier from submarine attack requires destroyers that can travel at over thirty knots for long periods during launching of aircraft and over twenty knots the remainder of the time. Only the nuclear-powered destroyer can meet such requirements.

Once a submarine contact has been made and the attack has begun, the destroyer's power plant must perform even more highly. A submarine can start faster, stop faster, and turn sharper than a destroyer. The nuclear submarine can travel faster than the destroyer, even when submerged. To make a successful attack, the destroyer must be able to go from full power ahead to full power astern in a few seconds notice. As will be explained later under "Flexibility of the Nuclear Plant," the boiler of the conventional destroyer cannot handle this requirement. The nuclear-powered plant would provide the needed maneuverability.

II. INSTALLATION PROCESS AND MECHANICS OF THE NUCLEAR POWER PLANT

Figure 1 shows the location of the power facilities aboard a destroyer. The reactor is shown in place of the conventional ship's forward fire room. This fire room, before the reactor was installed, was identical to the afterfire room.

Boiler Removal

Not shown in Figure 1 is a section of main deck (steel) about six feet wide, measured from superstructure to the hull. This width of deck runs the entire length of the ship. A ten-foot long section directly over the foreward fire room could be removed with cutting torches. The two boilers could be disassembled and removed through this opening.

Reactor Installation

Through this same opening the materials for the construction of the 21-foot diameter sodium-cooled graphite reactor could be brought in. The entire reactor could be constructed on an iron shelf which could be attached to the hull.

A radiation wall encloses the entire reactor room, plus separating the evaporators, superheaters, and reactor controls from the reactor and primary sodium loop. Radiation walls are simply steel shells about four inches thick.

Connection of Reactor to Present Power Facilities

The M-type boiler of the destroyer (the two remaining in the afterfire room) produces steam at 615 psig, 850° F. The sodium-cooled reactor produces steam at 615 psig and 825° F. thus almost identical conditions. Thus the steam from the reactor superheat can be delivered directly to the turbine. The reactor alone can drive the ship, the boiler alone can drive the ship in case of reactor casualty, or the two—the reactor and boiler pair—can be cross-connected to drive the ship together. The absence of two boilers does not appreciably affect the ship's operation. A normal destroyer cruises on only two boilers at a maximum speed of about 28 knots. With four boilers on the line, the maximum speed is increased to about 33 knots, with a great drop in efficiency.

Thus the installation of the nuclear reactor does not necessitate any alteration of any machinery in the other engineering spaces. Saturated steam can be picked off the steam drum for uses in gland-sealing, water distrillation, and many other shipboard uses. Yet, the advantages of the reactor are even more pronounced than indicated thus far. Examination of performance will show the reactor's potential.

III. OPERATIONAL CHARACTERISTICS OF THE NUCLEAR INSTALLATION

Shaft Output

The M-type boiler of the conventional destroyer produces 250,000 lbs. per hour of steam, with an enthalpy of 1434 BTU per pound, which is approximately 105,000 KW. The reactor has a heat producing capacity of 238 MW, which is 238,000 KW. This does not mean that the destroyer will have a greater power output under nuclear power. The turbines are designed for a maximum steam rate, above which the turbine efficiency is greatly decreased. Also limiting the shaft output is the condition of the engineering equipment. The bulk of the destroyers in the United States Navy are over twelve years old. In this time, the shafting has

become slightly out of balance. Heavy vibration will occur at a rpm of the shaft required for speeds above 35 knots. Continued operation at this speed would be detrimental to the entire ship, not only to the engineering equipment.

The inherent advantage, therefore, does not lie in maximum shaft output, but in two other qualities: duration of operation at high output, and flexibility of output.

Flexibility of Output

Rapid changes in firing rates due to rapid changes in turbine steam requirements have adverse effects upon the conventional boiler. These changes in heat inside the boiler warp the steel boiler side plates enough to necessitate boiler replacement. The nuclear reactor has no steel plates to warp. It is the quick starts and stops which add to the capability of the destroyer in anti-submarine warfare. In the conventional boiler, quick stops will blow safety valves on the steam drum and superheat tubes. The steam rate of the boiler is not as flexible as the throttles on the turbine. The steam generation of the nuclear reactor can provide excellent flexibility. For quick stops the feed water flow can be slowed or halted entirely. The sodium will continue to circulate. There is no danger of overheated and ruptured tubes, since the highest temperature in the system is 925° F. The reactor can be controlled instantaneously for heat output by the automatically operated control rods. (Control rods are rods which control the level of reaction in the reactor by their depth in the reacting material.) For quick starts, the feed water flow could be increased. Surge tanks in the primary sodium loop would automatically put more sodium into the system for greater heat transfer. The steam producing system could keep step with the turbine throttle for greatest ship performance.

Duration of Operation

The nuclear destroyer would be able to operate at high output for unlimited periods of time. The Nautilus, the first nuclear-powered vessel, traveled 62,562 miles on one nuclear fuel load. No longer would the strategic value of the destroyer be limited by the amount of fuel that could be stored in its hull.

Maintenance of Nuclear Power Plant

Limitations of the nuclear power plant are apparent when considering maintenance. The sodium loops must remain absolutely leakproof. Nine tenths of the power plant's maintenance is concerned with keeping this loop tightly sealed.

Results of faulty sealing in sodium loops:

1. Liquid sodium will react with water to form explosive hydrogen. If sodium were to leak into the evaporators and superheaters, or even come in contact with water on the ship's deck, the entire ship would be endangered.

2. Sodium will react with oxygen to become very corrosive to steel piping. The Navy's second nuclear-powered submarine, the USS Seawolf, developed leaks in the steam generators and superheaters due to the corrosive nature of sodium. To remedy this problem, the primary and secondary loops of the destroyer's sodium system could be pressurized with helium. All gaps in the sodium line would not contain oxygen, but the non-reactant helium. The high cost of helium would further necessitate the absolute leak-proof lines.

Maintenance constitutes a high cost in the operation of the nuclear plant.

Economy of Operation

"Nuclear power plants are more costly to design, build, operate, maintain, and repair than conventional power plants. With the present state of nuclear power plant technology, it is not possible to predict the ultimate economic feasibility of nuclear-power commercial ships," said Admiral Rickover. The fact that the Navy is building *new* atomic ships shows the requirement of the military for performance, not cost. However, there are points of economy to consider both in favor and against the nuclear power plant. First, let me concede the fact that present nuclear power cannot compete economically with conventional power. The first fuel for the Nautilus cost fifty times that for an oil-fired ship. Also, training of personnel to handle the nuclear power plant far exceeds that required for operation of conventional plants. Thus, at present, nuclear power costs are extremely high as shown by the Nautilus, which is continuing to produce 10,000 HP at ten times the cost of prevailing industrial power.

Now, let us consider these points:

1. The annual production of oil in 1949 in North America was 285,000,000 tons. The possible duration of oil at this rate (from North America) is fifteen years. Atomic power will ensure the United States power for an unlimited time and from internal resources.

2. Nuclear power costs are expected to drop one-third in five years.

Consider the costs of an industrial plant:

TABLE 1—POWER COSTS—SODIUM GRAPHITE NUCLEAR POWER PLANT

	Now	*Future*
Fuel	Uranium	Thorium
Fuel Temperature limit °F	1200	2000
Steam conditions Psig/°F	800/825	145/1000
Electrical Capacity K.W.	75,000	125,000
Capital costs $/KW		
Reactor system	135	80
Cooling system	45	20
Power Costs Mills/KW-hr.		
Capital costs	3.5	2.0
Fuel costs	2.0–3.2	1.0–2.0
Operating & Maintenance	2.0	1.0
	8.0	4.5

The totals of Table 1 show total industrial nuclear power costs to be presently greater than 8.0 mills per KW-hr. Present coal burning industrial plants are producing power at 3.5 mills per KW-hr. In the South, power costs go as low as 1 mill per KW-hr. The nuclear power plant may in the future compete with the coal and oil-burning plants, since coal and oil prices are going up, while atomic fuel prices are decreasing. Table 1 shows the expected nuclear power costs to be about 4.5 mills per KW-hr. For the Navy, any decrease in nuclear power cost is a long step toward nuclear practicability.

3. With a portion of the fleet under nuclear power, consider the money saved in the following:

a. Less Oilers at sea.

b. Since 1 lb. of nuclear fuel is equal to about 2,000,000 lbs. of fuel oil, the Navy will be able to store replacement fuel for all of the Navy's nuclear-powered vessels in a few buildings. Nuclear fuel is not radioactive and it does not deteriorate.

Safety of the Nuclear Reactor

Although personnel safety is a factor to consider in operating a steab power plant, of more urgent concern is positive protection from nuclear radiation.

The radiation wall shown in Figures 1 would reduce the radiation to a level such that, during a cruise lasting the life of the reactor, the average crew member would receive less radiation than he would during a lifetime from cosmic rays, routine and dental X-rays, television screens, etc. It is unfortunate that sodium becomes radio-active. This necessitates having two sodium loops. The primary loop is radio-active, while the secondary loop is not. The two are separated by a radiation wall. To restrict the spread of radio-activity in the event of a dual casualty (i.e., rupture of the primary coolant system and subsequent melting of the nuclear core with attendant release of fission products), the nuclear part of the plant is completely inside a steel container (radiation wall, Figure 1). This container is large enough and strong enough to withstand the pressure that would result from an extremely large rupture of the primary coolant system.

The radiation-monitoring system for a nuclear destroyer would be designed to ensure proper radiation levels for personnel protection. The system would include air-particle detectors, gamma detectors, boiler-leak detectors, and a discharge system activity indicator. The air detectors would sample the radio activity of the air in the shielded area and in adjacent compartments. Gamma detectors would be installed in various sections of the ship. The boiler-leak detectors would warn of a ruptured boiler tube in the steam generator which would allow radio-active coolant to enter the unshielded steam system. The discharge system activity indicators would ensure that radioactive water is not discharged at a dock or elsewhere where it would produce hazardous conditions.

In general, the nuclear power plant is considered as safe, if not safer than conventional power plants.

As a final consideration, let me discuss the costs involved in the installation process.

IV. COSTS OF REACTOR AND INSTALLATION PROCESS

The initial investment for the reactor and installation constitutes an amount almost equal to the value of the remaining portion of the ship. Actual costs are not available, but relative values and a few installation procedures can be cited.

Reactor Costs

Reactor costs in no way compare with boiler costs. A replacement of the Nautilus' engine would cost $18,000,000 compared with $2,500,000 for equal horsepower oil-fired unit. The Seawolf cost the Navy $57,000,000; $25,000,000 for the power plant and $32,000,000 for the ship. A World War II submarine would cost about one-half as much as the Seawolf. Thus, one could expect that the reactor for a nuclear destroyer would cost about the original cost of the ship.

Installation Costs

Once every two years a destroyer goes into the yard for major overhaul. This time would be opportune for installation of the nuclear reactor. Mayor overhaul of the forward fireroom would be substituted by reactor installation. Work could be performed by yard personnel. Costs of the installation would not be extremely high, probably less than two per cent of the cost of the reactor.

CONCLUSIONS

That atomic reactors can be substituted for boiler-buring conventional fuels was recognized as soon as it became clear that self-sustaining chain reactions could be brought about. The advantages of nuclear-powered ships have been demonstrated by the United States Navy's nuclear submarine fleet. I have attempted to show in brief how these advantages of nuclear power could be had in the surface fleet as half the cost of new ships plus the full cost of retiring an old ship. Certainly this study is not complete enough to be a basis for ship construction.

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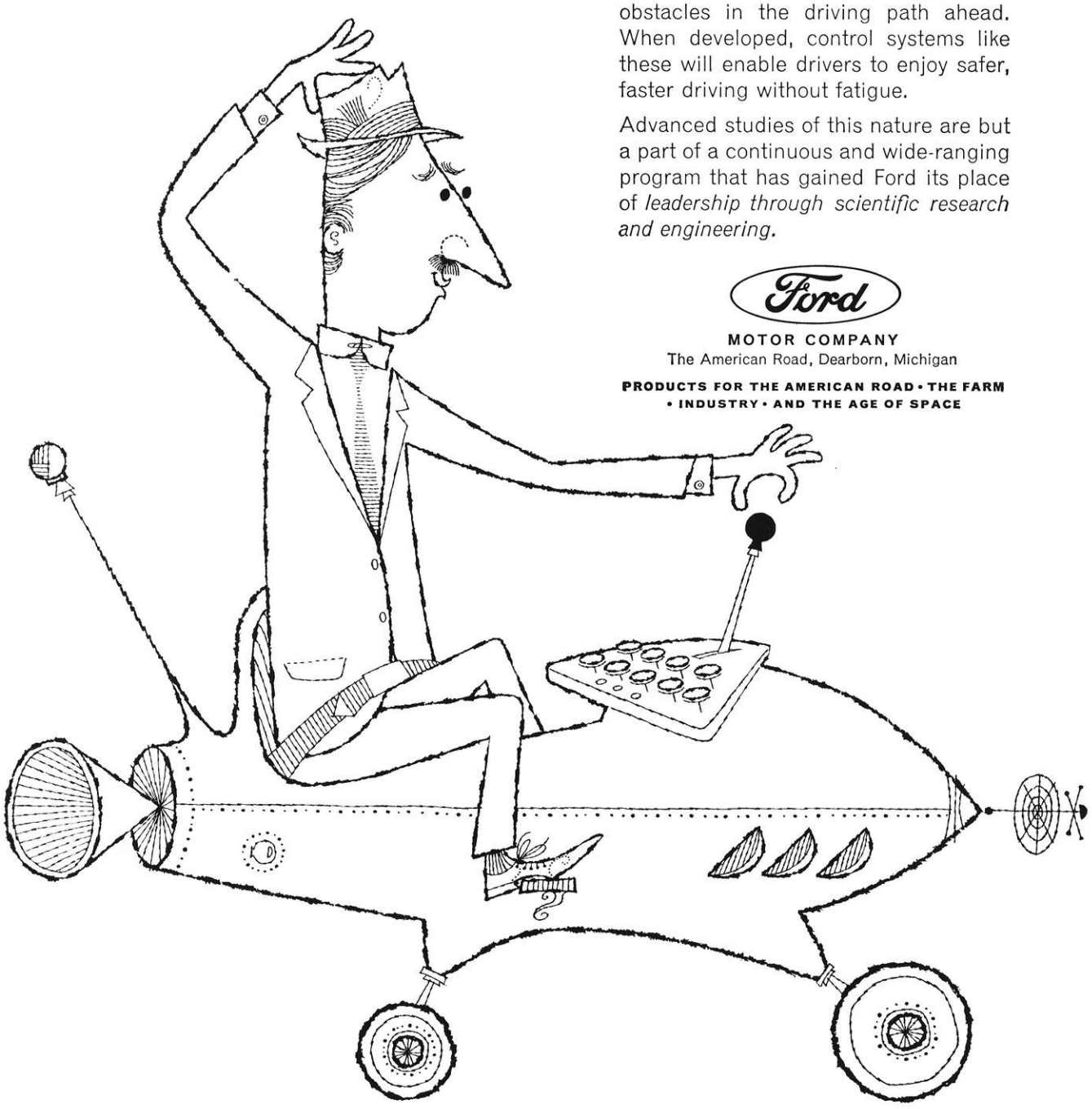

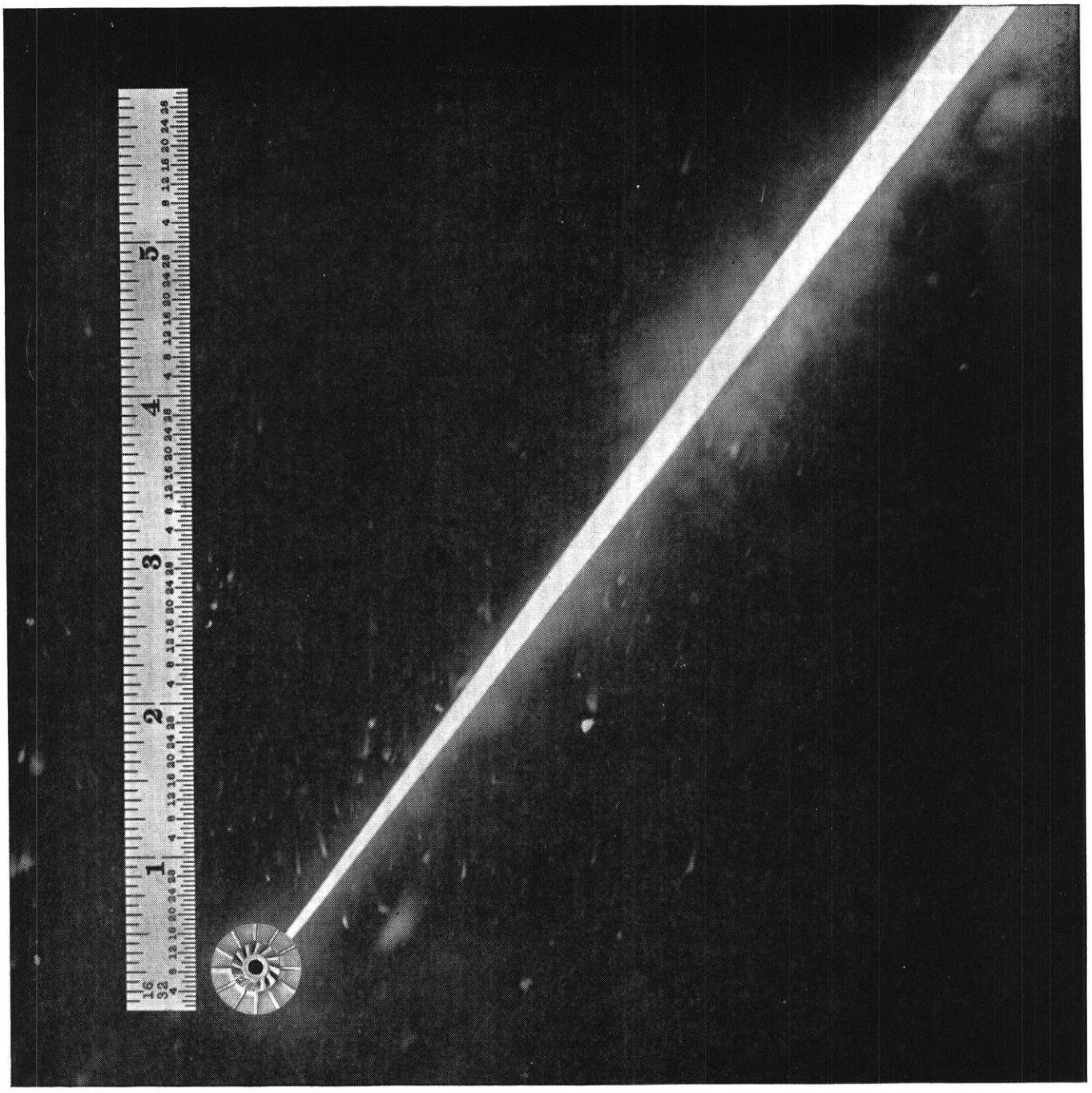

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Land Subdivision

by Robert J. Steindorf

I think you should identify the class status of your writers

A WIDELY accepted general definition of "subdivision" is, "the division of a lot, parcel, or tract of land by owners or their agents for purpose of transfer of ownership or building development."

Land subdivision, however, is more than just a means of marketing land. It can truly be called the first step in the building of a city. Subdivision can be broken down into three areas of study; the planning of new towns, the replanning of existing towns, and the scientific platting of new sections of existing towns.

While subdivision is of great importance, it has proceeded, until recently, in a haphazard fashion. Land developers were often guilty of gross land abuses. They would buy up large tracts of land for development without considering whether the site would be suitable for a residential area. Then they would divide the land into lots, construct some cheap houses, and sell it to the unwary public. There was little or no control exerted over these developers and the results were as might be expected. In many areas, the subdivisions were, at best, inferior in quality. The homse were substandard in construction, the streets were not uniform, and the subdivision was laid out in a rigid pattern without regard to beauty, function, or local conditions.

At worst, the subdivider sold off the lots and houses without supplying any of the necessary improvements such as water, sewers, storm drains, and paved streets, curbs, and sidewalks. Sometimes even the surveying done in laying out the lots was faulty. This often led to later land disputes. Yet the demand for housing was so great in many of these areas that the inferior homes were sold readily. Today many of these homes, which were built a relatively short time ago, are undesirable, if not actually unsafe, places in which to live.

State Restriction of Subdivision Practices

In recent years, the urgent need for some regulation over subdivision has been recognized. Many state governments became alarmed over the situation and took steps to counteract it. They tightened up their interpretations of existing statutes or pushed new statutes through their legislatures in order to gain more control over subdivision practices. The State of Wisconsin is probably typical of most states with regard to this matter. Wisconsin now has laws which enable it to control the layout, approval, and recording of plats.

The Wisconsin State Board of Health has been granted the power to restrict the size of lots, the location and construction of wells, and the installation of pumps. It may also require the subdivider to make certain soil tests.

As land subdivision tends to affect highways by generating traffic, increasing vehicular parking requirements, reducing sight distance, increasing the number of access points, and in general creating a traffic hazard, the State Highway Commission has been granted certain regulatory powers. The Commission has stated that the subdivision should be served by an internal street system of adequate capacity and that this system should have as few intersections with state trunk highways as possible. They also have ruled that individual lots do not require direct vehicular access to state highways and that lots should have a minimum setback distance from these highways.

Municipal Restrictions On Subdivision

In order to supplement these state requirements, many municipalities have established a set of restrictions in order to cope with their own individual needs. A good example of such restrictions is the set drawn up by the City Planning Commission of Madison, Wisconsin. The City of Madison has set up standards which limit the length and width of blocks and the laying out of separate lots. It also controls the street layout by restricting the size of streets, their frequency of intersection with major through streets, and even the desired angle of such intersections. In addition, it tells when to use pedestrian walks and gives their minimum size.

Protective Covenants

Further protection for the home owner and for the subdivider can be obtained by drawing up a protective covenant. A covenant is an agreement between the subdivider

and lot purchasers in which all parties seek to gain certain advantages. The covenant, to which all home owners in the particular area are bound, restricts the owner from using his land for any purpose that tends to downgrade the area or to create a nuisance. It is usually drawn up for a specific length of time, probably fifteen to twenty-five years, but often contains an automatic self-renewal clause. If the covenant is properly registered with the Register of Deeds, it has the authority of a law while in effect.

The format of such a covenant should contain a statement of purpose. This gives the reasons for the covenant and the names and addresses of all people involved. Next, there will be a clear description of the region covered by the covenant. After this comes the list of residential controls. These controls may provide restrictions on architectural style, size and quality of buildings, building location, lot width and area, and detrimental uses which the land might be used for.

There is often a fourth section of the covenant which is simply labeled "other controls". This is the section which contains anything not appropriately placed elsewhere. It may contain restrictions on landscaping, property maintenance, non-residential buildings, the use of signs, or the provisions made for parks and other recreational areas. It also outlines the enforcement and severability of the covenant.

The covenant may be drawn up as a blanket agreement, which involves all owners in the subdivision, or on an individual basis, in which each owner has a separate agreement with the subdivider. It has been found to be more desirable to use the blanket coverage because it is easier to enforce and there can be no cause for complaint as the restrictions are uniform.

Rectangular Subdivision Layout

Despite these seemingly thorough restrictions imposed upon him by the state, the municipality, and by private contract, the subdivider can exercise great flexibility in his work. However, all too often he doesn't use this freedom. The subdivider is naturally trying to make money. He will, therefore, usually lay out the subdivision as cheaply as possible. This almost invariably means that he will lay it out in a rectangular pattern.

A rectangular system, which may exist as either the gridiron or the checkerboard design, has many distinct advantages. It is easy to use, inexpensive, efficient, lot descriptions are easy to write, and the system can be extended indefinitely. These characteristics all combine to make this a valuable layout pattern. However, it should not be looked upon as a cure-all that can be rigorously applied to all situations. In fact, for most cases it is unsatisfactory.

The rectangular pattern is far too rigid to be applied widely. It doesn't take into consideration variable topography of the land or street differentiation. Even on level ground, it leaves something to be desired. It is certainly less attractive than other designs and is not so applicable to function of land. For these reasons, the rectangular pattern is declining in importance in planning residential areas.

Modern Concepts in Layout

Good subdivision is never a result of slavishly sticking to one particular design no matter what conditions may exist. Modern design procedures call for originality and imagination on the part of the subdivider. The present concept in layout demands that each area be laid out as an individual and independent neighborhood planned according to function. This is resulting in more original street patterns and block and lot layout.

The street layout is of primary importance in the laying out of subdivisions, for it determines the shape and function of the area. The streets are usually laid out first. Then other details of the subdivision are filled in. Care must be exercised in planning streets. The streets should be of the right width to be consistent with their use. A too narrow street will likely cause congestion if used much. A too wide street will impose unnecessary cost on the price of lots, is more expensive to build and maintain, and may attract a lot of undesirable through traffic.

Curvilinear streets are being extensively used in new subdivisions. They provide a more graceful appearance to the area as well as being functional. Curvilinear streets can be fitted quite easily to the topography of the land. In addition, they discourage through traffic. This is a distinct advantage as it keeps the area relatively safer and quieter.

Another valuable tool of the subdivider is the cul-de-sac street. This is a short street with one end permanently closed and terminating in a small loop. It is especially valuable in providing access in areas of steep grades. It also restricts the amount of traffic on it, thereby creating a safer neighborhood. However, this type of street should be used only where local conditions warrant it.

Some objection to the cul-de-sac street is raised by the street department, who claim that it is more expensive to service, and by delivery services, who cite the fact that they always have to retrace their steps when making deliveries. Also, if the street is a blind end, it will inevitably cause some traffic congestion. In many cases, a short loop would serve the purpose better than the cul-de-sac.

Laying Out of Lots

Incorporating new street designs introduces problems in laying out lots and blocks. Blocks should be wide enough to provide for two tiers of lots of appropriate depth. Appropriate depth is generally accepted as being about 120–150 feet. If the lot is too deep, it is likely that a second house will eventually be built on the lot. This is undesirable because the house in the rear is usually allowed to deteriorate. If the lot is too shallow, the house will be set too close to the street and there will not be adequate room for a lawn or garden. It is recommended that the total land coverage is residential areas not exceed 40% and a coverage of 25% is much more desirable.

(Continued on page 19)

Direct FM In Two-Way Radio

by F. J. Fruzyna

DIRECT frequency modulation is becoming popular in radio communications today. Of this type of voice communication system, the two-way radio, consisting of a stationary unit and one or more mobile units, is the fastest growing. The use of such systems, as authorized by the FCC, had increased by the end of 1960 to over two million. Major users are fire and police organizations, taxicab companies, public utility repair sections, medical people, and rural service and installation groups.

The Two-Way Radio System

A typical system would consist of a repeater unit, a control station which could be considered the desk unit of a police station, and two mobile units which could be two of the department patrol cars. This system, let us say, uses a transmission frequency of 460 megacycles and reception frequency of 465 megacycles; any point in the higher frequencies of the 25–470 megacycle band could have been chosen. Each unit's transmitter and receiver is tuned to these frequencies. The use of the repeater unit or more than one repeater in various locations increases the range of the entire system.

Assume that mobile unit one wants to communicate with mobile unit two. Unit one switches his radio to transmit and talks into his microphone. Out of his antenna comes a 460 megacycle modulated carrier with the information. This signal is picked up by the repeater and is converted to 465 megacycles and sent out to mobile unit two. Mobile unit two receives this 465 megacycle signal and demodulates it into the speech and comes from the operator of unit one.

Why FM Rather Than AM

Frequency modulation (FM) has proved more suitable for two-way radio systems. It provides greater coverage for reception of usable signals than does amplitude modulation (Am). This means a greater rejection of unusable signals. The range of operation of stations above 100 megacycles is only about 50 to 100 miles; countrywide, therefore, more stations can operate without interfering with each other. Control is exercised by the FCC and stations are assigned frequencies that will not overlap in the specific geographical area of operation.

The major advantage of FM is the freedom from noise. Almost everyone has had the experience of listening to both FM and AM commercial broadcasting stations and noticing the better reception of the FM stations. The "static" that must be considered is either natural or man made noise. The natural noise that is most important is caused by lightning, while the man made noise, of similar characteristics, comes from generators, motors, lighting fixtures, spark plugs or any other source where a spark jumps a gap. Since most of these units operate in motor vehicles this a very important factor that has made FM more popular. The cost of AM and FM units are approximately the same, so the noise advantage in FM is important. As a rule of thumb the signal to noise ratio of AM must be 100 to 1 while this ratio for FM must be 2 to 1 for good reception.

Why Direct FM Rather Than Indirect FM

The advantage of little interference between stations at a range of 50 to 100 miles of frequencies above 100 megacycles has been discussed. The Ultra High Frequencies (UHF) also have the advantage of less static and less man made noise than the lower frequencies. The UHF signals, above 400 megacycles, also have better reflection qualities that lead to advantages in urban uses. The signal is readily receivable in between buildings and other normally dead areas. Also the UHF has a shorter range, thereby decreasing the area of operation and allowing other stations to operate closer than in the lower range of frequencies. All these lead to the use of high frequencies in city use.

This is where the consideration of direct modulation becomes important. Direct modulation can be produced by the reactance tube, p-n junction diodes, and transistors. Each of these devices has its advantages. Direct frequency modulation as a whole is more economical. It is cheaper to build and maintain because each unit has fewer components and lower power requirements, and is smaller in size because of the use of semiconductor devices including transistors.

To show how the number of components is decreased, the two systems, indirect and direct, must be compared. The indirect modulation changes the phase of the signal and adds it to the low frequency, 200 kilocycle signal, producing a frequency variation of a few cycles. The oscillator frequency must be

low in order to produce a detectable change in frequency, thus requiring considerable multiplication to get the high frequency signal that is to be transmitted. Direct modulation is directly varying the oscillator by changing one of the reactive elements of the tuned tank of the oscillator. Usually the capacitive element is varied according to the audio or information bearing signal. This capacitive element can be changed by the reactance tube modulator or by use of the transition capacitance of transistors or semiconductor diodes in the place of the tube unit. When noting the frequency of the oscillator in the direct method, we see that it is at 5 megacycles, which is much higher than the indirect method. Therefore the multiplication factor is decreased from 3072 to 30 by using the direct modulation method.

These multipliers require the use of three tubes to multiply by a factor of approximately 25 times. When high frequency transistors are used, the oscillator frequency can be increased to 100 megacycles or greater which is very important in the use of UHF signals over 400 megacycles. This means that little multiplication is needed.

Transistors, along with their decrease in size and weight, decrease the current drawn from the power source by about 10 to 1. This is very important in the use of mobile units. The vehicle batteries last longer and special, more costly vehicle generators are not required to produce these high frequency signals.

To illustrate the decrease in size through the use of transistorized units, consider the miniaturized "Personalfone" developed by RCA. The weight of the transmitter is only 28 ounces and the receiver only 14 ounces. The total unit weight is only 42 ounces. The maximum range of this specific unit is 2 miles. This is just a specific example to show why semiconductor devices must also be considered when selecting the type of communication system to be procured.

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Land Subdivision

(Continued from page 17)

The Overall Picture

Despite the subdivider's concern with all of the details of laying out a residential area, he must always be able to step back and look at the project as a whole. He has to integrate all the fine points to produce the whole as a pleasing and functional unit. This would necessitate taking into consideration non-residential sections. Provision must be made for churches, schools, playgrounds, and parks or for access to such facilities as are already existing. In some areas, transportation is also a critical problem and nearness to transit systems would be of great importance.

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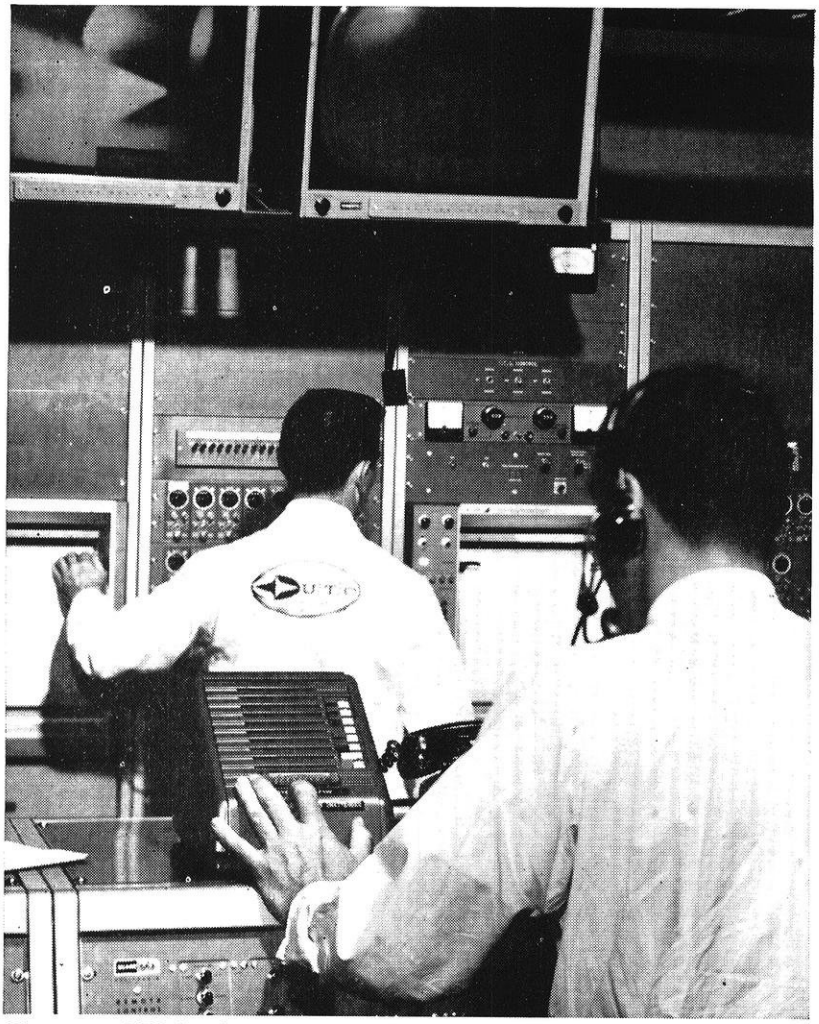

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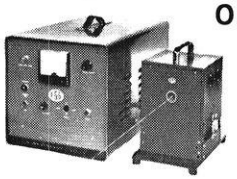

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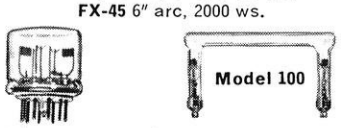

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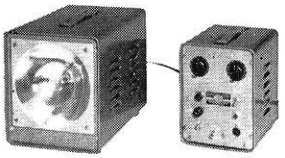

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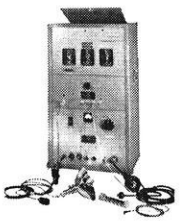

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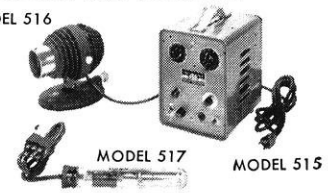

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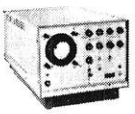

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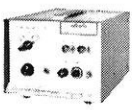

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DIODE RECOVERY CABLE SYSTEM

Model 760, a complete system for accurate observation and measurement of diode recovery time in the millimicrosecond region. Controls and meter on front panel of sturdy metal case.

PULSE INVERTERS

Model TR-6 — coaxial-ferrite balun with excellent frequency response for converting 50 ohm single-ended to push-pull 100 ohm signals. Model 819 (for use with EG&G Model 751 Pulse Generator) to provide negative pulse output.

RADIATION MEASUREMENTS

Complete systems using EG&G detectors and Model 707 Scope . . . available for measurement of high-frequency pulsed radiation.

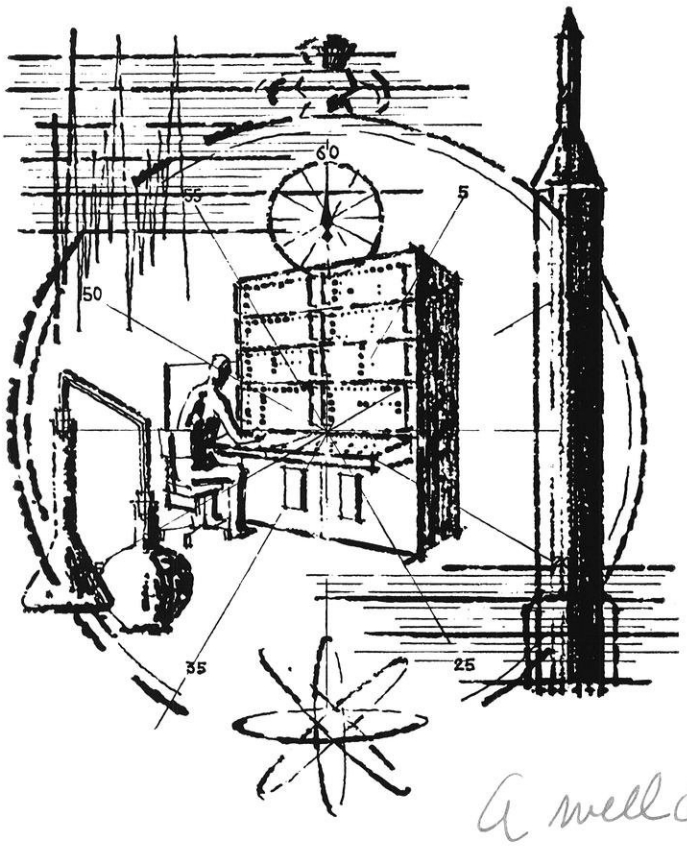
TRANSFORMERS, POWER SUPPLIES

EG&G is outstandingly well staffed and equipped to design and produce custom-built transformers, chokes, magnetic amplifiers, DC to DC converters, pulse transformers and power supplies for military or commercial use . . . and trigger transformers for all types of flash tubes.

Full technical information on all products available on request.

Edgerton, Germeshausen & Grier, Inc.

180 BROOKLINE AVENUE, BOSTON 15, MASS.



SCIENCE HIGHLIGHTS

by John C. Ebsen 3A'64

A well done recurring feature.

QUALITY TV KIT ANYONE CAN BUILD

The Conar Division of the National Radio Institute, largest-oldest Electronics Radio and TV school, announces availability of an outstanding TV receiver in kit form.

The "Custom Seventy" TV kit is the latest addition to a line of high quality electronic kits and instruments. Now, hobbyist, experimenter—anyone who likes to do things—can assemble this top quality TV receiver; an educational, practical, FUN project with lasting pride of accomplishment plus a substantial dollar savings.

Instructions for building the Custom Seventy are clear-cut, straightforward. There's no deep technical language to translate. Large picture diagrams guide the builder with handy check lists to insure against errors.

No technical knowledge whatsoever is needed to do a perfect job of assembling this set. However, a schematic diagram and detailed explanation of the circuitry are included for those interested in studying design features.

The Custom Seventy kit is complete in every detail including steel cabinet with baked-on finish, aluminized picture tube, all receiving tubes, wire, solder—everything. All parts are first quality, American-made, name-brand. Only tools needed for assembly are screwdriver, pliers and soldering iron or soldering pencil. Instructions on "How to Solder" are furnished with manual.

Attractive, two-tone metal cabinet; only 8½" deep; styled to match any decor. All controls in front for easy handling. Speaker mounted in front of cabinet behind gold-tone grille. Chassis wiring is greatly simplified through use of newly introduced multi-purpose tubes.

Extremely stable, trouble-free circuit with transformer power supply gives brilliant, glare free, sharp pictures with plenty of contrast and brightness—even under strong light. The tuner is already factory assembled (channels 2 through 13), pre-aligned and features new "Lock-Set" fine tuning. No need to readjust tuning when changing channels.

Nineteen inch aluminized picture tube (new—not rebuilt) has bonded safety face plate and generous 206 sq. in. of viewing area. Circuit includes 3 stages of pre-aligned video i.f., a separate pre-aligned sound i.f. amplifier and two-stage video amplifier. Has keyed AGC and sync noise limiter.

Audio power is sufficient to drive extra speakers if desired. Built-in rabbit ear antenna gives excellent reception in fringe areas. Has ter-

minal on back of cabinet for connecting outdoor antenna.

Cash price—$135 (complete, including 10% Federal Excise Tax.)

May also be purchased on a unique "pay-as-you-build" plan—four packages—$36 per package.

'THREE-SECOND SUN' CLOSES TEMPERATURE GAP FOR TEACHER AND SCIENTIST ALIKE

About the size of a bread box, it plugs into a standard electrical outlet, and within three seconds can produce temperatures approaching those of the sun's surface.

For the first time, the temperature gap has been closed, and the science teacher and industrial researcher alike have been provided a safe, practical means of producing controlled temperatures in the high realms unheard of a few years ago, but made almost commonplace by the materials requirements of the space age.

Developed by Baird-Atomic, Incorporated, of Cambridge, the Kopito Instant Furnace relies on a new heating concept in producing temperatures in excess of 5000 degrees F. within seconds. The heating element used is a strip of graphite cloth, supplied by National Carbon Company, Division of Union Carbide Corporation. Electric current controlled by an auto-transformer is conducted to the graphite cloth through water-cooled carbon rolls, and the sample or specimen to be heated rests directly on the inert graphite cloth strip. After the furnace is turned off, the heating element can be handled within 15 seconds, and temperatures return to a harmless level within 2 minutes.

The instant furnace is expected to find a wide range of application in the teaching of physics, chemistry and metallurgy in both college and high school classrooms. In industry, its design permits simultaneous demonstration and precise measurement of such high-temperature properties of materials as thermal expansion and strain, electrical conductivity, emissivity, specific and fusion heat, and phase transformation temperatures. Though most experiments can be conducted in the open air, the furnace is equipped with a bell jar and connections for controlled atmosphere work under conditions of complete visibility.

Baird-Atomic is preparing a comprehensive teaching manual describing the various experiments that can be performed. Included are alloy production; ore refining; crystal growing; production of glass and calcium carbide; illustration of surface tension, radiation characteristics and phase transformation; demonstration of chemical reactions; and the obtaining of emission and absorption spectra.

ELECTRIC WALK AVAILABLE FROM WESTINGHOUSE

An Electric Walk with flat entrance and exit areas has been developed by the Westinghouse elevator division. It is designed to carry pedestrians horizontally or on inclines up to 15 degrees, either ascending or descending, at speeds up to 180 feet per minute.

The new Electric Walk is available in any length, and in tread widths of 27 and 36 inches. Extensive precautions have been incorporated into the unit to insure the safety of riders.

The treadway surface is composed of narrow grooved treads of die-cast aluminum to provide secure footing. The treads are uniquely hinged together so that there is a continuous smooth path even when the surface angle changes. A stationary combplate at both ends of the Electric Walk meshes with the tread grooves to provide a "combing action" for maximum safety at these points. Handrails, moving at the same speed as the treadway, are standard equipment on Westinghouse Electric Walks.

Quiet operation is assured because of a unique drive system. The driving unit is directly connected to the treadway to conserve space by eliminating the need for a machine room. A steel reinforced rubber gear belt meshes with teeth on the underside of the treads to apply the driving force directly and uniformly to the moving pathway. On walks of unusual lengths, additional drive units are provided to share the driving load.

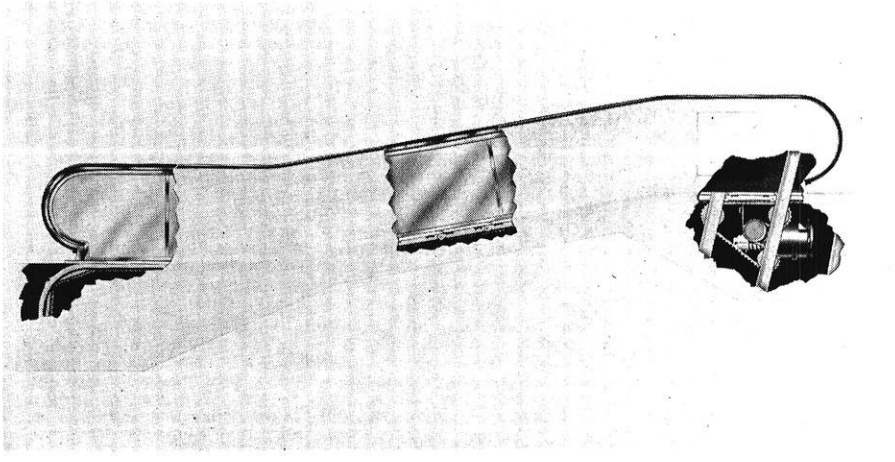
The standard speed for Westinghouse Electric Walks is 120 feet per minute. However, the company will supply walks that operate at a speed as great as 180 feet per minute, where the incline is not more than eight degrees. This conforms with requirements of the proposed safety code of the American Standards Association.

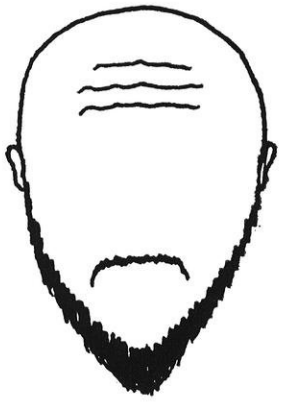
The tread-support configuration and truss are unique designs that provide great rigidity, yet conserve space. Except at the ends of the treadway, the vertical distance between the tread surface and the bottom of the truss is only 12½ inches. Because of this shallow truss design, only a minimum amount of space is needed under the Electric Walk.

Westinghouse has built the Electric Walk so that it can be easily installed on top of existing ramps. The only excavation necessary is a three-foot, five-inch pit below tread level at both ends of the walk.

A full operating Electric Walk model has been thoroughly tested.

First delivery of the Westinghouse Electric Walk will be made early in 1963 and can be furnished for indoor as well as outdoor applications.





BRAIN BUSTER

by L. L. Chambers

Two old favorities of mine are real toughies, both are logic problems and both are concerned with red and green hats. Here they are:

1. Upon the heads of three men are placed colored hats, either red or green. Each man knows there are three green and two red hats although none knows the color of his own hat. Two of them are allowed to observe the color of the hats on each of the other two men. The question is then asked of the first observing man, "What color is your hat?" To which he replies "I do not know." The same is asked of the second man who was allowed to observe and his reply is also negative. Now the third man, having heard these replies, is asked the same question, to which he replies "Yes." HE then states the color of his hat.

Now I ask you, "What color was his hat?" "Why?"

2. Again, upon the heads of three men are placed colored hats; either red or green. (In this case there are three of each color.) Each is allowed to observe the hats on the other two men and the group is then told, "IF you see a green hat sit down." The group took their seats. They were then told to rise if they could identify their own hat. After several dumbfounded moments one man arose and identified his hat. How did he know?

* * *

3. If twelve one-ohm resistors are arranged as the edges of a cube, find the resistance between two diagonally opposite corners of the cube.

* * *

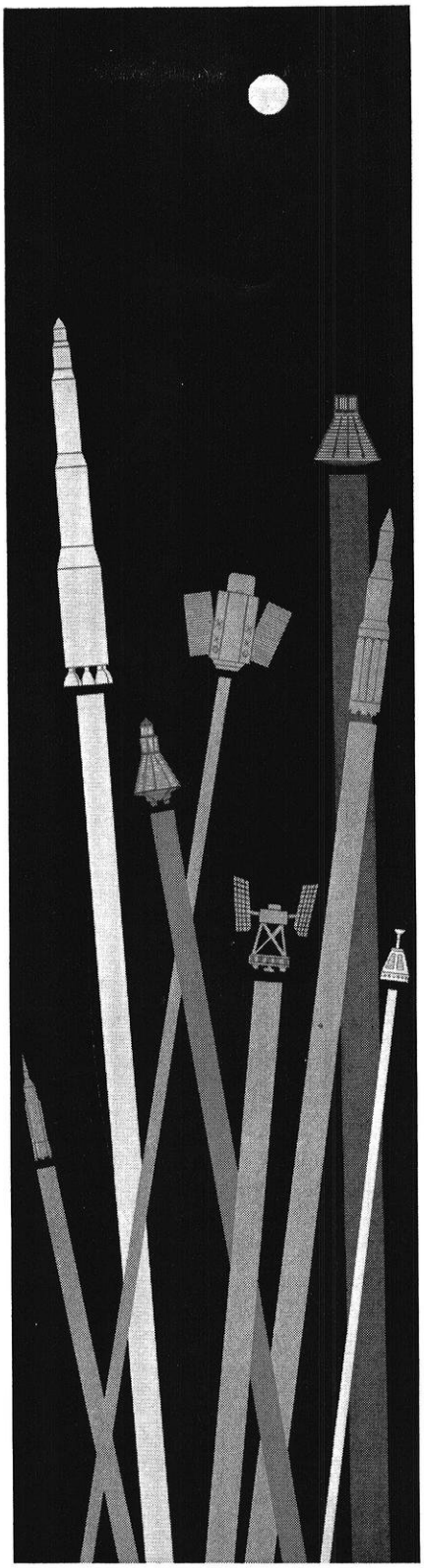
The following are the answers for the month of March.

The answer to the rocket problem is 28000000 miles.

The bear again was white, the hunter was 1.175 miles from the north pole on any meridian.

* * *

To see the answer to the problem, put yourself in the position of the shopkeeper in country A. When free exchange existed, each dollar in the till had the same value. However, when your government declared each B dollar to be worth only 90 cents, you lost ten cents on each B dollar you had. Likewise the owner of the diner in B lost ten cents on each A dollar he had in the till (at the instant they were devalued!). The two businessmen could have swapped their dollars privately, but they did not and each one thus bought half of the student's breakfast.



GROWTH CLIMATE

People . . . and ideas . . . do best in a favorable environment.

At NASA, scientists and engineers are favored by many "climatic" advantages, for the vigor, the importance, the scope and urgency of America's space program demands the best environment the nation can provide.

For professional employees NASA offers a graduate study program second to none. While on full salary, you can take graduate courses for credit during work hours at nearby universities, tuition-free. In-house seminars led by world-famous scientists and engineers are offered. In addition, NASA scientists and engineers benefit by early professional recognition, a wide choice of work areas, unmatched facilities, and participation in history-making projects.

Truly this is growth climate, where career opportunities are as unlimited as the scope of NASA's many aeronautical and space exploration activities. Here, the harvest of your ideas and discoveries may contribute to the benefit and enrichment of all mankind.

NASA has urgent need now for large numbers of qualified scientists and engineers. Positions are available in nearly all scientific and engineering disciplines, for men and women with B.S., M.S., or Ph.D. degrees.

NASA invites your inquiry to the personnel director of any of the following NASA centers:

NASA Manned Spacecraft Center, *Houston, Texas*

NASA Goddard Space Flight Center, *Greenbelt, Maryland*

NASA Marshall Space Flight Center, *Huntsville, Alabama*

NASA Ames Research Center, *Mountain View, California*

NASA Flight Research Center, *Edwards, California*

NASA Langley Research Center, *Hampton, Virginia*

NASA Wallops Station, *Wallops Island, Virginia*

NASA Lewis Research Center, *Cleveland, Ohio*

NASA HEADQUARTERS, *Washington 25, D. C.*

POSITIONS FILLED IN ACCORDANCE WITH AERO-SPACE TECHNOLOGY ANNOUNCEMENT 252-B.

ALL QUALIFIED APPLICANTS WILL RECEIVE CONSIDERATION FOR EMPLOYMENT WITHOUT REGARD TO RACE, CREED OR COLOR, OR NATIONAL ORIGIN.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Fill in your Own Lines

by Ronald Neder

Sing a song of sulfides,
A beaker full of lime,
Four and twenty test tubes
Breaking all the time.
When the cork is taken out,
The fumes begin to reek.
Now isn't that an awful mess
To have five times a week?

* * *

Bachelor: A guy who is footloose and fiancee free.

* * *

"Mech. Eng.: I hear the Student Council is trying to stop necking.

Chem. Eng.: That so? First thing you know they'll be trying to make the students stop, too.

* * *

"Beg your pardon, but aren't you an engineering student?"

"No—it's just that I couldn't find my suspenders, my razor blades were used up, and a car ran over my hat."

* * *

Girls are like newspapers: They all have forms, they always have the last word, back numbers are not in demand, they have great influence, you can't believe everything they say, they're thinner than they used to be, they get along by advertising, and every man, should have his own and not try to borrow his neighbors.

I'm tough to find
For love or money,
A joke that's clean
And also funny.

* * *

He was a rather under-sized freshman at his first college dance, but despite his smallness and bashfulness he was sure of himself in his own way. He walked over to a beautiful and over-sophisticated girl and said, "Pardon me, Miss, but may I have this dance?"

She looked down at his small size and lack of fraternity pin and said "I'm sorry, but I never dance with a child!"

The freshman bowed deeply and said, "Oh, I'm sorry, I didn't know your condition."

* * *

Freshman: "I don't know."
Sophomore: "I'm not prepared."
Junior: "I don't remember."
Senior: "I don't believe that I can add anything to what has been said."

* * *

"Did you hear about the wreck?"

"No."

"Yeah, four professors and one student were killed."

"Poor fellow."

Out of the wild and wooly West comes this hazardous adventure. It seems that a grizzled old prospector was reminiscing for a bunch of New England tenderfoots. "There I was," he drawled, "trapped in a narrow draw with a hungry ole grizzly not twenty yards away behind a tree, Th' only way I could figger to bag the crittur was to ricochet a ball off th' canyon wall to th' right. Now bein' a champeen shot like I am, I just gauged th' wind, judged the lead of the barrel and th' rate of twist, th' hardness of th' rifle ball and th' angle of yaw it'd have bein' smacked out of shape agin th' wall, and I figgered my chances of nailin' thet bar were about 70–30. A one rail bank shot. A controlled ricochet. So I let fly."

The old man paused. Softly one of the tenderfeet gasped, "Did you get him?"

"Nope," replied the prospector. "Missed th' wall."

* * *

A kiss is a peculiar proposition. Useless to one, it is absolute bliss to two. A small boy gets it for nothing, a young man has to lie for it, and an old man has to buy it. The baby's right, the lover's privilege, and the hypocrite's mask. To the young girl, faith; to the married women, hope; and to an old maid, charity.

A meek little man walked into a barroom and ordered two drinks from the burly bartender. He drank one of the drinks and poured the other into his shirt pocket. After about ten rounds of this procedure the bartender said, "Pal, why are you pouring the other drink into your shirt pocket?"

The little man jumped up into the bartender's face and snarled, "Mind your own business, you big bum, or I shall come over the counter and whale the fire out of you." About that time a blurry-eyed mouse stuck his head out of the man's shirt pocket and said, "That goes for your damned cat, too."

Papa Stork: "Well I guess I'll go out and deliver a few baby boys."

Mama Stork: "Believe I'll go out and deliver a few baby girls."

Baby Stork: "Well I guess I'll go out and scare the hell out of some of those college kids."

* * *

Two men were sitting in a bar. "Albert," asked one, "After you drink a lot, does your tongue burn?"

"I don't know, Sam," replied the other. "I've never been drunk enough to light it."

* * *

Wife: "Darling, tell me, how did you ever get junior to eat olives?"

Ch.E.: "Simple, I started him with martinis."

The businessman was showing his daughter, just returned from finishing school, around the newly completed mansion. At the swimming pool, they stopped to watch several athletic young men diving and stunting. "Oh, Daddy," she exclaimed, "you've stocked it just for me!"

* * *

Boarder: It's disgraceful, madam. I'm sure two rats were fighting in my bedroom last night.

Madam: What do you expect for $25 a month? Bull fights?

* * *

Sunday School Teacher: "Mary, do you know who made you?"

Mary: "Originally or recently?"

Dear Sir:

I am engaged to a girl and have been informed that you were seen kissing her. Kindly call at my fraternity house at seven Friday evening and make an explanation.

Alfred Zilch

Dear Alf:

I have received a copy of your form letter and will be present at this meeting.

Red

* * *

It seems this salesman had a lot of trouble locating one Colonel Sexhauer in the Pentagon. After a while, he started telephoning various departments. No success. Finally, he tried one last number.

"Hello?" he said eagerly, "Do you have a Sexhauer in your office?"

"No, sir," said a girl's voice. "We don't even have a coffee break!"

* * *

Parson Webster phoned the local Board of Health to ask that a dead mule be removed from the front of his house. The young clerk thought he'd be smart.

"I thought you ministers took care of the dead," he remarked.

"We do," answered Parson Webster, "but first we get in touch with the relatives."

* * *

Pedro (a braggart): "Pancho, I theenk I weel sheep 50 bools to the bool fight in Mexico City."

Pancho (who hears all, sees all, and says little) doesn't bother to reply.

Pedro: "Pancho, I theenk I weel sheep 100 bools to the beeg bool fight in Mexico City!"

Pancho still remains quiet.

Pedro (hitting the bench with his fist in anger): "Pancho, I theenk I weel sheep 200 bools to the beeg first in Mexico City. What you theenk of that?"

Pancho: "I theenk you are one beeg bool sheeper."

A lady bought a parrot from a pet shop, only to find that it cursed every time it said anything. She put up with it as long as she could but one day she lost her patience.

"If I ever hear you curse again, she declared, "I'll wring your neck."

A few minutes later she remarked rather casually that it was a fine day. Whereupon the parrot said, "It's a hell of a fine day."

The lady immediately picked the parrot up by the head and swung him around in the air until he was almost dead.

"Now then," she asked, "It's a fine day, isn't it?"

"Fine day," sputtered the parrot. "Where in the hell were you when the cyclone struck?"

* * *

Captain: "Why didn't you salute me yesterday?"

ROTC Recruit: "I didn't see you, sir."

Captain: "Oh, that's all right then. I was afraid you were mad at me."

* * *

A profound philosophy of life is reflected in the reply of a no-longer wealthy engineer who, when asked what he had done with all his money, said, "Part of it went for liquor and fast automobiles, and part of it went for women. The rest I spent foolishly."

* * *

A clergyman and a truck driver found themselves in an automobile smashup. The truck driver told the padre what he thought about him in profane terms. When he paused for breath it was the clergyman's turn.

"You know, my good man, that I cannot indulge in your kind of language, but this much I will tell you; I hope when you go home tonight, your mother will run out from under the porch and bite you."

"Doc," said the mountaineer leading a gangling youth into the presence of the village medico, "I want you should fix up my son-in-law. I shot him in the leg yesterday and lamed him up a mite."

"Shame on you shooting your own son-in-law!" scolded the doctor.

"Wal, doc," rejoined the mountaineer, "he wasn't my son-in-law when I shot him."

* * *

AgE to his girl: "I'll drive you home if you put your harness on."

* * *

Suitor: "Sir, I have an attachment for your daughter."

Father: "Young man, when my daughter needs accessories, I'll buy them myself."

* * *

An inmate of a certain insane asylum, feeling that he had recovered enough to be released, appeared before the desk of the superintendent. After he was partially examined he was asked the following question:

Superintendent: "If we discharge you, will you promise to let women and liquor alone?"

Inmate: "Yes, sir."

Superintendent (beckoning a guard): "Lock him up; he's still crazy."

* * *

The dean of women at a very well known university recently began a speech to the student with these memorable words:

"The president of the University and I have decided to stop petting on campus . . ."

* * *

Teacher: David, what does F-E-E-T spell?"

David: "I don't know."

Teacher: "What, what does a cow have four of, and I have only two?"

The class was dismissed.

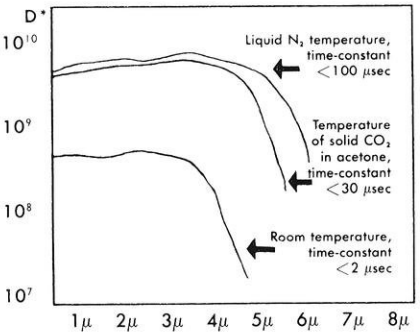
* * *

You can tell a lady by the way she dresses. If she were a lady she would draw the blinds.

Kodak beyond the snapshot...

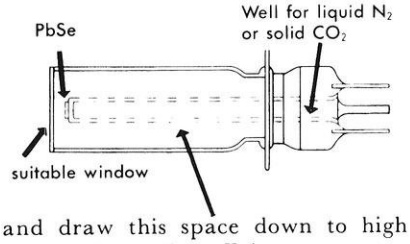
(random notes)

Cool, well-behaved PbSe



See what an improvement can be effected in D*, the normalized detectivity of a lead selenide photoconductive surface, by cooling it.

Therefore in catering to the infrared detector trade we put lead selenide into a little Dewar like this



and draw this space down to high vacuum for cooling efficiency.

But PbSe detectors are reputed to go quickly erratic in high vacuum.

Aha ! We have learned how to lick that.

We expect no congratulations. Just orders.

Could you use a pamphlet on Kodak Ektron detectors? Free from our Apparatus and Optical Division. Might eventually lead to an order. We are patient.

Honest physical labor

Ranking a bunch of films for c-r tube photography is useful work, and it makes the time pass pleasantly between breakfast and supper. Here is what we find:

RELATIVE SPEED

to a 525-line raster, two interlaced fields lasting 1/30 sec over-all, measured at a net density of unity (Transit time of the electron beam past a given point of the phosphor = 5 x 10^{-8} sec)

Normal development: 4 minutes in Kodak developer D-19 at 68°F.

Phosphor	P11	P4	P15	P16	P24
FILM Kodak Photoflure, Blue Sensitive	2400	180	60	200	83
Kodak Cineflure Kodak Photoflure, Green Sensitive Kodak Linagraph Ortho	1800	500	250	130	240
Kodak Royal Ortho (sheet)	1000	250	130	80	130
Kodak Linagraph Pan Kodak Tri-X Negative	900	320	120	82	120
Kodak Linagraph Shellburst	500	180	60	48	73
Eastman High Speed Positive	360	51	25	45	28
Kodak Royal-X Pan Recording	320	150	65	23	47
Eastman Fine Grain Sound Recording	123	17	5.2	41	4
Eastman Television Recording	*100	11	5.2	7.5	5.2
Eastman Fine Grain Release Positive	35	4	2	6	2
Kodalith Ortho, Type 3	32	5	8	5	8
Kodak High Contrast Copy	20	12	6	4	5

*Arbitrary basis of scale.

Why they rank this way even provides something to think about.

Patterns in blood

Electrophoresis is a means for separating ionic components of a mixture by virtue of their differing mobilities in an electric field. The man who first worked it out wound up with a Nobel Prize for his pains. (We never had the pleasure of an employment application from him.) Subsequently other highly creative types—biochemists mostly—invented ways of doing electrophoresis in wet paper, starch blocks, and other media.

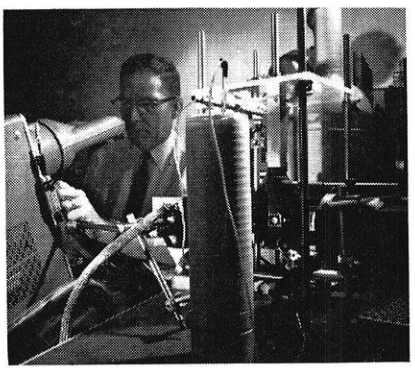
Recently two such chaps at The Mount Sinai Hospital in New York used polyacrylamide gels of two different pore sizes in combination. This speeded it up and permitted separation of blood serum proteins into many more components. It results in a visual pattern that represents an individual's body chemistry at a given moment.

We found out about this so-called disc electrophoresis by paying attention to what people tell us. Savants are always asking about Eastman Organic Chemicals that they hope we can make for them. Sometimes we find there will be no objection and some prospect of benefit to all parties if we will act as a broadcaster of technical information thus picked up.

This is happening right now with disc electrophoresis, which uses Eastman Organic Chemicals and about which we are offering far and wide a 69-page disquisition by the two New Yorkers.

In the name of corporate self-interest, much good dope gets cheaply spread.

SOLID-STATE MERCHANDISE PRODUCTION NEEDS GOOD PEOPLE



THE PHYSICS OF PHOTOGRAPHY NEEDS GOOD PEOPLE

VIGOROUS INFORMATION DIFFUSION NEEDS GOOD PEOPLE

From modacrylic fibers to microscope adapter kits, plenty of lively careers to be made with Kodak in research, production, marketing.

And whether you work for us or not, photography in some form will probably have a part in your work as years go on. Always feel free to ask for Kodak literature or help on anything photographic.

EASTMAN KODAK COMPANY

Rochester 4, N.Y.

Kodak

TRADE MARK

One of a series*

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

How Professional Societies Help Develop Young Engineers

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

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

Q. How do these societies help young engineers?

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

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

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

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

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

Q. How do you go about joining professional groups?

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

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

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

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

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

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

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