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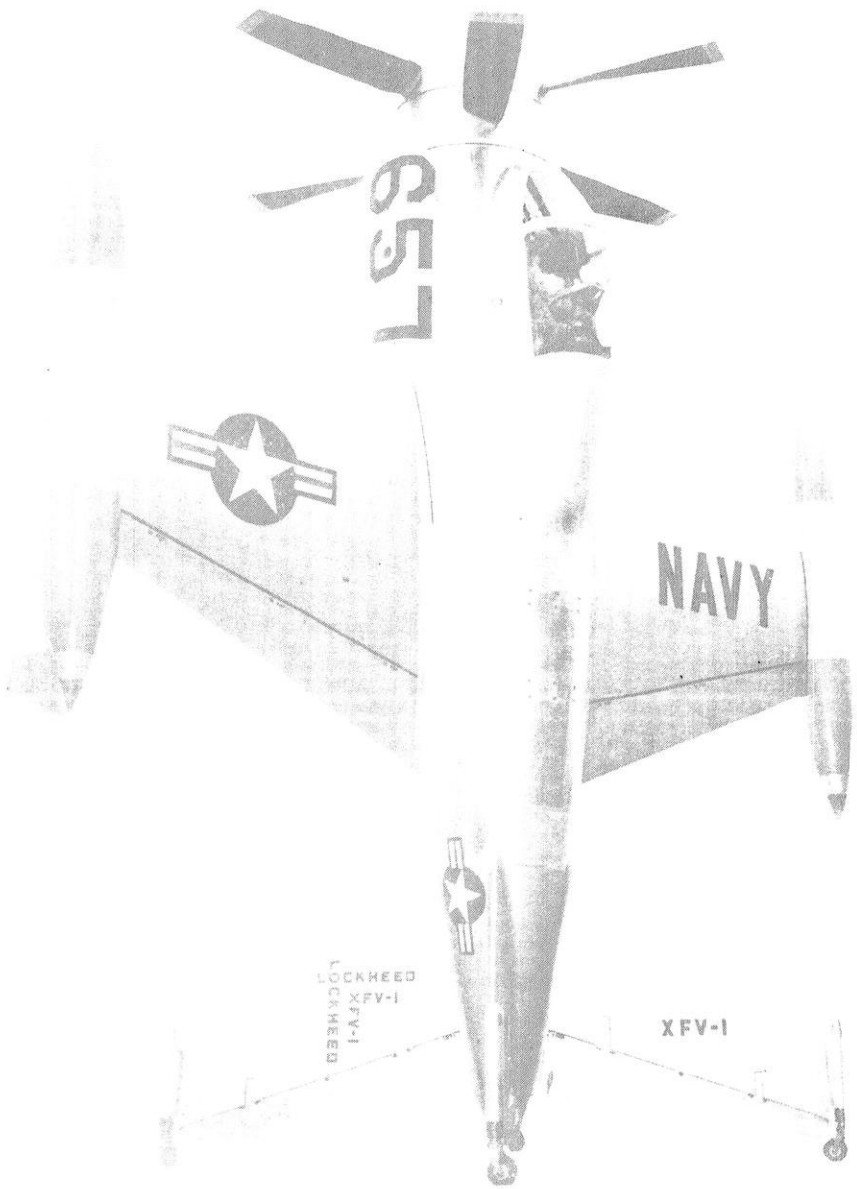
The Wisconsin

engineer



DECEMBER

1955

25c

Robert T. Blake, Class of '49

speaks from experience when he says,

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Bob Blake had his first experience in steel mills working there during summer vacations from college. After receiving his B.S. degree in Electrical Engineering, he became an operating trainee in U.S. Steel's Irvin Works. During his training program, his background and versatility were used by the Training Division to develop a training program for Electrical Maintenance employees. By the end of 1951, Mr. Blake had become a Foreman with experience in both Cold Reduction Maintenance and the Galvanizing Department.

Effort is made to have young engineers obtain varied experience before devoting themselves to one field. Mr. Blake feels that, "An engineering graduate has practically no ceiling provided he has the right attitude and is willing."

Promoted again in 1954, Mr. Blake is now Foreman—Electric Shop in Central Maintenance. Supervising a crew of 40 men, he is responsible for electrical construction work, maintenance and crane wiring. Mr. Blake feels he is in "an interesting and challenging field of work." He has found that "U.S. Steel is a highly desirable employer in this most basic of all industries."

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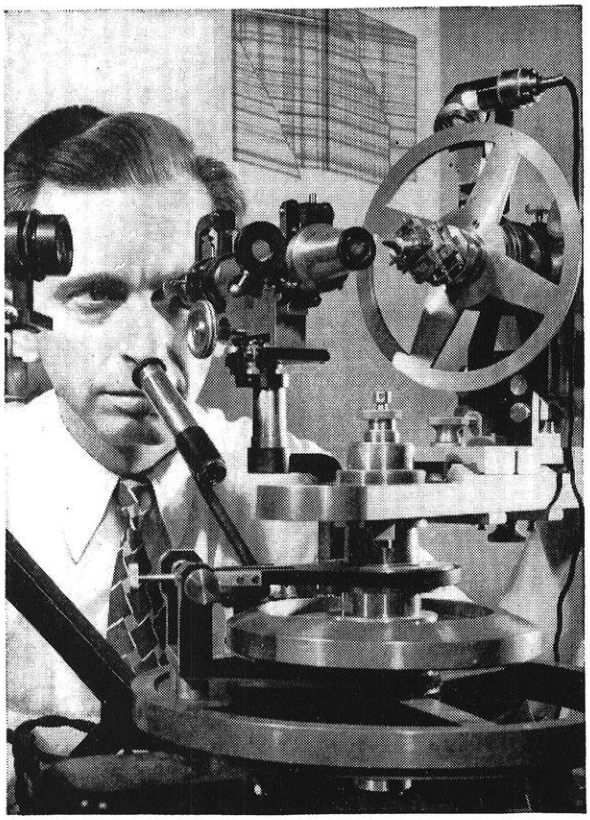

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Below: Missile Systems scientists and engineers discuss future scientific exploration on an advanced systems concept with Vice President and General Manager Elwood R. Quesada. From left to right: Dr. Eric Durand, nuclear physicist, systems research laboratory; Ralph H. Miner (standing), staff division engineer; Dr. Montgomery H. Johnson, director, nuclear research laboratory; Elwood R. Quesada; Dr. Louis N. Ridenour (standing), director, program development; Willis M. Hawkins (standing), chief engineer; Dr. Joseph V. Charyk (standing), director, physics and chemistry research laboratory; Dr. Ernst H. Krause, director, research laboratories.

▪ ▪ ▪

Those receiving Ph.D., M.S. and B.S. degrees are invited to write for information regarding their role in advanced research and development at Lockheed Missile Systems Division. Your Placement Officer can also arrange an interview with members of the technical staff who will be on campus this coming spring.

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Volume 60 DECEMBER, 1955 Number 3

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WISCONSIN ENGINEER

The Student Engineer's Magazine

FOUNDED 1896

Articles

Features

In This Issue...

by Alan Black, e'58

NELSON G. STEINMAN

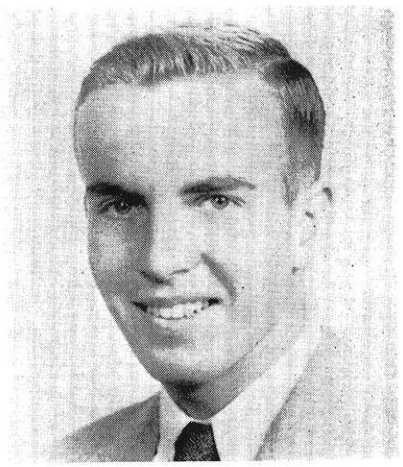
We've been hearing a great deal about the new "all weather" wonder motor oils. What we've heard has sounded good. But not even Duz really does do everything, and we've advertising claims always sound to good to be true. In short, this oil sounded like the greatest thing since slide rules, but we weren't sure. Fortunately we happened to read the copy of this month's Engineer and found a lot of answers in an article on all season high performance motor oils.

Nelson (Gerry) Steinman, the author, is a senior in Mechanical Engineering. He knows and likes his subject and the article shows it. It reads well and is timely. For anyone who has ever suffered the indecisive tortures of starting his car on cold winter mornings, it's a must.

RICHARD WHITE

Meet Dick White, the author of the article on soil cement. Dick is from Chetak and is a senior in Civil Engineering. He should be no stranger to Wisconsin Engineer readers. In addition to having contributed some fine articles in the past, Dick is a story editor on the magazine staff. As a matter of fact, Dick has had the unique job of first writing and then editing his article. When you read it I'm sure you'll agree that he has succeeded in both departments.

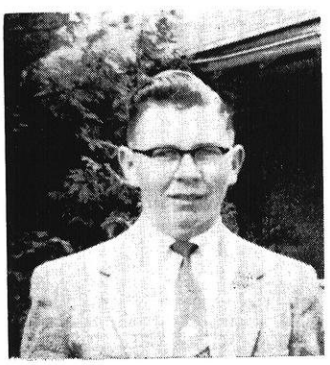
Dick's article is called "Soil Cement", and deals with a new-old method of making cheap and durable roads. The secret is to mix soil and cement. Basically that's all, but there is a story behind it that involves some drastic revision of old concepts about roadmaking. We hope you enjoy it as much as we did.



WILLIAM FOY

Almost everybody has heard the standard jokes about smog. It's a subject sure to get a laugh for any comedian. But it's becoming increasingly apparent that smog is more than a subject for a gag line. It's a new and increasingly serious problem; one of the unpleasant by-products of our industrial progress. But this is hardly more than a trite phrase and the answer to the problem is not in words.

Bill Foy, the author, makes his home right here in Madison. During the summer and in his spare time he has worked for the State Highway Commission. Had he not succumbed to the lure of the armed forced Bill would have been a Junior in Chemical Engineering this year.



DICK WHITE

New RCA Radar "Weather Eye" Sees Through Storms

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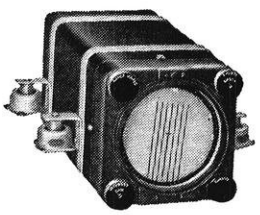
The leadership in electronic research that made the "Weather Eye" possible is inherent in all RCA products and services. And at the David Sarnoff Research Center of RCA, Princeton, N. J., scientists are continually at work to extend the frontiers of "Electronics for Living."



New RCA Weather Mapping Radar weighs under 125 pounds, takes little space in a plane.

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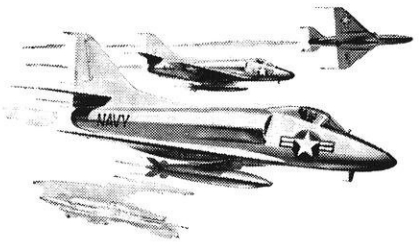
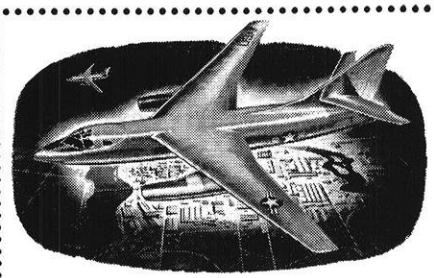
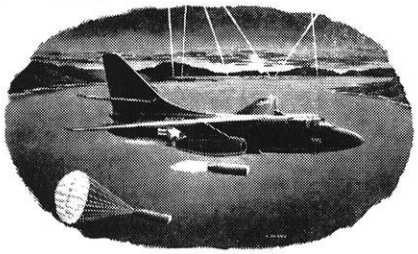


A4D, "SKYHAWK"— smallest, lightest atom-bomb carrier

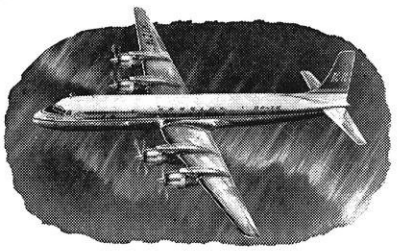


RB-66 — speedy, versatile jet bomber



A3D, "SKYWARRIOR"— largest carrier-based bomber

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



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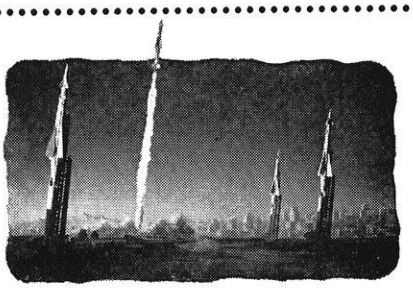
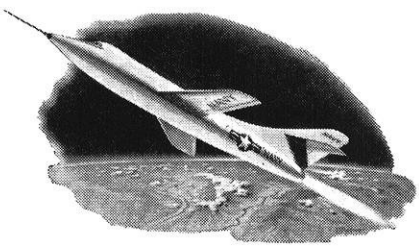


"NIKE"— supersonic missile selected to protect our cities



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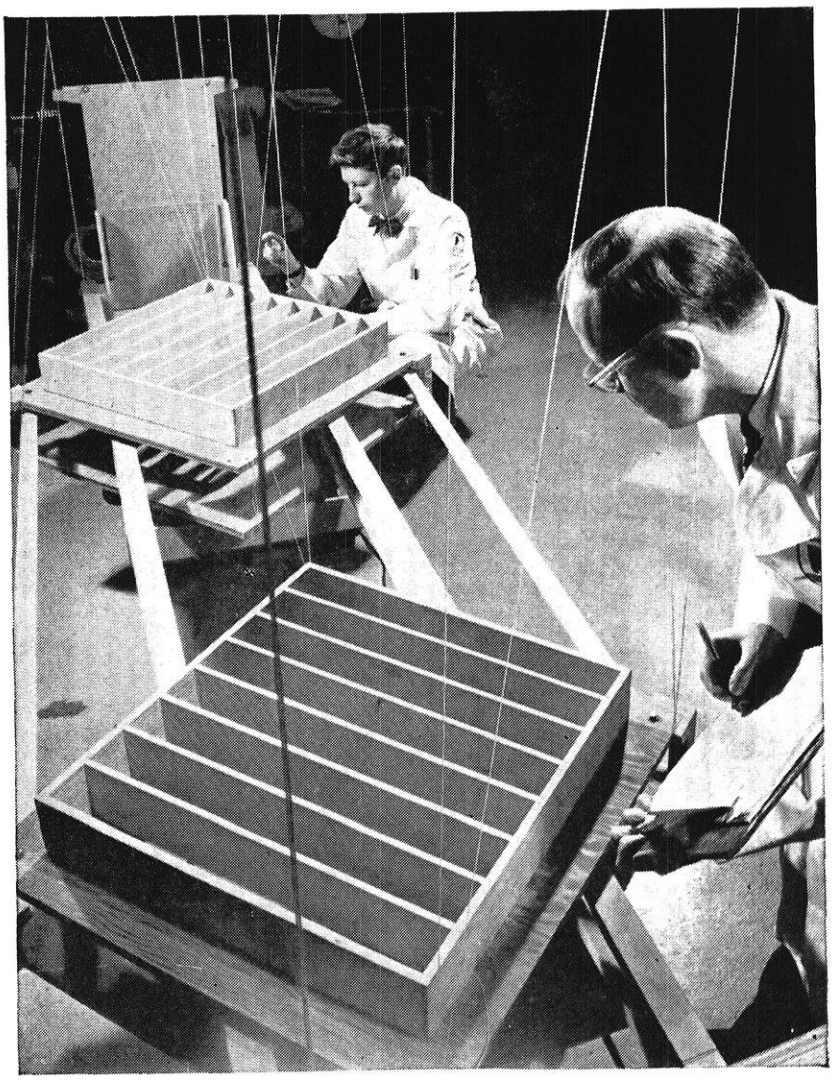

GM engineers in action

LOTS OF TIMES an engineer must interpret an ordinary problem in an unusual way to get the best results—as these General Motors engineers are doing.

So when a young engineering senior seeks to join GM's technical staff, the balance is weighed in his favor if he shows imagination, initiative, adaptability.

And that's true whether he happens to be a Chemical Engineer, Electrical Engineer, Mechanical Engineer, or whatever. For there's a broad range of opportunities where so many different products are made — automobiles, trucks, tanks, Turbo-Prop airplane engines, Diesels, earth-moving machines, home appliances—we can't hope to list them all here.

Yes, opportunity is the middle name of a company like GM, that operates 34 separate manufacturing divisions throughout the United States, and plants in 64 cities.

If you'd like to know more about plant locations, training programs, chances for advancement in GM, you'll enjoy reading a valuable 136-page handbook called, "*Job Opportunities in General Motors.*"

Why not ask to examine a copy in your school library or placement office, and then arrange an interview with our college representative soon as possible?

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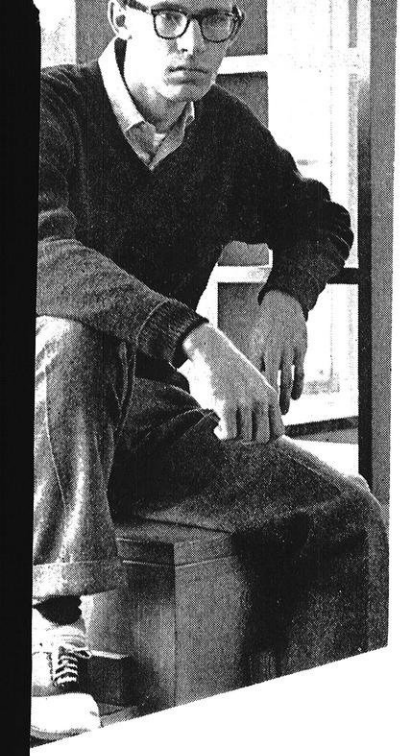


ONE MAN'S OPINION, BUT . . .

Marley was dead to begin with. There is no doubt about it. Poor Marley, he had become careless in approaching one of his automatic monsters, and as a result came out of the automatic assembly and packing line already packaged for the grave.

Scrooge knew Marley was dead. Of course he did, even if no one else even missed him. Scrooge and he had been partners for many years. Scrooge and Marley, Inc., Consulting Engineers, it still said on the door. Scrooge never painted out Marley's name—it remained as a grim reminder for Scrooge to stay clear of his automatic monstrosities after he had designed them.

Scrooge was a scientist, wrapped up in machines and scornful of mortal beings. In many ways Scrooge was a machine himself.

He was a one willed man always at the grindstone, Scrooge! A cold, hard man whose perpetual aim was to replace sentimental, weak, untrustworthy, undependable people with machines that did his bidding at the flick of a switch.

One day, the day before the workingman's last legal holiday of the year—Christmas—Scrooge sat at his drawing board where he could see his one assistant in the screen of his phonovision intercom system. Bob Cratchit, that was his name, stood before the huge electronic brain which he and Marley had designed and built these many years ago. Cratchit was busy punching the contents of encyclopedias onto the memory tape of this wonderful brain.

"Here," thought Scrooge, "is the brain that will take my place. All that remains is to design a designer—one that will even draw the blueprints and make scale models." He watched Cratchit's slow progress and wondered how long it would take for the brain to know everything. Cratchit had spent the last ten years filling the brain with memory tape that contained the coded contents of thousands of technical books, encyclopedias, dictionaries, atlases, et cetera, but the end was nowhere in sight.

"A merry Christmas, uncle," called a merry voice. It was Scrooge's nephew who had stolen into the room so quietly that his greeting was the first intimation Scrooge had of his presence.

"Bah," said Scrooge, "humbug!"

"Surely you don't mean to say Christmas is a humbug, uncle," said the nephew.

"I do," Scrooge replied, "Merry Christmas, indeed! Sentimental bosh!"

"Nevertheless," said the nephew, "you're invited to have dinner with us tomorrow. But this is no time to argue, I must run along, I just wanted to ask you to celebrate the holiday with us."

"Good afternoon."

"And a merry Christmas to you," the nephew said as he ducked out the deer.

"Bah!" said Scrooge, then added, "Humbug!"

A few hours later, after Cratchit had been dispatched and all the entrances were triple locked, Scrooge sat at his board again. As was usual with him, he drove himself until the small hours of the morning, utilizing his tremendous creative genius to design the greatest of his machines—the automatic designer.

Scrooge mused over his plans. Here, he thought, is the machine that will replace the bungling incompetence of people forever. He looked forward to the irony of the fact that this machine would even put an end to its own creator.

Later that night, just as the second hand of the clock on the wall showed midnight, Scrooge heard a horrible sound coming, it seemed, from the bowels of the building.

He jumped from his board and switched on the phonovision so that he could look into every nook and corner of the building. The sounds persisted, but Scrooge could see nothing amiss. Yet the horrible noises seemed to come from inside this very building.

"Humbug," said Scrooge, but it was a very weak "Humbug."

Suddenly the noise stopped. Then, much to Scrooge's horror, through the steel door, even though it was triple-locked, came—Scrooge gasped in amazement—came Marley, or his ghost.

"Who are you?"

"Ask me who I was," Marley replied.

"I'd say you were Marley except that I know I'm wrong?" Scrooge said.

"Aye, Marley, that was my name. Now I am nothing but a tortured soul not even good enough for hell. Beware, Scrooge, the same may happen to you."

"Why are you here?" Scrooge asked, by now somewhat concerned.

"Ebeneezer, I've come to warn you to mend your ways, to save you from the damnation that has befallen me. Ebeneezer, take heed to what I am going to tell you. It's not too late!"

"I am damned to spend my death doing what I should have done during my life. It is because you face the same fate that I come to show you what a folly this life of your is.

The Spirit of Christmas can't be denied—even by Ebeneezer Scrooge!

"During my life, I was a man of genius who wandered not from this building. My life was a world of machines—machines that I made with my own hands. Too late, after my own machine rebelled against me, I was made to realize that life should be a world of mercy, charity, benevolence. Ebeneezer, give up this world of machines and turn to the warmth of human love and kindness. Adopt the old-fashioned Christmas spirit. Let me show you what I mean . . ."

"Hum . . . ," Scrooge began, but he stopped short.

Suddenly, as Marley waved his arm, the scene changed. "There," he said, "is young Bob Cratchit, standing in line with other men—all wearing caps and gowns. Today, he is getting his degree in engineering. It should be a glad day, but all these men are sad. Do you remember why, Ebeneezer?"

"No, no I don't," Scrooge said.

"A year ago, Ebeneezer, you and I invented an automatic slide rule. That meant the elimination of 90 per cent of the jobs for engineers. What misery we caused, you and me! Cratchit was trained to operate a slide rule, but there is no need for such training anymore."

With another wave of Marley's hand the scene was changed to Bob Cratchit's apartment on Christmas eve. Marley spoke again, Scrooge remaining silent and thoughtful, "There is your clerk. After working for us and now you for over ten years, he cannot afford a prosperous Christmas, but notice he is making the best of it. We gave him a starting salary of $400 per month, Ebeneezer, and he has been given raises steadily. Yet he is still very poor.

"Why?" asked Marley, "because we have caused inflation. We invented so many automatic machines that produced so much so fast that soon the country was a great stockpile of surplus goods. Due to our inventions, these things were produced much faster than consumers were able to buy them. As a result the government issued more and more money so that people could afford to buy. This helped to eliminate the surplus at first, but the whole plan backfired until this country is in the midst of a Great Inflation. Money is worthless. People are starving because they can't use their money.

"Ebeneezer, we are responsible for this misery."

Another wave of the hand focused their attention upon Cratchit's young son, Tiny Tim, who was a cripple. "Another victim of our progress, Ebeneezer. When just a boy he was run over by an automatic sidewalk sweeper invented by you. He has never recovered and his father can't afford the proper medical attention because of the inflation."

"Will he die because of it," asked Scrooge in a guilty voice.

"We shall see."

A wide sweep of a hand brought them upon a graveyard scene. Looking closely at the tombstones Scrooge was able to pick out many familiar names, including Tiny Tim, Bob Cratchit, and even Scrooge himself. Suffering a slight relapse to his materialistic world, Scrooge asked, "Marley, before I die, am I able to complete my automatic creative mind and designer?

"You fool, Ebeneezer," cried Marley, "listen to what I'm telling you."

"I forgot," said Scrooge, once again realizing the misery he had helped to create. "But what about Tiny Tim?"

"Tiny Tim died soon after we saw him last, and Bob Cratchit, his heart broken, soon followed him."

"Poor boy," said Scrooge, quietly weeping for the first time in fifty years.

Another wave of Marley's hand brought them back to the workshop of Scrooge and Marley, Inc. "Here is your dream—your automatic thinker and designer.

"I will tell you this before I leave. You succeeded in designing and building this machine—and it worked. Cratchit had it loaded with all the available knowledge in the world so that it was by far the most brilliant mind anywhere.

"It was?" Scrooge asked, amazed.

"Yes," said Marley, "and displaying its genius, it produced human beings—happy human beings, full of warmth and kindness.

"Oh," was all Scrooge could muster.

"The future can be changed—it depends upon you, Ebeneezer Scrooge," Marley called and then faded and disappeared.

Marley was gone. Scrooge ran to the door only to find it still locked. He threw the switch which opened the door and looked outside. It was morning, and there were people in the streets.

Scrooge called to a small boy in the street, "Hey, hey you," he called, "is this still Christmas?"

"Sure, mister," said the boy, "all day."

"Good, good. Thank you . . . and a merry Christmas to you!" Scrooge called.

"I must go to visit my nephew. If the most brilliant mind anywhere decided that people were so wonderful, it must be right."

—R.A.H.

SOIL CEMENT

Not exactly new, but the use of dirt + cement + water to make soil-cement is coming into its own

by Richard White, c'56

In recent years much emphasis has been placed on the inadequacy of America's main highway system, and all of our leading magazines and newspapers have carried articles dealing with this nationwide problem (or should we say catastrophe?). Hundreds of millions of dollars have been spent for the construction of freeways, expressways, intricate interchanges, and for the right-of-way that these projects were built on. These high speed and heavy volume routes are certainly needed and many more must be built before our highway system becomes capable of safely handling the ever increasing loads being placed on it. However, it must be remembered that millions of Americans never get the opportunity to use our super highways and are entirely dependent upon the side roads, county trunk roads, and minor highways for their transportation needs. With the main highway arteries consuming a major percentage of the construction dollar, the lighter traffic roads must get along on a much reduced expenditure per mile. Adding to this difficulty is the fact that the light traffic roads cover many times the mileage of the main arteries.

Thus it is seen necessary to be as thrifty as possible in the construction and maintenance of the lower type roads. One way of doing this is to simply place a layer of gravel on a roadbed constructed of in-place material and grade it occasionally with a motor grader. But, this type of road is no longer satisfactory to the majority of America's rural population. With their standard of living at a near level with their urban cousins, they are demanding roads that will stay smooth and hard throughout the year, regardless of weather conditions, and be capable of withstanding the hard, high-speed travel of modern automobiles and agricultural produce trucks. We are indeed fortunate that some far-sighted highway engineers, realizing that an economical type of light travel roadway was of prime concern, started some practical experimenting with a material called soil-cement as a low cost road building material about twenty years ago. Today we have the many thousands of miles of soil-cement roads and streets and it is a certainty that only a good start has been made in this rapidly expanding method of road construction.

What Is Soil-Cement?

To the laymen, soil-cement is merely a mixture of dirt and Portland cement. A little more technically, it is an intimate mixture of pulverized soil with measured amounts of Portland cement and water, compacted to a high density. As the cement hydrates, it forms a hard, durable, semi-rigid paving material. One of its several economic advantages is the fact that almost any type of soil can be utilized in making soil-

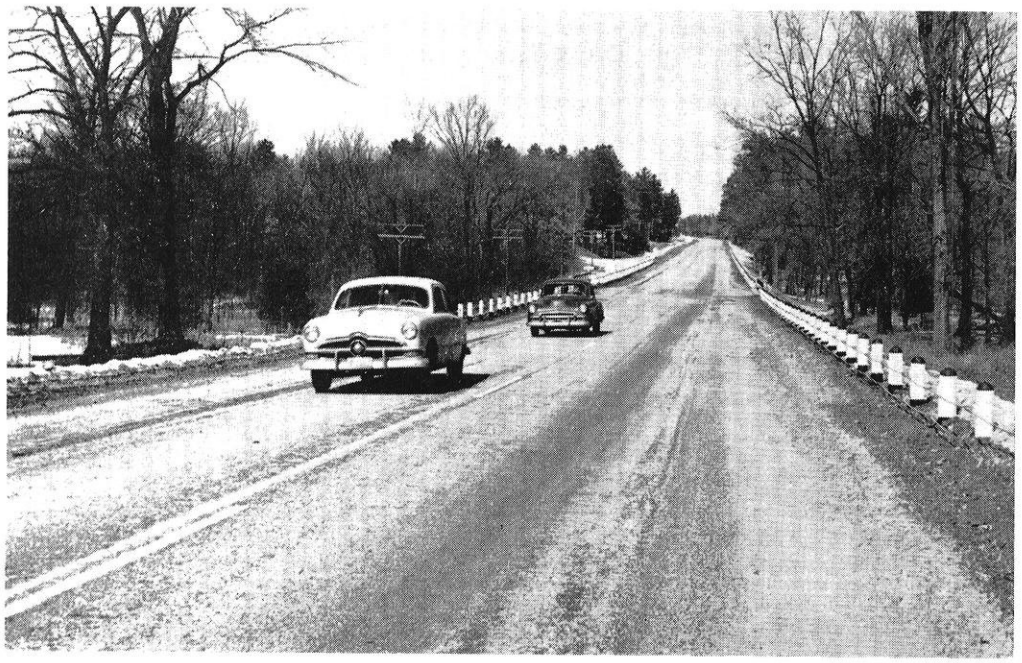


Fig. 1.—This soil-cement road, Route 13 in Adams County, Wis., was one of the first built in the Midwest. It is still giving good service after nearly 20 years of use. Samples of the pavement taken in 1954 tested 2,800 psi compressive strength, nearly five times the 640 psi strength of 7-day specimens taken when the road was built.

—Photo Courtesy Portland Cement Ass'n.

cement, including sand, gravel, all types of silt and clay soils, cinders, granulated slag, waste products from aggregate production, or any mixture of the above and other materials. There are certain types of clays that are not economically feasible as the necessary cement content would be too high, but they are the exception rather than the rule. Thus it is usually possible to use the soil in the road bed or street for the soil-cement and a great saving in buying and hauling aggregate is realized. The only costs are those of the cement and the construction processes.

The amount of cement used varies widely with the characteristics of the particular soil involved. Ordinary sandy soils require 7 to 12% by volume of cement while clayish and silty soils require 12 to 14%. A good round figure to use for a typical soil is 10% cement by volume.

Soil-cement, before being compacted, closely resembles the parent soil it was blended from. After compaction and hardening, however, all resemblance stops. The soil-cement is much more water resistant than ordinary soil; it is tough, semi-rigid, and capable of carrying traffic loads over short unsupported spans if the base or shoulder should get washed out during a heavy storm. It transmits wheel loads to the sub-grade over a much wider area, thus reducing the stresses introduced into the usually weak sub-grade soil. After becoming acquainted with these physical properties many people are under the impression that soil-cement is just another type of concrete. This is a false impression as its compressive strength and modulus of elasticity are usually appreciably lower than the values reached in regular Portland cement concrete. Soil-cement is intended primarily for the construction of light-traffic pavement, but with recent advances in design procedure, it is being built in some areas for main highways.

There are a few limitations on soil being used in soil-cement construction; therefore the in-place soil is tested for size of particles and physical properties. Since most of the strength and durability of soil-cement comes from material finer than 3/16 inch diameter particles, many specifications require about 50% of the soil be smaller than this size. The fine material, after being mixed with the cement, forms the body that holds the coarse aggregate together. In the other end of the gradation scale, the usual maximum size is 3 inches, which makes an extremely wide variety of soils permissible for use in soil-cement.

Construction of Soil-Cement

Constructing soil-cement streets and roads is a relatively simple operation consisting of several steps. (See fig. 2 & 3). First, the soil to be used must be thoroughly pulverized into small particles. This process becomes increasingly difficult as the clay or colloid content goes up, but with suitable equipment and a proper moisture content in the soil, it can be accomplished quite easily. The next step is the uniform distribution of cement, either by placing bags of cement

—Photo Courtesy Portland Cement Ass'n.

Fig. 2.—Three operations can be seen in this picture of soil-cement construction on a 12-mile section of SR–81 in Arkansas. On the left, a grader is shaping the surface for final compaction. In the center, a sheepsfoot roller is giving initial compaction to the soil-cement mixture. On the right, a rotary mixer is making a final mixing pass before compaction.

in a calculated spacing or by spreading with bulk cement trucks. The latter method is used almost exclusively on the larger paving projects. This cement is then thoroughly mixed with the soil, and a carefully controlled amount of water is added and mixed with the soil and cement. Both the cement and water contents must be determined accurately by laboratory tests and then controlled to the necessary amounts in the field if a strong soil-cement is to be achieved. Equally important is the compaction of the mix. From laboratory tests the optimum density can be computed; by using pneumatic-tired and sheepsfoot rollers the mixture is compacted until this density is reached. A 5 to 8 inch thickness of compacted slab is used on most roads and streets.

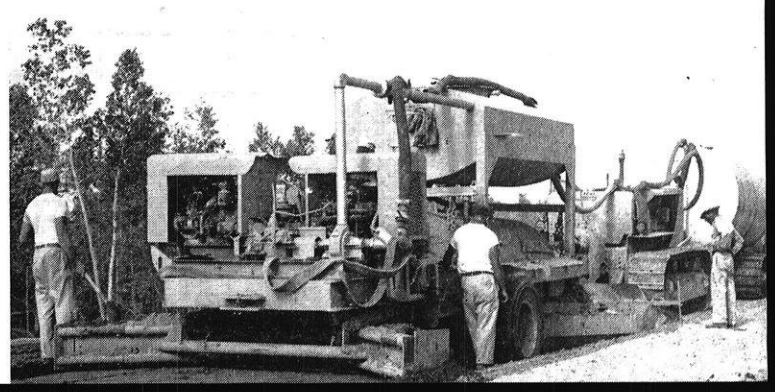
The hardening action in soil-cement is identical to the hydration action of Portland cement in regular concrete. In order to insure a complete hydration reaction (actually this reaction continues indefinitely, but is close to complete after several weeks), soil-cement is kept moist for a period of at least seven days by covering with moist burlap or dirt, a curing membrane, or a bituminous material.

The final step for most roads and streets is the addi-

(Continued on page 52)

Fig. 3.—Single-pass mixer at work on a 21.5-mile soil-cement paving job in Jackson County, Wis. This machine picks up soil and cement, adds the proper amount of water, and mixes the material to a uniform consistency.

—Photo Courtesy Portland Cement Ass'n.



Year Long Lubrication with All-Season Motor Oil

by Nelson G. Steinmann, m'56

Now you won't have to worry about fall and spring oil changes. Also, with this new oil come better lubricating properties.

The new all-season high performance oil is a recent development in lubricating oil that is completely different from any previous type. It is such a great improvement over present lubricating oils that some of its qualities are difficult to believe after these many years of slowly improving motor oils.

Present oils require a changeover in the winter to a lower viscosity type which permits easier starting in cold weather. The all-season oil eliminates this changeover, and the same grade may be used the year around. The properties of this new oil insure good service under all types of conditions, long engine life with maximum mileage between overhauls, mininum consumption of fuel and oil, and easy starting in cold weather. The oil accomplishes this by lubricating all sliding surfaces, thus preventing wear, and by preventing formation of solid carbon, lacquer, and sludge, which have an abrasive and clogging action in the engine.

Let's look at some oil properties and see how the all-season oil has improved them. What part does viscosity play in lubricating? The viscosity of an oil is its ability to resist shear stress. This property gives oil the ability to stay between two moving surfaces and not be squeezed or pulled out when they slide past each other. On the other hand, the viscosity also has a dragging effect when two surfaces slide past one another. This friction, caused by oil viscosity, uses a large portion of an engine's power. Lowering the viscosity will decrease this loss, but if made too low the oil no longer maintains its lubricating properties. Oil viscosity decreases rapidly with increasing tempera-

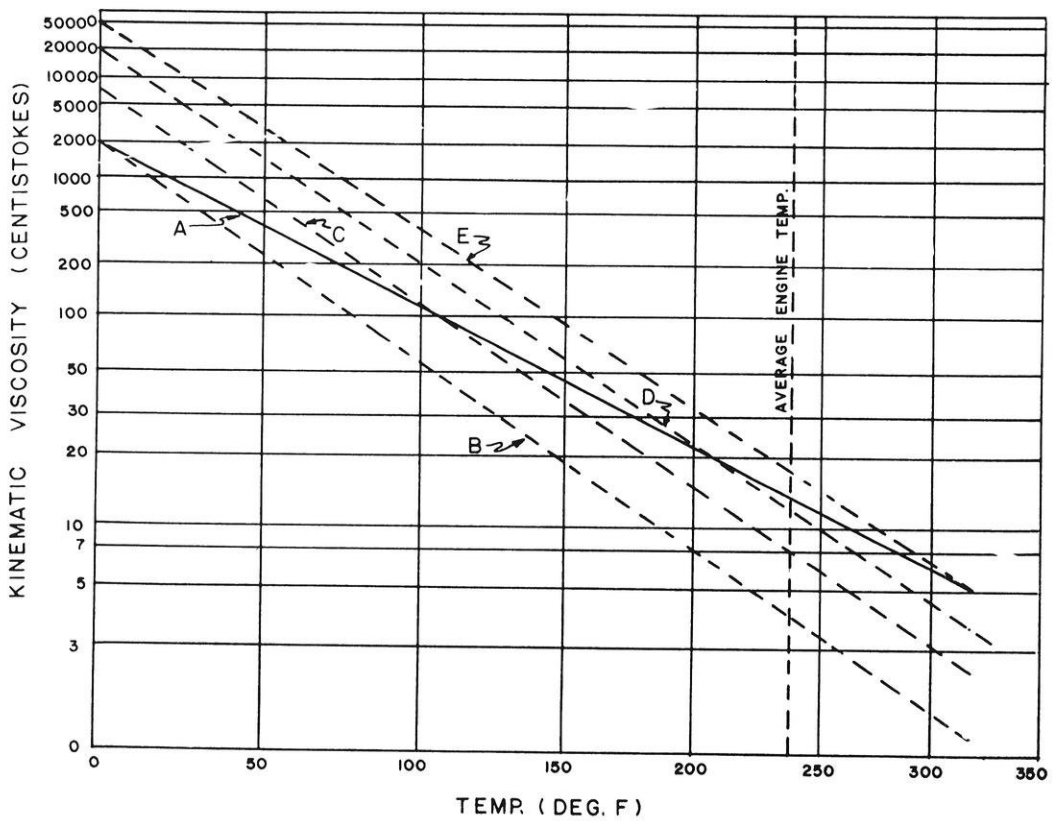
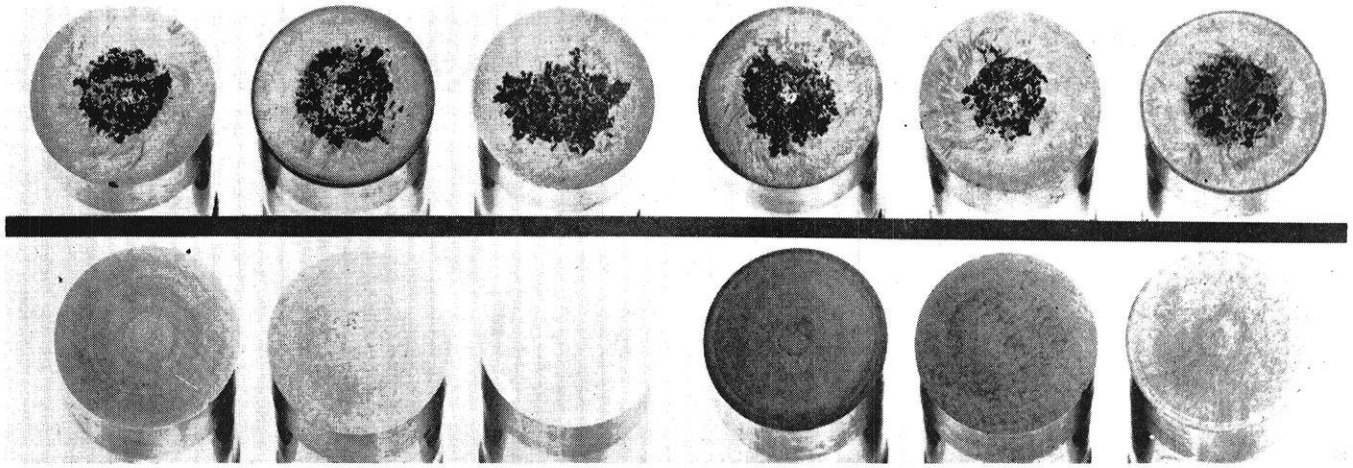


Fig. 1.

A. All season oil
B. SAE–10W
C. SAE–20W
D. SAE–30
E. SAE–40



—Photo Courtesy Pure Oil Company

Comparative accelerated wear tests on valve lifters reveal the striking difference between the lubricating properties of regular oil (top) and the new all-season oil (bottom).

tures; therefore we must produce an oil that operates best at the running temperature inside the engine itself. From this we see the ideal oil should have a sufficiently high viscosity at running temperature to lubricate all surfaces and a viscosity as low as possible to insure easy starting and good circulation during the warm up period.

Characteristics of the standard grade oil allow the use of SAE-10W in the winter time, for even with its low viscosity, which permits easier starting in cold weather, the engine does not reach the high working temperatures of summer operation. This permits use of slightly lower viscosity oil in the winter months. SAE–30 is a better summer oil for it has the higher viscosity needed for higher engine operating temperatures.

The all-season oil has different viscosity characteristics which make it far superior to standard oils. From figure 1, it can be seen that it not only has a low starting viscosity at low temperatures, but a high viscosity at high engine temperatures. Comparison with standard oils shows it has the properties of SAE-10W at low temperatures and properties of SAE–30 at high temperatures. Important factors in cold starting, from the standpoint of the automobile, are low torque to turn over the engine, a fast starting rpm, and less strain on the battery. All-season oil improves these factors immensely.

Fuel savings are of great concern to the average motorist. He will definitely get them by using all-season oil, but the total savings will vary with the type of operation the engine is subjected to. Large savings will be obtained by the engine that is used for short periods of time, where the engine does not have time to reach warm-up conditions. This is a decided advantage to the motorist who travels short distances, and there are millions of American drivers who fall in this category. Comparatively small savings are gained after warm-up is reached. Comparative data from extensive fleet tests is shown in Table 1 and represents all types of vehicles. Engine age was also considered by using engines which had been driven from 500 to 40,000 miles for test purposes.

Anti-wear properties are another important feature in the performance of a lubricating oil. Wear in an automobile engine is caused by:

1. Oil starvation at start-up.
2. Corrosion from acids in the products of combustion.
3. Abrasion from foreign matter reaching the engine through the air intake, crankcase breather, or with the lubricating oil.
4. Rupture of the oil film at high temperatures with low viscosity oils.
5. Indirect effects resulting from the presence of deposits.

Oil starvation at start-up is the condition that causes most engine wear to take place. Since the majority of auto engines undergo the operating conditions of a short running period, this is a very important lubricating problem. Oil starvation is curtailed with all-season oil by the viscosity and film strength properties. The oil's low viscosity at low temperatures permits the oil pump to supply oil to the moving parts immediately after starting the engine. The film strength keeps the film of oil already on the parts from breaking down until fresh oil is supplied.

The wear rate in an engine at start-up is known to be high, but not until recently has it been possible to find out the exact reason for this. With the introduction of radio-active piston rings, a close study of wear properties in a piston engine has been made. From the study it was concluded that wear at start-up is due to corrosion that takes place while an engine is not running. After shut-down, condensates from combustion gases deposit on the cylinder walls. This condensate is acidic and it attacks the cylinder walls and rings. Therefore, upon start-up, both metal from corrosion and metal from the grinding action of the corrosive material are worn off the piston, rings and

(Continued on next page)

wall. These harmful characteristics are almost entirely eliminated by the new additives in all-season oil. The test data for standard grade oils and all-season oil showing wear rates are given in figures 2 and 3. From these curves we see that all-season oil has a better wear rate at running conditions than the heavy duty grade oil, but it does not have the high wear rate at start-up that standard oils have. This is due to superior viscosity characteristics and the new additives of all-season motor oil. They substantially reduce corrosion and allow immediate oil flow after starting. Also, the daily run curve shows that the cumulative wear that takes place with start-up and shut-down is negligible with all-season oil, and that it remains constant at all times with no acceleration during warm-up periods as with standard grades.

The ability of a lubricating oil to maintain engine cleanliness is also important. Properties of oils that affect cleanliness are:

1. the stability of the oil itself.
2. the ability of the oil to prevent combustion chamber deposits.
3. the ability of the oil to keep in suspension carbon and foreign materials for filtration.
4. the prevention of sludge formation by the oil.

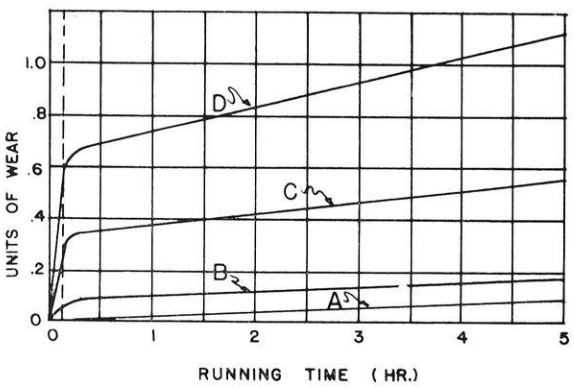
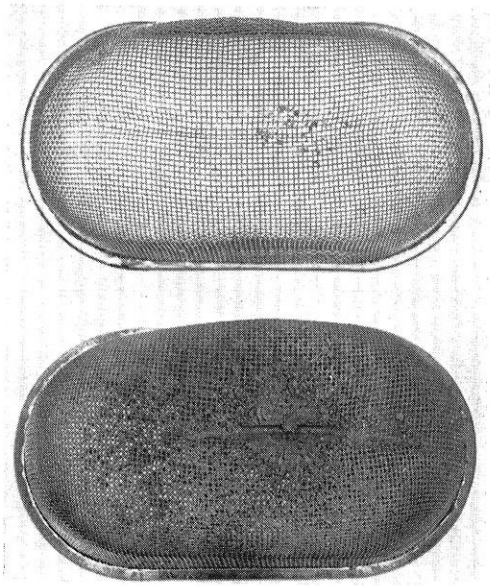


Fig. 2.

A. All-season oil
B. SAE–30 Heavy Duty
C. SAE–30 Premium
D. SAE–30 Regular



—Photo Courtesy Cities Service Oil Co.

Oil pump screens after test runs using all-season oil (upper screen) and regular oil (lower screen).

Stability of a lubricating oil is determined by the proper selection of the best crude oils and the type of refinement they undergo. Additives may improve poor oils, but for good quality only refinement of top quality crudes will suffice.

Combustion chamber deposits may be controlled by careful selection of a basic distillate oil of narrow boiling range, rather than mixing light and heavy types to obtain a certain viscosity. They are also influenced by weak additives that break down in the combination chamber. However, certain types of additives reduce combustion deposits by keeping them in a powdered form so they may be blown out the exhaust ports.

Piston deposits are largely controllable by the use of good detergents which prevent the formation of carbon and lacquers. These solids clog the ring slots, thus preventing free movement of the rings. Sticky rings in turn increase blow-by, which chars the piston wall oil film. They also form grinding compounds that increase wear. Layers of these solids on the piston prevent heat transfer to cylinder walls which increases

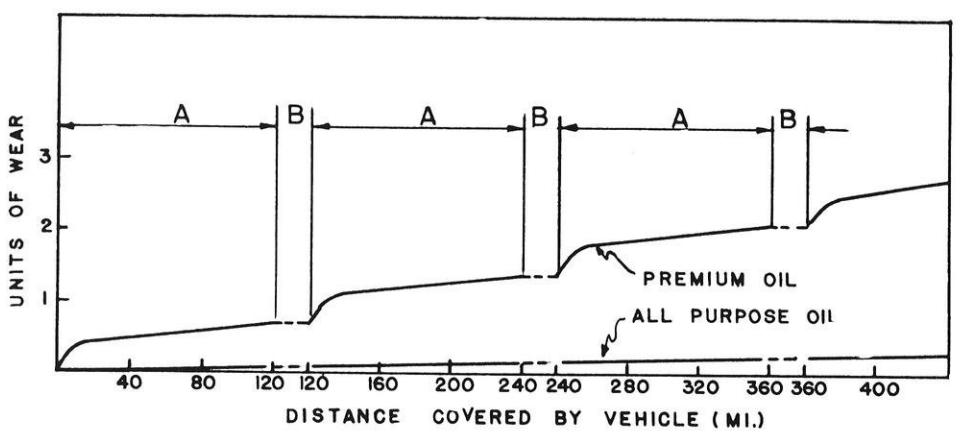
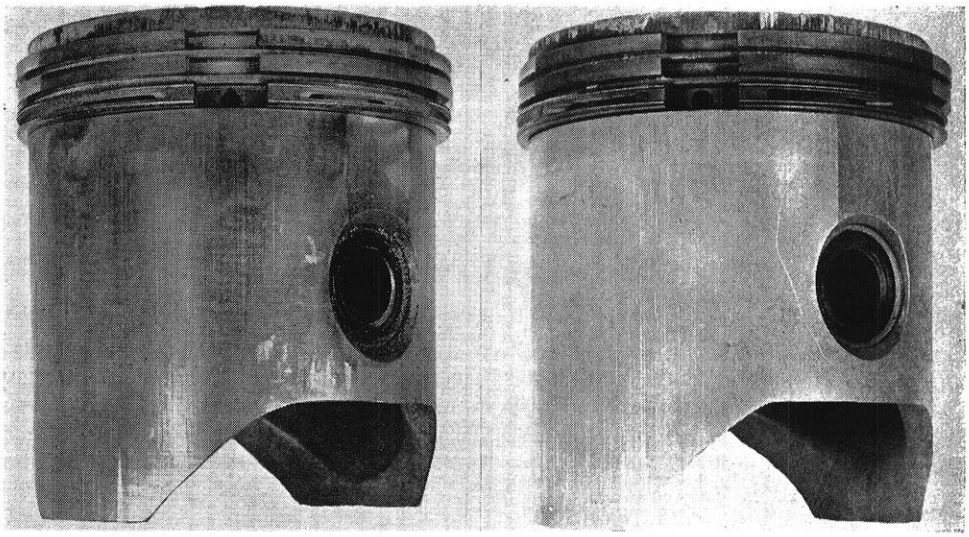


Fig. 3.

A. Daily running
B. Engine stopped overnight



Using all-season oil in a test engine showed it maintained a cleaner piston (right) than one used in another engine using regular oil under the same conditions.

—Photo Courtesy Cities Service Oil Co.

piston temperatures. The above illustration shows that the all-season oil has licked these problems by maintaining a clean piston throughout all test runs.

The remaining engine cleanliness factor of an oil is the ability to prevent sludge formation. Sludge results from the combination of solid particles of partially burned fuel, water, and break-down products of the oil. It is a pasty material that corrodes metal, wears bearings, and tends to choke up the entire lubrication system. To overcome the problem, an oil must have good dispersant properties, and it must not break down under running conditions. In the all-season oil these qualities are obtained by selecting good lubricating oils, detergents and anti-acid additives.

The unique viscosity characteristics of this oil provide better gas and oil economy, easier starting, longer battery life, and a reduction in engine wear. These achievements were largely brought about by the anti-wear detergent and anti-oxidant additives that were added to the oil, the final result being a much smaller overall operation cost for the motorist.

The superior qualities of all-season high performance oil are attributed to proper selection of base materials and well balanced portions of the proper additives. This leads to an oil with lubricating properties over a wide range of operating conditions that are superior to those of any other oil on the market today.

Although this oil is a great improvement over present oils, it is by no means a permanent oil in your crankcase. It does have longer life than most present motor oils, but it must be changed at regular intervals if full benefits are to be obtained from it. END

Factory testing of "U.S." electrical wires and

In Cable Testing, Part I (No. 9 in the series) this subject was outlined in a general way and Factory Tests on Entire Lengths were discussed in somewhat greater detail. Part II concludes this subject and discusses (in some detail) sample and miscellaneous tests made at the factory and tests after installation.

SAMPLE TESTS

These tests, as the name indicates, are made on short samples selected at any stage during manufacture or from the completed cable.

CONDUCTOR TESTS. Dimensional tests, tensile strength, elongation and quality of coating tests are made on the conductor to insure that the processing operations have been performed properly and that the conductor will meet the specification requirements.

INSULATION AND JACKET THICKNESS. The minimum and average thickness of insulations and jackets are determined by suitable micrometers or micrometer microscopes to determine compliance with the thickness requirements.

PHYSICAL TESTS. These tests determine the tensile strength, elongation, tensile stress and set of rubber and rubber-like or thermoplastic insulation and jacket compounds. Tensile strength and elongation are measured at the breaking point. Tensile strength in pounds per square inch is calculated from the cross-sectional area of the original test specimen. Elongation is expressed in per cent of the unstretched length. Tensile stress is the tension in pounds per square inch required to elongate a sample a given amount, usually 200 per cent. Set is a measure of the recovery after a specified elongation.

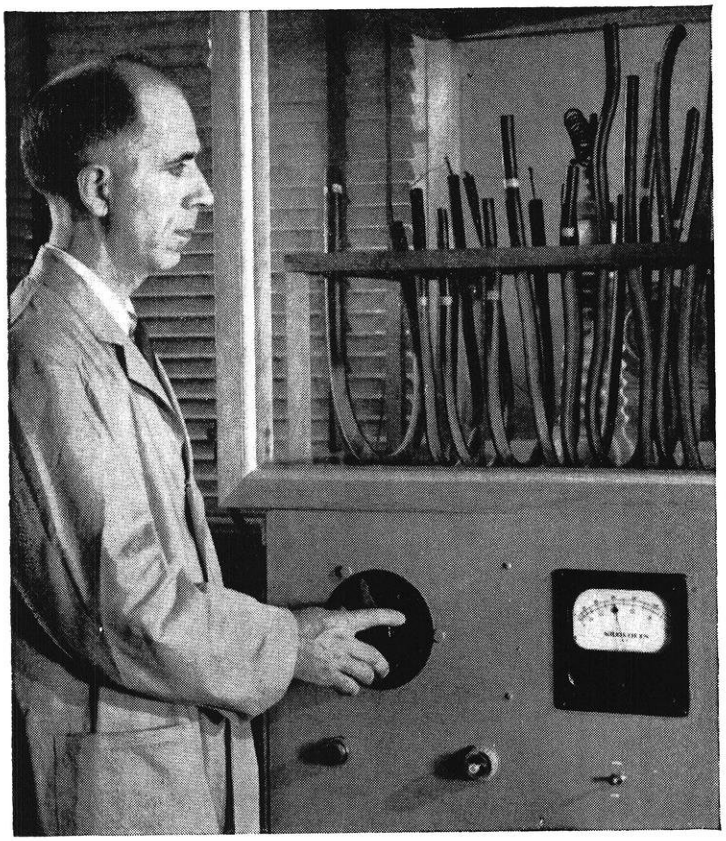
AGING TESTS. These are accelerated tests in which the effect of heat and/or increased oxygen concentration on the tensile strength and elongation of insulations and jackets is determined. The results of such tests indicate the temperature (conductor temperature) at which such insulations or jackets will operate continuously and their life-expectancy at higher temperatures. For example, an insulation that shows not more than 25 per cent depreciation in tensile strength and elongation after 96 hours in the oxygen bomb at 70° C is suitable for continuous operation at 60° C while an insulation that shows not more than 25 per cent depreciation in these characteristics after 168 hours in the oxygen bomb at 80° C is suitable for operation at 75° C.

Electrical tests, such as voltage breakdown, insulation resistance, power factor, etc., are frequently made during the development of insulating compounds to determine the effect of such aging on these properties. Such tests, however, are generally not covered by industry specifications.

MOISTURE ABSORPTION. The effect of moisture on the properties of insulations is important, particularly where they are exposed directly to water in service. Moisture absorption is determined by the gravimetric method and by the electrical method. In the gravimetric method a suitable sample is weighed, immersed in distilled water for 7 days at 70° C and reweighed. The gain in weight is expressed in milligrams per square inch of exposed surface. In the electrical method, the sample is immersed in water at 50° C and its capacitance is determined after one, seven, and fourteen days. The increases in capacitance from the first to the fourteenth and the seventh to the fourteenth days are a measure of moisture absorbed.

US RUBBER

cables–Part 2 *(plus tests after installation)*



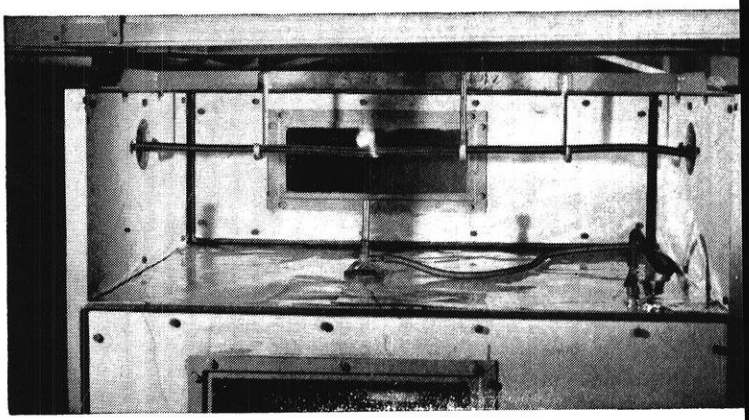
OZONE RESISTANCE. To determine the effect of ozone on insulations or jackets, a sample is bent around a mandrel of such diameter that the material under test is stretched about 15 per cent and then exposed to an atmosphere containing ozone at room temperature. One of two concentrations of ozone, namely 0.013 or .027 per cent is used, depending on the type of insulation. Acceptable insulations must withstand such exposure for a specified time without cracking. Ozone resistance is generally required only on those compounds designed for operation at above 5001 volts.

CAPACITY AND POWER FACTOR. The dielectric constant and power factor are important characteristics of insulations designed for use on high-voltage power circuits or on most communication circuits since they are a measure of the energy absorbed by such insulations. The dielectric constant is calculated from capacity measurements on a sample of known dimensions. For high-voltage cables, these measurements are made at the operating voltage of the cable at a frequency of 60 cycles after immersion in water for 24 hours. For communication cables, the measurements are generally made at 1000 cycles with about 20 volts applied to the insulation.

DIELECTRIC STRENGTH TEST. Samples of insulated cables designed for operation at voltages above 5001 volts are required to withstand for five minutes the application of a voltage twice the factory test voltage after immersion in water for at least one hour. Following this test, the voltage on the sample is increased 20 per cent and held for five minutes. This cycle is repeated until breakdown occurs and the breakdown voltage recorded for information only.

COLD BENDING AND LONG-TIME DIELECTRIC STRENGTH. Samples of cables designed for operation at voltages above 5001 are required to withstand bending at −10° C around a mandrel approximately ten times the cable diameter followed by the application of the factory test voltage for two hours. This test insures that the insulation and jacket have the required flexibility to withstand bending during installation.

MISCELLANEOUS TESTS. Numerous additional tests are required by specifications for wires and cables to determine their suitability for their particular applications. The more important of these include, abrasion, compression, cutting, low-temperature, tear and weathering tests on insulation and jacket compounds, and abrasion, bending, compression, flame and twist tests on completed cables. The results of such tests are of great value in the design of new types of wires and cables.



TESTS AFTER INSTALLATION

Wire and cable industry practice permits the application of an a-c voltage equal to 80 per cent of the factory test voltage for five minutes to metallic-armored, lead-sheathed or shielded cables immediately after installation. For proof-testing 75 per cent of the factory test voltage may be used. When a d-c test is used, its value for ozone-resistance insulation is three times the a-c value.

To obtain reprints of this advertisement, write Electrical Wire & Cable Department, Rockefeller Center, New York 20, N. Y.

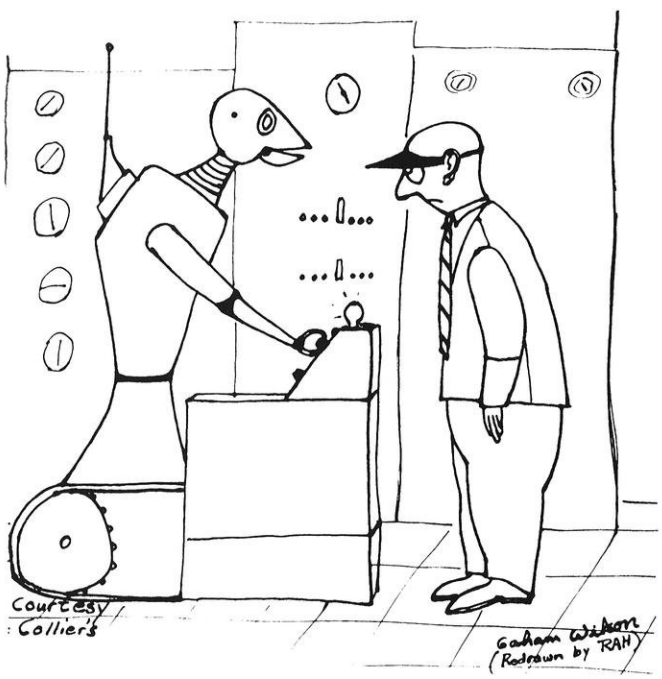
ELECTRICAL WIRE AND CABLE DEPARTMENT

United States Rubber

What? AUTOMATION a *Monster?*

by Don Edwards, m'56

This Is the Second of Two Articles on Automation and Its Effects Upon Society. It Would Seem that the Major Problem Stemming from Automation Will Not Be Unemployment, But What We Do with Our Leisure Time



"You've been with us a long time, Smith . . ."
THE ULTIMATE IN AUTOMATION!

Since automation means that machines will do jobs which men used to do, does this mean that automation will cause wide-spread unemployment? This has been a question asked since the very beginning of the Industrial Revolution when machines started to do man's work for him.

In 1661, when a loom was set up in Danzig to weave from four to six webs at once, the authorities suppressed it because it hurt the poor, who took heart, seized the inventor and drowned him in a nearby creek.

One hundred and fifty years ago, in Nottinghamshire, England, the hand-knitters broke into the mills at night with sledge hammers to destroy Cartwright's new power loom and Crompton's spinning mule.

Karl Marx described machines as the soul of capitalistic exploitation.

An 1830 propaganda cartoon shows all the dire disasters to be expected from the introduction of steam power in factories. It even went so far as to recommend that mothers bear no more children since steam would take away any possibility of jobs for them.

In the 1930's, the technocrats blamed science and invention for the unemployment in America. They were against any more technological progress.

It all adds up to the fact that fear of technological unemployment is nothing new under the sun. Do the facts support this fear, however? It would seem that they *do not*. In the period from 1850 to 1953, the population has increased seven fold while the number of workers has increased nine fold. During the same period, production has increased 25 times due to an increase in mechanization from 6 to 94 per cent. During the past 15 years, a period of rapidly increasing mechanization, the population has jumped 22 per cent, while the number of jobs has grown by 35 per cent. In the field of manufacturing itself, where mechanization has increased most rapidly, employment has gone up 73 per cent.

It would seem, then, that the rapid increase in employment has occurred chiefly because of mechanization, not in spite of it. Mechanization has increased the productivity of each worker with the result that he is paid more for his labors. With his increased earnings, he can buy more goods and services than before and thereby help to create jobs for his brothers who may have suffered temporary technological unemployment. It is likely that automation, which is just a new phase of mechanization, will actually accelerate the creation of new jobs.

It is interesting to see that leaders of both labor and management agree that mechanization or automation do not, in the long-run, cause unemployment. Phil Murray once said: "I do not know of a single, solitary instance where a great technological gain has taken place in the United States of America that it has actually thrown people out of work. I do not know of it, I am not aware of it, because the industrial revolution that has taken place in the United States in the past 25

years has brought into the employment field an additional 20 million people." United States Steel's Benjamin Fairless put it more strongly: "Automation has become a menacing word—a kind of modern bogeyman with which to frighten our people. The time has come to nail this vicious propaganda for the miserable fraud that it is. The facts show that only through the widest possible use of new and better machines can we hope to achieve the fullest measure of employment and a higher standard of living."

Automation's most important impact will be on the *functions* and *qualifications* of employees, not on employment. There may be no workers on the floor of tomorrows factory, but large numbers will be needed behind the scenes in new highly skilled jobs.

The trend in employment has been toward more highly skilled jobs as mechanization has increased. According to U. S. Department of Labor statistics, in the last 25 years the total number employed in industry has increased almost 50 per cent. But the total in unskilled jobs has been reduced from six million in 1930 to a little over half that today.

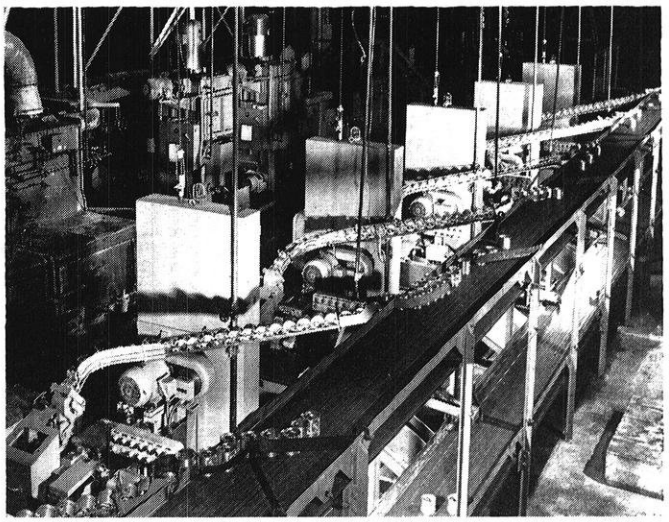
Automation will upgrade the semi-skilled machine operator of today into a highly skilled and knowledgeable technician. The new jobs behind the scenes of tomorrow's automatic factory will be machine builders, machine installers, repair and maintenance men, controllers of machinery and its performance, and programmers to prepare information and feed it into the machine. Large numbers of machine designers, draftsmen, systems engineers, and mathematicians will also be needed. Many will be needed for new managerial jobs requiring a high ability to think, to analyze, to make decisions, and to assume risks.

The need for highly trained personnel will be so great that the 8 or 10 million college graduates we can expect in 15 years will barely be sufficient. One large manufacturing concern now employing 150,000 hires 300 college graduates annually. Once it is automated, they will need 7000 college graduates a year, just to keep going. This will no doubt place much responsibility for training and education on industry, lest there be a serious shortage of qualified personnel to operate an automated economy.

The really serious problem then is not unemployment, but the need to upgrade whole segments of the population in a short time.

Everyone has become increasingly aware that organized labor is having much to say about automation. Many writers in the management camp seem to feel that labor is "against automation". This is not necessarily true, however. Actually labor is trying to protect itself against injustices it feels are apt to grow out of the swing to automation. Walter Reuther, President of UAW, said "We don't want to smash the automation machinery. But UAW intends to see that it works for the benefit of both labor and management."

Labor sees certain problems which will spring from the need to upgrade labor, and from the increased productivity which automation promises. It will be difficult to upgrade those workers whose mental capacities are definitely limited. Older workers may find their employers would rather not retrain them for more skilled jobs. The employer may feel that he would scarcely get a full return on his training investment if the employee will soon be too old to work. Relocation of industrial plants during the process of automating may cause sudden unemployment in one area. Workers may find that their employer is unwilling to retrain them when switching to automation. He may prefer to employ ready-trained personnel if he can get them. The employer may not be willing to share the increased profits that automation will make possible through lowering the unit cost of the product.

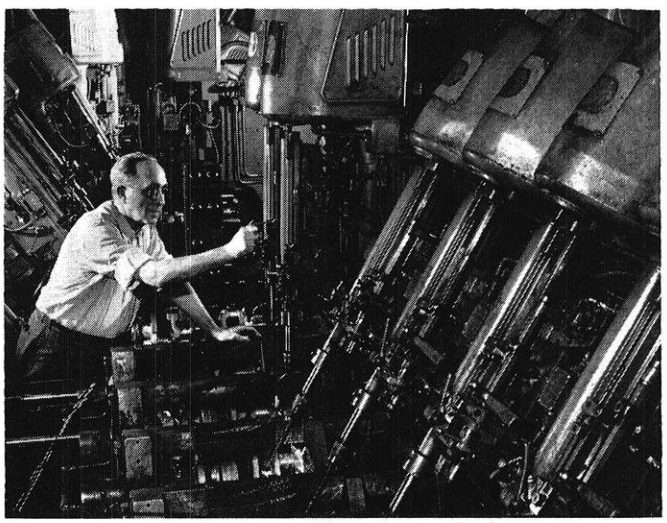


—Photo Courtesy Ford Motor Company

Many individual jobs have been eliminated by use of automatic equipment to machine automobile pistons. Will this result in widespread unemployment? If not, what happens to workers who have been replaced by automation?

Guaranteed Annual Wage (GAW) is UAW's cure-all for most of the ills that automation will bring on. The

(Continued on page 48)



—Photo Courtesy Ford Motor Company

Special purpose machines like this fully automatic machine, which drills the entire oil system in an automobile crankshaft in one continuous operation, eliminates many jobs, but it creates jobs for service- and repair-men who must watch the intricate mechanisms closely.

—Photo Courtesy Air Pollution Foundation

Los Angeles City Hall, left background, rises above other buildings in the smog-shrouded Civic Center.

SMOG – Is it Only a California Problem?

SCIENTISTS THINK THE HAZARD EXTENDS TO ANY HIGHLY INDUSTRIALIZED AREA

by William Foy, ChE'2

What is smog? The first and largely accepted definition of smog is smoke mixed with fog. This definition of smog is not entirely valid, however, since smog is often produced in the laboratory in smokeless areas. Scientists are not sure exactly what smog is, but they agree on the broad definition that smog is the pollution of air by hydrocarbons, oxidants and smoke, characterized by a visible haze.

What causes smog? Smog conditions, are most often caused by incomplete combustion of coal and petroleum products, hydrocarbon evaporation, metal fumes, and household trash burning. Along with these causes, which are fairly old, comes a comparatively new cause. This is radioactive contamination of the air.

These, then are the chief offenders in causing smog. Each of these smog producers is introduced in a different way. Factories which burn coal with insufficient draft are inviting the production of the deadly poisonous carbon monoxide, the nuisance of unburned carbon particles, and the introduction of sulfur and nitrogen

oxides into the atmosphere. Incomplete combustion of petroleum products in industry and in automobiles unleashes a flood of smog producing materials similar to those mentioned for coal. Evaporation of hydrocarbons occurs at petroleum refineries and again in autos. The householder contributes his share to smog by burning trash in his back yard incinerator.

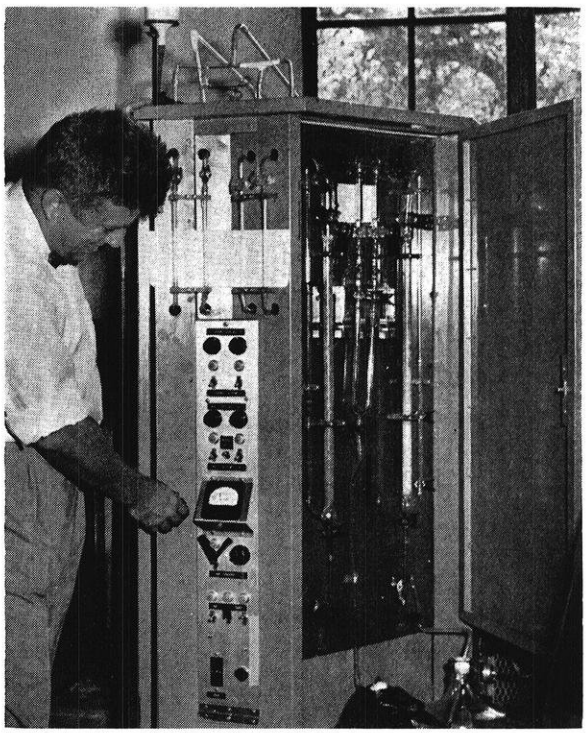
In the city of Los Angeles, a prime example of a city faced with a smog problem, there are an estimated 2000 tons of hydrocarbons released into the air daily, and the situation is further aggravated by having present about 250 tons of nitrogen oxides. Furthermore, a single power station in the area may release 120 tons of sulfur dioxide daily.

While all of the above mentioned facts are causes for smog, it is doubtful if Los Angeles or any other city would be cursed with smog if it were not for a phenomenon of weather in these areas known as "temperature inversion". Normally the temperature of air falls, as you rise in the atmosphere. However, in low lands and in valleys, it often happens that a pocket of warm air will move over a portion of cold air and hold it captive until a strong wind pushes it away. In this situation, there is little circulation about the land under the warm pocket of air and so pollutants that would normally be carried away and dissipated by winds, linger on building up a polluted atmosphere. Fog often develops in connection with temperature inversion and the moisture therein absorbs the oxides of sulfur and nitrogen to form corrosive acids. The most powerful oxidant found in a smog polluted atmosphere is ozone, a molecule consisting of three oxygen atoms, contrasted with the diatomic oxygen normally found in the atmosphere. It has recently been established that ozone formation is triggered by sunlight and involves the interaction of hydrocarbons and oxides of nitrogen.

Effects of Smog

The effects of smog may be divided into three categories; 1) effect on man 2) effect on plant life 3) effect on materials. First, and most important is the effect of smog on man. Since smog is generally accompanied by a heavy haze, the human body must go without much sunlight during periods of smog. Prolonging the period of reduced sunlight leads to reduced vitality and resistance to disease. Since sunlight also provides humans with vitamin D, man must go without that when living in a smog atmosphere.

Solid particles of unburned coal, together with hydrocarbons, provide irritants to the nose and throat. Sulfur dioxide, oxidized by ozone and dissolved in atmospheric moisture, forms sulfuric acid which may burn eyes and effect the respiratory tract. These conditions are blamed for many cases of bronchitis and heart disease and possibly even lung cancer. To show the seriousness of these smog-caused respiratory ailments, 4000 people died in one month in London, the deaths attributed to smog. Closer to home, 20 people were overcome by smog in a single day in Donora, Pa. in 1948. Radioactive smog is also very dangerous to humans. If humans are subjected to prolonged radiation, bones, blood and skin become affected and ultimately the afflicted will die. Poisonous carbon monoxide, which attacks and destroys the hemoglobin of the blood is often present in smog areas and may result in death.



Concentrations of four pollutants in the Los Angeles Basin atmosphere are measured simultaneously, automatically and around-the-clock on this instrument. The "Four-In-One" device was conceived to provide side by side comparative measurements of oxidant, oxidant precursor, nitric oxide and nitrogen dioxide. Activity of these pollutants throughout the day and night is recorded on the single sheet of graph paper at the right. This unique instrument is one of nine which have been developed or sponsored by the Air Pollution Foundation in Los Angeles for gathering of new knowledge in the battle against smog.

Acids and hydrocarbons are largely responsible for smog damage to plants. These pollutants have caused increasing plant death in smog areas.

Acids again play an important part in the corrosion of metals in a smog atmosphere. Ozone in the smog results in the short life of rubber products, of which the auto tire is the most important. Hydrocarbons and other organic materials form solvents and corrosives for organic products such as plastics, nylon, orlon and other synthetics.

Steps Already Taken in the Fight Against Smog

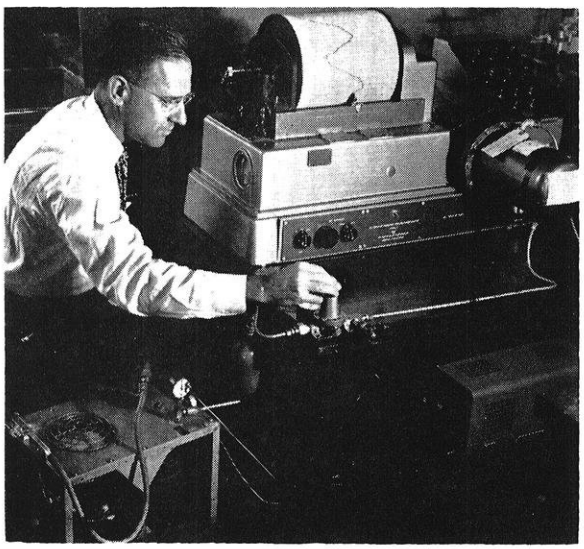
There are two fundamental steps in the fight on smog. First is the identification and analysis of the smog and, second is the remedying of the principle causes of the smog. Instruments have been developed which use infra red light absorbtion as a method of determining smog ingredients and their quantity.

(Continued on next page)

Radar has also been put into use, using absorption principles. The radar is beamed to a receiving station and the amount of absorption can be computed at the receiving end, thus giving a quantitative measure of the air pollutants. Analysis of a given volume of air, over a specified time, for radioactive elements, metals, oxides of nitrogen and sulfur, carbon monoxide and organic materials gives a qualitative and quantitative measure of smog. Ultraviolet light is used to identify the presence of smog in plants. The affected plants glow with a pale blue light when exposed to the ultraviolet light.

Having identified the smog, it is now necesary to take corrective measures. Many corrective measures are in use, and others have been proposed for future use. Industries which contribute to smog through incomplete combustion of their fuels, mainly coal, are building higher chimneys to increase draft and thus insure more complete combustion, eliminating the danger of carbon monoxide. This measure also decreases the number of particles of unburned carbon, since all the carbon is burned. Other factories employ dust precipitators, such as the Cottrell precipitator, which charges particles as they pass up the chimney and then removes them from the escaping flue gas by attracting them to an oppositely charged plate. Besides protecting the area from harmful pollutantes, these precipitators recover valuable by products for the manufacturer. For instance, it has been estimated that the amount of sulfur that escapes as sulfur dioxide from coal burning industries would be more than enough to supply the world with all the sulfur it needs.

Petroleum refineries have discovered that evaporation of petroleum during procesing adds to smog danger and costs them money besides. The skimming pond of a single plant has been known to evaporate 4 tons of petrolem daily. This action presents a fire hazard to the refinery and also costs the plant money. Hence many plants have put "floating roofs" over such open petroleum tanks to prevent evaporation and have taken care to prevent evaporation in other places.



Hydrocarbons escape into the air during the manufacture and use of gasoline and other petroleum products, and are suspected members of a chemical conspiracy in the sky which produces eye irritation and plant damage. Yet, the amount of hydrocarbons in the Los Angeles atmosphere is still an unknown quantity. Here an Air Pollution Foundation chemist adjusts a new instrument built by the independent, scientific research organization to measure and record hydrocarbons in the air—automatically and continuously.

Automobiles, through evaporation of fuels from the carburetor and the escape of unburned and partially burned fuel from the exhaust pipe add greatly to air pollution. There have been two measures suggested to cut down this hazard. The first of these is to provide the car with a muffler in which a type of afterburner is installed to completely burn all the fuel before it leaves the car. The second method is to have lightweight fuels. As auto fuels are now, many of its hydrocarbon constituents have a molecular weight of 150 to 200. These relatively heavy molecules do not burn and are shot out of the exhaust to pollute the air. If these heavy molecules were eliminated in favor of those having a molecular weight of about 50, more complete combustion would be insured. Also under consideration is the modification of the present auto engine so that it can burn an entirely different fuel such as propane, white gas or even alcohol.

However, science is not and cannot be satisfied with what it has done in the past and is doing now. Smog still exists in harmful proportions. It is a blight on all life in our industrial complexes. It has and still is killing plants and people, destroying property, and its dirty haze is ruining the natural beauty of our cities. Certain steps must still be taken if we are ever to be able to live without fear of smog. This is not to say that we need to get rid of smog entirely, but we do need to learn to control it to the extent that we no longer need to fear it as a threat of life and property.

Probably the most important single thing that needs to be done in the future is to continue to develop more sensitive tools to analyze smog, for it is only through an intimate knowledge of what smog is that we can successfully fight it.

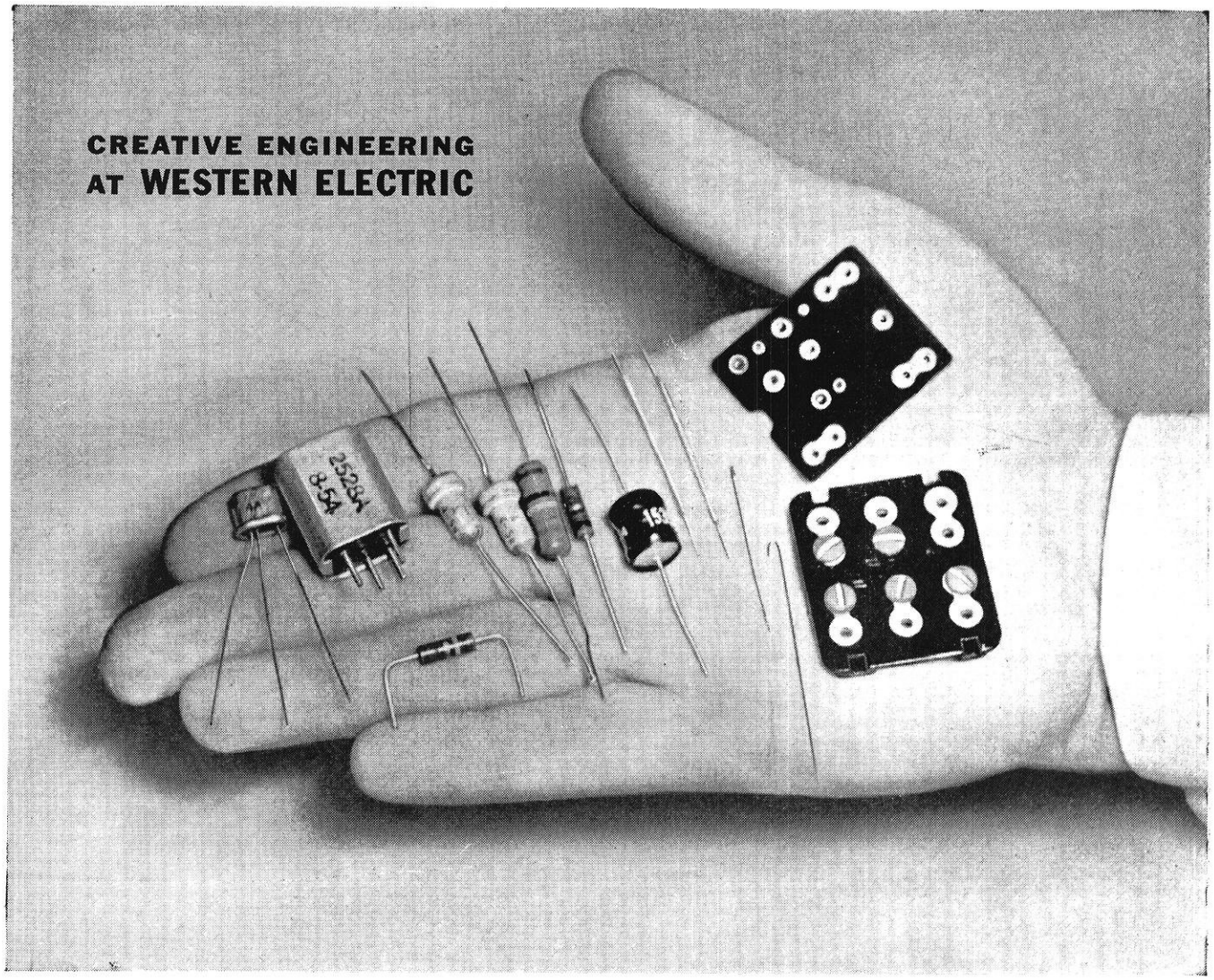
It would be a good idea to use computers to figure, with available data, when the occurrence of smog is likely so that protective measures may be taken. These protective measures might include slowing production at oil refineries or in industries where coal is used as a fuel.

In areas where smog is likely, household incinerators should be improved so they do not add to the pollution of the atmosphere.

New industries should be in such a location that they will not have to contend with temperature inversion and so will not bring smog down upon the surrounding area. They should also be located where prevailing winds will not carry their pollutants over heavily populated, or planted, areas.

With the proposed increases in atomic power as a fuel and the use of radioactive materials in industry,

(Continued on page 54)



Use of the transistor in Bell telephones

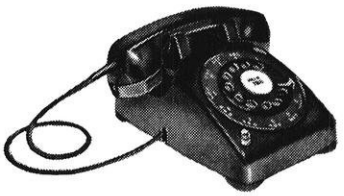
Shown here are the parts of the small amplifying unit in Western Electric's new Volume Control Telephone.

Because of the use of a transistor (shown above, extreme left on index finger) this amplifying unit is no larger than an ice cube and can fit inside the housing of a standard telephone.

Manufacturing of transistors on a commercial basis represents a solid engineering achievement... for it means volume production of an item that must be made under rigidly controlled laboratory conditions. For example, harmful impurity atoms in the germanium must be reduced to less than 1 for every 10,000,000,000 germanium atoms and then helpful impurity atoms added until there is approximately 1 for every 50,000,000 germanium atoms.

Western Electric has been making transistors since 1951 when our engineers set up the first commercial production line. This history-making achievement is representative of the way we work as the manufacturing unit of the Bell System... translating Bell System designs and inventions into the many things—from tiny semi-conductors to huge switching systems—used in the nationwide Bell telephone network.

It's a job that presents an unending challenge to our engineering staff.

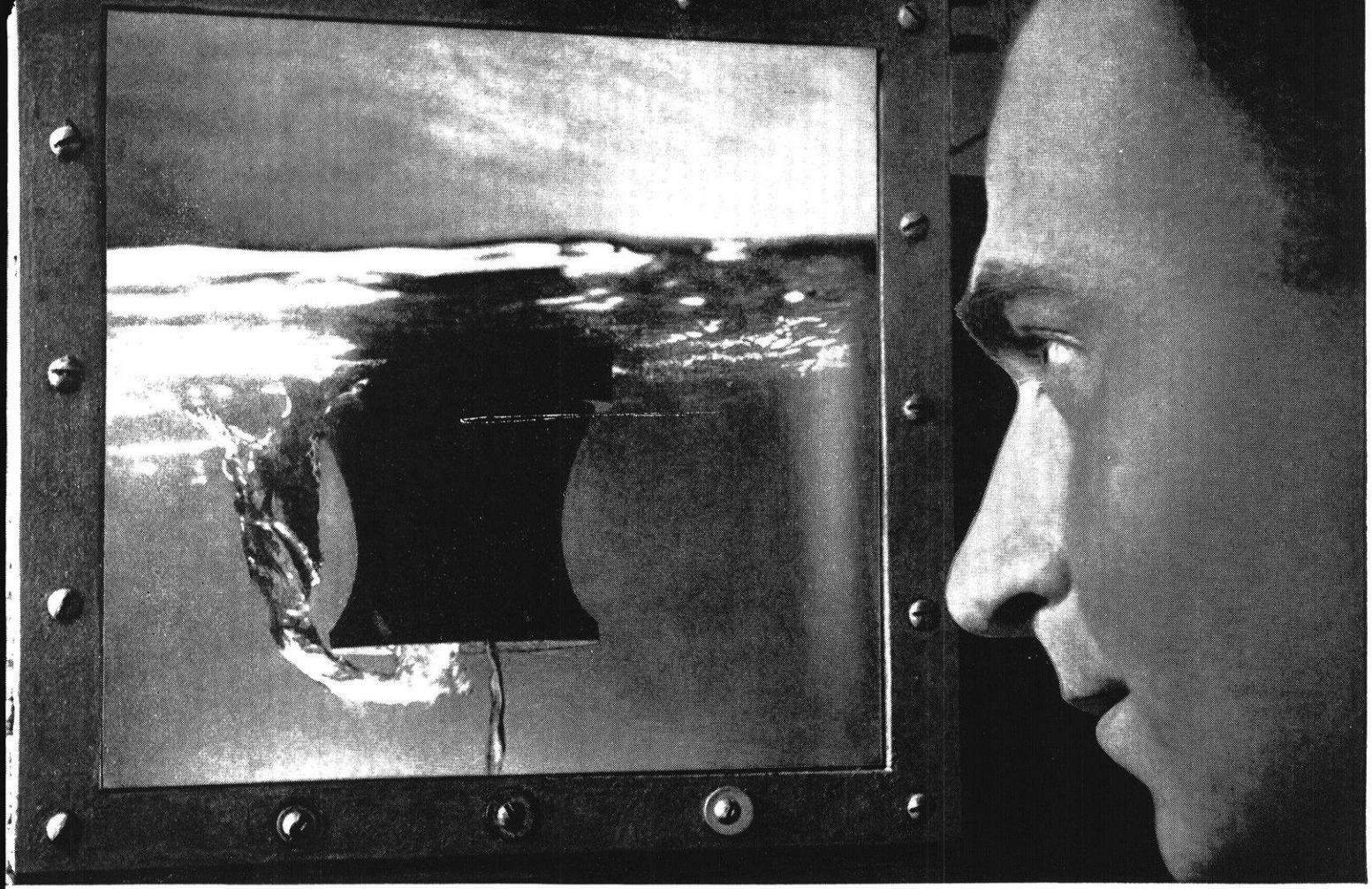


VOLUME CONTROL TELEPHONE: A twist of control knob increases listening volume... a boon to those who have difficulty hearing.

Western Electric

MANUFACTURING AND SUPPLY UNIT OF THE BELL SYSTEM

Manufacturing plants in Chicago, Ill.; Kearny, N. J.; Baltimore, Md.; Indianapolis, Ind.; Allentown and Laureldale, Pa.; Burlington, Greensboro and Winston-Salem, N. C.; Buffalo, N. Y.; Haverhill and Lawrence, Mass.; Lincoln, Neb.; St. Paul and Duluth, Minn. Distributing Centers in 29 cities and Installation headquarters in 15 cities. Company headquarters, 195 Broadway, New York City.



A WHIRLPOOL SPIRALS into the inlet of a model pump. This unique picture shows how air, a common cause of pumping trouble, was carried into the pump in . . .

The Case of the Baffled Whirlpool

Some time ago, the report reached us that two Worthington vertical turbine pumps installed by one of our customers weren't working right. They delivered plenty of water, but vibrated badly and burned out bearings.

The customer asked us to find the trouble fast. After checking we knew the pumps were okay, so Worthington Research had to answer him.

First thing we did was build a one-tenth scale model of the customer's installation. The photo shows what happened when we started pumping.

A whirlpool immediately formed between the water surface and the pump inlet. Air, trapped in the whirlpool and carried into the pump, was the villain in the case.

The solution came with experimentation. A simple baffle arrangement in a side channel eliminated the whirlpool—and the trouble-making air.

Chasing the gremlins from pump installations like this, boosting the efficiency of heat transfer in air conditioners, developing better seals for pumps and compressors — these are all in the day's work for Worthington's busy research engineers. At Worthington, research ranks right alongside engineering, production, and sales to develop better products for all industry.

For the complete story of how you can fit into the Worthington picture, write F. F. Thompson, Mgr., Personnel & Training, Worthington Corporation, Harrison, New Jersey. 4.25C

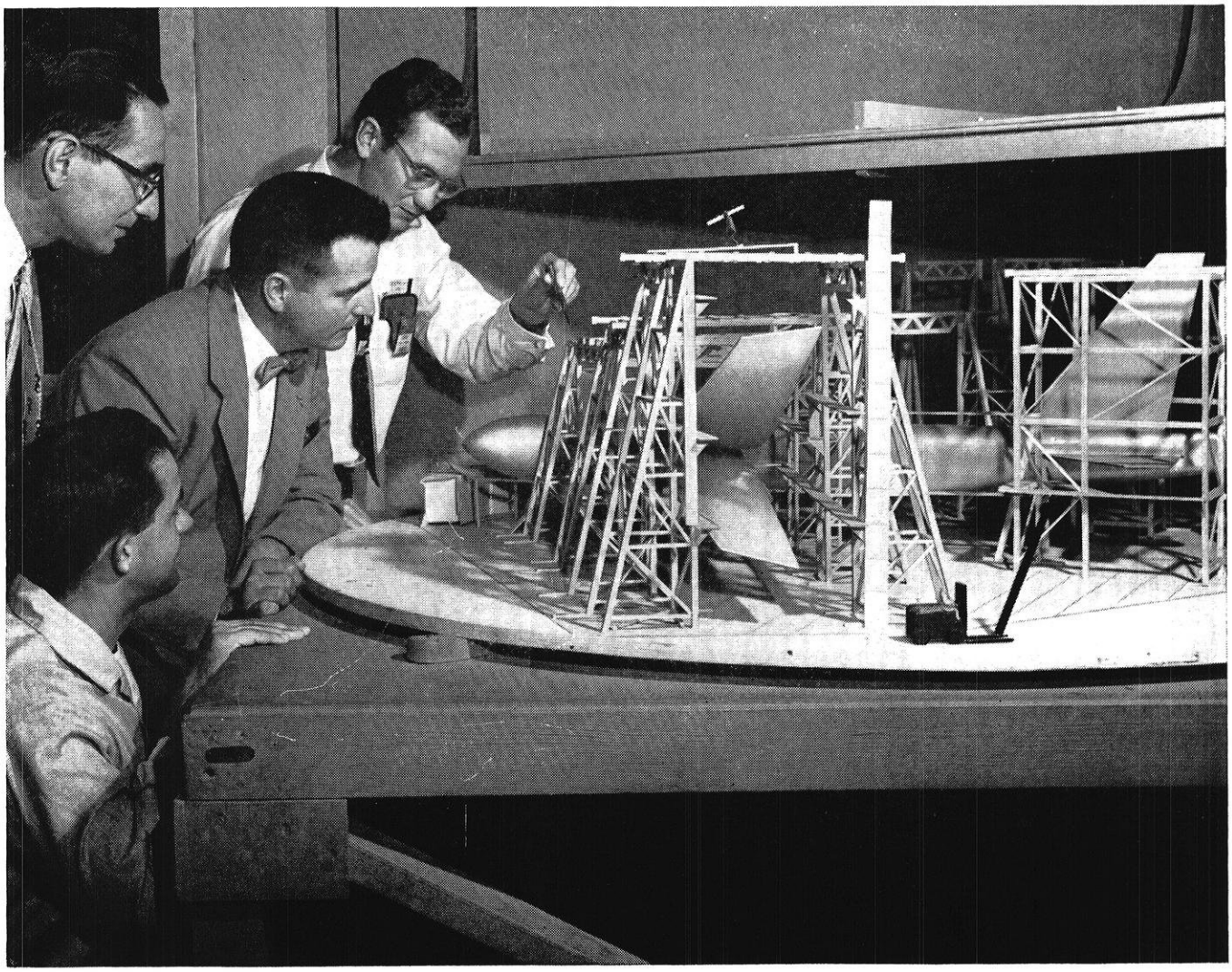
See the Worthington representative when he visits your campus

See the Worthington Corporation exhibit in New York City. A lively, informative display of product developments for industry, business and the home. Park Avenue and 40th Street.

WORTHINGTON

When you're thinking of a good job — think high — think Worthington

AIR CONDITIONING AND REFRIGERATION • COMPRESSORS • CONSTRUCTION EQUIPMENT • ENGINES • DEAERATORS • INDUSTRIAL MIXERS
LIQUID METERS • MECHANICAL POWER TRANSMISSION • PUMPS • STEAM CONDENSERS • STEAM-JET EJECTORS • STEAM TURBINES • WELDING POSITIONERS



Boeing engineers work with stimulating associates

Many engineering skills are represented in this picture. Mechanical, civil, electrical and aeronautical engineers—in almost equal proportion—work closely together in planning and conducting the structural test of airplanes such as the B-52. This stimulating contact among experts in every field is typical of Boeing projects. It makes a good engineer even better, and helps his professional growth.

In no other industry does the engineer have the opportunity to evaluate so completely—through destruction testing—the structural integrity of such a large and complex product. It is a "classical" challenge for mechanical and civil engineers. It tests the instrumentation ingenuity of electrical engineers and gives aeronautical engineers an opportunity to proof check designs by translating theoretical air loads into practical test loads.

Many immediate problems and "years ahead" projects involving these same skills and their infinite variations are under way at Boeing. The application of rocket, ram-jet and nuclear power to current and future aircraft and missiles is typical of projects in active study. Applied research in developing materials and components to withstand the tremendous heat and stress of flight at supersonic speeds offers even further opportunities to express engineering talent.

More than twice as many engineers are with Boeing now than at the peak of World War II—evidence of the company's solid growth. This outstanding group of engineers has been responsible for such aviation landmarks as the 707 Stratoliner jet transport and its KC-135 military tanker version, the Bomarc IM-99 guided missile, the global B-52 jet bomber and the B-47 jet bomber, present backbone of Strategic Air Command.

Graduates of top engineering schools all over the country come to Boeing. If you, too, want breadth of contacts, job variety and professional growth, it will pay you to investigate Boeing. There is always room for additional creative engineers on Boeing's research, design and production teams.

For further Boeing career information consult your Placement Office or write the Boeing plant nearest you:

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

ACCORDING TO THE DEAN . . .

COLLEGE OF ENGINEERING HAS INTEREST-FREE EMERGENCY LOAN FUNDS AVAILABLE TO YOU FOR SUCH PURPOSES AS FINANCING INTERVIEW TRIPS

ASSISTANT DEAN SHIELS AND MISS O'KEEFE

Each semester a goodly number of engineering students are referred to my office for information regarding loans. Students in the College of Engineering may apply for loans from two sources, the College of Engineering loan funds administered by the Dean of the College and the University loan funds administered by the Committee on Loans and Undergraduate Scholarships.

The College of Engineering loan funds are handled through the office of the Assistant Dean located in room 22, T24 Building. Loans for educational purposes and in amounts up to three hundred dollars may be made to students in good standing who have established a satisfactory academic record at the University of Wisconsin and who in their application show need for loan to further their educational objective. No interest is charged if the loan is repaid on or before the maturity date.

Since the money for loans is primarily for emergency purposes, loans cannot be made for more than one year; and students are encouraged to repay at as early a date as is possible. If for some unforeseeable circumstance the student is unable to repay at the date he sets, the loan may be extended with interest at 6% charged from the date of renewal. This policy enables a student who finds it necessary to seek some financial aid to complete the school year to obtain a loan at no interest, to repay the loan out of summer earnings, and to be in a position to make a loan the following year if necessary.

The College of Engineering loan funds are not of sufficient size to make large loans or loans for long periods of time feasible. However, we are able to meet the needs of our students for short term loans of reasonable amounts.

The source of the loan funds available to engineering students is worthy of note:

The Archibald W. Case loan fund was established by J. F. Case of New York in 1916, as a memorial to his son, a graduate in Engineering of the Class of 1915. This is the largest of the engineering loan funds and $5,100 was the total fund principal set up by Mr. Case for this worthy memorial, with the interest earned throughout the years bringing the total fund to approximately $7,250.00. The College of Engineering Loan Fund established primarily in 1901 by a friend of the college, residing in Milwaukee, now has a fund total of $2,075; additions to this fund have been made from time to time from smaller grants made by engineering organizations, such as Polygon Board.

The wise use of these funds results in real financial assistance to a large number of engineering students. Many emergencies arise throughout the school year, such as the vital need for immediate cash to finance inspection trips, short term loans for interview trips, or perhaps when invited to affiliate with an honorary organization one may need a small loan to allow one to accept the honor extended to him.

An analysis of the above funds makes it evident that individuals cannot be fully financed for a year of college, but a careful use of the loan funds during the school year, with the plan of repaying with summer earnings and borrowing again the next year when the need arises can result in very real assistance to many students. In any event students are encouraged to present their emergency financial problems to the College of Engineering, as it is our wish to assist our own students in so far as it is within our power.

The College of Engineering endeavors to care for the loan needs of the engineering students, but when our funds are depleted it is our privilege to participate in the use of the all-university loan funds which are available to all students.

If you have an acute financial need which can be met by a short term emergency loan, remember that the College of Engineering loan funds are available. We sincerely hope that no engineering student will leave the University during a semester for want of financial help.

—K. G. SHIELS

CAMPUS NEWS

compiled by Dick Peterson, m'57 and Larry Barr, m'57

HYLAND WRITING AWARD ANNOUNCED

In memory of the late Professor Patrick Henry Hyland an annual award for the best article published in the Wisconsin Engineer has been established. Professor Hyland died last spring after 34 years with the University of Wisconsin, of which 14 years were spent as a member of the Board of Directors of the Wisconsin Engineer. Professor Hyland was long interested in writing and taught technical writing to UW undergraduates for many years.

The Hyland Award, it is hoped, will provide the incentive for creative writing that Hyland can no longer give to his students. Any article written for and published by the Wisconsin Engineer is eligible for consideration.

See the November issue, page 22, for rules.

The award will be made at the Wisconsin Engineer banquet next spring.

EXPOSITION NEWS

LARRY BARR, *Publicity Co-Ordinator*

The 1956 Engineering Exposition is now in the making and it is time to start agitating for student exhibits. It will be the student exhibits that will make this "our" Exposition rather than "theirs", meaning the Industrial Exhibits.

One of the most popular exhibits at the last big exposition (1953) was a student exhibit. People would stand on a length of beam and have their weight determined by two slide-rule men who measured the beam deflection. Another popular feature was the big press back in the sheet metal shop that converted a powdery substance into a "useful" ash tray just by pressing on it.

These were student exhibits that out-did the industrialists in crowd-drawing power. You can be assured that the average spectator will be as impressed by a good student exhibit as by a good industrial exhibit.

If you have an idea for a student exhibit, don't wait until the 1st of April to do something about it. There are two student exhibits chairmen for the exposition who will be glad to help where they can. They are: Roger Jesse, Phone 51102, and Stuart Charlson, Phone Ext. 3198. Contact one of them as soon as possible and get your exhibit squared away for next April. Awards will be made for the best

(Continued on next page)

COLLEGE OF ENGINEERING—1954–55

SOPHOMORE HIGH HONORS

CHEMICAL ENGINEERING

Pomraning, Gerald C.	3.90
Ziegenhagen, Allyn J.	3.88
Elton, Robert L.	3.74
Wagner, John L.	3.73
Moy, James H.	3.68
Soukup, Charles L.	3.66
Kitze, Paul T.	3.64

CIVIL ENGINEERING

Christenson, James E.	3.90
Charlson, Charles H. S.	3.83
Krueger, Gordon P.	3.81
Birner, Richard E.	3.60

ELECTRICAL ENGINEERING

Spitzer, James F.	3.96
Meronek, Dennis F.	3.92
Schwartz, Richard J.	3.81
Weingarten, David H.	3.80
Carlson, Gerald J.	3.77
Oettinger, Joseph T.	3.73
Anderson, Allan H.	3.70

MECHANICAL ENGINEERING

Kruse, Robert E.	3.83
Bollinger, John G.	3.74
Barr, Lawrence D.	3.67

METALLURGICAL ENGINEERING

Gilpin, C. Barclay	3.79

SOPHOMORE HONORS

CHEMICAL ENGINEERING

Noth, Phillip F.	3.60
Kott, Richard G.	3.58
Spalding, Charles W.	3.55
Ryan, William J.	3.54
Baldovin, Donald E.	3.45
Mondloch, Anthony J.	3.40
Ott, Ronald L.	3.40
Hubbard, Davis W.	3 34
Samsel, Clyde M.	3 32
Makela, Lloyd E.	3 31
Kapheim, Ronald J.	3.21
Reutter, Raymond C.	3.21
Anderson, John W.	3 20
Mattes, William J.	3.12
Schwarer, Robert J.	3.10

CIVIL ENGINEERING

Culp, Jackie P.	3.54
Hauke, Jerome C.	3.32

ELECTRICAL ENGINEERING

Stahl, Kenneth L.	3.60
Flanner, Philip D., Jr.	3.59
Boettcher, William E.	3.56
Kanneman, Thomas A.	3.47
Daugherty, Don G.	3.43
Wilson, Joseph P.	3.42
Martinson, Lloyd W.	3.33
Hilden, Richard H.	3.30
Raymond, James P.	3.28
Rusch, Philip H.	3.27
Brown, James L.	3.26

MECHANICAL ENGINEERING

Hubbell, Alfred W.	3.57
Yates, Robert E.	3.44
Reichelsdorfer, Peter W.	3.24

METALLURGICAL ENGINEERING

Speerschneider, Charles J.	3.21

Campus News

exhibits and it may as well be you that gets one.

And, by the way, volunteers for helping with the planning and building of the exposition are needed. No, "dog-work" jobs are not the only ones available! The Exposition Committee needs men with ability and ingenuity for specific jobs. For details see any one of the chairmen listed on the M.E. lobby bulletin board or contact Larry Barr. We will be glad to have your help.

FACULTY NOTES

The resignation of William J. Rundle, associate professor of mining and metallurgy at the University of Wisconsin, was accepted by the UW Board of Regents.

The regents also approved the appointment of E. R. Shorey, professor emeritus of mining and metallurgy, on a special service contract, to take over the teaching work of Rundle in mining and metallurgy to the end of the current semester. Shorey retired from his duties in the department last June upon reaching the automatic retirement age of 70.

Rundle, who joined the UW mining and metallurgy department staff in 1946, resigned to join the Cyprus Mines Corp. with headquarters in Los Angeles, Calif. He will be engaged in engineering work and administration of the corporation's mining properties on the Island of Cyprus and in other parts of the world.

Rundle is a graduate of the Michigan College of Mining and Technology and received his master of science degree from the University of Minnesota.

In another engineering faculty action Saturday, the regents approved a three-month leave of absence without pay for Carl R. Oestreich, associate professor of civil engineering and superintendent of buildings and grounds at the Milwaukee Extension Center of the University. Oestreich requested the leave for reasons of health.

WELDING ARTICLES CAN WIN UP TO $200

The American Welding Society will award $700.00 in prizes for the two best articles on welding to appear in undergraduate publications such as the Wisconsin Engineer during the current school year. Author of the best article and the student magazine or paper in which it appears will each receive $200.00. Author of the second best article and the publication in which it appears will each receive $150.00.

These awards are made annually by the American Welding Society under the A. F. Davis Undergraduate Welding Award program. Sponsored by A. F. Davis, Vice President and Secretary of the Lincoln Electric Company, Cleveland, Ohio, the program's purpose is to stimulate interest of college students in the art and use of welding.

Articles on any type of welding or its application to design and construction will qualify including papers for the Lincoln Arc Welding contest. To be eligible, the article must be published between April 1, 1955 and June 1, 1956.

WELDING DESIGN CONTEST ANNOUNCED

The Ninth Anuual Engineering Undergraduate Award Program has been announced. This program, sponsored by the James F. Lincoln Arc Welding Foundation, is open to all engineering undergraduates and is based on welding design papers submitted. To enter the contest, a student or student group, must prepare an original paper on some type of welded design. The design may be in either the structural or the mechanical field.

The contest is planned so that preparing a contest paper can be done without interfering with normal school work. Papers should be submitted before June 25, 1956. Contest awards are duplicated for both divisions (Mechanical and Structural), and are as follows:

First	$500
Second	250
Third	150
Fourth (4)	75
Fifth (6)	50
Sixth (10)	25

In addition to these awards, Three Grand Awards will be made to the three best-of-the-program papers chosen from either of the two divisions. These are:

First Grand Award	$750
Second Grand Award	500
Third Grand Award	250

All papers are eligible for these awards as well as the divisional awards. The author of any acceptable paper will receive a Handbook on Welding Design whether he wins an award or not.

Furthermore, scholarship funds will be granted to the school at which the three Grand Award winners were registered. These funds, of the same amount as the award, are to be used for scholarships under the name of the award winner. Therefore, recognition as well as money may be gained in this contest.

For information about the contest write to: The James F. Lincoln Arc Welding Foundation, P. O. Box 3035, Cleveland 17, Ohio.

ENGINEERING INSTITUTES

READY MIXED CONCRETE

January 10, 11, 12

The Ready Mixed Concrete Institute will bring to persons engaged in the manufacture or use of ready mixed portland cement concrete the latest information on its production, distribution and placing.

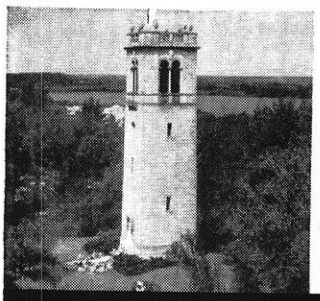
Leonard F. Hillis, Institute Coordinator.

ENGINEERING ECONOMICS

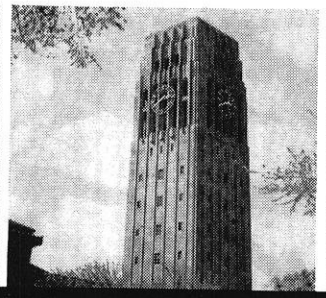
January 19, 20

Because many decisions in regard to the economic selection of equipment, methods and processes require technical knowledge, engineers are being increasingly called upon to either render such decisions or to furnish the necessary information. This institute will pre-

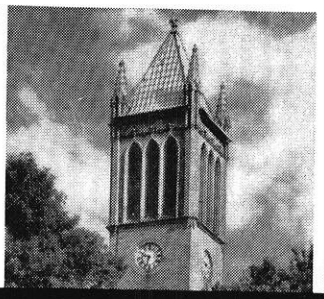
(Continued on page 56)



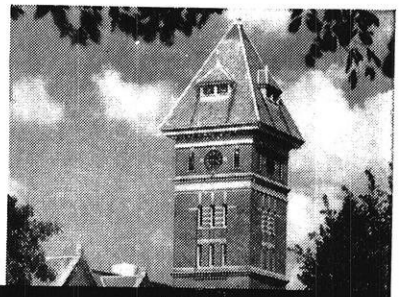
WISCONSIN



MICHIGAN

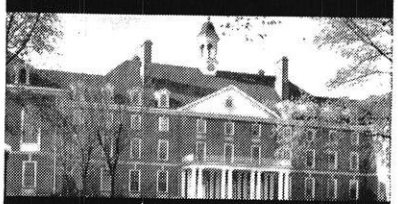


IOWA STATE



PURDUE

TEXAS A&M



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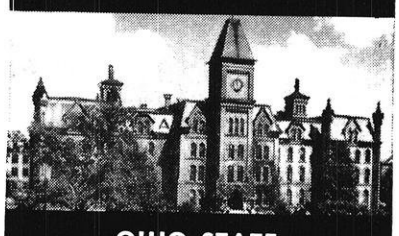
PENN STATE

GEORGIA TECH



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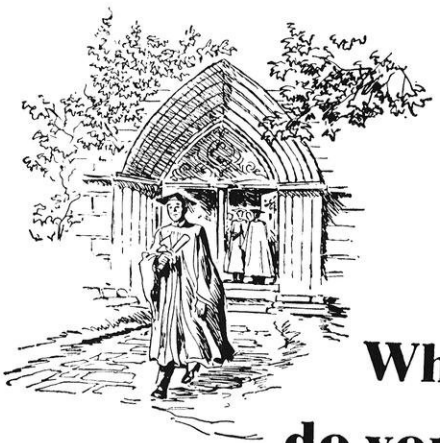


Where do you go from here?

Year after year, we draw on these nine schools for electrical, mechanical, industrial and general engineers.

If you are looking for a future with real opportunities for growth and advancement, Square D has a lot to offer. The potential growth and development of the electrical industry is tremendous—doubling every ten years, in fact. And Square D is a long established, top ranking name in that expanding industry. Equally important, Square D offers the kind of personalized training that equips you to go far . . . *fast!*

Why not let us tell you more about Square D and what we have to offer?

Mail the Coupon

We'd like to send you a brochure, "Your Engineering Career." It gives the simple rules to follow in selecting an engineering career.

Square D Company, Dept. SA
6060 Rivard Street, Detroit 11, Michigan
I'd like a copy of Square D's brochure, "Your Engineering Career"

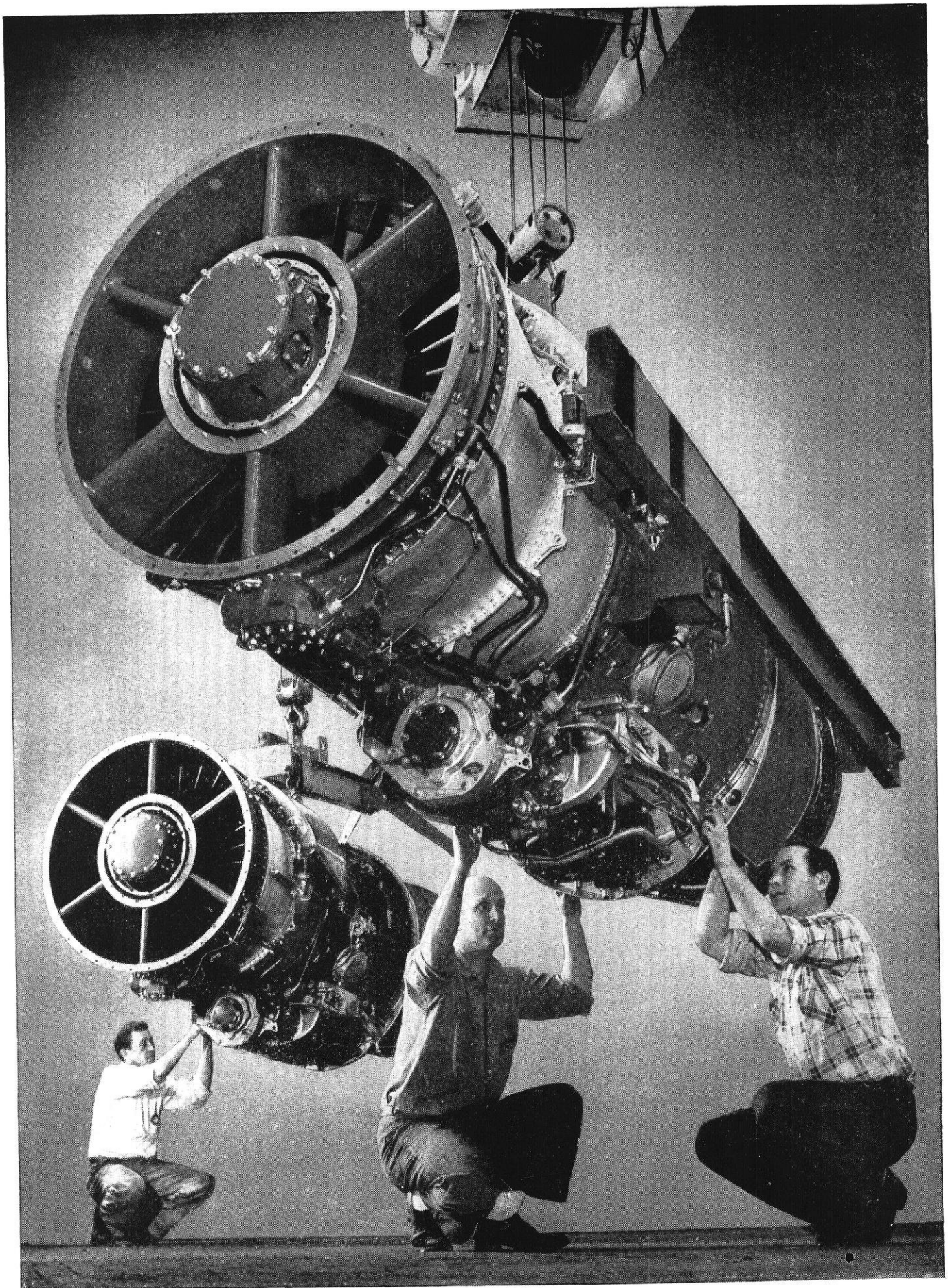
Name_____

School_____ Class_____

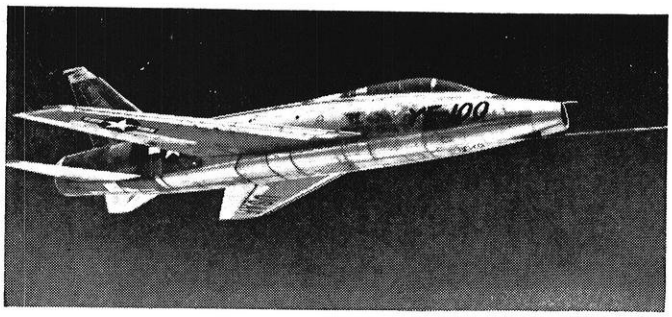
Address_____

City_____ Zone____ State_____

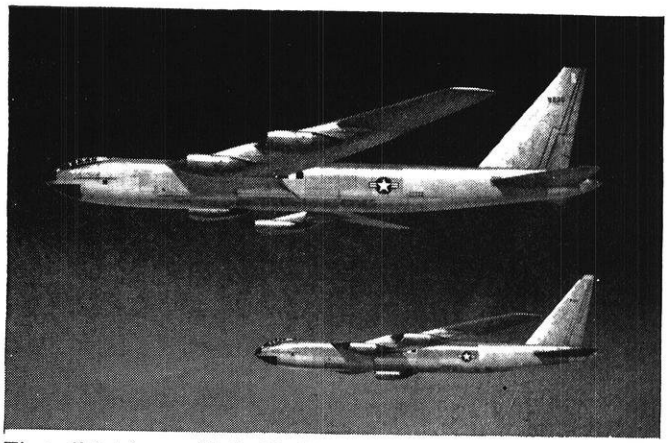
SQUARE D COMPANY



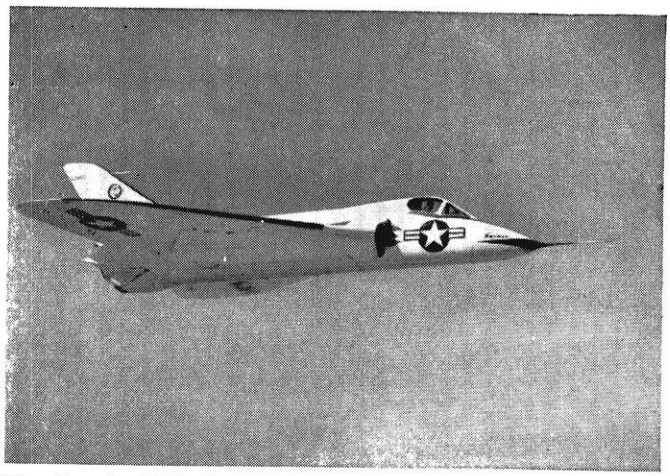
The J-57, in the 10,000-pound thrust class, is the most powerful turbojet engine now in production. A new generation of U.S. air power has been designed around this mighty new Pratt & Whitney Aircraft engine.



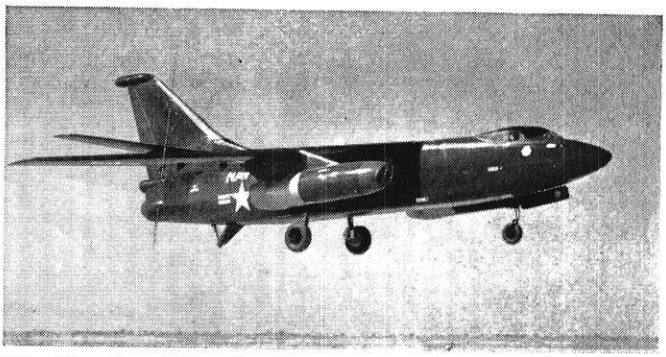
North American's F-100 Super Sabre, fastest Air Force jet fighter, is powered by Pratt & Whitney Aircraft's J-57 engine.



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.

Blazing the Way for a New Generation of Air Power

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

That engine is Pratt & Whitney Aircraft's J-57, the first turbojet to achieve an official rating in the 10,000-pound thrust class.

But the J-57 provides far more than extreme high thrust. Its unique Pratt & Whitney Aircraft design, achieved after years of intensive research and engineering, offers as well the low specific fuel consumption so vital to jet-powered bombers and future transports, plus the additional important factor of fast acceleration.

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.

PRATT & WHITNEY AIRCRAFT

DIVISION OF UNITED AIRCRAFT CORPORATION

EAST HARTFORD 8, CONNECTICUT

ENGINE-EARS

by Carl Burnard, c'57

A.I.Ch.E

The first meeting at the year was held on Oct. 12 and involved an open house in the Chem. Eng. Bldg. The student members and also members from the faculty took part in a guess-o-metric contest which included such events as guessing the concentration of a NaCl solution by taste or the temperature of the inside of a furnace by sight. Prizes were given to the winners and it was found that although the members of the faculty were usually quite close to the correct answers, they were consistently outguessed by undergraduates. Refreshments were served after the meeting. There was an excellent turnout for the open house and it was considered quite successful.

The second meeting was held in the Top Flight Room of the Memorial Union on Wed., Nov. 9th. The main speaker for the evening was Mr. Harold C. Radke, a Wisconsin graduate, now development supervisor of Goodrich Chemical Co. He gave an interesting talk on Polyurethanes in Industry. Mr. Radke showed how plastics are made by actually carrying out an experiment for the members. The plastic that he prepared along with several examples of the Goodrich Chem. Co. products were examined by the members.

Two members of the Polygon Board also outlined what the Polygon Board is doing and plans to do in the future. Reference was made to the Engineering Exposition which will be held in the spring.

Between 60 and 70 members attended the meeting and free refreshments were served after the meeting.

PI TAU SIGMA

The members of Pi Tau Sigma, honorary mechanical engineering fraternity, opened their year on October 25th, with a banquet at the Beef-eaters room in the union.

Following the banquet, a smoker was held to which the eligible candidates for membership were invited.

Several projects are being sponsored this semester. One project is the establishment of an all-engineering-school functions calendar to be set up in the office of the Dean. Plans are being made for the annual outstanding freshman-sophomore award. A exhibition for the Engineering Exposition is to be a part of this year's pledge project.

Delegate to this year's national convention on October 27–28 at Oklahoma A & M, was Robert Carey. While there he served on the Pledge Training Committee. He will report to the members at the Formal Initiation Banquet on December 6th.

Officers for the present year are:

Phil Reed—*President*

Milo Swanson—*First Vice-President*

Vern Overbye—*Second Vice-President*

Wallace Yeskie—*Corresponding Secretary*

Evelyn Knoke—*Recording Secretary*

John Misselhorn—*Treasurer*

Allan Freedy—*F. M. Young Award Chairman*

A.S.C.E.

The American Society of Civil Engineers has produced a varied and interesting slate of speakers for their last three meetings. On October 12, Professor Whitford of Washburn Observatory gave an enlightening talk on "Telescopes and their Uses". The program of October 26 featured a discussion of "The General Mission of Truax Field" by Lieutenant Friedman, U.S.A.F., and was highlighted by a 20-minute film depicting a simulated air attack on New York City. On November 9, Roy Chambers, Carl Rosser, and Page Johnson collaborated to present an interesting and illustrated speech on thin shell construction. Mr. Chambers is supervising engineer of the new athletic building now under construction; Mr. Rosser and Mr. Johnson are both with the Portland Cement Company.

The "civils" held their annual fall dance, the Transit Trot, on Friday night, November 11. They danced to the soft, syncopated strains of the Don Voegeli band. The dance was held in the Memorial Union.

S.A.E.

S.A.E. President, Donald Kueny, announced that the next meeting of S.A.E. will be December 7. The speaker will be a man from the Allison division of General Motors. He will talk about heavy duty transmissions.

S.A.E. plans to award prizes to its members for the best ideas for an Exposition display.

A.I.M.E.

At the last meeting of A.I.M.E., Professor Goehring gave an informative speech on what to do, what not to do, and in general, what to expect when being interviewed for a job.

AIME is laying plans for a dinner, to be held at Leske's on December 7. Plans are also being made toward the Engineering Exposition which is to be held next spring, and an investigating committee has been set up to learn more about the plans already made for the Exposition.

(Continued on page 46)

College graduates on the way up...

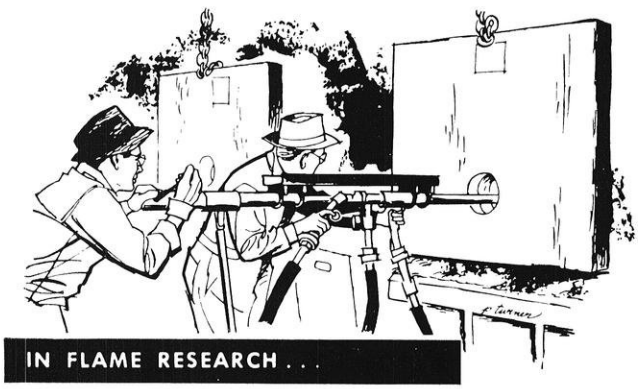
growing with UNION CARBIDE

IN PRECISION METAL CASTING . . .

"I'm a mechanical engineer, Class of '51. Because of my interest in foundry work I joined Haynes Stellite Company, which has a diversified foundry operation. After a familiarization program I was assigned to production work in the investment casting foundry. I'm now in my second year as a foundry foreman, supervising the type of work I like best."

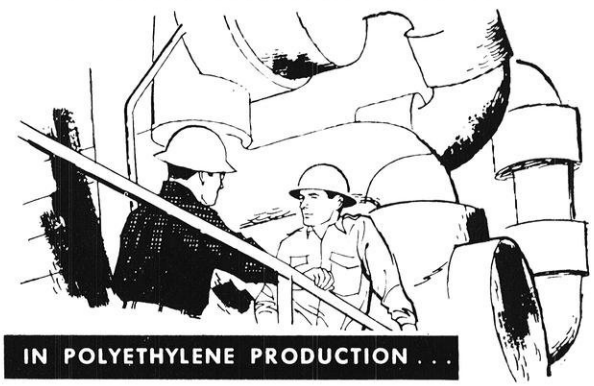
IN PLASTICS DEVELOPMENT . . .

"I'm a mechanical engineer, Class of '52. I wanted to work on the design and development of new production machinery, and Bakelite Company offered me the career I was looking for. I'm working in the fast-growing field of plastics, on a variety of machine design and development problems with the vinyls, phenolics, and polyethylene. To me it's an ideal assignment."



IN FLAME RESEARCH . . .

"I'm a mechanical engineer, Class of '51. I started at the Tonawanda, N. Y., laboratories of Linde Air Products Company, with a small group doing research on fundamentals of combustion and jet-burner design. Recently I became the technical field representative on this project, responsible for field-testing new jet-burners, working with customers under actual steelmill operating conditions."



IN POLYETHYLENE PRODUCTION . . .

"I joined Carbide and Carbon Chemicals Company after receiving my B.S. in Chemistry in 1950. I started in Process Development at the Texas City plant, where I soon found myself in the plastics end of the chemicals business. By 1954 I was production supervisor at a new polyethylene plant at Seadrift, Texas, supervising more than 50 men and working with top plant management.

THEY ARE KEY MEN WITH A FUTURE...

If you are interested in a future in production, development, research, engineering, technical sales, or advertising and public relations check the opportunities with any Division of Union Carbide. Get in touch with your college placement officer, or write directly to:

UCC DIVISIONS INCLUDE...

- Bakelite Company • Carbide and Carbon Chemicals Company
- Electro Metallurgical Company • Haynes Stellite Company
- Linde Air Products Company • National Carbon Company
- Union Carbide Nuclear Company

UNION CARBIDE

AND CARBON CORPORATION

UCC

Industrial Relations Department, Room 406
30 East 42nd Street, New York 17, N. Y.

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.

W. S. P. E.

TENTATIVE PROGRAM

W.S.P.E. ANNUAL MEETING, SCHROEDER HOTEL, MILWAUKEE, WISCONSIN, JANUARY 26, 27 AND 28, 1956

Thursday, Jan. 26, 1956

P.M.

2:00 Registration—4th Floor
2:00 Board of Directors—South Room
2:00 Chapter Presidents' Meeting—Parlor H
6:00 Theater Party Dinner—East Room
8:00 Buses leave for Fred Miller Theater
8:30 Performance at Fred Miller Theater
11:10 Buses leave Fred Miller Theater for Schroeder Hotel

Friday, Jan. 27, 1956

A.M.

9:00 Registration—4th Floor
9:30 Functional Groups:

A. Industrial—Parlor C
Louis E. Larson, Chairman
B. Education—Club Room
(Joint with Committee)
John Gammel, Chairman
Speaker: Dean C. Wendt
C. Public Employment—Parlor D
Carl Cajanus, Chairman
D. Consulting—Parlor E
Philip Davy, Chairman
Speaker: George Sievers

Committee Meetings:

A. Education—Club Room
(Joint with Functional)
John Gammel, Chairman
B. Ethics and Practice—Parlor I
Kurt Roth, Chairman
C. Membership—Parlor G
W. F. Baumgartner, Chairman
D. Program—Parlor F
K. O. Werwath, Chairman
E. Public Relations—Pine Room
A. Graettinger, Chairman
F. Legislative—Parlor B
E. J. Kallevang, Chairman
G. Interprofessional—Room 507
Charles Nagel, Chairman

P.M.

12:30 Luncheon—Crystal Ball Room
Arthur Behling, Presiding
A. Recognition of New Members
July 1 to December 31
Guests of President A. Owen Ayres
B. Recognition of Industrialists

1:30 Address—Crystal Ball Room
C. Y. Thomas, Vice President
Spencer Chemical Company
Kansas City, Missouri
Topic: Unity in the Profession

2:30 General Session—East Room
E. C. Koerper, Presiding
Panel on Engineers and Public Affairs
Paul H. Robbins, Exec. Dir.
N.S.P.E., Moderator
Washington, D. C.

Participants:

J. D. Coleman, Chairman & Introduction
Frigidaire Division
General Motors Corp.
Dayton, Ohio
Past President, N.S.P.E.

V. E. Gunlock
Chicago Transit Authority
Chicago, Illinois
Vice President, N.S.P.E.

C. Y. Thomas, Vice President
Spencer Chemical Company
Kansas City, Missouri

John B. Jardine
Fargo, North Dakota
Past Vice President, N.S.P.E.

6:00 Reception—Foyer
Dutch Treat—Cash Bar

6:45 Speakers' Assembly—Room 508
Out of Town Guests

7:00 Annual Banquet—Crystal Ball Room

A. Owen Ayres, President, W.S.P.E.
Presiding
A. Greetings from V. E. Gunlock
Chicago, Illinois
Vice President, N.S.P.E.
B. Introduction of Old and New Officers
C. Presentation of Awards
(1) Outstanding Engineer Award
(2) Outstanding Science Teacher Award

(Continued on page 38)

Meet the President

W. C. (WES) LALLIER

Milwaukee Chapter President

Our spotlight this month falls on W. C. (West) Lallier, President of the Milwaukee Chapter. Mr. Lallier is presently employed by the Wisconsin Telephone Company in Milwaukee and holds the position of Engineer of Transmission and outside Plant. One of his prime responsibilities in this capacity is that of being responsible for engineering plans for construction projects involving capital expenditures of over $10,000,000 per year.

Following his graduation from the University of Wisconsin, where he received a B. S. degree in Electrical Engineering, Mr. Lallier began his career with the Wisconsin Telephone Company as a transmission testing engineer in 1922. He has been with the company ever since.

In addition to WSPE, he is a member of the Engineer's Society of Milwaukee and is a Fellow of the American Institute of Electrical Engineers. He has served on membership committees of all of these organizations and was chairman of the Program committee for AIEE. Mr. Lallier is a past member of the Board of Directors and a past vice-president of the Milwakee Chapter. He is also a member of the Milwaukee Association of Commerce. During World War II, he served on the Civilian Defense Committee of Milwaukee. In his leisure time, Mr. Lallier enjoys bridge, golf, and is a member of the Wauwatosa Curling Club. In college, he participated in basketball and boxing.

Mr. Lallier was married in 1926 to Dorothy Ann Gray and now has two children. Mrs. James C. Keuper and Keith W. Lallier, now in the U. S. Navy. END

W.S.P.E.

(Continued from page 36)

D. Address
Merryle Stanley Rukeyser
Introduced by Robert C. Bassett
Publisher, Milwaukee Sentinel

Saturday, Jan. 28, 1956

9:00 Registration Continues—4th Floor

9:30 Business Meeting—East Room
President A. Owen Ayres, Presiding

A. President's Report

B. Secretary's Report

C. Treasurer's Report

D. National Representative's Report

E. Committee Reports:
(1) Education
(2) Ethics and Practice
(3) Membership
(4) Program
(5) Public Relations
(6) Legislative
(7) Interprofessional

F. Functional Group Reports:
(1) Consulting Engineers
(2) Education
(3) Industrial Employment
(4) Special Employment

G. New Business

P.M.

12:30 Luncheon—Empire Room
A. L. Genisot, Presiding
Recognition of Official Delegates from State Societies:
Michigan
Iowa
Illinois
Address: (To be announced)
Adjournment

2:30 Annual Business Meeting—Pere Marquette Room
Milwaukee Section
W. C. Lallier, Presiding

W.S.P.E. LADIES' PROGRAM, SCHROEDER HOTEL, MILWAUKEE, WISCONSIN

January 26 and 27, 1956

Thursday, Jan. 26, 1956

P.M.

6:00 Theater Dinner—East Room

8:00 Buses leave for Fred Miller Theater

8:30 Fred Miller Theater—Performance

11:10 Buses leave Fred Miller Theater for Schroeder Hotel

Friday, Jan. 27, 1956

A.M.

9:00 Registration—4th Floor

9:30 Organization of Ladies Auxiliary—Room 508
Discussion led by John B. Jardine

P.M.

12:00 Luncheon and Style Show—Empire Room

2:00 Cards—Empire Room

6:00 Reception—Foyer
Dutch Treat—Cash Bar

7:00 Professional Engineers Annual Banquet—Crystal Ballroom
For Members and Ladies—Informal

7:00 Ladies at Speakers' Table

MOODY SELECTED FOR A.S.M.E. AWARD

Arthur M. G. Moody, Trane Company senior development engineer, was awarded the 75th Anniversary medal yesterday for his leadership and outstanding contributions towards the aims and objectives of the American Society of Mechanical Engineers by the Minnesota section. The award was made during a dinner meeting, held in the Dubonnet Room of the Leamington Hotel in Minneapolis on October 11 by David W. R. Morgan, national president of A.S.M.E. and a vice-president of the Westinghous Electric Corporation.

Moody, who has been a member of the society for 20 years, was selected as recipient of the medallion by the executive committee of the Minnesota section. The special award is in commemoration of the national society's 75th anniversary.

During the ceremony, Morgan cited Moody for the active part he has played in work fostered by the A.S.M.E. during his many years of membership. He has been chairman of the Trenton, N. J.; Westmoreland, Pa. and Pittsburgh, Pa. local sections and was instrumental in organizing the La Crosse, Wisconsin section of A.S.M.E.

Moody was also the founder and chairman of the society's compressor committee for a period of four years and has served on the power test code committee for centrifugal compressors. He will assume the the chairmanship of the process industries division on November 1 of this year.

Moody joined The Trane Company in 1952 as a development engineer. He has twice been the recipient of the certificate of merit from the A.S.M.E. The author of numerous technical articles, Moody is listed in Who's Who in Engineering and Who's Who in the Midwest as well as being a registered professional engineer and an active member of the Western Chapter WSPE. He has extensive background in the field of centrifugal equipment development.

Moody is vice-president of the La Crosse Rotary Club and a vestryman of Christ Episcopal Church. He lives with his family in Wedgewood Terrace, Route 1, La Crosse.

Chapter News

MILWAUKEE CHAPTER

R. M. LYALL

At our November meeting James Kay, Jr., of the Citizens Governmental Research Bureau discussed Engineering Services in the Milwaukee County Government. A survey is nearing completion which may suggest changes in the present organization. President Owen Ayres was present and suggested the need for constructive cooperation by WSPE with the Research Bureau, especially in regard to analyzing this report. The suggestion was referred to the Civic Affairs Committee for study, and a report will be given at the next meeting.

The December 13 meeting promises to be one of the high points of the year. Harry C. Brockel will discuss the St. Lawrence Seaway and its special significance to the Port of Milwaukee and the Milwaukee Engineers.

Brockel is the Municipal Port Director in the City of Milwaukee, and has been connected with the Milwaukee port authority since its early inception.

Luncheon meetings are held by the Milwaukee Chapter on each Thursday at the ESM Building. Attendance now averages well over thirty, and the number is growing. While these are primarily social meetings, they often serve as a sounding board for the officers of the society in keeping decisions and policies in line with opinions of the group.

Speaking of "Opinions", we are going to try out the General Electric *Opinion Meter* at our January 12 luncheon. This device registers a group opinion based on the individual opinions dialed into the meter by members present. We expect some significant results and will report our findings in a later issue.

A special feature such as the Opinion Meter is included once each month at the Luncheons. On December 12 Herb Zwarra of the Telephone Company will tell us What Makes Colored TV Work.

Out of town visitors are most welcome at these Thursday Luncheons.

FOX RIVER VALLEY

V. A. KNEEVERS

On Thursday, October 8, Members of the Wisconsin Society of Professional Engineers traveled to Appleton to attend a lecture by F. L. Larkin, Vice President of the Wisconsin Electric Power Company.

Mr. Larkin based his lecture on the subject, "Selecting Future Management." According to Mr. Larkin, there is no shortage of management ability, the only problem is in discovery of the individual and in being able to put his abilities to use.

It was explained how the Wisconsin Electric Power Company embarked on a program designed to find management ability among it's own employees. This program was divided into three parts, which were ratings, interviews and tests. From these the company was given a picture of the individual management ability of each employee. While these three phases of the program did not give an exact and positive picture of each man's ability, it did narrow the selections down and enabled the company to spend more time with the qualified candidates.

It was found that some individuals are endowed by nature with natural ability toward management, and with the necessary technical training, exceeded others who were not fortunate enough to possess this natural ability. These were the type of men that the company wanted, and it was to discover these men that these tests were initiated.

Men were found at all echelons of the company's structure who, because of various circumstances were not being given the chance to put their management abilities to the fullest use. For various reasons, such as age, some of these men will never have an opportunity to prove themselves; but for the remainder the company has already proceeded to place them in positions where they can do the most good.

CATLIN SPEAKS

Wisconsin Assemblyman Mark Catlin, Speaker of the Assembly was principal speaker at the November meeting of the Fox River Valley Chapter, Wisconsin Society of Professional Engineers. The engineers convened at a dinner gathering at the Foeste Hotel, Sheboygan. The meeting was presided over by Robert Stieg, chapter president, and special guest was A. Owen Ayres, Eau Claire, president of Wisconsin Society of Professional Engineers, the parent organization.

Mr. Catlin spoke on "Unions and Unionism", a subject which has been and continues to be a major economic factor in American life. He sketched vividly the history of labor-relation legislation, indicating how the Wisconsin legislation has created basically better and more sound relations between labor and management and the community as a whole. The "Wisconsin Employment Peace Act", passed in 1939, has stood without the necessity of amendment or change since that time, and it is a legislative safeguard to the peace and safety of the community as a whole, as well as to both labor and management. He pointed out how those who want to control labor for selfish purposes, work to do so by gaining political control at the polls, using strongarm methods and many times "brainwashing" techniques.

Individual support of political efforts is an American institution and a healthful condition, but the effort to influence free elections by the gifts and contributions of either large corporations or labor unions is shown by the records to be based on intimidation and other methods against the American way of self-government. Robert LaFollette, Sr., famous in Wisconsin history as a champion of the rights of individuals, foretold and warned against many of the "boss" methods which in our own time are very real threats against the political and economic life of every Wisconsin citizen.

Mr. Catlin remarked with force that certain labor leaders obviously do not have the real good of our laboring people at heart, and pointed out that nonetheless there are a few leaders, in a pitiful minority, who continue to strive against great odds for the true benefit of the rank and file of workers who form the solid and highly important bulk of Wisconsin citizens.

Stressing the vital importance of the strict separation of American political life from any domination by either force or money, Mr. Catlin dynamically pointed out how existing Wisconsin laws are presently protecting all workers, and how the efforts of a few selfish individuals of the "labor movement" have been trying to destroy this protection. With the help of alert and thinking citizens this protection will continue to be part of our Wisconsin law.

(Continued on next page)

W.S.P.E.

(Continued from page 39)

NORTHWEST CHAPTER

WM. A. ROSENKRANZ

The Northwest Chapter held its November meeting at Reiter's Steak House at Chippewa Falls November 9. About 50 members, wives and guests attended the meeting. Mr. David Rowlands, Eau Claire City Manager, addressed the group concerning his impression as one of 12 Wisconsin Civilian Defense representatives at "Operation Q", the atomic bomb tests held last summer at Yucca Flats in Nevada.

A series of "before and after" pictures were shown which dramatically illustrated the damage caused by the bomb. Heavy Army tanks two miles from the blast were tossed about like toys. Frame and brick-faced cinder block houses were completely demolished at a distance of 4,700 feet. A reinforced concrete block house withstood the blast, having only the windows blown out. It appeared to Mr. Rowlands that in many instances people may have withstood the blast effect if they had been in the basement.

In conclusion Mr. Rowlands urged support of the Civilian Defense Program and pointed out the local civil defense warning signals and program.

Mr. Thor Gustafson, electrical engineer with the U. S. Rubber Company in Eau Claire and a new Society member, was presented with a membership pin by Mel Charlson, Chapter Membership Committee Chairman.

Pat Boyd, Education Committee Chairman, disclosed plans for a refresher course being planned for engineering graduates planning to take the E.I.T. examination. The University of Wisconsin Extension Division will subsidize the course if 15 students sign for the course. The course would include twelve sessions at a cost of 15 dollars per student. It is hoped that the course will be offered in time for completion prior to the June examination.

Bill Rosenkranz was appointed Engineers' Week Committee Chairman.

The Chapter nominating committee, headed by Al Lokken reported the following slate of candidates for Chapter offices:

President: Virgil Dufeck, Manager of the Eau Claire Cooperative.

Vice President: Walter Hestekin, present Chapter Secretary and heating and ventilating engineer for Hovland Sheet Metal in Eau Claire.

Secretary: Dale Gordon, engineer with the Wisconsin Highway Commission in Eau Claire.

Board Member: R. C. Cooper, Consulting Engineer in Rice Lake.

H. T. Hagestad introduced the following resolution, which was passed:

WHEREAS, The State of Wisconsin is planning a new highway between Hudson and Eau Claire and:

WHEREAS, Consulting services outside the State Highway Commission are to be employed for planning and:

WHEREAS, Competent Wisconsin engineers are interested in such work;

Now therefore be it resolved, That the N.W. Chapter of W.S.P.E. request that the State Highway Commission give consideration to engineers of the State of Wisconsin by due notice through the State Board W.S.P.E.

WESTERN CHAPTER

M. L. HOGLUND

The Western Chapter of the Wisconsin Society of Professional Engineers met at Walt's Restaurant, October 27 to hear Owen Ayres, State President, report on professional engineering activities. The membership was informed of the signing of Bill 668A by Governor Kohler this week. Mr. Ayres stressed the importance of the passage of Bill 688A by stating it was second only to the birth of the Engineering Society in 1944. Mr. Ayres briefly reviewed the history of the controversial bill and pointed out that it is in agreement with the "Code of Inter-Professional Practice" which the professional engineers and architects had agreed to earlier in 1955. The code was developed on the basis of "prime responsibility" for a project. Following is the part that is particularly pertinent to Bill 688A. "An Architect or a Professional Engineer may ethically accept commissions for projects embracing both architectural and engineering work involved or provided he will employ other registered engineers or registered professional engineers who are competent in those phases of the work in which he lacks proficiency." Bill 688A makes legal practice which has been in effect for several years. Mr. Ayres expressed deep appreciation to the engineers and legislators who had made a thorough study of the bill and had assisted in its passage.

Mr. Ayres also reported on the progress of the membership contest with the State of Michigan and presented a plan to improve the position of Wisconsin in that race. Both State Societies are affiliated with the National Society of Professional Engineers.

Mr. Ayres called the attention of the group to the efforts being made by the Wisconsin Society to encourage more young men to study engineering to offset the shortage, which may seriously affect the national safety. John Gammell of Milwaukee is head of the Awards Committee which at the present is seeking the most outstanding high school science teachers in the state who have done most to encourage the study of science and mathematics which are the basic subjects of engineering.

The speaker was introduced by Ted Neubauer, Program Chairman and Chapter President Richard Brindley presided.

SOUTHEAST CHAPTER

No chapter news submitted.

SOUTHWEST CHAPTER

No chapter news submitted.

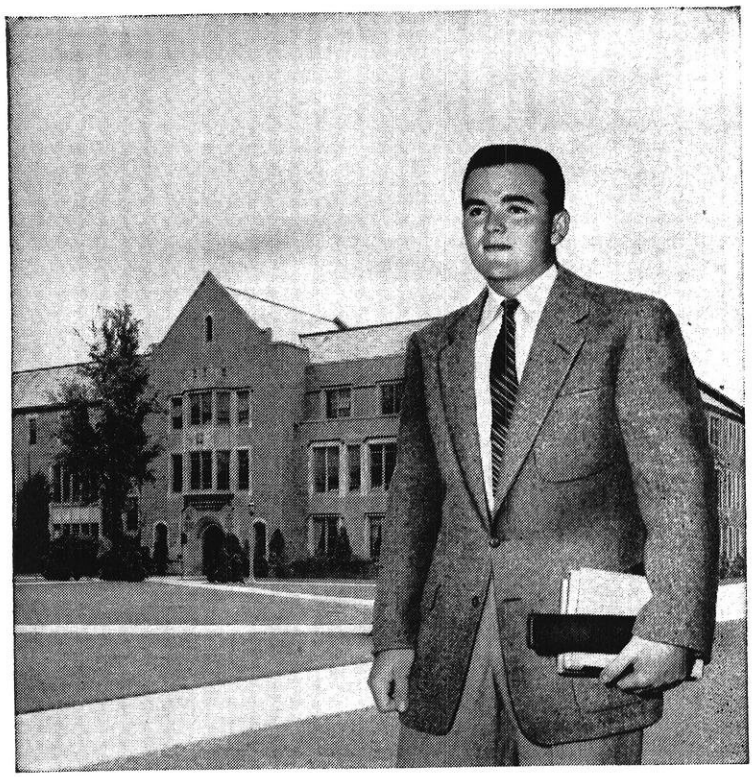
WISCONSIN VALLEY CHAPTER

No chapter news submitted.

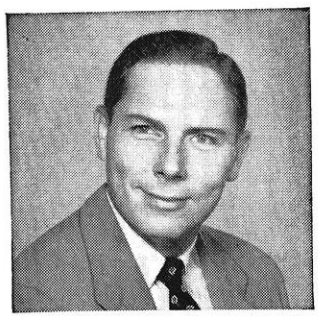
END

John Kennedy asks:

How much travel is there in technical sales work?



JOHN T. KENNEDY is working toward his B.S. degree in chemical engineering from Notre Dame University in June 1957. He's a member of the student branch of A.I.Ch.E. and is active in the Young Christian Students and in the Chicago Club. Because John feels one should make employment plans early, he's starting his investigations during his junior year.



A. HICKS LAWRENCE, JR., earned his B.E. degree from Yale in June 1940 and joined Du Pont in the following month as an analytical chemist. He progressed steadily at various plants, from line foreman to shift supervisor to senior supervisor. In 1949 he applied his technical training to sales work. Today Mr. Lawrence is a sales manager in the "Kinetic" Division of Du Pont's Organic Chemicals Department.

A. Hicks Lawrence answers:

Well, John, as the *Old Man of the Sea* told Sinbad the Sailor, "The quantity of travel varies with the specific situation encountered." Of course, you'll never be shipwrecked or encounter the other travel problems that Sinbad did, but a man shouldn't seriously consider a career in sales work unless he really enjoys travel. Most of our sales personnel do just that, because the work itself provides so many rewards and satisfactions. It's not unusual for a representative to be away from home base 30 to 60 per cent of the time.

You see, John, for a good salesman, every trip means meeting new people, new situations, and new challenges. Every one of these offers a chance to display individual initiative. Perhaps the customer will need technical advice on applying our product to a specific item he's developing. The Du Pont salesman may choose to use his own experience and "trouble-shoot" on the spot. On the other hand, he may refer the problem to "home base," where he knows he'll be backed up by a strong technical organization. This knowledge naturally stimulates a salesman and heightens his interest in his work. He knows that he never travels alone.

WANT TO KNOW MORE about technical sales at Du Pont? Send for "The Du Pont Company and the College Graduate." This booklet contains a section on sales work and also gives many interesting details about the technical staff and laboratory facilities which stand behind a salesman. Write to E. I. du Pont de Nemours & Co. (Inc.), 2521 Nemours Building, Wilmington 98, Delaware.

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

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

WATCH "DU PONT CAVALCADE THEATER" ON TV

ALUMNI NOTES

by John M. Albrecht, c'56

Robert Mercer (m'36) has been named northeastern manager of the sales department of the Sturtevant Division of Westinghouse Electric Corporation. His post, having its headquarters at New York City, was created in a reorganization of the Westinghouse sales department.

Mercer has served with Westinghouse since his graduation, holding sales posts in Camden, New Jersey; Syracuse, New York; and Cleveland, Ohio.

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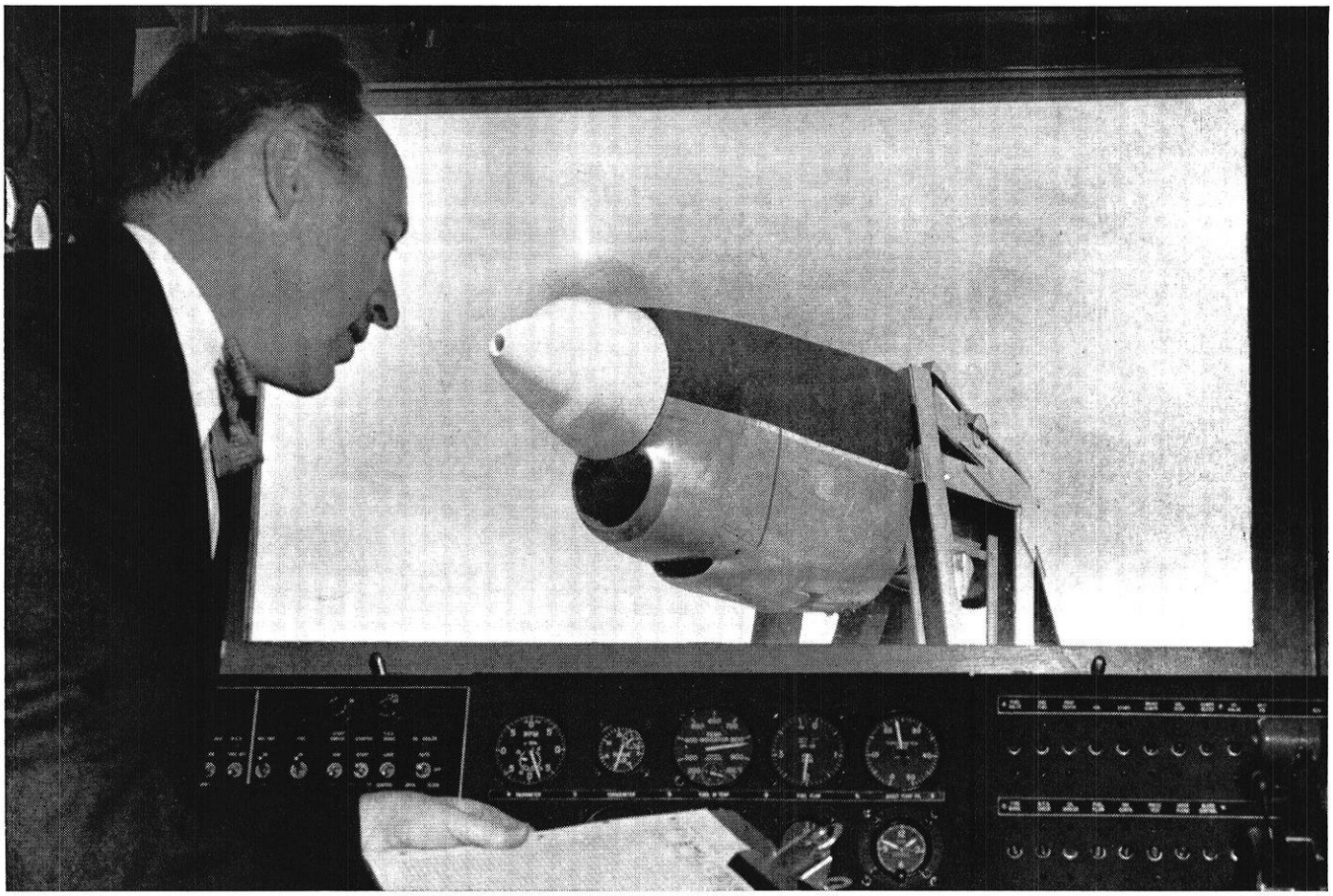
Many of last year's seniors, upon graduation, found employment with concerns in various parts of the country. The following list refers to former engineering students who graduated in June, '55.

Name	Course	Company	Nature of Work
Abele, Laimonis, A.	M.E.	Allen-Bradley Milwaukee, Wis.	Training Program
Ambrose, Roger	M.E.	Sperry Gyroscope Co.	Field Engineer
Antoine, Raymond G.	M.E.	Blackhawk Mfg. Co. Milwaukee, Wis.	Engineering
Anrold, Orville E.	C.E.	Inland Steel Company East Chicago, Ind.	Roll Design Dept.
Ausman, John M.	Ch.E.	Esso Research and Engineering Co. Linden, New Jersey	Chemical Engineer
Beebe, Donald J.	M.E.	Dow Chemical Company Midland, Michigan	Training Program
Bergauer, Jule C.	E.E.	Illinois Bell Telephone Co. Chicago, Ill.	Chicago Area Engineering Dept.
Berman, Neil S.	Ch.E.	Standard Oil Co. of California El Segundo, Calif.	Manufacturing Design and Economics
Bley, James R.	M.E.	Allen Bradley Milwaukee, Wis.	Training Program
Bluemke, Duane H.	Ch.E.	Fisher Governor Co. Marshalltown, Iowa	Sales Engineering
Boneham, Roger W.	M.E.	Caterpillar Tractor Co. Peoria, Ill.	Manufacturing
Bourcier, Gilbert	Met. E.	Revere Copper and Brass, Inc. Chicago, Ill.	Mill Methods Engineer
Bridges, Howard W.	M.E.	Westinghouse Electric	Graduate Training Course
Brinkman, Earl C.	Met. E.	Crane Company Chicago, Ill.	Foundry Developments
Callies, Fritz A.	M.E.	Kearney and Trecker Milwaukee, Wis.	Training Program
Case, James C.	Ch.E.	Westinghouse Electric Corp. East Pittsburg, Pa.	Engineering Training
Cockfield, David O.	M.E.	Boeing Aircraft Seattle, Washington	Project Design
Coulson, Lowell T.	E.E.	Farnsworth Electronics Co. Fort Wayne, Ind.	Research
Chare, Eugene C.	E.E.	Sandia Corp. Albuquerque N. M.	Research
Dauterman, David C.	C.E.	Douglas Aircraft Inc. El Segundoc Calif.	Stress Analysis
DeBruin, Ronald R.	C.E.	City of Milwaukee Milwaukee, Wis.	Civil Engineer I
DeMatthew, Anthony	M.E.	General Electric	Training Program
Derusha, James R.	M.E.	Marinette Marine Corp. Marinette Wis.	Ship Building and Steel Fabrication
Dudek, Joseph A.	Met. E.	NorthAmerican Aviation, Inc.	Nuclear Engineering
Dutton, William A.	Ch.E.	Marathon Corp. Menasha, Wis.	Process Engineer
Ebbers, Phillip C.	M.E.	IBM Corp. Endicott, New York	Eng. Training Program
Eberhardt, Wayne R.	Ch.E.	The Chemstrand Corp. Decatur, Alabama	Development
Fiedler, Ronald R.	C.E.	Inland Steel Co. East Chicago, Ind.	Construction Supervision
Flax, David P.	M.E.	Western Electric Company S. Kearny, N. J.	Machine Design
Fowler, Calvin D.	E.E.	Convair San Diego, Calif.	Research
Gersbach, Gunter K.	M.E.	Caterpillar Co. Peoria, Ill.	Engineer in Training
Graef, Richard W.	M.E.	Allis-Chalmers Mfg. Co. Milwaukee, Wis.	Training Program
Grebetz, John	Met. E.	Ladish Co. Racine, Wis.	Met. Engineer
Haase, Ronald W.	C.E.	Wis. Bridge and Iron Milwaukee, Wis.	Draughtsman
Hart, Dexter R.	M.E.	Farnsworth Electronics Ft. Wayne, Ind.	Electronics
Havranek, Frank D.	E.E.	Illinois Bell Telephone Chicago, Illinois	Training Program for Management
Hillman, DeWayne	M.E.	John Deere Waterloo, Iowa	Research and Development
Hird, Francis L.	C.E.	Ward and Strand Madison, Wis.	Consulting Engineering
Holdridge, Gerald R.	E.E.	Signal Corps Engineering Lab. Fort Monmouth, N. J.	Development Work
Hughes, Marshall W.	E.E.	Motorola Communications and Electronics Chicago, Ill.	Sales
Jennrich, James G.	M.E.	Caterpillar Tractor Peoria, Ill.	College Trainee
Jann, Richard H.	C.E.	Shell Oil Wood River, Ill.	Engineering
King, David A.	M.E.	Kearney and Trecker Corp. Milwaukee, Wis.	Training Program
Kling, Gary H.	C.E.	L. S. Tourneau-Westinghouse Peoria, Ill.	Structural Design
Kluever, Melvin L.	M.E.	Regal Ware, Inc. Kewaskum, Wis.	Tool Design and Production Engineering
Koentop, Preston E.	M.E.	John Deere Waterloo, Iowa	Training Program
Koester, James G.	M.E.	The Heil Co. Milwaukee, Wis.	Production Engineering Dept.
Krueger, Richard H.	E.E.	Wisconsin Tel. Co. Milwaukee, Wis.	Management Training Program
Krueger, Thomas O.	E.E.	Signal Corps Lab. Fort Monmouth, N. J.	Electronic Design and Development
Laine, Erick J.	C.E.	Aluminum Company of America New Kensington, Pa.	Production Engineer

(Continued on page 46)

16 TIMES "AROUND THE WORLD" AND NEVER OFF THE GROUND!



WHAT KIND of double talk is that—"16 Times Around the World, and Never Off the Ground?"

It's like this. With Allison's entry into the commercial airline field, there is a need for flight data on turbo-prop engines before they are put into regularly scheduled commercial service. In the absence of actual data, Allison is running a 1000-hour test schedule with a Model 501 turbo-prop engine mounted on an outdoor test rig.

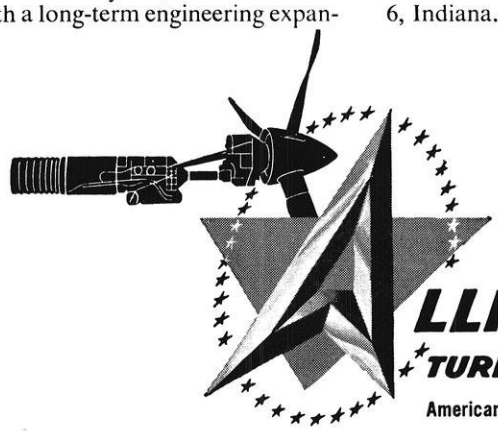
In reality, 1000 hours of flying time represents about 16 times around the earth, is the equivalent of about 4 months of normal, commercial airline usage.

For this test, actual airline operating schedules are used. This means that the engine is run through complete cycles of starting, ground idle, take-off, climb, cruise and descent for landing, and the cycle is repeated continuously 'round the clock as the schedule simulates trips of from 250 to 2500 mile blocks.

One of the young engineers who has been working on the project from the start is Donal J. Nolan, shown above at the test instrument control panel. Don is assistant chief, installation engineering at Allison. After his graduation in '42 from Case Institute of Technology, he came to General Motors in 1943 with a degree in ME.

Commercial acceptance of the Allison turbo-prop engine started with the purchase of a quantity of Allison-powered Lockheed Electras by American Airlines. This initial purchase, plus plans of other leading airlines to adopt the Electra, opens a new chapter in the growth and development of Allison Division of General Motors Corporation. Already a leader in the design, development and production of turbo-jet and turbo-prop engines for military use, Allison is underway with a long-term engineering expansion program covering advanced military and commercial engine installations. This $75,000,000 program, providing for newest engineering and research facilities, intensifies the *immediate* need for engineers.

Opportunity for young graduate engineers is unlimited at Allison. Arrange now for an early interview with our representatives on your campus, or write now for information about the possibilities of YOUR engineering career at Allison: R. G. GREENWOOD, Engineering College Contact, Allison Division, General Motors Corporation, Indianapolis 6, Indiana.



ALLISON
TURBO-PROP ENGINES
American built for the new era in air travel

(Continued from page 44)

Name	Course	Company	Nature of Work
Livingston, Richard D.	M.E.	Barber-Colman Rockford, Ill.	Machine Design
Marggraf, Bruce J.	Ch.E.	California Research Corp. Richmond, Calif.	Process Research
Markwardt, Donald C.	M.E.	Manitowoc Engineer Corp. Manitowoc, Wis.	Design
Martin, Richard W.	Ch.E.	Carbide and Carbon Chemicals Co. South Charleston, W. Va.	Development
McCormick, Lawrence	Ch.E.	E. I. duPont de Nemours Co., Inc. Niagara Falls, N. Y.	Chemical Engineering
Meinhardt, John E.	Met. E.	Pratt and Whitney Aircraft East Hartford, Conn.	Nuclear Engine Project
Miller, Wm. E.	M.E.	Metal Forms Corp. Milwaukee, Wis.	General Training Program
Nack, William W.	Ch.E.	Minnestoa Mining and Manufacturing Company St. Paul, Minn.	Process Engineer
Otto, Donald W.	C.E.	General Engineering Company Portage, Wis.	Consulting Engineer
Paulson, William G.	M.E.	U. S. Navy—Bureau of Ships Washington, D. C.	Mechanical Engineering
Petersen, Norman J.	C.E.	U. S. Public Health Service Atlanta, Ga.	Sanitary Engineer
Pless, Loren G.	M.E.	Westinghouse Air Brake Co. Milwaukee, Wis.	Engine and Compressor Testing
Polzin, Donald H.	M.E.	John Deere Waterloo, Iowa	Engineer Trainee
Potts, Jerome T.	E.E. M.E.	E. I. duPont Co. Niagara Falls, N. Y.	Electrical Engineer
Rands, Carroll C.	M.E.	Lockheed Aircraft Corp. Burbank, Calif.	Design
Ranscht, Warren G.	M.E.	N.A.C.A. Lewis Flight Propulsion Lab. Cleveland, Ohio	Aeronautical Research
Reese, Lee D.	M.E.	Terrington Co. South Bend, Ind.	Training Program
Reider, Clarence G.	C.E.	Caterpillar Tractor Company Peoria, Ill.	Research and Development
Riewe, Edgar L.	C.E.	The Texas Oil Co. Port Arthur, Texas	Structural Design
Ringey, Bruce W.	Ch.E.	Dow Corning Corp. Midland, Mich.	Product Engineering
Ritchart, Stuart T.	M.E.	Minneapolis-Honeywell Regulator Co. Minneapolis, Minn.	Design
Ritland, Murray R.	Ch.E.	General Electric Co. Schenectady, N. Y.	Chemical and Metallugrical Program
Roberts, Richard J.	M.E.	General Motors Flint, Mich.	Design and Development of Oil Filters
Salmela, John M.	Ch.E.	California Research Corp. San Francisco, Calif.	Research Engineer
Sands, Timothy B.	M.E.	General Motors Corp. Indianapolis, Ind.	Turboprop Test
Schachte, John J.	M.E.	Kearney and Trecker	Training Program
Schaefer, Carl A.	Ch.E.	Standard Oil of California El Segundo, Calif.	Manufacturing
Schmatz, Duane J.	Met. E.	Caterpillar Tractor Co. Peoria, Ill.	Training Program
Schroeder, David	M.E.	Westinghouse Electric Co. Pittsburgh, Penn.	Training Program
Schumaker, Dale H.	Ch.E.	Marathon Corp. Menasha, Wis.	Process Engineering
Schwandner, Gary	M.E.	Chrysler Institue of Engineering Detroit, Mich.	Graduate School
Schwellinger, Jerome	Ch.E.	Du Pont Louisville, Kentucky	Synthetic Rubber
Silbert, Paul L.	M.E.	Chrysler Corp. Detroit, Mich.	Chrysler Institute
Simenz, Rodney F.	Met. E.	Boeing Aircraft Co. Seattle, Washington	Metallurgical Lab. Unit
Slipper, Jerry C.	C.E.	Lockheed Aircraft Company Burbank, Calif.	Stress Analysis
Sorenson, Alan R.	M.E.	Beloit Iron Works Beloit, Wis.	Drafting-Layout
Sorge, Jack W.	M.E.	Caterpillar Tractor Co. Peoria, Ill.	Training Program
Spencer, Donald	E.E.	Collins Radio Co. Cedar Rapids, Iowa	Electronic Design and Development
Splees, William G.	E.E.	Bell Telephone Laboratories New York, N. Y.	Electronic Development
Sprague, Clarence G.	C.E.	U. S. Public Health Service	Sanitary Engineer
Stanislawski, Ralph	Ch.E.	Continental Oil Company Ponca City, Oklahoma	Development
Strand, H. Dale	E.E.	Engineering Research Associates St. Paul, Minn.	Development
Suhm, Frederick E.	M.E.	General Motors Ypsilanti, Mich.	Training Program
Sules, Guntars	Met. E.	American Smelting and Refining Co. Whiting, Indiana	Engineering
Tilley, Thomas A. Jr.	E.E.	Louis Allis Co. Milwaukee, Wis.	Application Engineer
Toft, David C.	M.E.	West Bend Aluminum West Bend, Wis.	Production Engineering Dept.
Vinton, David S.	M.E.	Caterpillar Tractor Co. Peoria, Ill.	Proving Grounds Training Program
Warren, Gilbert M.	M.E.	Carrier Corp. Chicago, Ill.	Student Engineer Trainee
Watkins, Sydney A.	E.E.	Boeing Airplane Co. Seattle, Washington	
West, Ralph C.	Met. E.	Aluminum Co. of America	Training Program
Weyres, James B.	M.E.	Convair Fort Worth, Texas	Propulsion Group
Wickesberg, Bruce A.	E.E.	Sandia Corp.	Research
Witt, Ronald	M.E.	Falk Corporation Milwaukee, Wis.	Training Program
Woolhiser, David A.	C.E.	University of Arizona Tucson, Arizona	Research in Hydrology
Yahata, Shoji	C.E.	North American Aviation, Inc. Downey, Calif.	Structural Design of Aircraft

END

Engine–Ears

(Continued from page 34)

KAPPA ETA KAPPA

In fall pledging ceremonies at Kappa Eta Kappa twenty new members were pledged to begin their period of pledge training. The new pledges are:

Donald Clarson, Norman Posepanko, Marshall Cornell, William Wahlin, Ben Hoy, John G. Hauser, Thomas S. Stafford, Arthur S. Wilke, Robert C. Bauer, Larry L. Homrig, Richard A. Frosch, Earl R. Strandt, Donald E. Olsen, Stanley Bart, Ojars Ziemelis, Richard Sobocinski, Ronald Munson, John Konop, John Pozorski and Bill Falk.

Kappa Eta Kappa is a national professional electrical engineering fraternity whose membership is open to any person enrolled in the college of electrical engineering. The Delta Chapter, located at 204 North Murray Street here at the University of Wisconsin, carries on an active program of intramural sports, social events, and scholastic achievement. Officers for the fall semester are:

Jerome Rolefson—*President*
John Leiker—*Vice-President*
Deronda Randall—*Secretary*
Barney Rae—*Treasurer*
Ray Biles—*Corresponding Secretary*
Earl Shoenwetter—*Rushing Chairman*

END

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A kitchen stove of hardwood plywood is one of the many unusual features of a "House of Tomorrow" built recently near Long Beach, Calif. The plywood kitchen range houses magnetic coils which set up eddy currents in the cooking utensils. This does the actual cooking. The utensils are suspended two inches above the surface of the stove by means of magnetic repulsion, and the wood range never gets hot.

A new electronics building of the Boeing Aircraft Company uses glued laminated wood girders and columns, and frame construction. Why so much wood? Steel would interfere with accurate testing. Wood won't.

1956-1957

The Ramo-Wooldridge Fellowships in

SYSTEMS ENGINEERING

FOR

Graduate Study at the

California Institute of Technology

or the

Massachusetts Institute of Technology

The Ramo-Wooldridge Fellowships in Systems Engineering have been established in recognition of the great scarcity of scientists and engineers who have the very special qualifications required for work in Systems Engineering, and of the rapidly increasing national need for such individuals. Recipients of these Fellowships will have an opportunity to pursue a broad course of graduate study in the fundamental mathematics, physics, and engineering required for Systems Engineering work, and will also have an opportunity to associate and work with successful engineers and physicists in this field.

Systems Engineering encompasses difficult advanced design problems of the type which involve interactions, compromises, and a high degree of optimization between portions of complex complete systems, as for example, between the electrical, mechanical, aeronautical, and chemical portions of a system. As an added complication the design of such systems is frequently very closely related to the characteristics of the human beings who will maintain and operate the systems. For the purpose of the Fellowship program, the words "Systems Engineering" are considered to include the techniques and practice of "Operations Research."

The program for each Fellow covers approximately a twelve-month period, part of which is spent at The Ramo-Wooldridge Corporation, and the remainder at the California Institute of Technology or the Massachusetts Institute of Technology working toward the Doctor's degree, or in post-doctoral study. Fellows in good standing may apply for renewal of the Fellowship for a second year.

ELIGIBILITY—The general requirements for eligibility are that the candidate be an American citizen who has completed one or more years of graduate study in mathematics, engineering or science before July 1956. The Fellowships will also be open to persons who have already received a Doctor's degree and who wish to undertake an additional year of study focused specifically on Systems Engineering.

AWARDS—The awards for each Fellowship granted will consist of three portions. The first will be an educational grant disbursed through the Institute attended of not less than $2,000, with possible upward adjustment for candidates with family responsibilities. The second portion will be the salary paid to the Fellow for summer and part-time work at The Ramo-Wooldridge Corporation. The salary will depend upon his age and experience and amount of time worked, but will normally be approximately $2,000. The third portion will be a grant of $2,100 to the school to cover tuition and research expenses.

APPLICATION PROCEDURE

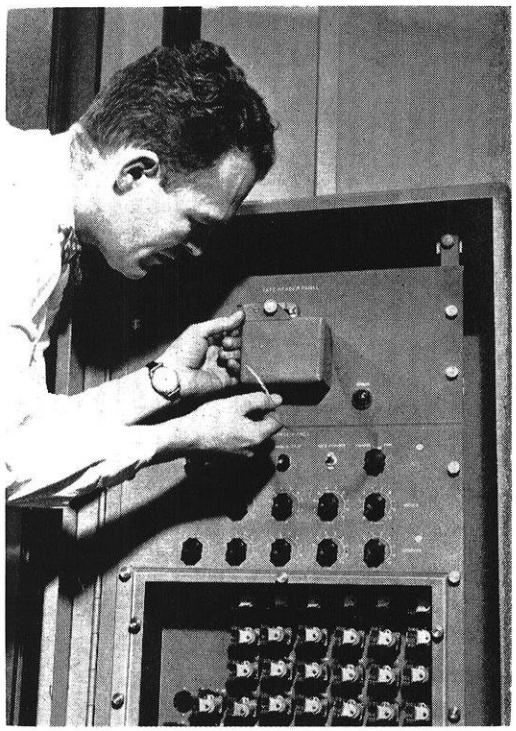
For a descriptive booklet and application forms, write to The Ramo-Wooldridge Fellowship Committee, The Ramo-Wooldridge Corporation, 8820 Bellanca Avenue, Los Angeles 45. Completed applications together with reference forms and a transcript of undergraduate and graduate courses and grades must be transmitted to the Committee not later than January 20, 1956.

The Ramo-Wooldridge Corporation

8820 BELLANCA AVENUE, LOS ANGELES 45, CALIFORNIA • LOS ANGELES TELEPHONE: OREGON 8-7161

Automation

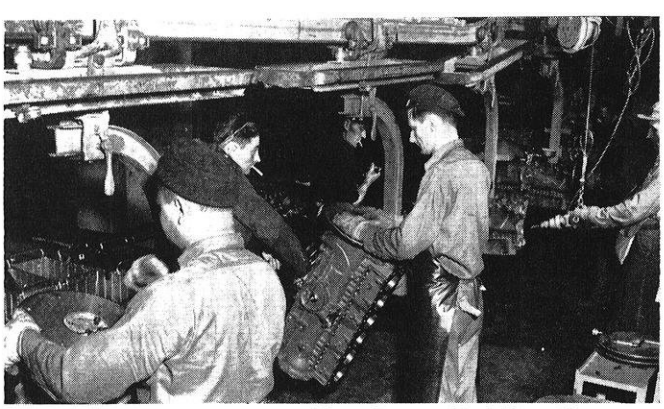
(Continued from page 21)



—Photo Courtesy Minneapolis Honeywell Regulator Co.

The growing use of and demand for automation is one of the prime factors in the great demand for engineers. Engineers are called upon to design controls such as this one where instructions, punched on a tape, are fed into a controller, which in turn transforms the instructions to machine operations.

plan is designed on the principle that employers can be made to act with an increased degree of social responsibility if they are required to bear a substantial part of the costs flowing from their decisions. Under GAW, an employee would receive full pay for one year in the event that he was laid off. The employer would make up the difference between unemployment insurance and the worker's actual working wage. Labor hopes that GAW will serve as a regulator of the process of technological change. Under GAW, management would avoid the introduction of automation in times when major layoffs would result. The introduction of new and more efficient equipment would have to be geared to periods of expanding markets so that other jobs would be available for the workers displaced by automation. The cost of maintaining displaced workers living standards for up to a year will act as a powerful deterrent to irresponsible location of the new automated plants. It will pay to retrain displaced workers for the new jobs that automation creates. It will pay to use every effort to discover or develop alternate employment for them. The employer will find it advisable to reduce prices rather than production.



—Photo Courtesy Ford Motor Company

The use of automation eliminates the back-breaking work formerly involved in moving and turning heavy engine blocks. An automatic conveyor system now moves, stops, and turns the heavy blocks for each assembly operation.

If GAW does for labor all that UAW hopes for, it will be a good thing. It may, however, simply keep management from hiring new workers. It would put a large added penalty on the failure of a new business venture. It would not be profitable to hire additional workers in a seasonal speedup. It would put a premium on a permanent labor body that would not be subject to ups and downs in business. This may be good in poor times, but would hold down employment opportunities in good times.

Labor has good reasons for wanting a share of the increased earnings which automation will make possible by lowering product unit-cost. Labor feels that the depression of the 1930's followed a decade in which a sharp rise in productivity was not offset by commensurate wage increases. In other words, labor was not able to buy what it produced. The increase in productivity brought about by automation will be more spectacular than anything seen in the 1920's. This will mean that wage increases will have to come even faster than was necessary in the 20's. We will have to balance our ability to produce with our ability to consume or surely face another depression.

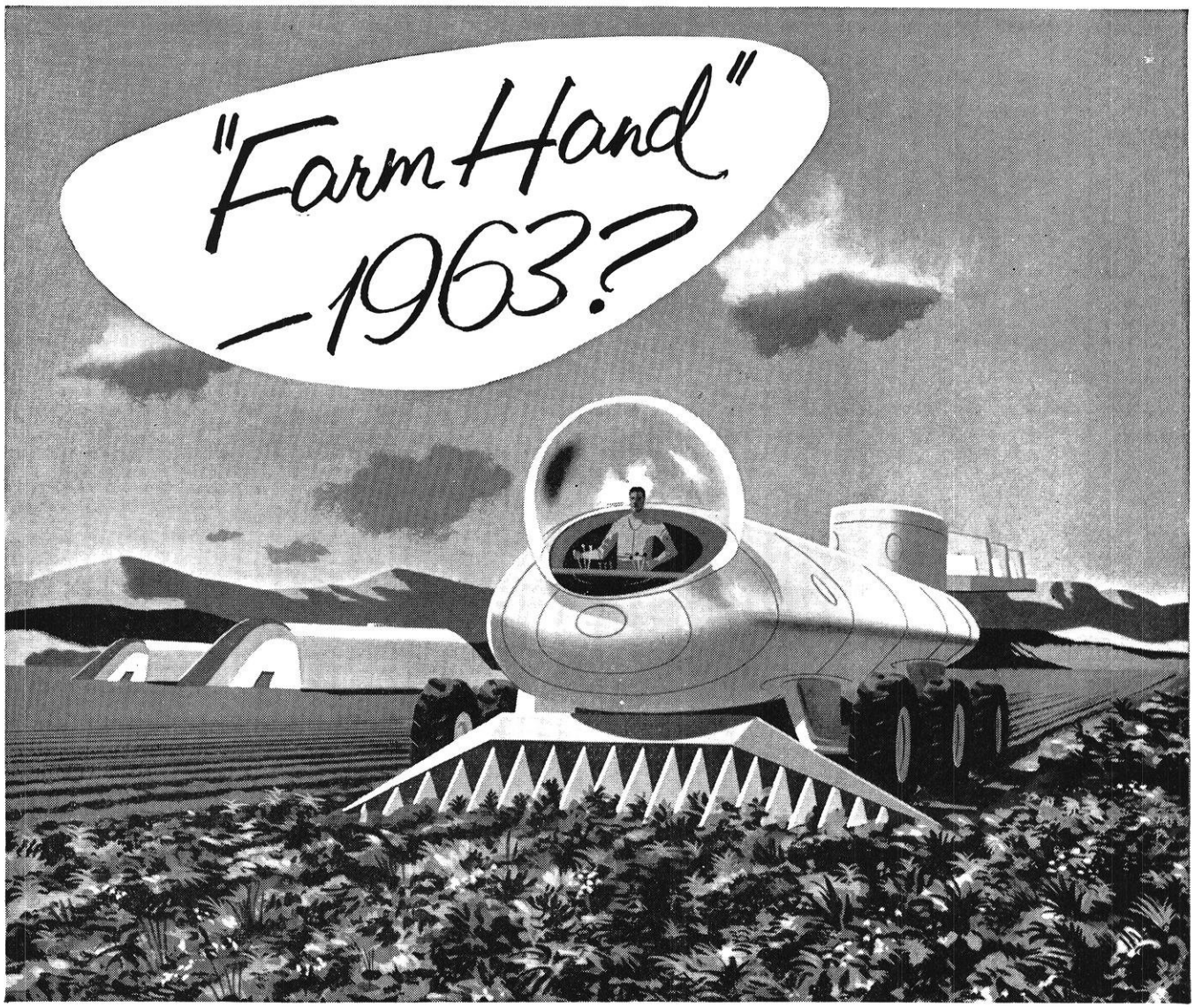
Another result of automation will no doubt be a further shortening of the work week. As we have learned to be more productive, we have been able to spend more hours on leisure time activities and less on working. It is not too long ago that men worked 60 hours a week to earn a living wage; now, the 40 hour week is standard, and labor is working to have this shortened. If this trend continues, are we capable of developing a culture that does not depend on work to give meaning to life? Can we learn to utilize leisure as something more than a respite during which we overcome the effects of work and prepare ourselves for additional work? The answering of this question may well prove to be the most difficult problem which automation creates.

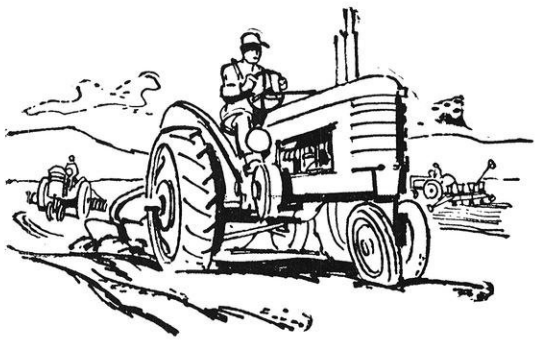
Conclusions

Automation and the resulting Second Industrial Revolution will mean that much of the monotonous and repetitive work now done by men will be performed by machines. These machines will be able to correct their own errors and make choices among several alternative courses of action.

(Continued on page 50)

NEW DEPARTURES OF TOMORROW





Today, New Departures are used by almost every manufacturer of farm equipment. That's because New Departure ball bearings have proved their ability to carry *all* loads, preserve accurate alignment of moving parts, cut friction and upkeep.

How you gonna keep 'em *away* from the farm after they've seen this machine? . . . Chances are, the people who develop this soil-conditioner, fertilizer-planter unit, with its air-conditioned control cab, will call on New Departure for ball bearings. Maybe they'll just need New Departures that are already in world-wide use—like the Sealed-for-Life or the double-row angular-contact ball bearings. Or they might want an entirely new type—a "new departure" in ball bearing design. Either way, New Departure is the answer. Manufacturers everywhere know that New Departure always lives up to its name—being *first* with the finest in ball bearings.

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

NEW DEPARTURE
BALL BEARINGS

NOTHING ROLLS LIKE A BALL

Automation

(Continued from page 48)

Automatic operation is not new, but several products of World War II research have made a new scientific approach to the problem possible. Stable feed-back and the electronic computer are the new developments which are at the base of automation's technology.

Process industry automation has been accomplished using the new technology. Unit industries, however, have encountered more difficult problems. The problems of product and process redesign, machine design, and product handling are now in various stages of solution. The computer will be used to coordinate all the operations in a fully automatic factory.

There are no automatic factories as described in this paper now in existence. When they will come and where is a matter for speculation. However, barring another great war or depression, it is almost a certainty that they will come.

Fear of technological unemployment has been common since the beginning of the Industrial Revolution. Employment statistics show, however, that this fear is not borne out by the facts. Automation will create more jobs and further increase our ability to produce. Our present standard of living has been made possible through mechanization of industry; an increasing standard will depend on how fast we can automate.

Automation's most important impact will be on the qualifications and functions of employees. Many new highly skilled jobs will be created. Whole segments of the population will have to be upgraded to fill these jobs.

Guaranteed Annual Wage is labor's way of forcing management to be responsible for solving the problems of upgrading the labor force. Labor also wants a fair share of the increased earnings made possible by automation. Ability to produce must be balanced with ability to consume. **END**

HOW HERCULES HELPS...

MULTICOLOR APPEAL—More than 1,000,000 square feet of exterior and interior surfaces of the new Beverly Hilton Hotel in Beverly Hills, Calif. have been decorated with single-spray applications of multicolor lacquer. Based on Hercules® nitrocellulose, multicolor lacquers are gaining increasing acceptance as a fast-drying, economical, and durable decorative finish.

A PRODUCTION LINE PROBLEM, excessive foam can destroy quality control in the manufacture of paper, synthetic rubber, and other products. A 2½ pound brick of convenient, easy-to-handle Hercules® Defoamer 4, however, can make as much as 40 gallons of highly effective foam control solution. Send for free testing sample.

A NEW SOURCE OF SUPPLY for acetone has been created by Hercules' Gibbstown, N. J. oxychemical plant. From photographic film to nail polish, from paints and lacquers to acetate rayon, acetone plays a vital production role as a solvent.

G55-10

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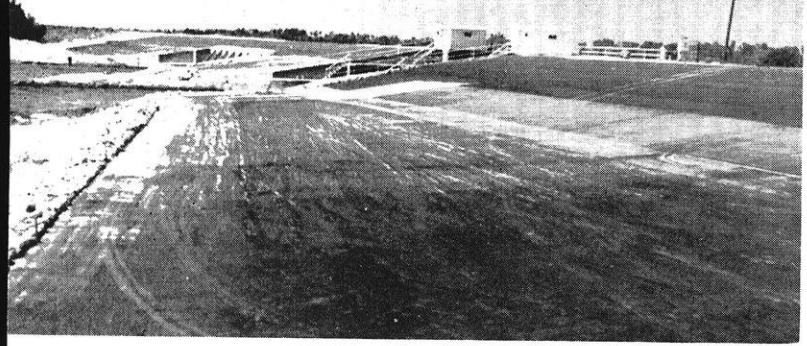
HERCULES
CHEMICAL MATERIALS FOR INDUSTRY



—Photo Courtesy Portland Cement Ass'n.

Fig. 4.—Compacted soil-cement facing on a levee at Lake Okeechobee, Fla. Work was done under the direction of the Corps of Engineers.

Soil-Cement

(Continued from page 13)

tion of a bituminous wearing surface. This wearing surface is an integral and essential part of a soil-cement road. It is usually placed immediately after the seven days of curing, and consists of a heavy bituminous prime coat to establish a good bond between the soil-cement and bituminous surface. Depending on the type of traffic, a final bituminous mix from ¾ to 2 inches in thickness is applied and the road or street is complete.

Advantages in Addition to Economy

1. Speed of construction and the resulting decrease of detours and road-blocks makes soil-cement popular with the public. Most contractors now average ½ mile of paving per day and some have completed as much as one mile in a single working day. In 1954 Minnesota built a 17 mile stretch of soil-cement paving (240,000 square yards) in 34 working days.

2. Soil-cement remains hard and retains its good properties when saturated with water, and/or subjected to freezing and thawing action. If a heavy rain storm occurs before the bituminous covering has been placed, no harm is done to the soil-cement. Also, it stands up fine in the spring when the subgrade is at its weakest.

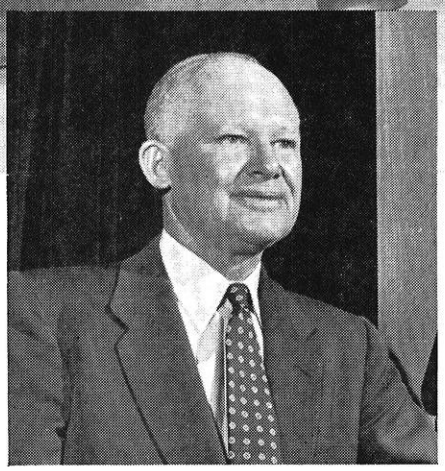
3. Maintenance costs are low with soil-cement. About the only maintenance required is an occasional patching job and a thin surface coating of bituminous material every four or five years to replace that worn away by traffic.

Is Soil-Cement Limited to Road and Street Construction?

The answer is an emphatic "No". In addition to being economical, soil-cement has become quite versatile in its adaption to varied construction projects. The Air Force and civilian airport authorities are making wide-spread use of soil-cement in building runways for handling the lighter aircraft. It is also used for sub-bases under the heavy reinforced concrete runways needed for modern jet fighters and bombers.

Soil-cement is an able relief for another highway

(Continued on page 54)



Four top scientists discuss creative thinking before fellow research men and engineers at a Joint Technical Conference held in French Lick, Indiana, by Standard Oil and its affiliates. Panel members were, left to right above, E. L. d'Ouville, G. W. Ritter, P. C. White, and T. A. Abbott. Moderator was Joseph K. Roberts, left inset, general manager of research and development for the parent company.

The Very Idea!

PETROLEUM scientists and engineers have a habit of coming up with the *very* idea to solve a problem at the very moment it is needed. They have created hundreds of new products and have improved others, putting the petroleum industry in the van of American industrial progress.

The contributions of Standard Oil scientists, working in extensive laboratories and with the finest equipment, have been outstanding. To give them even greater opportunity to exchange and develop ideas, Standard Oil uses the most modern techniques for stimulating creative thinking.

Groups of our scientists now meet in informal and relaxed creative sessions. Through "brainstorming" and similar devices, they contribute fresh, new thinking to the solution of specific problems. These men are creative by nature, and they "pop" even more ideas, faster, at sessions where one idea stimulates another.

In such an atmosphere of progress, young scientists and engineers find great opportunities to make positive contributions and build interesting careers.

Standard Oil Company

910 South Michigan Avenue, Chicago 80, Illinois

STANDARD

Soil-Cement

(Continued from page 52)

engineering headache—that of good road shoulders. Most highway departments have loose specifications concerning the construction of shoulders and the result is thousands of miles of rutted, soft, and gullied shoulders. A shoulder in this condition has lost most of its value as a safety device for preventing serious head-on collisions; soil-cement shoulders remedy the situation and provide a stable, safe place for motorists to take refuge on. Because of tight highway budgets, this use is usually confined to the heavily traveled main highways.

Other uses of soil-cement include the lining of erosion ditches, reservoirs, flood spillways and drainage channels; flood levees; earth dam cores; maintenance of other types of lower-class roads; and the construction of municipal and private parking lots.

This simple mixture of cement and dirt, with a bituminous wearing surface, has thus become a new and valuable tool in the hands of the civil engineer. Its wide acceptance is demonstrated perhaps best by the State of Louisiana—in the past eight years over 10 million square yards (equivalent to 900 miles of 20 foot roadway) have been used in the construction of roads and streets. Soil-cement is definitely here to stay, and with natural deposits of granular material getting seriously low in many areas, more and more engineers will eventually turn to it for their low cost paving needs. **END**

Smog

(Continued from page 24)

plants using them should be extremely careful that they do not bring radioactive materials down on the surrounding area.

Smog, though it has not always been called by that name, has been an ever increasing menace to mankind. It has gone hand in hand with industrial development down through the ages. In 1855, there was quite an issue about the "black fog" of London. However, the manufacturers were able to convince the government that it was not possible to correct the situation without suspending operations, and that was the end of the affair. Since that time industry has improved technologically, but the attitude of industry has been one of not caring about air pollution until a few years ago. Then they realized that they constituted a serious threat to the welfare of the community, without which they could not survive. Since then smog has become a political issue and, as such, everyone was to busy putting the blame for smog on somebody else to do anything effective about it. Finally, however, the problem became a social issue. Research on smog is being carried out by several nonpolitical nonprofit organizations and it is through their efforts that we have made so much progress in the fight against smog.

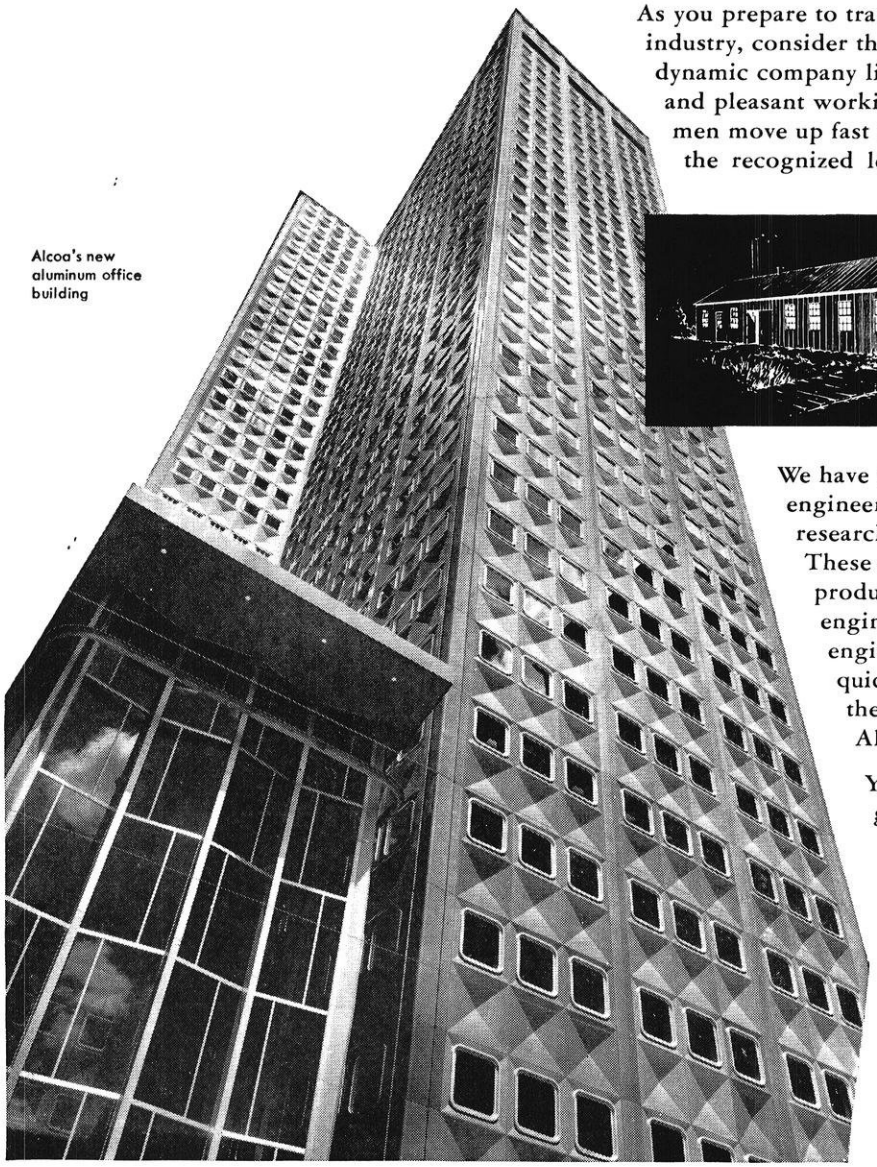
Since our ever expanding industry will soon bring the problem of air pollution to the entire country, we must back science in its fight against one of our nation's greatest peacetime enemies—smog. **END**

THE ALUMINUM INDUSTRY WAS BORN ON SMALLMAN STREET

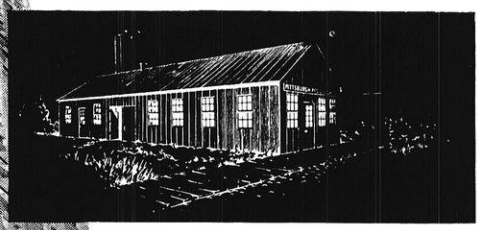
▶ In 1888, the aluminum industry consisted of one company—located in an unimpressive little building on the east side of Pittsburgh. It was called The Pittsburgh Reduction Company. The men of this company had real engineering abilities and viewed the work to be done with an imagineering eye. But they were much more than that. They were pioneers . . . leaders . . . men of vision.

A lot has happened since 1888. The country . . . the company . . . and the industry have grown up. Ten new territories have become states, for one thing. The total industry now employs more than 1,000,000 people—and the little outfit on Smallman Street? Well, it's a lot bigger, too—and the name has been changed to Alcoa. ALUMINUM COMPANY OF AMERICA . . . but it's still the leader—still the place for engineering "firsts".

As you prepare to trade textbooks for a position in industry, consider the advantages of joining a dynamic company like Alcoa—for real job stability and pleasant working conditions—where good men move up fast through their association with the recognized leaders in the aluminum industry.



Alcoa's new aluminum office building



We have fine positions for college graduate engineers—in our plants, sales offices and research laboratories from coast to coast. These are positions of responsibility in production supervision, plant and design engineering, industrial research or sales engineering. Right now it may be quicker than you think from a seat in the classroom to your career with Alcoa. Why not find out?

Your Placement Director will be glad to make an appointment for you with our personnel representative. Or just send us an application yourself. ALUMINUM COMPANY OF AMERICA, 1826 Alcoa Bldg., Pittsburgh 19, Pa.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

Campus News

(Continued from page 30)

sent methods and suggestions that will be valuable to technical personnel in calculating engineering economic analyses and in establishing programs for planned equipment replacement.

Robert A. Ratner, Institute Coordinator.

INDUSTRIAL POWER SYSTEMS

January 26, 27

This institute will be of interest to industrial and utility personnel responsible for the design, installation, operation and maintenance of industrial power systems. Subjects to be discussed will include load centers, circuit arrangement, voltages, grounded vs ungrounded systems, relaying, etc.

Ralph D. Smith, Institute Coordinator.

WISCONSIN FIRST IN PRODUCING Ph. D. SCIENTISTS

A dozen or so large universities including the University of Wisconsin form the nation's key training ground for scientists, a recent study by the National Research Council has revealed.

The study shows that more advanced students receiving doctorate degrees in the natural sciences during the period 1946–50 were educated at one of 12 leading universities than at all other schools combined. These dozen schools trained 5,748 of the 11,407 students who were granted doctorate degrees.

Not only did most young scientists obtain their advanced training at one of these 12 schools, most of them did their undergraduate work at one of 20 leading universities, the study shows.

During this period, 1946–50, the University of Wisconsin ranked first in the nation in the number of students—689—who successfully completed their studies and research for the highest of all academic degrees, the doctorate.

Following Wisconsin were Cornell with 559, MIT with 552, California (Berkeley) with 543, Illinois with 517, Ohio State with 516, Harvard with 445, Minnesota with 427, Chicago with 410, Columbia with 384, Purdue with 364, and Michigan with 342.

In a previous period, 1936–45, the first five schools in the nation in number of scientific doctorate degrees granted were Cornell, Wisconsin, Illinois, Chicago, and Columbia, in that order, the Council's study shows.

The first 20 schools at which these scientists studied as undergraduates were as follows:

California (Berkeley)—355; City College of New York—296; Illinois—276; Chicago—244; Harvard—214; Minnesota—208;

Wisconsin—204; MIT—195; Michigan—168; Ohio State—166; Brooklyn College—165; Cornell—165; Penn State—131; California (Los Angeles)—125; New York—124; Purdue—123; Columbia—119; Yale—117; Iowa State—113; Washington—104; Cal Tech.—100.

In explaining the purpose of its study, the National Research Council (a body of the National Academy of Sciences) reported:

"It was believed that some undergraduate institutions produce a relatively high percentage of graduates who go on to doctorates in the natural sciences and it was considered profitable to identify these institutions."

The scientific fields at Wisconsin in which most doctorate degrees were granted during 1946–50 are: 85 in agriculture, 36 in bacteriology, 109 in biochemistry, 62 in botany, 162 in chemistry, 46 in engineering, 22 in entomology and geology, 26 in mathematics, 40 in physics, and 35 in zoology.

END

To the engineer who can do original thinking...

AiResearch is looking for your kind of engineer.

Through the years, we have built an outstanding reputation for pioneering by seeking out engineers with a focus on the future. In pneumatics, electronics, heat transfer or turbomachinery there is always a better way, and the creative man will find it.

Proof of this is our record of accomplishment in putting air to work to solve many critical aircraft problems... one aspect of our leadership in developing the aviation accessories which make present day high-speed, high altitude flight possible. Our engineers also solved heat problems which seemed unsurmountable and blazed new trails in the expanding field of small turbomachinery (in which AiResearch has more experience than all other companies combined).

That's why we need creative engineers... and appreciate them. You who qualify for an AiResearch position will receive stimulating assignments, utilize some of the finest research facilities in the country and be well rewarded financially.

SOFT-PEDAL FOR A SUPERSONIC STORM

this AiResearch pneumatic control weighs only 3 ounces, yet regulates the flow of hot air to critical airplane parts with unfailing dependability. It reacts 100 times faster than equipment previously used.

Premium positions are now open for mechanical engineers ...electrical engineers... physicists...specialists in engineering mechanics... specialists in aerodynamics...electronics engineers ...aeronautical engineers.

Write to Mr. Wayne Clifford, AiResearch Manufacturing Company, 9851 S. Sepulveda Blvd., Los Angeles 45, California. Indicate your preference as to location either in Los Angeles or Phoenix.

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So You Think You're SMART!

by Sneedly, bs'60

Another secretary has been fired! A slight typing error on her part tended to make the whole state of Wisconsin smart enough to solve the wholesaler's problem which appeared in the October issue of Wisconsin Engineer. Of course, there are not any clocks in the boxes; how can there be when the problem deals with slide-rules? To correct this error, Sneedly wants you to try to solve the problem after you substitute the word "slide-rule" for "clocks". He guarantees this will increase the difficulty of the problem's solution. Remember last March when Sneedly had to fire the first secretary? She went to Monroe. You can guess where this one went!

* * *

Eight men entered a tennis tournament. The tournament was played on three consecutive days, one round per day and, luckily, no match was defaulted. The first and second round matches were stipulated to be two sets out of three, while the final match was to be three sets out of five. Sneedly, present as a sportswriter on all three days, reports the following facts to you:

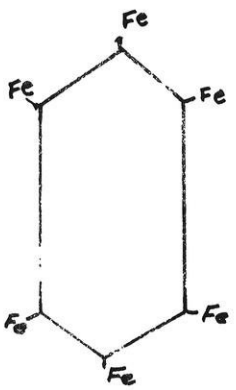
1. Wyconowitz never met McCarthy.
2. Before play began, Ryan remarked to Haverson, "I see that we meet in the finals."
3. Charles won a set at love but lost his first match.
4. Altogether, 140 games were played of which the losers won 43.
5. When the pairings were posted, Cromwell said to Oliver, "Do you concede or do you want to play it out?"
6. On the second day, the first round losers played bridge, and the same table gathered on the third day with Wyconowitz in place of Cromwell.
7. Haverson won nine games.
8. Jones won thirty-seven games.
9. The first score of the tournament was a service ace by Ryan, at which Wyconowitz shouted, "Hey, I'm not over there!"

Who won the tournament? Whom did he beat and by what score? Sneedly dedicates this problem to L. H. Shaffer. May he spend many pleasant hours working out these facts—and nothing but these facts!

Sneedly usually digs up his own problems for this feature but this next problem was given to him by a senior in Chemical Engineering. How he ever became a senior we shall never know but judge for yourself.

Name this compound:

The only hint allowable is for you to keep a very open mind when thinking up the name of this slick little outfit or you shall never get the right answer.



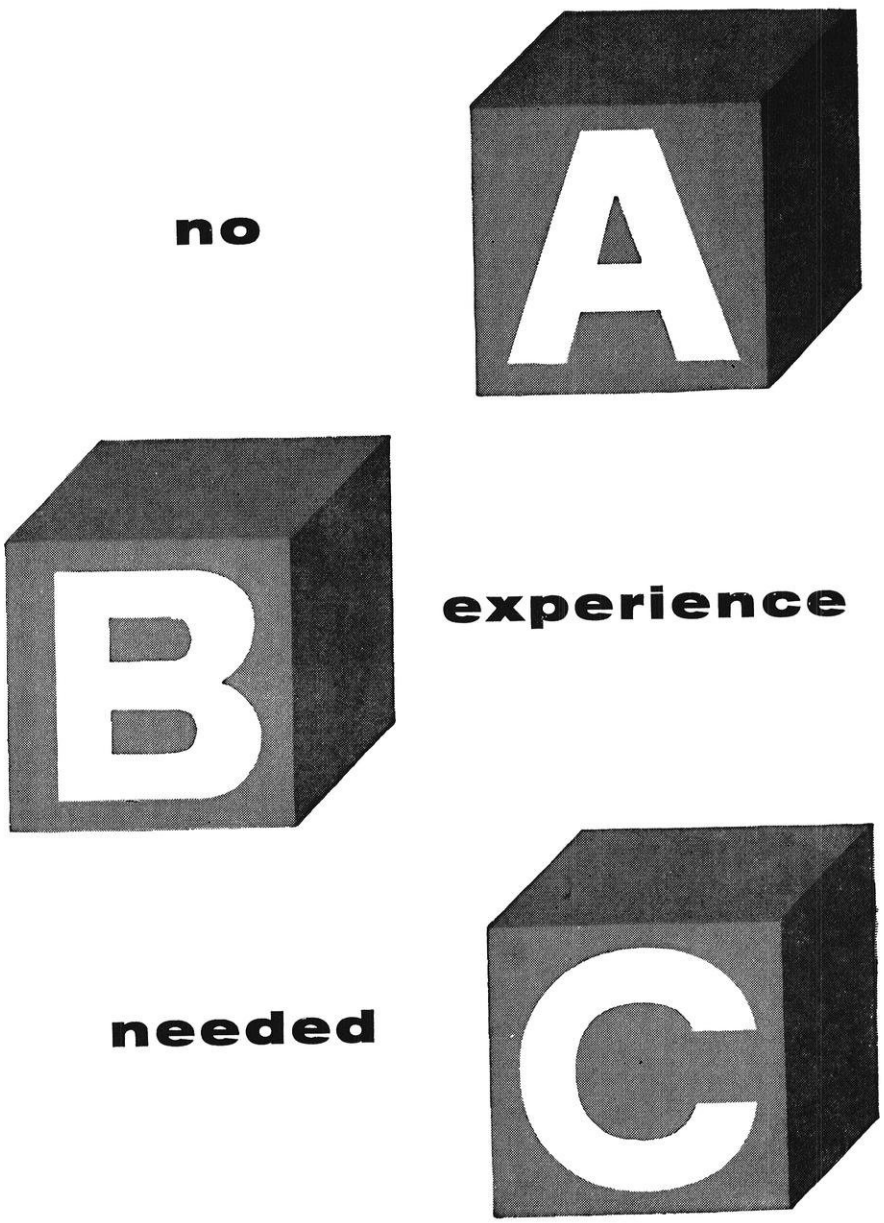
This problem should be solved by the Ch. E. fans but perhaps one of the other engineers on campus can slip out the correct answer. [To obtain his solution Sneedly dissolved this in water.]

* * *

One morning a certain chemical reaction was started at exactly a quarter of the hour. The chemical reaction finished precisely at the first meeting of the minute and the hour hands. If the reaction took more than an hour, what was the exact time it started and how long did it take?

The answers to both November and December problems will appear in January 1956.

Merry Christmas and Happy New Year! **END**



A Many of the coming developments at Martin lie in areas still so unexplored that little experience even exists.

Gravity, nuclear power, rocketry, space vehicle development.

B In today's new world of flight systems development, practical experience may be less important than creative engineering ability.

Most of the people on the Martin engineering team are young and moving ahead fast.

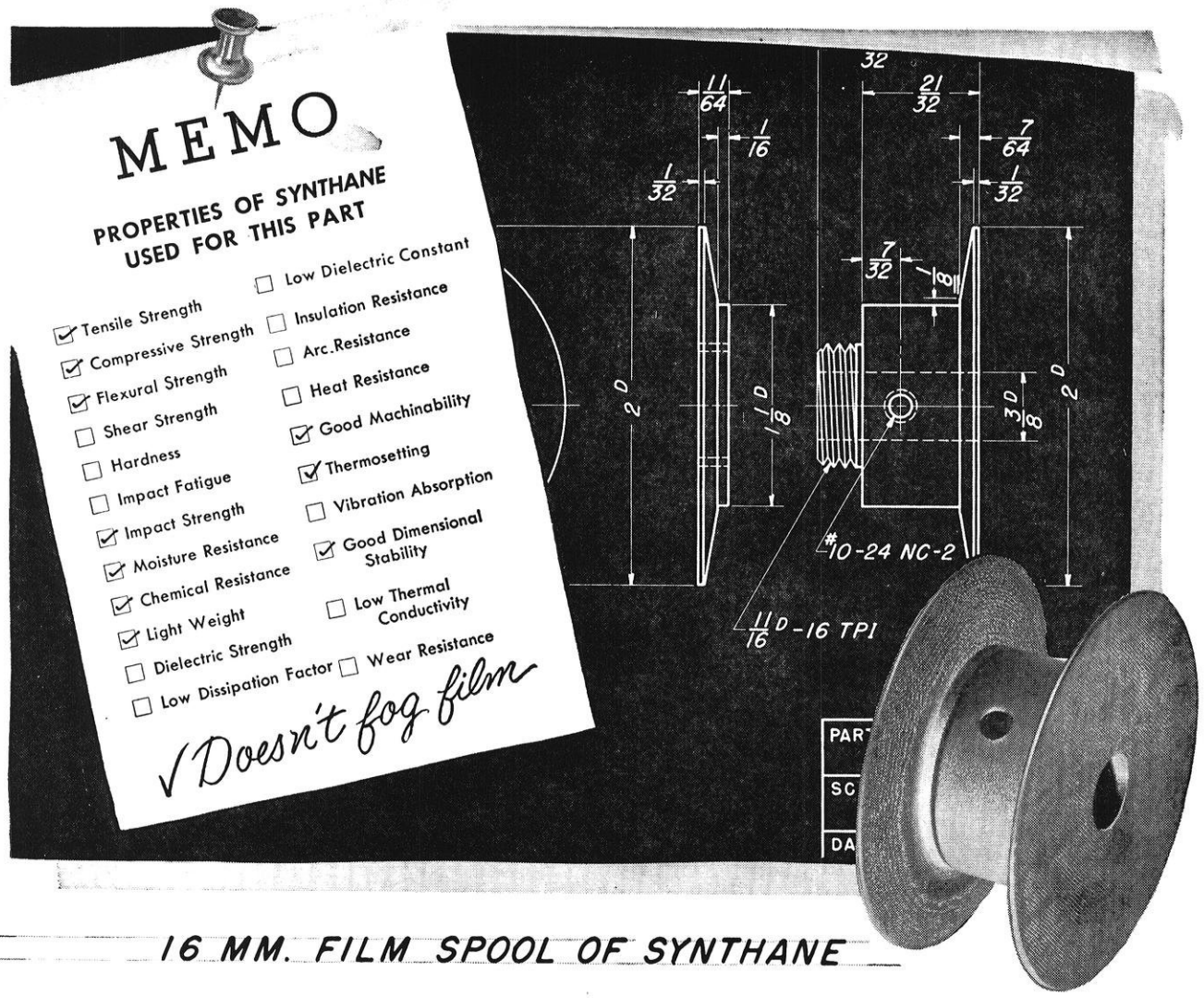
C The aircraft industry offers engineers the most immense future to be found in any major industry today.

Space itself is the next frontier!

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

MARTIN
BALTIMORE

YOU FURNISH THE PRINT, WE'LL FURNISH THE PART



16 MM. FILM SPOOL OF SYNTHANE LAMINATED PLASTIC RESISTS PHOTOGRAPHIC CHEMICALS, HOLDS SHAPE, DOESN'T FOG FILM.

The film spool we're talking about is one used in the processing of movie film. The material for this spool has to be light in weight, strong and easily machined. Since it is always in contact with film and photo solutions, it must also be chemically-resistant and—most important—not fog the film by chemical contamination.

This isn't an easy assignment for any material, but *Synthane* fills the bill.

Whenever you want parts requiring many properties, consider how *Synthane's* combined benefits may help you improve your product.

Synthane produces finished parts from many different grades of *Synthane* laminated sheets, rods, tubes and molded-laminated and molded-macerated parts. Service and quality characterize *Synthane* fabrication.

We can handle the whole job for you from your print to the finished part—eliminating your tooling-up, reject and machining problems—and producing parts of excellent quality at a saving of your time and money.

For more information about *Synthane* grades, properties and fabrication facilities, send in the coupon.

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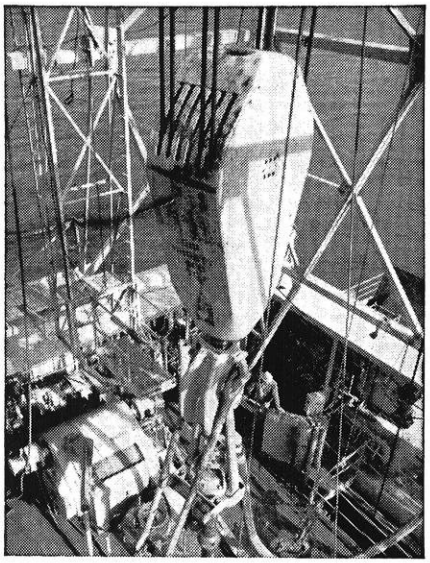
Another page for **YOUR BEARING NOTEBOOK**



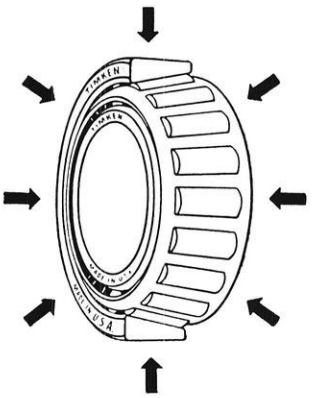
How to tackle heavy thrust loads in a 400-ton traveling block

Fleet angles set up a thrust problem on this oil rig traveling block. Engineers solved it by mounting the sheaves on Timken® tapered roller bearings. They keep the sheaves in positive alignment regardless of the fleet angle or line load, give the 400-ton capacity block maximum stability.

Timken bearings are designed to roll true, and precision-made to live up to their design. As a result, sheaves rotate freely and easily, even with a full weight of drill string, reducing line slippage and wear.

The taper in TIMKEN® bearings lets them take radial and thrust loads in any combination

Timken bearings are tapered to take thrust loads as well as radial loads, or any combination. And Timken bearings can handle heavy loads because (1) they have full line contact between rollers and races. And (2) the rollers and races have shock-resistant cores under hard, wear-resistant surfaces.



Want to learn more about bearings or job opportunities?

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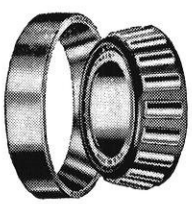
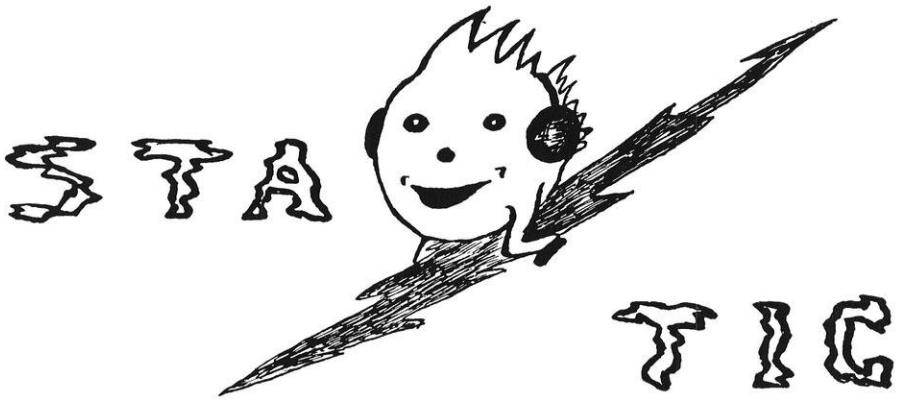
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS



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



I. R. Drops, II

"I'm going to quit dating engineers; they always leave prints on my neck."

"Yeah—but lawyers are always contesting your will."

* * *

Voter: Why I wouldn't vote for you if you were St. Peter himself."

Candidate: "If I were St. Peter, you couldn't vote for me. You wouldn't be in my district."

* * *

A typical incident at U. W.:

Prof. Elliot rapped on his desk and shouted: "Gentlemen—Order! Order!"

Whereupon the entire class yelled: "Beer."

* * *

B.M.O.C. (over phone): John Smith is sick and can't attend classes today. He requested me to notify you."

Professor: "All right. Who is this speaking?"

B.M.O.C.: "This is my room mate."

* * *

Said the pretty girl as she dashed for the train, "Sure my sailor's got a girl in every port—it's me."

* * *

Jacobson: "What is the difference between an accountant and an engineer?"

Niles: "An engineer is a damn fool running around with a slide rule whereas an accountant doesn't own a slide rule."

* * *

Sign in real estate office: "Get lots while you're young."

* * *

All the world's a stage, and the engineers are the bad actors.

* * *

Fashion note: The most popular shades this winter will be the ones left up in the girls' bedroom windows.

* * *

The professor who comes in late is rare; in fact, he's in a class by himself.

* * *

Most engineers think more toasts should be given to the girl who steals, lies, and swears—steals into your arms, lies there, and swears she loves you.

And then there's the story . . . of the E.E. who married an E.E. and the little ones were named Einstein, Steinmetz, and Slide Rule.

* * *

"We had the honor system in our school, but the faculty had to cut it out."

"Why?"

"Well, the profs had all the honor and we had all the system."

* * *

For all you engineers who arrive at class without breakfast, this column introduces the new Kentucky breakfast. It is light, compact, and portable. The one and only course consists of a quart of Bourbon, a bull dog and a steak. . . . (the dog eats the steak).

* * *

If every boy in the United States could read every girl's mind, the gasoline consumption would drop off fifty per cent.

* * *

A faith healer ran into his old friend Max and asked how things were going.

"Not so good," was the pained reply. "My brother is very sick."

"You brother isn't sick," contradicted the faith healer, "he only thinks he's sick. Remember that he only thinks he's sick."

Two months later they met again and the faith healer asked Max, "How's your brother now?"

"Worse," groaned Max, "he thinks he's dead."

* * *

Caterpillar: An upholstered worm.

* * *

"I shall now illustrate what I have on my mind," said the professor as he erased the board.

* * *

G.I. Haircut: A patch of hair with white sidewalls.

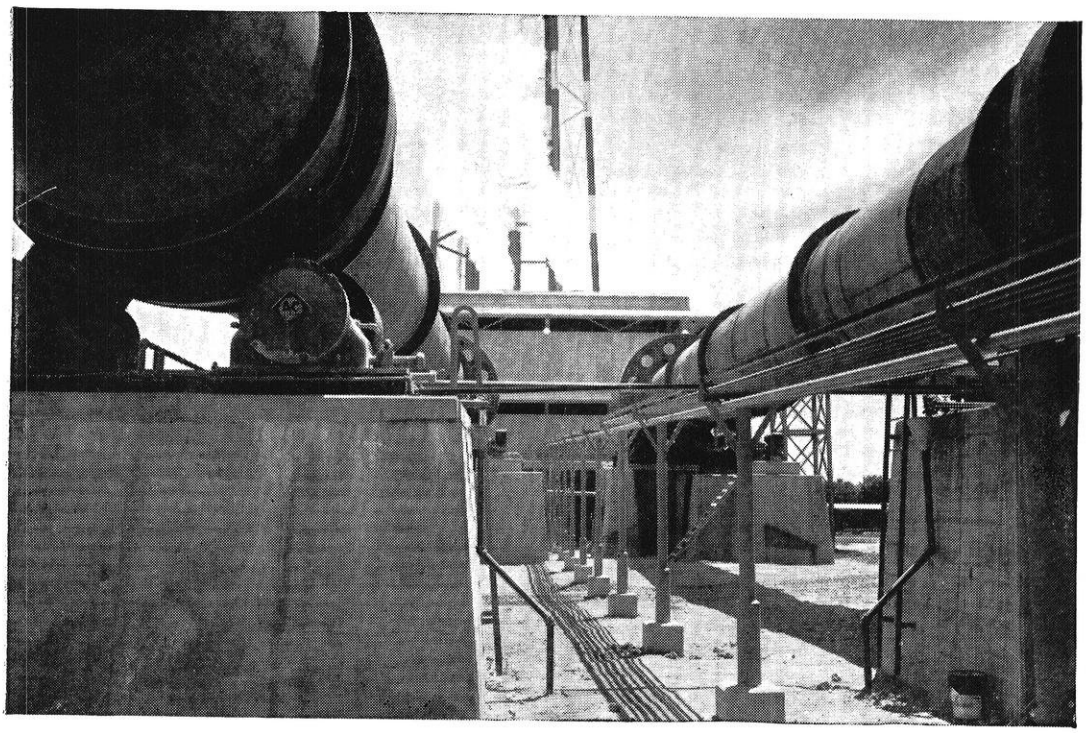
Evening Dress: A dress that's more gone than gown.

* * *

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

* * *

Did you ever note how often a narrow mind and a wide mouth go together?



CONSTRUCTION— Tremendous rotary kilns, like these, typify Allis-Chalmers role in the cement industry.

Join the company that serves 3 GROWTH INDUSTRIES

Match your engineering talents to the future needs of the construction, power and manufacturing industries. These are growing needs—for the population is climbing at the amazing rate of 50,000 people every *week!*

Many billions of dollars for highway *construction* alone are called for by the President in the next ten years. Allis-Chalmers builds equipment used in making cement, aggregate and steel as well as earth movers and graders.

Electric *power generation* will double in ten years. A-C builds the machines that make electricity.

Manufacturing output must increase $3.5 billion by this time next year. Allis-Chalmers builds motors, control, drives and many other types of equipment for this industry.

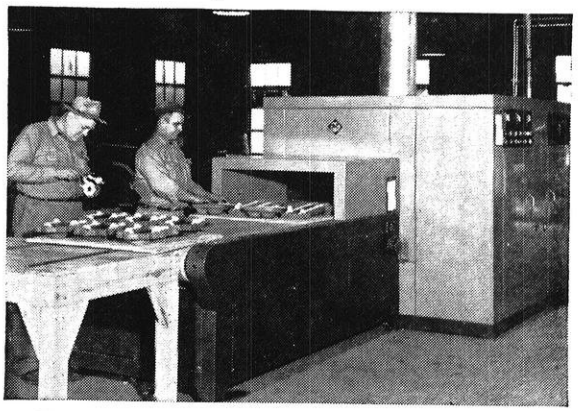
Here's what Allis-Chalmers offers to Young Engineers:

A graduate training course that has been a model for industry since 1904. You have access to many fields of engineering: electric power, hydraulics, atomic energy, ore processing.

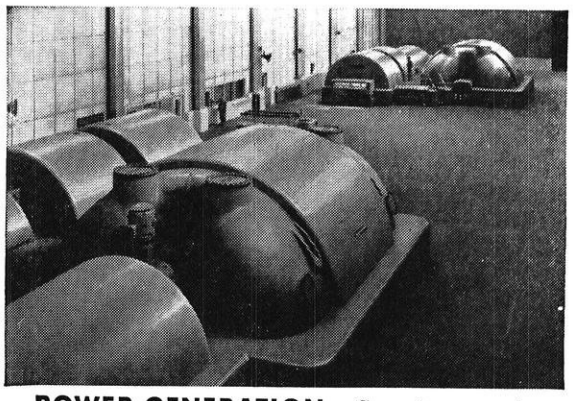
There are many *kinds* of work to try: Design engineering, application, research, manufacturing, sales. Over 90 training stations are available, with expert guidance when you want it. Your future is as big as your ability can make it.

Or, if you have decided your field of interest and are well qualified, opportunities exist for direct assignments on our engineering staff.

In any case—learn more about Allis-Chalmers. Ask the A-C manager in your territory, or write direct to Allis-Chalmers, Graduate Training Section, Milwaukee 1, Wisconsin.



MANUFACTURING—A-C aids high speed production and helps improve quality with dielectric sand core dryers like the one above.



POWER GENERATION—Growing use for power means growing demand for A-C steam turbines, transformers, and other equipment.

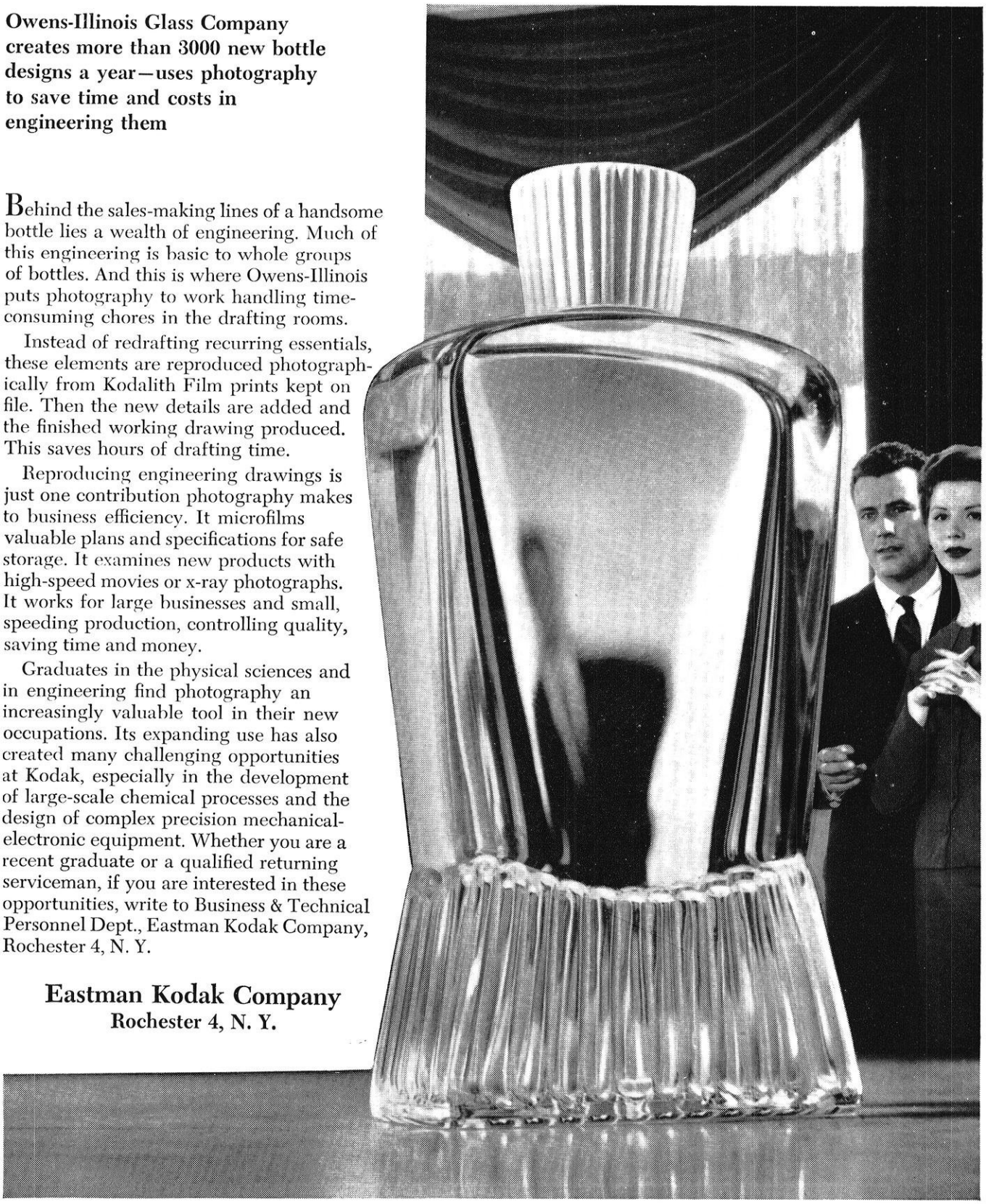
ALLIS-CHALMERS

A-4685

Glass turns salesman

–as photography speeds bottle design

Owens-Illinois Glass Company creates more than 3000 new bottle designs a year—uses photography to save time and costs in engineering them



Behind the sales-making lines of a handsome bottle lies a wealth of engineering. Much of this engineering is basic to whole groups of bottles. And this is where Owens-Illinois puts photography to work handling time-consuming chores in the drafting rooms.

Instead of redrafting recurring essentials, these elements are reproduced photographically from Kodalith Film prints kept on file. Then the new details are added and the finished working drawing produced. This saves hours of drafting time.

Reproducing engineering drawings is just one contribution photography makes to business efficiency. It microfilms valuable plans and specifications for safe storage. It examines new products with high-speed movies or x-ray photographs. It works for large businesses and small, speeding production, controlling quality, saving time and money.

Graduates in the physical sciences and in engineering find photography an increasingly valuable tool in their new occupations. Its expanding use has also created many challenging opportunities at Kodak, especially in the development of large-scale chemical processes and the design of complex precision mechanical-electronic equipment. Whether you are a recent graduate or a qualified returning serviceman, if you are interested in these opportunities, write to Business & Technical Personnel Dept., Eastman Kodak Company, Rochester 4, N. Y.

Eastman Kodak Company
Rochester 4, N. Y.

Put science-engineering backgrounds to work in new General Electric research facilities

Up-to-the-future facilities such as G.E.'s $5 million Metals and Ceramics Laboratory recently dedicated at Schenectady, N. Y., offer unlimited opportunity for qualified applicants with backgrounds of science or engineering.

Historically one of America's research leaders, G.E. continues to expand facilities across the nation for exploring new developments for the home, industry and defense. Research conducted in this Metals and Ceramics Lab, for example, is destined to provide new materials for applications ranging from rockets and atomic power plants to labor-saving appliances. Here, inspecting the surface of a casting, are George Colligan, RPI, and Allan Kiesler, Missouri School of Mines (white shirts).

For careers offering professional growth, investigate G.E.'s Engineering and Science Program. You will be trained in the field of science or engineering most suited to your interests and aptitudes—building on technical backgrounds in physics, chemistry, math or these engineering fields: mechanical, electrical, electronic, metallurgical, nuclear, chemical, aeronautical. 956-3

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College ..... Degree & Year .....

Address .....

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