

The

CLEVITE

Journal



MARCH 1957

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THE CLEVITE

JOURNAL

This is the first issue of the new Clevite Journal. We hope you will like it and hope it will give you information about your company which you haven't had before.

We think you ought to have the opportunity to learn as much about Clevite as you can. The Journal will be as interesting and straightforward as we can make it, in giving you the broad picture of what we are doing and where we are going.

The Journal will come out four times a year. It will be mailed to your home without cost. If you have been getting True Bearings, Brushtronics or The Center Line, you will find that they will skip an issue in the month when the Clevite magazine is printed.

If you have comments on the Journal, or if there are subjects you want covered in future issues, write to the Clevite Journal, 17000 St. Clair Avenue, Cleveland 10 — or tell your personnel department what you think and ask them to pass the word along.

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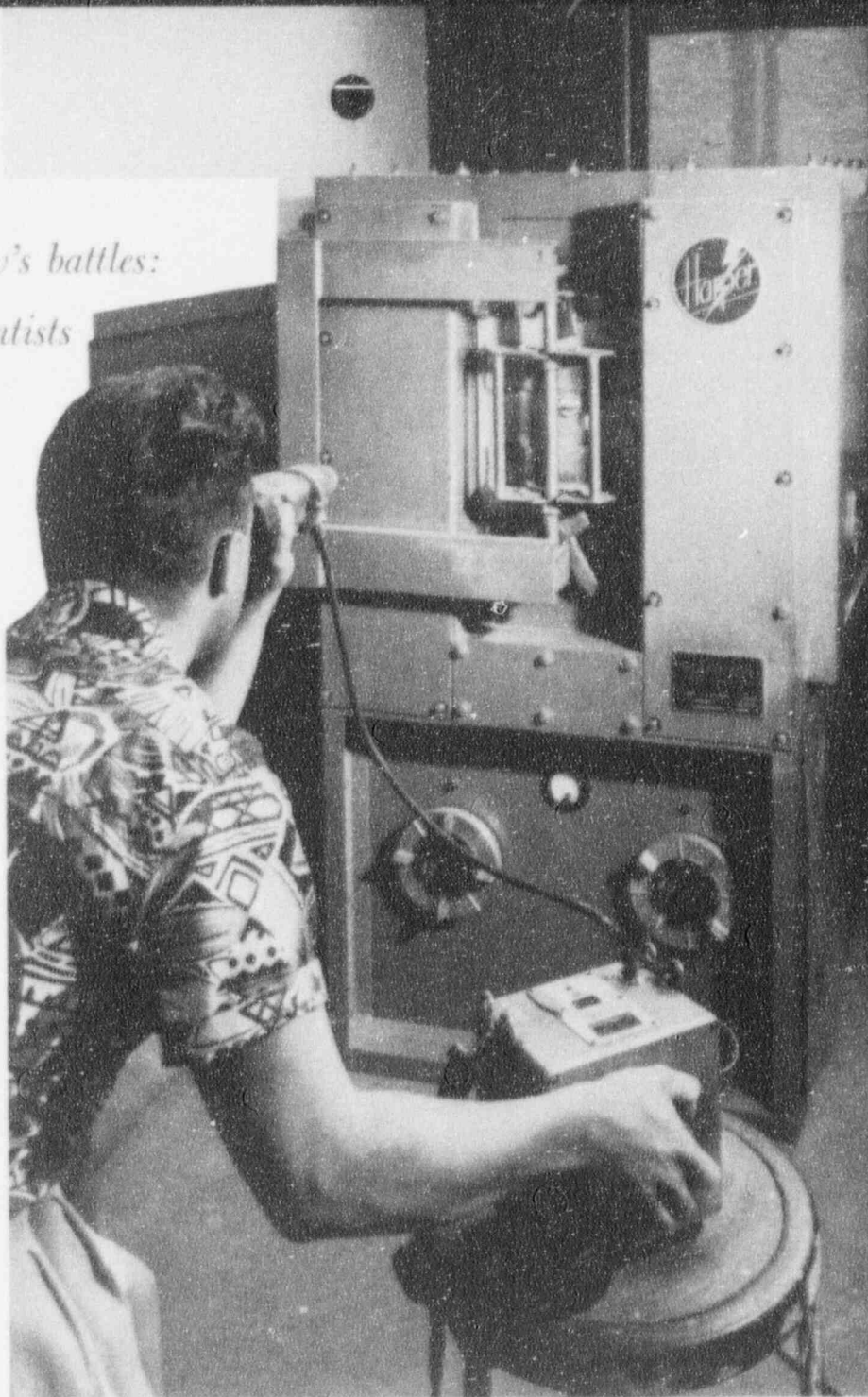
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THE COVER: The gaping but harmless jaws are those of a vacuum furnace at Clevite Research Center. See page 4.

*The advance guard for tomorrow's battles:
the team of top research scientists
who are*

BEATING

*Clevite's
Invisible
Competition*



An optical pyrometer can determine furnace temperatures up to 5000°F.

IF YOU HAVE been following business news in recent years, you know that competition has increased in almost every industry. If you are a Clevite salesman, you know that men from other companies are calling on our customers, offering good products — sometimes at lower prices.

Every operating unit is concerned about this competition, and knows that winning the battle for sales is the key to the success of our day-to-day operations.

But that's only one of Clevite's battles. Another one — a serious one which will eventually affect your job

as deeply — is being waged in the laboratories at our Research Center on 105th Street in Cleveland. It's the effort to beat competition that won't exist for five, ten or twenty years. You can call it "invisible" competition.

"Invisible" competition can be defined even though it can't be seen. Generally, it can be summed up as: changing market conditions; or improved products which will be developed by competitive companies.

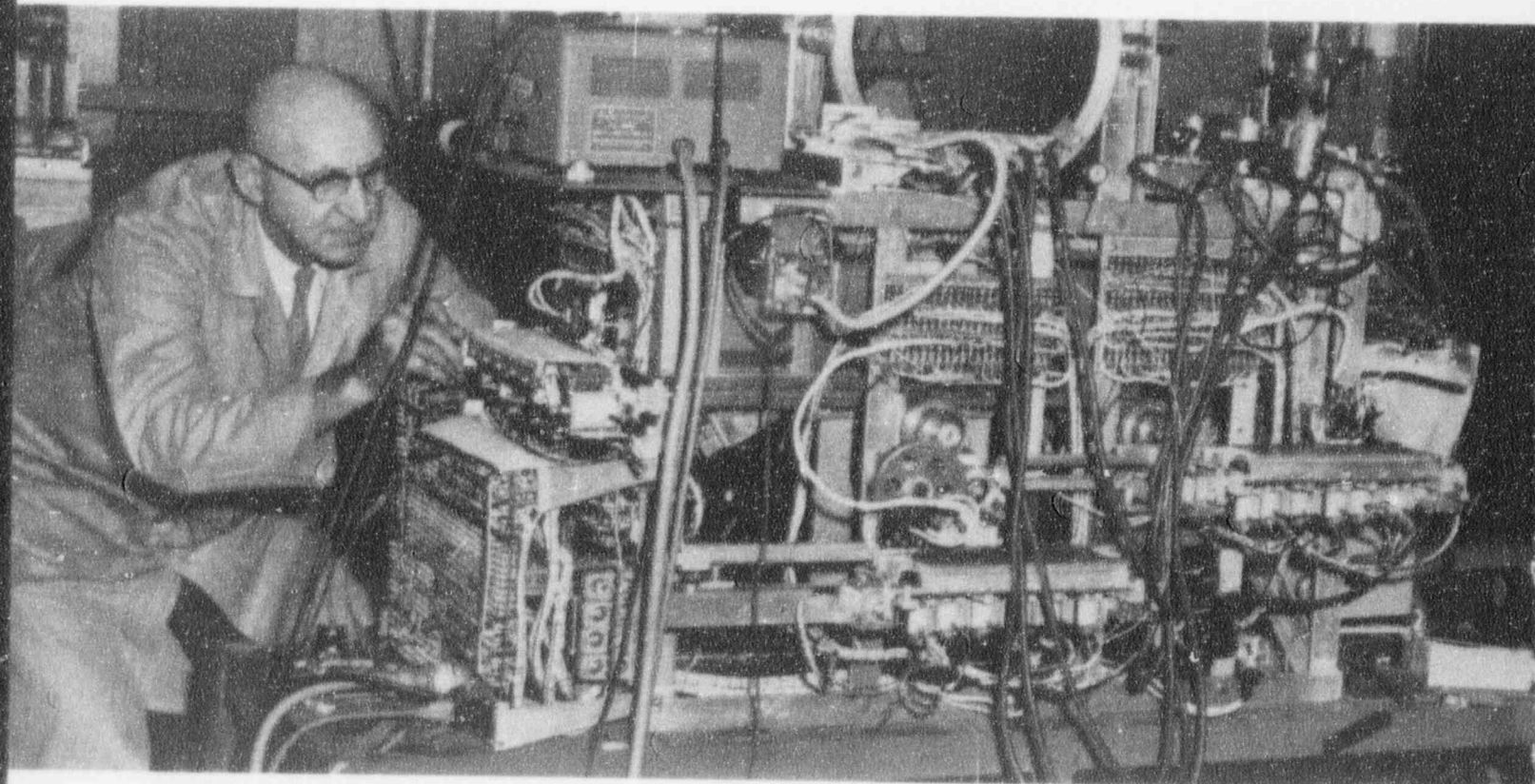
Changing market conditions have become more and more a factor in our business. Since the 1930's the growth of the markets we serve has been rapid. Tele-

vision has become a part of everyone's life. Auto horsepower has risen sharply. More people have more money to buy things made with precision parts. We are now entering a phase which may be dominated by even more extreme departures. Jet propulsion, turbine auto engines, atomic power, color television, the new super highway program may all be elements in the changing economy which we must meet and conquer.

Improved products from competitors: Clevite units have supremacy in some fields; Brush crystals and ceramics; CGB auto bearings; the Harris rubber-and-

features, a soft-spoken, precise English manner of speech. He generates a rushing flow of imaginative and persuasive ideas.

Williams served with the British Royal Navy for twelve years, including duty as Lieutenant Commander in the submarine service during the first World War. He has attended the Naval War College, and is known internationally as an authority in specialized fields of naval warfare and defense. He is a Clevite director, takes an active interest in the Cleveland Hearing and Speech Center and other civic activities. He is, inci-



Thorough knowledge of intricate electronic circuitry helps maintain Clevite's leadership in the industry.

metal bearing, to name a few. Thousands of skilled research men in other companies know we have that supremacy and want to take it away from us. They are investing millions of dollars in the belief they can do it. Can they?

CLEVITE'S ANSWER to this is in over 250 scientists, engineers and technicians at the Research Center. With the aid of intensive conferences at the manufacturing divisions, the men who manage the Center have planned their strategy for beating invisible competitors; now they are putting it into action.

A. L. W. ("Wiggs") Williams is top man at the Center. He makes a forceful impression; sharply carved

dentally, one of the country's experts in developing and growing orchids.

WILLIAMS' right-hand man is J. K. ("Kneel") Nunan, who combines scientific and administrative experience in an unusual way. He helped build and headed the electronics department at the University of Southern California, where he was also assistant dean of engineering; became associate director of Columbia University's Underwater Sound Laboratory at New London during the war. He received the Presidential Medal for Merit for this work — the highest civilian honor the U. S. Government bestows. His executive work included managing Ansco's motion picture de-



A. L. W. Williams,
president, Clevite Research Center

CLEVITE'S
answer to the threat of
tomorrow's competition is in
250 scientists and technicians
at the Research Center



J. K. Nunan, Research Center
vice president and general manager

partment, and the presidency of Consolidated Vacuum Corp., in Rochester.

Others at the Center:

TOM LYNCH, who has been the lead man in a group which has created new types of naval weapons and which presently has official technical responsibility for certain types of homing torpedoes for the U. S. Navy.

ART SCHWOPE, formerly the chief of Battelle Institute's mechanical metallurgy division, who has worked extensively with high temperature metals.

HANS JAFFE, a world authority in piezoelectric materials and formerly head of crystal research for Brush Development Company.

Ninety top engineers and scientists, including eleven who have doctors' degrees in scientific fields.

Eighty-eight technicians with widely distributed skills, and an administrative and general office staff of eighty-seven.

These men have been given the job of developing new knowledge which can be used by Clevite operating units to beat tomorrow's competition — "invisible" competition.

A LARGER corporation, active in 50 or 100 different fields, can put almost any good new idea to use, and can benefit by having its research teams roam through any area of science. For Clevite, the search has to be concentrated on projects which make sense in terms of our markets and process technology, and the Center is organized just for this.

There are four major groups of interest at the Center:

Materials Division — does work on bearing materials, plating processes and other CGB-and-Clevite-Harris fields. One of the projects the men in this group are currently working on is an entirely new design of bearing. It is being tested, revised, tortured, analyzed, revised again.

Electronics Division — handles most of the projects in the Brush-and-Transistor fields. Some of the men in the electronics group are hard at work on a new method of recording electrical signals in permanent visible form; if the method can be brought to commercial practicality it may well be a milestone in instrument history. A typical part of this development is aimed at finding what kind of ink or other marking material will make the most precise record; dozens of materials are being tested and studied.

Ordnance Section — works on most defense projects for the Navy. Ordnance men, who can't even tell their wives what they do during the daylight hours, are trying to perfect a powerful and dramatic new weapons for naval warfare and defense as one part of their program.

Physics Division — serves the three departments in addition to conducting projects itself. Here the problems are likely to be more abstract and closer to "pure" science.

Often a project requires teamwork among departments: work for Clevite Transistor Products may call for help from Materials, Electronics and/or the Physics Division, for example.

Throughout the building which houses the Center men are absorbed in digging out new facts and knowledge. You see a test furnace baking a new kind of piezoelectric material, carrying a stream of samples through on a belt made of pure platinum — used because it can be heated without reacting chemically with the samples.

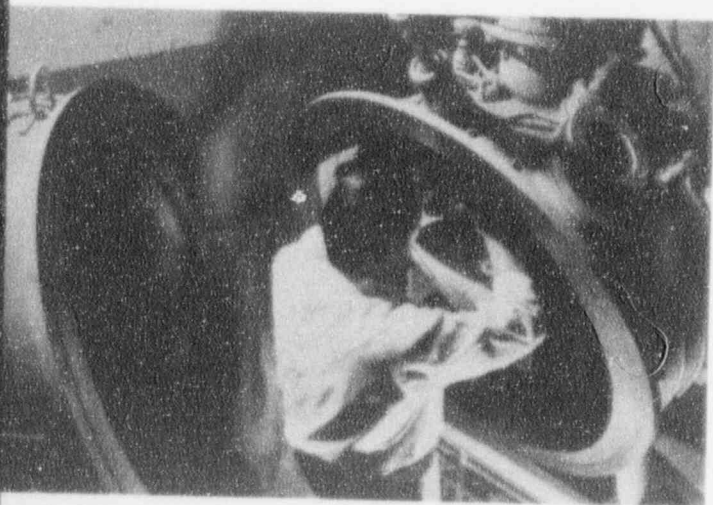
A gleaming machine hums at high speed, making wear tests of jet engine seals at high temperatures.

A technician turns up the burners on a small furnace, and the indicator climbs up toward 1300° Centigrade — a little hotter than 2300° Fahrenheit.

Three men are arguing in front of a blackboard covered with mathematical equations; two others turn from a laboratory bench to microscopes, with samples of a cadmium sulphide compound, a material which looks promising for use in solar batteries. DANGER HIGH VOLTAGE says one sign. Others read: RESTRICTED AREA NO ADMITTANCE; CAUTION RADIOACTIVE.

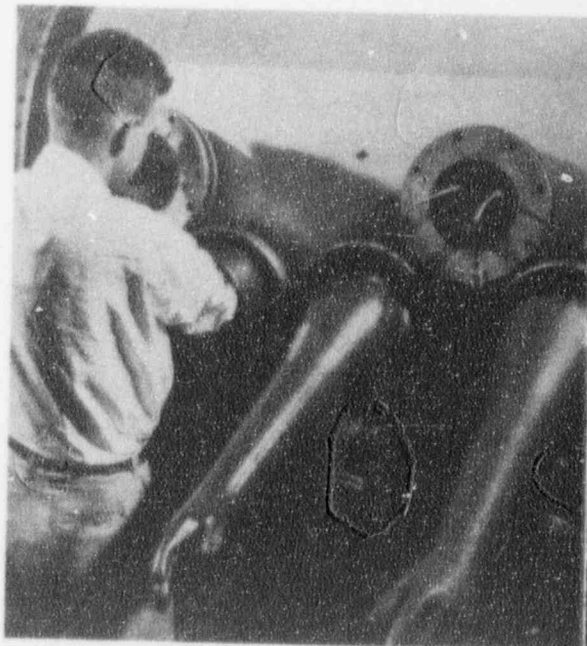
WHAT ARE the problems, as the research man sees things, in welding his function to the overall purpose of the Corporation?

Not the least of these is the tendency of production men the world over to be a little suspicious of "long-hairs." Every company which has done research has discovered this. "Putting a research man up



Vacuum induction melting furnace prevents air from contaminating metals such as titanium and zirconium as they are handled at high temperatures.

The arm-length rubber gloves permit a technician to perform welding and other operations in carefully controlled atmospheres in this "dry-box."



against a factory organization is like throwing Daniel to the lions when they are all hungry," said Boss Kettering, the General Motors engineering genius.

The decisions on what projects should be worked on, and when to stop one, are hard to make. Research projects are regularly weeded out — a painful process, but necessary if the strongest and most likely ones are to succeed. These decisions should come from the research management men, but they have to depend heavily on thoughtful help from the men at the operating units.

The real key to success at the Center, according to Kneel Nunan, is how well its men understand the problems at the units.

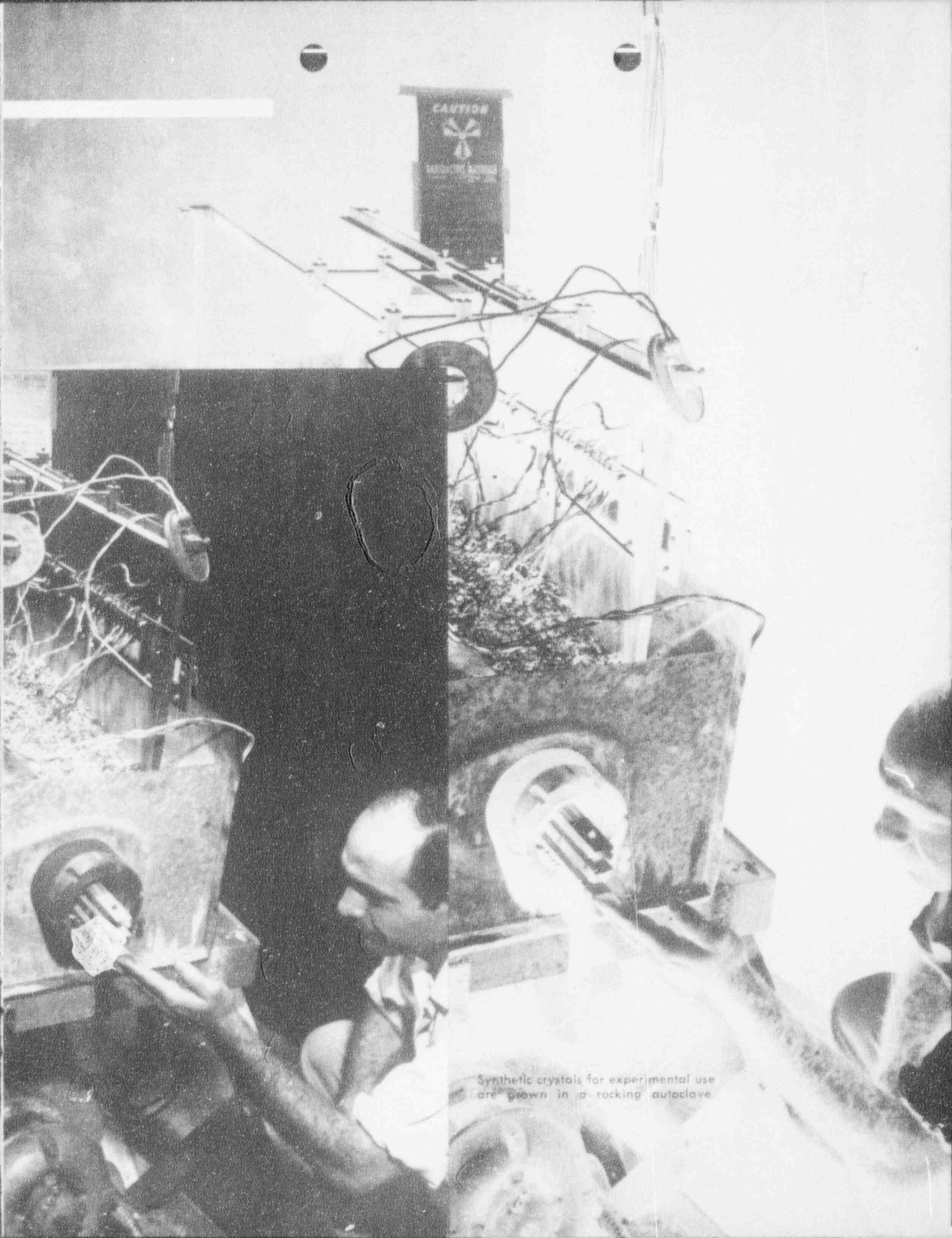
"We are in business to serve the operating companies in Clevite," Nunan says. "We need to know everything about CGB, Brush, Harris and the other units that they can tell us and we can learn."

AFTER a difficult period of setting up the Center in its new home, and hammering out a practical and forceful organization, there is good evidence that Clevite's battle against tomorrow's "invisible" competition is in skillful hands.

The results of their efforts are beginning to show. A big share of Brush's sales today are the result of naval ordnance developments made here last year and before. In sections of the electronics field, in early work with materials, the Center already is helping Clevite units to increase their sales, payrolls, and profits.


Providing that kind of help is the Research Center's purpose, and its challenge for the future. The Center's men and women of science know it, and have accepted the challenge with enthusiasm and confidence.

The battle against Clevite's "invisible" competition is underway.

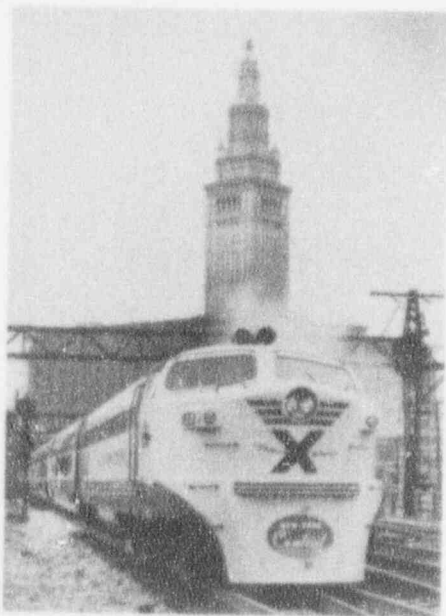


Synthetic crystals for experimental use are grown in a rocking autoclave.

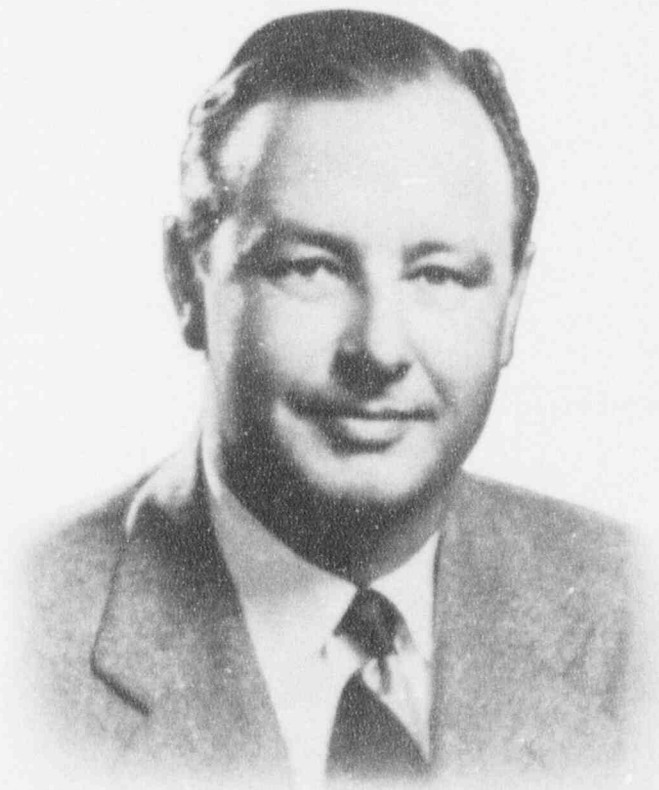
CLEVITE IN THE NEWS



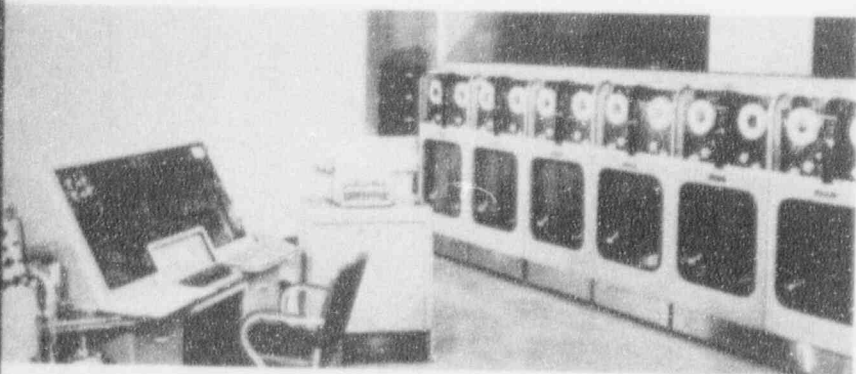
PIEZOELECTRIC MATERIALS (see also page 13) are helping this damsel catch fish. Her boat is equipped with a new type of echo sounder, using Clevite-made crystals, which instantly shows water depths and also passing schools of fish.



EXPERIMENTAL TRAINS now being tested by American railroads include many completely redesigned components. The New York Central's Xplorer, powered by a Baldwin-Lima-Hamilton locomotive, is now in regular service between Cleveland and Cincinnati. It uses several Clevite Harris Products rubber-and-metal parts in its suspension system.

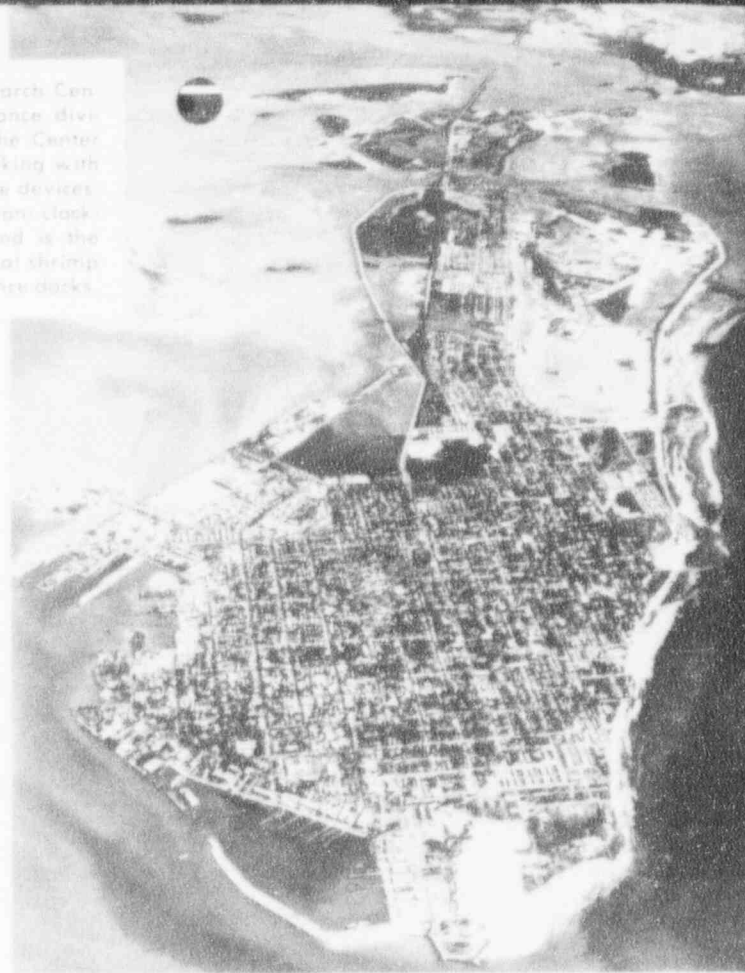


JAMES J. WELKER, elected Clevite vice president in charge of operations late last year, has general responsibility for the company's five operating units. Long prominent in the auto industry, Mr. Welker for the past five years has served as New York regional executive of Ford International, responsible for Ford operations in England and Germany. For 20 years he was a General Motors executive in this country, Japan, China and Australia. He is married and the father of three grown children.



TWENTY THOUSAND DIODES are used in each Remington Rand Univac, the high speed computer that makes intricate mathematical calculations in less than a twinkling. Clevite Transistor Products, large supplier of diodes for Univacs, is a leading producer of transistors and diodes.

KEY WEST, FLORIDA, where Clevis Research Center operates a field station of its ordnance division. A staff of regular employees of the Center move our laboratory and shop here, working with U.S. Navy personnel on underwater warfare devices. In the foreground is the U.S. Naval Station, dockwise around the main part of the island is the Navy's landing base at 2.00, a commercial shrimp boat harbor at 9.06, and the Naval ordnance docks where war facilities are, at 9.30.



AFTER a long-term development effort, Cleveland Graphite Bronze has introduced a new design of automotive engine bearing. Its early heavier loading than standard bearings without costing as much as the deluxe "Elevite 77" heavy duty bearing. The new design, named "Elevite 55" is in production now for use in cars this year. (Left to right): "Chris" Christensen, vice president sales, whose department helped put the 55 across with customers; Ed Crankshaw, chief engineer, whose department brought the 55 through development; Fred Salzman, works manager, who directs manufacturing of the bearing.



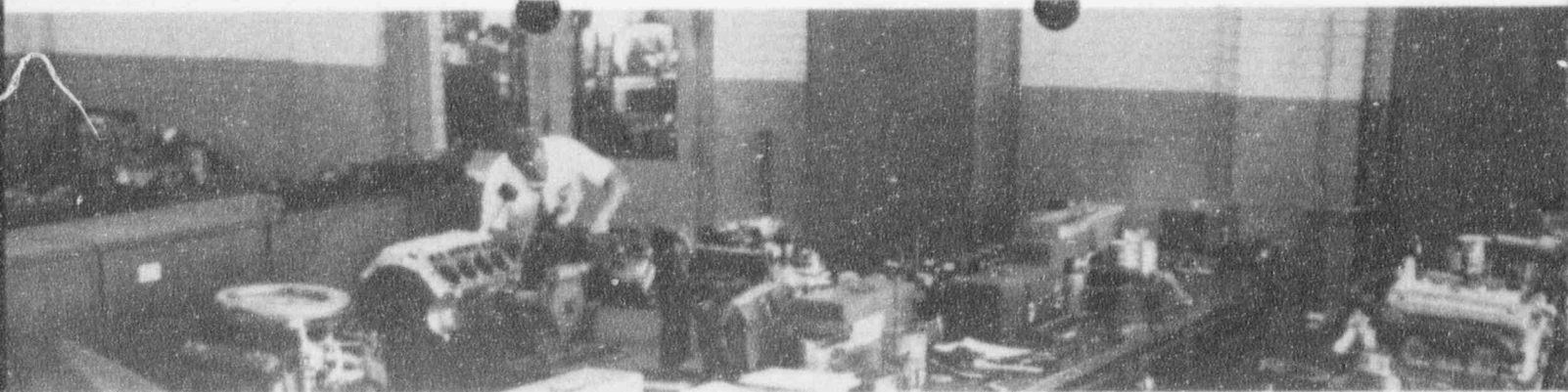
MEETINGS of management executives from all Clevis units, held every three months, have been expanded to include inspection visits of major preparation plants. Left: late in 1956, the group visited Clevis Motor Products plants at Milan and Napoleon, Ohio. Above: last month's meeting included a detailed tour of Brush Electronics plant on Perkins Avenue in Cleveland. For the tour, the executives split up into small groups like these, and meet together in a group of over fifty afterward to discuss recent performance and plans for the future.



He carries a slide
rule in one pocket
and a wrench in
another. He's . . . THE

OF THE BEARING BUSINESS





Late at night, Tony Kaminkos works on a build-up in a customer's plant.

He carries a slide rule in one pocket and a wrench in another. He's . . . THE

SOMEONE once remarked that the ideal field engineer is half designer, half trouble-shooter, half diplomat. Mathematically speaking, this leaves much to be desired, but most field engineers agree it's an accurate job description.

In the Detroit territory, where nearly everybody builds cars, Cleveland Graphite Bronze field engineers often work on design problems

"One Man Band" **OF THE BEARING BUSINESS**

three years in the future. Right now the 1959 models are on the drawing boards. CGB is already prepared to submit complete bearing and lubrication studies for their engines.

The 1958 models are being rigorously tested in the shops and on the proving grounds and the trouble-shooting talents of the field engineers are being called on to make "running changes," to eliminate bugs that develop during initial testing.

Diplomacy is an important factor in both these situations. It is brought into full play in such cases as that of the non-automotive company, a long-time customer, which ran into bearing trouble not long ago.

This company ordered more than a million bearings for one installation over a period of years and has never had a bit of trouble.

Then four or five out of a hundred bearings started to break down on routine tests.

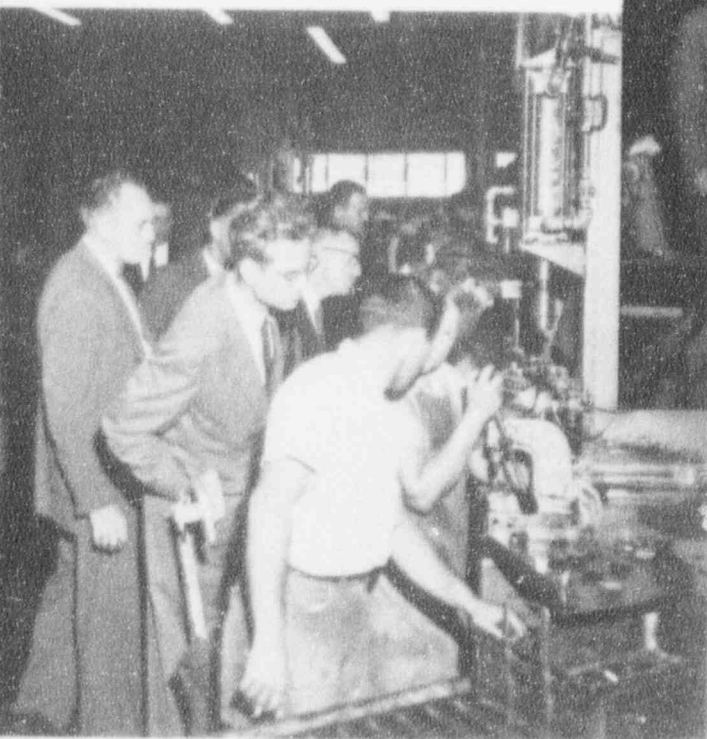
They thought the bearings were faulty, but the field engineer on the beat went over every step of CGB's production process and checked with the metallurgists, foremen and inspectors.



KEY WEST, FLORIDA, where Clevite Research Center operates a field station of its ordnance division. A staff of regular employees of the Center mans our laboratory and shop here, working with U. S. Navy personnel on undersea warfare devices. In the foreground is the U. S. Naval Station; clockwise around the main part of the island is the Navy's turning basin at 7:00, a commercial shrimp boat harbor at 9:00, and the Naval ordnance docks, where our facilities are, at 9:30.



AFTER a long-term development effort, Cleveland Graphite Bronze has introduced a new design of automotive engine bearing, to carry heavier loading than standard bearings without costing as much as the deluxe "Clevite 77" heavy duty bearing. The new design, named "Clevite 55" is in production now for use in cars this year. Left to right: "Chris" Christenson, vice president-sales, whose department helped put the 55 across with customers; Ed Crankshaw, chief engineer, whose department brought the 55 through development; Fred Salzman, works manager, who directs manufacturing of the bearing.



MEETINGS of management executives from all Clevite units, held every three months, have been expanded to include inspection visits at major corporation plants. Left: Late in 1956, the group visited Clevite Harris Products plants at Milan and Napoleon, Ohio. Above: Last month's meeting included a detailed tour of Brush Electronics' plants on Perkins Avenue in Cleveland. For the tours, the executives split up into small groups like these, and meet together in a group of over fifty afterward to discuss recent performance and plans for the future.

"There are thousands of things that can cause bearing failure," he said, "but only a few can be traced to defects in the bearing itself, as long as we keep the right control on our production standards. For this reason, the trouble can often be traced to the customer's plant. Pointing this out is not always the easiest job in the world."

In this instance, he found out that the bearings were being installed improperly. A simple change in the assembly line solved the problem. In a similar case, he found a high wear rate in a bearing installation, but without the usual excessive temperatures. Improper finishing on the journal and crankshaft thrust face was the answer.

Let's take a closer look at this engineering Jack-of-all-Trades. Any one of them you talked with could tell a fascinating story; take, for exam-

Future engine designs at American Motors may mean heavier demands on bearings. Here, Tony Kaminskas tells John Adamson, Nash assistant director of research, what performance can be expected from CGB's intermediate bearing.



Field Engineer John Masley, Chief Engineer Ed Crankshaw, Bearing Design Manager Bill Weinkamer and Field Engineer Tony Kaminskas discuss a customer recommendation for altering a bearing design.

ple, Tony Kaminskas, a blond, friendly ex-steel-worker, who is one of three CGB field engineers devoting full time, and then some, to customer needs and problems.

Tony views his duties and responsibilities with great respect and it's obvious he likes his work. In his younger days, this sort of life never occurred to him.

"I was born in Vandergrift, Pa., near the Carnegie Illinois steel plant where my dad worked. He came over from Lithuania when he was 25 and met my mother here, who lived in a nearby town in the old country. I have four brothers and three sisters.

"I worked in the steel mill right after graduating from high school, and of course I planned to work there for good. That's what everybody did. You might say I never really knew there were other jobs and other places to work."

The Navy made the difference to Tony. They needed aviation metalsmiths. This work exposed him to a type of training he found interesting and challenging. He saved his money and was discharged after 42 months as a petty officer first class.

Back in civvies, he knocked around for a while and one day, with nothing better to do, went along with a friend who was enrolling at nearby Washington and Jefferson College.

The dean, talking with the friend, took a liking to Tony and asked why he didn't go to college, too. Tony said he'd been thinking about it and the dean urged him to think pretty fast, for the ex-GI's would soon start flooding in.

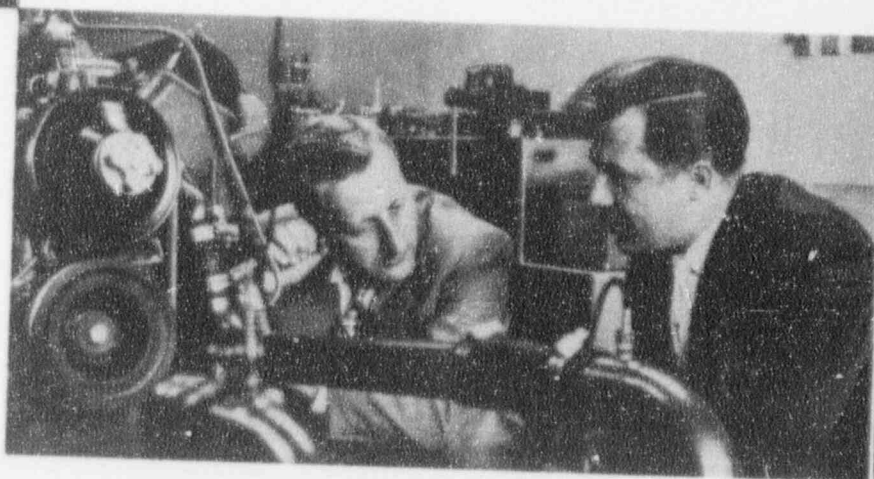
"Why don't you give me five dollars to reserve your seat?" the dean suggested. "If you decide against it, you won't be out much. You have everything to gain and only five dollars to lose."

This made sense to Tony and that fall he was enrolled in an engineering course at W. & J. In his second year he transferred to the University of Pittsburgh. In his junior year he married Regina Kaleda, a hometown girl.



The CGB field engineer, sleeves rolled up, is building up a test engine at Nash for John Adamson, assistant director of research, Wallace Berry, director of research, and Carl Burk, experimental engineer. Tony will check the block, crankshaft, connecting rods, bearings and all components related to bearings, log the installation measurements and then rev up for a grueling 100-hour test.

The bearing installation is being carefully checked on this Ford engine during a critical test.



away that was the kind of company I wanted to work for." (As it turned out, that "recession" lasted about three more months.)

Tony liked the CGB training course. They put him in the "bullpen" (advanced product engineering group) as an assistant product engineer. Soon he was a product engineer and a "spare tire" for the field engineers. Now he is a senior field engineer.

"I like being busy," Tony says. "And I don't mind getting grease on my shirt. If I'm working on a build-up (a complete bearing installation on a test engine) at 8 o'clock at night up in Detroit and find I have to start another in the morning, that doesn't bother me, cause I know that's all part of the business. But it does bother me, sometimes, when I think how I've had all the breaks. I wonder how long this can go on."

"You can tell she's a Lithuanian, too, from her name. In fact, its translation means Christmas," Tony says, smiling. "But it's just a coincidence that I married a Lithuanian girl."

By taking summer courses, he shortened his college training to 3½ years. By the time he got his diploma in 1949 the demand for engineering graduates was mounting. More than half a dozen company representatives made job offers to him. One was from Cleveland Graphite Bronze.

He was strongly attracted to a Pennsylvania company, but then learned that he would have to wait to begin his training course "because of economic conditions." Lots of people were worried then that the country was headed for a slump.

"I made it a point to see the CGB man and asked if they had stopped their training course. He said CGB's program was a long range one, to help the company in good times or bad. I knew right

ALTHOUGH only 35, Tony is the oldest member of the field engineering staff. The others are John Mosley and Charles Small.

John, 29, is a Carnegie Tech graduate and has been a field engineer nearly two years. His territory, Cleveland and the east, includes the large diesel engine manufacturers, aircraft companies and automobile component producers. Charley, 31, covers the territory west from Chicago. Among his more important customers are the big farm implement manufacturers.

The three of them report to Chief Engineer Ed Crankshaw, whose professional reputation extends far beyond the boundaries of CGB. They make full use of the talents of the engineering department, research staff, and others.

Each of them has to keep his eyes and ears open and his mind responsive to the advanced thinking of customers, as evidenced by the hun-



dreds of hours he and his associates, engineers and research people, have spent on studies for the 1958 and 1959 automobiles. Many of these are for "dream" engines which may never come into being. Yet, the company considers it good business to furnish these studies at no cost and with no strings attached. No competitors of CGB do this.

It's in the nature of the field engineer's job that he must think fast, move fast and land on his feet when the bottom drops out. There is no lack of excitement, to say the least. But there are times when things get especially hot, really exciting.

Tony and his associate are now breathing steadily for the first time since the most recent

occurrence of this type. It came as the result of CGB's development of the intermediate bearing, called in the trade the "Clevite 55." Introducing the 55 to the auto makers, and ushering it through the required tests (described gleefully by some and woefully by others as torture tests) was a demanding job.

Orders are in the plant for the 55, a high grade bearing which fills the gap between the regular production bearing and the ultra-high performance item that costs too much for use in autos. Every member of the engineering and sales departments pitched in, along with field engineering -- and it paid off.

In a very real sense, the field engineers are a key part of CGB's engineering staff. From customer engineers come thousands of plans, dreams, needs, trends and problems, gathered from hundreds of plants throughout the country.

In most cases the field engineer is the pivotal figure in evaluating, sorting and acting on these. The "tools" of his trade are his own training plus the special talents and experience of CGB's design engineers, metallurgists, research and production men, salesmen and executive staff. On his skill in making full use of these "tools" rests much of the company's future success.

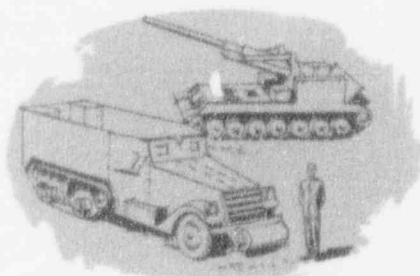
Clevite Leaders...



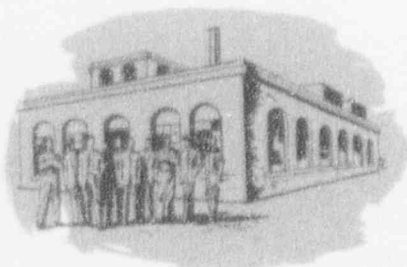
James L. Myers
Chairman of Clevite's Board of Directors

Born in New Jersey in 1890, he graduated from Stevens Tech, which gave him its Honor Award in 1954.

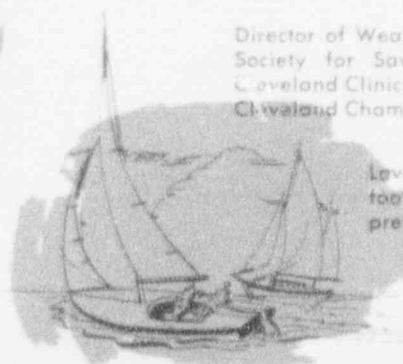
A captain in World War I — designer of the first half track, and the first self-propelled gun.



One of the "four horsemen" who founded Cleveland Graphite Bronze in 1919.



Director of Weatherhead Co. and Society for Savings, trustee of Cleveland Clinic, was president of Cleveland Chamber of Commerce.



Loves to sail—owned a 50-foot ketch for years, but prefers little boats now.



MOTHER KNOWS BEST

Bartow family follows mother to CLEVITE HARRIS' Milan Plant

NINE YEARS AGO Mildred Bartow, her youngest son then in high school, got a job at the newly-opened Harris Products plant in Milan, Ohio. This was the first job she'd ever had and it suited her just fine.

In fact, within three years her husband and three sons were working there, too. A married daughter, with a family of her own, was the only member of the clan not on the Harris payroll.

Mrs. Bartow's husband, George, and youngest son, Jim, are rubber molding press operators. She is a trimmer and her oldest son, Ralph, is a foreman. George, Jr., who worked at the plant for about three years, left this summer to take a job in nearby Norwalk.

The Bartow name has been associated for nearly a century with Milan (rhymes with "smile-in"), a quiet, tree-shaded town which was Thomas Edison's boyhood home. The neatly landscaped Clevite Harris plant, located on the southern outskirts, is widely recognized as one of the finest precision rubber molding plants in the country.

Mr. Bartow was raised just a few miles away, one of 11 children, and served as a machine gun-

ner with the 37th Division during World War I. During the Argonne offensive, three months after landing in France, Pvt. Bartow was wounded and spent five months in hospitals.

Soon after discharge he married Mildred Stickradt and during the next 30 years worked for the phone company, the highway department and a grain elevator company. He joined Clevite Harris in 1950.

Mrs. Bartow, born and raised in Milan, was pretty well occupied with her family during most of her adult life. But now, after nearly a decade in the plant, she says she wouldn't want to stop working; there wouldn't be enough to do around the house. As a trimmer, she helps remove excess rubber, or "flash," from molded parts, taking an occasional stint as an inspector. For the past several months she's been working, with a proud twinkle in her eyes, under Ralph's supervision.

Ralph, who graduated from Milan High School, spent 3½ years in the Navy during World War II. When he returned to the states after service on the battleship *Indiana*, he was entitled to wear 11 battle stars on his South Pacific ribbon. After the war he worked as a spot welder in a plant in Sandusky but when a general layoff came in 1948 he signed on at Clevite Harris as a press operator. He was made a foreman in 1953. Ralph's wife worked at the plant for about two months last year, but found homemaking for three children to be a full-time job.

Jim went in the Navy right out of high school, spent about nine months in fire control school and served out the balance of his year on the U.S.S. *Mississippi* at Norfolk. He was transferred to the ready reserve in the spring of 1950 and immediately went to work for Clevite Harris as a press operator. He, too, is the father of three children.

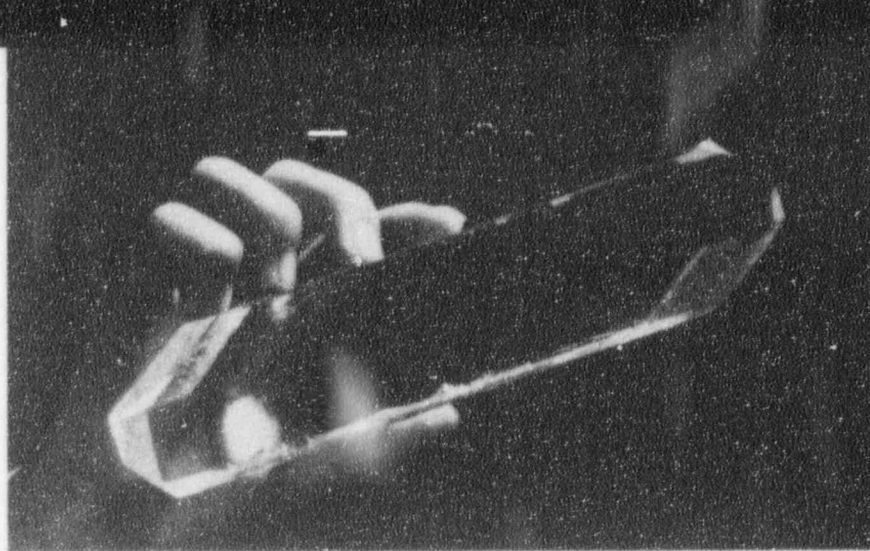
The Bartows are a good natured lot, but Mr. Bartow says they all have a streak of cussedness in them ("I guess that's the main reason why I came out of the Army a buck private. I wouldn't take anything off the corporals.")

Today, though, he takes a gentle ribbing for being the "baby" of the family in plant seniority. He was the last one to join the company.



The Bartows working at the Clevite Harris Milan plant are Ralph (left), Mildred, George and Jim.

Piezoelectric crystals are things of beauty, but they're workhorses, too. Man-made crystals, "grown" at Clevite's Brush Electronics division, are cut into small plates for use in electronic devices.



Clevite Is World Leader In Piezoelectric Materials

You're at home, relaxed. It's the quiet after-dinner hour. You're watching TV, or maybe listening to your radio or record player. You have your pick of Presley or Callas, Brubeck or Rubinstein, Omnibus or Rin Tin Tin — thanks to piezoelectric crystals.

Around the globe, piezoelectric materials are working day and night. Beneath the sea they are helping probe for submarines, and in the sky they are performing vital functions in our guided missile programs. In a manufacturing plant they're helping fashion new materials — hard, dense, difficult materials — into tools for producing red hot steel or fine nylon thread. Or perhaps, as a vital part of a sensitive medical instrument, they are helping a heart specialist save a life.

What are these piezoelectric materials? Most people aren't even sure how to pronounce the word, much less understand it.

As you might expect, the Greeks had a hand in the name; it comes from "piezo," meaning press or squeeze. The dictionary says it should be pronounced "py-eat-zo," but you can find experts in the field who say "pea-ate-zo," and even an occasional "pee-zo" and "py-zo."

But no matter how they're pronounced, they're basic to many aspects of our modern life. They generate electric current when squeezed, or, vice versa, change shape when a current is passed through them.

In a phonograph, for example, they convert the vibrations of a needle in the groove of a turning record into electrical signals. They are also the nerve centers of a microphone in a radio or TV station, of the ultrasonic drills that shape hard, brittle materials, like carbide; or precise instruments, such as the Brush oscillograph. They're the

heart of the unobtrusive hearing aid and even the pickup of Elvis' electric guitar.

CLEVITE'S Brush Electronics division was formed in the late 1920's to carry forward research and development of piezoelectric crystals. For many years it has been the world leader in the production of crystals and has made major contributions to their scientific and commercial development.

Among the pioneers of piezoelectric technology at Brush were Dr. C. Baldwin Sawyer and Bengt Kjellgren. Dr. Sawyer is now consultant to Clevite Corporation and is a member of its board of directors; Mr. Kjellgren is president of Brush Beryllium Company. Later, A. L. W. Williams, now president of Clevite Research Center, and Hans Jaffe, head of the Center's physics department, played important roles in development of the materials.

From these beginnings Brush has grown to be an important factor in the booming electronics industry. It employs more than 1100 people and has been a consistent profit-maker for more than 20 years. From piezoelectrics have come the major portions of Brush business: homing torpedoes, instruments, electronic components. And, today, the company is producing six different types of crystals and two major ceramic piezoelectrics.

Development continues, spurred by the national defense program and the constant pressure of competition for better industrial materials, processes and products.

In the fields of entertainment, military preparedness, communications, medicine, business, industry and many others, piezoelectric materials are an important part of everyone's life.



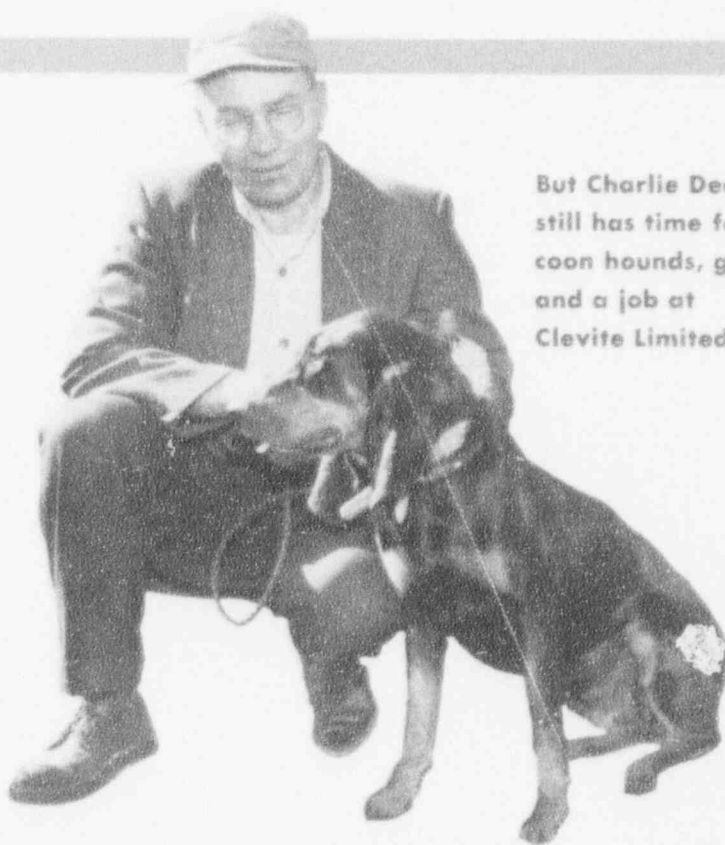
BIRDS, BIRDS *Everywhere*

CHARLIE DEAN raises pigeons, chickens, hound dogs and gladiolas.

He specializes in rare chickens. His eight Lakenvelders, for instance, he believes to be the only ones in Ontario. He has 15 different breeds of pigeon, 120 birds in all, some worth as much as \$15 a pair. Charlie has shown his birds at Western Fair in London, Ontario, for the last three years, and has many prizes. He has 6000 gladiolas.

Charlie was born in 1908 in the Elgin County fishing village of Port Burwell. He has worked for Clevite Limited since March 1952. He holds down the job of boiler room lead hand. He lives in Port Stanley and has three boys, one girl and two grandchildren.

In November and December each year, Charlie and "Black Trailer," his black and tan purebred coon hound, spend many pleasant evenings in the field. During a good season they've netted as many as thirty coons.



**But Charlie Dean
still has time for
coon hounds, gladiolas
and a job at
Clevite Limited**

New Ventures AT CLEVITE

AT CLEVITE, as at any other healthy company, new things happen constantly, bringing with them new faces, new problems and new satisfactions.

Two of the many interesting developments now going on within the corporation are the near-completion of a project to develop a commercial process for bonding rubber to metal at Clevite Harris Products, and the growth of a flourishing powder metal parts operation at Clevite Limited, our Canadian subsidiary.

Since Clevite Harris was founded in the late 1920's, it has built a solid business in farm equipment, automotive, railroad, aircraft and electronic industries around its line of metal-to-rubber components. In these products, the rubber is stretched between an inner and an outer metal tube in assembling the part, making a mechanical bond. Employment at Clevite Harris is over 300, including employees in plants at Milan and Napoleon, Ohio, and administrative, engineering and sales personnel in the Cleveland home office.

Since 1953, when sales engineers sold the first part into the front-end suspension of an automobile, a total of thirty different auto suspension points have been redesigned to use our mechanical-bonded products.

You don't have to be a design engineer to see the advantage of these products. Rubber-to-metal bearings require no lubrication. If they could be built into every point of your car's suspension, you'd never have to put the car up on a grease rack again.

To extend the applications for their products, our engineers have for the last two years been working to solve the problems of chemically bonding rubber to metal.

You can't always design so that the rubber is under tension — the required condition for a mechanical joint. But if you can glue the two materials together (chemical-bond them) many different shapes and types of part can be made.

During 1956, Clevite Harris has been working on several contracts for chemically bonded parts on a pilot-production basis. Enough of the problems have been solved to permit us to take on full-scale jobs.

In the chemical-bonding process, the metal is cleaned by vapor degreasing and grit blasting, a chemical-bonding agent is applied to it, the rubber part is assembled into place and the unit is

then subjected to high pressure and heat and is vulcanized.

"Why haven't we done it before?" you ask. Often, apparently simple processes are the most difficult to control. The metal must be absolutely clean. Exactly the right amount of bonding material has to be applied under precisely controlled temperature and humidity. The atmosphere must be dust-free. Assembly pressure and vulcanizing heat and cycle time must also be closely controlled to get a successful bond, and high material strength.

Clevite Harris has begun work on a new contract for a chemically bonded seal from an appliance manufacturer. Engineers have developed prototypes of a ball-knuckle joint that could replace the mechanical ball joint on many modern automotive front suspensions.

JUST AS the rubber-to-metal chemical bond should simplify the design problems of many of Clevite's customers in the United States, powder metal parts offer large economies through better material utilization and lower manufacturing costs for our Canadian customers. Door locks, bushings, automotive shock absorber pistons, business machine parts, latches and refrigerator hardware are among the items which our Canadian subsidiary is turning out in increasing volume.

Our powder metal business was initiated about three years ago when we formed Paxol, Ltd. Hard work by both the production and sales staffs is beginning to pay off. This year, we expect to double the sales volume reached in 1956.

Paxol became a wholly-owned unit of Clevite Corporation last fall. In mid-January this year, its operations were combined with those of Clevite Limited.

Today, there are some 20 production and management people working in the Canadian end of our powder metal operation. Most of their output is in iron powder parts, some in brass. While you couldn't call the venture a large-scale operation, it is being given a solid, careful build-up.

The Research Center's materials division is carrying on a continuing program to help the Canadian plant develop improved materials. Other Research Center programs are aimed at investigating the possibilities of using powder metallurgy techniques to fabricate many different metals, such as titanium, zirconium and niobium.



the President's Page

What Makes a Company Grow?

Everyone likes to be with a successful, growing company. This is because growth brings real advantages for us all. It brings new jobs, and these make more opportunities for promotions to foreman, supervisor, and on up the line.

As we grow we can manufacture more efficiently, and pass the savings along to our customers and the public. Growth also helps provide money for research, which leads to even more jobs, more opportunities, and better products at lower prices.

What makes our company grow? I think the answer is,

1. Maintaining, strengthening and expanding our position in fields where we have already been successful.
2. Developing new fields of business where Clevite can make a worthwhile contribution.

Everyone has to contribute to the first objective, and it is the most important. The second objective is mainly the responsibility of Central Staff and Research Center people.

It is easier to say it than to do it, but our aims are actually as simple as that.

Good Advice

RALPH BESSE, Executive Vice President of the Cleveland Electric Illuminating Company, gave a fine talk at the Clevite management meetings last month. I am sorry you could not all have been there to hear his stimulating analysis of the duties of every company's management.

One of his most interesting points was that everyone in a good organization should go a little out of his way, from time to time, to congratulate someone who has done a nice piece of work.

Most of the people in the room thought to themselves, "Of course, I do that all the time."

Mr. Besse anticipated that thought. "Now, wait a minute," he said. "You think you do, but what are the facts? When did you last say to someone who works with you, 'Gee, you did a fine job on that!'"

"Have you said something of that kind in the past day? In the past week? In the past month?"

"Be truthful with yourself, and you may find that you have been neglecting a very important matter."

I think that's a good point for all of us, at home as well as on the job.

William G. Zaffer

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The Cleveland Graphite Bronze Company

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Brush Electronics Company

2405 Perkins Avenue, Cleveland 14, Ohio

*Plants at Cleveland and Bedford, Ohio
Texas Division plant and office at Houston*

Products include piezoelectric crystals and ceramics, electronic instruments for industrial and research u.z., noise and sound and vibration measuring equipment, textile instruments for quality control, production instrumentation, magnetic recording components, computer components, acoustic products, homing torpedoes, underwater sound detection equipment, seismographic equipment

Clevite Harris Products, Inc.

6545 Carnegie Avenue, Cleveland 3, Ohio

Plants at Milan and Napoleon, Ohio

Products include rubber-and-metal bearings, rubber bushings, magnetic recording belts, vibration mounts

Clevite Limited

1177 Talbot Street, St. Thomas, Ontario, Canada

Products include sleeve bearings, bushings, bi-metallic materials, rubber-and-metal bearings, sintered bearings and shapes

Clevite Transistor Products

241-257 Crescent Street, Waltham, Mass.

Products include transistors, diodes

Intermetall G. m. b. H.

Dusseldorf, Germany

Products include transistors, diodes

Clevite Research Center

540 East 105th Street, Cleveland 8, Ohio

Departments: Materials, Electronics, Ordnance and Mathematics-Physics

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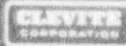


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