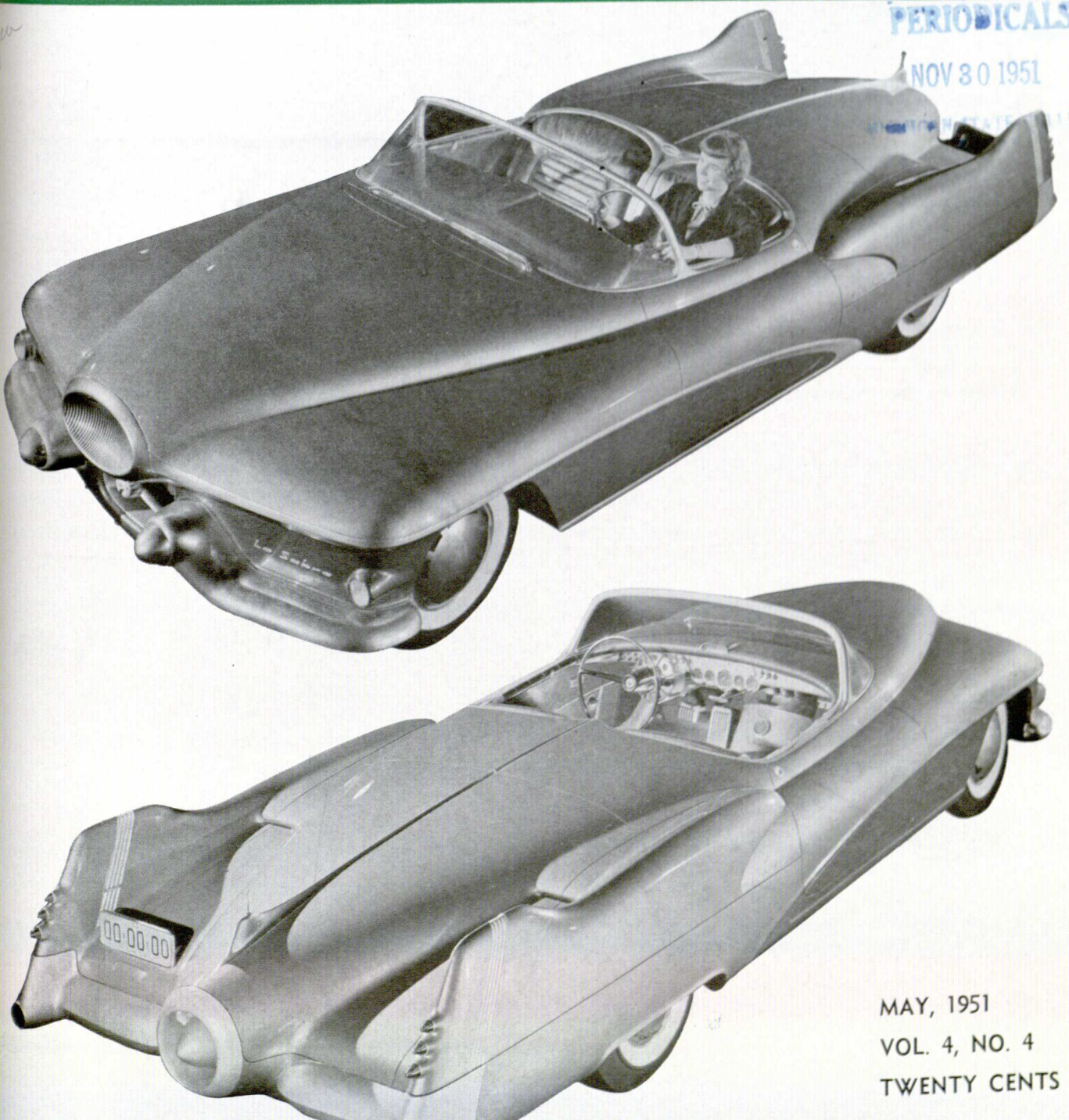
Spartan ENGINEER



MAY, 1951
VOL. 4, NO. 4
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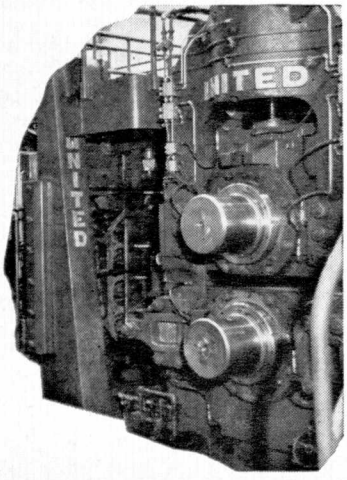
Another page for **YOUR BEARING NOTEBOOK**



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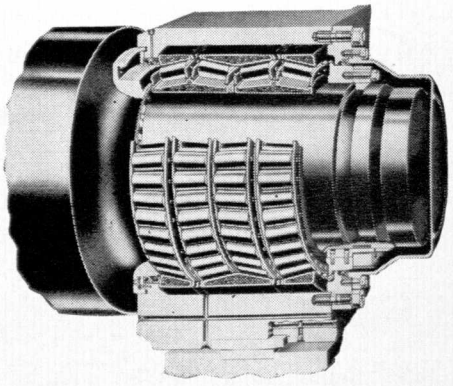
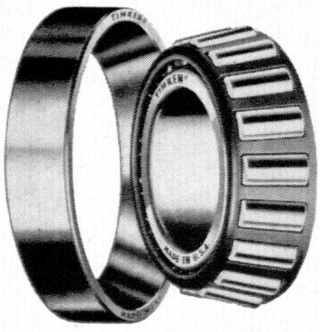
TIMKEN® bearings keep costs low

Tonnage records indicate that Timken bearings help keep cost per ton of steel rolled to a minimum. In many mills Timken roll neck bearings are still going strong after more than two decades of service. Because of balanced proportion design, they give greater mill rigidity, permit larger diameter roll necks than ever before. Roll neck strength is increased 50 to 60%. Load ratings are increased up to 40%.





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TRADE-MARK REG. U. S. PAT. OFF.
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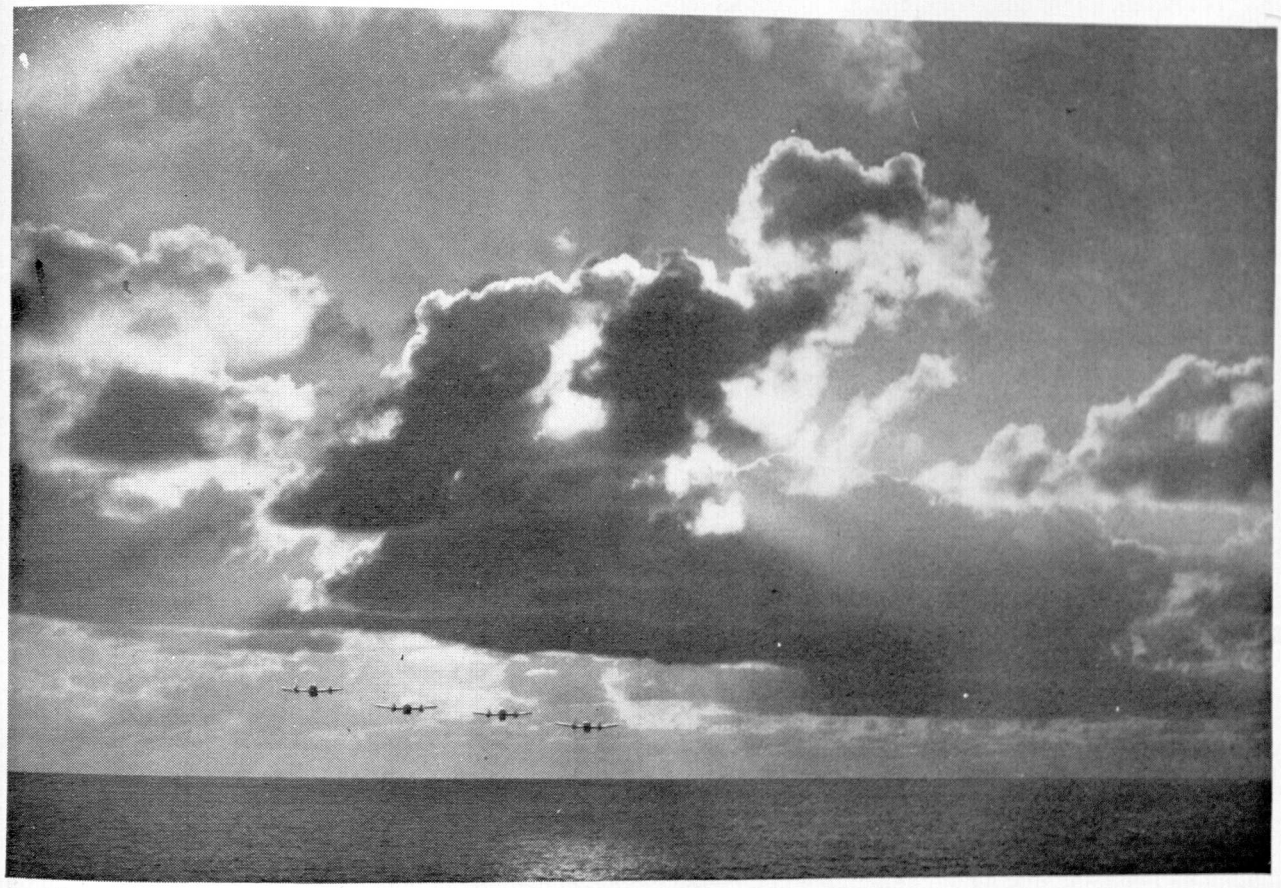
Learn more about bearings

Some of the engineering problems you'll face after graduation will involve bearing problems. If you'd like to learn more about this phase of engineering, we'll be glad to help. For additional information about Timken bearings and how engineers use them, write today to The Timken Roller Bearing Company, Canton 6, Ohio. And don't forget to clip this page for future reference.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION



From "California 73"

—to 20,000 lbs. over Korea

"CALIFORNIA 73" was the popular name of the best aviation gasoline ever produced before the day of synthetic additives. It was the best fuel obtainable for the pre-World War I planes that used it. But today it couldn't get one of the Army's newest heavy transport planes off the ground.

These new monsters wing westward across the Sea of Japan, carrying cargoes of 20,000 lbs., or 64 infantry troops, and at 18,000 feet fly at over 200 m.p.h. Quite a lift! And their engines demand fuel with performance ratings far beyond the properties of any gasoline that can be separated directly from crude.

The most significant difference between "California 73" and the gasolines in use today is synthetics of one kind or another. These man-made petroleum synthetics blended into modern gasolines have yielded performance ratings undreamed of little more than two decades ago. We have them now thanks to research—in which Standard Oil has been a leader.

The technically trained men who work in Standard Oil's research laboratories and pilot plants cannot foretell future developments in gasoline. But of one thing they are certain: it is synthetics that will make possible tomorrow's even better aviation gasolines. And when better gasolines are made, research men will help make them.

Standard Oil Company

910 South Michigan Avenue, Chicago 80, Illinois

STANDARD

What the paint said to the PERIOD PIECE

"I don't know what this stuff is, but it certainly is giving me a *lift.*"

The paint "spoke" truly. It *was* about to be completely lifted off the period piece . . . because the "stuff" was paint remover formulated with methylene chloride, a Dow chlorinated solvent.

Methylene chloride type formulations for paint, varnish and lacquer removers are products of extensive research in the Dow laboratories. Under their own brand names, many paint manufacturers use these formulations to develop products that have many advantages over the old style paint removers. They are nonflammable and so offer a wide margin of safety from fire hazards. They work quickly. In tests, as many as five coats of paint have been removed, leaving the wood free from discoloration and without raising the grain. Considering these advantages, it is plain to see why methylene chloride type removers have established a new trend in paint removal for both commercial and home workshops.

Methylene chloride is but one of a long list of chlorinated solvents which Dow supplies to industry. There are others for fast, safe dry cleaning, for degreasing of metals, for pharmaceutical preparations, for the manufacture of weed killers and for fat extraction, to list but a few uses of chlorinated solvents. These are but one group in the constantly expanding Dow list, numbering over 600 chemicals "indispensable to industry and agriculture."

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DOW

CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Oh say can you see-

"That's Jonesey—putting out his flag again.

"He hasn't missed one Sunday in the eight years we've been neighbors. I used to kid him about it a lot. Asked him why didn't he buy a cannon to shoot off with it. He took it good-natured-like. But we got to talking last week about war in general. That was the first time I even knew he had a son.

"His boy, Joe, enlisted right after Pearl Harbor and got overseas fast. When young Joe came back, Jonesey met him at the railroad station, stayed up with him all night and rode out with him to the cemetery on the hill. After it was all over, the sergeant gave Jonesey the flag that had covered Joe. *That's it over there.* I don't kid Jonesey any more.

"Instead, I've been listening respectfully when he talks about the flag . . . only when *he* says it, it's Flag. With a capital F. Same capital F he puts on Freedom, which is what he really means. Jonesey sure made me think about Freedom a lot. For instance . . .

"When I vote, nobody knows where I put my X's. Nobody puts me in jail for picking out my own church. And no teachers tell my kids to spy on me and turn me in because I squawk about taxes or high prices. And when I told my boss I was quitting to open a little grocery with the dough I'd saved in war bonds, he wished me luck and said he'd have his missus buy their groceries from me.

"*That's* what Jonesey meant when he said our Freedom is right under our noses. Can't feel it or see it. But it's there just the same, wrapped up in every star and stripe in that Flag across the street.

"And, if you'll excuse me, I'm going outside and hoist *my own* Flag, too . . . just bought it last night. 'Oh say can you see?' *I sure can . . . now!*"

REPUBLIC STEEL

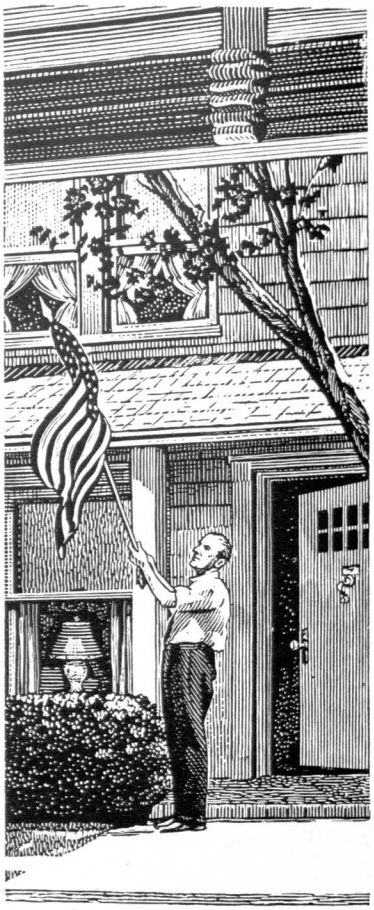
Republic Building, Cleveland 1, Ohio

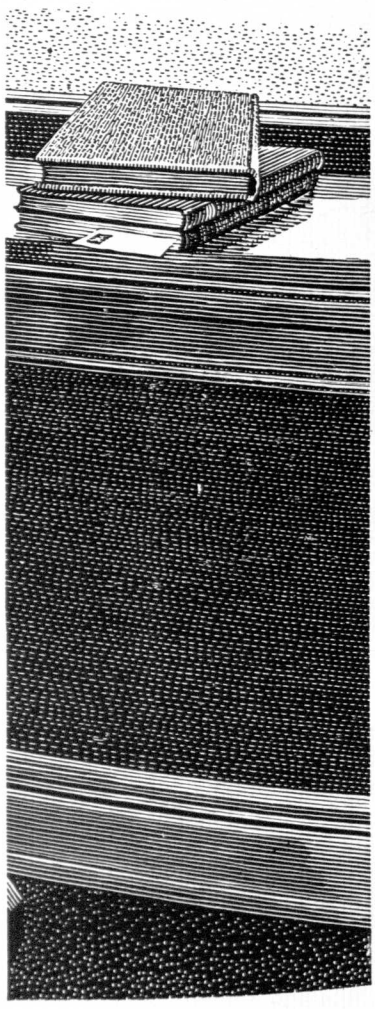
REPUBLIC STEEL

Republic BECAME strong in a strong and free America. Republic can REMAIN strong only in an America that remains strong and free . . . an America who owes much of her prosperity to her many huge industries that provide her people with the world's finest living. *Through these many industries, Republic serves all America.* A typical example can be found in the Petroleum Industry whose products furnish much of the nation's power, heat and light. In this production, too, steel plays a vital role . . . carbon, alloy and stainless . . . much of which comes from the many mills of Republic.

* * *

For a full color reprint of this advertisement, write Republic Steel, Cleveland 1, Ohio





Spartan ENGINEER

Table of Contents

• articles

• features

COVER --
The LeSabre, a Custom Built General Motors Laboratory on Wheels to Test Futuristic Styling and Mechanical Features.

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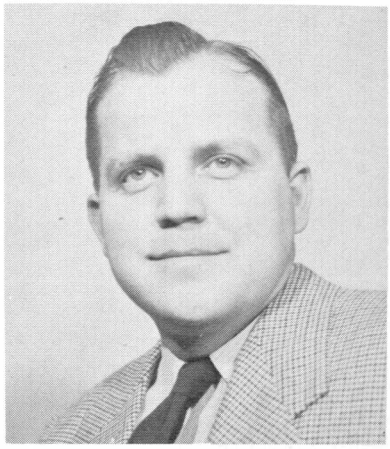
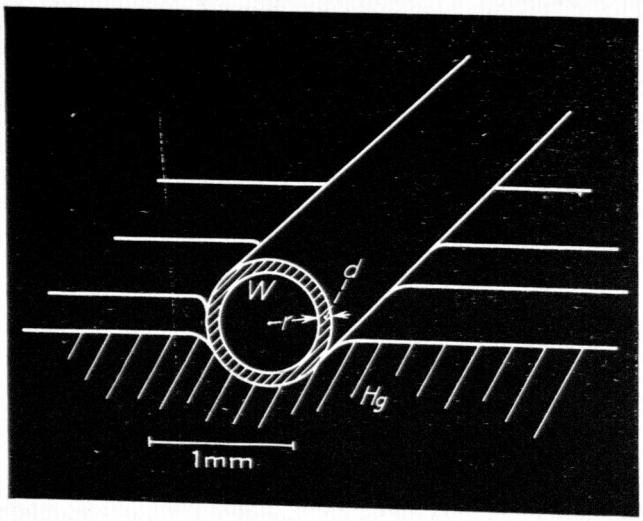
The Big "E" in Industrial Control



By Wm. Guntrum
Senior E.E.

Today, electronics is much more than a perplexing eleven-letter word which has some vague relationship to electricity. Yes, its effects have entered into our everyday life and include the development of television, the improvement of safety in rail travel, the increasingly important role in medicine, and the cure of malignant diseases. Further, its effects are seen in the use of electronic controls to improve the efficiency of industry and free many people from monotonous routine work.

It is of this latter phase -- use of electronics in industrial control -- that will be written about here. There are, in fact, three basic applications of electronics in industry: power conversion, amplification of small signals, and motor control. All of these have as their common characteristic, as far as industry is concerned, the use of each application as a control mechanism no matter how small that contribution may be when compared with the overall control device. By that I mean -- some industrial controlling device may have as its initiating condition, the amplication of some minute signal by means of an electronic circuit which in turn would activate a large piece of machinery or switchgear. The amplification would be a very small part of the complete controlling procedure, but without it automatic control could not take place with the rapidity and accuracy required by modern industry.



Cross Section of Igniter Element in Mercury Pool, showing the Meniscus which is formed at the Edge of the Starter Electrode.

Of primary concern in the use of electronics in industrial control is rectification. Rectification of electric current is the process of changing an alternating current into an unidirectional current. Its importance to electronic control lies in the fact that the power supply to the anode of electron tubes requires the use of direct current. Electronic methods have proven their superiority over commutating methods in rectifying a.c. current. They are more economical, have no moving parts, require no maintenance, possesses flexibility of output, and are more efficient -- 95 to 97 per cent.

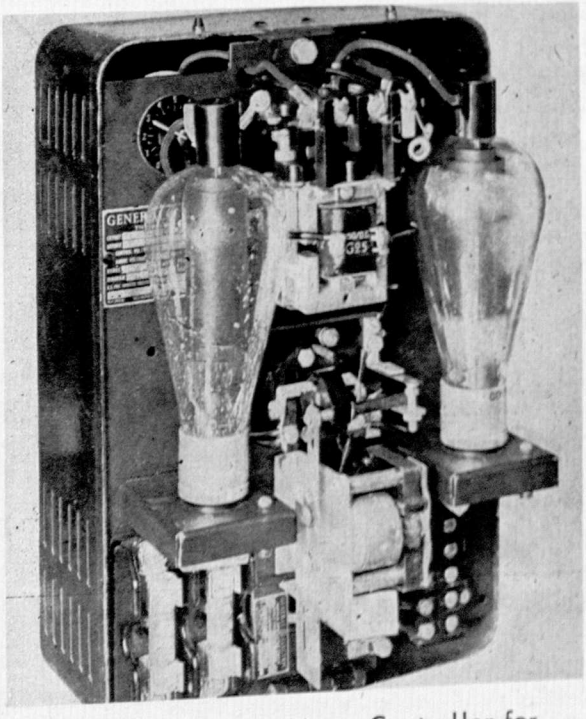
Electronic operation of direct-current motors has become an increasingly important phase of industry since World War II. The d.c. motor, although more costly and requiring

more maintenance, possesses excellent characteristics of speed and torque. The d.c. shunt motor possesses good torque characteristics and can be operated over a wide range of speeds with good regulation at all speeds. The d.c. series motor, with nearly constant energy imput and with a variable speed, develops high starting torque which is a desirable characteristic of d.c. motors for certain types of load. Such desirable characteristics resulted in the fact that during World War II approximately one-hald the kilowatt capacity of all machinery manufactured above one horsepower was direct current.

Photoelectric control devices are another great source of initiating and controlling scores of industrial operations. Basically, photoelectric control circuits depend on electron emission from the phototube cathode which is proportional to the intensity of light. This electron emission controls the grid of a triode causing it to conduct under certain conditions depending on the other circuit parameters. The conduction in the triode plate circuit can be made to do a host of controlling and initiating operations. Automatic lighting control, which when installed in factories has done much to alleviate eyestrain and decrease inefficiency, is one. Another is the photoelectric protection device in which beams of light may serve to prevent the starting of machines when obstructions are present, or to guard the dangerous working regions of a punch press and moving parts of machinery. Also, banks, stores, and factories can be adequately guarded at night by the use of invisible light beams to set off alarm equipment. Still another is the photoelectric counting device which is one of the most common methods of initiating and controlling various kinds of equipment. There are many others including, sorting and inspection photoelectric relays, photoelectric color selection, photoelectric recording, and photoelectric smoke detection -- its uses being almost unlimited.

A fourth important use of electronics in industrial control is in the process of resistance welding. Resistance welding depends on the heating effect of I^2RT over a small area surrounding the point of contact. Since a heavy current is used, the metal quickly reaches the fusion point and the pressure of the electrodes brings about a molecular union which on cooling results in a welded joint. Nearly all of the present-day welders are of the fully automatic type employing electronic controls. The complete duty cycle is performed automatically in sequence leaving nothing to the operator except the initiation of the cycle through push button control.

As to the future -- the new status which electronics has achieved in the field of industrial control should continue on to even greater heights. The use of electronics has some outstanding advantages over the use of mechanical means of control. The use of electronics is generally more economical than



Inclosed Thyratron Motor Controller for D-C Motors.

mechanical devices. The use of electronics requires less maintenance and has the distinctive advantage of not closing down an operation completely since replacing a tube requires the loss of very little time. And the use of electronics is more efficient than other means of control. Yes, there are few scientific investigations which will not benefit from the application of electronics techniques. The importance of the use of electronics in industrial control is now a reality and its possibilities are limited only by man's genius for devising new ways of utilizing their versatility to better his way of life.

ELECTRIC RAZORS

Man's Greatest Invention?

By Phil Sanford
Freshman E.E.

I wish I were a boy again,
For youth I have a craving;
No trials, tribulations, cares --
And best of all, no shaving.

One of man's greatest problems was partially solved by Colonel Jacob Shick, who invented the first modern electric razor. Shick got his idea for a dry shaver while confined to camp when stationed in Alaska. It was his intent to create something that all men would have to buy.

In 1928 Shick filed patents on his razor and in 1931 opened a razor-making factory in Stamford, Connecticut. Hand-made, these implements were an immediate success. Selling for $25 a piece, 3,000 were sold in the first year of production. The following year sales more than tripled to 10,000, and with the price reduced, doubled its money income.

For a few years after that the electric razor led a rather turbulent life. In 1933, John A. Hanely displayed the Shick razor in the Chicago World's Fair. As a result of Hanley's efforts, sales of razors multiplied fourfold, and Hanley became vice-president and general manager of the Shick Corporation.

Another factor in the great jump in sales was the work of Archie M. Andrews, Shick's advertising manager. Andrews, who had been booted out of the Chicago Stock Exchange for questionable progressive tactics, continued his gaudy methods in promoting the sale of Shick razors. He is generally given credit for ramming the idea of dry shaving down the public's throat.

This happy relation between the three men continued until both Hanley and Andrews broke off and started producing razors independently. Hanley introduced the Clipshave razor in August, 1935. His biggest contribution to the electric razor industry was to suggest using a Bakelite casing for the shaver motor.

Andrews came out with the Packard Lekto-Shaver. In advertising his products, Andrews continued using progressive tactics -- his razor was a favorite with punchboard operators, and was at one time used as bait to buy candy in burlesque houses.

Colonel Shick seemed to resent the competition brought by Hanley and Andrews. In fact, he brought suit against them for infringing on patent rights. After a great deal of wrangling and changes of decisions, in the spring of 1937 the United States Court of Appeals ruled that Shick did not have a monopoly on dry shaving.

With that, a number of other razors appeared on the market. Although Shick led the field in sales in 1937, it sold only half of the total number purchased that year. Of 1,500,000 razors sold, 756,109 were Shicks. Second and third in sales were two new razors. Remington-Rand, in second place, sold over 400,000 despite not going into production until October. Third in sales was the Shavemaster, produced by the Chicago Flexible Shaft Company, which later changed its name to Sunbeam. Archie Andrews, who had been instrumental in gaining the decision over Shick, found the sales of his Packard drop to fourth place.

Since then, sales of electric razors have increased annually, with Sunbeam, Remington-Rand, and Shick leading the way.

Typical of the conventional type is the Remington Blue Streak Five. This razor weighs 12 ounces with its cord, and is 4-1/2" long, 2-1/16 wide, and 15/16 thick. The head is 1-1/4 wide and 19/32 long. The cutter, which corres-

ponds to the series of slots in the barber-shop clipper, has 185 of those slots in 37 rows, while the corresponding series of blades is composed of 19 double-edged knives that move across the slots 17,000 times a minute.

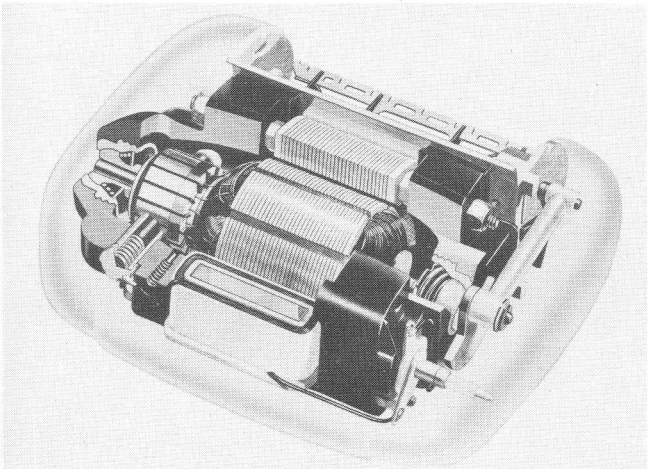
There are three cutters in this type razor. One cutter is rounded for close shaving; two are flat for getting the long hairs of the beard. The outer shells of these cutters are about .0025" thick. This set-up is run by a tiny motor that makes 8500 revolutions per minute.

The rim of a starting wheel sticks through a hole in the shave case, and can be twirled with the thumb to move the motor off dead-center. Under the wheel is an eccentric collar on a rotor shaft which moves the oscillator once in each direction for every turn of the motor. The three-pronged oscillator is what vibrates the cutter.

On the other end of the shaft is an egg-shaped collar that pushes contact points apart with each turn of the motor. This makes and breaks the circuit and keeps the motor going.

While the Remington-type razor has an impulse motor and a flat head, the Sunbeam Shavemaster has an oval head, and originally used a brush-type motor. The latest development in the electric razor business came out in 1948 in the form of the Sunbeam Model W Shavemaster.

This new model is revolutionary in many respects. First of all, it is smaller than any other previous model--Sunbeam or otherwise. Then, it operates with a small self-starting, armature-type motor, similar to the one in the Sunbeam Mixmaster.



Sunbeam Shavemaster (Internal Cutaway)

Another new device on the newest Sunbeam is the crank-shaft drive that moves the cutter at a rate of 792 feet per minute. This takes the place of the direct vertical eccentric drive used by former Sunbeam models and other razors.

The cutter itself is revolutionary in that it is a single, hollow-ground blade, with double edges. It rests freely in the cutter-holder and depends upon centifugal force to press it against the head. Making over 28 million cutting actions per minute, this single cutter leaves the holes of the head open 97 percent of the time.

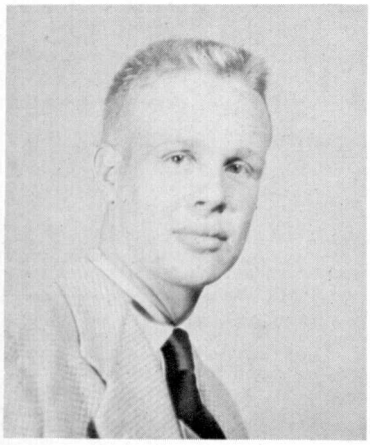
Although the original Shavemaster also had an oval head, or comb, the Model W head is twice as wide as the original Model R and has twice as many holes as the intervening Model S. The comb of the Model W has 1,750 holes, arranged alternately, which are .002" thick at their thickest point. In addition to the round openings, the head has four long slots designed to pick up the long hairs and the curly whiskers that stick to the skin.

Along with these improvements to the razor itself, some improvements have been made in the supplements to the razor. As was mentioned, John Hanley suggested the Bakelite casing for the shaver motor.

Another external improvement came out with the Model W Shaver master. That was a compact plastic case for the razor. The most distinctive feature of this thing is a self-contained cord-reel in the bottom of the case. The cord is removed by pinching a bottom catch on the case, removing the reel, and then unwinding the cord.

With all these improvements in electric razors, and the fact that many hotels and trains and ships have put in 110-112 volt electric outlets, dry shaving is continuously growing in popularity in the United States. In addition to electric razors, batteries for dry shaving have been produced that give three-months service, and nine-months service. Once, dry shavers were even put in Cadillacs.

And now, with the price of the electric razor reduced from the original twenty-five dollar, it costs the American male only about twenty dollars for a little bit of heaven on earth.



Automatic Transmission

Fluid Does It

By David H. Wing
Freshman M.E.

Whether one realizes it or not, it seems that the day of the manual shift automobile is nearly past. The automatic and semi-automatic transmissions are becoming as much a part of today's car as the automatic starter.

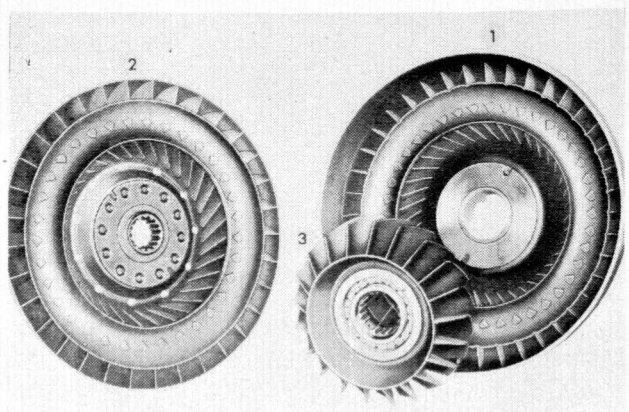
General Motors and the Chrysler Corporation were the first to use automatic shifting. Now nearly every car has an automatic or semi-automatic transmission either as standard or optional equipment. The last of the "Big Three" in the automotive field to come out with such a transmission is Ford. In the past it has borrowed the Hydra-Matic unit from General Motors, to use on its Lincoln.

The first automatic stepped transmission to come into extensive use in this country was the Warner automatic overdrive, and was first offered by Chrysler in 1934. Although it is not known under that name, it is essentially a two-speed automatic transmission used in combination with a three-speed hand-controlled unit. This combination today is still considered to be the most efficient of all the automatic transmissions.

In most automatic and semi-automatic transmissions either a fluid coupling or a torque converter is used, in some a combination of both. Fluid couplings have been used in passenger cars and motor busses, chiefly as a means of obtaining a smoother pick-up. There are also certain other advantages in the use of such couplings, one being that they make it impossible to stall the engine. The practice originated in England, where the Daimler Motor Company adopted the "fluid flywheel" for its motor cars in the late twenties. It was nearly a decade later that the device gained recognition in this country, and was pioneered by the Chrysler Corporation.

The fluid coupling consists of just two working parts: a bladed centrifugal impeller (a form of pump) attached to the engine crankshaft; and a turbine, attached to the transmission. To get action, the spinning impeller directs multiple streams of oil into the blades of the turbine under high pressure. The impeller and the turbine are close to each other, but not in actual metal-to-metal contact. In the simple fluid coupling the acceleration after starting is reduced due to the fact that it does not multiply engine torque. The slippage that occurs in this system increases fuel consumption.

The late Herman Fottinger of Germany, invented the torque converter over forty years ago. It was developed in Europe until the thirties. In 1937 General Motors introduced the converter to American bus lines. The first private-car application was the Buick Dynaflow in 1948.



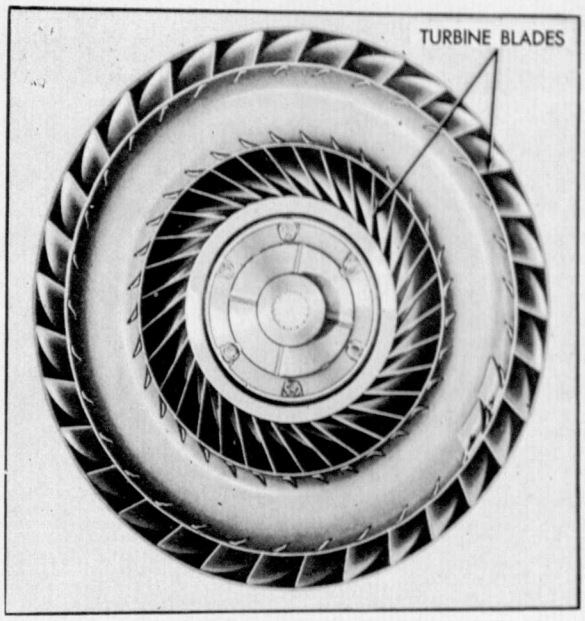
Typical Torque Converter Parts
(1) Impeller (2) Turbine Stator.

The hydraulic torque converter is a less efficient mechanism than the fluid coupling. It is significant that wherever a torque converter is used means for cooling the oil must be provided. This introduces a loss of efficiency which is one of the compromises made to obtain the converters ability to increase or multiply engine torque for accelerating and hill climbing. The more efficient fluid coupling only transmits input torque, without any multiplication or increase.

A torque converter is composed of three elements: a pump, driven by the engine; a turbine, driven by the pump; and a stator (reactor). In the converter the oil hurled by the pump at the blades of the turbine is changed in direction by the shape of the blades. They turn the oil back against the blades of the reactor, and this vigorous rebound increases the oil velocity, therefore its force.

The reactor, under this backward impact of oil, remains stationary; it is mounted so it can only turn forward, with the pump and converter. The reactor blades are shaped to violently divert the oil toward the trailing side of the pump blades, so as to help drive the pump. This violent change of oil direction in the reactor might be described as a fluid fulcrum where great fluid leverage is exerted to help drive the pump. As the turbine picks up speed the direction of the oil flow off its blades gradually changes until the oil is striking the trailing side of the reactor blades. This means that the stationary reactor begins turning with the turbine, and as all parts approach the same turning speed less and less oil force assists the pump and torque multiplication lessens until, finally, the converter becomes a simple fluid coupling. In some converters oil force is increased not only by changes in the direction of flow but also by narrowing the blade channels through which the oil must pass.

Probably one of the most used transmissions today is General Motors Hydra-Matic. It is employed now in eight automobiles: Cadillac, Oldsmobile, Pontiac, Lincoln, Nash, Kaiser, Frazer, and Hudson. In most of them it is regarded as optional equipment. The Hydra-Matic is essentially a four-speed-and-reverse planetary transmission combined with a fluid coupling. This device is considered to be the most refined of the automatic transmissions. The Hydra-Matic combines the efficiency of the mechanical drive with the fluid cushioning.



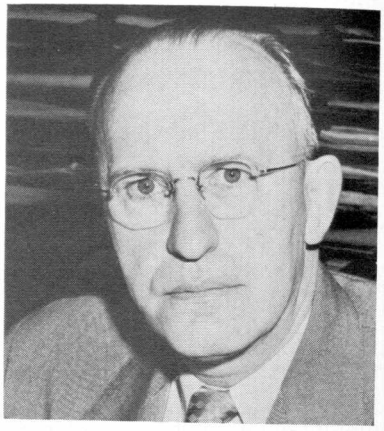
Velocity of Oil Hurled at the Turbine Blades by the Pump is Increased after Striking.

The hydraulic torque converter, as used in the "Powerglide" and "Dynaflow" transmissions, is a less efficient mechanism than a fluid coupling. This loss of efficiency is one of the compromises made to obtain the converter's ability to increase fluid coupling only transmits input torque, without any multiplication or increase. As used in the Hydra-Matic, the fluid coupling is responsible for only a small power loss.

The basic principle of the "Powerglide" and "Dynaflow" are similar. There is no clutch pedal in either car. The "Powerglide" converter includes an "over-run" coupling arrangement inside, to improve power transmission efficiency when car is driving engine, as in downhill braking, or for push starts. With "Powerglide", axle ratio is decreased from 4.11:1 to 3.55:1. This change reduces engine speed which tends to lessen fuel waste. The "Dynaflow" type of transmission is the simplest possible. There is almost nothing to wear out or go wrong. One of the main differences between "Dynaflow" and "Powerglide" is a small reverse pump for additional

Continued on Page 26

THE PLACE OF ENGINEERING DRAWING IN THE ENGINEERING SCHOOL CURRICULA



By Professor Stanley Radford
Staff Member of M.S.C.
Engineering Drawing Dept.

This topic essentially involves the cooperation of engineering educators and industrial training supervisors to determine current trends of industrial thought relative to engineering drawing -- for the purpose of evaluating its place in the engineering school curricula.

Since engineering educators are engaged in training engineering students to meet industrial needs from year to year, it is desirable to ascertain current trends of thought expressed by industrial representatives before making changes or revisions of engineering curricula.

Industrial Trends of Thought

The following summary of industrial thought should be given careful consideration by engineering curricula study committees at M.S.C. and elsewhere.

1. There is a definite trend of thought that the four year engineering school curricula provides sufficient time for basic preparation during the first two years, and for considerable specialization by all types of students in their major field of engineering work. In the present curricula as it exists in most accredited engineering schools, the time allotted to basic engineering drawing courses is not sufficient to prepare engineering graduates for positions as design or process engineers, or to supervise the work of others. Further training in industrial drafting rooms and in actual shop processing methods or field and construction work is necessary before the young engineer is ready for promotion to supervisory positions.

Four years is enough time to require of the majority of engineering students in college, preparation for further development as engineers by industrial employers. The five year curricula should not be made mandatory by engineering colleges for all types of students.

2. It is of primary importance to provide thorough training in basic engineering studies such as mathematics, English, engineering drawing, physics, chemistry, and related shop subjects such as pattern making, foundry, machine shop, sheet metal, forge shop, and other studies, such as surveying, strength of materials, and mechanics during the first two or three years of college work. The balance of the time left, should be special option or design courses offered in the major fields of students' interest.

There are a few courses that should be required of all engineering students; such as: Introduction to the Engineering Profession (one hour freshman seminar per week), Engineering Law and Ethics, Industrial Organization and Plant Management, Engineering Materials and Processing Methods, Advanced Design, and special laboratory courses in each major field. Placement Procedures and Interviewing Techniques during junior and senior years are other essentials.

A wide range of elective studies should be permitted in accordance with individual student interest after required work is completed. The elective studies should be a humanistic, business, or technological nature to permit more choice at the senior level to broaden their training and increase their versatility.

3. The place of engineering drawing is one of primary importance in the engineering curricula not only because of its practical and cultural value, but also due to the part it plays in integrating other basic academic and related shop studies in preparation of students for advanced courses in college and their eventual success in industry. Practically all engineering students utilize technical sketching and drawing. Therefore the time allotted to it should be sufficient to teach basic units of subject matter as outlined in any of the more recent engineering textbooks.

Most Engineering Drawing Depts. at present are not allowed sufficient time to adequately cover basic units of subject matter. In some engineering schools there is even talk of discontinuing the Engineering Drawing Dept. as a department. It is being proposed that drawing courses should be taught in each of the major fields of engineering such as Civil, Mechanical, Chemical, etc. This policy would result in drawing courses being organized and taught to serve the need of each major field. This procedure is apt to result in too narrow specialized courses in drawing. It would also create a problem for the many students from other schools on campus at present taking courses in the Engineering Drawing Dept. In many colleges, the number of students from courses other than engineering, who are taking drawing courses, exceeds the number of engineering students in these courses. This is true at M.S.C. Therefore, the abolishment of our Engineering Drawing Dept. and the present service it is rendering to all types of students does not seem feasible or practical.

4. A letter on the T-square page in the Nov. 1949 A.S.E.E. Journal of Engineering Education indicates that some engineering educators desire to add more special option courses within the 4 year curricula. This would be done by reducing the present 3 hour class period in engineering drawing, meeting 3 times per week, to two 4-hour class periods per week, or possibly two 3 or 2-hour periods. This would result in reduced per-pupil cost, might increase the pupil-teaching load, and might seriously impair the efficiency of student preparation.

The trend of industrial thought relative to this proposal is expressed in a resolution written by the Detroit Engineering Society to the President of the Engineering Drawing Division of the American Society of Engineering Education: that their officers "give vigorous support to the retention of adequate training in Engineering Drawing in all engineering curricula."

Basic training in engineering drawing should not be reduced to a dangerous minimum for the sake of effecting a minor reduction in the cost of student preparation. The time allotted should be increased instead of decreased at a time when the demand for design and process engineers is greater.

While engineering drawing courses may be stream-lined to some extent by requiring more outside homework, the tendency to reduce the actual classroom time allotment for beginning students in basic engineering drawing and descriptive geometry courses is apt to result in "the students getting only a minimum of knowledge and technique in the rendering of drawings".

Their training may become "inadequate to meet the demands of industrial employers and training supervisors who, utilize our engineering graduates." A survey of the training supervisors of the large machine tool industries who employ engineering graduates will reveal in many instances that much time is spent by them in supervision of young engineers during "the breaking in process" to help them "bridge the gap" which already exists between the engineering school type of training and the highly technical requirements demanded of the young engineer during his initial experience.

Despite their efforts, the young engineering graduate often experiences much "grief and difficulty in making adjustments" to the industrial environment, due to lack of sufficient training in making and reading highly complex drawings. The young engineer often expects a highly paid supervisory position before he is thoroughly qualified or "fitted to supervise" the work of others. The concensus of opinion of industrial employers is that the training in basic engineering drawing courses should be more practical and intensive

Continued on Page 24

Alumni News

(Contributions to this feature are welcomed.
Send to Alumni News Editor c/o Spartan Engineer)

George H. Ellis, '07, was civil engineer and hydrographer for the Montana Power Company from 1929 until his retirement in 1949. He now lives in Butte, Montana.

William Piper, '07, is plant engineer for the Allegany Ballistics Laboratory in Cumberland, Maryland.

Samuel C. Harding, '11, has been with the Niagara Mohawk Power Corp. Fulton, New York, for thirty-two years.

H. C. Diehl, '19, is director of the Refrigeration Research Foundation in Colorado Springs, Colorado.

Joseph Newman, '26, is a plant engineer for General Motors in Kansas City, Kansas.

J. Stanley Jeffery, '28, associated with Consumers Power Co. in Jackson, recently was elected president of the Jackson Engineers Club.

Frank Jones, '34, is water pollution control engineer for the state of California. He resides in Los Angeles.

Clarence Feightner, '39, is an industrial hygiene engineer at Tinker Air Force Base in Oklahoma City, Okla.

Ross J. Martin, '40, Since 1949 an associate professor of mechanical engineering at the University of Illinois, has recently been appointed associate director of the University of Illinois engineering experimental station. He is the first to have such a post in which he will serve as consultant to heads of departments in the college of engineering on matters pertaining to work in the station, and coordinate research in all departments.

Professor Martin graduated from M. X. C. with a bachelors degree and received his master of science degree from the University of Illinois in 1946. He is also a member of the American Society of Refrigerating Engineers and the American Society of Engineering Education.

Robert Parkhurst, '43, E.E. for International General Electric, South America Inc. Caracus, Venezuela.

Fred Lee Warner, Jr., '43, a bridge design engineer with the California State Highway Department for the last four years died Dec. 22, 1950 in Altadena, California.

George Busch, Jr., '44, is located in Grand Rapids as sales engineer for Haven-Busch Co.

Richard Merrell, '44, is a research engineer for General Motors in Detroit.

Richard Graves, '46, is a draftsman for General Motors Truck and Coach in Pontiac.

William Sharrad, '46, is the mechanical engineer in charge of heating and ventilating problems for S.S. Kresge Co. in Detroit.

James E. Bowman, '47, is a lucky man. He is laison man between Midwest Solvents and Seagram Distilleries, checking quality of alcohol purchased by taste and odor.

Edward S. Humenny, '47, is the plant manager of a synthetic rubber company in Alhambra, California. He previously obtained his Masters Degree in Business Administration from Harvard.

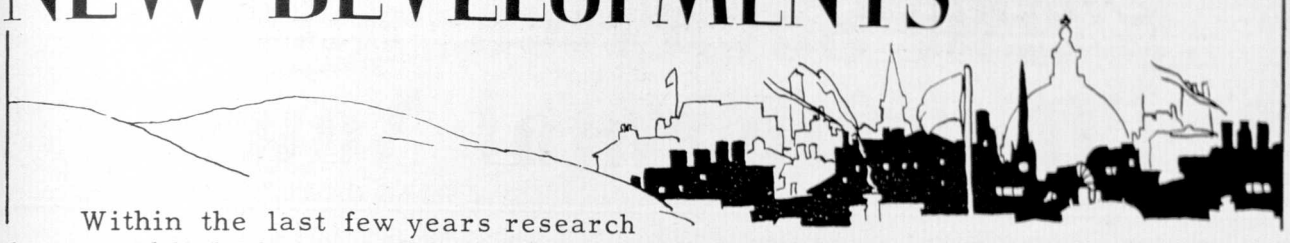
Harold Nuechterlein, '47, has joined the Minnesota Mining and Manufacturing Co., in Detroit.

James Houle, '48, is a sales research and technical service engineer for Minnesota Mining and Manufacturing Co. in Detroit.

John Stevens, '48, is area engineer for Du Pont in Grand Island, New York.

Continued on Page 28

NEW DEVELOPMENTS



Within the last few years research has established the need of plants and animals for certain periods of light and darkness for normal growth. For example it has been found that the poinsettia should have about 10 hours of light and 14 hours of darkness if it is to bloom properly.

Although the intensity of illumination is important, the major factor is the frequency and duration of illumination, or "photo-periodism." It is a scientific belief that all living matter grows in rhythmic cycles, consisting of successive periods of light and dark. In conjunction with this it is believed that by changing the cycle time lengths, but still maintaining raditions similar to those produced in actual sunlight, plants and animals of better quality and greater abundance can be grown.

An example of this is shown from the findings of an experiment performed on a chicken. When the chicken was exposed to artificial light in excess of the normal day length, its egg production increased. When it was exposed to less than the normal day length of light, the egg production dropped off, but the chicken grew fatter.

Other experiments have been conducted to show that it is possible to grow onions from seed to seed without producing the onion itself; mink can be made to grow their winter pelts in the summer; the butter-fat content of butter can be increased if the light received by the cow is increased, also it has been found that a human being, exposed to light, hears better than one in the dark.

Soon by using artificial light farmers may be growing crops the year round.

DIGITAL COMPUTER

An electronic computer, 5,000 times faster than a human being has recently been developed. The machine will be used to help solve complex engineering and scientific problems in a fraction of the time otherwise needed.

Although officially unnamed, it is presently referred to as "Omibac," an engineering abbreviation for "Ordinal Memory Inspecting Binary Automatic Calculator." "Omibac" is a digital computer which deals directly with the digits of the original problem, as contrasted with the other broad type -- the analog computer -- which translates the problem into analagous terms such as length, speed, or voltage. It employs the binary systems of counting, a simplified method which utilizes only two digits -- 1 and 0 -- rather than the 10 characters of the familiar decimal system. In this system the two digits can be made to correspond to any of the decimal numbers. For instance, the binary equivalent of the decimal numbers 0 and 1 is 0 and 1, but the decimal number 3 is 11, 4 is 100, 5 is 101, etc.

The calculator combines the action of 3,300 electronic tubes, and two "memory" devices. It can "remember" more than 1,000 separate instructions and more than 1,000 numbers, which it gives up when it is called upon. The machine's "memory" comes from fast spinning cylinders coated with a black magnetic material. "Omibacs" information is stored on these cylinders in the form of magnetic impressions. One cylinder contains instructions, in binary code, which determine what the machine does. Another contains the numbers it uses in the solution of a particular problem.

Orders coming from the instruction cylinder control not only the selection of numbers but also whether the numbers are to be added, subtracted, multiplied or divided.

Once the problem has been set up, the instructions and numbers are fed into the machine by means of a tape, perforated by a machine similar to that of a standard typewriter. This typewriter-like device, has been modified so as to translate the instructions into binary form before the information goes into the computer. Continued on Page 22

The Societies and Departmental News

AMERICAN SOCIETY OF AGRICULTURAL ENGINEERS

At the last meeting of the society Mr. Samsel and Mr. Wright from the J. I. Case Co. showed a movie, "Handling of Baled Hay." This movie showed the progress made by research men at Michigan State in cooperation with the J. I. Case Co. on the drying of baled hay through the use of ventilated bales.

Mr. Samsel, from the main office in Wisconsin talked on the general requirements for students desiring jobs in industry. Mr. Wright is manager of the Michigan branch office here in Lansing.

SOCIETY OF AUTOMOTIVE ENGINEERS

During winter term SAE sponsored two trips, one through the Olds engine plant, the second through the assembly plant and the heat treat department.

Another trip, through the AC Spark-plug plant, was made March 5th with a talk in the evening on the engines used in the 1950 Indianapolis 500 mile race.

Also during winter term SAE received its National Charter which is one of three in the state.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS INSTITUTE OF RADIO ENGINEERS

A talk on "Electronics in Industrial Control" was given during winter term by Mr. Croft of Oldsmobile. This was the Michigan Section Electronics Group Meeting.

A picnic is planned which will be held sometime in May.

TAU BETA PI

Elections were held recently at a Tau Beta Pi meeting. The outcome was as follows:

President - Tom Dewey;
Vice-President - Hartley Owen;
Corresponding Secretary - John Buxton;
Recording Secretary - Bill Ball;
Cataloger - Willard Friedel;
Council Representative - Ildo Caputo

After the elections, former President Jim Jursik informed the new members and officers of the present working plans being accomplished now. They included the project committees, which consist of the bent monument committee, and the bent paper weight committee. Also were the plans to purchase new furniture and drapes for their lounge on the fourth floor of Olds Hall.

C.E. DEPARTMENT NEWS

Dr. Harris, head of the C.E. Dept. gave a talk on Galloping Conductors for the Illinois Tech. local chapter of Sigma Xi, national honorary scientific research fraternity.

Dr. Baines gave a paper at the 71st General Meeting of the ASME-Hydraulics division at New York. The subject was "Investigation of Flow through Streams" and covers work done by Dr. Baines at the University of Iowa.

J. T. McCall and R. J. Claus are working on a research project for Dow Chemical Company. They are working on the effects of admixtures of different forms of calcium chloride on the compressive strength of concrete.

Mr. McCall also presented a talk before a conference of the Michigan Builders' Supply Association on "The Use of Light Weight Aggregates in Concrete".

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TECHNICAL WRITING
Writing Guide for Engineers

CRITICISM OF THE WRITING ABILITY of the average engineer is heard nearly as often as criticism of the weather. But in neither instance is anybody doing much about it. Some people say that nothing can be done about engineers' writing, that skill at writing is a gift from heaven, and you are either born with it, or born without it. Others say that skill at writing is not particularly desirable, or at least not very important, and there is no need to do anything about it. Before accepting either of these views, let us examine the evidence. Maybe technical writing ability is of real value, and maybe something can be done about developing it.

Those who say that the average engineer can get along well enough without writing ability often contradict their own theory when they undertake to explain what they mean. What they consider unimportant is found to be fancy writing rather than good writing. Though these critics place a low valuation on writing ability, they still want what is written to be clear, concise and easy to read. And that certainly requires a certain amount of skill at writing.

Does Good Writing Require Training?

Remarks recently made by a nationally prominent business executive illustrate this clearly. Deploring the idea of including more English composition in college engineering courses, he contended that "Literary composition is a pretty unimportant matter in good technical reports." All that is needed, he claims, is that the reports should say what they really have to say in the clearest and briefest possible manner. For that he believes no particular training is needed.

"Young college graduates," he continues, "can express themselves well enough to conduct their personal affairs in a rather complicated world, or they never would have emerged from college." Because many a young graduate understands football and describes a football game orally "with enthusiastic clarity and fluence," this executive reasons that anyone who understands his subject should be able to do good technical writing.

It would be interesting to record on a dictaphone the average young college graduate's description of the football game and then have it put on paper for someone who had not been present at the oral presentation. That the written version would demonstrate the talker's enthusiasm seems very likely. That it would describe the game clearly and fluently is, to say the least, questionable. Actually the conditions surrounding an oral presentation are such that we overlook defects that would be glaringly apparent in a written presentation.

Knowledge of Subject Is Not Enough

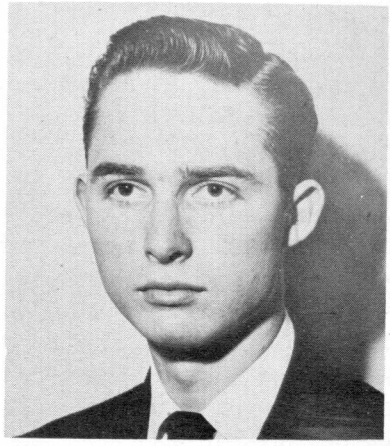
Many years of experience in reviewing technical papers and articles have convinced the present writer that knowledge of the subject is by no means all that is essential for good technical writing. Knowledge of the subject is the beginning. Without it the writer is defeated before he starts to write. But that alone is not enough. The technical writer must know also how to put his knowledge into words -- in the simplest and clearest possible words, and in the smallest possible number of them.

Perhaps an analogy can be drawn from the problem of painting a barn. Everyone knows that barns must be painted from time to time. That is purely a practical matter. Since the building to be painted is a barn we can dispense with the services of an artist to select a color scheme, but we still need someone who knows something about painting. He need not be a professional painter but he must know what kind of paint to use under the existing conditions and how to apply it so that it will not blister or peel in a short time. For that kind of writing there is no need for a literary artist, but there is need

Continued on Page 36

"A Parade of Wheels"

The 1951 Engineering Exposition



By
Arnold V. Nelson
Jr.E.E.

May 11 and 12 -- Those are the dates.

Again this year, the M.S.C. School of Engineering extends an invitation and a welcome to you at their annual Exposition.

This year the Exposition has adopted "A Parade of Wheels" as the central theme.

In accordance with this theme, a parade is planned for May 12 featuring vehicles and contrivances which use wheels to move on. Every thing from a stage coach to a "Hot Rod" is planned to participate in this parade. With the cooperation of the campus police, this parade should be a huge success.

Another main attraction of this year's Exposition will be the crowning of "Miss Engineer" at the half-time of the spring green and white football game. "Miss Engineer" will reign over the the two day affair and will receive a personally conducted tour of the Exposition by Roland Carlson, President of the Engineering Council. She will be picked by nominations and votes from students in the engineering school.

Still further, another new attraction will be the inauguration of M.S.C.'s. recently completed television studio in the Electrical Engineering Building. The studio is located on the fifth floor which can be reached by the elevator. The studio will be open during the Exposition and everyone will be given the opportunity to see the latest in T.V. equipment and have an explanation as to its operation. Telecasts are being planned for the near future.

Also on the T.V. bill will be a demonstration of the "Utiliscope" by Allan Black, a recent Michigan State engineering graduate. The "Utiliscope" is a wired television system and finds extensive use in industry, research, commerce, education, and science. To sum up the utility of this instrument, it can be said that with the "Utiliscope" you can see where you can't look. For further illustrations of this wired television system, look for it in Olds Hall at the Exposition.

Novel, as well as practical, is the scale model of a swimming pool which has been obtained for the Exposition and demonstrations of the same will be given in Olds Hall. Its dimensions approximate four by seven feet.

To top the list of outstanding attractions at this year's Exposition, General Motor's "Previews of Progress" will be featured. It is the story of the General Motors science show. Demonstrations showing dependency of power on degree of compression, miniature jet, and other intriguing experiments will be given. Shows will be presented both days of the Exposition. Consult program for the time and place.

Speaking of jets, a fly-by of jets from Selfridge Field is being investigated for May 12.

Speaking further of jets, again this year the cut-away of the J-33 turbo-jet engine used in the F-80 will be exhibited. Cutaways of conventional, piston-driven, radial and in-line aircraft engines will also be displayed.

Movies, such as those shown last year, will not be on the program for this year's Exposition, for it was felt that they would be too time consuming for the large program offered.

Counseling and aptitude tests will be given to those desiring them. A large crowd of high school students is expected and these tests are given chiefly for their benefit.

As was true last year, there will be exhibits and demonstrations in Olds Hall, Shop Building, Forge and Foundry, Chemical Engineering Building, Electrical Engineering Building, and finally Agricultural Engineering Building.

The mechanical engineers will open up the power lab in Olds Hall. In operation will be steam engines, diesel machines, and a materials testing laboratory demonstration. Over in the Shop Building they will be operating the machine shop, pattern shop, and dynamometers in the automotive lab.

The metallurgical engineering students will be giving their demonstrations on the fourth floor of Olds Hall. They will exhibit a Jominy Hardenability Test, automatic temperature controls, optical pyrometers, and a number of interesting experiments dealing with metallurgy.

In the Chemical Engineering Building, the Ch.E's will show a distillation column absorption column, filter presses, evaporater, heat exchangers, and many more processes.

The civil engineers will be having open house on the first floor of Olds Hall. They will have their surveying transits and levels on display and operation of the same on the lawn in front of Olds Hall. Testing equipment, wires, and graphs will also be on display.

Supplementing the C.E.'s equipment, the Highway Research Department will exhibit Abrams Aerial surveying dis-

"Miss Engineer?"

play, Ambassador Bridge Model, Arch Bridge Model, model power hoist, and also models of cloverleaf traffic intersections.

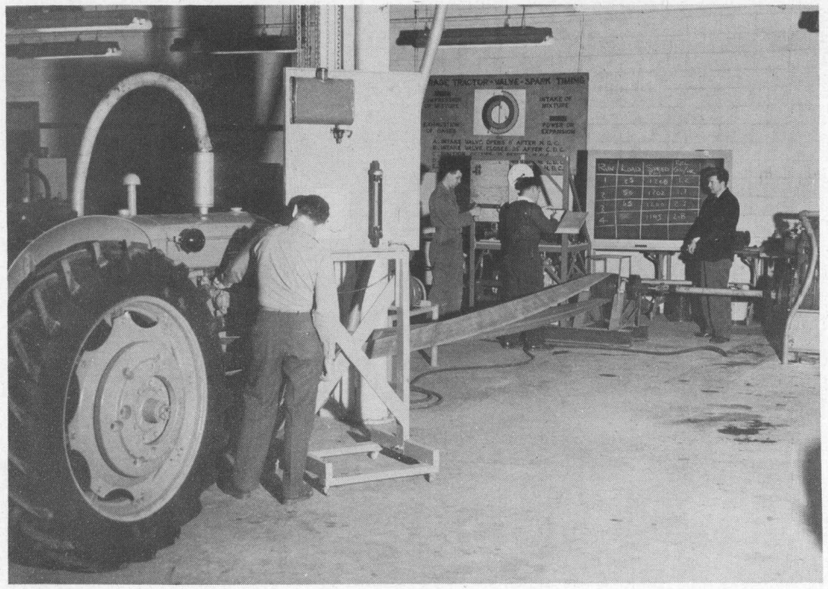
The E.E.'s will team up with the Physics majors and put on a show in the E.E. Building. Such equipment and demonstrations as an X-Ray machine, arc welder, precipitron, servo mechanism, oscilloscopes, geiger counter, stroboscope, and polarized light will be shown.

On South Campus, in the new and modern Agricultural Engineering Building will be the exhibits of the Ag. engineers. Their exhibits will center around such labs as rural electrification lab, refrigeration lab, farm machinery lab, and farm structures lab.

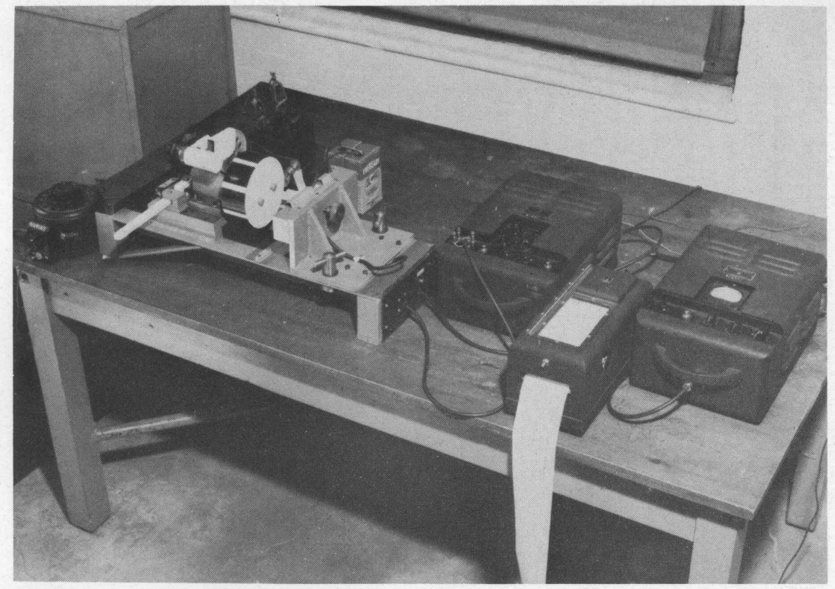
A brief preview of this year's Exposition has been given here and it is hoped that you will make plans to be one of the 10,000 visitors to this year's show.

Thus, while the welcome sign is being readied, won't you make those plans to attend the biggest Exposition yet and allow the school of engineering to be your host.

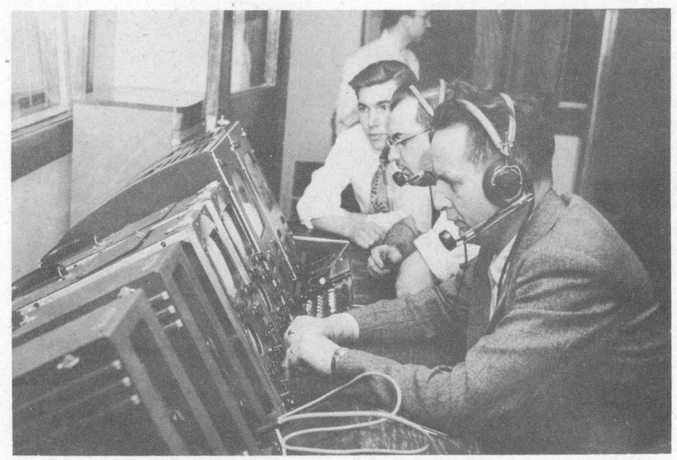
CAMPUS DEVELOPMENTS



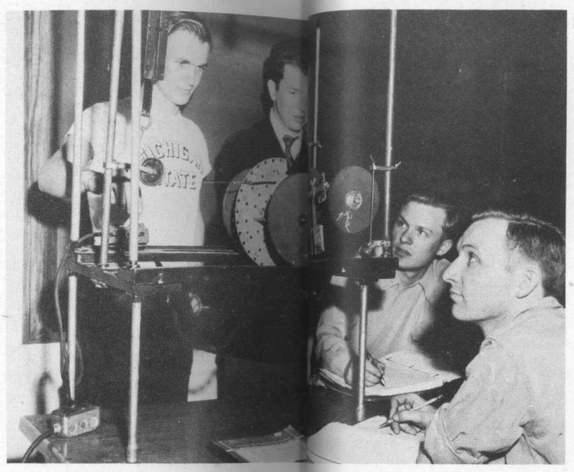
Testing Belt H.P. and Fuel Consumption with the Dynamometer and Rotometer.



Prof. DeKoning's Torsion Impact Testing Machine

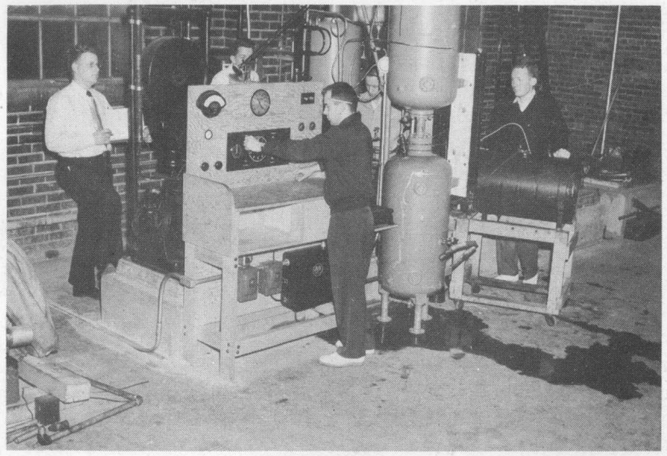


Views of the New TV Studio and Control Room

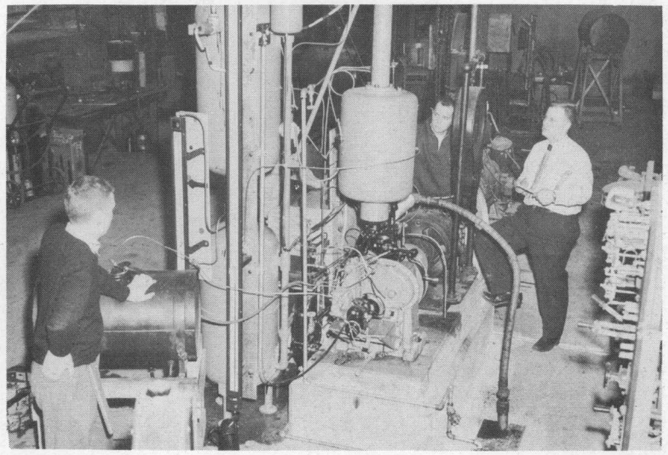


Tractor Stat Testing

The New Hy c Torsion Testing Me



Front and Rear View of Recently Acquired Fuel Testing Engine



NEW DEVELOPMENTS

Continued from Page 15

Electric impulses tripped off by the combinations of perforations in the tape, record, by magnetic means, the numbers and instructions in the machine's memory.

If the problem is very complex, the machine will operate -- entirely automatically -- before producing the final result.

QUARTZ FIBERS

Quartz fibers, 1/50th the thickness of a human hair, are being produced for use in sensitive balances and various measuring instruments. Some of the fibers produced are so fine that more than ten miles of them could be wound on an ordinary-size spool that holds 250 yards of cotton thread.

The fibers are drawn from rods of quartz that have been heated to very high temperatures. The threads are drawn from the molten ends of the rod and are attached to a revolving wheel, which winds the fiber in a continuous strand.

Quartz fibers that are produced in the laboratories are used in making sensitive balances for use in microchemistry. These micro-balances are sensitive enough to show weight differences less than 1/30,000,000th of an ounce, yet strong enough to hold weights 1,000,000 times greater. The fibers are ideal for use in measuring instruments, because they are not affected by temperatures changes and do not lose elasticity even when under continued strain.

Making the parts for balances and electrometers, requires skill comparable to that of a watchmaker. One part, in which a fingernail-size mirror is suspended by a delicate quartz fiber between two supports, is made entirely of a single piece of quartz.

LUBRICATED CARBON BRUSHES

Through the use of new, chemical treated carbon brushes jet planes are now able to fly for greater periods without having major overhauls.

The brushes are the small blocks of carbon that take the electricity from the commutator of the generators and supplies the different parts of the plane with power. In the extremely dry air of the high altitudes, these brushes must create their own lubrication or they will be ground away.

The problem of lubrication has been overcome by impregnating the brushes with a special chemical compound belonging to the same family as table salt. As the brushes press against the revolving commutator, the new ingredient promotes the formation of a lubricating film that reduces the friction at the highest attainable altitudes.

Despite its strength, the film is so thin that two thousand layers of it would barely equal the thickness of this sheet of paper.

The problem of finding a satisfactory method was not an easy one as the temperatures created on the face of the brushes during the starting phase of jet engines, using starter-generators may run as high as 1000 degrees Fahrenheit. This may evaporate the chemical treatment in the carbon brush, so that when the plane reaches the higher altitudes, the brush cannot produce the necessary lubricating film.

The new chemical treatment can stand up under both excessive heat and sub-zero temperatures of the higher altitudes.

RADIATION MONITOR

A new development in radiation detection, is the radiation monitor which permits direct radiation readings at a glance.

The monitor weighs less than a pound and is about the size of a quart can. It is equipped with a self-contained power source and has neither tubes or batteries.

Radiation measurements are read from the monitor simply by taking the position of a pointer as it moves across a graded scale. The speed at which it moves across the scale is in proportion to the strength of radiation, and the distance it moves in a given time indicates the amount of radiation to which the instrument has been exposed during that time.

The monitor is for use by engineers, scientists, doctors, and technicians who are working with or near sources of radiation. With a continuously visible indicator, it will give warning of a radiation hazard in the area while there is still time to avoid excessive exposure.

ENGINEERING DRAWING

Continued from Page 13

by provision of greater time allotment instead of reducing it when the need for thoroughly trained young engineers is greater than ever to meet the all-out demand of war-time production.

5. If it is desirable to add more advanced technology courses to the present engineering curricula, it would seem feasible to do so at the graduate level in a fifth year where such training would be more effective because of the maturity and special interests and abilities of the students. Students having special talent for design and experimental engineering work should be encouraged to continue in the graduate school. This procedure would result in the up-building of the graduate school by providing a corps of students with capacity for further development at less expense than would be possible in the undergraduate school. There is a definite need for graduate students to work on a cooperative basis with industry in the solution of special research or experimental problems in design development.

This procedure would appear desirable in solving the need for more specialized technology courses and would permit the retention of an adequate time allotment for the teaching of basic engineering drawing courses.

6. Engineering students should remember that opportunity exists for specialized training in the school of practical experience in industry -- provided they do not have the inclination, the time, or money to spend in continuing a fifth year in college. Engineering graduates should not be adverse to working in industrial drafting rooms as a part of their initial training for supervisory positions in industrial organizations. Work as a detailer and layout man thoroughly familiaries the engineering trainee with the company products, their design, and the processing methods used in their manufacture. This experience is an essential part of the training of engineering graduates to develop their judgment and capacity to supervise the work of others. Many industrial employers encourage or require this type of training for all types of students, as it is considered basic in the training of design, experimental, process, and technical sales engineers. The value of design and process engineers with inventive and creative imagination to improve present methods and products or to develop new ones is being recognized today more than ever before.

7. Engineering educators should not lose sight of the fact that industry provides the opportunity for further specialization by engineering graduates. Many industries are better equipped with special facilities and have more financial support for conducting experimental or research projects than most engineering schools.

Many industrial representatives say, "Give us engineering graduates thoroughly trained in engineering fundamentals in any major field of engineering and industrial employers will provide the specialized training to meet the specific job requirements at any level of engineering achievement."

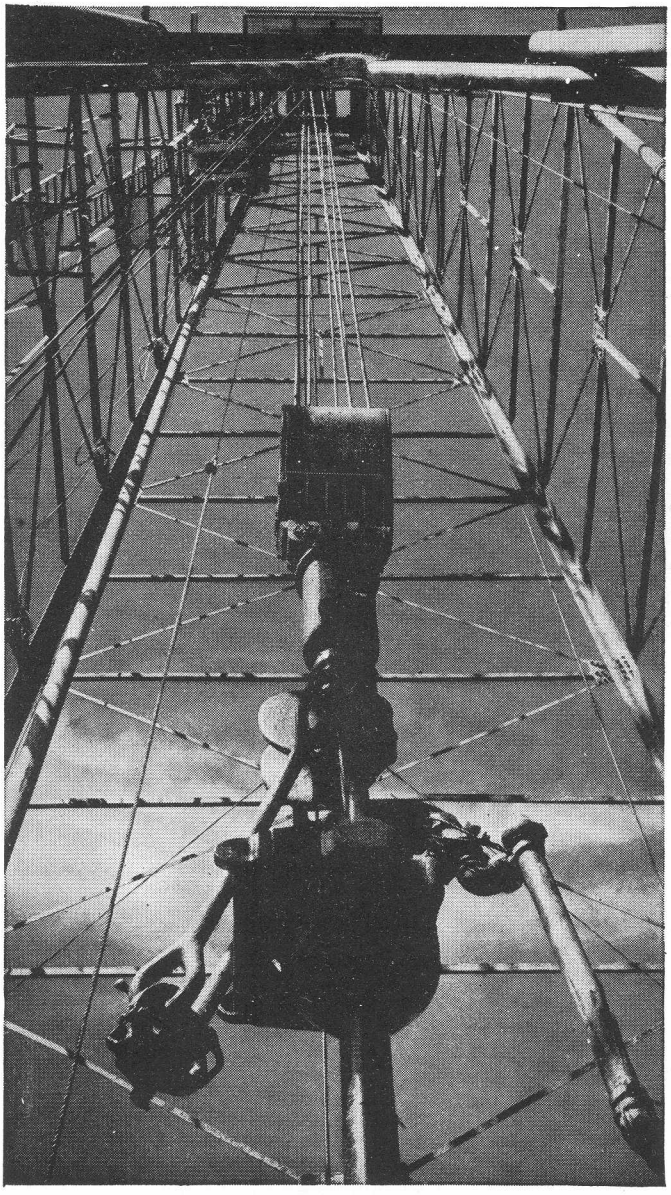
SUMMARY

The following recommendations are submitted as a result which we feel are essential to determine the place of Engineering Drawing in the engineering curricula.

1. Some engineering schools have already established a "Dept. of Basic Engineering Drawing and Related Subjects" - such as Pattern Making, Foundry, Machine Shop, Forge Shop, Sheet-Metal Shop, Auto-Mechanics Shop, Electrical Shop, Field Surveying, Strength of Materials, Mechanics and Hydraulics, and Introduction to the Engineering Profession (Freshman Seminar). This work is given over a two year period, regardless of whether the school operates on the semester or term basis. This is a practical two year terminal course, with provision for a graduation certificate, provided the student wants to become an engineering technician, and does not want to spend four years for an engineering degree. Full credit is allowed toward the four year degree if the student should decide later to continue his education to obtain a B.S. degree in any major field of engineering, such as Civil, Mechanical, Electrical, Chemical, etc.

Continued on Page 28

WIRE ROPE



Roebling Preformed has longer service life... works better on the job

FOR EVERY make and type of rope-rigged equipment, Roebling Preformed "Blue Center" Steel Wire Rope provides extra handling ease... extra toughness and long life. "Blue Center" steel, an exclusive Roebling development, assures top resistance to fatigue. Roebling Preformed rope spools better... minimizes vibration, whipping and kinking.

There's a proper Roebling wire rope for every requirement. The Roebling Field Man is always ready to recommend the best rope for economical performance on any operation. In addition, his suggestions on the proper installation, use and maintenance of wire rope often bring further substantial savings. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

Atlanta, 934 Avon Ave ★ ***Boston,*** 51 Sleeper St ★ ***Chicago,*** 5525 W. Roosevelt Rd ★ ***Cincinnati,*** 3253 Fredonia Ave ★ ***Cleveland,*** 701 St. Clair Ave, N.E. ★ ***Denver,*** 4801 Jackson St ★ ***Houston,*** 6216 Navigation Blvd ★ ***Los Angeles,*** 216 S. Alameda St ★ ***New York,*** 19 Rector St ★ ***Odessa, Texas,*** 1920 E. 2nd St ★ ***Philadelphia,*** 230 Vine St ★ ***San Francisco,*** 1740 17th St ★ ***Seattle,*** 900 1st Ave, S. ★ ***Tulsa,*** 321 N. Cheyenne St

AUTOMATIC TRANSMISSIONS

Continued from Page 11

braking power in the "Powerglide" unit.

The Studebaker automatic transmission is a hydraulic torque converter combined with a 3-speed-and-reverse planetary transmission. At speeds between 18 and 58 mph, the transmission automatically shifts to direct drive. Direct, eliminates the hydraulic torque converter, thereby reducing power losses. The converter is used primarily for starting and full-power acceleration. The Studebaker torque converter is of the three-element type, which may be less efficient than the five-element type used by Chevrolet and Buick. The use of the direct drive clutch makes converter efficiency of less importance. An outstanding feature of the new Studebaker transmission is that by trapping oil under pressure in rear brake lines the usual "creep" of most automatic transmissions is elimimated. Another feature is that while the transmission is in drive range with the motor running the car may be left on slight upgrades without any application of brakes. This is due to a "no roll back" feature of Studebaker.

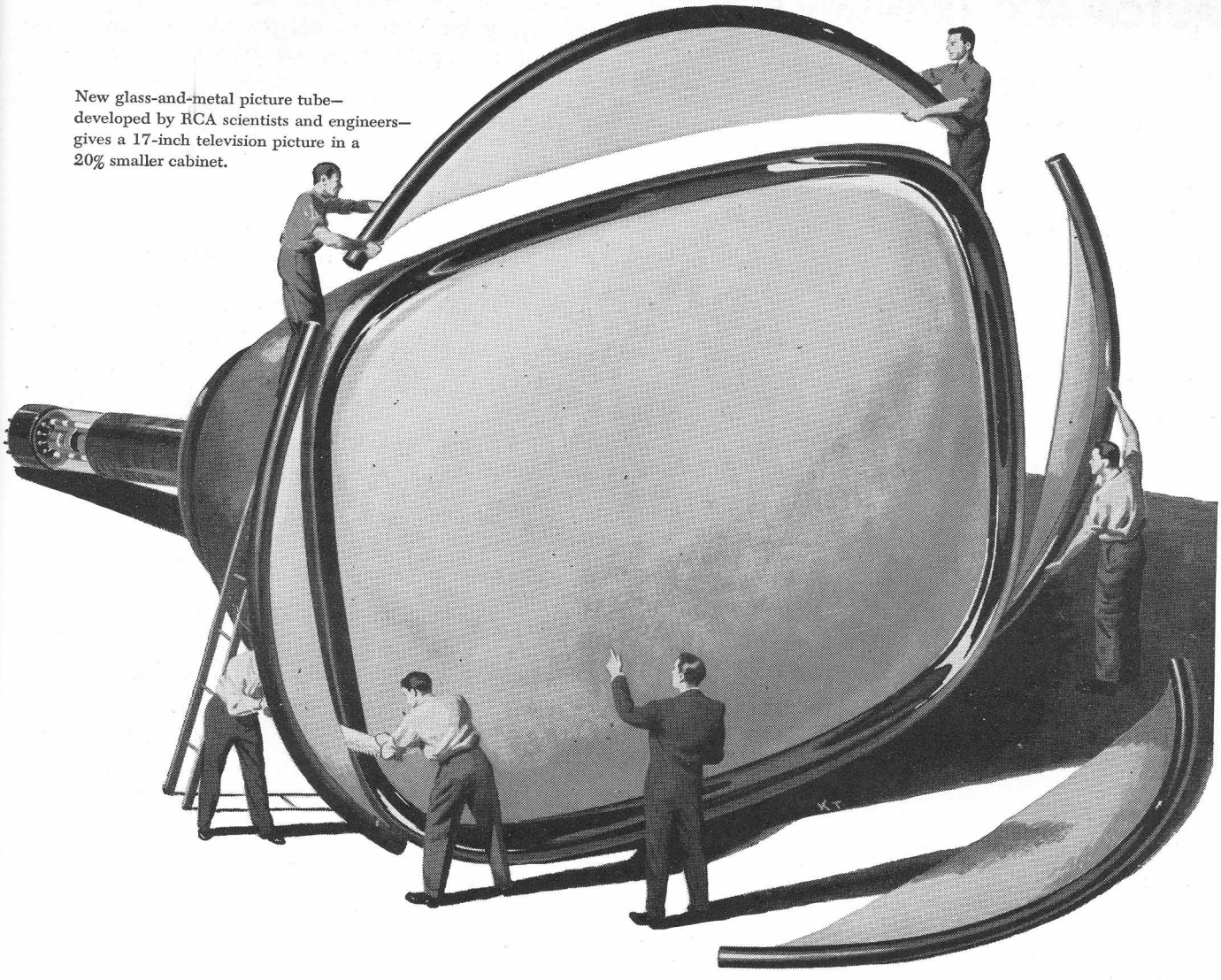
The Packard "Ultramatic" is one of the more complex units. The transmission is composed of a torque converter, planetary gear set and direct-drive clutch mechanism. As in other automatic transmissions the "Ultramatic" equipped car has no clutch pedal. The "Ultramatic" unit locks out the torque converter between 15 and 55 mph, and the car is left in direct mechanical drive. For sudden acceleration the accelerator is depressed, and the torque converter kicks in.

The Chrysler Corporation offers a semi-automatic transmission for its Chrysler, DeSoto, and Dodge cars. The cars are equipped with a manual gearshift and a clutch pedal. They are automatic in that they automatically downshift at a predetermined speed and automatically upshift when the car is accelerated above a predetermined speed. This transmission employs a fluid coupling and a synchromesh gear set with four forward speeds and reverse.

The last of the "Big Three" to come out with a automatic transmission is Ford. The New transmission can be bought as optional equipment for the '51 Ford and Mercury. The unit consists of a hydraulic torque converter combined with a fully automatic transmission. The transmission has a torque converter that is gear assisted some of the way. In this unit, as in Buick and Chevrolet the converter is always in the power train whether it is multiplying torque or merely acting as a fluid coupling.

There can be no doubt about it, automatic and semi-automatic shifting are here to stay. In the next few years new transmissions will come out that will make the most advanced units now present seem crude.

I would like to thank the following persons for their help in preparing this article: P. M. Heldt for his permission to use material from his "Torque Converters or Transmissions"; D. W. Baldwin, Lincoln-Mercury; Tri-Tower Fact Service.



New glass-and-metal picture tube—developed by RCA scientists and engineers—gives a 17-inch television picture in a 20% smaller cabinet.

Now—television "squares away" with a **Bigger Picture**—*smaller tube!*

Ideal for mass production, compact, and lower in cost, RCA's glass-and-metal picture tube was a major advance in television history.

Now comes still another important RCA engineering advance, *rectangular* glass-and-metal kinescopes. Engineered for the big 17-inch pictures you want in a receiver that takes up *less* cabinet space—as much as 20% less—the new kinescope gives you finer pictures than ever before . . . in sharp and brilliant focus over every inch of your screen. And, as yet another step ahead, RCA's new picture tube offers an improved type of Filterglass faceplate—frosted Filterglass—developed on principles first investigated by scientists of RCA Laboratories, to cut reflection, and give you sharper picture contrast.

* * *

See the latest advances in radio, television, and electronics at RCA Exhibition Hall, 36 West 49th Street, N. Y. Admission is free. Radio Corporation of America, RCA Building, Radio City, New York 20.

Continue your education with pay—at RCA

Graduate Electrical Engineers: RCA Victor—one of the world's foremost manufacturers of radio and electronic products—offers you opportunity to gain valuable, well-rounded training and experience at a good salary with opportunities for advancement. Here are only five of the many projects which offer unusual promise:

- Development and design of radio receivers (including broadcast, short wave and FM circuits, television, and phonograph combinations).
- Advanced development and design of AM and FM broadcast transmitters, R-F induction heating, mobile communications equipment, relay systems.
- Design of component parts such as coils, loudspeakers, capacitors.
- Development and design of new recording and producing methods.
- Design of receiving, power, cathode ray, gas and photo tubes.

Write today to College Relations Division, RCA Victor, Camden, New Jersey. **Also many opportunities for Mechanical and Chemical Engineers and Physicists.**

RADIO CORPORATION of AMERICA

World Leader in Radio — First in Television

ENGINEERING DRAWING

Continued from Page 24

A general service department organized on this basis seems highly desirable as it would provide greater opportunity for teachers in such a department to gain a greater variety of teaching experience and at the same time permit as much or more time for efficient teaching of basic engineering drawing courses that is possible in the present M.S.C. Department of Engineering Drawing. Such a department would take care of the special interests of the many students from schools or divisions other than Engineering desirous of such training.

2. Further, it appears that the place of Engineering Drawing in the engineering school curricula is a problem for further study by a curricula committee composed of representatives from industry and the engineering faculty in any particular college, with the results of their work submitted to the A.S.E.E. national accrediting agency for final approval. The work of such a committee will involve careful evaluation of the present offerings, instructional facilities, time available, and the cost involved - measured in terms of the value of the training for engineering students and to the engineering profession and society in general.

3. Finally, we recommend that this study be presented to Dr. R. J. Jeffries, Engineering School Representative on the All-College Research Council for consideration by that group, which is presently engaged in all-college curriculum revision at M.S.C.

ALUMNI NEWS

Continued from Page 14

Donald Morfee, '48, is in a district contracting office of the American Bridge Co. in Boston, Mass.

Hajime Ota, '48, is with the U. S. Department of Agriculture in Washington, D. C. His work deals with the heat and moisture measurement of domestic fowl to improve specifications for farm poultry houses.

Continued on Page 30

How to open a can of fog

The pilot pushes a button on the instrument panel.

And instantly, from metal tanks fixed to a warplane's fuselage, thick streams of artificial fog pour forth.

Today it is possible for a fast plane to obscure an Army division or a Navy squadron in a matter of seconds. For scientists and engineers at Corning Glass Works, working with the Armed Forces, have developed a new way to open a can of fog.

A specially engineered disc of one of the tough Corning glasses is used to form the end of the metal fog chamber. In the center of this glass disc, which is sealed to the metal can, is a percussion cap—connected electrically with the plane's instrument panel.

When the pilot pushes the button, the percussion cap is detonated, breaking the glass disc and opening the end of the cylinder.

Since the containers have to be stored at depots scattered from the tropics to the polar regions, the discs are made of heat- and cold-resistant glass which sudden temperature changes won't break. The glass has to be strong to prevent releasing the fog-making ingredients prematurely.

And the discs are made so that they will break evenly and completely from the force of the exploding percussion cap.

The design for this strong, heat-resistant glass disc that will break in a predetermined way is only one of the more than 37,000 designs for glass products developed by Corning engineers in a full century of glass-making.

Today, throughout industry — *Corning means research in glass*, research concerned with making glass do countless jobs never thought possible before.

Glass, as made by Corning, is a material of limitless uses. That's a good thing to remember when you're out of college and concerned with new products and processes or improvements in old ones.

Then, if you think glass can help, we hope you'll write us before your planning reaches the blueprint stage. *Corning Glass Works, Corning, New York.*

CORNING
means research in glass

1851—100 YEARS OF MAKING GLASS BETTER AND MORE USEFUL—1951

ALUMNI NEWS

Continued from Page 28

Russel A. Morrison, '23, has accepted a position with the Cleveland Frog and Crossing Co. in Cleveland, Ohio.

Fred Burris, '24, has accepted the job as engineer of maintenance-of-way for the Chesapeake and Ohio in Detroit.

Carl Billings, '48, is leaving Milwaukee to work for a construction company at Anchorage Alaska.

Nick Colas, '47, has been with a sugar refining company in Venezuela and is working as a factory representative in South America for several American companies. His headquarters are in Havana, Cuba.

James Hubbert, '40, is now located in Muskegon at Campbell, Wyant and Cannon Foundry.

Mr. and Mrs. Bill Hanel now living at 261 Oakland Drive, Lansing, have announced the recent arrival of their second daughter, Susan.

Cornelius C. D. Beukema, '43, just moved into his new home 3202 Alden Drive, Lansing 15. He works for the State Highway Department.

Jack Fleming, '33, is with the New Departure division of General Motors, Detroit.

George Kosky, '51, (winter) is with the Saginaw Malleable Iron Plant of General Motors Corp., Saginaw, Mich.

Arlie R. Kinnee, '51, is with the Conservation Department, Fish Division of the State of Michigan.

Robert Hinoger, '51, is with General Motors Corporation in Detroit.

Continued on Page 39

EVER HOLD HANDS LIKE THESE?

They're not soft and warm, these hands. They're hard and cold — and mechanical. They work at the Oak Ridge atomic energy plant, preparing radioactive isotopes for shipment to Bell Telephone Laboratories and to other research centers.

These isotopes — which serve as tracers — are used by Bell scientists to study the materials that go into the telephone system. Our research men, working with Geiger counters, are able to detect wear in relay contacts, impurities in metals, the penetration of preservatives in wood.

This new research tool helps us to learn more in less time, helps us to make telephone equipment even more rugged and dependable. That's especially important right now when the Nation relies on the telephone to help get things done.

BELL TELEPHONE SYSTEM

The Most Important Job in the World

by O. V. TALLY, *Manager, Midwest Region,*
General Machinery Division, ALLIS-CHALMERS MANUFACTURING COMPANY
(Graduate Training Course, 1927)

O. V. TALLY

YOUR FIRST JOB is the most important job in the world. Picking that first job carefully can mean the difference between a running start in a really satisfying life work and merely working for a living. You must have been giving this problem a lot of thought as you look toward the end of your scholastic career. I had exactly the same problem while I was working for my E. E. at North Carolina State in 1925.

I happen to think that the man who applies his company's product in the field is the most important man in the American business system. Not only does he help create the demand that keeps our factories working, he is also the force behind many of the great improvements in products and processes which have been made. He must know and understand the customer's problems and the factory's facilities, then bring the two together to produce better goods at lower cost.

I knew I wanted this kind of work. Most of all, I wanted to be free to try several fields of work; to find out where my talents lay; to see where my individual effort would bring the greatest satisfaction.

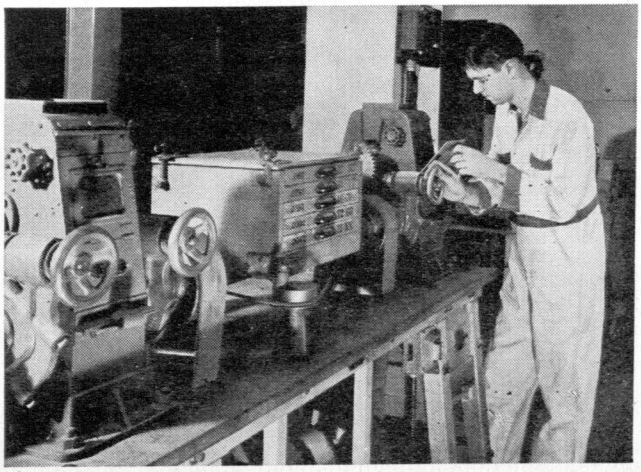
Allis-Chalmers Serves All Industry

I chose the Allis-Chalmers Graduate Training Course because Allis-Chalmers has a hand in solving the problems of every basic industry . . . food, steel, mining, aluminum, electric utilities, public works, chemicals, and many others. Here I saw my chance to find out which I wanted to work in.

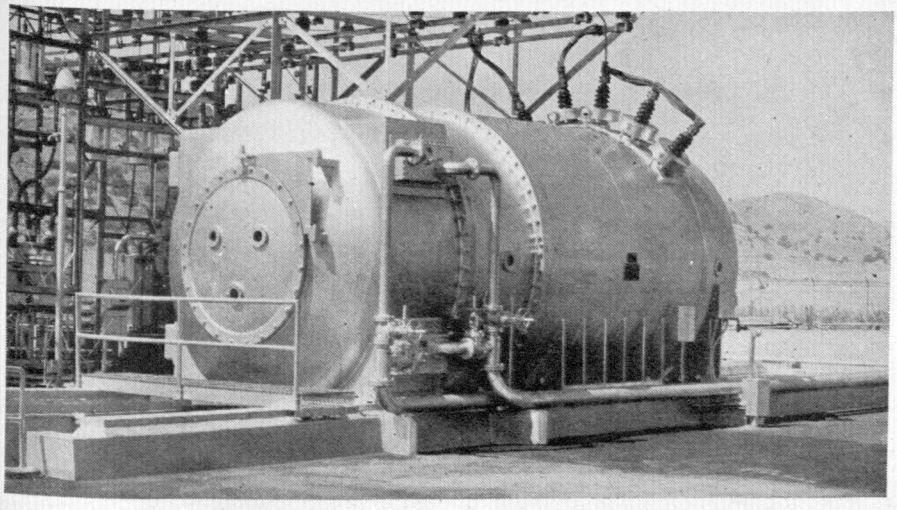
Taking the course in many different departments, I learned as much as I could about as many products and industries as I could. Then I began application engineering in the New York District Office. Since then, I have been in Washington, Philadelphia, St. Louis and Chicago. As it turned out, I didn't specialize in any industry, but worked on applications for all kinds of goods to many industries. And I found the work that has made me happy.

Find Your Spot

Of course, not everyone wants to be a field application engineer. The Allis-Chalmers Graduate Training Course offers you an opportunity to find out which branch of industry you will be happiest in and which job in that industry you can do best. You choose your own courses and may alter them whenever you like. You choose among electric power generation, distribution and utilization equipment; motors, pumps, blowers; basic industry equipment for processing cement and rock products, ores, wood, chemicals, food; and many other types of equipment. You can get actual practice in design, manufacturing, sales, research, administration, service and erection before choosing which one to follow. And many Allis-Chalmers customers have openings for training course graduates.



In Basic Industries laboratory scaled-down equipment is used to investigate processes and make pilot runs. Lab includes complete food, ore, wood, rock products pilot plants.

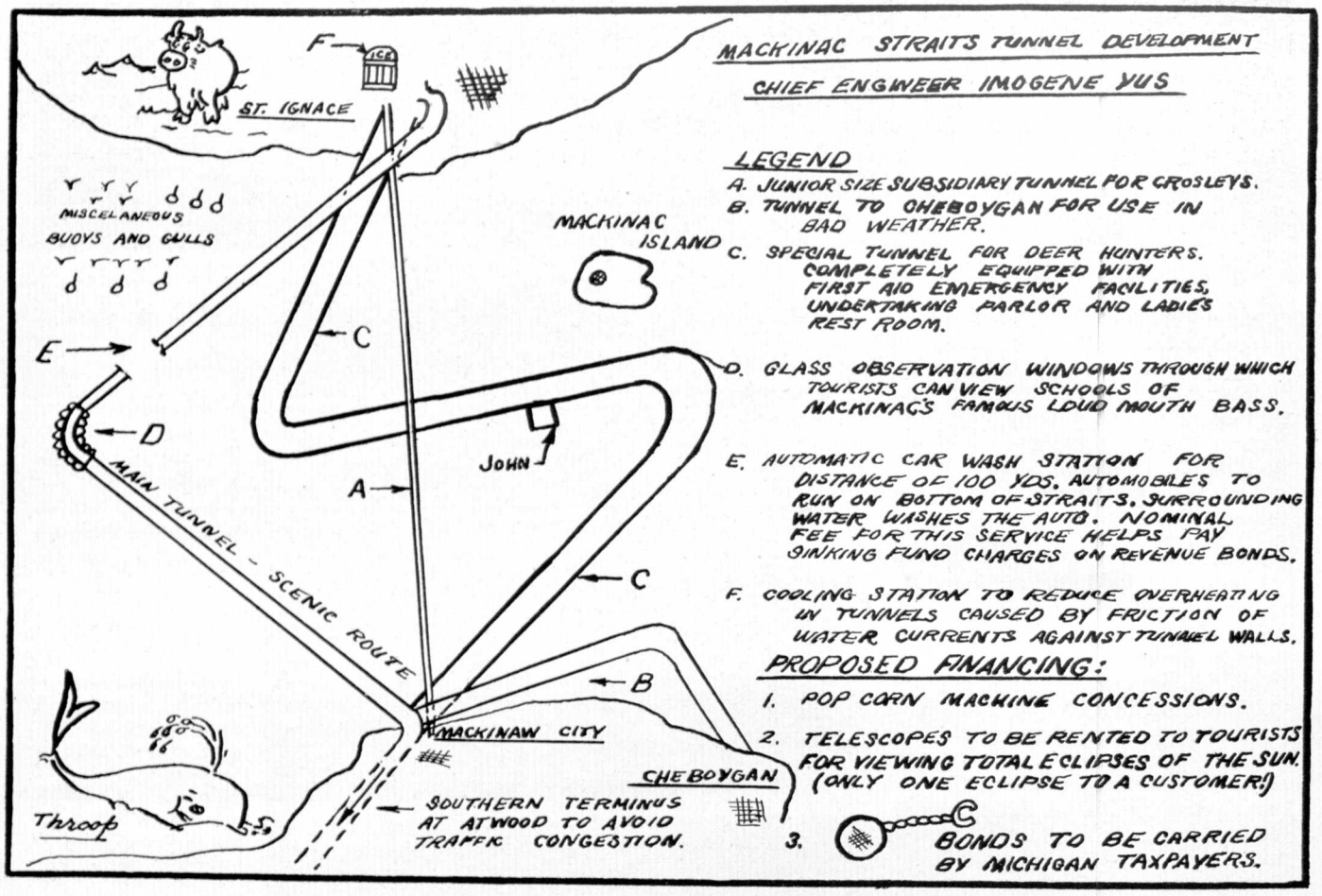


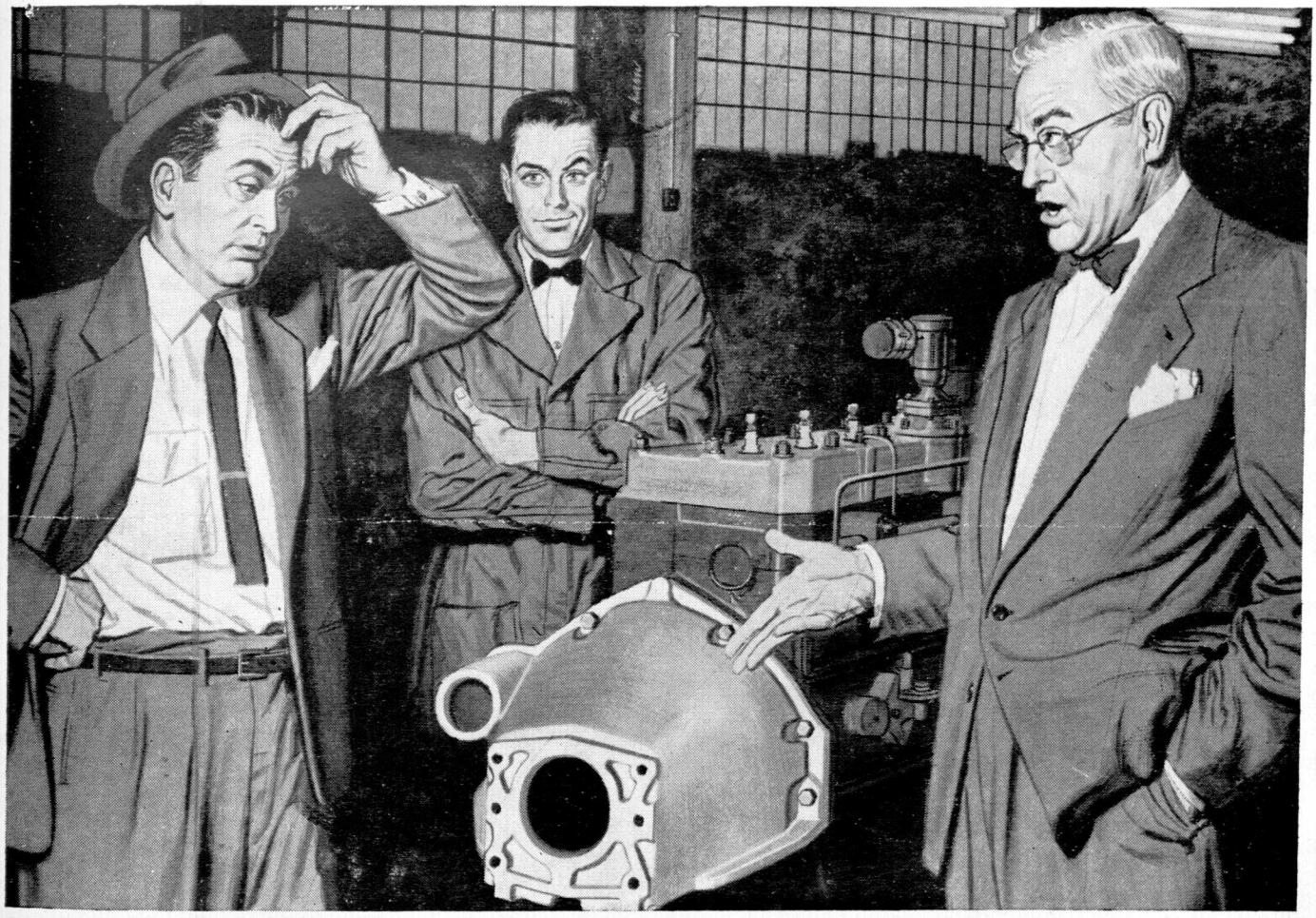
Large Allis-Chalmers synchronous condenser corrects power factor on giant Southern California Edison Company distribution system.

As I've said, I believe the most important job in the world to you is your job after graduation. Choose the job that gives you the greatest opportunity for advancement through your own effort. If you want to talk to someone about the opportunities at Allis-Chalmers, visit your nearest Allis-Chalmers Sales Office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for details.

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin





Why can't this be an ALUMINUM DIE CASTING?

This challenge was thrown at us by a leading automobile maker.

"It's possible," we agreed. But . . . the clutch housing also supports half the engine's weight, it is highly stressed, must absorb vibration. Could a die casting economically be made that strong?

An Alcoa Development Program was started. With the auto maker we drew up designs. We selected our strongest die casting alloy; poured *sand castings* from it; machined it to the dimensions of the die casting design.

Shear static loads and bending stresses were measured. Brittle lacquer and strain gauges show us stress concentrations. Castings, engine and transmission were assembled, then run with an unbalanced shaft to measure dynamic stresses.

With the auto maker we modified designs. Die castings were made. We repeated the laboratory tests while the auto maker made road tests. The first stressed automotive die casting was a success. 25% stronger in shear, 10% stronger in bending, 100% better in fatigue life than the original clutch housing. Only ¼ as much weight as the original cast-iron housing. *And 15% lower in cost.*

This case is typical of the engineering problems Alcoa men undertake and solve. Throughout the Alcoa organization similar challenging jobs are in progress now and others are waiting for the men with the imagineering ability to tackle them.

ALUMINUM COMPANY OF AMERICA, Gulf Bldg., Pittsburgh 19, Pennsylvania.

A business built on co-operation

ALCOA®

ALCOA

ALUMINUM COMPANY OF AMERICA

TECHNICAL WRITING

Continued from Page 17

for someone who knows what words to use and how to put them together.

Anyone Can Learn Technical Writing

Granting, then, that some knowledge of how to write is of real value to the engineer, the question is what can be done to develop it. The people who say that writing ability is a special gift from heaven take a too gloomy view of the situation. Some special gift may be needed to become a Shakespeare or a Mark Twain, but none is required for engineers' reports, papers for engineering societies and articles for technical magazines. Any informed person can write them acceptably if he learns the proper procedure and follows it.

Whether or not our engineering schools should devote more time to instruction in technical writing is a subject too complex for discussion here. Much could be said in favor of it. At the same time there are some very real difficulties in the way. In any event there are thousands of young engineers already graduated who could benefit by a serious attempt to develop their writing ability. So let us consider what can be done independently of the college curriculum.

Contrary to a prevalent idea, the development of technical writing ability is not a difficult matter. Experienced editors and publishers can cite instances by the hundreds where young men without any unusual gifts have become good technical writers by applying themselves conscientiously to the job. If they have done this, others can do it.

Learning the proper procedure and acquiring facility at it are a good deal like learning to play golf. You can buy a book or take a correspondence course on the subject. We have all seen advertisements of these kinds of instruction. No doubt you can learn something that way, but it's hard to work up much enthusiasm through such impersonal exercise. You can take personal lessons from a professional. That is more fun, but involves following a rather rigid schedule which is not always convenient. Or you can learn casually by getting a

little advice here or there, and practicing by yourself. That easy procedure for acquiring writing ability will serve very satisfactorily to meet the needs of the average engineer. It doesn't take much effort -- but it does take some. Doing what comes naturally is not quite enough to accomplish the purpose.

Probably the most important step in the development of technical writing ability is to cultivate the habit of putting yourself in the position of the reader of what you write. Try to build up a picture of that reader -- who he is, what his interests are, what he already knows about the subject you intend to discuss, and what more he wants to know. Then, as you write, ask yourself what questions will arise in the mind of the reader and whether you are answering them. When you can honestly say that you have visualized the reader, have put yourself in his place, and replied to all the reasonable questions you think he will want answered, you will have assembled the basic material for a good paper or technical article.

Two Ways of Organizing Material

The next step is to organize the material. Some authors like to prepare a comprehensive organization plan before starting to write. Others find it easier to put down on paper all that they have to say and then shuffle the elements around into the most logical order. For most purposes the latter method is somewhat easier. The biggest hurdle in writing a technical article is getting down on paper, and it's not a bad idea to get over the biggest hurdle right at the start.

Writing without a detailed plan leads to a job of rearrangement after the writer has made up his mind what his plan ought to be. But you can hardly avoid rearrangement no matter how you tackle the problem, unless you have had a great deal of experience. Any comprehensive plan drawn up in advance of writing is likely to prove unsatisfactory as the job progresses and to require modification later. So rearrangement is inevitable at some point in the proceedings, and there are many advantages in direct action -- getting essentials down on paper first.

From then on the job is one of polishing. That sounds easier than it really is. Polishing is just as important

in writing a technical article as it is in making a roller bearing. A smooth finish is essential for the frictionless functioning of the machinery. You don't want creaking of the machinery in a manufacturing process or in a technical discussion.

On the other hand, you don't need to carry the polishing process to a silly extreme. A split infinitive, or a preposition at the end of a sentence, is not necessarily the awful sin the purists would have us believe. When a critic of this kind attempted to Correct Winston Churchill for using a preposition at the end of a sentence, the latter scribbled boldly over the suggested change. "This is nonsense up with which I will not put!"

Extensive Vocabulary Not Required

In a written paper the first thing to be polished is the wording. An extremely extensive vocabulary is not needed, but the author must be sure he knows the exact meaning of all the words he uses. The need for that is so obvious as to deserve no mention. Actually a good many authors use words that do not mean quite what they intend to say. Take for example the word "unique." This has the very simple meaning of having no counterpart, yet many writers use it as though it had no more significance than "unusual." Misuse of a single word may not confuse the reader seriously, but the greater the number of words that are carelessly used, the more hazy is the general impression created in the mind of the reader.

Of importance equal to that of the author's understanding of the meaning of his words is the readers' understanding. This is something that engineers are prone to neglect. The trouble is not so much their use of obscure words, though there is some tendency in that direction, but in the use of an ordinary word in some specialized sense. Thus an automotive engineer, when he speaks of a "job," means a vehicle, while the electrical engineer takes the word to mean the performance of a certain amount of work. On the other hand, the electrical engineer says "jack" when he means a receptacle with connections to electric circuits, while the automotive engineer thinks of it as a device for lifting a heavy weight.

This kind of confusion is avoided if the author keeps always in mind the character of the reader. Then he can determine in advance whether or not the reader will correctly grasp the specialized meaning of the word he intends to use. If there is any doubt about it, the author had better substitute another word. It is a good plan to be on the safe side and to avoid specialized meanings, wherever possible. There is almost always a way to say what you want in perfectly plain words whose meaning no one can misunderstand.

Short Words and Short Sentences Are Best

Plain words--and short words--make the best reading anyway. It has been pointed out in a recent government pamphlet based on studies by Dr. Rudolph Flesch at the Readability Laboratory of Columbia University that a simple rule-of-thumb way to measure the simplicity of any piece of writing is to count the total number of syllables per 100 words. If the number of syllables runs much over 150 per 100 words, there is opportunity to improve the writing by using shorter words.

Perhaps you think that rule may be all right when you are writing for children, but that it won't work for grown-ups. Try it and see. For example, count the number of syllables in the first 100 words of this article, which was written without any conscious effort to economize syllables, and you will find the total is 159. Or, count the syllables in one of your own business letters. You will find, unless you are particularly prone to use long words, that your natural style averages only about three syllables to two words. The trouble is that natural style is too often thrown overboard in technical writing, and in its place miraculously appears an unnatural, ponderous style that discourages the reader.

Another handy rule-of-thumb proposed by Dr. Flesch is to limit the average number of words per sentence about seventeen. This is no magic in that particular number. It just happens to be a good average for easy reading. Sixteen or eighteen would be perfectly acceptable. But if the average should drop to ten, the writing would seem choppy, and if it should rise to twenty-five, the reader would have to work

appreciably harder to get the meaning. Short sentences also make the author's job easier by simplifying the punctuation problem. You aren't likely to get into any serious punctuation difficulties when you have only seventeen words to handle.

Revise and Re-Revise

Most important of all the things to be done in the polishing process is to revise, and revise, and re-revise. Sometimes an engineer feels that it is a confession of inexperience to revise a piece of technical writing. That is a mistaken idea. Actually, the reverse is true. Scarcely anyone can write a thing the best way at the first attempt. A second attempt is almost sure to produce a better piece of writing, and a third attempt, a still better piece. Willingness to revise, far from indicating a lack of experience, shows that the writer is approaching his task in a spirit of craftsmanship, and that he realizes that a first-class result comes only from persistent effort.

Along with willingness to revise should go a willingness to take suggestions from others. Here a middle-of-the-road policy is best. The author who seeks advice from a multitude of counselors is likely to end in a maze of conflicting opinions. On the other hand, the most experienced authors often find suggestions extremely useful. Certainly, therefore, an author of limited experience should not feel himself above taking suggestions.

Simple Rules for Technical Writing

In brief, therefore, the secret of success in technical writing is short words and short sentences presenting the author's thoughts in clear, logical order -- plus painstaking revision. Much more might be added about introductions, conclusions, illustrations and other details, but those are matters that can be considered after the fundamentals have been acquired.

Writing for general magazines and newspapers, because of the different type of readers to whom it is addressed, requires techniques different from those needed for engineering papers and articles. Consideration of ways to acquire these techniques is beyond the scope of the present discussion. They are not likely to be of primary concern to the average engineer, anyway. But the technique of good technical writing should be of concern to him, and fortunately it is one that can be easily acquired.

ALUMNI NEWS

Continued from Page 30

Edwin Crosby, '48, is doing graduate work in chemical engineering at the University of Wisconsin at Madison.

Henry T. Darlington, '49, is a tire research engineer for the U. S. Rubber Co. in Detroit.

J. Stuart Falls, '49, is a metallurgist for the Aluminum Company of America in Detroit.

Leroy R. Genaw, '49, is an engineer for Electric Auto-lite in Hazelton, Pa.

Robert Gunderson, '49, is a civil engineer for the Department of Public Works in Flint.

Howard Keskitalo, '49, is a research engineer for the Creamery Package Manufacturing Co. in Fort Atkinson, Wisconsin.

Melvin H. Nuechterlein, '49, after training in power electricity, he is now with the Public Service Electric and Gas Company of Newark, New Jersey.

Carlton Ogger, '49, is a metallurgy trainee at Buick in Flint.

Harold Robinson, '49, is a sales engineer for the Westinghouse Air Brake Co. in Chattanooga, Tennessee.

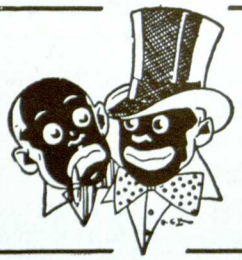
John Herzog, '50, is in the overseas training program of the National Carbon Division Union, Carbide and Carbon Corp. of Cleveland, Ohio.

Leonard Klein, '50, is now in charge of the Northern Illinois territory for the Armco Co.

Clerk: "Please, sir, I'd like next week off if it's convenient?"

Boss: "Oh, you would, eh? What's up?"

Clerk: "Well, my girl's going on her honeymoon, and I'd kinda like to go along with her."



SIDE TRACKED

Protect the birds. The dove brings peace and the stork brings tax exemptions.

She tenderly whispered: "Am I the first girl you ever kissed?"
The engineering reply was: "As a matter of tact, yes."

There was the worm who met another worm coming up out of the ground and said, "You're pretty, I'd like to marry you."
Whereupon the other worm replied, "Don't be silly, I'm your other end."

Skidding is the action
When the friction is a fraction
Of the vertical reaction
That does not result in traction.

Absent Minded Professor: "Give me some prepared monaceticacidester of salycylic acid."
Druggist: "Do you mean aspirin?"
Professor: "That's right! I can never think of that name."

The barkeep of a downtown tavern kept a pet parrot. One evening a drunk spotted it, climbed atop a stool, and tried to catch hold of it.
"Scram, landlubber!" Cried the pol. "What's the big idea?"
The drunk looked surprised, tipped his hat, and mumbled, "Golly, I'm sorry mister, I thought you was a boid!"

One of the latest styles is Robert sox—they're a little longer than bobby sox.

"Jiminy, Seth," screamed a hillbilly bride to her husband. "Yer beard is caught fire."
"I know it, I know it," he answered, "Cain't you see me prayin' for rain?"

Old fashioned girls preserved fruit. Modern ones can their husbands.

A city and a chorus girl
Are much alike 'tis true;
A city's built with outskirts,
A chorus girl is too.

"Hey," cried Satan to a new arrival, "you act as if you owned this place!"
"I do," came the reply. "My wife gave it to me before I came."

After his fourteenth highball, Jackson staggered out of Clancy's bar, and crashed head-on into the corner lamppost. Rubbing his forehead sadly he then tripped over the fire hydrant. Reeling across the sidewalk, he somersaulted down a flight of basement steps and landed in a heap at the bottom. "T'hell with it," he said. "I might as well stay here till the parade passes."

Do you know Art?
Art who?
Artesian.
Oh yes, I know Artesian well.

A stranger looking for Western Michigan College, took the wrong turn and ended up in an insane asylum.
As the guard re-directed him, the stranger quipped: "Well, I guess there isn't too much difference between the two places after all."
"That's what you think," said the guard. "Here you have to show improvement to get out."

The doctor told his pretty, young patient she had acute appendicitis.
"Don't get fresh," she said, "I want to be examined, not admired."

Nit: "Do you work in a shirt factory?"
Wit: "Yes."
Nit: "Why aren't you working today?"
Wit: "We're making nightshirts this week."

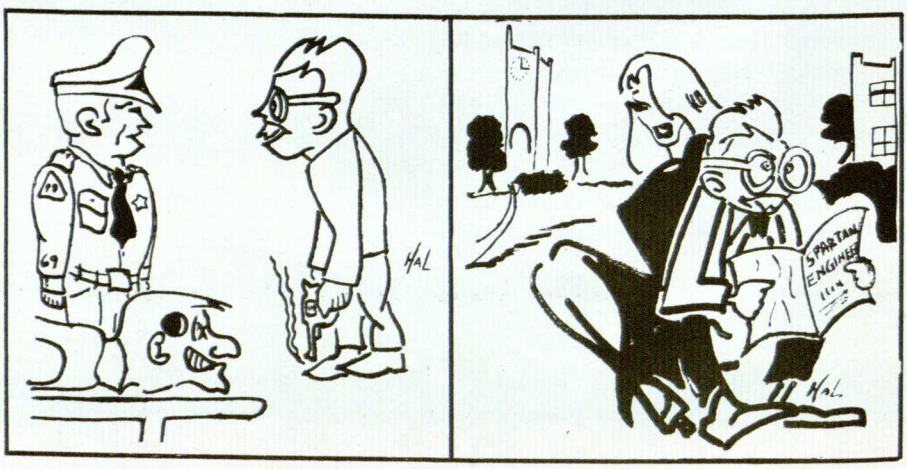
A little boy had been climbing the tree in his back yard. For the second time, he came in with his trousers torn.
"Go upstairs and mend them yourself," ordered his mother.
Some time later she went up to see how he was progressing. The trousers were there, but no sign of the child. Puzzled, she came downstairs and noticed that the cellar door, usually closed, was open. She went to the door and cried angrily, "Are you running around down there without any pants on?"
"No mam," came the reply. "I'm reading the electric meter."

An Italian was being examined for naturalization as a United States citizen.
"Who is the president of the United States?"
The foreigner answered correctly.
"And the Vice-President?"
Again he answered correctly.
"Could you be President?"
"No, no."
"Why not?"
"Mister, you 'scuse me, please. I very busy -- I gotta da pushcart."

I hear that one of the M. E.'s has an eccentric brother who goes to bed on the chandelier because he's a light sleeper.

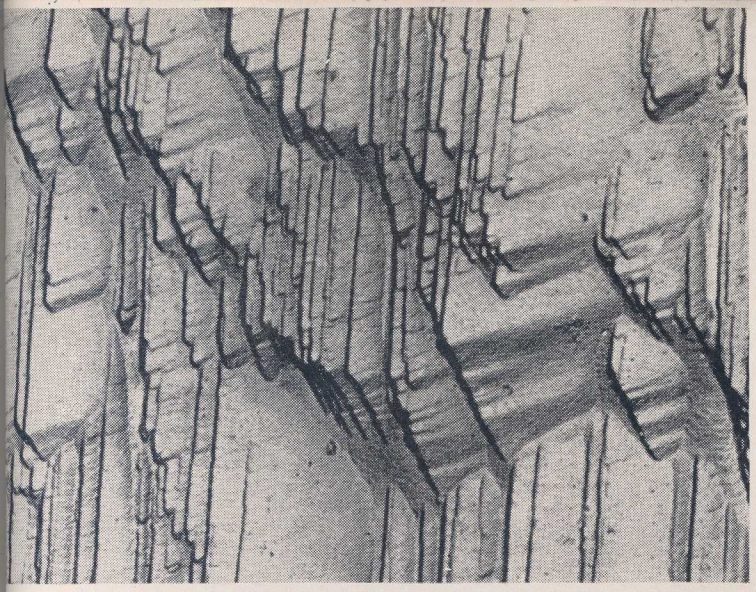
First Pvt.: "I feel like telling the sergeant where to get off again."
Second Pvt.: "What do you mean, 'again'?"
First Pvt.: "I felt like it yesterday, too."

The wife and daughter of Lieutenant Berry were halted by a sentry on duty, who had orders to allow no one to enter by that gate.
"Sorry, but you will have to go around to the front gate."
"Oh, but we're the Berrys."
"Lady, I don't care if you're the cat's meow! You can't go through this gate."

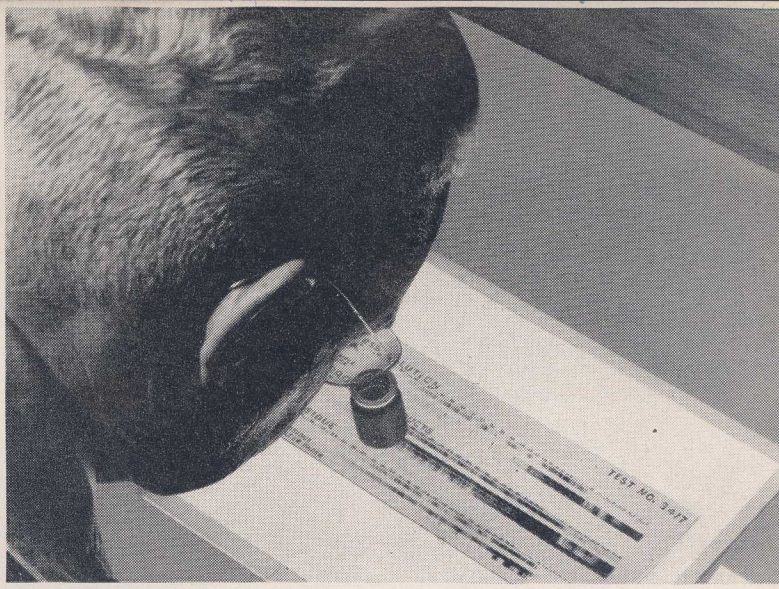


"THE STUDENT COUNCIL WILL HEAR OF THIS!!"

"HAVEN'T YOU ANY OTHER INTRESTS???"

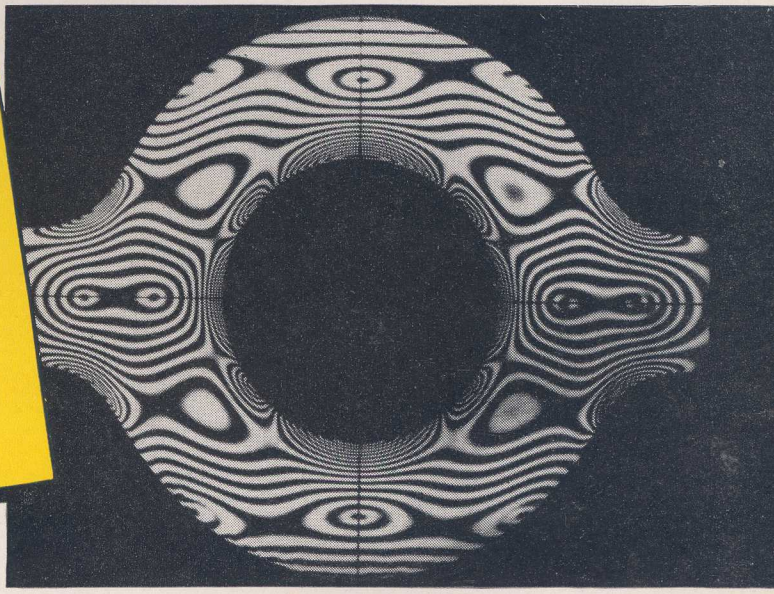


REVEALS NEW FACTS ABOUT METAL STRUCTURE. Electron micrography—up to X50,000 with the electron microscope—reveals new facts about metal structure, surface protection, and effect of processing procedures.



DETERMINES COMPOSITION OF MATERIALS. The composition of almost any material is shown in a flash through spectrography. It is a means of making frequent production line analyses that keep a check on specifications.

Engineering has an ally in photographic analysis



SHOWS STRESSES AND STRAINS VISUALLY. By photographing the patterns developed by polarized light as it passes through a plastic model of a part, the engineer can have visible evidence of the points of stress within the part.

In the engineering laboratory—on the production line—photography is today an important tool. It searches metal structure through electron micrography, x-ray diffraction, and micro-radiography. It makes swift mechanical motions seeable by showing them at a snail's pace with high speed movies. Or it can halt an instant of an instrument's fleeting trace and record it for study.

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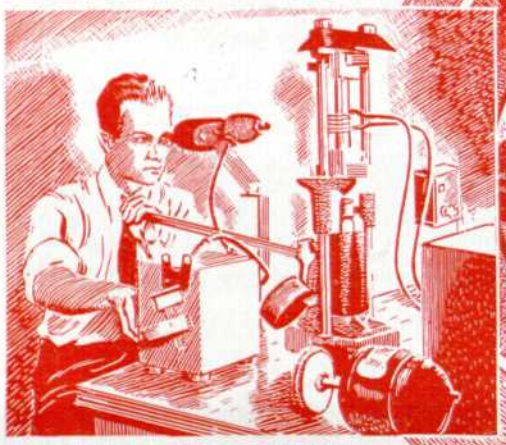
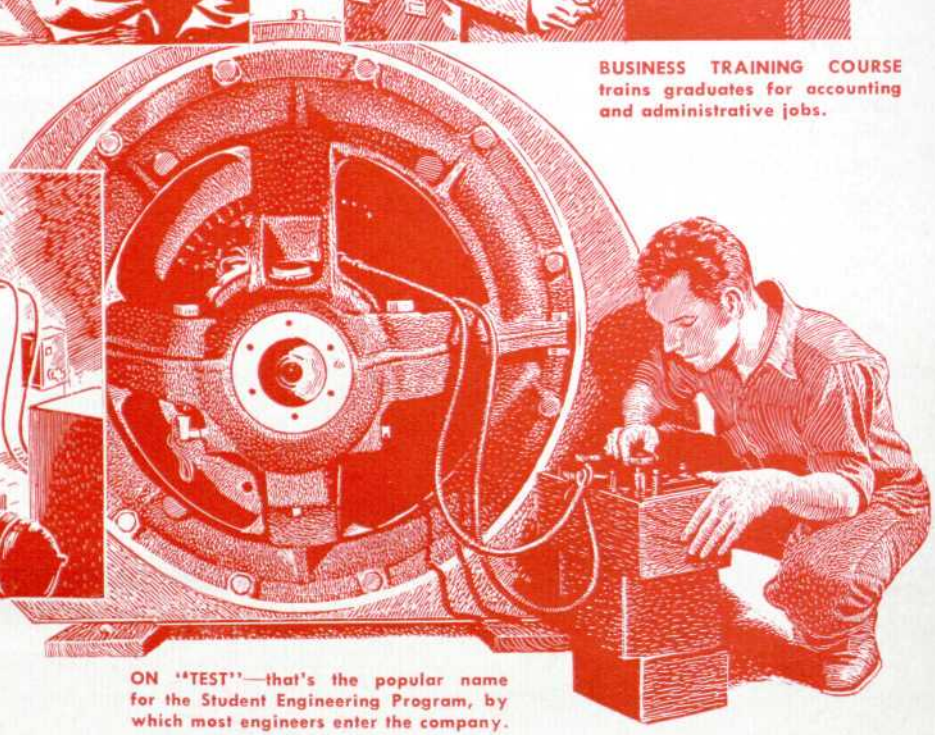


CHEMICAL AND METALLURGICAL PROGRAM is for chemists, chemical and metallurgical engineers.



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