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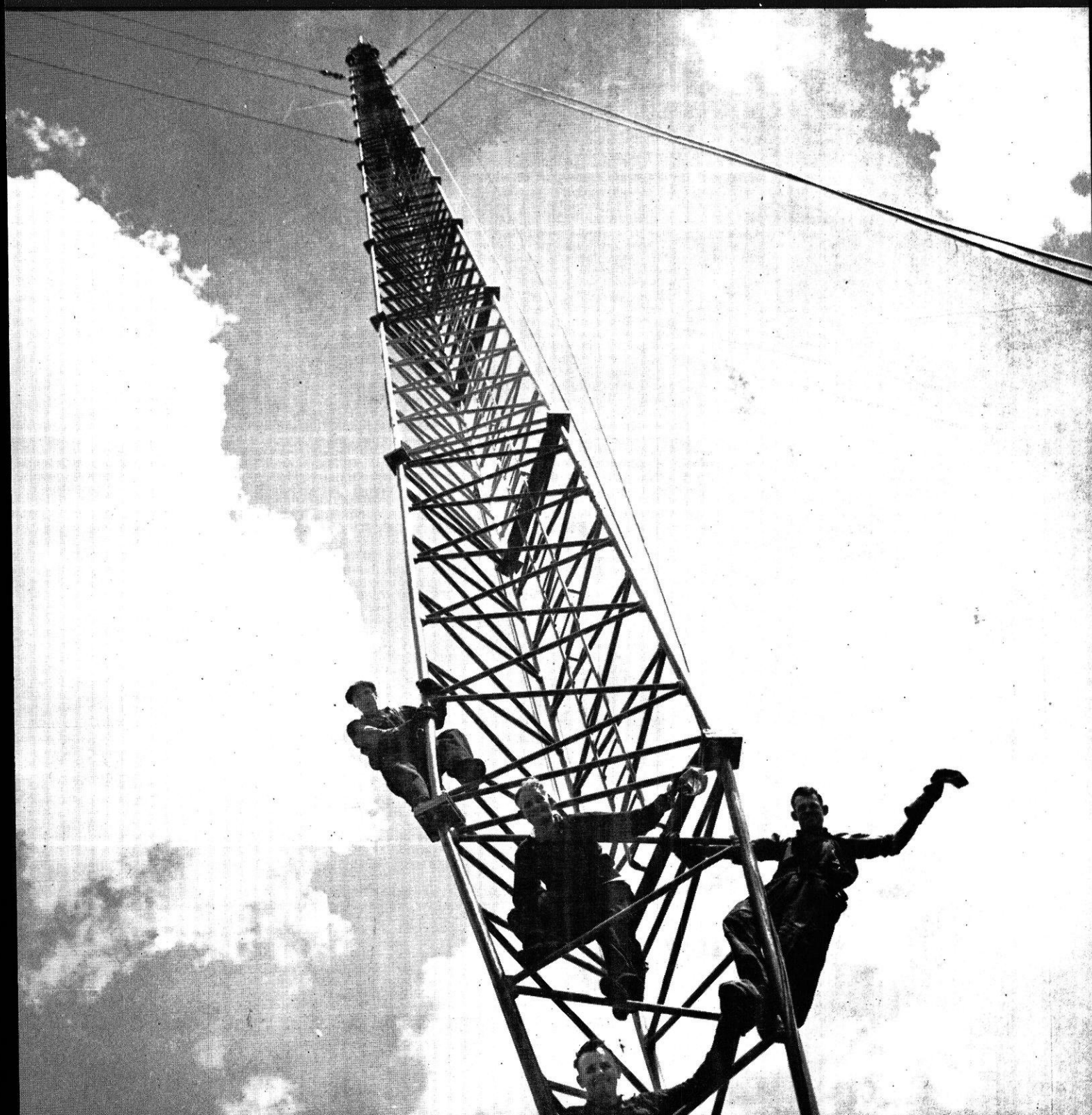
WISCONSIN ENGINEER

September, 1945



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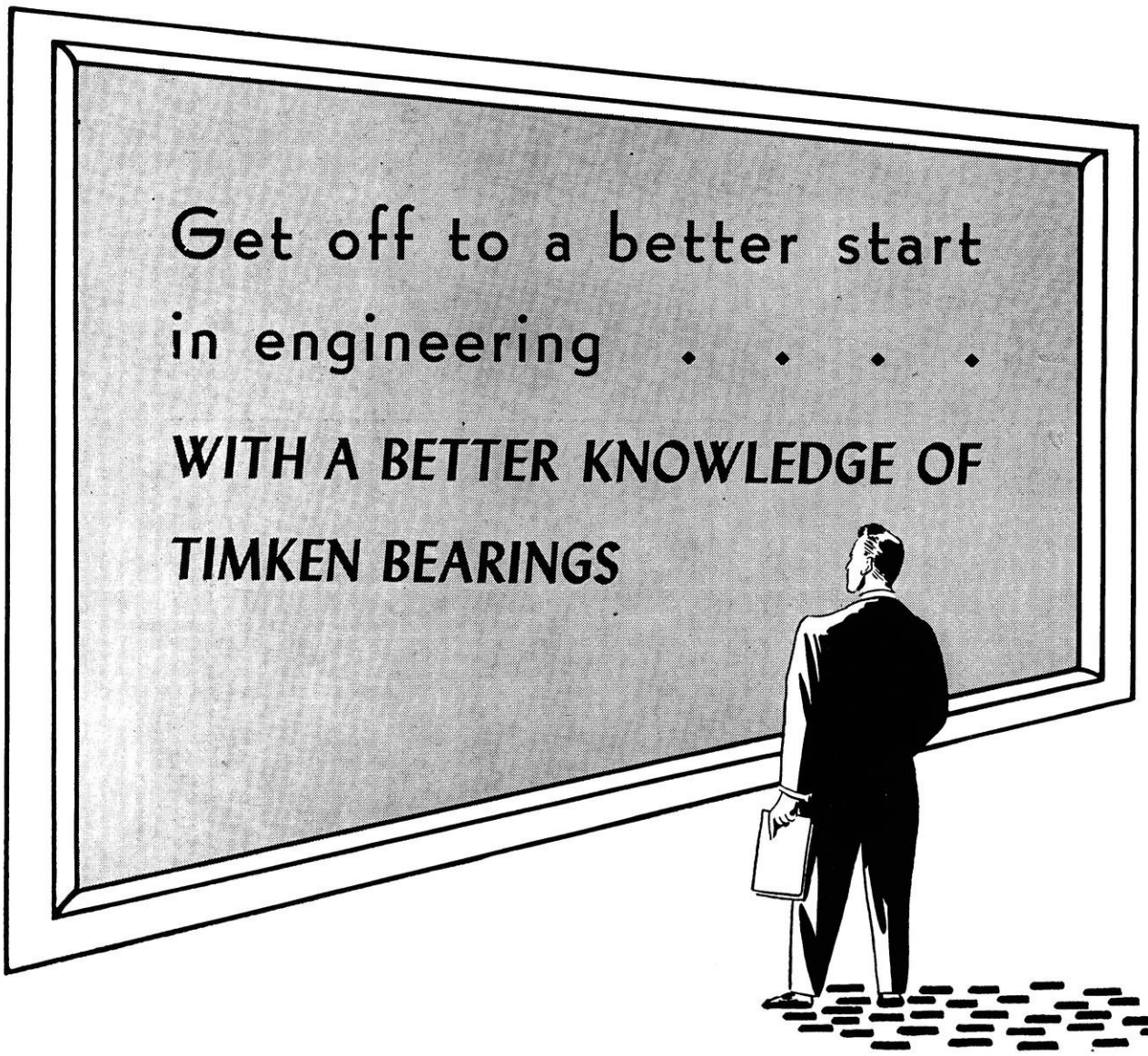

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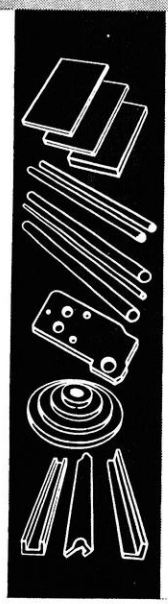

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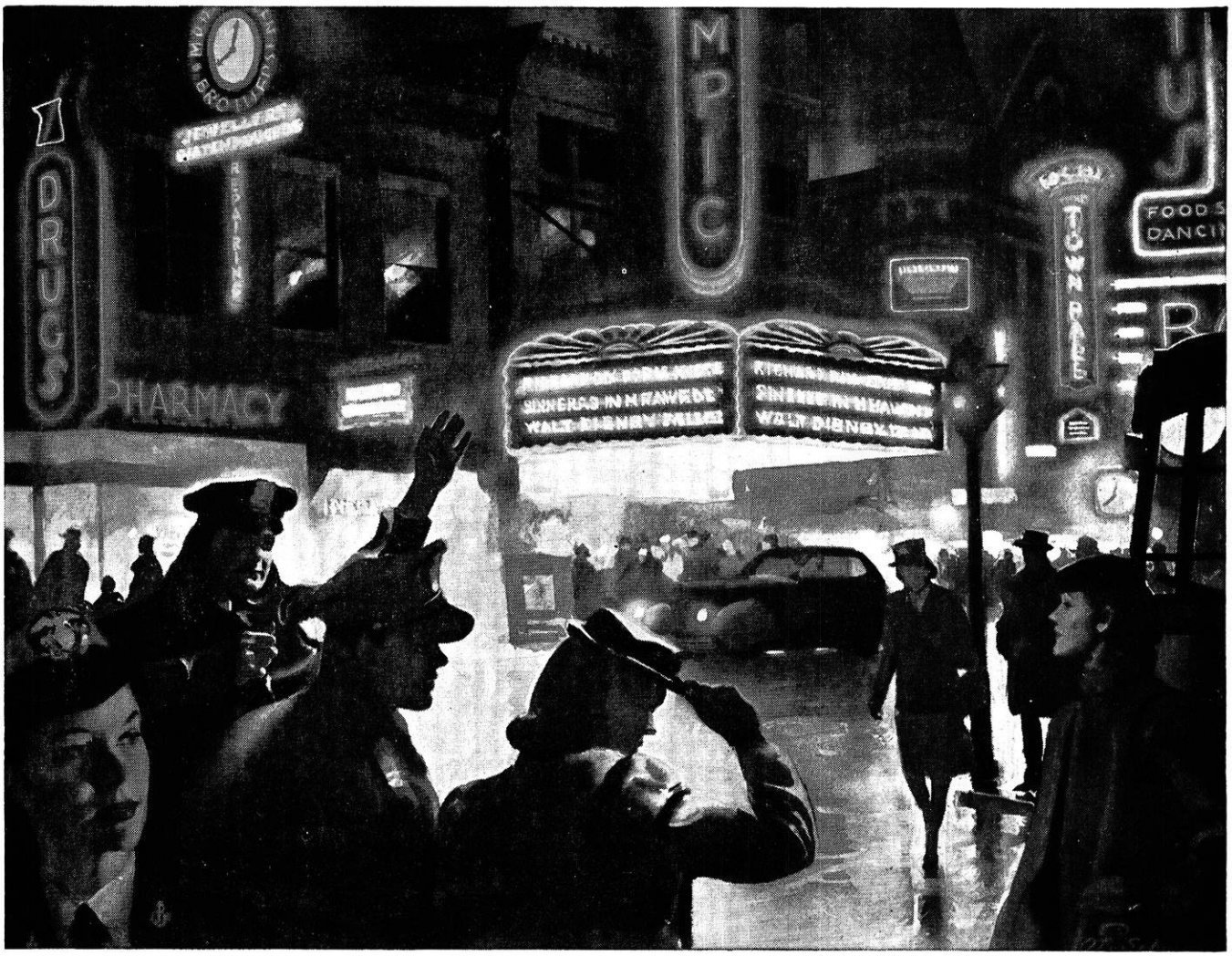

MAIN STREET'S RAINBOW *glows at night*

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WISCONSIN ENGINEER

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In This Issue . . .

Watthour Meter Calibration

—Gerald D. Keppert, e'46

EVERYONE from the layman to the engineer has seen a watthour meter in one form or another. The meter attached to private homes at the entrance of the power lines is the most common watthour meter. The watthour meter integrates or records power consumption in watthours or more commonly in kilowatt-hours.

There are many phases about the watthour meter that could be discussed, such as the construction details, calibration, and actual use. This discussion will dwell principally upon the calibration and accuracy of watthour meters.

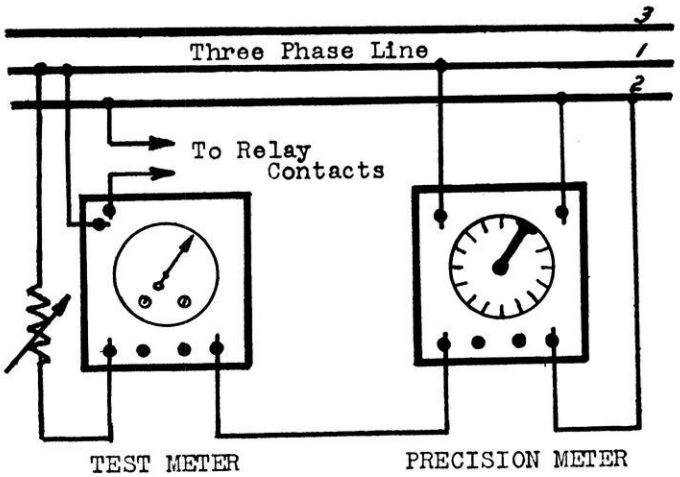
The need for accuracy is evident when we consider that practically every city home has its electrical power metered by means of the watthour meter. This accuracy can most forcibly be expressed in terms of what it will mean in dollars and cents. For example: The University of Wisconsin uses approximately 9 million kilowatt-hours per year. If we assume that the meter that recorded this power was recording 1% slow, then the power recorded would be 90,000 kilowatt-hours short of the 9 million kilowatt-hours actually used. To put this accuracy in dollars and cents let us assume a rate of 1 cent per kilowatt-hour, then the loss to the power company is $900. If three such instances were corrected yearly by a utility, the added income would pay the salary of a good meter tester. There are many other large consumers of power, such as, industrial plants and private homes. Thus this point can be a serious one. Of course, the inaccuracy of a meter can be in the other direction, i. e., the meter may be indicating more energy than was actually used, in this case the user is overcharged. The University of Wisconsin Electrical Standards Laboratory calibrates from 75 to 100 watthour meters of the portable rotating standard type each year. The majority of these run slow due to handling and the accumulation of dirt.

So important is the need for accurately calibrated meters that the Public Service Commission of Wisconsin has included in their rules, a rule which stipulates thus:

Rule 48, Sec. A: "Each utility shall submit to the Commission's electrical standards laboratory located at the University of Wisconsin for checking of accuracy one of each type (60 cycle, 25 cycle, and direct current) of its rotating standards at least once in each year, and one portable indicating voltmeter, ammeter, and wattmeter, if owned by the utility, at least once in each two years."

Each power company has one or more standard watthour meters which they use to calibrate the meters to be placed at the various points of energy consumption, homes, industrial plants, etc. These secondary standards are sent to the Electrical Standards Laboratory where they are checked. The points checked will be outlined in the paragraphs that follow.

At the Standards Laboratory an attempt is made to adjust the meters that come in for calibration to an accuracy of 0.05%. In order to obtain such accuracy special and accurate equipment is necessary. Among the equipment needed is a generator set with a synchronous drive to maintain a constant voltage at 60 cycles. A good source of voltage is needed to excite the generator field, this is accomplished by a floating bank of storage cells on a d-c generator. An accurate timing system is essential. A precision torsion head type wattmeter is used as a standard. A simplified circuit diagram is shown in Figure 1.



SCHEMATIC DIAGRAM WATTHOUR METER TESTING
FIGURE 1

(next page, please)

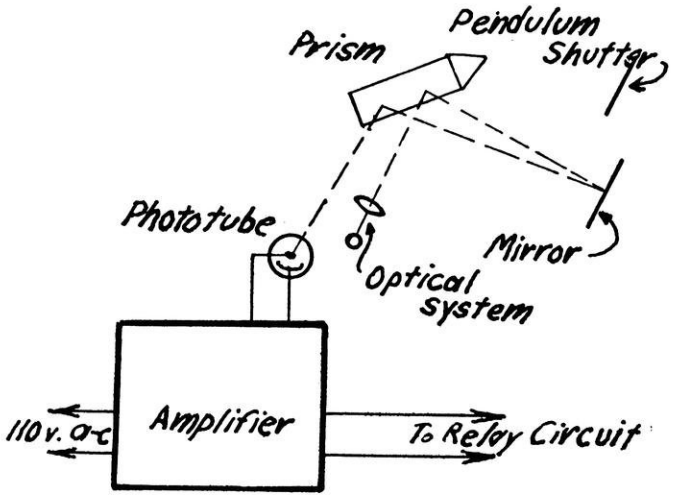
(from page 7)

This circuit diagram is indeed simplified, the switches for switching from 115 volts to 230 volts, switches for obtaining lagging power factors, pilot lights, etc., are not shown. The standard torsion head wattmeter is set by means of a vernier type head. The precision wattmeter is kept in calibration by periodic checking by means of a potentiometer, standard cells and standard resistances which are called the primary standards of the Laboratory. The primary standards are calibrated periodically by the National Bureau of Standards in Washington, D. C.

It might be well to say a word or two about the importance of the timing system. The watthour meter will start to record energy as soon as both the voltage and the current are applied to it. In test work the current is applied and the voltage is switched on and off by means of an elaborate timing system. The timing system closes the potential circuit for a set number of seconds and then opens it. The importance of the timing element can be seen by looking at the relation, Watthours = Revolutions of meter $\times$ Meter constant = Time $\times$ Power. Thus, an error of ± 0.08 seconds in an interval of 42 seconds will cause an error of 0.2% in the meter calibration. Special efforts are made to control the time quite accurately. This is accomplished by means of a pendulum clock which intercepts the light beam which is focused onto a photo-cell by means of the prism. The small current from the photo-cell is amplified by the amplifier and then fed into a complicated relay system which switches the voltage on and off at the proper time. A schematic diagram is shown in Figure 2.

Now that we have the basic equipment in mind let us follow the utilities' rotating standard through the Electrical Standards Laboratory. First, a complete history is obtained, serial numbers, type, owner, etc. A complete record is kept of each meter calibrated so that if the meter has been calibrated before, the old report is taken from the file for reference. Next, the meter is placed on the test bench and put into a circuit similar to that shown in Figure 1. The first test is the "As Found" test which is a test taken to determine whether or not the meter was out of calibration before being sent to the Laboratory. This information is of importance to the owner. Next, the meter is thoroughly cleaned and inspected to be sure that there are no visible defects. Frequently new bearings and other necessary new parts are installed. Now the meter is ready to be adjusted and calibrated. Adjustments are made on the 5 ampere at 3 points; full load unity power factor, full load 50% lagging power factor, and 10% load unity power factor (light load). A fourth point is the half load on the 1 ampere coil at unity power factor. Complete adjustment takes about a week by part-time workers. There are many things that must be taken into consideration as adjustments are made such as temperature effects and the effect of one adjustment upon a previous adjustment.

Having made adjustments on the 5 and 1 ampere coils, these coils and the remaining coils are calibrated. This over-all calibration includes approximately 40 points. After this calibration the original 4 points are checked again to be reasonably certain that the meter has not changed its calibration and will not change in the future more than can be expected.



Schematic Diagram of Photo-Relay Timing System.
Figure 2

WATTHOUR METER

Serial No. ---------- Type ---------- Ambient Temperature ------ °F.

Per Cent Registration		Amperes	Current Coil
50% P. F.	2.---- Volts	¾	1
	1.---- Volts	½	
100% P. F.	2.---- Volts	1	
	1.---- Volts		
		¾	5
		½	
		1½	
		2½	
		5	
		10	10
		10	15
		15	15
		25	15
		15	25
		25	25
		50	25

ELECTRICAL STANDARDS LABORATORY
UNIVERSITY OF WISCONSIN

Test No.---------- Date---------- Checked by ----------

Figure 3

(please turn to page 24)

The New in the News

BACTERIA HAVE PERSONALITY

ALL BACTERIA of a given type have been assumed to be alike, but Dr. H. C. Rentschler of the Westinghouse Lamp Division, Bloomfield, New Jersey, and his associates have discovered that they, too, differ one from another and pass definite traits on from generation to generation.

Working with two new tools that he developed—a photo-electric meter for bactericidal ultraviolet radiation, and a method of seeding culture plates with substantially the same number of bacteria — Dr. Rentschler has added a higher degree of accuracy to the science of bacteriology. The results show how some erroneous conclusions have appeared in the earlier literature. For example, he found the E. coli that lives in the intestines of men and animals, are not equally resistant to ultraviolet radiation. Radiation that kills 99 per cent of one strain kills only 75 per cent of another strain of the same organism. Furthermore, this trait is inherent from generation to generation, and the strain that is more resistant to ultraviolet radiation is also more resistant to heat.

Another discovery is that a bacterium is more susceptible to irradiation at some times during its life cycle (the period from the instant it is formed by subdivision until it divides itself) than at others and that this difference in susceptibility is as much as five to one. A bacterium injured but not killed by ultraviolet radiation takes longer to subdivide and produces "sickly" offspring, which in turn take longer to subdivide for several generations.

While these discoveries are of great importance to the bacteriologist, they may have far reaching importance in other fields. For instance, cancer cells are similar to bacteria and also multiply by subdivision. One of the treatments for cancer is X-radiation, similar to ultraviolet but of shorter wave-length. It may be found more effective to treat these cells for long periods at low intensity so as to be more likely to catch them during their "weak moments" rather than use high intensity for short periods, as at present. If so, there will be less chance of injuring adjacent healthy tissue.

BLACK-LIGHT, THE DETECTIVE IN A NEW FIELD

Many counterfeit bills were passed successfully as sound money—until their falsity was revealed by ultra-violet light. Forgeries of paintings have been discovered by the same twentieth-century detective. Now, the revealing talents of these rays take a more human turn—to the diagnosis of skin and scalp ailments. Some diseases of the skin are difficult to distinguish, some, in fact, are not visible at all in ordinary light. But short rays, in the invisible spectrum see behind their masquerade and make it easier for the dermatologist to make positive diagnosis.

Built by Westinghouse, the lamp itself is simple. It consists of the conventional black-light bulb used in a sun-lamp fixture and uses sun-lamp controls.

MORE WELDERS, LESS WEIGHT

Out of a war necessity comes a new Westinghouse direct-current welder that will be of lasting value. On all types of fighting vessels, from landing craft to aircraft carriers and the largest battleships, welding sets are among the most vital of all repair tools. Considering the cramped spaces aboard these ships, the small-size hatches, and the need for quick, easy portability, light weight is extremely important. In usual peacetime or industrial plant service use, light weight in welding sets has not been of prime importance, but with the new need in mind welder designers combed the previous satisfactory but rugged construction to pare down its weight. The results are astonishing. The new d-c 200 ampere welder weighs only 333 pounds. Compared to it the 150 ampere conventional welder weighed 500 pounds. In other words, a decrease in one third weight is accompanied by a one third increase in capacity. Furthermore the older machine was driven by an alternating-current motor which inherently weighs less than the d-c motor of the light-weight set. This has been achieved without any change in basic form of construction, i. e., steel is still used for all structural parts. A large component of the weight reduction comes from a vastly improved ventilating system in which the underside of the core is, in particular, well ventilated. That no ruggedness has been sacrificed is indicated by its being able to meet the Navy's shock test.

In its present form the welder is mounted on skids. An oval handrail surrounds the set so that it can be picked up by four men and carried to any place on the ship that needs it.

Because full-production capacity is being used to supply the Armed Services, these welders are not available for industrial use.

Gyro Stabilizes Tank

A WESTINGHOUSE

AMERICAN tanks now have a decided advantage over those of the enemy because they can fire accurately while racing at full speed over proving grounds or battlefields. This is due to a robot aiming device developed by Westinghouse and now produced in quantities matching the nation's output of tanks. This gyro stabilizer increases by several hundred per cent the shooting accuracy of Army tanks in motion.

Gyro stabilizers are used on American tank guns to minimize the amount of pitching transmitted from the moving tank to the gun. The electro-hydraulic stabilizing system floats the tank gun about its trunnions so that the gun barrel remains at a fixed elevation, and the target within focus of the gunners' telescopic sight, regardless of the lurching of the tank. At tank speeds of approximately 15 miles per hour over typically rough cross-country terrain, this device makes possible better than 70 per cent hits over a target range of from 300 to 1200 yards, in contrast to the less than 1 per cent hits scored by even experienced gunners under similar conditions without the stabilizer.

The four basic components of the gyro stabilizer system used for tank guns are:

1. The gyro
2. The silverstat regulator
3. The oil pump system including the electro-magnetically controlled valves.
4. The piston and cylinder assembly

The gun mount is carried on roller bearings at approximately its center of gravity. Due to its inertia, the gun tends to maintain its angular position relative to the horizontal, regardless of the motion of the tank in the vertical plane passing through the axis of the gun. However, trunnion friction, unbalance, and the operations of the gun crew exert forces which disturb the position of the gun. The gyro control tends to maintain the tank gun fixed in its aimed position. Tank fluctuations tending to alter this position precess the gyro which, through the silverstat, varies the current to the electro-magnet valves. The valves are affected in such a fashion that the oil pressure above and below the piston increases and decreases in accordance with the signal current. The greater the displacement, the higher the current differential causing the proper valve to act. Oil is forced to the cylinder in a direction to oppose the force tending to move the gun from its set position. Since the piston is fixed to the gun, its movement to the low pressure side maintains the gun in the aimed position.

Mono-Gyro Control

The latest development of the tank gun stabilizer is the mono-gyro control, which has a single gyro controlling the silverstats through its response to angular velocity and through its slight gravity response. The gravity response is effected by an offside unbalanced weight which causes a slight deflection of the silverstats in the proper sense when the gyro is tilted from the vertical, and brings about a gradual return to the vertical.

The present mono-gyro control was developed from the original type of stabilizer which utilized two gyros, an upper and a lower one. The upper gyro in this system provided an absolute vertical reference. It was discovered, however, that satisfactory stabilization could be obtained by using only the velocity responsive gyro. With the dual system, the response of the upper gyro to lateral accelerations was so pronounced that firing was accurate only at fairly uniform tank velocities. Aside from the advantage of simplicity in omitting one of the two gyros the response of the mono-control system to lateral accelerations was greatly reduced. Since the gunner must continually aim the gun, the slight drift in the mono-gyro system is unimportant.

The mono-gyro control, consisting principally of the gyro-motor and flywheel, the dampener bellows assembly, and the silverstat control, is only slightly influenced by an acceleration or sharp turning of the tank. The gyro has a gradual and approximate return to the aimed position. The gyro motor, operated from the tank storage battery, is a 12 volt direct current machine for light tanks or a 24 volt direct current for medium tanks, operating between 12,500 and 16,000 revolutions per minute. The rotor is dynamically balanced before assembly in the motor; and the dynamically balanced flywheel is mounted on frictionless bearings. Attached to a bracket on the motor, a Micarta spacer opens and closes the silverstat contacts as the gyro moves on its bearings.

The silverstat is a form of rheostat whose resistance values are varied by shorting out sections of the resistance

Gun in Action

NEWS STORY

by closing a series of contacts. These contacts consist of silver buttons fastened to flexible phosphor bronze leaves and separated approximately four thousandths of an inch by Micarta spacers. The leaves connect to taps on resistors. The current through the magnetic coils on the oil pump valves can thus be regulated by making and breaking silverstat contacts.

In order to prevent oscillations or hunting, the gyro movement in its gimbal bearings is controlled by an hydraulic dampener. Movement of the gyro causes a small bellows to deflect, forcing oil through a needle valve into a larger bellows which acts as a reservoir. The amount of dampening is controlled by adjusting the needle valve. For successful operation of the dampener, the entire assembly must be filled with oil. To eliminate air bubbles, the bellows are charged under oil in tanks which are first heated to drive all the air from the oil. The tanks are then evacuated with the bellows in place under oil, thus removing the air from the bellows so that when the vacuum is broken, oil completely fills the bellows assembly. The sealing cap screws are put in place while the assembly is under oil. The bellows assembly is attached to the gyro control base and is connected to the gyro with piano wire. It acts to prevent resonance about the vertical precession axis and to return the Micarta spacer to its correct position between the silverstat leaves.

Servo-Mechanism System

A power means is used for stabilizing the tank gun rather than a gyroscope large enough to resist the disturbing torques directly. Because the required accelerations are excessive, an electric motor is impractical for this purpose. High angular accelerations can be obtained with an electric motor drive, but the unit would be too large for the limited available turret space.

The servo-mechanism in use is a composite hydro-electric system having a constant-delivery type pump with an actuating mechanism consisting of three small gears, one driven and two idler gears. The porting is arranged to obtain the effect of two complete pumps, one discharging to the top and the other to the bottom of the controlling piston. Pressure difference is controlled by a pair of seated by-pass valves regulated by the teeter bar armature of an electro-magnetic unit. The entire assembly, including the magnetic valve-control device, is oil immersed. If a valve is partially closed by a differential pull of the magnet coil, the pressure increases, forcing oil into the cylinder supplied by that side of the pump. Since the magnet valve is encased within the sump of the hydraulic system, the operation is free of friction. Furthermore, since a very small movement of the valves immediately provides any proportion of the constant flow of oil, the operation of the system is instantaneous for all practical purposes.

Any angular displacement of the gun arising from tank motion will tend to displace the gun-mounted gyro control from its position. When the tank pitches or vibrates:

1. The gyro control is slightly displaced from its former vertical position.
2. The resulting precession of the gyro makes electrical contacts, shorting resistances through the silverstat.
3. The changed current alters the two electro-magnets regulating the teeter valves.
4. The operation of the oil valves decreases pressure on one side of the hydraulic piston and increases the pressure on the other side.
5. The piston is forced toward the low pressure side.
6. The movement of the gun is controlled accordingly since the piston is fixed to the gun.

The recoil of the gun barrel after firing results in large gravity unbalances. To prevent the violent disturbances which this would cause, an auxiliary control is provided: a micro-switch closes when the gun recoils and furnishes current to an auxiliary magnet recoil of the valve in a manner to supply supporting pressure for breech heaviness during recoil. The recoil adjustment need not be precise because the gyro control through its silverstat regulation of the other magnet coils compensates for any remaining differences.

In the development of the stabilizer, it was found that the principle disturbances average 1½ cycles per second corresponding to the pitching frequency of the tank on its springs, while angular velocities are about 30° per second and accelerations about 300° per second squared. The rather great inertia of the gun barrel is a favorable element, for if balanced and unhindered, the gun would remain at a constant angle. Moreover, as the tank pitches, the comparatively small trunnion friction would give only low angular accelerations of the gun; and relatively close

(continued on page 20)

CAMPUS HI-LITES

—Millie Smith, m'46

Jane Strosina, c'46

POLYGON BOARD

The Polygon Board announces the annual engineers' "Autumn Ball," an all-campus affair, Friday, October 5, 1945, from 9 to 12 in Great Hall of the Memorial Union. Don Voegeli's band will furnish the music. A Slide-Rule Queen will be chosen from among the girls present at the dance. So come on, fellows, bring your best girl!

•

M.E.S.W.

Mr. Grutzner of Fairbanks-Morse spoke on the "Diesel Electric Locomotive." Refreshments were served to a disappointed group of men who had to drink cokes because the Rathskeller's beer facilities were closed.

A.S.C.E.

Two meetings were reported for the month.

At the first, Professor Woodburn, C.E. department, spoke on "The Grand Coulee Dam." Refreshments were served. They seemed to like the queer combination of beer, ice cream, and pie. Bromo-Seltzer. Bromo-Seltzer.

At the second, Professor Kinne of the C.E. department spoke on "The Failure of the Washington Narrows Bridge." Refreshments were served.

•

A.I.CH.E.

Dr. E. E. Harris of Forest Products Laboratory spoke on "The Hydrolysis of Wood." Refreshments were served.

The month was highlighted by two picnics at Burroughs Park. Beer was served. The usual gay time was had by all. Hmm! That's the report.

•

A.I.E.E.

Two meetings were held in the past month.

At the first of these, movies on frequency modulation and television were shown.

At the second, Professor B. G. Elliot spoke on "Buffalo Bill." Refreshments were served at both meetings.

•

TAU BETA PI

Congratulations are in order for the new members elected to Tau Beta Pi, National Honorary Engineering Fraternity. They are: C. I. Hansen, M.E.; M. Horwitz, Ch.E.; R. P. West, C.E.; C. E. Aten, C.E.; E. R. Detjen, E.E.; F. B. Eiseman, Jr., Ch.E.; R. L. Gausewitz, E.E.; R. L. Heinrich, M.E.; O. K. Hunsaker, M.E.; R. R. Marichal, M.E.; E. R. Mathews, M.E.; R. F. Miller, E.E.; B. C. Potts, Ch.E.; D. J. Sakols, M.E.; B. C. Smith, M.E.; D. Hyzer, M.E.; and J. D. Wethern, Ch.E. June Hartnell was elected an honorary member.

•

John Morse Awards of 500 dollars each went to June Hartnell, E.E., Donald Hyzer, M.E., and Donald McIntire, Ch.E. Congratulations to you all. We know you earned them for your outstanding leadership.

•

V-J DAY, JAPAN SURRENDERS

This proved to be the biggest, most important event of the past month. The news came at 6 p.m. Tuesday, August 14, while most of us were at dinner. The campus celebrated the event uproariously. Even the Navy with their "confined" celebration welcomed the news—and we even had a one-day vacation from classes.

•

While June Hartnell was still in the hospital, she received a pamphlet from her mother entitled "That Troublesome Little Weed, Poison Ivy" — good advice, but a bit late.

(please turn to page 19)

Alumni Notes

—Joe M. Teskoski, me'45

Mechanicals

WARREN, GLENN B., me'24, has been advanced to Designing Engineer of the combined Steam Turbine and Generator Division of General Electric Co. In 1944 Mr. Warren published a paper on gas turbines, that was published in the August issue of the WISCONSIN ENGINEER.

SOMMER, MAJ. WARREN L., m'42, son of Prof. and Mrs. H. H. Sommer, was recently promoted to his present rank. He is executive officer of an engineer combat battalion stationed at Camp Van Dorn, Mississippi. He entered service immediately after graduation, and served as an instructor in the O. C. S. until this spring.

WENDT, WILLIAM R., m'45, was awarded the Mechanical Engineers' regional award at a recent conference in Milwaukee. The award is given by the regional conference of the association of which a number of universities are represented. 'Bill" Wendt's paper was subjected to a phase of diesel engine combustion research.

CLEVEN, ENS. LORCH B., was recently commissioned an ensign in the U. S. Navy after completing an officers' training course at the Naval Midshipman's school, New York City. He is now attending radar school at Harvard University and will complete his training at M. I. T.

ANDERSON, LT. CHARLES E., and his wife visited Madison and the latter's parents, Mr. and Mrs. William H. Westphal. Lt. Anderson just completed an engineering course at Ft. Belvoir, Va., and now is waiting for further assignment at Ft. Lewis, Wash.

HIRCHERT, ENS. WALTER F., JR., has recently received his commission in the Naval Reserve and reports for duty to Ft. Schuyler, N. Y. Mr. and Mrs. Ross Shultis, Reedsburg, announce the engagement of their daughter, Louise Ruth, to Ensign Hirchert.

HITCHCOCK, GEORGE, passed away in a local hospital. Mr. Hitchcock was an instructor in Mechanical Engineering at the University for twenty years. He was also University wrestling coach for fourteen years.

STREHLOW, ROBERT WILLIAM, has been working as a Junior Engineer with the Curtiss-Wright Corp., Columbus, Ohio. He will work on the production of Helldiver dive bombers and Seagull scouting planes.

TOLLEFSON, BENNETT H., spent a vacation in Madison with his parents, and his fiancee Miss Jane Lucille Crown. Their engagement has been announced by Miss Crown's parents. Mr. Tollefson is employed in the engineering department of the General Electric Co.

•

Civils

WADE, JOHN C., ex-c'12, is colonel of a general service Engineer Regiment in the Philippines.

JACOB, ELMER A., c'13, former city engineer of Provo, Utah, has been appointed superintendent of the Provo City Utilities Department.

WAGNER, ELDON C., c'37, who left the teaching staff of this college for active duty with the army, has been promoted to the rank of major and is with the 649th engineering topographic unit in Germany.

DIETZ, JESSE C., c'40, lieutenant colonel with the 862nd Engr. Avn. Bn. in Germany, has been awarded the bronze star for meritorious service. His command built front-line air fields for fighter-bomber planes.

TENNEY, ENS. VERN W., c'41, visited Madison on June 12, on crutches and minus the left foot. He joined the Seabees in December, 1942, and was hit by flak in February, 1943, while on a reconnaissance flight over Bougainville. An infection has kept him in the hospital ever since. He was married in 1941 to Ardith E. Tangen of Two Rivers, Wis.

FISK, LT. CHARLES C., c'42, who is with the 20th Weather Squadron, has a daughter, Cherie Lyn, born on July 3.

HANSON, WILLIAM, c'42, who was captured at the battle of Kasserine Pass in Tunisia, in 1942, and was a prisoner in an officers' camp near Danzig for over two years, landed in this country in May and visited Madison on June 27. He was looking well and expected to be assigned to the Pacific area.

JOINER, ROBERT C., c'42, a lieutenant of engineers who served in the North African and the Italian campaigns, visited in Madison on June 27. He was married on May 2, 1944, in North Africa, to Elizabeth Morgan of Uxbridge, Mass., an army nurse.

WARZYN, WILLARD W., c'42, engineer with the Dravo Company at Pittsburgh, announces the arrival of Carol Jeanne on June 12.

Mr. G. B. Warren

JOHNSON, KENNETH F., ex-c'44, visited Madison on May 16. He holds the rating of S 1/c (Rd M) on the USS John R. Pierce, DD 753.

ZUEHLKE, GEORGE H., c'44, at last reports was in training at the Naval Research Laboratory in Washington, D. C. His rating is RT 3/c.

GETTELMAN, WILLIAM F., has returned from the Army Air Corps June 9, 1945, after serving three years at Stockton Field, Calif. While in Stockton Mr. Gettelman renewed acquaintance with Prof. Leonard S. Smith who retired from the University of Wisconsin in 1930. Mr. Gettelman is now working as a hydraulic engineer at the Crow Irrigation Project, Billings, Mont.

•

Chemicals

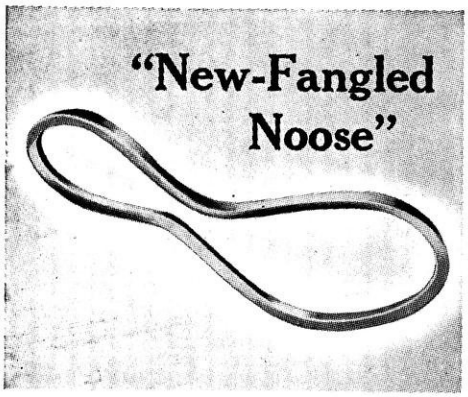
BEYER, JERRY, '44, Ensign USNR, has been stationed at the Knoxville, Tenn., plant of the Clinton Engineering Co.

(continued on page 25)

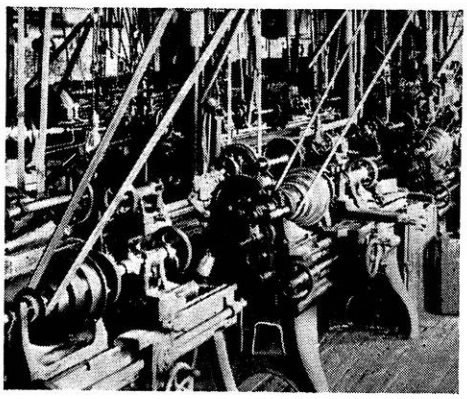
TEXROPE

-EVER HEAR OF IT?

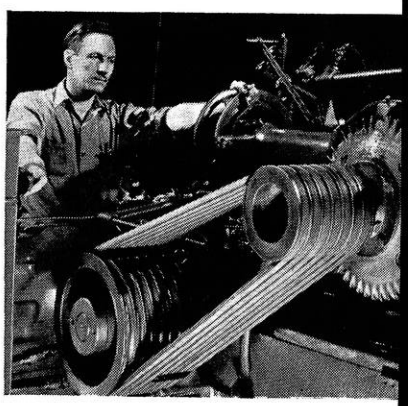
PROBABLY THE BEST EXAMPLE OF HOW ALLIS-CHALMERS STUDIES AN INDUSTRY'S PROBLEMS—EFFECTS PRIME ECONOMIES



1 This is the heart of the simple Texrope Multiple V-Belt that solved a problem plant engineers had been studying for years — *power loss between motors and the industrial machines they drive.*

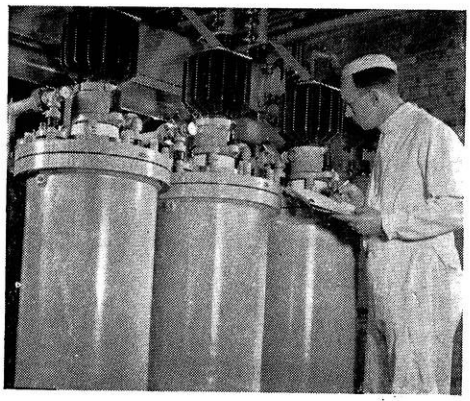


2 Multiple V-Belt Drives, invented by A-C, eliminated usual "jungle" of clumsy belts (shown above) driven by line shafts. Each machine could have its own motor and drive with better efficiency and economy.



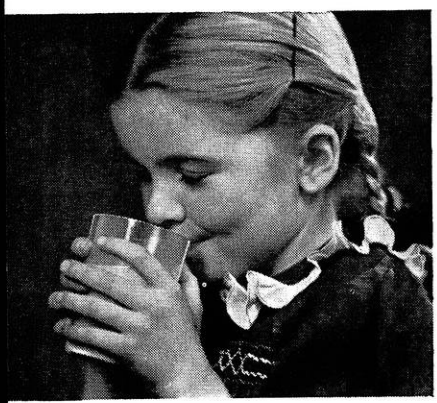
3 The whole field of power tra sion was revolutionized. T Multiple V-Belt Drives, made under license from A-C, drive of all industrial machines t out U. S. war and civilian su

4 Just as typical as the Multiple V-Belt Drive is another important Allis-Chalmers' development in the electronic field that aids the vast aluminum industry—*the A-C Mercury Arc Rectifier.*



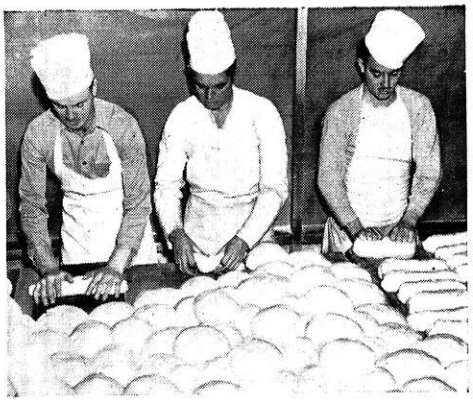
5 This giant electronic device inexpensively and reliably converts a-c to d-c current—the electric power needed for electrolytic reduction of light metals. Again Allis-Chalmers helped solve a major problem.

6 It helped assure the U. S. a adequate aluminum supply fo production of fighting planes. Victory, it will help the light industries introduce a host o products for America.



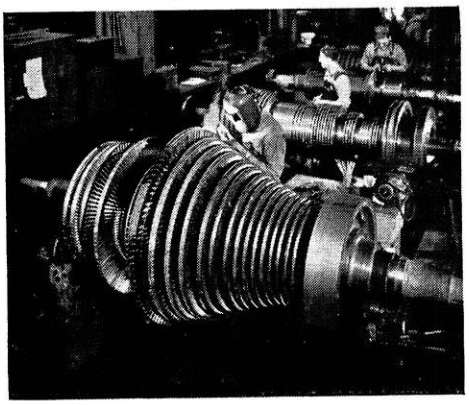
7 Speeding food to America's tables is another important Allis-Chalmers' job. Packers, shippers, processers, canners all draw on Allis-Chalmers' industrial experience for vital machinery and equipment.

8 Even on farms, A-C engineering is at work. It produced the first low-cost tractor, the All-Crop Harvester, the One-Man Hay Baler—machines that mean big savings in time and manpower on family-sized farms.



9 A large part of the flour for U. S. bread and pastry is milled by A-C machinery. In almost any kind of mill—flour, steel, textile, cement or lumber—you're likely to find a big share of equipment stamped A-C!

10 A-C "Know-How" aids *every* industry. Our scale model "Unit Sub Builder" Set saves time—helps you plan visually in working out more efficient power distribution in your plant.



11 Here you see just one small part of Allis-Chalmers' vast manufacturing facilities. In 8 huge plants, A-C builds the largest line of capital goods machinery and equipment in the world!

12 Call on this wide range of industrial experience in meeting new wartime cost and production problems. There's an Allis-Chalmers office nearby that can help you!

Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin.

TEAM UP WITH THIS "KNOW-HOW!"

In this crucial period, when engineering skill is so urgently needed — put the Producer of the World's Largest Line of Major Industrial Equipment to work for you!

ALLIS-CHALMERS

PRODUCER OF THE WORLD'S LARGEST LINE OF MAJOR INDUSTRIAL EQUIPMENT

A-C

"Engineering That Aids All Industry and Furthers American Good Living"

S - t - a - t - i - c

—Gene Daniels, e'46

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

•

A New York City resident went to the sugar rationing board and attested: "My wife has no sugar at all in the house, not an ounce of it."

"Remember, now, you're swearing to this," the chairman of the board warned him, "you've got to tell the truth."

The applicant hesitated and repeated, "Gotta tell the truth, eh?"

"Yes, or you'll go to jail," was the reply.

"In that case I'll tell the truth. We ain't married."

•

The stork is one of the mystics
And inhabits a number of districts.
It doesn't yield plumes
Or sing pretty tunes,
But helps out with the vital statistics.

•

Heredity—something every father believes in until his children begin to act like fools.

•

E.E.: "Since I met you, I can't eat, I can't sleep, I can't drink."

Co-ed: "Why not?"

E.E.: "I'm broke."

•

Then there's the fellow with the stern look on his face because his mother was frightened by the rear end of a ferry boat.

•

"But officer, I didn't see that fire plug. When I parked here it was hidden behind an Airedale."

•

"Why don't you use that other straw?"

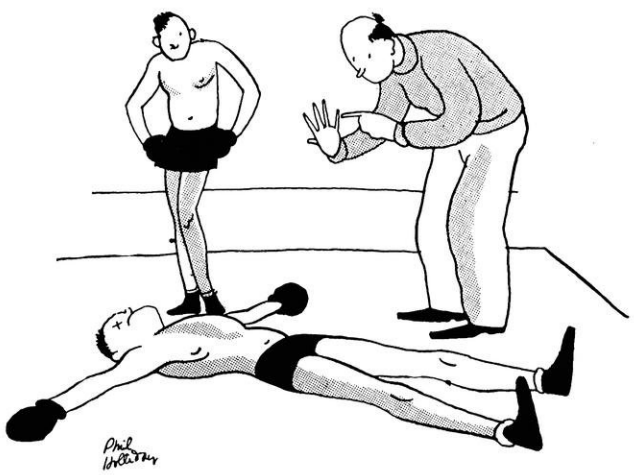
"This one's not empty yet."

•

The old, narrow trails where two cars could barely pass without colliding are rapidly being replaced by splendid wide highways on which six or eight cars can collide at once.

•

"This is a funny world,
Its wonders never cease;
All civilized people are at war,
All savages are at peace."



Five—Six, Pick Up Sticks

—Wisconsin Octopus

Sentry: "Halt! Who goes there?"
Soldiers: "British soldiers."
Sentry: "Pass, British soldiers."
Sentry: "Halt! Who goes there?"
Soldiers: "French soldiers."
Sentry: "Pass, French soldiers."
Sentry: "Halt! Who goes there?"
Soldiers: "Who in the hell wants to know?"
Sentry: "Pass, Yanks."

•

If your girl seems cold,
Don't leave her;
For chills are always
Followed by fever.

•

I never kiss, I never neck,
I never say hell, I never say heck;
I'm always good, I'm always nice,
I play no poker, I roll no dice.
I never drink, I never flirt,
I never gossip or spread dirt;
I have no line or funny tricks,
But what the hell, I'm only six!

•

"Repeat the words the defendant used," said the lawyer.

"I'd rather not. They were not fit words to tell a gentleman."

"Then," said the attorney, "whisper them to the judge."

•

"Well, fellows, is this a Dutch treat or do the girls pay for everything?"

(there's more!)

Post-war radio "handie-talkies" and "walkie-talkies" will enable you to take your radiophone anywhere you go!

"I'm telling Helen about this—right now!"

You're a hundred miles from "nowhere" and you just landed the finest trout in the world! You've simply got to tell your wife (and the boys) back home.

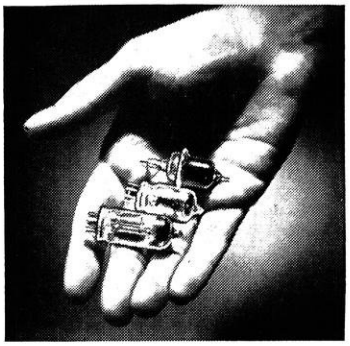
So you turn on your "handie-talkie," signal the nearest "receiving station," get put through long distance and r-r-r-ing!—she's on the other end!

Fantastic? Not at all! For after the war such instruments can be made—about the size of a camera—weighing as little as three pounds—with a range of many miles!

Similar equipment is going to the Allied Armed Forces right now—made possible by miniature electron tubes developed in RCA Laboratories. These miniature tubes are the size of peanuts and acorns! Actually, with these tubes there can be radios the size of a cigarette case or a lady's compact—with "big radio" reception!

Similar research goes into all RCA products. And when you buy an RCA Victor radio, television set or Victrola, you get one of the finest instruments of its kind that science has achieved.

Radio Corporation of America, RCA Building, Radio City, New York 20. *Listen to the RCA Show, Sundays, 4:30 P.M., E.W.T. over the NBC Network.*



RCA miniature tubes—another example of RCA pioneering in radio and electronics. The "handie-talkie" and smaller radios were made possible through the development of these tubes. Moreover, much valuable space can be saved through their use in larger sets.

RADIO CORPORATION of AMERICA

APPLICATION PHOTO

What Do You Think?? Or Do You??

—Don Caldwell and Dick Luell, CheEse '44

(Reprinted Because of So Many Requests)

IN THE life of every senior engineer there comes a time when he is pestered to death by filling out applications for that infernal job that must be got if he is to be sustained and so forth. My roommate and I received one the other day which we forthwith reproduce.

Employment Application of Little Ajax Machine Shop

General Questions:

1. Name—of course.
2. Born—yes.
3. State—naked.
4. Sex—occasionally.
5. Living—doubtful.
6. Special Marks on Hands and Face—fingers, eyes, nose, mouth.
7. Complexion—pasty.
8. Eyes—two.
9. Hair—needs trimming.
10. Name of Father—never did find out.
11. Name of Mother — Helen Wheels.
12. Occupation of Mother—Obvious.
13. Do Father and Mother Live Together — I don't think he's my father.
14. Address of Mother — I see what you're up to—nothing doing.
15. Any Living Brothers or Sisters—I've often wondered.
16. If you have not registered for social security, why? — Didn't pay back taxes.
17. Give name of wife, if living—For all practical purposes, Mabel.
18. Do you own a car? — Some people call it that.
19. School attended — School of Hard-knocks.
20. Years in college — Yes, they certainly have been.
21. Degrees held—B.S., Holstein.
22. Position desired — Bed with innerspring mattress.
23. Check the type of work at which you prefer to start Operating ( ) Research ( ) Development ( ) Maintenance ( ) Construction ( ) Other (√).
24. What do you expect to be paid?—Money, of course.
25. Draft classification—4F+.
26. Until when?—Until they take morons.

27. Medical History

Whooping Cough: Nope, whiskey cough.

Flu: Up two or three times.

Measles: A few here and there.

Athlete's Foot: Two of them.

Ever been x-rayed?—No, but I've been ultraviolated.

Transfusions?—I transfused from L & S in 1940.

28. Number of children — None . . . to speak of.
29. To what professional or honorary societies do you belong—Don't be silly.
30. Do you own or rent home, board, or live with relatives — I sponge.
31. Give number of telephone where you may be reached—Davenport 002 short.

32. References:

(a) Esquire, August 1940, pp. 27.
(b) The Sunday comic, L'il Abner (he's my hero).

Training and Sales Experience:

33. Are you a proficient stenographer?—They never get tired sitting on my lap.
34. What selling experience have you had? — My God, what'll they ask us next?
35. Sales for the past year—None.
36. By whom are you employed at present?—No one.
37. Why do you wish to leave—I don't.
38. Present occupation—Hunting for a job.
39. Last occupation — Job hunting.
40. Next previous occupation—Hunting for a job.
41. When would you be ready to start work?—I've been ready for years.
42. Have you ever been suspended from any situation?—The last situation I had cannot appear in print.
43. Has your application for fidelity bond ever been declined?—Certainly. If so, state particulars—Don't get personal, bub.

CAMPUS HI-LITES . . .

(from page 12)

The M.E. 106 and M.E. 10 N students are looking forward to a trip to Milwaukee. The trip promises a study of the power plant in the morning and a study of the pipes in the brewery in the afternoon.

•

And then there are the two girl engineers who had an alarm clock that wouldn't ring. Rumor has it that if it would run now it would ring.

•

An there is the story of Jim "Peaball" Davis.

•

Leo Stavros, Sr., "V-12" C.E., traded in a pair of worn out blue trousers in a clothing exchange. At a recent clothing exchange he was issued the same pair of trousers he had traded in three months previously.

•

Maybe we should post "Danger! Explosives" signs near M.E. 11N and M.E. 124 students. They've been pipetting gasoline.

•

Surprise news of the month: Otto Uyehara, Chem. E. grad student's marriage to Chisake Suda, U. of California grad. Congratulations to you both. - - - Bob Leaf, Sig. Ep., traded in his beer mug for a woman's hand. He recently pinned Jolie Douglass. - - - Keith Rhodes, M.E. 4, drops (?) out of circulation as he becomes e n g a g e d to Doris Hansche, H.E. 2.

•

The C.E. department welcomed back L. K. Kessler, who recently returned from service with the army during the war. He is gradually slowing down to the rate of a college prof., but his present rate of teaching has cut class sleeping time down to less than 10%.

GYRO . . .

(from page 11)

balancing of the mass about the trunnions would minimize the acceleration torques arising from the vertical and horizontal movements of the tank.

Actual field conditions, however, are severe because of considerable oscillations, dust, moisture, and wide temperature ranges. In addition, the cramped and limited tank turret space imposes simplicity and compactness on the design of a stabilizer.

The stabilizer not only satisfied field conditions but surpassed original requirements. The Ordnance Department had requested that disturbances of $\pm 2\frac{1}{2}°$ at $1\frac{1}{2}$ cycles per second for the tank, typical fluctuations over average rough terrain, should be reduced to $\pm 1/3°$ error at the gun. The stabilizer as developed exceeded these specifications by about 3 to 1—that is, disturbances of $\pm 2\frac{1}{2}°$ at $1\frac{1}{2}$ cycles per second result in less than $\pm 1/8°$ gun error instead of the specified $\pm 1/3°$.

Testing

After tests were conducted by firing the tank guns while operating the tank on average terrain, correlating data was obtained in the laboratory by oscillating a tank turret about pivot bearings. From this data, production test stands known as "shaker stands" were designed. They consist of a heavy mass corresponding to the inertia of the turret, and a dummy gun barrel. The gun barrel is connected through the gyro stabilizer cylinder assembly to the large mass, which is oscillated by means of a motor driven eccentric. The frequency and amplitude of operation correspond to the movement found on tanks were the terrain makes the tank pitch at the natural frequency of its spring suspension.

While the shaker test is operating, the gun must be held within the limits which are recorded on a moving chart made by a pencil fastened to the gun barrel. The chart is rigid with the base of the equipment. Each unit is checked on one of these stands, which also checks the electrical components.

In addition to shop test equipment, units are spot checked in actual tanks on the test track adjacent to the factory. Not only sighting observations but "shooting" tests are conducted by using a gun camera. The camera is mounted on the gun barrel and its lens has cross hairs which are lined up with those in the tank sights. Both single shot and moving pictures are used.

The Inventor

This device, which is giving American tankmen a decisive offensive advantage over the tanks of the enemy, was invented by Clinton R. Hanna, research engineer for the Westinghouse Electric and Manufacturing Company. Mr. Hanna started work on the gyro stabilizer in the Westinghouse Research Laboratories at East Pittsburgh, Pa., in 1939. The device was adopted by the United States Army and first put into use in 1942. It is now being built into every American tank shipped overseas, and units are also being supplied to the British and to Russia.

For his solution of the problem of making tanks mobile while firing, Mr. Hanna was given a Presidential citation in 1942. At that time it was held in such secrecy that this citation did not even vaguely describe what he had invented. Now that its real merit is known, it is plain that the modest, soft-spoken research engineer, at the age of 44, has given his nation a contribution that has saved and will continue to save countless lives of his countrymen.

Post-War Uses

The benefits of the gyro stabilizer will not cease when the war is won, Mr. Hanna believes. He has ideas about applying the principle to many peacetime jobs. The same principles that enable American tanks to fire on the run with deadly effect promise to provide "floating" rides in high-speed trains and other vehicles. Calculations show, for example, that only about three horsepower are needed to stabilize the vertical movement of a railroad coach. Since stabilizer power and size vary as the mass and as the square of the fluctuations, an automobile and a railroad car would require units of about the same size since an automobile although lighter in weight, vibrates more excessively. The railway and automotive fields are merely typical of possible applications of the general principles of the stabilizer; such principles are applicable wherever stability is required in a member of a body in motion.

SOME OF OUR BOYS—

Those Heat Power Boys—

Librarian—
H. Cain

Teskoski and His Women

The Boy Who Studied Himself Out of V-12

TESTING AIRPLANE MOTORS AT 30,000 RPM.

The creation of small high-speed motors for airplanes has been going forward at a rapid pace under the impetus of war. To help analyze the performance of such machines, Westinghouse small-motor designers have built their own test dynamometer. In the past, dynamometers suitable for testing motors and generators at speeds up to 20,000 rpm have not been available. Performance of some high-speed motors of conventional design has been determined reasonably well by extrapolation of curves based on data obtained at slower speeds and on one or two spot checks obtained by driving high-speed fans of known characteristics. But the performance of the new types of airplane motors needs to be obtained with precision from actual tests.

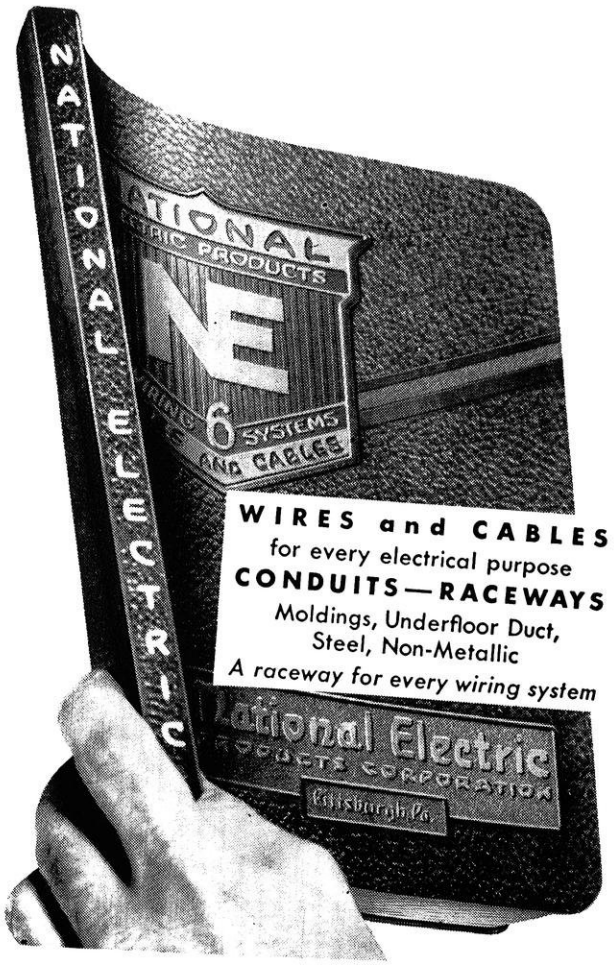
The new high-speed dynamometer is capable of testing machines of 1/100 to 3/4 hp, and is frequently operated at speeds up to 25,000 rpm. It has been run as fast as 30,000 rpm. With aircraft motor needs so great, no attempt has been made to determine whether it can be safely run at higher speeds. The dynamometer is of the conventional cradle type, but uses special low-loss steel in the armature and embodies every known expedient to provide high bursting strength. It is strictly a laboratory instrument; commercial models will not be available.

ELECTRIC FURNACES KEEP FISH COMFORTABLE

Insect laboratories have been air conditioned, dirigible rivets have been refrigerated so that they can be driven better, and there is even a case where telephone books have been cooled mechanically to speed the hardening of the bindery glue. But it is only recently that a General Electric air conditioning and automatic heating distributor made the first automatic heating installation designed specifically for the comfort and health of tropical fish.

Devil fish, sharks, rays, the only porpoises in captivity, and thousands of other unusual specimens find their adopted home in the Marine Studios, Marineland, Fla. There, in huge tanks literally perforated with glass portholes to facilitate study and photography, the many specimens live together. Unlike ordinary aquariums the marine life at Marine Studios is not segregated by species but is placed together much as it exists in its native waters.

But the tropical fish require water that is not only filtered and aerated but is also held at a temperature of approximately 70 F.—considerably higher than the year-round temperature of the natural water supply at Marineland. So the Southern Air Conditioning Corp. installed five G-E oil furnaces, which hold the 500,000 gallon "oceanarium" at a temperature just like home for the transplanted tropical specimens.



MORE STATIC . . .

"Ah wins."
"What yuh got?"
"Three aces."
"No yuh don't. Ah wins."
"What yuh got?"
"Two eights and a razor."
"Yuh sho do. How cum yuh so lucky?"

•

She was only a conductor's daughter, but she certainly had a low resistance.

•

"You can't talk about my friend that way. As a dancer she's one of the best. Why, she's famous all over the country."

•

She was only an optician's daughter, but two glasses and what a spectacle she made.

•

She was only a grave-digger's daughter, but how she could lower the bier.

•

"Who was the cleverest inventor?"

"Edison. He invented the phonograph so people would stay up all night to use his electric light bulbs."

We were never able to find grandma's glasses, but now she leaves them just where she empties them.

•

Exercise kills germs, but we haven't found out how to get the darned things to exercise.

•

"Busy?"
"No, you busy?"
"No."
"Let's go to class then."

A beautiful co-ed (from some other school) was wearing a blue sweater: it was one of those marvelous form-fitting kind.

Said she, coyly: "Don't you think it brings out the blue in my eyes?"

He: "Gulp."

WATTHOUR METER . . .

(from page 8)

A complete report of the calibration data is written up for the owner and also stating any tendency toward erraticness or weak points. A summary of the calibration is placed on a card similar to that shown in Figure 3. This card is placed in the meter cover for reference during test work in the field.

The work at the University of Wisconsin Electrical Standards Laboratory is under the direction of Prof. L. C. Larson. The work is done by part-time University students. This plan was devised not only as a source of income but also as an educational program for students

From the student viewpoint, the above work is of interest because it provides the student assistants with valuable experience and some income. The training so received has often placed these students in responsible positions in various electrical utilities.

ALUMNI NOTES . . .

(continued from page 13)

BROWN, R. T., '44, was recently hospitalized with an attack of poliomyelitis. Later he contacted chicken pox, but is now improving satisfactorily.

CALDWELL, DONALD, '44, former business manager of the ENGINEER, is taking primary as a radio technician at Oklahoma A & M, Stillwater, Okla.

CALDWELL, JOHN, '44, Ensign USNR, is also stationed with Beyer with the Clinton Engineering Co. He was hospitalized and returned to Columbus, Wis., for convalescence.

•

Electricals

SCHINK, WILLIAM N., '42, was in Madison recently for a two weeks' vacation. He is an Associate Engineer with the Navy Dept., Bureau of Ships, in the standardization and coordination of radio electron tubes.

SALAY, JOSEPH B., '43, is doing design work for the Navy Dept., Bureau of Ships, Electrical Section.

LOWER, JACK W., e'43, has worked as a development engineer on Navy Airborne radar with Zenith Radio and Hazeltine Corporation for two and one-half years after graduation. Jack was inducted into the U. S. Army May 14, 1945, and now is working as an electronics and radar specialist at Wright Field, Dayton, Ohio.

CREMER, JOHN B., '44, Ensign USNR, is doing research in marine mine warfare at the Naval Ordnance Laboratory, Washington, D. C.

HALGREN, J. H., '44, has been employed by RCA, Victor Division, as Contact Engineer to Government Agencies and Laboratories, East Orange, N. J.

COMINGS, W. S., '45, has obtained a position with the Minneapolis-Honeywell Regulator Co. as Field Engineer teaching maintenance and operation of automatic flight control equipment.

OLESON, MERVAL W., e'45, is now serving in the Navy as a Radio Technician 2/c. His work consists of radio maintenance and repairs. Recently Merval met several Wisconsin men in Washington, D. C.—Ensign John Cremer, Willard Swanstrom, Art Luebs, Joe Salary, George Zuehlke, and John Halgren.

BRADY, GORDON F., recently returned from India where he was with the 20th Bomber Command. He is now working out of the Chicago office of the General Electric Co.

KLANG, DONALD E., Ensign USNR, is studying radar at the Naval Training School, Camp MacDonough, N. Y.

LUER, VERNON, T/S U. S. Army, wrote his former adviser, Prof. Larson, recently regarding the possibility of continuing his studies by correspondence.

Lady Macbeth needed an electric washing machine

LADY MACBETH was the original lather lady! She hated spots. A "Damned Spot" . . . to be exact. In fact it was a tell-tale spot of blood that caused her downfall, according to Will Shakespeare, the w.k. Bard of Avon. All Lady Macbeth needed was some peroxide, cold water and an electric washing machine . . . to change her destiny.

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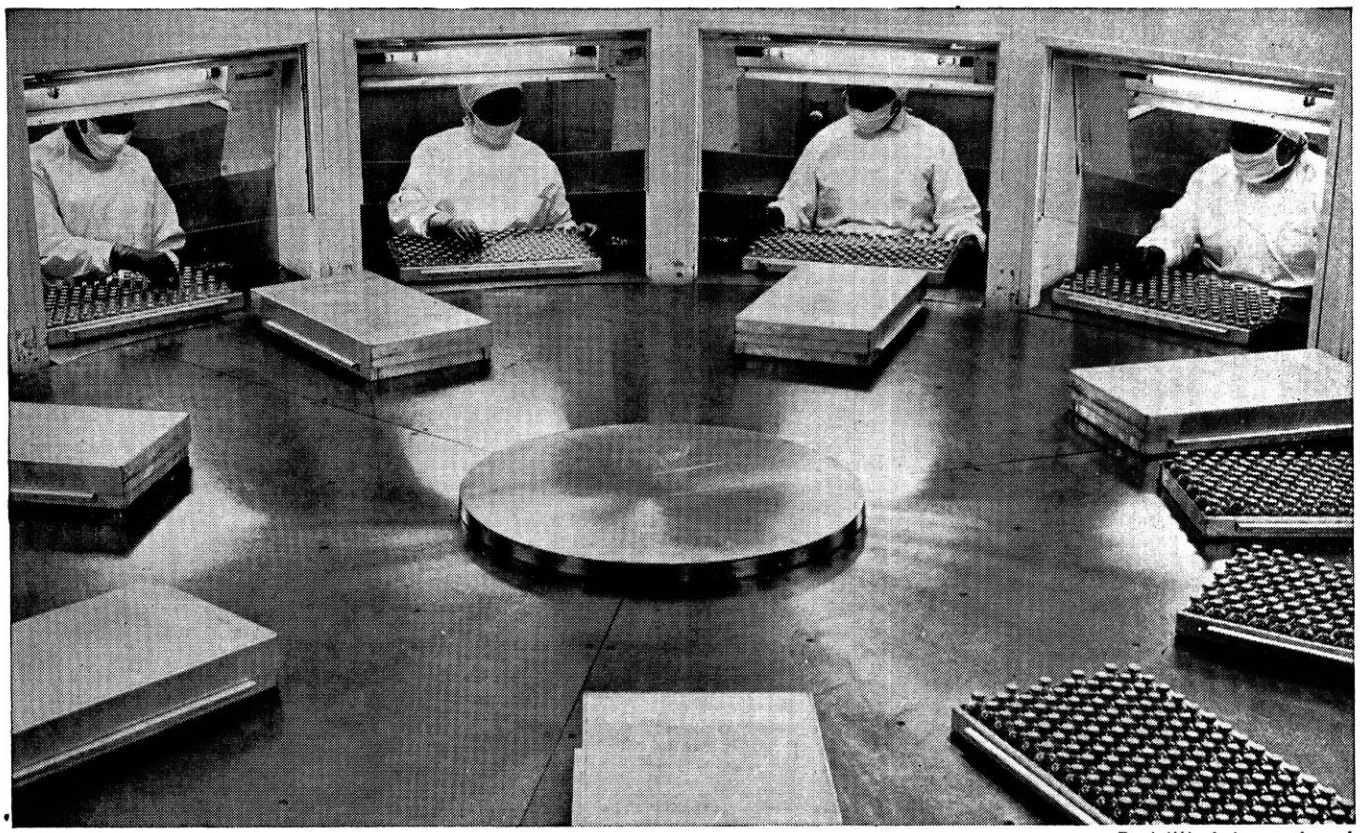
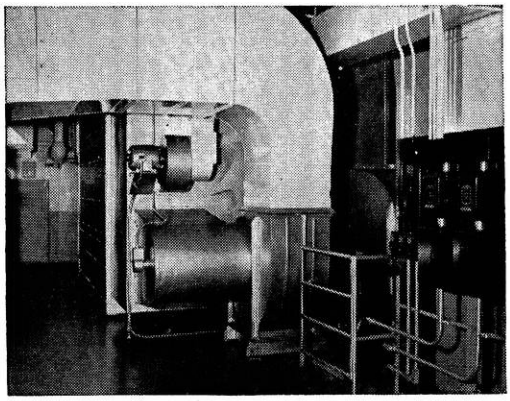


Penicillin being packaged

World's Largest Producer of Penicillin

uses GAS for important operation



Penicillin drying unit

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THAT'S RIGHT...NOTHING. A blank, an absence of anything ...or, technically, a high vacuum...is all-important to television.

For a high vacuum in a television tube is necessary for control of the electrons that make television a reality.

The first step toward a high vacuum is pumping the air out of the tube. But pumping won't remove enough of it.

Here's where a "getter" of barium, one of the less common metals, comes in—and more air goes out of circulation. Inserted inside the television tube, the barium "getter" is *flashed* from the outside by electricity. Instantly it vaporizes and entraps the remaining air.*

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**Barium has a high affinity for oxygen ...and other gases. When the "getter" is flashed in television or radio tubes, molecules of hot metallic vapor combine with...and immobilize...remaining particles of air. The barium, with the "captured" air is deposited as a silvery film inside the tubes.*

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