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WISCONSIN ENGINEER

IEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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A Valuable Post-War Asset for Every Student Engineer . . .

Until Victory has been won, all the Timken Tapered Roller Bearings we can make will continue to go into war equipment of all kinds and into the many different types of machines that help to make them.

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TAPERED ROLLER BEARINGS

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LANDING ON A DOT is commonplace for our warplane pilots today, thanks to new blind-flying instruments made by Westinghouse. There are two pointers in the instrument — one to give pilot his *direction* — the other, his proper *gliding angle.* By manipulating flying controls to keep both pointers crossed over a dot on the dial, pilot can locate field and land blind in fog or darkness.

ALL THE KING'S HORSES — 990,000 of them—would be needed to equal the power generated by six giant Westinghouse water-wheel generators at Grand Coulee Dam—largest of their kind ever built.

ZIP . . . A certain type of gyro flywheel must snap up to full speed (12,000 rpm) *in just 1/5th of a second.* Westinghouse engineers devised a 10½ pound midget 22 horsepower electric motor to do the job. Secret of fast starting lies in special brushes that carry 600 amperes to the armature—at a density of *1600 amperes per square inch of brush area.*

YO! HO! A 50-foot mast performing sea service many miles from salt water, rolls more wildly than any crow's nest in a storm. The mast top travels 30 miles an hour, in swinging back and forth through a 90° arc every six seconds. Westinghouse developed this land-going mast to test sensitive shipboard electronic devices under conditions more severe than they will face at sea.

SAVED—800 MAN-HOURS PER SHIP. By changing the design of Victory ship gear cases, Westinghouse engineers saved 1/5 of a mile of arc welding (about 800 man-hours) on each case. Bending some of the thick steel plates, to make right angles (formerly welded), made possible this important saving in production time.

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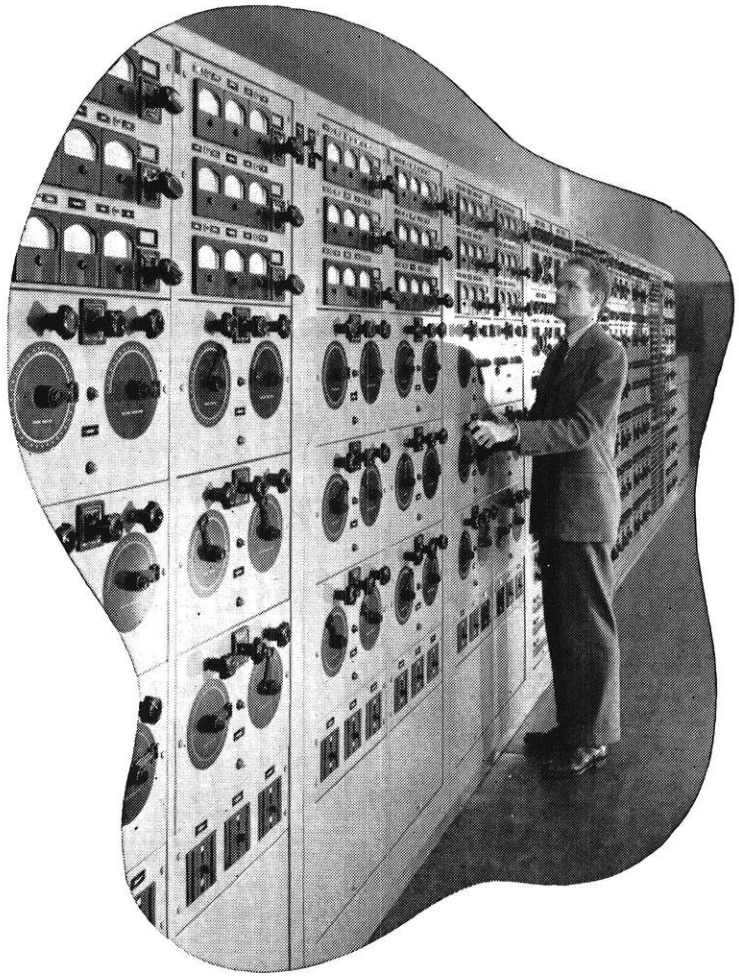
The above items are condensed excerpts from articles in the WESTINGHOUSE ENGINEER, a bi-monthly engineering review. Regular subscription price—$2.00 a year. *Special price to students—50¢.*



Getting the right answers—*fast!*

Pictured above is a remarkable "electrical brain" that enables an engineer to solve—*in a single hour*—intricate calculations that would take him more than 100 hours by mathematics. And other calculations, impossible to compute by *any* other method, are easily solved.

It's the new Westinghouse Network Calculator. The first model was developed in 1929 by Westinghouse engineers to help them analyze the electrical characteristics of a huge power system—by creating a *synthetic replica* of the system to laboratory scale.

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Today, this new and improved Westinghouse Network Calculator is available at our East Pittsburgh Works for making studies of public utility and industrial power systems. Another Westinghouse service to industry — giving the right electrical answers — fast. *Westinghouse Electric & Manufacturing Company, Pittsburgh 30, Pennsylvania.*

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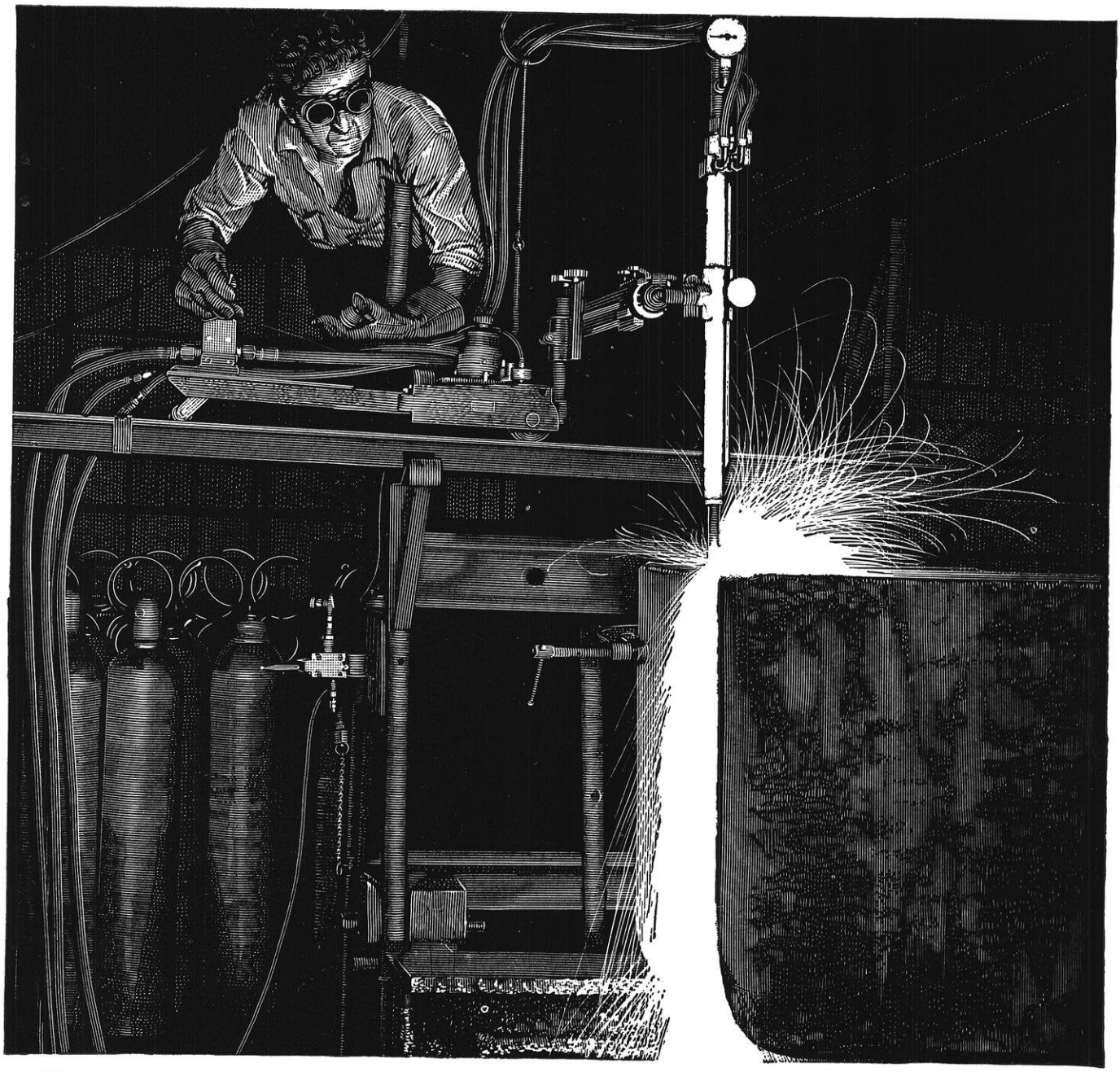
In This Issue . . .



Cutting 1000 Hours Off an Ordnance Schedule

Under the piercing heat of the oxy-acetylene cutting flame, thick metals like this 32" alloy steel block are shaped into parts for heavy weapons faster than ever before.

For example, the flame cutting operation shown here saves more than 1000 hours machining time in producing one heavy part for ordnance use. Similar valuable savings in time and labor are being achieved on hundreds of other war production schedules by this method . . . cutting steel up to 51" thick on a fast, production basis.

Air Reduction engineers have pioneered in the development of many machine flame-cutting methods to speed operations in war and peacetime industry.

If you would like to receive our informative publication "Airco in the News," we shall be glad to send a free copy. Write to Mr. G. Van Alstyne, Dept. C. P., Air Reduction, 60 East 42nd Street, New York 17, N. Y.

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O W I Photo by Palmer, in an Allegheny Ludlum Plant

Final Examination

BEFORE STAINLESS GETS ITS WINGS

REDUCE ACCIDENTS!

In 1941, accidents were first cause of death among men from 22 to 38 years of age. The productive man-days lost were enough to build twice as many battleships as now possessed by the combined Allied Navies.

These are losses that *can* be avoided. Don't take unnecessary risks at any time; and later, when you enter business life, remember that carelessness is the single greatest factor in human and economic loss.

A GREAT deal of costly processing is done on stainless steel, to secure the physical characteristics and surface finish required for the particular war job it is to perform. But one day all the rolling, heat treating and surface finishing is completed, and bright sheets of Allegheny Metal lie ready for final inspection and shipment to the war plants.

They're *right,* those sheets—flawless of surface and true to specifications. They'll do their job and more—which is what everything and everybody *must* do, in a war like this. In the case of stainless steel, that job is the supplying of vastly increased strength with equal or decreased weight, and high resistance to heat and corrosion. These are qualities of great value now, and of even greater promise for the future.

AL

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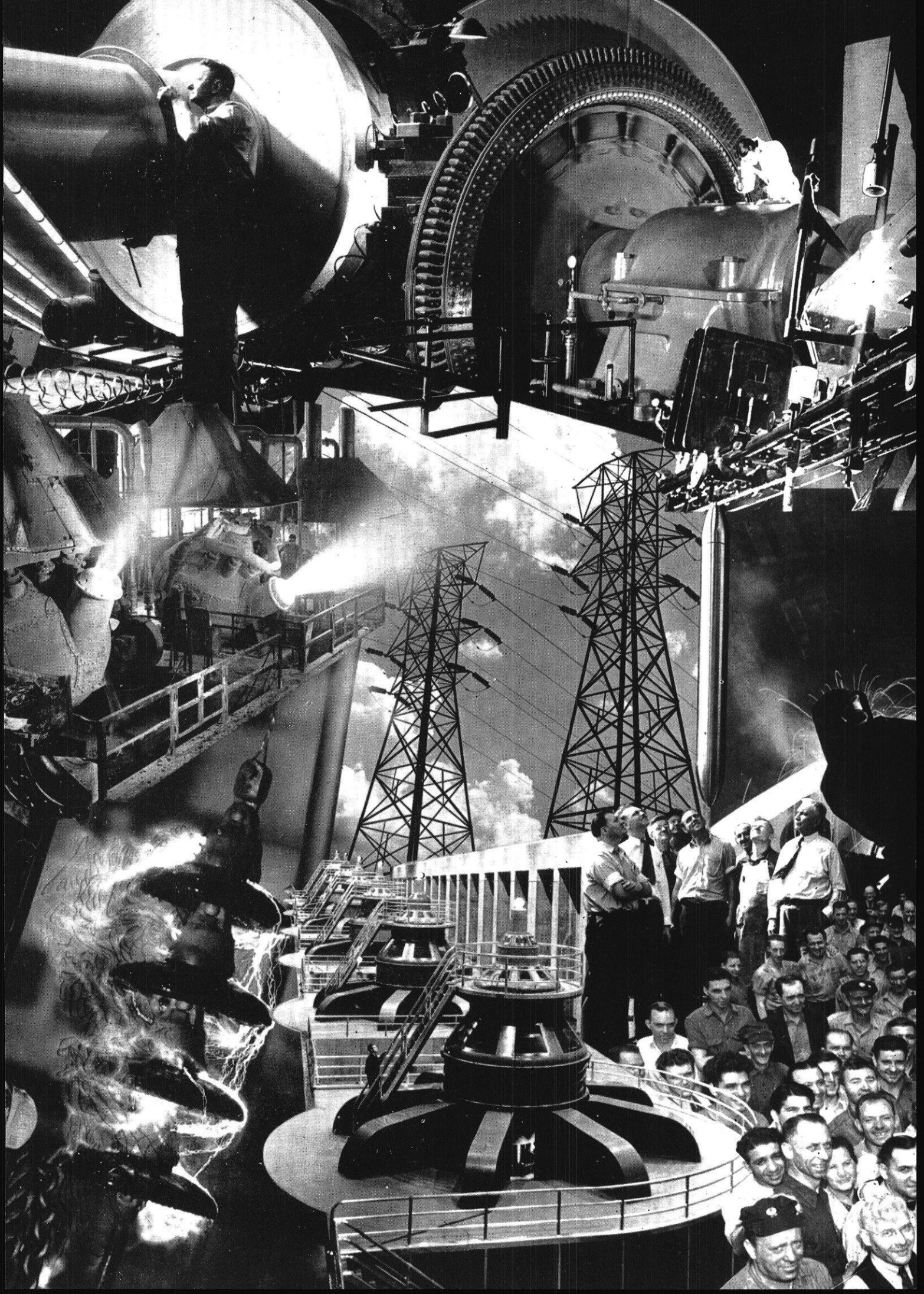


SERVICE ENGINEERING

by Drake

THE SITUATION. Because of the enormous complexity of the modern airplane, and because of the great number and variety of its engineered parts, servicing the plane has become an engineering problem requiring careful attention. And because of the importance of aircraft in warfare, plane servicing is a matter vitally affecting our national safety. At some points we are taking severe losses for lack of such attention.

Not long ago, flying the plane was done by so-called "practical" men, who took pride in having learned the art by their own experience, "the hard way". Servicing too was done by men of the same school of thought. More recently, however, flying is done by delicate scientific instruments rather than by the instinctive reactions of the pilot. Not only must our servicemen be highly qualified, but we must have them in unprecedented numbers, and quickly, to man the clouds of ships we are now producing. Hence, the necessity for dependable, detailed instruction covering all phases of operation, repair and maintenance of our ships. It must be the very best available.

The Necessity For Servicing

According to reports, a consignment of planes went to one of our allies. For lack of adequate servicing instructions, a painfully small percentage of the planes was ever in the air at one time. A low performance rate was inevitable.

How many times could the enemy have blasted our bases in Alaska while we were trying to get our engines started, if we had not been well prepared with a winterization program!

Because of a misinterpretation of the **breakdown diagram** in a service manual (maybe it should have been called the **buildup diagram**) a service station requisitioned a hoisting device costing $24,000 to lift out the center wing panel of a plane. The plane did not disassemble that way; the special equipment had failed of its purpose. Servicing, somehow, was not adequate! Could it be that the manual writer had used poor English?

A report described eleven expensive planes, storm-blown into a heap at one corner of an airfield. Possibly it was inadequate mooring; or perhaps it was total lack of mooring. Less spectacular, but still involving money enough to pay a college president's salary for several years, was a "small" accident caused by careless mooring service. During the night a tire deflated, allowing one wing-tip to go down. The other wing-tip went up, incipiently, but being anchored, held, and distorted the wing structure. When a million dollars buys only a few planes, replacement of a wing means loss of precious time and treasure.

In the matter of airplanes, the penalties of neglected maintenance are so obvious, so immediate, so certain, so terrible, as to prohibit neglect. Even the unspectacular maintenance problems are fraught with punishments for error. Consider the problem of selecting the oils and greases required for lubrication. Someone must make up a lubrication chart, and show on a picture of the plane what lubricants to use and where and how often to use them. A plane weighing perhaps 100,000 pounds comes in for landing, hitting the ground at a speed of 120 miles per hour. To take that stupendous shock, one or more air-oil shock struts are incorporated in the gear. What fluid shall be used to provide cushioning effect in all weathers and temperatures from 50° below to 130° above? For the 50-caliber machine gun, firing hundreds of rounds per minute at 130°, and within a half hour firing at elevation 35,000, temperature minus 50? Shall the same oil be used throughout the plane's hydraulic system with its mile of piping, hundred valves, many motors, and accumulators? Many mechanisms of the plane must be studied for their lubrication requirements, considering material, speed, load, temperature.

Army orders restrict the number of lubricants to less than a dozen. Then there is the problem of determining equivalents among commercial products, preferentials, permissibles, availables, and at the same time treating all vendors with fairness. Fortunately the customer assumes the responsibility of procuring and storing the material, and of establishing the control to ensure that the lubricants, once in the depots, will be used with the skill and regularity necessary.

The service engineer is now a school teacher with a tremendous responsibility. Let us see whether his plans bid fair to get better results than those obtained by the so-called "practical" methods.

The Place of Servicing

Whose Job? The manufacturer, having created, developed, and constructed the plane, is generally considered the party best qualified to engineer a maintenance program. As the housewife said of the housework, **Who else is there to do it?** It is therefore usual for purchasers, mili-

THE AIRPLANE

P. Dale, ce'17

tary and civil, to contract with the manufacturer at the time of purchase, for engineering service of some kind.

Evolution of the Servicing Function. It may be noted that in highway and railway transportation, the emphasis tends to shift, in time, from construction to conservation; that in any transportation system, the basic principle of maintenance—an ounce of prevention is worth a pound of cure—is sound; and that so long as there are airplanes, intensive and extensive maintenance will be demanded. If there is poor airplane servicing, there will soon be no airplane.

The Place of Servicing in Aeronautics. Service-engineering the plane, although an important matter which has been too often neglected, is after all only one of many problems to be cared for by the organization which creates and constructs the particular plane. The service engineer must cooperate intelligently and harmoniously with other individuals and departments and industrial enterprises at many points of contact. In a large community of specialists he must know his way around; he must know how to utilize the many available resources; he must give as well as take. If he is to service a machine, he must know that machine, and must keep up with it in its constantly evolving design. And then there are the processes by which it is produced, the costs and problems of production.

The progressive service engineer will take even a larger view. He will watch developments in the field of airplane transportation, and play a part in that rapid expansion which has been the trade mark of aviation ever since the Wright brothers crossed the threshold of the new era. He may go as far afield as medicine and law, where they affect his specialty.

At 40,000 elevation the pressure is less than three pounds per square inch. Oxygen for this and for much less elevations must be provided; passenger fatigue at 8,000 elevation is a well known incident. Ensuring oxygen is a function of the service department; traffic regulations and related laws are already important in airplane operation. The necessary clearance for landing and for taking off is arranged by radio, lights, and communicating devices, items requiring specific servicing. In busy traffic centers, servicing and safety-regulating the many planes are features now restricting needed expansion. It's the service engineer's move!

The Place of Servicing in the Corporate Organization. By the functional organization of a typical plant, there are four principal executives, with duties somewhat as follows:

The Chief Design Engineer is head of a staff of specialists, in aero-dynamics, thermodynamics, structures, materials, testing, hydraulics, general design, etc. These specialists are available for plant and sometimes interplant consultation, and constitute a supreme court in resolving engineering problems. Let not the service engineer feel that he has no concern in design, for planes must be maintained essentially as they were designed.

The Administrative Engineer handles correspondence; specifications; blueprint reproduction, and filing; personnel; planning and scheduling, and drawing changes.

The Chief Draftsman sets up drawing standards; manages layout reproduction, coordination with tooling, liaison coordination, lofting, patterns, plastics, X-ray, photography.

The Chief Service Engineer is executive in service engineering; supervises preparation of service manuals and service bulletins; he administers the field service.

In the **project** organization are as many separate projects as there are plane models being developed or produced. Planes in the design-mockup stage require the largest staffs; conversion projects relatively smaller ones. Planes in full production, such as the Liberator Bomber, must maintain staffs. Changes in design are continually being made. These are the bugbear of production, involving tedious revisions in the drawings, vexatiously interrupting production and inspection routine, and requiring special groups of facilitating personnel for their administration. It is as if class schedules in college were being daily rearranged. But mechanical progress will go on; what cannot be cured must be endured.

A full project organization typically includes a number of groups, each consisting of a few score draftsmen under a group leader, all under the general supervision of a chief engineer and his staff. Typical groups are Fuselage, Wing, Power Plant, Armament, Control Surfaces, Radio, Hydraulics, Electrical, Plane Controls, Structural, Furnishings, Landing Gear, Thermo-dynamics, General Design, Weights. These groups get out the detail-assembly, and installation drawings for shop use. They are controlled strictly by contract and specification data, and by general features evolved by design specialists considerably higher in the organization.

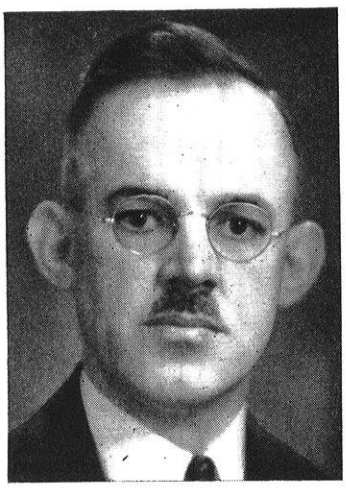
(continued on page 26)

PROFS IN

by

G. F. TRACY

Gordon F. Tracy, Associate Professor of Electrical Engineering, was born February 16, 1896 at Toronto, Ontario.



G. F. TRACY

He attended the University of Ontario from 1914 to 1916 at which time he enlisted in the armed forces of Canada, later returning to the same university graduating with the degree of B. A. Sc. in 1921. From 1924 to 1925 he went to M. I. T. where he received a degree of M.S. in 1925.

He is a member of Kappa Eta Kappa, Sigma Xi, Tau Beta Pi, A. I. E. E. and S. P. E. E.

At the University of Toronto he was employed as a full time research assistant from 1921 to 1924 studying frequency control for large A. C. generating systems. In 1925 he came to the University of Wisconsin and has been here ever since, with the exception of one year leave of absence in 1938 spent at the University of Toronto. From 1925 to 1928 he was an instructor at the University of Wisconsin. In 1928 he received the title of Assistant Professor of Electrical Engineering which he held until he was promoted to Associate Professor of Electrical Engineering in 1937, a position which he still retains. He has worked for seven summers for the Allis Chalmers Company in the A. C. design department.

In 1925 he married Jean Sword at Toronto. The Tracys have two children, a daughter Helen and a son, Robert.

At the outbreak of World War I, Prof. Tracy had just completed his sophomore year in college and at that time enlisted in the Canadian Expeditionary Force and later became a sergeant in the Signal Corps. He was an instructor in a signal school in England and later in France. (Prof. Tracy commented that the three year lapse between his sophomore and junior years did not hamper him to any great extent which should be of some consolation to present draftees).

Professor Tracy has been Chairman of the Board of Directors of the "Wisconsin Engineer", holding the position for five years. At the same time he also was student counselor for the A.I.E.E.

He has published an article on the applications of the Watt Oscillograph in conjunction with Prof. Kelso, and also an article on methods of starting large single phase generators.

He is interested in music and is an ardent devotee of Symphonic and classical music. His basement workshop and Victory garden receive a good share of his spare moments. It has been a custom of the Tracy family to motor each summer to Ontario.

•

O. E. HOUGEN

Olaf Andreas Hougen, Professor of Chemical Engineering, was born at Manitowoc, Wisconsin, October 4, 1893.

Professor Hougen graduated with honors from the University of Washington in 1915 with a degree of B. S. At the University of Wisconsin he received his degree in Ch. E. in 1918 and seven years later in 1925 obtained the degree of Ph. D.

He is a member of Alpha Chi Sigma, Sigma Xi, Delta Pi Epsilon, Phi Beta Kappa, Phi Lambda Upsilon and Tau Beta Pi. He is also on the National Defense Research

O. E. HOUGEN

Committee and is treasurer of the Wisconsin Norwegian Relief Society. Professional organizations to which Prof. Hougen belong include A. I. Ch. E., S. P. E. E. and the American Chemical Society.

WHO'S WHO - - -

Ed Brenner, ch'44

In 1919 he married Miss Olga Berg at Madison, Wisconsin. The Hougens have one daughter, Esther.

Prof. Hougen was an instructor at the University of Wisconsin from 1917 to 1918. As a research chemist he worked for the Carborundum Company during the years 1918 and 1919. He was Technical Director of the United States Testing Company located in Hoboken, New Jersey from 1934 to 1935. From 1936 to 1937 he was Professor of Chemical Engineering at Armour Institute of Technology. Since 1937 he has been an Assistant Professor of Chemical Engineering at the University of Wisconsin.

During his summer vacations Prof. Hougen has worked for various industries engaged in the production of such products as textiles, oil, pigments, leather, etc. In the first World War he was in the Chemical Warfare Division engaged in production service.

He is co-author of two textbooks, one being "Industrial Chemical Calculations" and the other "Chemical Process Principles". He has also written chapters in several other books. Prof. Hougen has published over sixty papers covering many fields including refractories, heat transfer, textiles, gas absorption, drying, leather, etc.

At present Prof. Hougen is engaged on three projects for the War Production Board including the thermal production of chlorine. He is also the chairman of the Projects Committee of the American Institute of Chemical Engineers. The present work of the organization is to supply the Russian Government with information for Chemical Engineering education in Russia.

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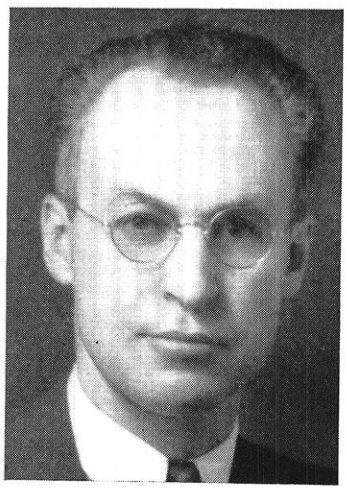
D. W. NELSON

Delmar Wood Nelson, Associate Professor of Mechanical Engineering was born at Peshtigo, Wisconsin in the year 1896.



D. W. NELSON

He received his schooling at the University of Wisconsin obtaining his B.S. degree in 1920 and an M.E. degree in 1921. After spending several years in industry he returned to the university to obtain his M. S. degree in 1931. During his undergraduate days he was a member of A. S. M. E. and was elected to Pi Tau Sigma and Tau Beta Pi. Later he became a member of Sigma Xi, A. S. H. V. E., S. P. E. E., and the Wisconsin Society of Professional Engineers.

During the summer of 1916 he was employed with the Ford Motor Company. In the World War years 1917 and 1918 he worked for the Bethlehem Steel Company, later accepting a position with the Republic Rubber Corporation where he was in charge of the testing laboratory. From 1918 to 1919 he was employed by the Nordberg Manufacturing Company and was with the Brunswick Balke Collender Company from 1921 to 1922. At the Goodyear Tire and Rubber Company, where he worked from 1922 to 1923, he was a checker of designs and calculation in the airship division. During the summers of 1923 to 1927 he was employed with the State of Wisconsin Engineering Department.

Professor Nelson has been at the University of Wisconsin since 1923 where he was an instructor until 1927 at which time he was promoted to an Assistant Professor. In 1937 he received the title of Associate Professor which he still holds.

Prof. Nelson has been the author and co-author of over a dozen publications on heating and ventilating, the emphasis being on air distribution.

In 1922 he married Miss Elizabeth Miller. The Nelson family consists of two daughters, Marjorie and Ruth.

Professor Nelson has been active on numerous heating and ventilating committees. He is at present the chairman of the Wisconsin Chapter of Heating and Ventilating Engineers. He is the faculty advisor of A. S. M. E. and is a member of the University Nominating Committee. For the past fifteen years Prof. Nelson has been the treasurer of the University Methodist Church.

PLASTICS FROM ACETYLENE

by Jack Strohm, ch'45

ONE of the most important chemicals in the industrial world of today is the wonder compound made from coal, limestone and water—acetylene.

Judging by the great demand for acetylene and the ever increasing number of its uses, one might conclude that it is a comparatively new development and was only until recently discovered. Actually acetylene was more familiar to those of the gay nineties than it is to the average person of today. It was used at the end of the last century as a lighting gas in competition with coal gas. All bicycles and automobiles were equipped with acetylene lamps. With the innovation of Edison's incandescent lamp, the field of gas lighting became obsolete overnight except for isolated locations, and then the greatest use of acetylene vanished.

It had been known that when this colorless gas was burned a very hot flame was produced, and it was not long before a new use for acetylene was developed, that of high temperature heating and welding. Its use in welding was developed and today acetylene is almost universally used as the combustible gas in high temperature welding. When used with oxygen in special type burners it produces a flame with a temperature greater than 6,000 degrees Fahrenheit. While illuminating and welding uses of acetylene would be enough to maintain a continuous demand for acetylene, these uses are relatively unimportant, compared to its other applications.

In the middle of the nineteenth century when the nebulous and unknown field of organic chemistry exploded, and was suddenly brought forth to the average man, the real value of acetylene was discovered. From this reactive compound hundreds of thousands of vital materials are now made.

The list of these essential substances produced from acetylene is practically inexhaustible. It would be impossible to innumerate even a fraction of the total number of acetylene products. As an example of the values of acetylene, consider the importance of one of the many substances prepared directly from it, acetic acid.

Acetic acid is now made almost entirely from acetylene. Although it was made by fermentation and other processes, the industrial trend has been toward the acetylene process. Since acetylene itself is merely made by heating limestone and coal in an electric furnace to obtain calcium carbide which, when treated with water yields acetylene, the availability and low cost of this principal raw material has outmoded the fermentation process. Outstanding uses of acetic acid are in textile manufacturing, synthetics, dyes, manufactured solvents, and the preparation of other essential chemicals, such as acetic anhydride, acetone, and acetaldehyde. Acetic acid is so important that two hundred million pounds of the acid are produced annually. Other acetylene derivatives are of even greater industrial values than acetic acid. When one considers the actual chemicals and substances produced, and then the materials produced from these new chemicals one begins to realize the tremendous importance of acetylene.

With the current war and shortages, the uses of acetylene have been increased, and expanded to include many synthetic developments.

Then the vast field of plastics which has just recently been thrown open to full scale uses is abundant with acetylene products. Three of the fundamental groups of plastics are dependent on acetylene as an essential component of the finished product. The first group is the acrylic resins which are manufactured from the acetylene derivatives, acrylic acid. Acrylic acid is commercially prepared by treating acetylene with special catalysts at high temperature. Acrylic resins have excellent stability to light, a property lacking in many plastics, unusual optical clarity and brilliance, and high refractive indices. These refractive indices are so high that these resins can actually bend a beam of light around a corner. The acrylic resin group comprises many different varieties of plastics. Some of the more common varieties of acrylic resins are acryloid, cell-o-silver, cell-o-glass, and clearsite.

Another great group of plastics is the vinyl varieties, commercially made by catalytic dehydrogenation and coupling of acetylene. These vinyl resins were a German specialty, but are now well known in America. Vinyl resins have been light stability that most varieties, but have poor electrical properties. Some common vinyl plastics are elastiglass, alvar, vimlite, and saflex.

The third group of acetylene plastics is the cellulose acetate type. Again the principal material used in their manufacture is derived from acetylene. Important examples of this group are crystallite, bakelite, and polaroid.

(continued on page 21)

CAMPUS NOTES

by John Tanghe, ee'44

The university police at last

have found a legal claim against Frank Hyland's (EE 4) red and white Ford flivver. Joe Hammersley, everybody's friend, presented him with a ticket for no '44 plates while parked at E. W. Easter evening. Too bad Frank!

Lazy engineers!!!

The members of Kappa Eta Kappa, electrical engineering fraternity, have rigged up an inter-room loudspeaker system which enables the fellas to talk to each other without leaving their rooms. Pretty soft!

Scene through a keyhole:

Harvey Zielke (M&ME 4) listening to the record "Por Jud Is Daid" from "Oklahoma" by the hour. Incidentally, Harvey claims that reading the Engineer is non-habit-forming. Hmmmm!

Bert Lloyd, E. E. lab meter man, tossing a wet rag across the lab in defiance of snippy engineers.

Heavy-dating engineers breathing a sigh of relief and catching up on their report-writing when the gals went home for spring vacation.

Peggy, Triangle's canine mascot, spending her free time chewing up candy, bedroom slippers, sliderules, etc. around the house.

Engineers putting last deferment hopes in Form 165.

Wisconsin Engineer staff tripling since June Hartnell, fair EE 1, has joined the staff.

Bob Lawrence (EE 4) calling for a date at Lizy Waters and forgetting to have her paged. Guess he's been going with that town girl too long now.

Prof. R. Ragatz of Chem. Engineering Dept. predicting "darker days" for the engineering students just a week before the quota was abolished.

All the engineering fraternities planning wild pre-induction parties. Wheee! KHK's social chairman frantically searching for a deaf, dumb, blind, and tasteless chaperon who is unable to climb steps.

Engineer members of Theta Chi cooking up a really "super" initiation for their lone lawyer pledge. Take it easy, fellas—St. Pat's day is over (but not forgotten, no?)

SOCIETY NEWS

Eta Kappa Nu

The first meeting of the present semester was held on Wednesday, April 5, in the Memorial Union. Officer's duties for the semester were discussed and the financial standing of the organization was outlined. A four-step social and business program for the semester was proposed and agreed upon.

A. I. Ch. E.

Mr. Thorwald A. Carlson of the Forest Products Lab presented an interesting talk on "Wartime England" to the A. I. Ch. E. on Wednesday evening, April 12, in the Memorial Union.

Financial and membership reports were given and plans for the coming party and summer picnic (Local Board permitting) were made. Co-chairmen for each of these events were announced. Those in charge of the summer picnic are Stan Fulwiler and Jack Strohm, while the co-chairmen of the dance are Bob Wagner and Dick Novotny.

Refreshments were later served in the Paul Bunyan Room.

Mining and Metallurgy Club

On Tuesday, March 28, a meeting of the Mining and Metallurgy Club was held for the purpose of electing new officers. Those elected were Harvey Zielke (M & ME 4), President; Harold Goldfein (M&ME 4), Vice President; and James Hall (M&ME 3), Secretary and Treasurer. Plans for a party or picnic in the future were discussed and the meeting was then adjourned.

A. I. E. E.

Doctor W. E. Gilson spoke before the A. I. E. E. on "Electronics in Medicine" Wednesday, April 5.

John Shaw, Polygon representative, reported on outcome of St. Pat's campaign and in addition reported on the smoker to be held in the near future.

The business meeting was then adjourned and refreshments were served in the Rathskeller.

—Richard Novotny

What the '44 Grads Are Doing

by Melvin Sater, ch'44

Chemicals

ANDERSEN, JOHN W., is in Milwaukee awaiting action on his application for a Navy commission.

BEYER, GERHARD H., is on active duty as an ensign near Knoxville, Tenn.

BEYER, JAMES H., is an ensign in the Navy and is stationed at Fort Schuyler, N. Y.

CALDWELL, JOHN R., is on active duty as an ensign near Knoxville, Tenn.

DISMAN, SOLOMAN, is with Abbott Laboratories, North Chicago, Ill.

HOFFMAN, KENNETH P., is with Victor Chemical Company, Chicago Heights, Ill.

JACOBSON, E. WILLIAM, is located in California with the Standard Oil Company of California.

JAEGER, BERNARD O., is in Decatur, Ill., with the Houdaille-Hershey Corporation.

KEATING, JAMES C., is with the Standard Oil Company of California and is located in California.

KOZUSZEK, PETER P., is in the U. S. Navy.

KRASKE, WILLIAM A., is at the Institute of Paper Chemistry, Appleton, Wis.

KULCZYCKI, WALDEMAR A., is in the U. S. Navy.

LATONDRESS, EDWARD G., is with Armour and Company, Chicago, Ill.

MARTIN, A. HAROLD, was recently commissioned an ensign in the Navy and was sent to Fort Schuyler, N. Y.

MORMAN, FRANKLIN C., is at Borger, Tex., with the Phillips Petroleum Corporation.

OMAN, ALBERT O., is with Union Oil Company, Los Angeles Calif.

RAHN, WALTER H., is in North Chicago, Ill., with the Abbott Laboratories.

RODGERS, THOMAS T., is also with Abbott Laboratories.

SOIT, RICHARD H., is with the Shell Development Company.

TOMLINSON, CHARLES W., is with Abbott Laboratories, North Chicago, Ill.

VOLLMER, ARTHUR F., is with Houdaille-Hershey Corporation at Decatur, Ill.

WOERPEL, MARVIN D., is working with Prof. Daniel's Nitrogen Fixation Process in Madison, Wis.

YUNDT, CHARLES G., is with the Shell Development Company.

Mechanicals

ANDERSON, ROY I., is with the National Advisory Committee for Aeronautics at Cleveland, Ohio.

BOLZ, ROBERT M., no report.

COSGROVE, DAVID F., no report.

DZIRBIK, EDWARD M., U. S. Navy.

ENGLE, DARRELL G., graduated from V-12 Unit.

ENTRINGER, JAMES S., U. S. Navy.

FOX, ELWOOD A., graduated from V-12 Unit.

GARSIDE, WAYNE H., is at the Naval Research Laboratory in Washington, D. C.

GEIGER, FELIX E., JR., no report.

GREENWALD, ROBERT R., is with the Goodyear Tire and Rubber Company located in Akron, Ohio.

GUTHRIE, CHARLES J., U. S. Navy.

HACKBARTH, REUBEN J., graduated from V-12 Unit.

HAMACHEK, OGDEN D., graduated from V-12 Unit.

HEDSTROM, ROBERT E., is located in California, but no report as to which concern.

JOHNSON, ADELBERT B., U. S. Navy.

KLUENKER, FREDERICK W., graduated from V-12 Unit.

LIETZKE, ARMIN F., is with the National Advisory Committee for Aeronautics in Cleveland, Ohio.

LOVELL, JOHN C., U. S. Navy.

MANN, RICHARD A., is with the Douglas Aircraft Company in Santa Monica, Calif.

MASON, RICHARD G., is with the Fisher Body Company located in Flint, Mich.

MUELLER, F. WILLIAM, is in West Bend, Wis., working with the West Bend Aluminum Company.

REHR, HENRY W., no report.

ROGERS, BENJAMIN T., U. S. Navy.

ROHDE, ROBERT L., U. S. Navy.

SALMI, REINO J., is with the National Advisory Committee for Aeronautics in Cleveland, Ohio.

SMITH, JAMES W., no report.

TRAUTMANN, PAUL R., has applied for the Navy.

Civils

BAUMAN, MERRIT R., is with Douglas Aircraft Company at El Segunda, Calif. His address is 2292 W. 22nd St., Los Angeles, Calif.

BERG, RAYMOND L., is with Consolidated Vultee at San Diego.

ERICHSEN, ROY H., is an ensign, USNR, E(V)(S), Bureau of Ships. He reported at the University of Arizona at Tucson on April 15.

NELSON, ELWYN F., is an ensign in the USNR.

PORATH, DONALD A., is in the Navy.

SCHMIDT, RICHARD E., is with Consolidated Vultee Aircraft at Fort Worth, Tex. His address is 1808 Hillcrest Ave., Fort Worth 7, Tex.

SCHOLBE, JACK L., is with Douglas Aircraft Company at El Segundo, Calif. His address is 2292 W. 22nd St., Los Angeles, Calif.

(continued on page 22)

ALUMNI NOTES

by

Arnold Ericsen, ch'44

Chemicals

MASSEY, LESTER G., '42, was a recent visitor to the campus. Following his graduation he was commissioned an ensign in the Navy, and after having been sent to various stations has settled down at the Navy Ammunition Depot at Crane, Ind. He is engaged in the manufacture of incendiary bombs and other types of pyrotechnics. He lives at Bedford, Ind. He was promoted to a lieutenant (junior grade) October 1, 1943. He was married to Rose Ann Meyers of Watertown, Wis., in November, 1942.

SHASKY, JOHN L., '43, was recently married to Miss Janet Hebbe, of Jefferson, Wis.

Electricals

DEERHAKE, WILLIAM, '42, is working in the Radio Laboratory at M.I.T.

DICKINSON, ED, '43, worked in the Experimental Department at the Cutler-Hammer Co. of Milwaukee, but is now at Midshipman School at Notre Dame.

GARSIDE, WAYNE, is working in the Naval Research Laboratory, Washington, D. C.

MAXFIELD, FREDERICK, '29, Ph.D. '38, who is on leave of absence from the University, is working with the Naval Ordnance Laboratory, also at Washington, D. C.

MAY, HAROLD, '42, in a recent letter states that he has changed jobs and is now working for the Galvin Manufacturing Corp. of Chicago and is in charge of the tube section of the company, which manufactures radios.

SCHENK, WILLIAM N., '42, is now working in the Radio Branch of the Bureau of Ships, Washington, D. C., on cathode ray tubes in cooperation with manufacturers. He was recently married to Miss Marjorie Bakken in Madison.

SCHITZ, NORMAN, '42, is working with electric hoist controls at the Cutler-Hammer Co. of Milwaukee.

Mechanicals

DRIES, JEROME F., '32, is also working at Cutler-Hammer.

GRUBER, GERRY, '41, is now in England with the Engineer Corps.

Civils

LANDWEHR, WALDEMAR J., c'25, on leave from the Madison Metropolitan Sewerage District and now a lieutenant commander, USNR, CEC, has recently been transferred from Puerto Rico to San Francisco, where he will be engaged in construction work for the 12th Naval District.

BUCKMASTER, JAMES L., c'27, topographic engineer with the U. S. Geological Survey, has been receiving recognition for developing a "sketch master" for use in aerial mapping.

ZOLA, STANLEY P., c'27, has recently been promoted to the rank of commander, USNR, CEC, and transferred from Trinidad to the Norfolk Navy Yard.

GOELZER, VERNON G., c'35, is a lieutenant of engineers in the European theater of war.

STEIMKE, ROBERT E., c'36, MS '40, associate professor of sanitary engineering at North Carolina State College at Raleigh, N. C., is in charge of the Engineering Experiment Station at that college.

EPPLER, JOHN F., c'37, who has been teaching at Kansas State College, began work for the National Advisory Committee for Aeronautics at Langley Field on April 3.

SCHLUTER, ALBERT L., c'38, Lt. (jg) Bureau of Yards and Docks, has returned from Hawaii, where he was located at the time of the Pearl Harbor bombing, and has been ordered to report to Camp Park, Calif.

RYAN, EDMUND J., c'41, is associate sanitary engineer with the 7th Service Command at Omaha, Neb. He supervises the maintenance and operation of all water plants in the command.

WERREN, FRED, c'41, Lt. (jg), who has been stationed at Pearl Harbor, has been transferred to the Bureau of Ships and sent to the University of Michigan for a course in naval architecture, beginning February 29.

Mining and Metallurgicals

HYMER, H. G., min'21, EM '22, is field engineer with the War Production Board.

IWERSON, LLOYD J., min'36, is with the Strategic Minerals Division of the War Production Board. He was recently in Bolivia and is now located in Spain.

JONES, T. D., min'22, met'29, is in Perth Amboy, N. J., as chemical metallurgist with the American Smelting and Refining Co.

KRON, J., ex-'44, is now a first lieutenant in the U. S. Army at Camp Leonard Wood, Mo.

SCHLASS, JEROME, met'43, recently joined the Battelle Memorial Institute of Columbus, Ohio, as metallurgist.

SLAVNEY, GERALD, met'43, is metallurgist with the Caterpillar Tractor Co. in Peoria, Ill.

LINDEN, JOHN F., min'24, is a chemical engineer with the Interstate Iron Co. of Hibbing, Minn.

RAMSEY, R. H., min'31, MS '33, is the Associate Editor of the Engineering and Mining Journal.

A.S.T.P.

When the engineering section of the A.S.T.P. was recently broken up, most of the men stationed at the University were sent to Fort Belvoir, Virginia. Below is a list of these men. Note: some of these men have graduated and reference to them will be found in the recent graduate column. Their companies and platoons for addressing them are also given.

Co. H-57	Platoon
Anderson, Charles E.	A-1
Rogers, Ben T., Jr.	A-1
Paul, Raymond E.	B-4
Smith, Edward L.	B-4
Needham, Harold C.	A-2
Arnold, Phillip E.	B-5
Batker, George R.	A-2
Carlson, Robert A.	B-6
Clark, Charles R.	B-5
Devine, James E.	A-3
Eck, Robert T.	B-5
Fox, Osmon C., Jr.	B-4
Hartung, Kenneth J.	B-6
Hales, David E.	A-2
Heckenkamp, William B.	A-3
Hill, James H.	B-6
Hiller, Melvin C.	B-6
Holton, Raymond R.	B-6
Klunick, Chester H.	A-3
Lanz, Robert H.	B-4
Larsen, Elwood M.	B-5
Lauritsen, Harry L.	B-4
Miller, Gerald A.	A-1
Nehmer, Elvin C.	A-2
Rosenfield, Murray Z.	B-4
Mathewson, James E.	A-3
Schmitt, Frank J.	A-1
Svoboda, James J.	B-6
Switzer, Raymond A.	B-4
Wegener, Karl O.	A-1
Co. H-58	
Kriegel, Herbert G.	A-1
Meier, Robert H.	A-2
Srdich, Louis P.	A-2
Watts, Marvin E.	B-4

To the Men of American Science and Industry

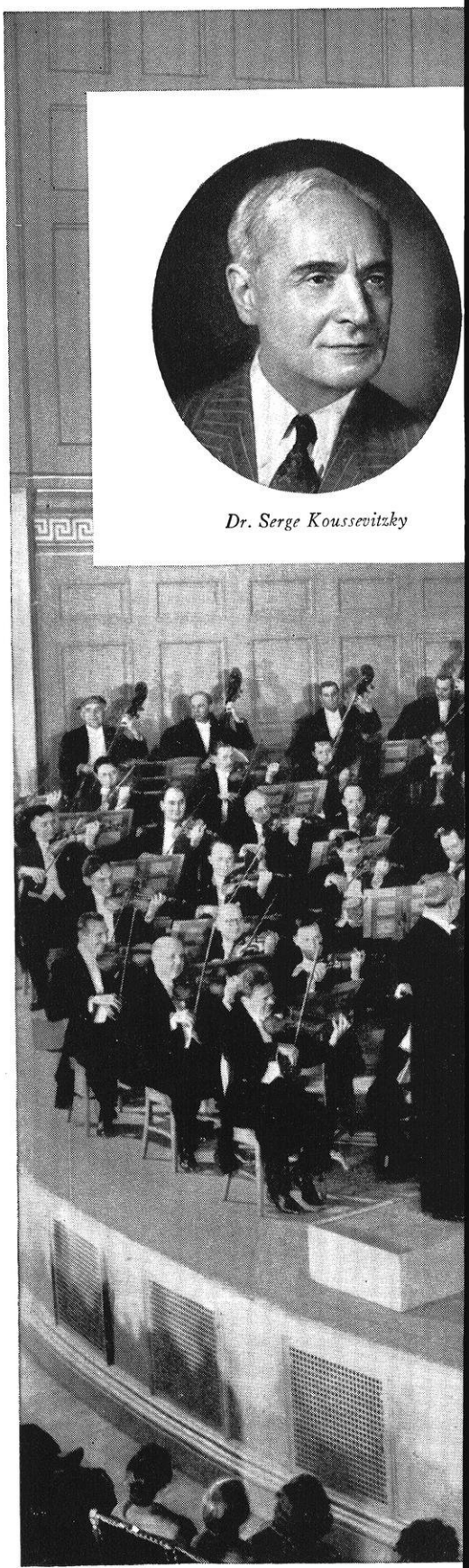
working to
further American Good Living . . .

WE DEDICATE

our Radio Sponsorship of the
World's Finest Music, by the
World's Finest Concert Orchestra . . .

THE BOSTON SYMPHONY

Saturday Evenings, at 8:30 P. M. (E.W.T.)
over 165 Stations of the Blue Network,
from New England to California



Dr. Serge Koussevitzky

ALLIS-CHALMERS A-C MILWAUKEE

"ENGINEERING THAT AIDS ALL INDUSTRY
FURTHERS AMERICAN GOOD LIVING"

Sister to every science furthering Good Living— Music, by the world's finest musicians, is Allis-Chalmers' choice of radio entertainment for America

THE WORDS of Serge Koussevitzky, world-famous conductor of The Bos- Symphony itself: "Today Amer- n audiences show not only their love l admiration of music, but also a p understanding of the necessity l importance of musical art in the gress of humanity."

Americans also enjoy the highest standard of living of any people on earth—the finest food, clothing, homes and transportation—because they are the mightiest industrial nation on earth.

That is why we respectfully dedicate to the Men of American Industry, our radio sponsorship of The Boston Symphony—why we have chosen it as the vehicle to carry to the American public the Allis-Chalmers story . . .

Engineering that aids all Industry—furthers American Good Living.

Today over 1600 Allis-Chalmers products are helping America to the earliest possible Victory—*after the war*, the same engineering will mean Good Living, the American Way.

ALLIS-CHALMERS MFG. CO., MILWAUKEE, WISCONSIN

ALLIS-CHALMERS

STATIC . . .

by Lee Evans, m'44, and Fab. Brusoc, ch'45

The big business man had died and gone to—well, not to heaven. But hardly had he settled down for a nice long smoke when a hearty hand slapped him on the back, and into his ear boomed the voice of a persistent salesman who had pestered him much on earth.

Salesman (chortling): "Well, Mr. Smith, I'm here for the appointment."

Mr. Smith: "What appointment?"

Salesman: "Why don't you remember? Every time I entered your office you told me you'd see me here!"

•

V-12: "My father was a Pole."

U. W. Co-ed: "Really, how interesting? North or South?"

•

He answered all her silly questions, but he had grown tired, and for the past half hour he had been trying to get some sleep.

Wife: "George, dear, is everything shut up for the night?"

Hubby (yawning): "Everything else, dear."

•

Over in a corner near the fireplace, Uncle Ezra had been working industriously with a stub pencil and a piece of paper. Suddenly he looked up, and smiled. "Dog-gone!" he exclaimed, "if I ain't learned to write."

Maw got up and looked over his shoulder at the lines scrawled across the paper. "What do it say?" she asked.

"I don't know," said Uncle Ezra, puzzled, "I ain't learned to read yet."

•

Doctor (taking visitor around asylum): ""This room is reserved for auto maniacs."

Visitor: "But the room is empty, are there no patients?"

Doctor: "Yes, they are all under the beds repairing."

•

"Didn't you feel a strange sensation the first time you kissed a girl?"

"No, she was no stranger, and she was no sensation."

•

"This means a good deal to me," said the poker player as he stacked the cards.

•

Wife (second inning of second game of a double header): "Let's go John, this is where we came in."

The mistress of the house heard the bell ring and saw standing at the open front door a Chinese hawker. Quickly retreating, she called out to the maid: "There's a Chinaman at the door. You go Ella."

This was too much for the Chinese who stuck his head well into the hall and shouted indignantly: "You go 'ella yourself."

•

A hungry Irishman went into a restaurant on Friday and said to the waiter:

"Have yez any stewed whale?"

"NO."

"Have yez any fried sharks?"

"No."

"All right then," said the Irishman, "bring me a steak smothered in onions. The Lord knows that I asked for fish."

•

A middle-aged woman lost her balance and fell out of a window into a garbage can. A passing Chinaman remarked: "Americans velly wasteful. That woman good for at least ten years yet."

•

A clergyman from South Milwaukee tells the story of an Italian who brought his baby in to be baptized.

"Now," he said, " you see you baptize him right. Last time I tell you I want my boy call 'Tom', you call heem Thomas. Thees time I want heem call 'Jack,' I no want heem call Jackass."

•

Said a foolish young lady of whales
"A smell of escaped gas prevails."
Then she searched with a light
And later that night
Was collected in seventeen pails.

•

He: "I like your form."

She: "Must we go all over that again?"

•

And then there was the Alpha Phi who was so dumb that she thought a buttress was a female goat.

•

Mother: "Son, I don't want to see you going around with that wild girl anymore."

Son: "Aw, heck, maw, she ain't wild. Anybody can pet her."

(continued on page 18)

Tough problems in Engineering . . . licked in record time

New Radio—with 80 voices—revolutionized our tank warfare

IN 1940 the Signal Corps brought one of its toughest radio assignments to Bell Telephone Laboratories and Western Electric.

A rugged multi-frequency set was wanted for the armored forces. It must be, in effect, a radio switchboard to interconnect tanks, scout cars, command cars, artillery units, anti-tank vehicles.

The model was ready in one quarter of the time normally required to design and build such a complex set—an FM transmitter and receiver having 80 crystal controlled frequencies. Any 10 crystals could be quickly plugged in—and push buttons provided instant switching from one channel to another. The set was tested—accepted—ordered in quantity.

Meanwhile Western Electric engineers were tackling knotty production problems—tooling up of plant, training girls for the exacting work, procuring raw materials, setting up complex testing procedures.

Among the toughest problems were those of crystal manufacture. Millions of these tiny quartz wafers would be needed—each lapped to dimensions, silver plated in a vacuum, and mounted on wires so small that they must be soldered in place under a microscope. Amazing new machines and methods were devised—and the crystals came out on time.

Radio, electrical, mechanical and industrial engineers at Western Electric—Bell Laboratories men and Signal Corps men—all contributed invaluable aid. Early production goals were met—volume increased steadily.

Today huge numbers of units have been delivered. They are providing the instant communications that enable our armored forces to travel farther and faster and to hit harder!

Buy War Bonds regularly — all you can!

75TH ANNIVERSARY

Western Electric

IN PEACE...SOURCE OF SUPPLY FOR THE BELL SYSTEM.
IN WAR .. ARSENAL OF COMMUNICATIONS EQUIPMENT.

STATIC . . .

(continued from page 16)

We know of one co-ed who was cured of that cute little habit of injecting an "r" sound into each word.

Male (over phone): "Hello Cutie."

Co-ed: "Why Phillurp, when did you get back?"

Male: "Just a while ago. Say, how about a date tonight kid, what are you doing?"

Co-ed: (coyly): "Nurthin".

Male: "Gosh, excuse me, I didn't know."

•

A man was arraigned for assault and battery and brought before the judge.

Judge: "What is your name, occupation and what are you charged with?"

Prisoner: "My name is Sparks; I am an electrician, and am charged with battery."

Judge (after recovering his equilibrium): "Officer, put this guy in a Dry Cell."

•

Hobo's Toast: "Here's to de holidays! Bless de hull t'ree hundred and sixty-five of 'em."

•

The other day in Ch. E 111, this oddity occurred:

Prof: "What does lake water contain that well water does not have?"

V-12 student (meekly): "Fish!"

Shavetail: "Under what sign of the zodiac was she born?"

Buck Pvt.: "Under what?"

Shavetail: "Under what sign was she born?"

Pvt.: "Room for rent."

•

The sweet young thing tried to buy a railroad ticket to the city near which her soldier-sweetheart was stationed, but she was informed that she would have to have at least a three-day reservation. She went to the bus depot and met difficulty of a similar nature. Later, as she was passing the flower store, she noticed a sign in the window saying they would telegraph flowers any place you name. She went in.

Sweet young thing: "You telegraph flowers anywhere?"

Clerk: "Certainly. What do you wish to send?"

Sweet young thing: "Well, I am Pansy Miller."

•

Barber: "Well, sonny, how would you like your hair cut?"

Small boy: "Just like dad's, and be sure to leave that round spot on the top where his head shows through."

•

Math Prof: "We all know what Roman numerals are, but can you tell me what the figures we use are called?"

Frosh Eng: "I dunno."

Prof: "One, two, three, four, five, six, seven, eight, nine, ten."

(continued on page 22)

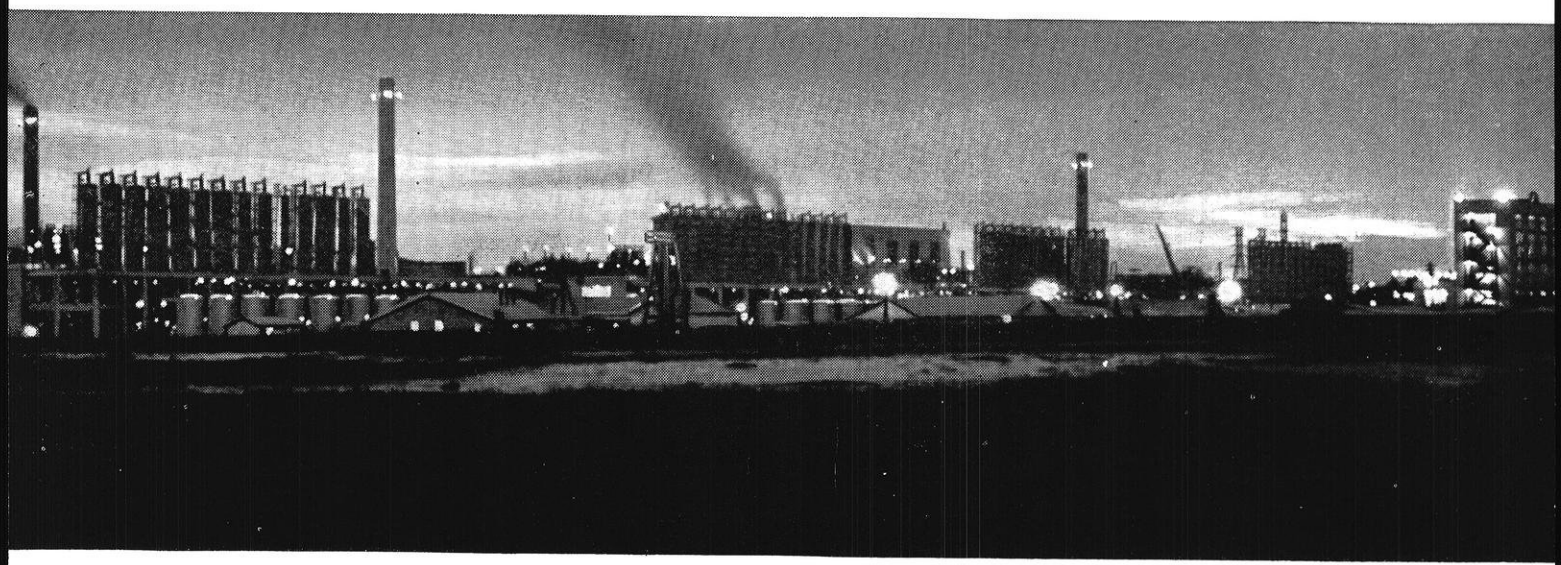
UNION CARBIDE REPORTS

first full-year's production of

BUTADIENE

for the Government's Synthetic Rubber Program

(INSTITUTE, W. VA. PLANT)



Night view of the immense butadiene plant at Institute, W. Va.

A LITTLE OVER A YEAR AGO* the first tank car of butadiene was shipped from the Government's large integrated rubber project at Institute, W. Va. This historic shipment came from the immense butadiene plant which was designed and built by CARBIDE AND CARBON CHEMICALS CORPORATION for the Government's Defense Plant Corporation—and is being operated by this Unit of UCC, for the Rubber Reserve Company.

FIRST YEAR'S PRODUCTION OVER THE RATED CAPACITY— that is the record of this huge 80,000-ton-per-year plant during its first twelve months! This has been accomplished in spite of the many inherent problems that had to be solved in starting a wholly new project of this magnitude.

Over 8/10 of a short ton of butadiene is required to make about one long ton of Buna S type synthetic rubber. Butadiene from this plant during the past year has provided more than 90,000 long tons of synthetic rubber for the Nation's requirements, both military and essential civilian. The delivery of this all-important ingredient also has made possible early production of synthetic rubber under the Government's program.

*The first tank carload of butadiene from Institute was shipped on February 18, 1943 — less than one month after Unit No. 1 of the four large butadiene-producing units had started operating. Subsequently, Unit No. 2 started producing in March, Unit No. 3 in April, and Unit No. 4 on May 25, 1943.

NOW HUGE BUTADIENE PRODUCER — although originally designed to produce 80,000 tons annual capacity, the Institute plant is now delivering butadiene at a rate of more than 100,000 tons per year. An identical plant using Carbide's process was put into operation by the Koppers United Company in September, 1943, at Kobuta, near Pittsburgh, Pa.

OVER 75% OF THE TOTAL PRODUCTION OF BUTADIENE for the Government's synthetic rubber program in 1943 came from the alcohol process developed by CARBIDE AND CARBON CHEMICALS CORPORATION.

In addition to the plant at Institute, Carbide made available plans for the large plant at Kobuta, which was built and is being operated for the Government by Koppers United Company.

CARBIDE AND CARBON CHEMICALS CORPORATION also has designed and built for the Defense Plant Corporation, and is operating for the Rubber Reserve Company, another large butadiene plant at Louisville, Ky.

▼

Business men, technicians, teachers, and others are invited to send for the book P-4 "Butadiene and Styrene for Buna S Synthetic Rubber from Grain Alcohol," which explains what these plants do, and what their place is in the Government's rubber program.

BUY WAR BONDS AND STAMPS

UNION CARBIDE AND CARBON CORPORATION

30 East 42nd Street UCC **New York 17, N. Y.**

Principal Units in the United States and their Products

ALLOYS AND METALS
Electro Metallurgical Company
Haynes Stellite Company
United States Vanadium Corporation

CHEMICALS
Carbide and Carbon Chemicals Corporation

ELECTRODES, CARBONS AND BATTERIES
National Carbon Company, Inc.

INDUSTRIAL GASES AND CARBIDE
The Linde Air Products Company
The Oxweld Railroad Service Company
The Prest-O-Lite Company, Inc.

PLASTICS
Bakelite Corporation
Plastics Division of Carbide and Carbon Chemicals Corporation

The material herein has been reviewed and passed by the Office of Rubber Director, the Rubber Reserve Company, the Defense Plant Corporation, and the War Department.

Freshman Honors

The following are the top-flight members of the Freshman class. Results are tabulated on the number of semesters completed.

FRESHMAN HIGH HONORS

Near, Donald E	2.94
Conant, Orin T.	2.83
Moote, Paul A.	2.81
Mackal, Roy P.	2.78
Fischer, Edwin F.	2.75

FRESHMAN HONORS

Crilly, William M.	2.66
Marichal, Robert R.	2.64
Heinrich, Richard L.	2.58
Laubenstein, Richard	2.57
Nash, William H.	2.56
Clayton, Robert T.	2.50
Siegel, Robert C.	2.50
Hunsaker, Oral K.	2.48
Luff, Laurence	2.44
Nelson, Robert C.	2.42
Smith, Bruce C.	2.42
Lee, Thomas E.	2.40
Pain, Charles E.	2.39
Solberg, Wm. R.	2.37
Benzinger, Robert	2.31
Emerson, Harry L.	2.31
Stuckert, Earl F.	2.28
Teuscher, John	2.25

FIRST TERM FRESHMAN

HIGH HONORS

Zumbach, Walter	2.89
Whitby, Kenneth T.	2.78

HONORS

Hartnell, Viola J.	2.72
Hyzer, Donald V.	2.72
Haugner, Raymond C.	2.61
Dunton, Stanley W.	2.56
Marquardt, James F.	2.56
Drnek, John L.	2.50
Holloway, George A.	2.50
Martin, Cecil G.	2.50
Woroch, Richard F.	2.50
Kono, George	2.45
Donahoe, Robert J.	2.44
Schroeder, Forrest F.	2.44
Smythe, Lowell J.	2.33
Fogt, Thomas H.	2.28
Goode, James M.	2.28
Haas, Donald L.	2.28

PLASTICS . . .

(continued from page 10)

Synthetic fibers have been one of the recent industrial developments. In 1940 rayon, the most common synthetic fiber, was produced in larger quantities than was wool. About 36% of the American rayon was produced from the cellulose acetate process which is indirectly dependent on acetylene for most of its raw materials. These fibers are superior to natural silk, they are actually stronger, wear better, and dye more easily than does silk. They also have many adaptations in the war effort. Besides their great textile use, acetate rayons are being used in self sealing gas tanks for aircraft, wire insulation, and most recently automobile tires.

Another war time product dependent on acetylene is cordite. Invented by Alfred Nobel of Sweden, cordite is now widely used as a smokeless powder. It is prepared by dissolving in a strong solution of acetone a mixture of guncotton and nitroglycerine. This explosive is in most respects superior to other types and will probably be used to an ever increasing extent.

In 1927, J. Niewland of Notre Dame discovered a process whereby it was possible to convert acetylene into divinyl acetylene. Du Pont chemists also perfected a method by which chloroprene can be made from acetylene. These two discoveries opened the way for new synthetic rubbers. Germany had, during World War I, when cut off from South America and Africa, made synthetic rubber from acetylene.

Those World War I German synthetic rubbers were, however, comparatively expensive and of poorer quality. Today many types of synthetic rubbers are acetylene products. While these rubbers are slightly more expensive than the natural product; they have many advantages. Neoprene for example, has much better resistance to oils and sunlight than natural rubber and is used in covers for gasoline and oil-loading hose.

Since 1935 commercial production of synthetic rubber from Butadiene, which was prepared directly from acetylene, was announced in Germany. These were called "Buna rubbers" and since 1935 have been also made in the United States. Buna N, and butyl rubbers are three of the examples of this group. Buna S most nearly duplicates the properties of natural rubber, both good and bad. Buna N has unusually good resistance to abrasion, oils, oxygen, sunlight, and to aging. Butyl rubber is an excellent material for low cost tires.

In the modern organic chemical industries, acetylene plays a vital role. With it chemists and chemical engineers can produce many of the unobtainable natural resources or find new substitutes to take their places. No one can place a value on acetylene which would truly cover its importance to our modern world. Referring to acetylene as "The Wonder Compound," is a mild understatement of its actual importance.

STATIC . . .

(continued from page 18)

Some fellows think the easiest way to get a fortune is to marry one.

•

Junior (to dad): "What is a maxim?"

Dad: "Son, it is something a man hangs over his desk and never practices."

•

Bride: "Aren't you one of the three tramps I gave cookies to last week?"

Tramp: "Yes'm, I'm the sole survivor."

•

Daffynitions—

Gentleman: A patient wolf.

Pessimist: A person who has financed an optimist.

Bridge: A structure used for overland transportation; also a method of training husbands to eat leftover sandwiches.

Neighbor: Any visitor from your neighborhood you do not have to stop to entertain while dinner is being prepared.

Widow: A woman of middle-age who has been left a little life insurance entirely surrounded by suave and glib-tongued rascals.

Reno: Where the cream of society go through the separator.

•

It happened at a busy intersection downtown . . . . . The motorist cut the corner too close and knocked down a fat pedestrian, who said indignantly:

Pedestrian "Couldn't you have gone around me?"

Motorist: "I wasn't sure whether I had enough gas left."

•

A wealthy movie star, who was entertaining at various camps in England, was invited to a country house for the week-end festivities.

Duchess (to movie star): "You American girls haven't such healthy complexions as we English women have. I always wonder why our noblemen take a fancy to your white faces."

Star (quickly): "Oh, it isn't our white faces that attract them . . . it's our green backs."

•

If a pretty girl's face is her fortune, the manner in which she applies cosmetics changes it to buried treasure.

•

Civilian Eng: "What is petty larceny?"

V-12 Eng: "I'm not sure, but I think it has something to do with stealing your girl."

•

He: "Darling, I'm groping for words."

She: "Well, you won't find them there."

•

A girl's a minor until she's 18. After that she's a gold-digger.

GRADS . . .

(continued from page 12)

SPITZER, ELROY F., is in the Navy.

ZEHRT, WILLIAM H., is in the Navy.

Mining and Metallurgicals

BENSON, CHARLES GORDON, is in U. S. Naval indoctrination course.

ERSPAMMER, ERNEST GORDON, is in U. S. Naval indoctrination course.

EVANS, MARVIN, is in U. S. Naval indoctrination course.

FOLTZ, ROSS CAMPBELL, is in U. S. Naval indoctrination course.

HAKES, LA VERNE GLENN, with Western Electric in Chicago.

MUELLER, RICHARD CARL, is in U. S. Naval indoctrination course.

MICHAEL, ARTHUR BRUNO, is in the U. S. Army.

PATSFALL, RALPH EARL, is in U. S. Naval indoctrination course.

WOLLERING, WALTER RICHARD, a former V-12 student, is now in the U. S. Naval indoctrination course.

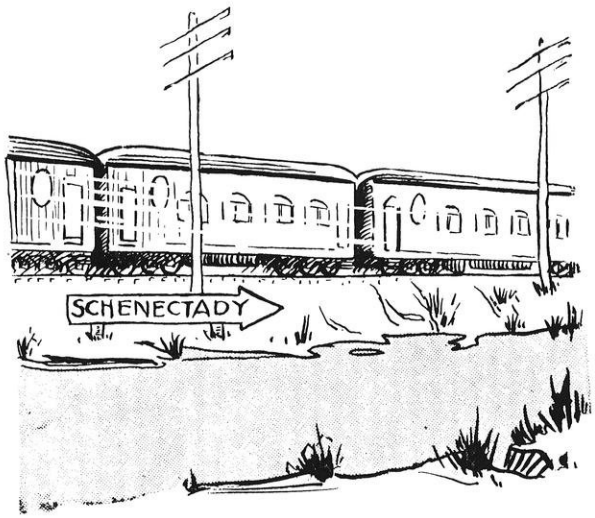
ZAHALKA, HAROLD JEROME, is in the U. S. Army.

Electricals

BUXBAUM, JOHN, is with R.C.A., Camden, N. J.

CRAWFORD, ROBERT S., is taking the graduate training course at Allis-Chalmers, Milwaukee 1, Wisconsin.

CREMER, JOHN, is a test engineer with General Electric Company, Schenectady, N. Y.



FITZGERALD, EDWIN R., is in the physical research department of the B. F. Goodrich Company. His address is 500 South Main St., Akron, Ohio.

GEHRKE, FORREST E., is engineer with the Sylvania Electric Products Company, Emporium, Pa.

HELFRECHT, D. J., is in the U. S. Army.

JEPSON, T. S., no report.

JOHNSON, RUSSELL H., is engineer with the Douglas Aircraft Company. His address is 3000 Boulevard Ave., Santa Monica, Calif.

McGRATH, W. J., is in a V-12 Naval Unit.

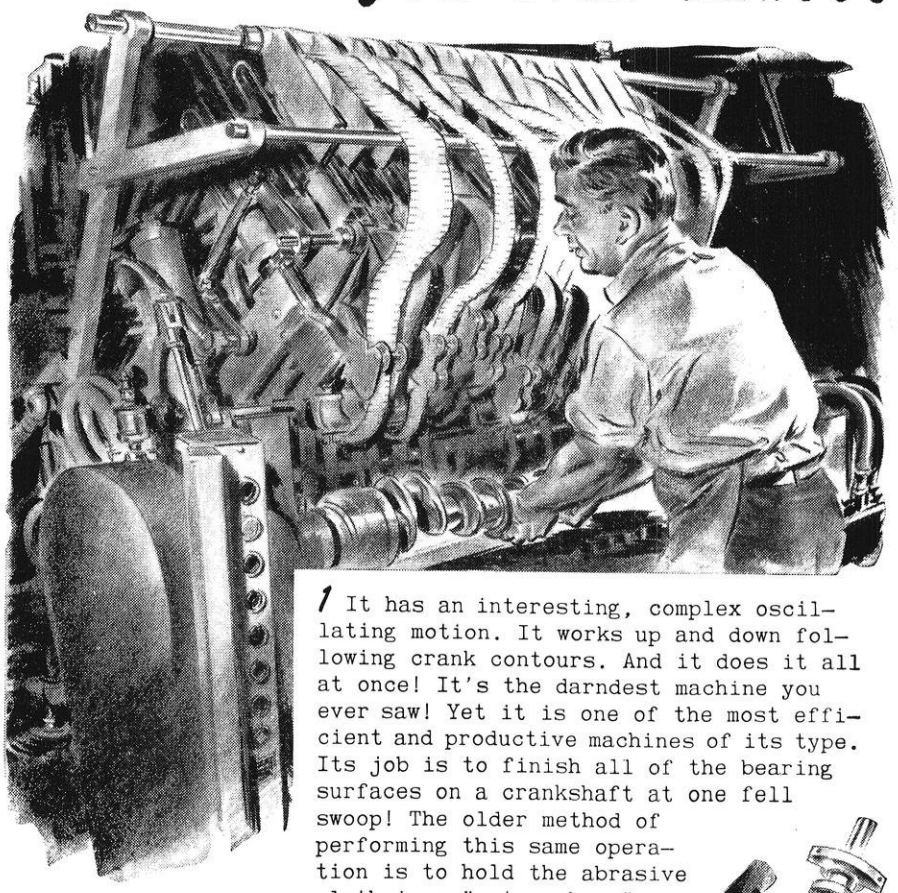
NETTESHEIM, JOE C., is a test engineer with General Electric Company, Schenectady, N. Y.

PALMATIER, FRANCOIS, is a design engineer with R.C.A. Manufacturing Company, Camden, N. J.

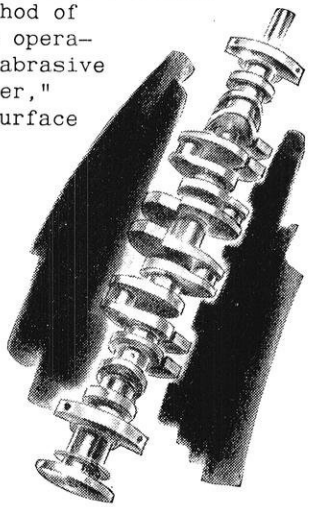
PLASS, HAROLD JOHN, is with Radio Corporation of America, Camden, N. J.

RIEGER, WILLIAM, no report.

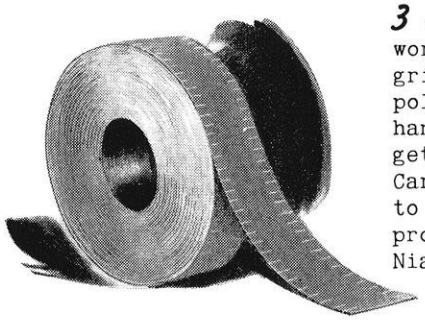
The darndest machine you ever saw...



1 It has an interesting, complex oscillating motion. It works up and down following crank contours. And it does it all at once! It's the darndest machine you ever saw! Yet it is one of the most efficient and productive machines of its type. Its job is to finish all of the bearing surfaces on a crankshaft at one fell swoop! The older method of performing this same operation is to hold the abrasive cloth in a "nutcracker," finishing only one surface at a time.



2 With the new machine, strips of successively finer grits of abrasive cloth, having serrated edges to permit the strips to follow the fillets of the bearings, are automatically inched past the revolving crankshaft from a feed roll of the cloth. And on many a job it's Aloxite Brand cloth by Carborundum that gives the ultimate smooth, satin finish.



3 Carborundum Research is steadily working to improve production through grinding, finishing, sharpening and polishing. It will continue to work hand in hand with industry. When you get into the field, remember that Carborundum Engineers will stand ready to help with your production problems. The Carborundum Co., Niagara Falls, New York.

CARBORUNDUM
TRADE MARK
ABRASIVE PRODUCTS

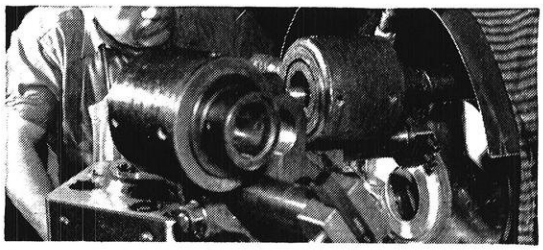
Carborundum and Aloxite are registered trade-marks of and indicate manufacture by The Carborundum Company.

STANDARD CARBOLOY TOOLS
SET THE PACE ON AIRCRAFT PRODUCTION

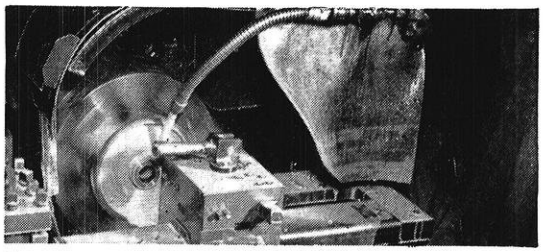
★ LOW TOOL COST! Standard Carboloy tools, available in 10 styles, 5 grades, wide range of sizes, are priced as low as 70c per tool.

IN the aircraft industry, on thousands of vital jobs, *STANDARD* Carboloy tools have set the pace on machining production! Cutting speeds stepped up as high as six times faster than with former tools! Tool life increased often as much as 20 to 1! Finish, on critical parts, so fine that 75% or more of hand-polishing time is eliminated! Close tolerances once believed "impossible" on mass production work, commonly obtained. Production of vital parts often doubled or tripled.

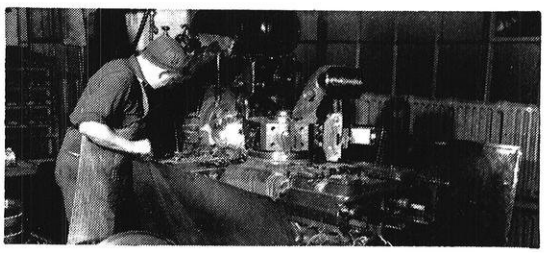
On aircraft manufacture—as well as in all other industries vital to war—*STANDARD* Carboloy tools have helped point the way towards new economies, new production peaks. These tools—at prices comparable to all other cutting tool materials—are available in 10 styles, 5 grades, for cutting *ALL* metals and non-metallics. Write for new catalog GT-175, just issued.



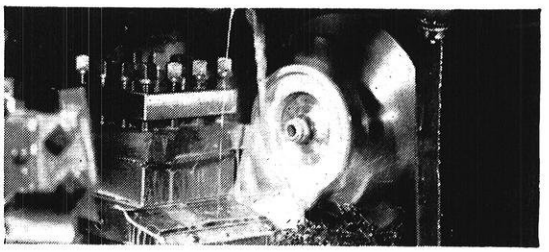
★ HIGH FINISH! On this steel gear, Carboloy tools produce a finish that eliminates 80% of former hand-polishing needed.



★ EXTRA TOOL LIFE! Machining steel gears for superchargers, Carboloy increases tool life 2800% on eleven operations.



★ INCREASED PRODUCTION! Simply by changing to Carboloy tools, in place of ordinary tools, 86% machining time was saved on this job.



★ EXTRA OPERATIONS ELIMINATED! Tooling with Carboloy Standards made possible the elimination of 4 stations on turret—total of 19 tools saved.

CARBOLOY COMPANY, INC.
11149 E. 8 MILE AVE., DETROIT 32, MICHIGAN
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Seattle • Thomaston, Conn.

CARBOLOY
TRADEMARK

For Cutting CAST IRON and Non-Ferrous Metals

For Cutting STEEL

TUNGSTEN CARBIDES ★ ★ ★ TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES

SERVICE ENGINEERING . . .

(continued from page 7)

The problem of adapting planes for special purposes can hardly be considered in the mass-production line. The purchaser ferries the ships to modification centers, and there revises and refits them for particular missions.

"Weight efficiency is the conscience of the position." The thing that must forever and always be kept in mind in design and serving is that dead load is to be scrupulously held down to the lowest possible point consistent with a predetermined measured, margin of safety.[a]

How Service Engineering Is Accomplished

The ostensible reason for existence of the service departments in any manufacturing organization is to assure the customer's continued satisfaction with that firm's product. In other words, their fundamental duty is the maintenance of goodwill. In the case of airplane manufacturers, the departments attain this objective by instructing users in the economical operation and maintenance of the airplanes.

Without such instruction something vitally necessary in the scheme of things would be lacking. What folly, from the social economic viewpoint, to devote our time and financial resources for the services of design specialists, skilled mechanics, and the overhead facilities of a large organization, all to build a plane, only to have it perform far below its possibilities, merely because the users could not operate and care for it properly.

Ordinarily four modes of attack are used:

1. **Service manuals;** a series of handbooks describing the major component installations in the plane, and giving instructions for diagnosing and remedying the various troubles likely to occur.

2. **Field men;** a body of Field Service Engineers whose duties are to investigate specific unsatisfactory items; assist and instruct operating personnel on engineering problems; instruct flight personnel in emergency operations and in the proper use of cruise control charts and weight and balance data.

3. **Service bulletins.** These periodicals maintain friendly contact with the users; they describe changes in design currently being made, and set forth the advantages and possibilities of incorporating such changes on planes in service.

4. **Visual aids.** Partly as cooperation in the accelerated training program, airplane manufacturers are making moving pictures showing details of construction of their planes, and outlining approved methods of operating and maintaining them.

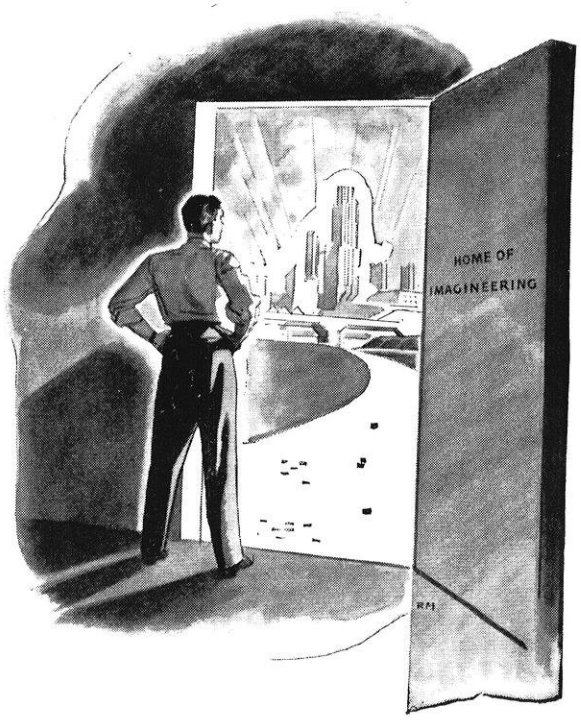
Service Manual Requirements. A good service manual must contain only dependable statements and advice; cover its field completely, not encroaching on others; be skillfully written so that the content can be grasped readily; be written so that learners of widely varying degrees of training and intelligence can benefit from it; be arranged and indexed so that desired information can be quickly found; contain conversion-of-units data in order to be usable by our allies; must be attractively printed and bound. A good series of manuals must cover the whole field of airplane servicing, or so much thereof as is decided upon; must make definite, logical allotment of the total task among the books in the series; must have titles for the manuals expressive of their contents; must be physically designed and adapted for service requirements; must conform to customer specifications.

Because of the time element service manuals and service bulletins must be carefully prepared and served up. So many items of servicing must be done right, and quickly, literally on penalty of death and destruction, that instruction just **must** be truthfully formulated, instantaneously found when wanted, and immediately understood.

Consider the oxygen system. Much of the cruising is done at elevations where pure oxygen is breathed continuously. Should enemy fire rupture the supply line, an alternate supply must be put into operation within the time a man can hold his breath, or the unconsciousness wherein no man can work closes in. Or, should a ditching operation become necessary, the escape hatch must be made to work by electric, hydraulic, or manual control within ap-

(continued on page 28)

[a]Indicating the severe cumulative restriction of deadload, it has been calculated that for the Liberator Bomber one pound of added weight necessitates approximately one-third pound more of fuel and oil to maintain the same range; that, based on commercial operations, weight saved is worth $80 per pound, over a five-year operation of one ship; also held that when the deadline total weight is passed, all designs made no longer apply.



Your Tomorrow Began Yesterday

Yesterday someone did something that will make tomorrow better.

We do not mean to be Pollyanna. We are totally engaged in the grim business of producing for war. But it is still hard, realistic fact that the good things of tomorrow are being planned today, were planned yesterday. Jobs, for instance. Your future job.

This is one reason why we enjoy working with aluminum. It's full of possibilities for making new things, and making old things better. The future of aluminum is exciting.

There is now much more aluminum and it costs less. It will be usable in many more places. Alcoa has been imagineering in aluminum for 54 years and we have good reason to feel the postwar future of aluminum is something for a man to want to have a part of.

Look what aluminum can do to help patch up this shattered old world. It's the wings of the Air Age. It is going to tie remote peoples together and help bring about understanding.

Aluminum's strength with light weight makes things easier to lift, less expensive to move. It offers another spurt of growth to all forms of transportation.

Alcoa Alloys in brilliant colors promise a new splurge for beauty. Think what you can do to brighten homes and hospitals, stores and schools with a metal that is easy to work, resistant to corrosion, light, strong and capable of being dyed practically any color of the rainbow!

We have seen a lot of good imagination engineered into plans utilizing Alcoa Alloys. We have done some Imagineering of our own, too.

These plans are today's blue-prints for tomorrow's jobs. Many of you younger men will be needed to turn them into action. In fact, we hope some of you will want to help put across the ideas we have been cooking up here at Alcoa.

ALCOA
REG. T.M.

A PARENTHETICAL ASIDE: FROM THE AUTOBIOGRAPHY OF

ALCOA ALUMINUM

• This message is printed by Aluminum Company of America to help people to understand *what we do* and *what sort of men* make aluminum grow in usefulness.

SERVICE ENGINEERING . . .

(continued from page 26)

proximately 15 to 40 seconds after striking water, or all is lost.

It is probably safe to say that the chap who thought English was not essential for engineers never wrote an airplane service manual. What is more, he probably never sold one to the Army.

A Typical Series. The following subjects connote the contents of the books in one series: Design Data Book: Erection and Maintenance Manual; Structural Repair Manual; General Manual for Structural Repair; Power Plant Manual; Hydraulic Manual; Electrical Manual; Radio Manual; Armament Handbook; Weight and Balance Book; Parts Catalog. These manuals of course refer to one model of plane. It is obvious that every model requires a separate series of manuals.

This series has pages nine by eleven, and is elaborately illustrated. There are close-up photographs, keyed perspectives, exploded views, orthographics, phantoms, schematics, ordinary graphs, multivariable graphs, nomographs, tabulations, operational diagrams, charts, all artfully executed. Separate volumes contain 100 to 300 pages each, and a hundred or more illustrations. Continuity is maintained by similar typography and binding, and by gremlin Lester Boner, who dances colorfully through the pages. In one instance he is shown when his uncontrolled curiosity leads him to test a circuit by touching the terminals. The explanatory verse emphasizes a warning:

"Lester Boner, our technician, speaks a language quite unChristian!
It does no good to swear at juice, for ignorance is no excuse!"

Manuals for warplanes must be prepared in accordance with government specifications, AN-H-7a being the document outlining general requirements for service handbooks. A separate set of specifications exists for each handbook; for example AN-H-8 is the specification for the Pilot's Operating Instructions (flight manual). These specifications embody the results of labors of an international committee, accepted international standards being specified in them. In addition the "Style Manual" (25c from the Superintendent of Documents), a very detailed treatise on punctuation, capitalization, indention, and the like, must be observed.

Commonly the first service manual assembled is the **Design Data Book.** It is a compilation of design data and general performance characteristics. Entering into its makeup are specification requirements, aerodynamic estimates and calculations, test data of the experimental model.

The Pilot's Operating Instructions purports to furnish in textbook form the information necessary for proper operation of the plane. Early chapters are headed "How To Fly", "Special Instructions" (e.g. maneuvers prohibited, automatic equipment). A chapter is devoted to each of the main systems, such as fuel, oil, electric, power plant, hydraulic, fire extinguishing, heating, ventilating, radio, communications, oxygen, landing gear, etc. Other sections deal with the operations; starting, takeoff, landing, taxiing. Cruise control charts enable a variety of problems involving range, load, time, fuel, speed, to be solved graphically and quickly. In perhaps no other manual are ease of reference and economy of reader effort so important.

The Erection and Maintenance Manual is primarily for use of the ground crews in keeping the plane in first-class working order.

First are description of the plane; data on dimensions, leading particulars, shipment and erection procedure, ground handling, hoisting, jacking, leveling, tying down, towing, use of brakes and control locks, routine fuel and oil supply. Lubrication requirements are treated at length. The special tools and equipment used in moving, erecting, and repairing are described.

The principal section of the book treats of the major component parts and installations of the plane, and gives explicit directions for care of them. Federal specifications furnish the breakdown, and require that each assembly be treated, as the situation warrants, under the following heads: Description; Removal; Disassembly; Maintenance Repairs; Replacements; Adjustments; Tests Before Assembly; Reassembly; Tests After Reassembly; Service Troubles and Remedies. Last item is the trouble-shooting chart, and is usually treated in columns headed **Trouble, Probable Causes, Remedies.**

Since in some cases salvaged or "converted" materials may have to be used in making repairs, a treatise on materials is given. It includes SAE designations of metals used; theory of heat treatment; instructions for annealing, hardening, normalizing, tempering; list of structural parts in the plane, with tabulation of part number, material, appropriate heat treatment. Chapters on tubing, plastics, finishes, fittings, follow. Warning is given against such unmechanical practices as using excessive torque in tightening bolts. Permissible wrench loads are given by classification.

Climaxing the text is the chapter on service inspections. Forms for record, inspection regulations, detailed descriptions of the six standard inspections are given. Of the six, persumably the **preflight** is most important; twenty pages are used to delineate it.

EDITOR'S NOTE: This is the first installment of an article by a former Wisconsin student. Dale, who graduated in civil engineering in 1911, received his C.E. degree in 1917. At present he is employed with an aircraft company in Dallas, Texas.