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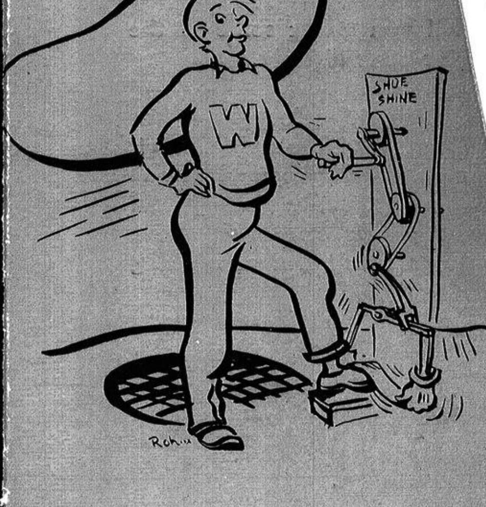
The

WISCONSIN ENGINEER

Presenting

The Mechanical Engineers



February, 1942

Air Flow ★ Shell Forging ★ Handbooks

MEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED

Science Shoulders Arms

What science in the past has done for peacetime America needs no recounting.

But science today tackles a grimmer job. Research now must give America at war the fighting weapons she needs.

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THE FORGED STEEL BEARING

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The WISCONSIN ENGINEER

Founded 1896

Volume 46 — FEBRUARY, 1942 — Number 5

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

PROF. H. C. RICHARDSON, *National Chairman*
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Minneapolis, Minnesota

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In This Issue . . .

As has been our habit in preceding issues, we present another engineering college department, this time the **mechanicals,** and its chairman, **Professor G. L. Larson.** Here's the history of the engine-oiling group.

To acquaint you with **Wisconsin research** under way in the H & V lab, we give you "Air Flow Analysis," page 6, by **G. E. Smedberg,** mechanical engineering fellow, and his assistant, **Clyde Kaiser,** ME4. If you ever have a heating problem, and you want to decrease her resistance, this is for you. These gentlemen and their magic box grace our cover this month.

One of the greatest production problems at present is the **conversion** of existing machinery from peace-time manufacture to war-time (NOT referring to seven o'clock eight o'clocks) output. A good example of what can be done is shown by **R. T. Herdegen,** page 8.

Handbooks are invaluable to the engineer, both student and graduate. You can't know everything, despite professorial desires. **Don Niles** has done a good job in his resume of the new references in our library.

Harry Hummel, recent grad from Kentucky, now teaching and work on a MS degree here, has some up-to-the-minute philosophy on **Young America,** page 12.

"There comes a time when even the best of friends must part," and this is it for your editors and the Wisconsin Engineer. Wringing out the old (and how we need it) and in the new, we present **Jerry Baird,** editor, **Herb Blocki,** associate editor, and **Walt Spiegel,** business manager. Keep 'em.

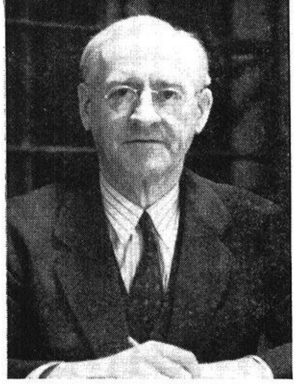
L. F. Van Hagan, civil prof and long champion of yrs trly, the Wisco Engo (estab. 1896), comes through again. Delving deep into his files, as we hope others of our faculty will, he brings us several interesting excerpts from correspondence with his **former students.** Let us let their experiences guides us, page 16.

Just as though it wasn't the first thing you turned to, we'll mention that S*T*A*T*I*C writhes on page 24.

Check your I.Q.? To further validate what your ego has long been telling you, tackle this truly terrific intelligence test, **turning to 24.**

On our **frontispiece,** courtesy of Westinghouse Electric & Manufacturing Co., we see **infra-red lamps** used for rapid drying of painted surfaces. Would you like an article about it?

Only two weeks gone this semester, and already we are a month behind. Oh, well . . . .



The Department of the Month

MECHANICAL ENGINEERING

by Professor G. L. Larson

Chairman, Mechanical Engineering

MECHANICAL ENGINEERING *is one of the older branches of the College of Engineering at this institution. It was one of the three original courses at the time the College was established in 1870. In that year Col. William J. L. Nicodemus was elected Professor of Military Science and Civil and Mechanical Engineering. The course in Mining and Metallurgical Engineering was also established in 1870 when Professor Roland D. Irving was called to the chair of Geology, Mining and Metallurgy. The Civil Engineering course was established two years earlier in 1868. Instruction in these three courses was carried on for the first seven years in Bascom Hall, at that time called University Hall, the only building on the campus that had class rooms.*

The completion of old Science Hall in 1877 provided space for recitation rooms and drafting rooms on the upper floor. One room in the basement was equipped as an engineering laboratory and machine shop. The laboratory was used for tests in steam units, on hydraulic machinery, and materials of construction. In 1884 old Science Hall, located on the present site of Science Hall, was burned and most of the equipment was destroyed.

During 1887 and 1888, there was considerable building activity on the campus. The present Science Hall, together with the present Chemical Engineering Building (then called the Chemistry Building), the present Radio Hall (then the Central Heating Plant), and the Electrical Laboratory and Art Education Building (then the Machine Shops) were all constructed during this period. The new Science Hall provided rooms on the first floor for recitation, lectures and drafting; while the entire north wing basement was used as an Engineering laboratory for classes in steam engineering, hydraulics, and materials testing. All mechanical shop practice, such as machine work, carpentry, pattern making and foundry work, was carried on in the Machine Shops (now the Electrical Laboratory and Art Education Building). In 1894 the Machine Shop was enlarged not only to provide more space for the increased enrollment, but also to provide space for the Testing Laboratory which was transferred from Science Hall. The Electrical Laboratory, which had previously occupied part of the first floor and basement in the South wing of Science Hall, was also transferred to its present location at that time. Up to this time, Electrical Engineering had been a part of the Physics Department.

The year 1900 marks the completion of the present Engineering and Education Building (then the Engineering Building). This building provided space for lecture, recitation, drafting and class rooms for all branches of engineering, together with space for the Steam Laboratory and the Materials Testing Laboratory. The Hydraulic Laboratory was built in 1907. In 1910 the Engineering Building was enlarged by the addition of the Northwest wing, and a small addition at the rear of the Steam Laboratory (now the Materials Testing Laboratory).

Throughout the history of the Engineering College, the enrollment increased faster than space was provided to care for the larger classes. Additional buildings came at such great intervals of time that expansion could relieve only a few of the departments. The Machine Shops, already cramped for space, were further reduced in 1910 by the necessity for giving space to the Department of Art Education. Unsuccessful attempts were made to secure funds for enlarging the shops at this time, and the Woodworking Shop was moved to the Service Building. Between the years 1910 and 1931, the only addition of space that the Engineering College received was the Randall Shop Building which was built in 1916. This is the one story, saw tooth roof structure between the wings of the present Mechanical Engineering Building, and now occupied by the Welding and Heating & Ventilating Laboratories.

The foregoing history of the growth and expansion of the Engineering College quite accurately reflects the growth, until recent years, of the Mechanical Engineering Department. By 1925 increases in enrollment in Mechanical Engineering and other engineering courses caused considerable overcrowding in all laboratories and departments; and in 1927, a realization of the needs of the Engineering College led the legislature to appropriate $577,000 for a Mechanical Engineering Building. This building was dedicated on Commencement Day, 1931. The following year the Department of Mining and Metallurgy moved from what is now Radio Hall to the building it now occupies, vacated by the Forest Products Laboratory. The completion of the Mechanical Engineering Building provided amply for the Department of Mechanical Engineering and the vacating of space that the department formerly occupied partly relieved the cramped condition of some of the other departments of engineering.

In the meanwhile, the Department of Mechanical Engineering has continued its rapid increase in enrollment until at the present time the Mechanical Engineers comprise 40% of the total Engineering registration. The present senior class of an even 100 students is the largest in the history of the department. While this large enrollment has very much occupied the full time of the staff, the pursuit of research has continued with chief emphasis on Diesel engine combustion studies and fuels, and air distribution in relation to air conditioning. The research work of Professor G. C. Wilson and R. A. Rose on Diesel engine combustion, and that of Professor D. W. Nelson on air distribution has won national recognition for themselves and for the Department of Mechanical Engineering.

Air Flow Analysis

by G. E. Smedberg, ms'34 and C. L. Kaiser, me'42

AIR is a substance which does not lend itself to distinct observation of its action under actual conditions of operation. It has been the desire of research investigators for years past to overcome this obstacle so that more information could be obtained as to the behavior of air flow. Several methods of recording photographically such behavior have been used. They may be classified into the following divisions: Schlieren method, kerosene and lamp black method, textile threads or ribbon method, and the method of particles suspended in the fluid.

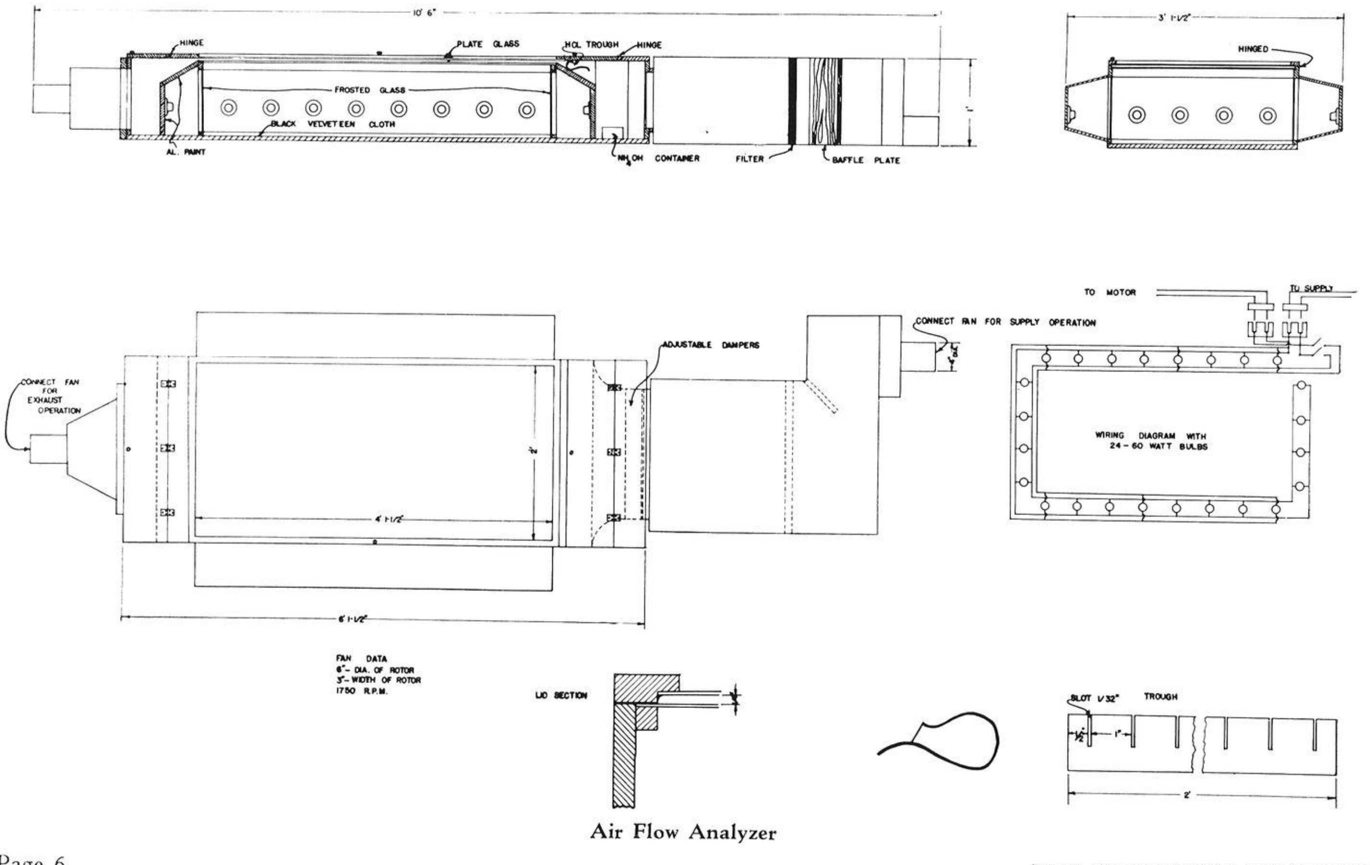
In the Schlieren method, differences in the densities of the air are produced by minute electrically heated resistance wires. The shadows thus produced by the rays of an arc light are projected against a screen. While for direct observation, satisfactory results are obtained without lenses, it is necessary, for photographic purposes to increase the light intensity through the use of lenses.

Of considerable interest and occasional practical use is the kerosene and lamp black method. The model to be studied is coated with a mixture of kerosene and lamp black or in some cases paint. This is then placed in an air stream which, figuratively speaking, etches the flow lines upon the surface. This method is used principally in the study of air flow over automobile bodies, airship hulls, and also through turbine nozzles and blades.

Textile threads or ribbons, used either singly or suitably arranged in multiples for simultaneous observation, result in the simplest means for determining the direction of flow. However, their weight and inertia limit their use, especially in turbulent flow.

The method of observation by noting the action of particles suspended in the air stream appears to be the most useful method. Ammonium hydroxide vapors when placed in intimate contact with hydrochloric acid form a smoke of ammonium chloride and water. Titanium oxide also forms a white smoke when it is in minute particle form and is used extensively in this work.

In the heating and ventilating laboratory of the University of Wisconsin research on the flow of air from stack heads and from horizontal ducts with side outlets is being carried on. At the outset of this work it was apparent that some means for visual observation of the flow phenomena would be of value. The drawing shows the construction of the apparatus made at the University for this purpose. In addition to the use for study of air flow in ducts the apparatus can be used to study air flow over various shaped objects. However, the apparatus is limited to the recording of two dimensional air flow phenomena. It consists of two glass plates spaced one-quarter

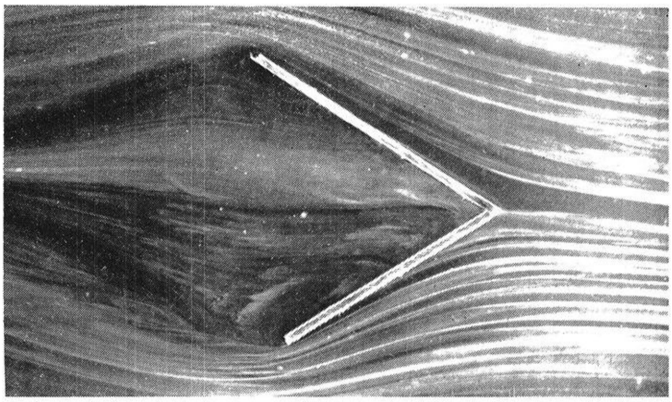


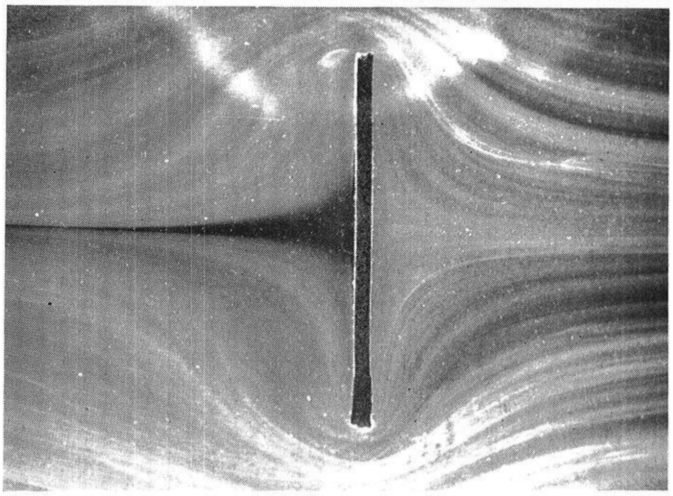
Air Flow Analyzer

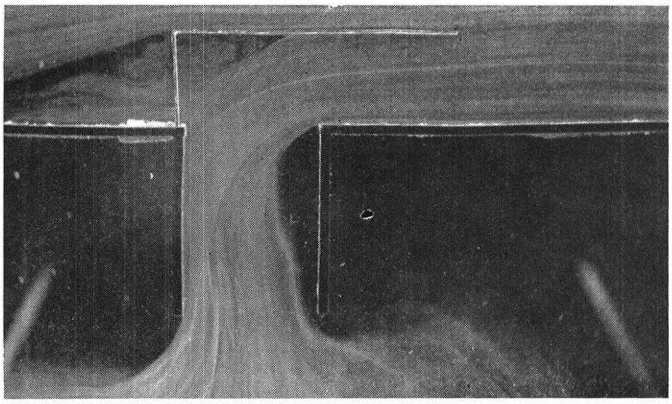
inch apart. The model duct or shape to be studied is made up from rubber strips or rubber sections and placed between the glass plates. A slotted trough placed at the upstream end of the device is filled with hydrochloric acid in back of which is an open container of ammonium hydroxide. The fan can be used at either end, and when on the upstream side it acts as a supply fan, blowing the streamlines over the model. When used in this manner the transition chamber on the upstream side is used. This chamber consists of a baffle arrangement which results in an even flow across the entire width of the apparatus. Air flow from right angled openings in duct work can better be studied when the fan is placed in the upstream position. When used in this manner a vent strip is removed from the side of the apparatus allowing the stream lines to be projected outward from the opening in the duct work into the atmosphere. If the fan is attached to the downstream side of the apparatus it acts as an exhaust fan drawing the streamlines over the model. Operating in this manner the vent strip on the side is closed and the streamlines of smoke are drawn straight through the apparatus and discharged to the outside by suitable vent piping. This method of operation is used when studying the flow of air over various shaped objects as wing sections and cross sections of condenser or boiler tubes.

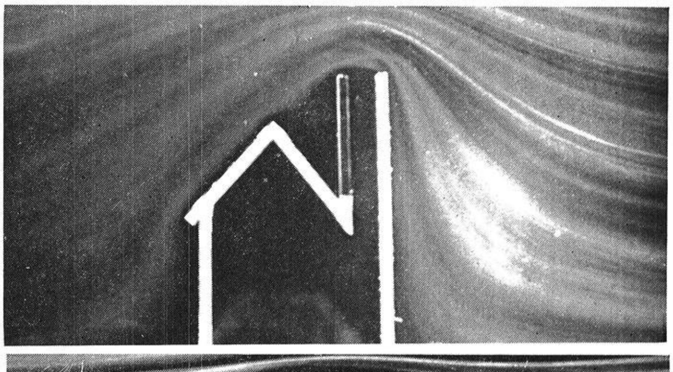
The flow of air over various objects can be visually studied by means of this apparatus and a great deal of valuable knowledge can be obtained. However, if the flow is recorded photographically, the results can be studied at leisure and are of value for illustrating various points of theory. Recent developments in photography have made it possible to get photographs of the above method through the use of inexpensive cameras and high speed emulsions. When recording photographically the camera is mounted directly over the glass plates on a rigid support. The built-in lighting arrangement furnishes sufficient illumination to allow a shutter speed of one-fiftieth to one-hundredth of a second with an aperture of f2.8. These speeds are based on the use of a film with a Weston tungsten rating of 64.

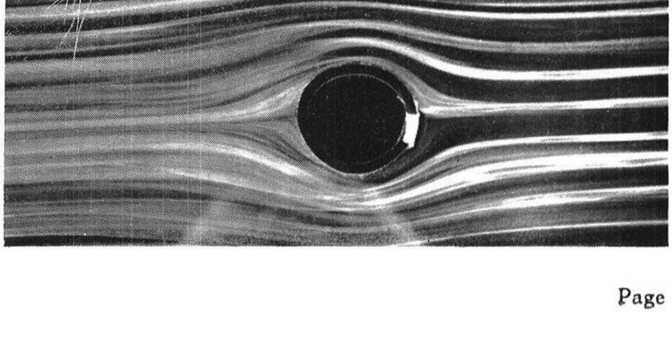
Several photographs are included to show the effect of air flow over objects of various shapes. In each case the flow of air is from right to left. In the first photograph the air is flowing over a V-shaped object and the drag resulting is shown. The higher resistance offered by a flat plate is shown in the next photograph. The third photograph is one of a series taken during the progress of the horizontal duct research. In this view the air is flowing from a side outlet in a duct with an extension on the face of the outlet and a scoop arrangement inside of the duct. The crowding of the air stream to the left side of the extension and the even spread across the outlet of the extension is of interest. In the fourth photograph the flow of air over the cross section of a house is shown. Models of this sort are of value in studying the draft characteristics of various chimney heights. The last photograph shows the flow of air over a cylindrical object such as a condenser or boiler tube.











Shell Forging By The Upset Method

by R. T. Herdegen, e'42

ONE of the most useful and important methods of fabricating steel is by forging, and one of the most useful and important machines for forging is the upsetter. The upsetter is not new, but its application to the production of shells has resulted in a new method of shell production. The upsetter consists of a frame on which is mounted a fixed die and a movable die. Facing the machine, the fixed die is clamped at the right with the impression facing left. The movable die, or gripping die, faces to the right, and, when slid horizontally into position by a series of toggles, it matches with the right die. This is the first cycle of operation of the machine. As soon as the gripper dies have made contact, the heading tool or die is moved up horizontally to the front of the machine. It performs its movement of metal, retreats, and the gripper dies then separate. In most upset forging operations there are two or more operations, so that the desired flow of metal is attained in not one but several stages.

This discussion will be centered about the process as practiced in a certain Canadian forge plant which has developed this efficient method. The shell-forging plant is a rectangular building divided into two bays, with the inspection and shipping department in one bay and the forging department in the adjoining bay. They are separated by an overhead conveyor system. In the forging section are three forging units, end to end, along the length of the bay. A forging unit consists of an upsetter flanked by two slot-type heating furnaces, two mono-rail hoists along the front of the equipment, and a roller conveyor for transfering finished shells to a marking station back of the upsetter.

Because the bar stack chosen for the job is of a length correct for making five shells it need only be heated at the end, and for this reason a slot-type furnace is used. One furnace will heat thirty bars at one time. Each unit is fired at both ends with an oil-gas-air mixture adjusted to provide a loose scale that is removed on half round scraper plates mounted on the front of the furnace. The

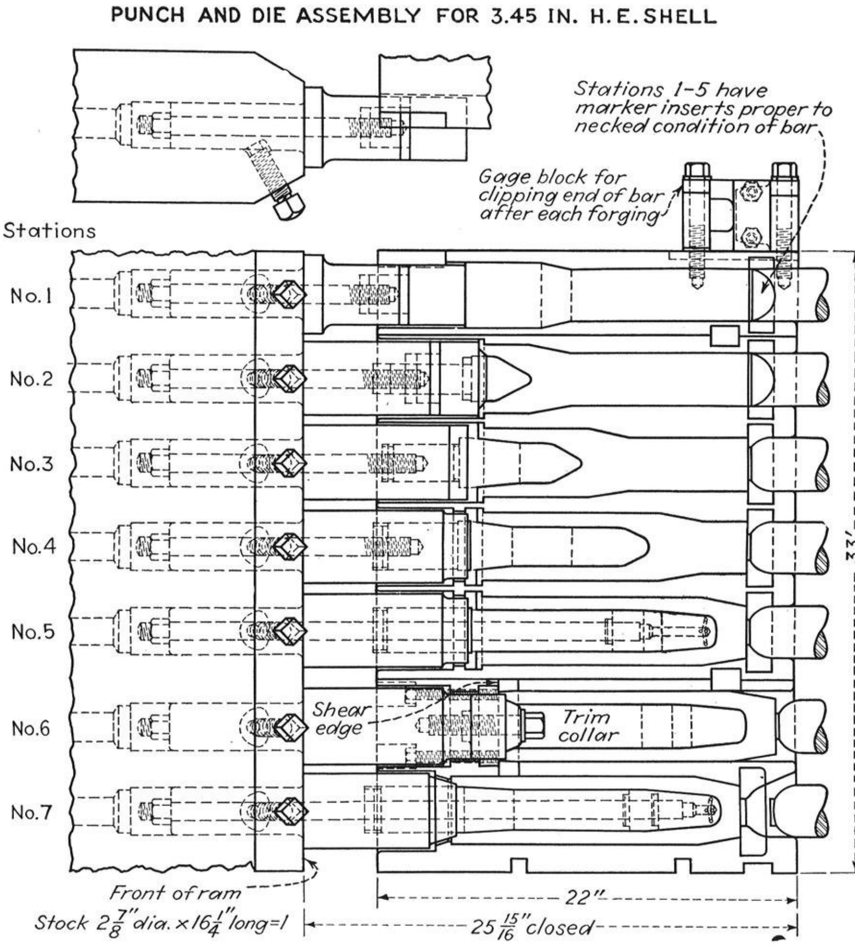


FIGURE II

Seven Impression Dies Are Used to Forge This Shell

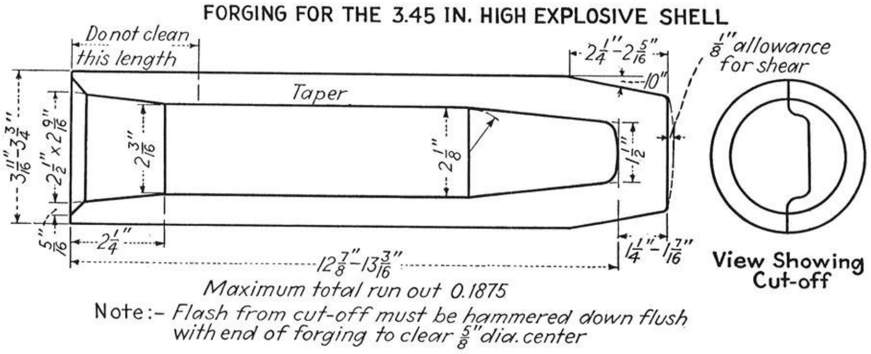


FIGURE I

Size and Shape of Finished Shell

temperature control is achieved by a Browning recording and controlling potentiometer, connected to several thermocouples along the furnace hearth in such a way that a uniform temperature is maintained over the entire hearth.

The marking and inspection station behind the upsetter is adjacent to the overhead cooling conveyor separating the bays. In the area between the row of furnaces and upsetters and the building wall is a series of light monorail electric hoists for handling the forging stock.

Figure one shows the size and shape of a shell as forged. This forging is sent to machining companies that turn the outside walls and both ends, groove the shell for driving bands, nose in the front end so that it tapers, thread the nose for a fuse unit, and send the machined shell to the shell-loading plant for loading and final inspection.

Forging the Shells

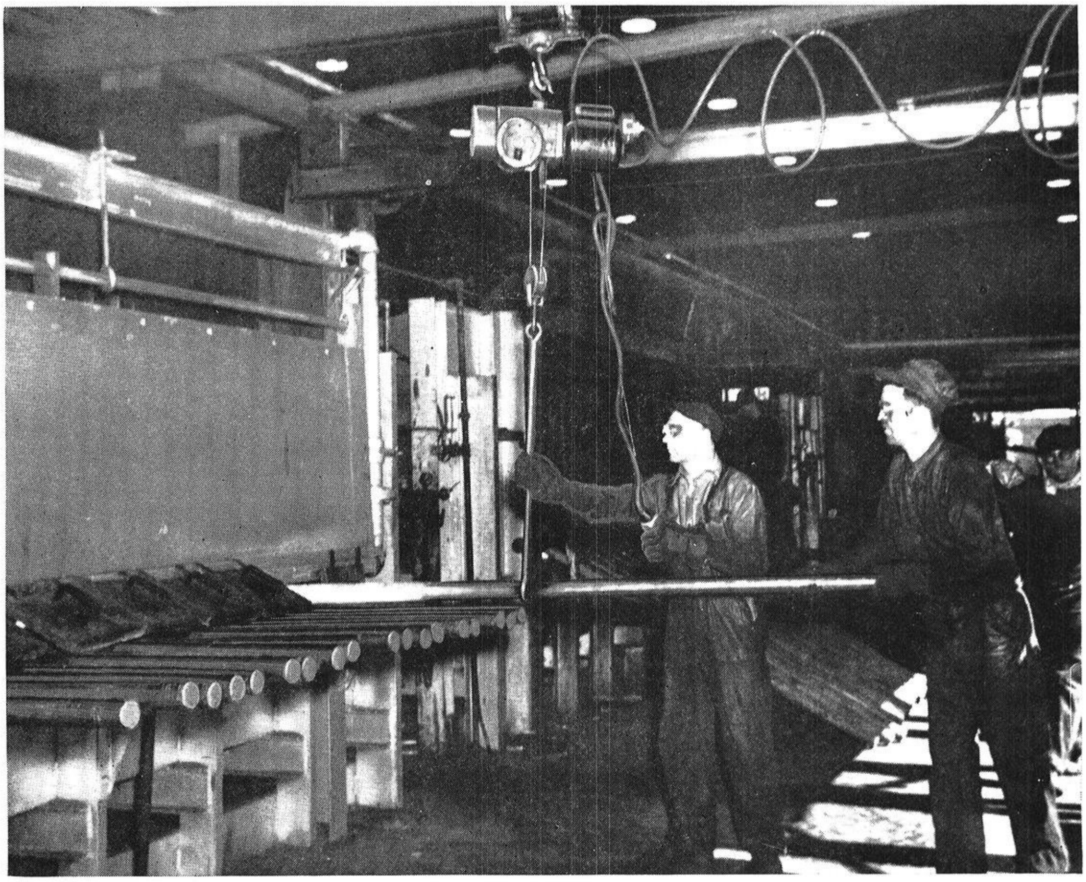
The punch and die layout necessary to forge the shell is shown in figure two. The cycle of operation is as follows. Assume that a bar has been heated in a furnace to the left of the upsetter. After the bar is freed of scale by oscillating it on the scraper plates, its temperature is checked by an optical pyrometer. At the same time, the three men of No. 2 upsetter crew, an operator and two handlers, are finishing a shell, after which they step back out of the way. The No. 1 crew of three men walks into position with bar suspended on the hoist. The No. 1 operator guides the bar into successive stages of the dies as the hoist operator lowers the bar to each stage. At the completion of the shell it is thrown on the conveyor and the bar is placed back in the furnace.

Seven-impression dies are used to forge this shell. Atop the die block is a trimming tool which roughly squares the end of the bar. At the first station the proper bar length is located by a guide arm which flips out of the way before forging. The header tool for No. 1 station is flat-ended and upsets the bar to a larger diameter for a short length while squaring off the end. At station No. 2 the heading tool begins the piercing operation and at the same time upsets the end of the bar to the full outside diameter for the shell. This operation is very important since it locates the center of the hole for further piercing. Stations No. 3, 4, and 5 are equipped with punches which continue the piercing operation to an approximate depth of 13 in., dividing the work about evenly between them. The 6th operation merely serves to trim off the supporting collar which is formed in station No. 2. The function of this collar is to prevent the walls of the shell from being pulled into the cavity by punch drag and thus spoiling the shell.

A pair of necking inserts at the front of the gripper dies prevents the thrust action of the headers and punches from pushing the stock out of the end of the dies. The pair of inserts in station No. 1 narrows the stock down at the proper length to an oval cross-section of somewhat less area than the stock. These inserts thus act as thrust shoulders. Each succeeding station excepting No. 6 and No. 7 has a corresponding pair of inserts, revolved through different angles about their horizontal axis to prevent ridges on the shell along the lines where the dies meet. Station No. 6 has no inserts in order that the shell may be driven free of the collar. Station No. 7 carries a punch which finish forms the whole cavity and establishes the thickness of the base. The inserts at this station shear the shell from the bar stock, and also serve as thrust shoulders similar to the inserts in previous operations.

At the inspection station the shell is casually checked

(continued on page 22)



Slot Type Furnace, Showing Heated Bar Being Removed

New Handbooks in the Library

by Don Niles, me'44

A few years ago, there appeared in this magazine a summary of the handbooks available to engineers. Since that was printed, five more handbooks have been published. Wishing to keep the student engineers well informed, we are now presenting a review of each of the new ones.

•

Standard Handbook for Electrical Engineers, Knowlton, seventh edition, 1941. Cost: $8.00.

The most obvious changes in this new handbook are the new size and the new print. The bulky handbook printed in 1933 has been done away with, and the new issue is of standard book size of about 6½x9 inches. Thus it will be not quite so easy to break the back as so often happens with the top heavy 4½x6½ inch sizes. The print has been made larger and more readable, easier on the eyes. Illustrations (diagrams of electrical connections, largely) have been used to a greater extent, making the reading more enlightening and informative. Thumb tabs are cut deep so the indexing numbers can be easily read, and the table of contents itself is easily accessible on the inside front cover.

Before planning the issue, more than 100 electrical engineers were interviewed as to what they expected to find in a handbook, and the pattern was built around this. It was primarily designed as an encyclopedia of information useable to electical engineers, but it has not been concentrated to such an extent that the student can't understand what is said. The encyclopedia effect is interesting as it provides paragraphs of explanations as the main part of the book, rather than just using them as supplementary to tables.

LIBRARY HOURS

Beginning with this semester the hours the library is open have been extended and during the first five days of the week the closing hour will be 10:00 P.M. instead of nine as heretofor. The hours the reading room will be open are now as follows:

8:00 A.M. to 12:00 and 1:00 to 5:30 P.M. daily, except Sunday.

7:00 to 10:00 P.M., Monday to Friday, inclusive.

Mechanical Engineers Handbook, Lionel S. Marks, fourth edition, 1941. Cost: $7.00.

The new M.E. handbook is of the same general dimensions as the old, which makes it nearly three inches thick. Very impressive on the bookshelf.

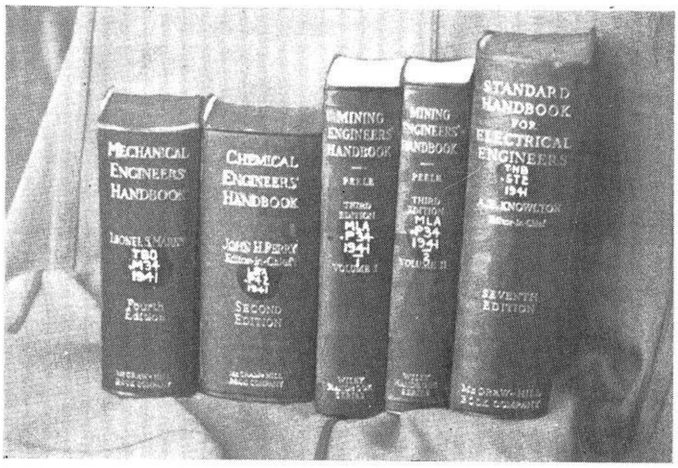
It is mostly rewritten, and some of the applications whose importance has lessened have been condensed still further than before, and some (notably the condensed statements of the ASME Power Test Codes) have been omitted completely. This was done to make room for the new material which had increased in importance since the last edition in 1930.

Among the new subjects dealt with are models, characteristics of plastics (eleven years ago plastics were used only for ash trays), stress concentration, noise, powder metallurgy, and wind pressure on structures. The last named has certainly increased in importance since the Tacoma bridge collapse.

The book now covers everything from aeronautics to railways, or from statics to dynamics, and each section is written by someone who knows what he is writing about. Marks claims there are over ninety contributors at the present time.

This book is not as smooth looking an article as Knowlton's E.E. handbook. The small size is the biggest trouble, as it is hard to read the lines near the inner margin without straining the neck. One is tempted to apply pressure to force the pages down flatter and as soon as that is done the back is broken, which is not a nice way to treat such a valuable book. This breakage is noticeable in even the best bound books of this size, and is inevitable in the ordinary cardboard cover editions.

The paper is of the usual thin tissue in which the printing on the opposite side shows through objectionably, especially in the spaces around diagrams. This paper will also tear easily, and if the book is used to any great extent scotch tape will be patching a lot of pages. However, the book would be a good investment for any mechanical in the market for one.



The New Handbooks

Civil Engineers Handbook, Urquhart, second edition, 1940. Cost: $5.00.

This is not a handbook in the strictest sense of the word, rather it is a textbook. It contains more written matter as compared to tables than an ordinary handbook does, and as such it is useful in a different line.

Urquhart intended his book primarily to present the fundamentals of the many kinds of civil engineering so that engineers will be able to use it when they are confronted by a problem outside of their special fields. Secondarily, many of the sections have been so arranged that they can be used as a textbook in undergraduate courses. As such, each section is not as complete as specialized books could be and so would make a good single supplement to a handbook of the individual's specialized branch.

This theory would work out excellently in connection with a student's line of work, and if it is so desired a more limited but elaborated handbook could be purchased when the need comes up.

The page and print are of standard book size and very easy to work with. The paper is thick enough so that very little printing shows through from the back. The paper is white and has a slight gloss which might hurt the eyes under a glaring light or if one did much reading.

For a student, this book is very valuable, **unless** he wants tables. They have been omitted almost completely.

Mining Engineers Handbook, Peele, third edition, 1941. Two volumes: $15.00.

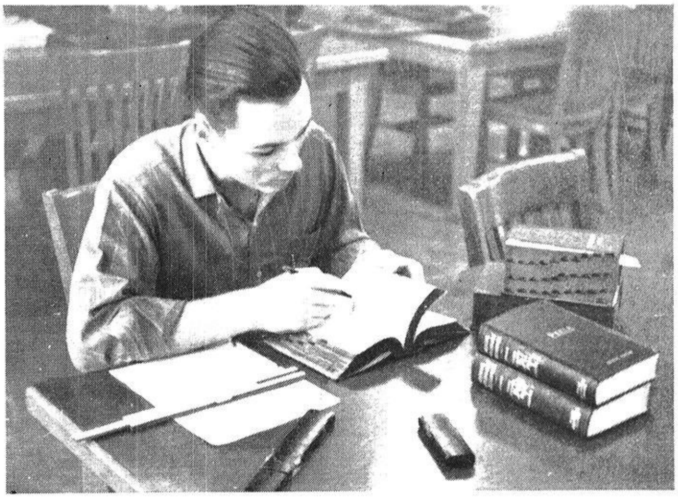
Now we're getting somewhere. This handbook has been divided into two volumes, each of normal book size. The pages are of heavier material than is commonly found, so they are not as likely to tear and they are not quite so transparent. The pages fold back flat and the whole length of the line can be read without moving the head. A distinct advantage indeed. A convenience not found, however, is the thumb tab arrangement which is so useful in reaching each section rapidly.

Eighteen of the forty-six sections have been radically changed along with minor revisions in the rest of the book. Notable among these are the bringing up to date of the methods of mining section, a new section on petroleum production, and enlarging the geophysical prospecting section due to the great improvement in technique in the past decade.

The print has been changed to a larger size, which, although not as good as in Knowlton's E.E. handbook, is quite a bit easier on the eyes than the old print. The paper has a slight cream tint and has no glare in direct light of any kind. This is a great improvement over the rice paper often found in handbooks.

Both volumes are, of course, important to the engineer, but volume II seems to be the main one for metallurgists, while the miners will have to use both volumes.

It may be of interest to the reader to note that Peele's Min.E. handbook is just one in a series published by Wiley which includes editions of handbooks for other branches of engineering as well, all in the same handy size, good print, and strong paper.



Chemical Engineers Handbook, Perry, second edition, 1941. Cost: $10.00.

The Ch.E. handbook is another of the awkward size, but the inside margins have been made wide enough to allow the whole page to be read. While the pages are still thin enough for the printing on the back to show through, they are not as bad as the old edition.

The sections on mathematics, factors in chemical plant location, accounting, and reports have not been changed since the first edition which is as it should be as mostly those items are the same as before. However, subjects such as compounds which have become important lately, sublimation, calculations, thermodynamics, and mechanical separators have been added, enlarging the book by about 400 pages.

The seventy-one page index is a beauty to see. It is elaborately cross indexed and filled with headings and sub-headings. If, for example, you want to look up anything connected with coal, it is sure to be among the thirty-three sub-headings. If you are writing a paper on heat, you can find everything, whether it be heat capacity, heat of crystallization, heat-transfer coefficients, or heaters in no less than one hundred ninety-one sub-headings. It would not be necessary to look under five or six headings to find the one under which a particular case is indexed as it can be found under them all.

A bit of interesting information is contained in the front of the book, namely the Code of Ethics of the AIChE. Several of the parts are directly applicable to students, all are to be used after graduation. It might be profitable to mull over them and be ready.

Section 27 is devoted to cost finding. Mr. Perry claims that students and recently graduated engineers have a deplorable lack of information on even approximate costs of apparatus and structures.

IDEALISM AND YOUNG AMERICA

by Harry Hummel, ch graduate

Tau Beta Pi Prize-Winning Pledge Article

PROBABLY in no other age of recorded history have young people been subjected to a more thorough scrutiny from the standpoint of morals and ethical ideals than in our own. Pages upon pages have been printed discussing the religious attitudes, sex habits, and outlook on life of modern young American men and women. A universal topic of late has been the isolationist position of many college students with regard to world affairs. Criticisms have been leveled from some quarters that this viewpoint reflects a lack of moral responsibility, an evasion of sacred duty.

Perhaps all of this discussion is only a symptom of what Professor M. C. Otto has described as "the profound ethical and moral confusion that is one of the most tragic commentaries of our times." By what standards are the young people of today to be guided? Where should they put their trust? To whom or what should they turn?

There have not always been the possibilities for confusion that there are at present. In times past, great systems of thought, into which every detail of existence was fitted, have held authoritative sway as the accepted dictums of their ages. However, the developments of science in the last two or three centuries have profoundly affected our conception of the universe, as well as our economic, social, and political life. As a result of these changes many people no longer find it possible to accept an explanation of life in terms of such an all-embracing system.

The consequence of this has been a diversity of viewpoint of awesome proportions. Philosophers, traditionally in disagreement with each other, are more divided today than ever. Apart from their minor differences, they are segregated into two great groups: those who believe that truth is absolute, and those who believe that it is relative, a function of the situation. Between the two positions is a gulf as impassable as the Grand Canyon, and views of life based on one are totally irreconcilable with those based on the other. The honest observer must admit that the prospects seem slim indeed that philosophers will soon unite in any real sense to produce an idealism that will light the way out of confusion for questioning young minds.

But if philosophy gives us no certainty, what of religion, the long-time refuge of the weary and sick of heart? Consider the Christian Church, through which most of American religious life finds expression. We may consider its members as roughly divided into two classes: those who hold to an authoritarian viewpoint, and those who stand for the freedom of the individual conscience. The first position, that of the Catholic Church, demands that morals must be imposed wholesale on a person by the teaching of divinely inspired leaders. The other is the traditional stand of Protestantism. Most people do not realize the profundity of the difference between these points of view.

Furthermore, the Protestants are divided among themselves. On the right are the fundamentalists, who hold for a literal biblical interpretation, and on the left are the most extreme liberals, who ask only that one live significantly. Between these are all shades of intermediate opinion.

Is it from all these sources that will come a unified vision that will appeal to the modern temper? Perhaps, but let us not be too sanguine.

Ethical decisions must be made by an individual on the basis of some larger purpose that he wishes to serve. Viewing the matter realistically, what is the possibility that America can furnish its young with a common ground for such decisions?

Our country is striving today to find unity about her traditional ideal of democracy, of freedom for the individual and respect for the human spirit. Certainly we may be proud of these elements in our heritage, and they give us hope for the future. Indeed, it seems possible that America may be the last place in the world where these noble ideals are still held dear.

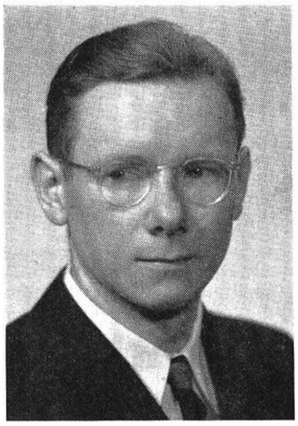
But even here there are dissident strains in the symphony of praise for democracy. The critical observer is bound to notice a certain amount of shallowness and inconsistency in it. One is led often to wonder just how much there is behind the chant of "God Bless America" and "It's Great to Be an American" that represents anything substantial in the way of devotion to the ideal of human freedom. There is a temptation at times to regard some of it at best as fat complacency, and at worst as a veneer glossing over racial, religious, and political intolerance, perhaps to be finally broken away by the rushing currents of our time. Patriotism is a splendid virtue when it is aroused in a noble cause, but it is certainly not necessarily synonymous with democracy.

These are difficult times for everyone; for the young they are tragic. We need to live by ideals, to feel ourselves part of a great movement for human betterment. Instead we find that we are in a world of conflict and confusion, in which all that we have held precious is likely to be torn to bits. Let us hope that from the turmoil and stress there will emerge an American idealism based on a rededication to the principles of freedom and tolerance that will light the way for the whole world. It seems likely that unification of some sort will come, but of what sort it will be is for the historians of the future to write.

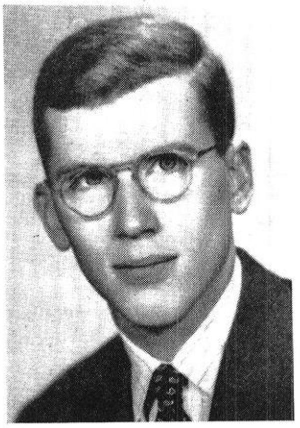
New Engineer Executives

ON FEBRUARY 6 the Board of Directors of the Wisconsin Engineer received the annual reports of the editors and business manager and appointed the new staff executives. They are Jerome Baird, editor, Herbert Blocki, associate editor, and Walter Spiegel, business manager. These men, all juniors, have started work on the March issue and will hold office for one year. Ex-executives Schneider, Erwin, and Schlintz will remain in advisory capacities for the remainder of the semester.

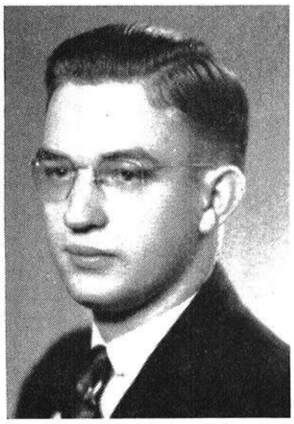
Since it is hardly probable that the new heads would print anything about themselves, it is only right that they appear in print for your sake at this time. Here are the men who will be responsible to you and to the college for the publication of the Wisconsin Engineer.



Baird



Blocki



Spiegel

Jerome Emmett Baird, alias Jerry, alias Ossie, etc., is the red-headed gentleman who has been working in and out of the office since his freshman year. A monument to his Herculean strength and industry is his reorganization of the cut files—he numbered and filed hundreds of drawings and cartoons with a finesse that was beautiful to behold. Going further, he assumed charge of the Borrowed Engraving Dept., Unltd., and wrote millions of letters asking "if we could borrow the cut of the whatsit on page 17 of the Whoosit Engineer? Thank you for your cooperation. Very truly yours . . . " Jerry has held the position of editorial assistant this last semester and has also found time to write articles along the way. He is a Madison boy, an uncle to Thomas Jerome, a track and cross country runner (harrier), and is an integral part of the mining school.

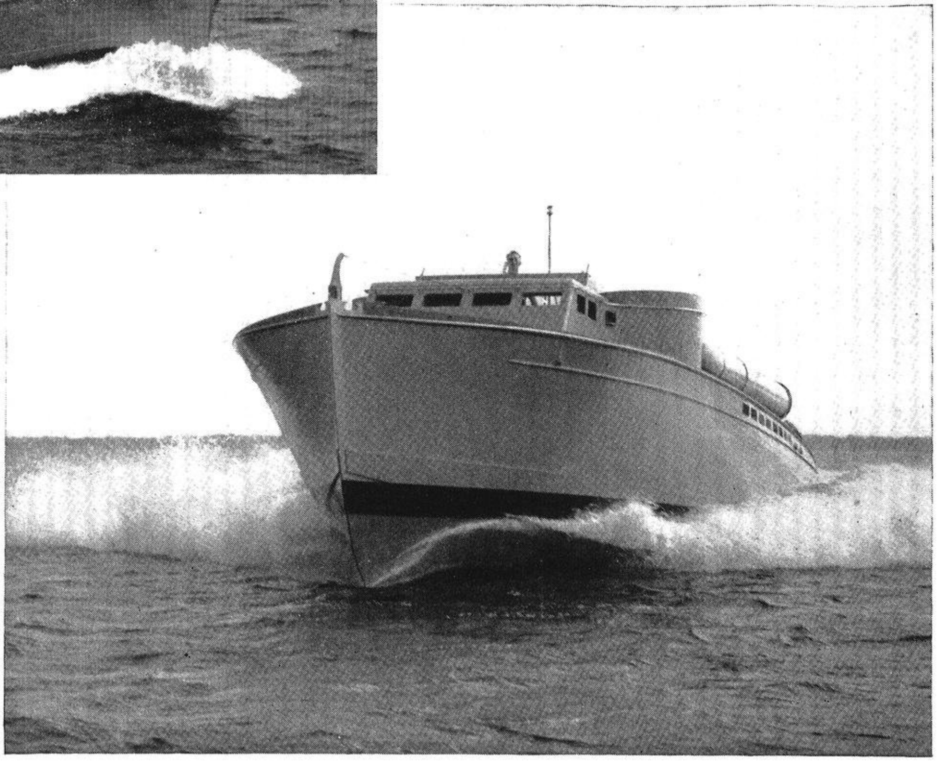
We rather suspect that the mining school is proud of Honor Man Baird, for besides earning high grades there, he also prepares mineral specimens for gainful employment and has exhibited mineral resource maps and samples in the last two expositions. Though generally called a miner, Jerry wishes it to be known that he and most other miners are not miners at all, but metallurgists.

The new associate editor is Herbert A. Blocki, who with Jerry will form the team which will edit the magazine. Herb showed his value to the Engineer by rooming with Carl Wulff, of the circulation wolves, and by running (without stopping) all the way out to the Forest Products lab on his first assignment. He has been feature editor the past semester. Herb expresses himself colorfully, to say the least, and if allowed free run he will put the magazine on almost any map. His lovable qualities include traits which forbid him to tell what his high school activities were or if he has a Pi Mu Epsilon key, but authoritative sources report that he attended Sheboygan Central High and graduated in four years. He is a dorm man, at present a Conover resident. Herb likes sailing and iceboating, to say nothing of mechanical engineering. Having had four years of high school Latin, Herb is able to converse fluently in that tongue with Editor Baird, who had three and some fraction years, and Room 356 is frequently echoing Ciceronian declamations to shame and embarrass little Schneider who barely finished Caesar. Mr. Blocki's intentions are good—he would like to see more student participation in the magazine, with the magazine catering more to student interests.

Walter Spiegel, the new business manager, has a good job to keep him busy. With the depression finally over in the Wisconsin Engineer office, the editors will have to hump to keep up with the new advertising pages Walt is anticipating. Walt has been in charge of campus circulation, which means getting hold of engineers who will distribute the magazines in freshman drawing classes and at the Mechanical and Chemical Engineering buildings. As was the case with the editors, Walter was also born and bred in Wisconsin. He graduated from Oconto Falls High with thirteen letters and is not particularly repulsive. After fleeting interludes of forensics and music Walt has settled down to chemical engineering. At present he is a pledge of Alpha Chi Sigma, chemical fraternity, and is interested in industrial laboratory work—preferably oil or explosives. A Chamberlin resident, Walt sings in the Dorm Chorus with Blocki. Besides wishing for rapid transit between the Chemical Engineering building and the Engineer office in the West, Walter would be especially happy to have some second-semester freshmen on the staff.

America

DISTRIBUTION BOX BOATS (above) for the U. S. Coast Artillery must serve under the most critical conditions. It is this type of boat that must be able to work her way through to offshore mine-fields and connect up or repair the electrical circuit which enables the shore control station to fire the mines.



P-T BOATS (above) are the fast torpedo boats of our mosquito boat fleet. These 77 foot craft which are armed with four 21 inch torpedo tubes and four .50 caliber machine guns have a top speed of 50 knots and a cruising range up to 2,000 miles at moderate speeds. Recently one of these boats got into Subic Bay under the cover of darkness, torpedoed a 5,000 ton Japanese ship and then roared safely out of the harbor under a hail of fire from machine guns and shore batteries.

—*Courtesy Mechanical Topics*

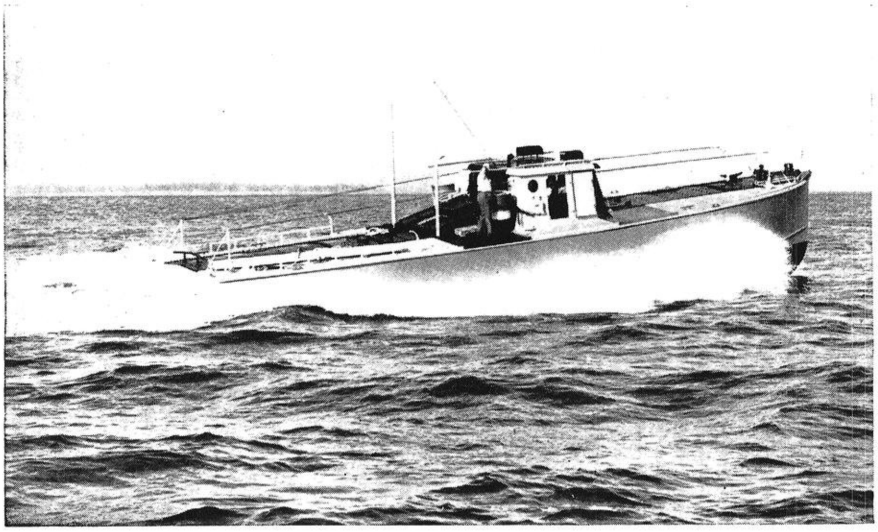
THE ARMY'S NEW SCOUT CAR (left) is equipped with caterpillar treads in the rear to permit reconnaissance in areas with difficult terrain. They are one of the many wartime products that are rolling off the production lines in automobile plants that are changing to wartime production.

—*Courtesy Automobile Facts*

In Action

CURTISS WRIGHT P-40 (right) fighter planes, which are powered with the Allison horizontal motor, have been giving an excellent account of themselves on all fighting fronts from England and Russia to Rangoon and Bataan. They are equipped with six .50 caliber machine guns and are noted for their fire power and their excellent maneuverability.

—Courtesy Westinghouse

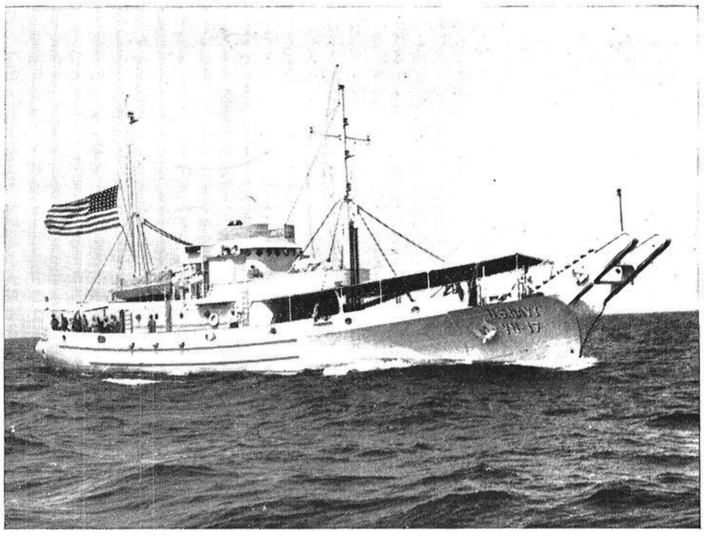


BOMB TARGET BOATS (left) of the Navy can be handled manually or remote controlled by radio as they speed through the waters, dodging and swerving to test the skill of the Navy air bombers. Built with a steel deck, these sturdy little 60 foot boats will withstand the direct hits of numerous service bombs loaded with water from 10,000 feet altitude.

—Courtesy Mechanical Topics

NAVY'S NEW NET TENDERS (right) tend the anti-submarine nets strung across U. S. harbors. These 150 foot diesel driven boats are important factors in the control of ship movements during the present submarine warfare along the Atlantic coast. They are armed with one 3 inch and two .50 caliber anti-aircraft guns.

—Official U. S. Navy photo,
Courtesy Allis-Chalmers



Experience Was Their Teacher

by the Civil Engineers

Compiled by L. F. Van Hagan

There was plenty of work for engineering students during the summer of 1941. For eleven years, during the Depression Decade and beyond, summer work was scarce, and engineering students had to take any sort of work that was available. Then the national defense program created a shortage of engineers, and even men with only partial training were in high demand. With few exceptions, engineering students accepted the opportunity to get practical experience. Some of their experiences have been reduced to writing and are set forth below in their own words in the belief that these personal stories will have general interest.

THE CONTRACTOR WANTED DETAILS

Work was just beginning on a highway grading project near my home, so I immediately went to the contractor to apply for work. I got the job after convincing him that I could do practically anything. The work consisted of setting stakes for shovels and scrapers, checking grade, keeping time, keeping records of all material used by each machine and the work done by the machine, and maintaining progress records. The contractor insisted on all this work being up-to-date at all times, so that he could check on anything at any time.

Much of this work seemed to me unnecessary. As time went on, however, I began to see what use he made of the information. He plotted cost curves, he compared the costs and progress with those of other jobs, and he checked on the machines and operators by the yardage moved. I helped him figure for a bid once and was surprised at the arrangement of the information on past jobs and the use he made of it. There was no guess work; every cost was calculated.—R.G.J.

THERE'S NO NEED TO APOLOGIZE

One phase of submergible shipway construction is the jetting of mud from the sheet piling which forms the walls of the shipway. It is necessary for the sheets to be clean, down to an elevation fifty feet below the water surface. Often it is impossible for a shift to finish a section, and the following shift must complete it before starting a new one. Sometimes a few sheets will offer particular resistance to cleaning the last foot or two, and it is a question whether it is worth the effort. The specification states that, "the sheets shall be cleaned to elevation −49.5," but it is up to the discretion of the field engineer just how closely this is to be followed.

The third shift superintendent told me to take charge of the jetting crew and start work where the first shift had left off. I asked whether we should continue working on the tough part or start a new cell.

"Are you deaf?" he snapped. "I told you to start where the first shift left off. Even a college student can understand that." I decided that the thing to do was to continue work on the unfinished cell. A short time later he came around and saw where the gang was working.

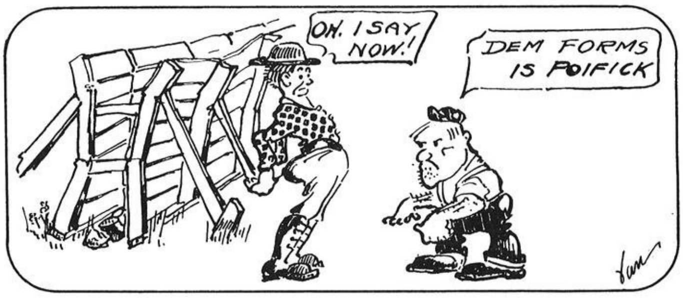
"What the hell are you doing over there?" he demanded.

"The first shift," I tried to explain, "left this part high. It all has to be done eventually."

"You poor college student! Are you so dumb you can't understand English? Not ten minutes ago I told you to start here." He pointed to the new cell.

"I'm sorry, sir," I apologized, "I did what I thought was best."

"Listen," he said, "every time you open your mouth you say you're sorry about something. You're in construction work now. If you fail occasionally, and we all do at times, there is no need to apologize for it. No one gives a damn whether you're sorry or not. Don't apologize. Put that in your pipe and smoke it."—A.C.I.



THEY SHALL NOT PASS

I learned that a young engineer, acting as an inspector, does not at all times have an enviable position. One Sunday morning another fellow and I were inspecting forms, none of which was acceptable if a strict interpretation of the specifications were to be followed; but we were throwing out only the ones that were so bad that obvious imperfections of the slab would result from their use.

The foreman of the formsetters was one of those undersized individuals who try to make up for their lack of size by developing an over-confident and offensive personality. After some time, he became openly assertive in his opinion that the forms we had thrown out were all right. Finally, he told the crew to move one forward. By this time we were all angry but not too sure how far our authority went. It seemed like a good time to find out; so, with scarcely a look at the forms, we started to mark and throw them out in order as we came to them. After four successive forms were disposed of in this way as we came to them, the foreman left without a word, and we went back to our old standards and completed the work. We were relieved when the resident engineer approved of our action.—J.F.E.

FOR WANT OF A NAIL, THE KINGDOM WAS LOST

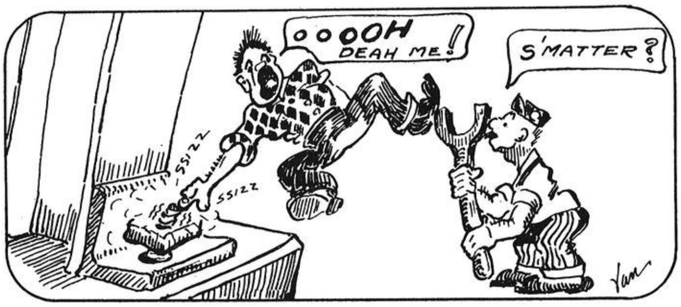
I found summer employment on a big construction job that involved much pouring of concrete. One night, near quitting time, a wall was hurriedly poured. Someone on the crew that had set the forms had failed to set an old "button" properly on its "sleeve," and soon after the pouring, the fresh concrete oozed out onto the concrete slab, where it began to harden. A crew was immediately put to work to repair the damage, but before long a twenty-foot section of the wall had poured out onto the slab and begun to harden quickly. Many air hammers were brought into service to break it up. It took a whole day to remove the concrete, and it was three days before work could be continued on the wall.—F.M.

WISDOM IS WHERE YOU FIND IT

"Give me the wisdom of the uneducated to the loquaciousness of the intellectual."—Cicero.

I have a habit of picking up adages such as the above. I cut this one out of a magazine and pinned it to the wall in my little testing laboratory in a corner of an old barn at Twin Bluffs, where I was testing aggregates and concrete beams for a highway job.

Twins Bluffs is a small town where everyone wants to know about everyone else's business. The advent of the engineers caused quite a commotion, and I had quite a few visitors. One farmer in particular came around often but never said much except to comment on the weather. Then one day he took notice of the slip of paper pinned to the wall. He read, sat down, and began asking questions; intelligent and leading questions, which I had difficulty in answering. We spent a good half hour discussing engineering and farming. When he left, I had a better appreciation of Cicero's philosophy.—M.A.N.

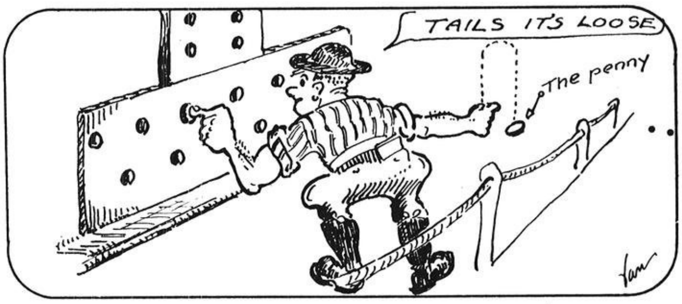


HEAT EXPANDS AND COLD CONTRACTS

On a steel construction job, we had trouble bolting an H-column to the anchor bolts. On our first trial, we had to remove the nuts and repunch the holes in the anchor clips. The nuts had gone on easily the first time and came off without much trouble. However, when we tried turning one of the nuts on the second time, the work increased tremendously. After several of us had exhausted ourselves on it, I felt of the bolt and nut and found them extremely hot. Then one of the crew tried cooling them with water. In just a few seconds we were able to turn the nut tight without much difficulty. It seemed impossible that heat could affect so small a piece to so great an extent.—J.L.

THE ARCHITECT WANTED ACCURACY

I was helping layout a residence hall for a college. The specifications called for all layout dimensions to check within one-sixteenth of an inch of the dimensions given on the working drawings. I could not understand the reason for such accuracy. To check within one-half inch I thought should be satisfactory, until one of the architects explained that if all of the contractors on a job work to this limit of accuracy, there will be no claims for "extras" arising out of difficulties encountered because of inaccurate layout. Care in the beginning results in fewer arguments in settling accounts at the end of a job.—G.F.



HE TESTED RIVETS WITH A PENNY

I was made inspector on a bridge construction job and put in charge of testing rivets. The engineer on the job showed me how to do it: Hold a penny between thumb and forefinger of the left hand and place it on one side of the rivet head. Strike the other side of the head with a light hammer. If the rivet is loose, a jar will be felt through the coin. If the rivet is tight, the hammer blow cannot be felt, and the blow sounds as though the section had been struck. If a loose rivet were found among a large group of rivets, it is deemed imprudent to cut it out, as the hammering required to push it out tends to loosen some of the other rivets and spoil the entire joint.—R.B.

SAFEGUARDS ARE NECESSARY

An incident which occurred on a highway job last summer illustrates the necessity of enforcing safety regulations that may seem unnecessary. The contractor had neglected to barricade the side roads which crossed the job under construction, and the engineer had not forced him to do it. This is common practice, since the side roads carry little traffic other than that of local inhabitants who know the condition of the main road.

At certain places on the main road the old concrete slab had been removed. One night a local young man came off a side road and drove down the main road until he struck a spot where the slab had been removed, and the car overturned. He escaped with a few cuts and bruises, but the car was badly damaged.

The young man immediately saw the contractor and demanded reparations. The contractor tried to pass the buck to the engineer, but the latter called his attention to the specifications that called for barricades and advised him to pay the claim, which he had to do.—D.E.

ALUMNI NOTES

by Roy McIntosh, met '42

Mechanicals

McLENEGAN, D. W., '21, has been promoted to engineer of the General Electric air conditioning and commercial refrigeration department at Bloomfield, New Jersey. He has been with General Electric since 1922.

REX, H. E., '29, who is with the Carrier Corporation of Chicago, was in Madison on business on January 6, 1942.

BARNEY, EDWARD, MS '36, has been with the Boeing Aircraft Corporation since March, 1940. He is now Assistant to the Project Engineer of the B-17 Flying Fortress Unit.

CALDWELL, LT. J. R., '40, was killed in action in the Philippine Islands on January 16, 1942. He had charge of a crew constructing hangars and expanding the field.

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Chemicals

WATSON, CHARLES C., PhD '38, was married Sunday, Dec. 14, 1941, to Jean Barbara Mathews, of Madison, Wis. Mr. Watson has a position as research engineer with the Universal Oil Products Co. in Chicago, Ill.

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Civils

SAVAGE, JOHN L., '03, chief designing engineer for the U. S. Bureau of Reclamation at Denver, continues to be the recipient of high honors. He was one of five outstanding civil engineers in the country to be made an honorary member of the American Society of Civil Engineers at the January meeting of the society in New York.

SHOREY, EDWIN R., JR., '35, has a leave of absence from the Shell Oil Company, where he had the position of production engineer, due to military duty. He is now a 1st lieutenant and is temporarily located at Camp Joseph Robinson, Little Rock, Arkansas.

JANKUS, ALLAN, '39, left the American Bridge Company in August to join the staff of the Abell-Howe Company, contractors and engineers of Chicago.

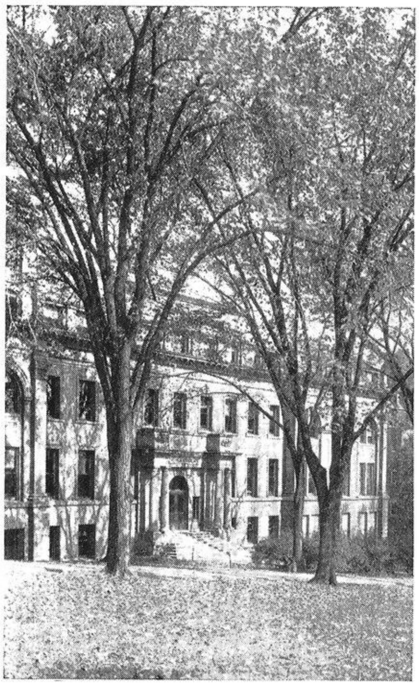
LEHMANN, KENNETH F., '39, left the Oliver Mining Company last November and flew to Panama, where he is junior engineer on reinforced concrete design. He reports "conditions better than I expected," and appreciates the change from cold Minnesota to a tropical climate.

VOSS, ARNOLD W., '39, now with the Timber Mechanics Department of the Forest Products Laboratory, has been in Louisiana on a government project.

DIETZ, JESSE C., Jr., '40, who was instructor in sanitary engineering at this university during the first semester of this year, left at the end of January for active duty. He reported for six weeks of training at Ft. Belvoir, Va.

DOLLHAUSEN, JOHN L., '40, maintenance engineer for Dupont - Nemours Co., at Niagara Falls, N. Y., reports the arrival of a son, John Roger, on November 28, 1941.

SANDERSON, JOHN L., '40, is estimator and salesman for Wendnagel and Co., a structural steel company in Chicago.



CLARKE, HARRY D., '41, is a lieutenant in the U. S. Marine Corps, stationed at the Basic School, Navy Yard, Philadelphia, Pa.

SUNDERMANN, IRWIN G., '41, is an ensign in the U. S. Naval Reserve and is taking four months of training at Annapolis.

SCHUETTE, EVAN H., '40, resigned his fellowship at Stanford University at Christmas recess and began work on January 4 in the section on Structures Research of the National Advisory Committee for Aeronautics at Langley Field, Va.

REMLEY, ROBERT R., '41, joined the Air Corps and is taking flight training at Cal Airo Academy, Ontario, California.

Miners and Metallurgists

EHRLINGER, H. P., '25, is a Captain in the QMC of the U. S. Army at Fort Bliss, Texas, and is engaged in construction.

HAHN, EMILY, '26, who has been teaching at the Customs College, Shanghai, China, volunteered and is serving as nurse at the Queen Mary hospital for the duration. Her work since leaving the University has been principally in the field of journalism, being the author of "Beginner's Luck," "Seductio ad Absurdum," "Affair," 'Congo Solo," "With Naked Foot," "Steps of the Sun," and "Three Soong Sisters."

SIREN, JULIUS E., '39, was killed in a mine accident at Nigoni, Mich.

CHRISTENSON, JAMES O., '39, formerly of A. O. Smith, is now 2nd lieutenant in the Ordnance Department, Washington, D. C.

VAN BUSKIRK, HECTOR A., '39, was married Dec. 27, 1941, to Marge Wojta, a graduate of the University of Wisconsin Nursing School. They recently returned to Canada where he has a position as geophysicist with the Emperial Oil Co.

BLACK, ERROL V., '40, resigned his position in the time-study and job analysis department of the Bell City Malleable Iron Co. of Racine, Wis., to take a position as junior metallurgist at the Philadelphia Navy Yard.

WORDEN, STEWART, '41, is a 2nd lieutenant in the Ordnance Division of the U. S. Army at Shreveport, La. He is in charge of Construction and Public Relations.

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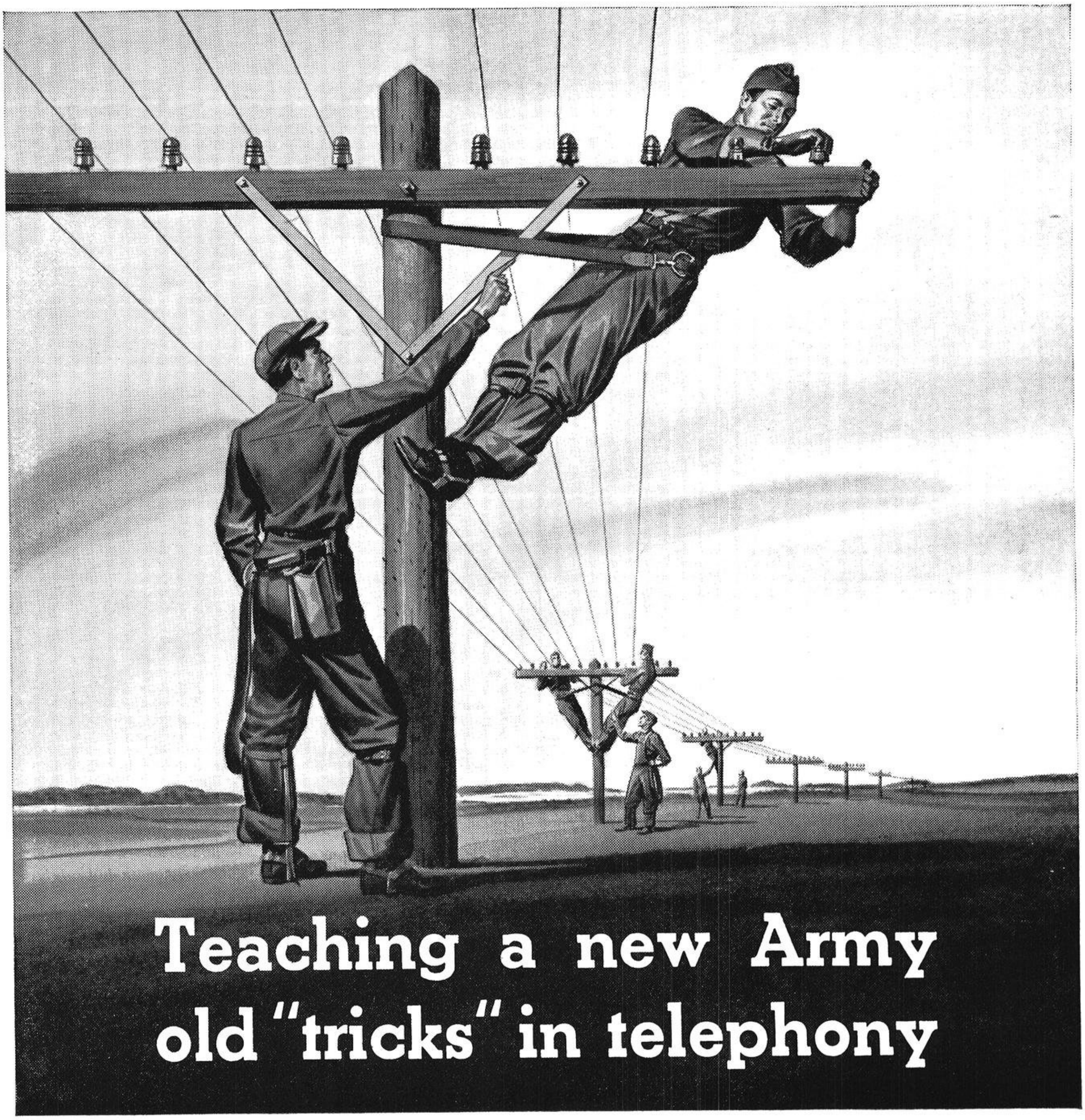
Electricals

BICKELHAUPT, CARROLL O., '11, has been elected a vice-president of the American Telephone and Telegraph Co.

ANDREW, EDWARD L., '16, vice-president of Fuller & Smith & Ross, Cleveland agency, has been selected by Industrial Marketing as the "industrial advertising man of the year," for his series of advertisements, "Aluminum, Defense and You," produced for the Aluminum Company of America.

REED, PHILIP D., '21, chairman of the board of the General Electric Company, and also deputy director of the materials division of the OPM, gave a talk before the Sales Executives Conference of the St. Louis Chamber of Commerce, St. Louis, Mo., on November, 14, 1941, in which he described the "bright stars in a dark night" which justify faith and confidence in the future.



The telephone plays a vital role in army communications. So the Bell System is helping to school Signal Corps men in practically every phase of telephone construction, operation and maintenance.

This training job is but a small part of the tremendous task Bell System people are doing in this national crisis. They're setting up telephone systems for new camps, bases and factories — handling an enormous volume of calls needed to co-ordinate the Nation's war effort.

Throughout the country, Bell System people are wholeheartedly cooperating in the drive for victory. To men and women of their high caliber, there is real satisfaction in a difficult job well done.

American Telephone & Telegraph Co. and Associated Companies
Bell System

February, '42 Grads

Mechanicals

BOGART, J. D.—No report.

ENGER, R. C.—has accepted a position with Linde Air Products.

GRUENWALD, K. H.—has a position with the Allis Chalmers Mfg. Co. in West Allis, Wis.

HARP, C. W.—is with General Electric.

HEAGLE, R. E.—is with General Electric.

HENNINGFIELD, D. S.—has a position with the Allis Chalmers Mfg. Co. in West Allis, Wis.

KAISER, CLYDE L.—No report.

KLAUS, D. E.—is with Remington Arms in Ilion, N. Y.

KNUTSEN, H. K.—No report.

LAVIN, H. J.—has a job with Chain Belt in Milwaukee.

LUCAS, WOODROW — is with the Electromotive Corporation in LaGrange, Ill.

MAINZER, K. C.—is in the Naval Aviation Corps of the United States Naval Reserve.

MILAUC, FRANK, Jr.—is with Allis Chalmers Mfg. Co. in West Allis, Wis.

ROWE, CARL B.—is going to teach in the Mechanics Department of the University of Wisconsin.

ROWE, WILLIAM H.—is in the United States Naval Reserve.

SCHAAK, G. C.—is with General Electric.

SHARROW, R. F.—is with General Electric.

SOMMER, W. L.—has an Army Commission.

Chemicals

ALLEN, JAMES S.—No report.

CLEMENS, ROWLAND A. — has a position with DuPont in Morgantown, W. Va. He is in the ammonia division.

DOWIE, DOUGLAS W.—is going into the army as a 2nd lieutenant.

GILBERT, JULES—No report.

HUSSA, OWEN L.—has a position with Proctor & Gamble.

MUELLER, FLOYD F.—No report.

PETERSON, HAROLD E. — is employed by Kimberly Clark Corporation, Neenah, Wis.

ROBERTS, ARTHUR J.—is with Proctor & Gamble.

WAMSER, ROBERT G.—is employed by the Hercules Powder Co.

Miners and Metallurgists

KOSS, WILLIAM J.—is going to the navy.

SCHMIDT, ERWIN H.—has a position with the Giddings & Lewis Co. of Fond du Lac.

STERN, MARVIN—has a position in the Cleveland Tube Plant of the United States Steel Corporation.

Civils

McBURNEY, ROBERT S.—has registered in the Graduate School at Wisconsin and is continuing a research project on brick masonry.

MILAEGER, RALPH E.—is with the Standard Oil Co. of Ohio.

SPIEKERMANN, JOHN C., JR.—reported on February 13 to the Boeing Aircraft Co. in Seattle.

Electricals

ANCELL, J. E.—is in the Naval Reserve.

CARTER, E. T.—has a position with Boeing Aircraft Co., at Seattle.

GIBBS, C. L.—No report.

LARSON, R. W.—is doing Defense Research Work at Massachussetts Institute of Technology.

LINDSLEY, W. F.—is with General Electric Co.

LUNDBERG, E. J.—is with General Electric Co.

MAY, H. E.—has a position with the Hygrade Sylvania Corporation.

MILLER, R. D.—has a position with the Electromotive Corporation in La Grange, Ill.

OLSON, S. E.—has a job with General Electric Co.

PETERSON, R. A.—has a position with Boeing Aircraft Co. in Seattle.

RETZER, T. C. — is in the Signal Corps Laboratory at Fort Monmouth, New Jersey.

REUTER, P. L.—No report.

RICHARD, V. W.—has enrolled in the Graduate School at Wisconsin.

SCHMIDT, C. J.—is in the Signal Corps Laboratory at Fort Monmouth, New Jersey.

TOY, E. M.—No report.

WHEELER, B. G.—is with General Electric in Schenectady with his bride, the former Ellen Bridge of Madison.

SOCIETY NOTES

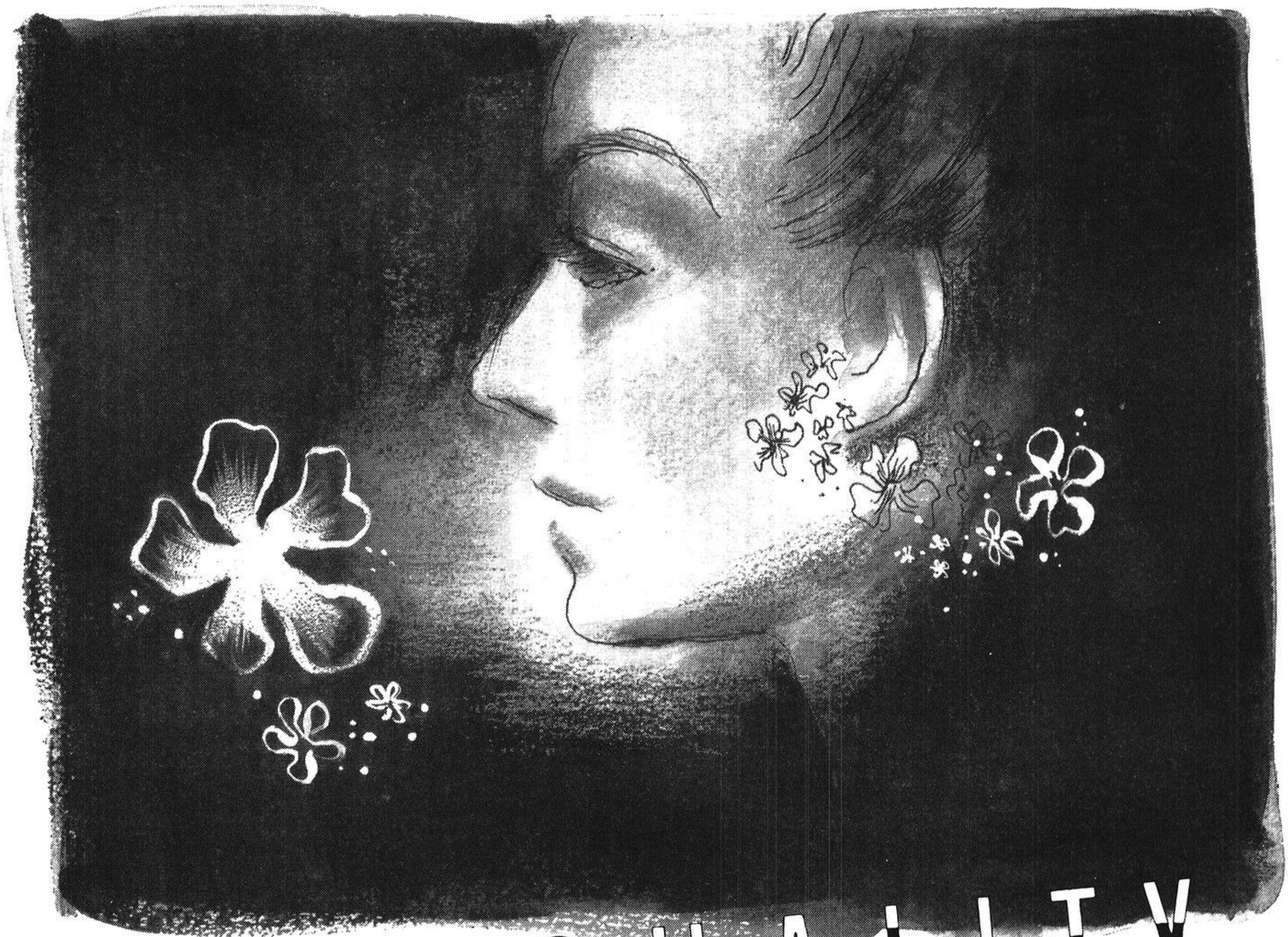
The last meeting was held on February 11. Professor Williams of the chemistry department gave a talk on centrifuges. The organization gave its annual award for the outstanding sophomore of last year to Roger Lescohier, ch'43, who earned a 2.93 grade point average.

Election of officers was held at the December 10 meeting, and the leadership passed from Willard Warzyn to Alfred Ingersoll. The next meeting will be held February 18, at which time Mr. Jagger, one of the most important men in the national ASCE and a field secretary, will speak. In March they plan a joint meeting with the AIEE, and will have a talk by some prominent religious leader.

At the January meeting Mr. V. D. Claffey of the General Malleable Co. of Waukesha spoke to the miners about the opportunities for graduating engineers. He said that engineers should not be discouraged because of overcrowding in his field; that opportunities will come. A dinner prepared by the boys was served.

The last meeting was held on February 5. Hollister Moore of the national chapter dropped in unexpectedly and fifteen or twenty SAE's gathered in the Rathskeller and held a bull session over their beers. They discussed plans for the next year's membership campaign. They will have another field trip to Milwaukee to hear a lecture on gas turbines soon. The Polygon member and St. Pat will be elected at the next meeting in time for St. Pat to start growing his beard. A debate team is in training to meet Kansas University next September at the National Tractor meet.

The first meeting of the semester was held on February 5. At that time the announcement was made of the resignation of George Acree as Vice-Chairman and the appointment of Art Lytle as his successor. In addition, Ed Dickenson was elected Polygon representative, and George Acree was elected St. Pat candidate of the electricals. Three student papers were presented by Mike Larson, Vic Richard, and Mike Supitilov. Attention was called to the AIEE contest for technical papers. The next meeting, on March 12, will feature a movie on Electrical Safety.



SHELL FORGING . . .

(continued from page 9)

for correct depth and serious imperfections and it is then marked with the lot number and placed upright on the overhead conveyor. A sheet metal cover is placed over the shell to slow the cooling process. After the shell has been cooled for four hours the cavity is sandblasted to remove scale, then ground by hand grinders to smooth out any rough score marks from the punch drag. This is followed by a final inspection. No further processing is done at the plant.

More than 120 of these shells have been produced per hour per machine on a single shift of eight hours, including the time necessary to change punches and dies. At times production rates considerably higher than this have been achieved on a 16-hour run.

The stock used is a round bar 2⅞ in. in diameter and about 8 ft. long; enough stock for five shells, with about 10 lb. of butt scrap left over. The finished-forged shell weighs about 35 lb.

The dies used for this process are chosen for their ability to withstand the heat of the stock, the pressure attained in gripping the stock, and the abrasive action of the flow of the metal being displaced. The steel used in the dies for this process has a standard analysis common to this type of work, being a chrome-nickel-molybdenum alloy, heat-treated for toughness and wear-resistance at high temperatures.

Punch Problems

The punches have been the biggest single obstacle in achieving a high rate of production. They are subject to large thrusts, which necessitate a tough, strong steel, yet they have to be very hard to withstand the terrific abrasive action at the high temperatures. No perfect solution to the problem of combining these two seemingly incompatibles has yet been accomplished, but some notable advances in length of punch life have already been achieved.

In their development, several troubles immediately arose. The punches, having straight sides, would often bind in the shell and be pulled out of their holders. When the punches did come free after piercing the shell they were badly scored by small bits of scale which formed on the steel between operations. And as one of the big advantages of the process lay in the fact that no machining of the shell cavity was to be necessary, a shell made by a scored and pitted punch would not pass inspection. Furthermore, some punches were wearing and scoring much sooner than others, causing a lot of down time for the machine. The path of the engineers and die designers was a rocky one, but in time several developments served to increase punch life from 50 shells per punch to the present rate of several thousand shells per punch.

The punches had a taper of about 10 minutes on a side, allowable under the specified diameter tolerances; were re-designed as to length and shape to evenly distribute the work and wear on each punch, and were given a cyanide case hardening to improve their wearing ability. A mixture of graphite in oil swabbed on each punch before forging has proved to be the most successful lubricant in preventing sticking and scoring.

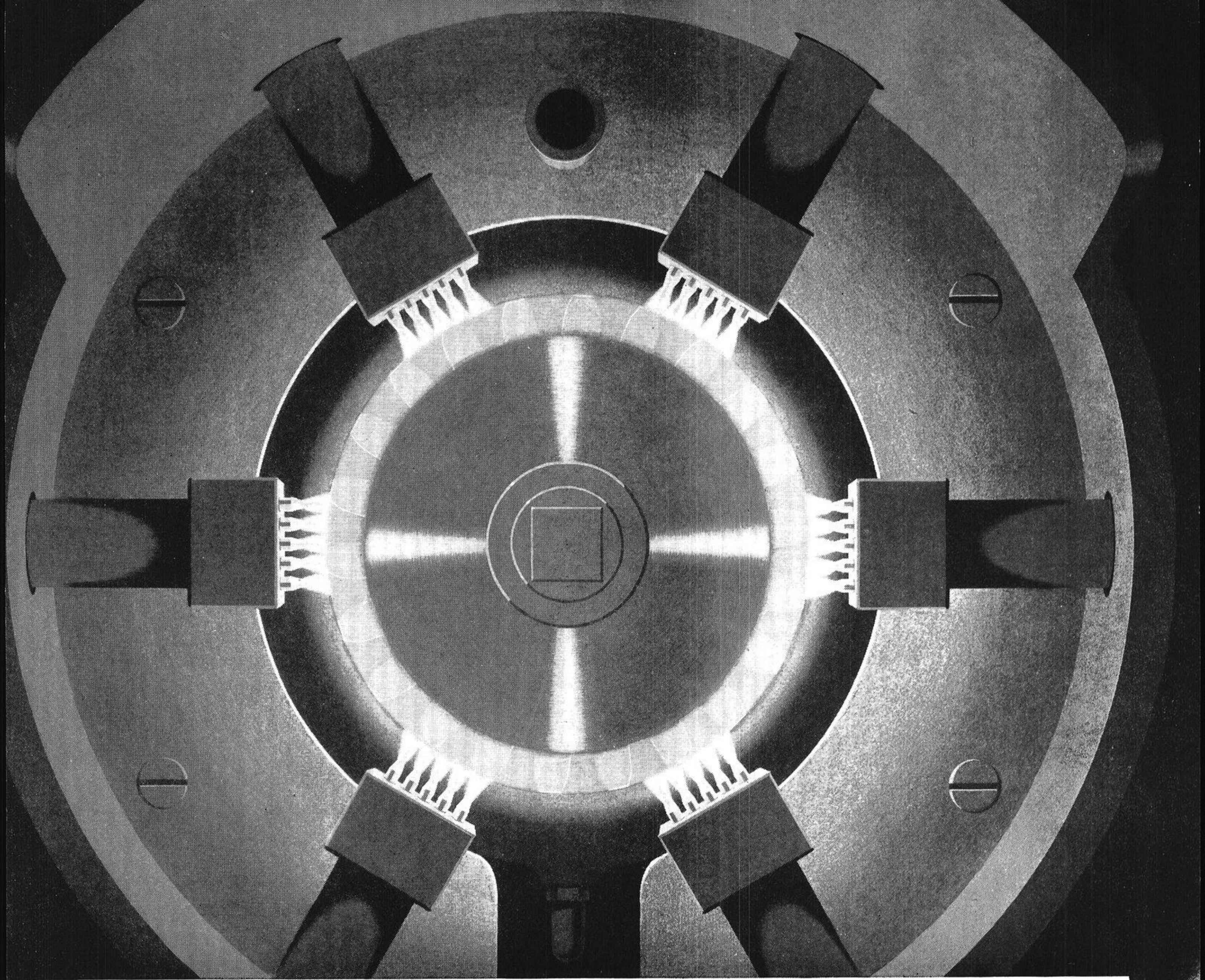
This process has several inherent advantages. The most important is the reduction in the amount of machining necessary on an upset shell to that necessary for a shell made by any of the older processes. Machining time is cut in half because the cavity needs no machining, and less turning is required on the outside diameter and the ends. Previous methods required more stock in the base and at the open end of the shell because of indefinite cavity depth, and needed more stock in the walls to allow for the lack of accurate control of the concentricity of the cavity. The high explosive shell discussed here is tapered at the base and only the upset and one other newly developed process will provide this taper, necessitating less steel and less turning.

Importance of Process

More important than the machining time saved is the saving in steel itself. This is possible because of smaller machining allowances. At times when shells are needed in a hurry the important factor in their production is the availability of steel. And as the steel available is dependent not just on the supply of iron ore and coke but on the capacity of the steel mill, any saving in the original steel requirements for a given lot of shells is of paramount importance. By a typical old process 50 lb. of rolled stock are necessary to produce a finished 20 lb. shell. By the upset process 36 lb. are necessary. Then for the same weight of steel stock the upset method will produce $50/36=1.4$ times as many shells as the typical old process. Expressing the idea in a different way, the saving in steel capacity of the upset method over the old is $(50-36)/36=40\%$. Considering that 500,000 antiaircraft shells were used in one day over London some time ago, this process would have reduced steel requirements for that day alone by 3500 tons.

It should be brought to mind that by a "typical old process" is meant one of the methods used for shell forging during the last war and up to two or three years ago. Recently, however, several processes for forging shells have been developed, the discussion of one having been published since the inception of this paper. These new processes utilize various forms of hydraulic and mechanical presses for piercing a billet larger in diameter than the finished shell, and depend on various types of rolling or drawing machinery to form shell by extrusion. The one advantage that may be claimed for the new processes over the old, with the exception of the upset process, is that the cavity is finished in forging.

Two more advantages are claimed for the upset process over any other process yet developed. The upsetter used is standard forging equipment, very valuable for making many peacetime products, and is cheaper than the specialized and numerous pieces of equipment used for any other shell process. Special machinery in addition to being more expensive has usually but one use. And last but still very important is that the cost of manufacture of shells is least for the upset process.



A SHORTER WAY TO LONGER LIFE

Spinning furiously in a bath of fire, gears that will play a vital part in the nation's production are given longer, more useful, more productive life . . . in a hurry. Through the swift magic of the oxy-acetylene flame, not only gears, but a host of other metal parts and articles can have their wearing surfaces hardened . . . exactly where hardness is needed to resist wear.

This is something *new* in metal working. The secret of it is that heat is applied so quickly and with such precise control . . . and quenching follows so rapidly . . . that any piece so treated has no chance to become hardened all the way through. This means that valuable properties like toughness and ductility are retained in the core of the metal.

The advantages of oxy-acetylene flame-hardening are manifold. By its use, hardening can be localized to those areas where wear will occur. Thus one section of a shaft, or the rim of a wheel, or the teeth of a gear can be hardened, leaving the rest of the piece in its original condition for needed properties or easy working. Cheaper and more plentiful ferrous metals can often be made to do the work of less readily obtainable steels.

The method is lightning fast, so it saves on operating expenses. Some pieces can be hardened in as little as five seconds. Production is speeded up as costs go down. In many cases, machines can be simplified in construction by the use of flame-hardened parts.

Materials which can be flame-hardened include dozens of plain carbon, chromium, manganese, nickel, chromium-nickel, chromium-molybdenum and chromium-vanadium steels. High strength cast iron and pearlitic malleable iron can also be hardened by this method.

Linde supplies the oxy-acetylene equipment, also the oxygen and acetylene for use in the flame-hardening process. Inquiries about oxy-acetylene flame-hardening, flame-cutting, fabricating, and treating of metals are cordially invited.

• • •

The important developments in flame-hardening — and other processes and methods for producing, fabricating, and treating metals — which have been made by The Linde Air Products Company were greatly facilitated by collaboration with Union Carbide and Carbon Research Laboratories, Inc., and by the metallurgical experience of Electro Metallurgical Company and Haynes Stellite Company — all Units of Union Carbide and Carbon Corporation.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

GENERAL OFFICES: *New York, N. Y.* OFFICES IN PRINCIPAL CITIES

HERE'S . . .

STATIC

. . . FOR YOU

WHAT THE OTHERS THINK

In order to obtain an unprejudiced viewpoint of the engineers, we conducted a non-partisan poll on the campus recently. The question was—"What is your impression of the Engineers?"

The balloting was extremely heavy, and we obtained many and varied answers. The three most common opinions were: Engineers are—

1. Wolves
2. Uncouth
3. Wolves

Knowing that this was not entirely the case, we prevailed upon a representative of the "culture college" (L. & S.) to circulate amongst us to see for herself what a serious, diligent group the Engineers really are.

Herewith is her report:

"On the first morning I wandered into the Engineering library. The absolute quiet of the group amazed me. Some of the Engineers were concentrating on linear curves from the sacred pages of ESQUIRE, while others were asleep on the tables. Not wishing to disturb them, and knowing Engineers, I rushed out the door.

"The next stop was a Machine Design class. I arrived just in time to hear the professor ask this question: 'If you start at a given point on a figure and travel the entire distance around it, what will you get?' Student: 'Slapped.'

"Aha, I muttered to myself, they may be wolves, but they're not stupid.

"Next, I quietly slipped into an electrical engineering class, and was privileged to hear Prof. Bennett explaining a complex derivative: 'Just watch the blackboard while I go through it again.'

"Not daring to watch, I hurriedly retraced my steps.

"My fourth stop was made at a Steam & Gas class where the instructor, a certain Noble Sherwood I believe, was giving an oral quiz. 'Now, Mr. Ingersoll, can you give the class an example of wasted energy?' 'Yes, sir—telling a bald-headed man a hair-raising story.'

"The instructor winked at me, and feeling quite embarrassed and self-conscious, I immediately dashed for the door, but was unable to escape without hearing the following: 'Mr. Custin. Give me an example of perpetual motion.' 'A cow drinking a pail of milk.'

"I quickened my pace, and soon found myself in the lobby of the Mechanical Engineering building where I had hoped to analyze a composite group of Frosh, Sophs, Juniors, and even Seniors. However, as I passed the M.E. Auditorium I heard a disgusted professor shout: 'You may go now, but for Heaven's sake don't flap your ears on the way out.'

"Anticipating the tremendous stampede which was to follow, I decided to forego my last scheduled analysis in order to insure my own safety. As I flew out the door, I remarked to myself: 'Everything that people say about the Engineers is true—very true'."

•

After a rather serious accident involving one of the local taxis the policeman who was investigating the case asked, "How did you knock him down?"

"I didn't," the poor driver replied, "I slowed down to let him go across—and he fainted."

•

WHAT'S YOUR I. Q.?

1.—Here's a problem in simple mathematics. You have four number sevens, and you are allowed to combine them by using any or all of the four common mathematical processes — addition, subtraction, multiplication, and division. How can you obtain a result of 56 by using only the four sevens?

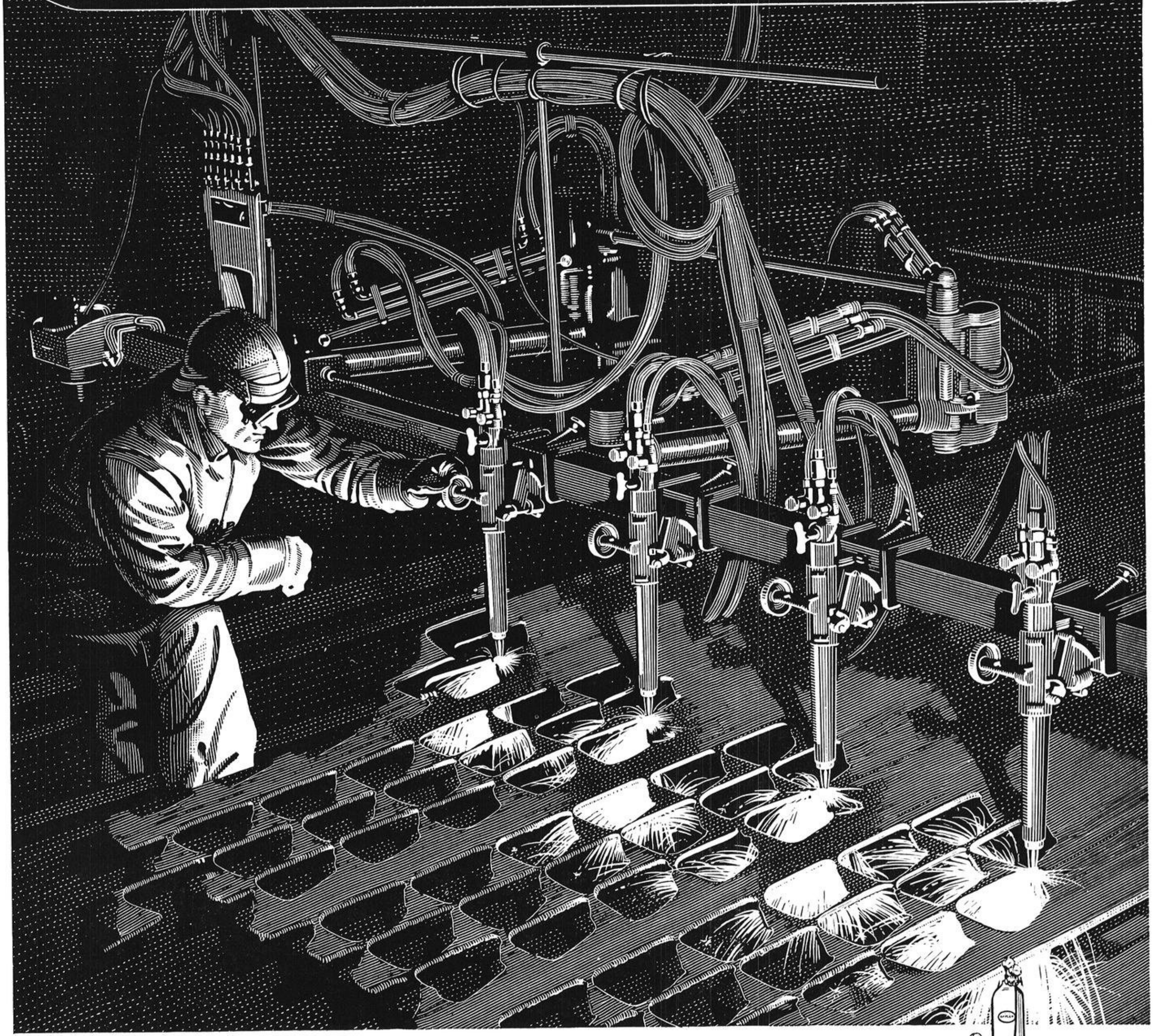
2.—You are given a room which is perfectly insulated and which is at a temperature of 70 degrees Fahrenheit. Inside the room is an electric refrigerator with its door open. The refrigerator is connected to a source of power which is outside of the insulated room, and electrical energy is supplied to the refrigerator. What is the effect upon the temperature of the room?

3.—If you were on a frictionless surface, what would be the best way to get off?

(a) just walk off
(b) fall down and kick yourself off
(c) take off your shoe and throw it off
(d) blow yourself off

Answers on Page 28

FLAMES ARE THE CUTTING TOOLS



EACH hour is worth ten in production time when steel plate for our machines, guns, tanks and ships are multiple flame cut by the Airco Oxyacetylene Flame. Slicing its way through steel and iron, this white hot flame has revolutionized metal fabrication by providing a swift, accurate, economical method of shaping sheets, forgings, castings, structures and pipe. Size and shape which can be cut is practically limitless. A single piece or hundreds of identical pieces can be shaped to amazingly close tolerances. Changes in design require only new blueprints or templets to guide the torch.

Other defense jobs being done by this versatile metal working tool include hardening steel to any degree and depth; welding two or more metal parts into a strong, homogeneous unit; machining metals with unrivaled speed, and cleaning and dehydrating metal surfaces for long lasting paint jobs. To insure greatest speed, efficiency and economy in applying the Airco Oxyacetylene Flame to defense production, Air Reduction offers industry the cooperation of a complete engineering staff.

To better acquaint you with the many things that this modern production tool does better we have published "Airco in the News", a pictorial review in book form. Write for a copy.

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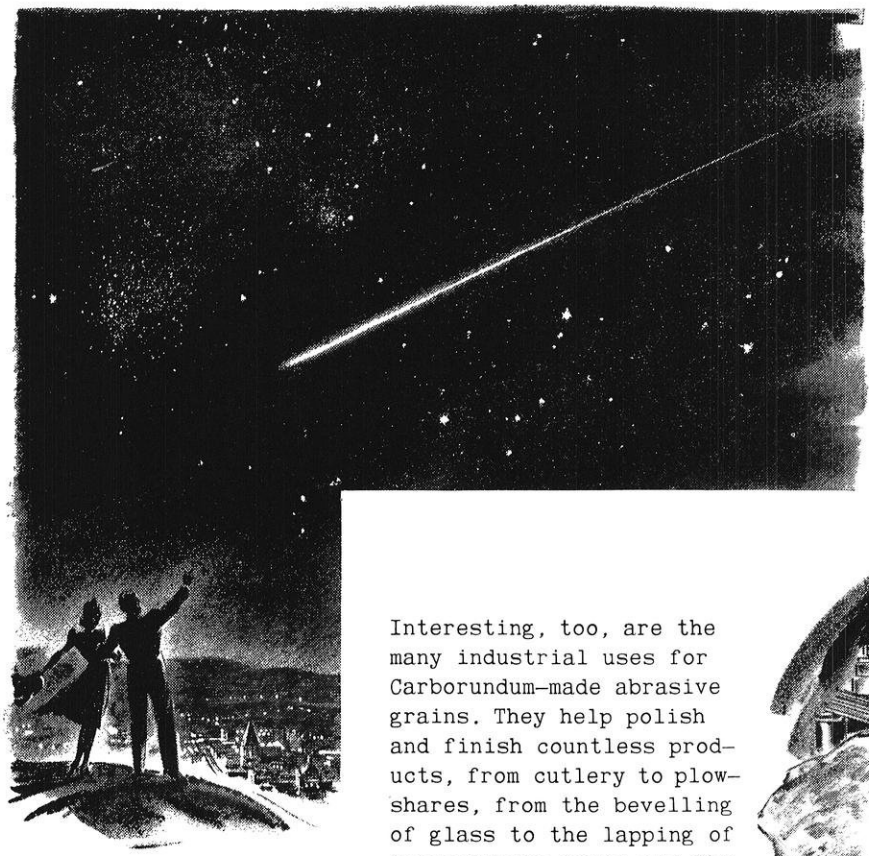
Librarian Volk Reviews Some New Arrivals at Library

ADVENTURES of a White-Collar Man. This is a fascinating little book which one is tempted to try to read at a single sitting. I tried to but my better judgment triumphed shortly after 2:00 A.M. It is more than the story of an engineer from his first adventure in seeking a job as a recent graduate of M.I.T. in 1895, to his present position as head of one of the largest business enterprises of the world. It is a saga of the development of modern manufacturing—especially the automobile industry,—and it emphasizes the value of an engineering education to the modern industrial executive. Toward the end of the book Mr. Sloan discusses some modern trends and the "Adventures Ahead" for the young men now starting their careers.

•

The Boulder Canyon Project, by Paul L. Kleinsorge. "A noteworthy feature of the past decade is the marked progress of the development of the water powers of the country through vast federal projects . . . The first of these projects in point of time and among the first in size and importance, is the Boulder Canyon Project . . . Special emphasis is placed here upon the historic and economic aspects in order to appraise the project from an economic point of view . . . A study of the services of the project and their value in relation to the costs incurred." The author is a Stanford man and sticks to the original name of Hoover Dam.

How to Slice a Meteorite!



Ever see a shooting star? There are about 7,500,000 every night! Most of them burn up in the outer atmosphere, and the few that reach the earth are man's only material link with celestial space. For examination and study, these hard, dense meteorites are easily sliced with a special type of bandsaw using Carborundum Brand Abrasive Grain as cutting agent, then finished with finer grain and powders.

Interesting, too, are the many industrial uses for Carborundum-made abrasive grains. They help polish and finish countless products, from cutlery to plowshares, from the bevelling of glass to the lapping of transmission gears and the grinding of optical lenses.

Whatever may be the use of grinding wheels, coated abrasives and other abrasive products in the industry you enter, you'll find our outstanding research, manufacturing and engineering facilities can render a real service. Write The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
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ABRASIVE PRODUCTS

S-T-A-T-I-C

WHY LOCOMOTIVES ARE CALLED "SHE"

They wear jackets with yokes, pins, shields, and stays. They have aprons and laps, too. Not only do they have shoes, but they have pumps and even hose, while they drag trains behind them. They also attract attention with puffs and mufflers, and sometimes they refuse to work. At such times they need to be switched. They need guiding and require a man to feed them. They all smoke, and they are much steadier when they are hooked up.

•

A censor is a lovely man—
I know you think so too;
He sees three meanings in a joke—
When there are only two!

•

Caller at hospital: "I'd like to see Mr. Jones."
Nurse: "He's in the sitting room."
Caller: "Oh, well, I'll wait until he's through."

•

WHAT'S YOUR I.Q.?

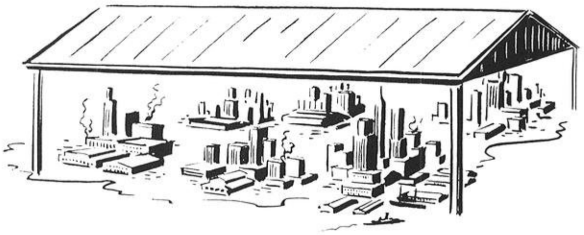
Answers:

1—Seven divided by seven plus seven times seven is fifty-six.

2—The temperature of the room rises because energy enters the room and is not allowed to leave.

3—(c).

G-E Campus News

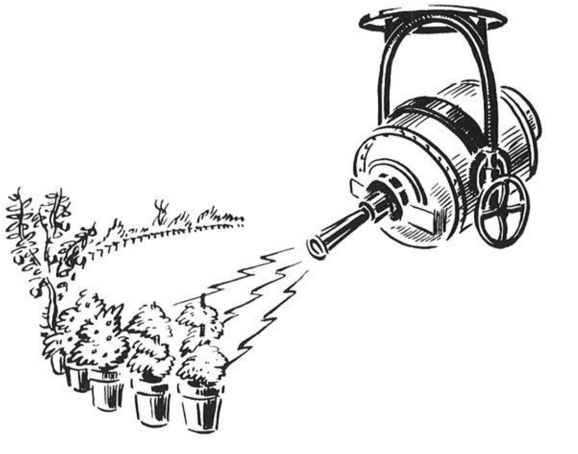


UNDER ONE ROOF

THE General Electric Company has a leased-wire communication system which functions as smoothly as if all G-E branches were housed in a single building.

During the year 1941, a total of 3796 miles was added to the leased-wire communication system to help speed the handling of contracts. A network of 11,565 miles is now available for telephone and teletype messages.

The telephone network covers 5630 miles and serves 17 key industrial cities in the East and Middle West. It contains 37 individual wires, many of which can be interconnected for greater flexibility and coverage. The teletype network comprises 4822 miles of full-time circuits and 1113 miles of part-time circuits. Thirty-one cities are served directly, and many others are served indirectly.



VOLTS AND VITAMINS

THE General Electric industrial X-ray laboratory recently moved a large number of apple and other fruit trees, berry bushes, and tomato and string bean seeds into the confines of its workrooms.

There, under an X-ray machine, these various specimens of flora were bombarded with 1,000,000-volt X rays. They were then returned to the New York State Experiment Station at Geneva for planting and subsequent observation of the effect of the X rays upon the color, size, flavor, quality, resistance to disease, and other characteristics of the fruit and vegetables.

Variations and mutations are to be expected when living plant cells are subjected to bombardment with X rays. Under forced germination, effects of the 1,000,000-volt treatment on seeds may be observed within a few days, but, for the young trees and berry bushes, the full effect will not be known for at least five years.

LE DERNIER CRI

THE General Electric Company's construction of the first large electric plant in the Belgian Congo was stalled by the lack of dowel pins, the only items missing from an inventory of hundreds of parts. The whole camp was searched, natives were questioned, but not a single dowel pin was found.

With a 90-day deadline, replacements were out of the question, so, with makeshift materials, tools, and help, new dowel pins were fashioned. The job was finished on schedule.

Months afterwards a visitor to a half-savage tribe in the Belgian Congo found men and women alike wearing a new type of nose ornament. Thrust through the cartilage of the nose, gleaming and twinkling in the African sunlight, the missing dowel pins were the pride of the natives.

GENERAL ELECTRIC

953-32-211