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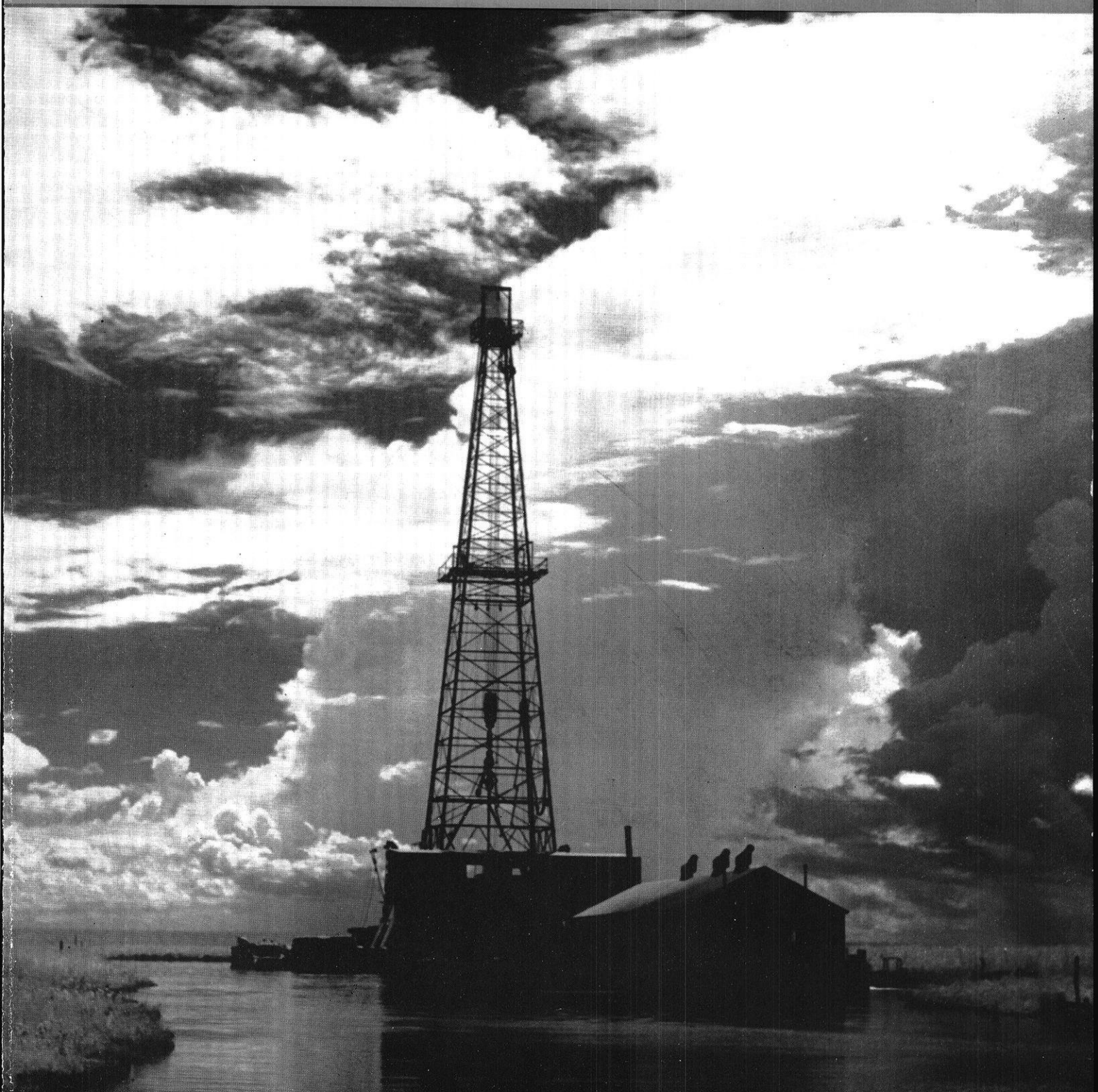
WISCONSIN ENGINEER

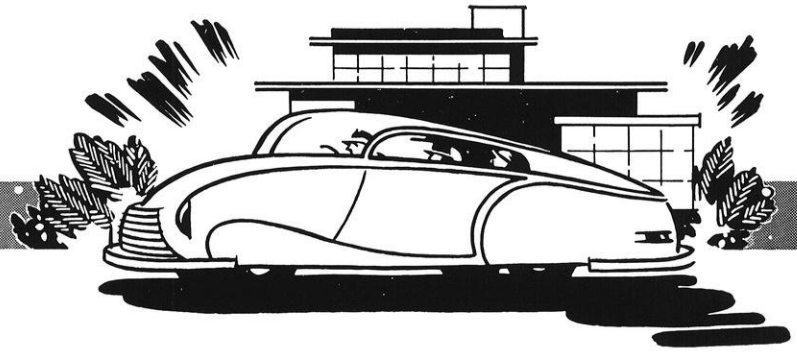
December, 1943



MEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED

Knowing your Bearings

gets results in WAR and PEACE



MANY of the veteran engineers responsible for the design of the equipment that is winning the war—tanks, trucks, guns, airplanes, etc.—began to acquire their knowledge of Timken Bearings while in college. Now the results are telling on the battle fronts of the world.

When Victory has been won and industry calls you to help in the tremendous job of reconstruction, you'll find a thorough knowledge of the design and application of Timken Bearings one of your most valuable assets. Begin to acquire that knowledge now. The Timken Roller Bearing Company, Canton, Ohio.

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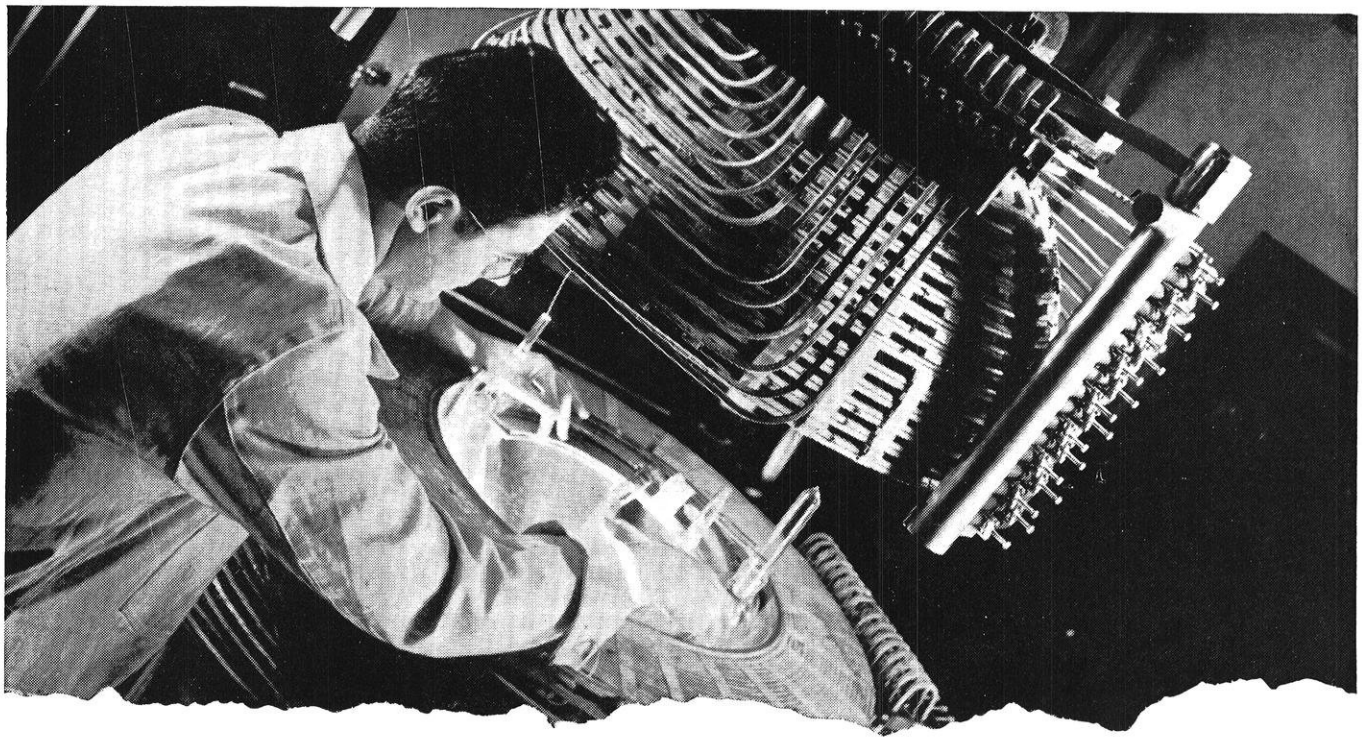
TAPERED ROLLER BEARINGS



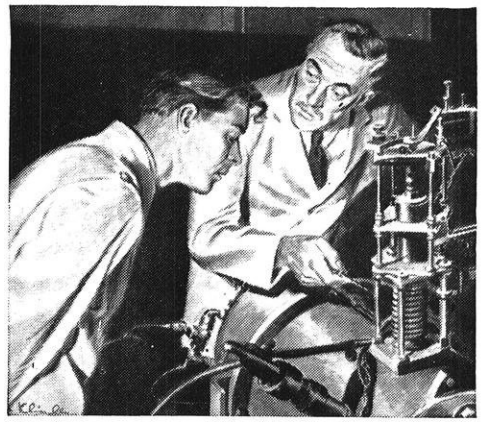
Helping the tire maker: Pictured here is a laboratory model of the new Westinghouse-developed "mass spectrometer," an adaptation of which analyzes gases with incredible swiftness and accuracy. Right now, one of the most important of its many uses is speeding up tremendously a step in the making of synthetic rubber.

Westinghouse research accepts every wartime challenge . . .

Under the spur of war, Westinghouse research is delving into numberless mysteries, not only in the vast field of electricity and electronics, but also in chemistry, physics, metallurgy, plastics. And as a result, out of the great Westinghouse laboratories has come a steady stream of new war products, and new and better ways of making old ones.

Westinghouse research develops new talent for America . . .

To Westinghouse, each year, come several hundred budding scientists and engineers—to work, to learn, to blaze new trails in electrical research. And each year, through more than 100 Westinghouse scholarships, young men enter America's engineering colleges to develop the native skill and talent that have made America great and will make it greater.



Westinghouse research promises new wonders for peace . . .

You have heard much talk of the marvels science will offer you after the War. Well, there *will* be marvels—plenty of them—and Westinghouse research is working to contribute its full share. But we will never lose sight of what we consider our first duty: seeing that, beyond all question, each Westinghouse product, old *or* new, is the very finest of its kind. Westinghouse Electric & Manufacturing Co., Pittsburgh, Pennsylvania. Plants in 25 cities, offices everywhere.

We know what's happening on your campus

Here's what's cooking on ours

We're very much aware of what you are doing.

It's because we are grateful that we want to tell you this.

You've never known industry—not really well. It's probably still a vague place that makes things you buy. You probably think of us as just a place aluminum comes from . . . the aluminum that makes the planes you are going to work with.

But we're people—fathers and older brothers, mothers and sisters, doing the most interesting work we know.

When you come back you'll see this other side of industry. You'll see people figuring out what they can do to make a better world, and you will want to join them, doing something to make the peace rich and worth the fight.

There will be a great many things to be done. A lot of them will be done with aluminum.

Think of all the things the world is going to want in a hurry. A great deal of them will be shipped by air. So they'll be as light as possible. That's one reason why they'll be aluminum.

Millions of things are waiting for someone to make them lighter or more resistant to corrosion, brighter, prettier, cheaper. They'll be made of aluminum, too.

None of that can start till the war's over. But just as soon as our wartime job is done, we mean to make aluminum make a lot of jobs.

And that's what's cooking on our campus. We're studying right now ways of making those jobs. Some of them, we hope, will be right here at Alcoa Aluminum. Still more will be in industries using aluminum for the first time. Wherever they are, they should be exciting.

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.

A Tau Bete President's Swan Song

My best-liked and most fruitful course on campus has been fraternity. It was three years before I started doing any work in the course, other than that all laid out for me — like making friends of roommates and lab partners. Then I found that a lawyer living in the same house with me was a darn nice fellow even if he did think that the carburetor was located behind one of the dials on the dashboard. An engineer whom I hadn't even noticed until my last semester in school suddenly revealed himself as exceptional, being in training for the boxing team and a very devoted student of the violin as well. I often wonder at all I would have missed if I hadn't purposely fooled around with one of the fellows who worked with me serving the Waves, in hopes of passing more pleasantly the time spent at the dishwashing machine. I found that even an L & S student is human (and I had doubted that for a long time).

There is time for both school work and the making of friends! Don't allow the mounting pile of engineering achievement to form a barrier between you and a fellow who might be your friend for life — if you'd meet him half way.

Give me a man who can build friendships and I'll not worry about his technical ability. Together we can always look that up in books.

—Gerhard H. Beyer

or Me and Moses

The other night Moses and I were talking about things in general. Then the lights went out. And I, like most people, had no idea where Moses was. It was hard enough to keep track of Moses when the lights were on . . .

That's true of many of us, you know — we aren't at all auspicious and most people don't even particularly notice us even when the lights are on, and are at a total loss as to our whereabouts soon after we leave school. Even in the heyday of our senior year we engineers pick our small circle of friends, enjoy the associations of this limited group, and become even more attached to it on finding that some effort is required to make new acquaintances.

This making friends is not listed as a course under any of the departments of the School of Engineering and nets no credit toward graduation. You can even graduate without taking the course. But now that the end of my college days approaches, I regret most that I did not apply more of my time to making friends and — treasonable though it may be — less of my time to the meticulous preparation of multicolored graphs and elaborate reports. Just think, as you look at the growing pile of reports ground out by you taking course after course, how much more lasting and greater an achievement would be a group of friends as multitudinous as those reports.

A Brief

Introduction to the Issue

By the time you read this, you should be in the process of digesting your Christmas dinner. This issue should sit well on a full stomach as there is nothing technical in it.

To start out, we have a "swan song" by Jerry Beyer, retiring head of Tau Beta Pi. There is a point discussed there which few of us have considered before—I know I hadn't. If, after you read it, you don't agree with his views, well, don't read it.

Jerry is going to honor us with another article in the near future, one on gas warfare. Gas hasn't been used yet by or against our forces, but most people think it will before the scrap is over. In case you don't know Jerry, he's tall, dark and smiling. A chem, so they say.

Then we have an article on the production and use of diamonds by Lou Niles, my wife. She's typing this and is in the School of Journalism. No, that's not why I married her.

George Zuehlke finally came through with his article—a treatise on the evolution of highways. George is the big guy working with Stinky May in Professor Volk's domain—the engineering library. He looks vicious, but really his teeth are rubber, so he can't bite.

Immediately following this we have the story of military aviation, done up in a few words by Don Niles. He's a tall mechanical who can't understand how anyone could not be nuts about airplanes. But really, he's a nice guy. He's me.

The highlight of the issues is our center spread, "The Engineer's Wife," or "50 Years with a Slide Rule." My wife, Loella, and Russ Johnson's wife, June, hacked this out together. It's completely uncensored, so it's up to you whether you want to show it to your girl friend. I have an inkling that it wouldn't be safe if you plan on marrying the girl.

As promised, I will tell all about the regular staff. Maybe we won't have a staff after I tell all, but we'll have to take that chance.

We are taking up our associate editor, Glenn Jacobson, and we are seeing (heavens, I knew I shouldn't have taken that course) a tall, blond sophomore chemical who plans on taking law after the war. Heaven forbid! But still, if we didn't have patent attorneys, who could translate that lawyer's jargon into our lingo, or vice versa.

Then we have that hardy soul, a converted ee, ex civil, Gene Daniels. As is obvious from the pages of Static, "Geney-with-the-light-brown-hair-on-his-chest" wouldn't recognize a funny joke if he saw one. His biggest ambition is to slip in a joke which would get the editor kicked out of school.

Chuck Tomlinson is turning over the Alumni News column to Arnold (it's spelled without a "k") Ericsen. Both fellows are quiet, unassuming chaps who stand around at a party afraid to ask the girls to dance, and who dislike noise. Both want to work in powder plants.

I'll save the rest for the next issue—now I've got a gripe. See this issue? About a week late, only 32 pages long, and ten of those pages were written by myself and my wife. What the devil is wrong? I know everyone's busy—I'm carrying 20 credits myself, besides this magazine. But out of 1,000 engineers, there should be at least three who could find time to write an article.

I'm limited to begging students to write. Now this is the situation. We need at least three main articles per issue. They should be divided among the departments, and one should preferably be technical. Writing ability counts for nothing, as the staff dresses them up anyway. If you don't think you can write worth a darn, well, try it anyway, and we'll make it look pretty. If you really don't have time, O.K. But if you would like to see this magazine published regularly and think you could spare three nights out of thirty to write, please let me know. I want to see that the magazine is as good as possible, but I can't do that if I have to write it myself.

In a few words, I would like at least one senior or junior per month to write a technical article, and two more of any classification to write non-technical or semi-technical articles. Also, about half a dozen or a dozen freshmen and sophomores to keep the staff kicking.

Here's hoping, fellows (also you lady engineers!).

—Don Niles

WISCONSIN ENGINEER

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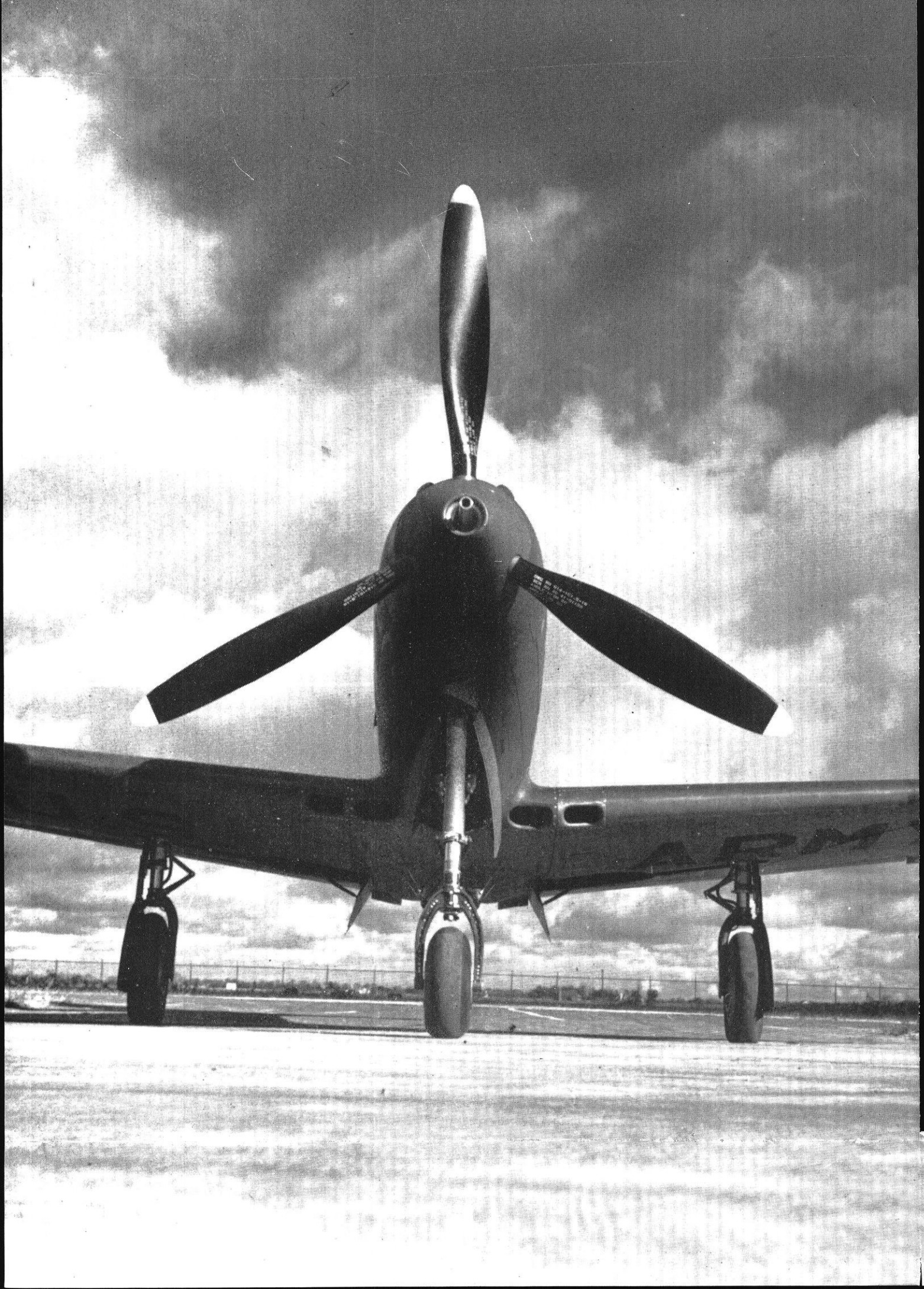
In This Issue . . .

ON THE COVER . . .

An oil-drilling rig mounted on a barge on the Mississippi delta in Louisiana. By means of this system wells can be drilled as deep as 12,000 feet. Much oil which would be ordinarily unavailable can then be pumped.



ENGINEERING COLLEGE MAGS

or what to do with a free period

by Don Niles, m'44

Do your feet hurt between classes? Then stop in the library and read some of these magazines. Some are almost as good as ours.

IN THE western end of the shelves of magazines in the Engineering Library is a shelf devoted to the magazines of the other engineering colleges. Most of the schools turn out magazines similar in style to the WISCONSIN ENGINEER. That is, they have articles of interest to one of a student's mentality and all but one or two have humor columns. How some of them get away with the jokes they tell . . .

One of the mags there is THE VIRGINIA TECH ENGINEER. In the November issue they have an article on subterranean caverns, by Sgt. Larry Burns of Beloit College. Sgt. Burns broke his baby teeth chewing on the Cave of the Mounds. Now that he is stationed at V.P.I. he wrote this article mainly on a Virginia Cave—Pig Hole by name.

They also have jokes; witness this, quote:

"Under the drooping mistletoe
The ugly coed stood
And stood and stood and stood and stood
And stood and stood and stood."

On about the same position is the VILLANOVA ENGINEER. Villanova College (at Villanova, Pennsylvania) must be loaded with brains because this issue (October) has a beaut of an article on the "Theory of Lubrication" and another on the insides of a microphone. "My Little Jap" is a beautiful piece of literature which we will reprint if we get permission. They also have jokes but they were swiped from us so you've already seen them.

Sitting in its own little aura of sunshine (paying no attention to our temperature in the negative bracket) is the CALIFORNIA ENGINEER. In their November issue they have a general interest on "Color Psychology" telling the effects of different colors on the people who look at them. Also a deep mathematical treatise on the "Statistical Handling of Laboratory Data." Brr.

Humor? Lots of it. Under the title of "Mad Engineer" we pick up the following gems:

Fellow (over telephone): "Say, Mabel, can I come over tonight?"

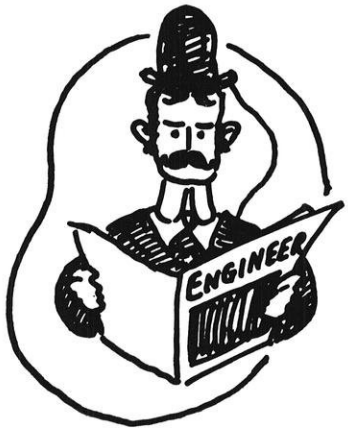
Coed: "Sure, Bill, come on over."

Fellow: "But this isn't Bill."

Coed: "This isn't Mabel either, but come over anyway."

Also, "Her figure was harder to ignore than a ringing telephone."

You couldn't miss that orange cover of the November COLORADO ENGINEER and you shouldn't. They have an article on power line construction dealing with timber poles. Another really good article is on the subject of pi, incidentally given its value to 154 decimal places (slightly more than you read on a slide-rule). But, horror of horrors, no jokes!



Johnny Buxbaum and mustache caught reading the Nebraska Blueprint Humor. Tsk, tsk, he should be ashamed.

Tucked back into a corner is the PENN STATE ENGINEER. They feature full color covers, all of Martin airplanes, but color none-the-less. Inside? Well, in the September issue they have an article on "Turbosuperchargers" written by a fem, another on "Time-Study" and a third on a "minerals museum." Also there is an article on optical illusions with figure 6 being unusually interesting. The joke columns shows a distressing propensity towards our friend, the little moron. Although the explanation of the oceans being wet was given the fact that the sea weed.

To finish off, the MINNESOTA TECHNOLOG claims that if you were a bee, you'd buzz too, if someone stole your honey and nectar.

And don't miss the cover on the November MICHIGAN TECHNIC.

DIAMONDS-

or, all Is Not Gold that Glitters

by Lou Niles

FOR centuries men have gone to the farthest corners of the earth in a vain attempt to garner for themselves the glittering stones we know today as diamonds.

From the writings of certain of the ancients, among them the works of Pliny, we find that diamonds were well known and their worth recognized more than 2,000 years ago. Those the Romans treasured are thought to have come from India, where they had probably been mined for several centuries. Pliny mentions that the Indian rivers yielded rich stores of **adamas,** a word which has finally been changed into our "diamonds."

Coming to more modern times, it's interesting to note that if the Germans hadn't "blitzed" France quite so unceremoniously, diamonds might well have had quite a bit to say about the course of the war in 1939. It is reported that just before the Germans took over, the French were feverishly digging underground from their own Maginot Line toward the German Siegfried Line. In this tunnelling they were doing, using drills with diamond bits, they were carrying out a plan in which huge tunnels were to be dug, filled with dynamite, and finally exploded, thus blowing up enough of the Siegfried Line to make the spot pretty uncomfortable. Only, as we all found out, the Germans weren't playing that way, and thwarted the attempt of the diamond-bitted drills to change the course of the war.

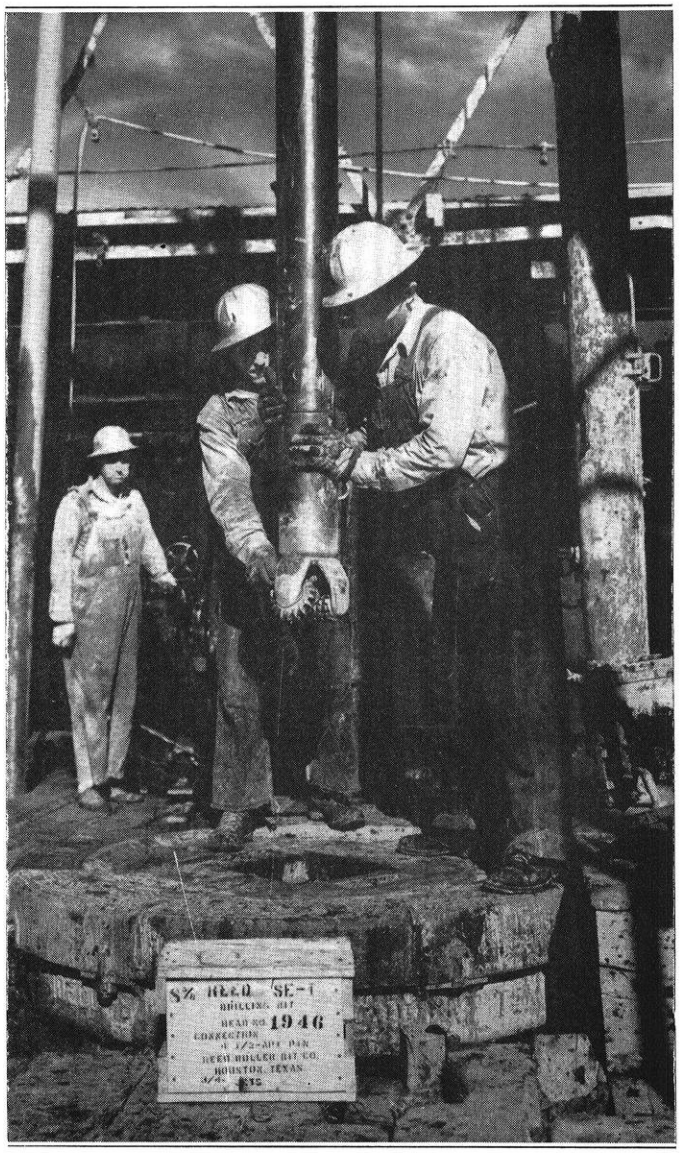
Diamond Production

Kimberly, in South Africa, is called the "diamond city" and the title doesn't seem to be in much danger, since 95% of the world's diamonds come from Africa.

There are only a few fields of real importance. The ancient Golconde fields in India are nearly exhausted, and Brazil produces about three per cent of the world's supply.

Concerning that 95% of diamonds of the world coming from Africa, it's interesting to note that most of those South African diamond fields are under the control of one company, De Beers, Consolidated by name. This almost fabulous company has recently closed and abandoned one of the biggest group of mines in the world—mines which for 50 years provided stones. From 1871 to 1908 De Beers mine is said to have produced $450,000,000 worth of stones. The richness of the mine is further shown by the use of the name De Beers now to indicate exceptional values in any other mineral deposit.

The mine is now being flooded—and it'll take a lot of water to fill that hole covering 40 acres to a depth of 1500 feet. Most of the mining was done by just shovelling out dirt. That is, it was done that way until 1885 when water began seeping into the place. Then underground work was begun and carried on until the mine was closed.



Oil drill bits frequently are faced with fine diamonds for boring through rocks.

Southern Africa began a decline about 1925, however, as far as monopolistic production was concerned because Brazil, the Belgian Congo and Angola began producing stones of just as much worth, although not in as great quantity as North Africa. The Belgian Congo is now the world's leading producer of diamonds.

On September 25, of the present year, three tons of industrial diamonds, consisting of 15,000,000 carats, were transferred from Johannesberg to Canada. The shipments were made at the request of the Allied governments and are believed to be the largest and most valuable in history. The diamonds were all of African origin, but came mainly from the Congo.

A fairly accurate estimate of world trade in gems and industrial diamonds for 1942 was 9,254,000 carats, or 1.841 metric tons, valued at $27,000,000. About 79% of this was bort, or industrial diamonds, and 21% was gems.

The general boom accompanying the beginning of World War II didn't affect diamonds at first and for a while the largest mines in the world were virtually at a standstill. Today, the demand for expensive stones is limited and as far as gem stones are concerned the demand is mainly for varieties sometimes known as "American qualities," which have appeal as a safe war-time investment. Enough material of gem quality is found in the African mines to keep prices up. And just another headache to the economists is the fact that because of the fear of inflation, both here and abroad, there is quite a bit of "investment buying" of diamonds going on in the black markets of Europe and the free markets here.

Last year was the most prosperous year in a decade for the diamond mines because of the unprecedented demand for industrial diamonds. Most of these came from the mines in central and northwest Central Africa, since the only African mines now operating are producing diamonds of industrial grades.

Diamond Producers' Association

In spite of its name, the Diamond Producers' Association is not a union to keep diamond producers from working more than an 8-hour day. Rather, during the stage of overproduction in 1926, this organization was formed and saved the mining interests. The organization is a grouping of all interested producers, including the Union government. It has established complete control of the industry by apportioning production and sales on a quota basis.

The Diamond Trading Company, which in normal times controls the sale of 95% of the diamonds in world production, is capitalized at 2,000,000 pounds Sterling, which is invested in rough diamonds. In 1942 this company sold well over $50,000,000 worth of goods. An interesting note is that the prices of rough diamonds advanced from 5 to 20%.

The South African Diamond Mines

The diamond mines, as one might expect, are quite heavily guarded. But outside of armed guards who patrol the premises 24 hours a day, electrically charged barbed wire fences, and specially trained Alsatian dogs who know how to behave when they scent an intruder, no **special** precautions are taken. Both visitors and mines are carefully watched as they leave the mine.

In the "good old days" the Kaffir boys who did the mining, tried ways of smuggling diamonds that were quite ingenious, and sometimes even worked. On the other hand there is the tale of the boy who complained to his boss of a continual stomach ache, and when his stomach was operated on, it was found he had swallowed six diamonds weighing several carats. Another favorite trick was for the miners to wound themselves and then conceal diamonds in the wounds. The I.D.B.'s (illicit diamond buyers, to you) used to make quite a tidy little nest egg by buying these smuggled diamonds.

To prevent excessive wear on the teeth of a power shovel, diamond chips can be imbedded in the steel.

Today all that is changed, however. A bonus is given to each worker who finds a diamond of substantial size (don't leave for S. A., however, because some of the men have worked for 30 years without ever having seen one diamond; very rarely is a shiny diamond found, even though they're all around.) Each employee now signs up for a six month term, agreeing to work 8 hours a day, 6 days a week for $1.00 a day, plus room and board. The workers live in a "compound" inside that electrically charged barbed wire fence and can't leave during the six month period. They're under continual watch while there.

(turn to page 26, please)

The Old and New in HIGHWAYS

by George Zuehlke, c'45

Introduction

PUBLIC highways, like many other familiar things, are used constantly with little thought of how necessary they are to the conduct of the business of the nation or of the relation they bear to the everyday life of each of us. The degree to which a nation utilizes and perfects its systems of highways is an index to its industrial progress. The average citizen will invariably think of these systems only as they affect him directly and does not concern himself with the problem of improvement until it is brought to his attention through taxation or by the publicity connected by specific improvements.

The improvement and development of our highway system is of national importance as it is inconceivable that any community in any nation can exist or prosper greatly without benefits from other parts of the country. The importance is even more sharply defined today in this state of national emergency, and the much talked about international solidarity of the Western Hemisphere will depend a great deal on the completion of the Pan-American Highway which will link the U. S. with her neighbors.

The Start of It All

The economic value of roads in its broadest sense was not appreciated as much by the ancient races as it is today. The primary purpose of most roads built by them was to facilitate the movement of troops rather than for the development of commercial and social welfare. Most countries who led in the pursuits of civilization and commerce had no road systems, however, but depended almost entirely on their ships for means of transportation.

History, previous to 1900 B.C., is rather vague concerning the subject of highways, though Herodotus tells of a road which was constructed about 4000 B.C. and over which materials of construction for the pyramids were supposed to have been hauled. Although Biblical history mentions in several instances that there were public highways, the first roads of which there is any authentic record are those in the Assyrian Empire which were built about 1900 B.C. These roads radiated from Babylon and the remains of one can still be seen today between Bagdad and Ispahan.

The Romans are perhaps the first extensive road builders in all history and to them goes the credit for building some of the most permanent highway structures yet known. According to Isadore de Seville, who lived in 600 A.D., the Carthaginians were the first to build paved roads, their methods being later copied by the Romans. Carthage flourished from about 600 B.C. to 146 B.C., at which time this empire was destroyed by the Romans. The Romans built roads on a much larger scale than did any of the other nations as road building was a state policy by the Romans, and by means of the system they developed, the whole of the Roman Empire could be easily traversed. Soldiers were able to travel as much as twenty miles a day over these roads.

During the reign of the kings, the Roman roads were doubtless constructed of the natural soil without paving. In the year 311 B.C., the censor Appius Claudius commenced the construction of the first paved road, which led from Rome to Capua. This road, known as the Appian Way, marked the beginning of the construction of Rome's remarkable system of roads and the beginning of the development of highway engineering.

Realization of Necessity of Roads

The art of road building was advanced and improved by many men throughout the following ages. The French and the British made great contributions, particularly along the lines of building technique and methods of construction and drainage.

The development of highways in North America was much slower than in most countries. The United States was settled by various colonists, principally from England, at a time when the road situation in England was particularly bad. Therefore the value of improved highways was not appreciated. The old York road which ran from New York City to Philadelphia was the first important road in the colonies, being laid out in 1711. The following roads to be laid out were of stone or crude macadam and were for most part rather successful. The old Lancaster Turnpike, which ran from Philadelphia to Lancaster, Pa., was the first macadam road to be built in the United States. As first constructed in 1792, the surface was composed of stones of all sizes thrown together and covered with earth. The roadway became very unsatisfactory and at a later date it was reconstrcuted with a macadam surface, no stones being larger than two inches in its largest dimension. The success of this type was quickly appreciated and many of the roads thereafter were built by this method, which is extensively used today.

As the frontiers extended and gradually disappeared and as our country became industrialized, the importance of improving the old and building the new became fore-

most in the minds of many open minded Americans. Thus, our highway system began to take shape. Perhaps most indicative of its growth is the growth of the motor vehicle registration.

Year	Number of Registered Autos
1892	1
1895	4
1900	8,000
1904	55,000
1920	9,232,000
1930	26,545,000
1940	32,453,000

According to the U. S. Bureau of Public Roads, there are approximately 3,000,000 miles of road in the United States at present.

Location of Roads

Ancient roads were not located in the sense that they are now. When the caveman cut a trail to his source of water, he seldom following a definite path. When he came to a tree he stepped around it and continued on his way. As a result, the path became a winding and sometimes indefinite course. The Roman roads, in contrast, were very straight. It is evident in examining them that directness of line between any two points was a prime object. A straight line was attained many times in spite of the tremendous natural difficulties which had to be overcome.

Location today is perhaps the most important aspect of highway ·ering because upon it depends the success of the project, ·om the aspect of economy of construction and operation as well as for adequacy and safety. An essential factor in location is that of preliminary investigation. This varies greatly in detail depending on the character of the highway, but all investigations should cover the following factors: Location, esthetics, traffic census, climatic conditions, traffic regulations in force, maximum speeds to be expected, topographical features, local building materials, and character of available equipment and labor.

The actual location neither follows the winding trail as the caveman did nor does the engineer project his highway across the terrain with little regard for barriers, as did the Romans. The modern engineer has developed the art of location into a science based on adequacy, safety, and economy. The prospective road or highway is located so as to develop the commercial, agricultural, and industrial interests of the communities, to serve the largest possible number of people, to minimize the amount of cut and fill, to secure good drainage, and to utilize good natural foundations. Locations are also picked to make possible long easy grades rather than steep slopes, and to minimize dangerous crossings. If the engineer could embody all of these things into his highway-to-be, he could die happy. Unfortunately, this isn't probable and the engineer proceeds to pull out his remaining gray hairs, and again attempts to find the ideal location. Usually the engineer is confronted with several possibilities for a route, none of which is entirely satisfactory. His job then is to weigh the merits of each and bring about the best choice of route that his years of technical training and experience can afford him.

Very often it is his job to locate a highway over tremendous obstacles where location calls on every skill he has acquired and some besides. An example of such location is the Alcan Highway, conceived to connect our highway system with that of our "49th state," Alaska. The route, no matter how located, meant at least 1600 miles of swampy and strange country, much of which has never been mapped or at best only hastily sketched. A goodly portion of the country to be crossed had never before been traversed.

Because of the nature of the country, ordinary methods of location could not be used. The answer to the problem was aerial photography, a method very much used today, even in accessible country. By using a stereoscope on the assembled photograph, an experienced man can distinguish the types of vegetation common to the area photographed, and since vegetation is a key to the soil characteristics, a prime factor in road location, this affords a means of approximate location. The route is then plotted on the photograph and located in the field by referring to prominent landmarks evident on the photo by means of triangulation.

This is but one example of the problems confronting highway engineers every day. Every job has its problems that may never have been met before and may never be seen again.

Pennsylvania Turnpike

The Pennsylvania Turnpike is perhaps the greatest monument to modern engineering skill the world has ever known. It was created for the one purpose that has tried engineers' skills for the last century; that of finding a direct route across the Allegheny Mountains. Since, as early as 1837, men have dreamed of connecting industrial and agricultural sections of the middle west with the seaports and commercial centers of the coast, with Philadelphia as the logical terminus at the eastern end. Early attempts at realizing this culminated in the creation of the South Penn Railroad project which resulted in more than 5,000 miles of location survey being established and in the piercing of the mountains by eight tunnels. The withdrawal of financial backing in 1885 caused the project to be stopped and it was not until 1937, at the creation of the Penn Turnpike Commission, that the vision and the dreams of early pioneers was put to practical application. Immediately the old railroad locations were examined and explored with special consideration being given to the tunnels. The commission spent three years in obtaining further surveys and studies for the purpose of improving and shortening the old line and to establish a route that would meet engineering standards for an express highway over this rugged country and yet to bring about a loca-

(turn to page 24, please)

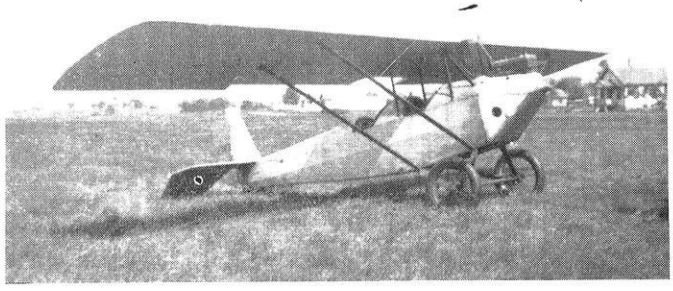
Development of Modern

by

BACK in the year 1908, the United States Army asked for bids on a flying machine. The requirements for this plane number one were these — it must be able to carry a pilot and a passenger whose total weight was not less than 350 pounds, must fly ten miles at an average speed of forty miles per hour, and must carry fuel for 125 miles. The last requirement, that of easy demountability, is the forerunner of the modern requirement for interchangeability.

Immediately the newspapers began ridiculing the request. It seems that none of them thought it could be done, and if it could, it would be worth millions rather than the paltry $25,000 offered.

Imagine the surprise of the reading public when a total of 41 bids was received by the War Department. Even the Signal Corps, which made the offer, was rocked back on its well-polished heels. Nevertheless, they loosened their Sam Brownes and started to run the bids through the mill.



Imagine this oldtimer over Germany in this war.

Then came the joker. It seemed the army had a clause in small print requiring the bidders to pay a ten per cent deposit of their bid and state how long it would take them to build the plane. So, 38 of the 41 suddenly lost interest. Of the three left, one asked $1,000, another $20,000 and the Wrights asked an even $25,000. The Wrights' bid was the only one to produce a flyable plane.

A tragic, though ironic, feature of these trials happened when an army officer, Lieutenant Thomas Selfridge, was killed. Up to this time few people believed that flight was possible and newspapers would not publish the accounts. But when a man was killed in an airplane accident, the morbid tendencies of the American public came into effect and the newspapers published the account. Now it was common news that man could fly.

After this plane was built, the Wrights sold a few more to the Army, but up to 1914 about the only changes made were to put a small bit of fabric on the fuselage and improvements in the engine.

One feat of especial importance took place in 1911. Although it meant no improvement in the airplane as such, it opened the way for new regions of conquest. In that year, Eugene C. Ely landed an airplane on a specially built superstructure on the stern of the U.S.S. Pennsylvania. The landing run was shortened by means of several wires stretched across the deck, attached to sandbags at the ends. A hook on the bottom of the plane snagged the wires in series so when the landing run was completed, the plane was dragging a young sand pit. It wasn't until 1922 that a practical means for arresting large numbers of planes was arrived at and the Navy still isn't telling what these means are.

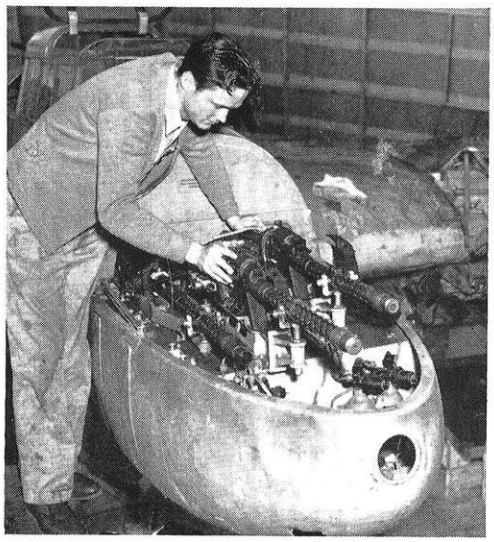
When the World War began, aviation was not far beyond the place it had been in 1903. As related in numerous books, the enemy pilots were very friendly with each other. After all, the brotherhood of pilots had been going longer and was stronger than the mere anger of nations.

It wasn't very long until someone felt he had been snubbed by a bosom friend in the enemy's camp, and so took some bricks with him. Planes were not constructed to stand up under falling bricks so one plane at least was damaged. Although this Battle of the Bricks is supposedly an actual happening, no record has been kept as to who was involved or what the outcome was, other than that it broke up the fine camaraderies among the pilots.

From this time on, the pilots stuffed any armament into their pockets that they could lay their hands on and the battle was begun. Everything from small caliber pistols, to heavy carbines who kick frequently shook the wings off, was used.

Military Planes

Don Niles, m'44



Modern Armament.
Center hole contains camera.

The British then brought out, early in 1915, the Vickers Gun Bus. Although it had been displayed at the Paris aero show in 1913, as the latest in warplanes, the brass hats did not believe it was practical. This novel, but deadly, machine had the unmistakable lines of a winged bathtub. Its two wings were held together with miles of baling wire and held apart with yards of spruce strut. A motor sputtered near the back of the bathtub and a pusher prop churned the air just behind the pilot's head. The tail surfaces were stuck on booms projecting from the rear of the wings, in a somewhat primitive version of the P-38. The deadly feature of this super-fortress was that where the faucets should have been was mounted a light machine gun.

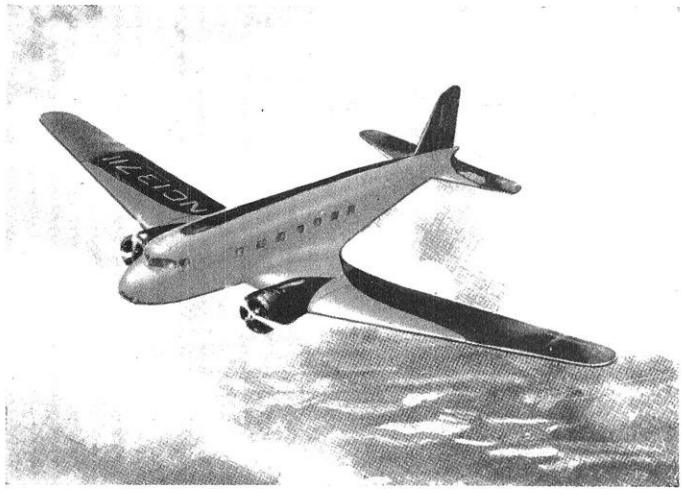
For a few months, this buggy was the scourge of the German Air Force, or Luftwaffe I. Then along came a German plane with a forward firing gun above the propeller arc to keep that priceless stick from being shot to slivers. This was faster and more maneuverable than the bathtub-on-a-wing so it dominated the air.

This also had a drawback, however. Those engines did not have much power in any case, so the kick of the gun was a sizeable force in comparison to the thrust of the propeller. So every time the machine gun was fired a couple was introduced pointing the plane up. The wings had all they could do to hold themselves up without expecting them to hold a couple of machine guns outside the propeller arc and resist the kick, so it appeared that the only thing to do was bring the gun nearer the line of thrust and reduce the moment arm.

This was accomplished by one Frenchman by mounting heavy steel plates on the back of the propeller to deflect the bullets that tried to be in the same spot as the propeller. The rest of the bullets would go to the point to which the plane was aimed.

Then came the most ironic event of the war. A little Dutchman named Tony Fokker built a plane in which a gun could fire all day without even chipping steel off the propeller. This was ironic because Fokker had been turned down by the Allies when he offered to build for them. This plane, built by an uneducated Dutchman who had spent years in debtor's prison, did not have a "von" in front of his name, and who wasn't good enough for the Allies, proceeded to tear the Allied Air Force into shreds.

(turn to page 30, please)



Peacetime transports such as this are now machines of war.

APPLICATION
PHOTO

What Do You Think?? Or Do You??

by Don Caldwell and Dick Luell, CheEse '44

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

Employment Application of Little Ajax Machine Shop

General Questions:

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

27. Medical History

Whooping Cough: Nope, whiskey cough.

Flu: Up two or three times.

Measles: A few here and there.

Athlete's Foot: Two of them.

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

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

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

32. References:

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

Training and Sales Experience:

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

Pady Previews

by

Reynold Pady, ch'44

AIRCRAFT RIVETING . . . by A. H. Nisita.

This excellently prepared text book and teacher's manual is based on the practical experience of the author in riveting and also in training student riveters.

The various skills and practices used in aircraft metal construction, of which riveting is one of the specific techniques, are treated in a separate and distinct form so that any of them can be applied in metal aircraft or sub-assembly work.

These chapters have been prepared simply as a treatise on riveting fundamentals, basic skills and practices used in aircraft construction or repair, without reference to the completed airplane or its parts. The author wanted to provide training broad enough to prepare students for any type of riveting operation prevailing in any shop or locality, keeping in mind the fact that these methods differ in various plants and locations.

The sequence of material has been presented in such a way as to be most helpful to the students. The first few chapters cover identification of rivets and equipment, safety precautions. Next in order come the techniques of drilling rivet holes and preparation of materials, and specifications and nomenclature covering aircraft rivets in common use. Testing and checking methods, removal of rivets, use of bucking bars and care of pneumatic equipment and accessories are treated in succeeding chapters. Special riveting procedures are approached through a discussion of upsetting solid and semi-tubular rivets and reverse bucking and flush riveting. The final chapter describes automatic and multiple-setting machines and the appendix contains riveting terminology, miscellaneous tables, weights and other data. A recommended course of instruction is appended as "Suggestions for Teachers." The book is profusely and unusually well illustrated, with descriptions and discussions of the illustrations giving the student a true view of the presented material.

•

WAR PLANES OF THE AXIS . . . by David C. Cooke

The author has written this book to show the average American, in fact, figures, and pictures, the strength of the Axis nations. He has used no padding or pussy-footing and his attitude has not been that of an alarmist or an awe-struck person. Instead, the writer has tried to straddle the fence, as it were, and take an impartial view in all instances in describing the war planes of the Axis.

Information is supplied on individual fighters, bombers, and reconnaissance airplanes used by the Axis. Separate sections are devoted to a consideration of each model's description, specifications, and performance record. Accompanying each description are photographs that help to give a comprehensive idea of what the enemy airplanes look like, their armament, how far they can fly, and their fighting abilities when pitted against the airplanes of the United Nations.

The mechanical element is not the only thing discussed for account is also given of the organization of the three air forces, the productive capacity of each nation, and their pilot-training programs.

•

AIRCRAFT WELDING . . . by L. S. Elzea.

Many years of experience in the welding departments of several aircraft factories and more than five years of work with students in the capacity of instructor of welding in night school and a national defense school has enabled the author to write a book which can be of great value to both students and instructors of welding. In fact, the book is valuable to anyone interested in knowing just what means are used of making aircraft joints hold under the tremendous stresses set up in a 600 mi./hr. power dive.

Just the fundamental principles that are accepted by the aircraft industry are presented in this book for the techniques used in the different plants and can easily be acquired once the fundamentals are known.

Aircraft welding is a highly specialized type of work, far different from other phases of the trade, thus the general conception that experience in any branch of welding—such as pipe-line welding, job shop welding, and tank welding—qualifies a worker to step into a job as an aircraft welder is not true.

The material is presented in such a way that the student can most easily and quickly acquire it. Equipment, tools, and materials are discussed in the first few chapters. Next in order comes the characteristics and types of welds, stresses due to expansion, contraction, and cracks, jigs, and methods of construction. Aluminum and stainless steel welding, problems in aircraft welding, drawing and prints are treated in succeeding chapters. The last few chapters consist of tables and the specifications and explanation of the army test.

Gas welding alone has been discussed in this book because the demand for gas welders has been so much greater than for electric welders and also because electric welding is, in itself, a subject great enough to justify a separate publication.

THE ENGINEERS' OR 50 YEARS

by Mrs. Russ Johnson

IN THIS brief article, we're going to endeavor to the very best of our somewhat limited experience (a year for Lou and a month for June) to tell just what gals rushing into matrimony with engineers (any old type) are going to face.

THE RESULT OF LOOSE TALK or WILL YOU MARRY ME?

Believe it or not, engineers sometimes do succumb to conventionality enough to formally ask a girl to marry 'em—that is, those that don't just toss her over the shoulder and carry her off.

So, the scene is set (you've had it planned for three months, letting him chase you, until you catch him) and the moment you've waited for all your life is at hand. The lights are dim, in the distance music plays hauntingly, a comfortable davenport, and your parents playing bridge at the neighbors.

And after no more than an hour or two of delicious, soul-stirring talk on the merits of the Diesel engine, he begins to get that restless look. And then, he asks the question, and, natcherlly, you accept (the manpower shortage, you know). Yes, you'll be his, and you're about to sink blissfully into his arms, and he remarks brightly,

"Now, just look at this diamond—there it is, right there in the middle. Notice its sparkle? That's because of its numerous facets. And the index of refraction is . . . " Let me warn you now, that this is only the beginning to more and more of the same. **You'll** never be able to settle down to a comfortable evening of bridge, or a cozy foursome at some smooth club—not and discuss normal subjects, that is. No, you'll find the discussion on the computation of airfoil characteristics or the hysterisis loop.

THE HONEYMOON or THREE BELLBOYS, PLEASE

Perhaps your engineer is also a photography fan. Mine is. Wherever he goes he carries a camera around his neck in a shiny leather case, a tripod and extension tube in one hand and a flash synchronizer in the other. Just try to get him to hold hands and he'll say, "Golly, we might drop the tripod and bend it." Besides, you're probably carrying the flash bulbs.

As we drove to the front of the splashy Chicago hotel, him in a new suit with an old faithful, gravy-spotted tie, and me in my mother's new fur coat, a bellboy came to the car. Immediately, my new husband began piling photo paraphernalia in his arms. With a plaintive, "Be careful with these, they're hard to get," he hands over numerous cartons of flash bulbs, a lens shade, one tripod, two types of cable release and many cartridges of various speed film (the engineer himself has only one speed), but not the camera.

With pockets of his once neatly pressed uniform bulging material, the bellboy leads the way, I fellow next, carrying the suitcases, and hubby? Oh, he comes behind, carefully guarding the lens of the camera. And thus you parade through the lobby, past people who obviously never heard that it's impolite to stare and right to the desk. Since this takes place on a Saturday night during the holiday season, you can bet there'll be **plenty** of people. He registers, and on you stagger, past millions of doors, and into an elevator . . .

HELP! THE PIPES BROKE or BRING ME A BLOTTER, QUICK

Engineer! The word sounds efficient, and even in person, the species isn't so bad. It brings forth the idea of proficiency and unsuspecting persons are privately assured that anyone bearing the title can step masterfully into any situation, domestic or otherwise, and take full control. In other words, the key to a serene, well-ordered household is an engineer-husband.

A minor catastrophe hit our erstwhile peaceful home the other night—the joint in the cold water pipe loosened and a fine spray was gayly spouting forth. I determined

to lessen future trouble by calling **the** engineer to do the fixing. Like all engineers, he came manfully to look the current problem squarely in the face, and that's where he got it—squarely in the face.

He twisted and turned, pulled and pushed and the stream grew larger while I ran and got our assortment of tools, which I still don't know by their first names.

We finally changed tactics, for the good of the house, and I gathered all the rags I could find. We left the pipe tied up bulkier than a fake Santa, waded out of the place, and called—a plumber!

WIFE
WITH A SLIDE RULE

and Mrs. Don Niles

I HAVE TO STUDY NOW or WAKE ME AT 3:30

Another means by which you may tell, and so beware of, an engineer is by one of his worst habits—that of studying. It cuts down on dates and noise until you automatically glare at the clock because it's ticking too loud.

After your O.A.O. has been battling away at his desk for hours, you finally venture near enough to glance over his shoulder (if he lets you in the room, that is) to see what mighty mathematical formulas he's solving. Here you find he's been doing nothing at all but draw silly colored lines on funny checkered paper. But **never, never** ask what he spent so much time on **that** for, unless you want him to withdraw, meanwhile giving you a long, sad, reproachful look as he explains, "That is the effect of change of current on the resistances of a d-c motor." And, when he thus explains, everything becomes just as clear as the first coffee you ever made—judge for yourself.

Another habit which may be slightly hard to understand at first is that of "concentrating" or "mental computing" (the names **he** gives it). To me, it look a great deal like he's asleep—but again, **never** mention that.

DON'T THROW THAT AWAY! or EMPTY ANOTHER OF YOUR DRAWERS FOR MY NOTES, DEAR

In marrying an engineer, you must be ready to take almost anything in your stride. At any rate, be prepared never to throw anything away. An endearing habit of engineer-husbands is that they gather copious notes. Notes, until they overflow every drawer, cabinet and box in the usual two or three room apartment you'll be occupying. These are never of uniform shape or size—and the very hour after you finally get brave and throw away that little, dirty, triangular-shaped piece of wrapping paper, he will demand to know **what** you've done with all his material. What follows, we will not and cannot repeat here, so all we'll say, is "Beware!" and, when you move, be prepared to get an extra trailer to take care of the notes. And, because he's always too busy to look over any of these notes, eventually, I guess, you just move out and let the notes have the house. I'll let you know about that in another year or so.

THE SLIDE RULE or DON'T TOUCH THAT!

The average girl on the campus has heard of the slide rule and has seen this inseparable companion of the engineer, in its yellow-orange case. One thing, though, is sure.

She'll know none of the secret, hidden sorrows, wonders, and joys that surround this piece of wood, until she actually marries an engineer.

The first days are the hardest. You treat the unromantic slab of mahogany like any other kitchen utensil—respectfully, but not worshipfully. If it is lying open on the desk, you leave it, or set it down on a shelf somewhere. It doesn't take very long (one week at the longest) until you learn to put an uncovered rule in its protective case, dust it carefully, and like all good engineers' wives, look upon its unyielding form as a symbol of something intangible and mighty. There's one extremely annoying feature about it, and that is that no matter how valuable it is for the engineer, there isn't one thing it can be used for around the house—not even measuring curtain material. What's more, you can't even add up the weekly grocery bill on it.

Far be it from us to doubt the values of the rule—and, who knows, some day you may get to mean as much to him as the slide rule does (providing that you're an exceptional wife, that is). As for me, I'm starting to set a third place at the table for it.

No kidding, we really love it—and we can guarantee that there'll never be a dull moment, providing you marry the right kind of engineer. And what other kind is there?

CAMPUS NOTES

Hot Shot Frosh

HIGH HONOR RATE

Orin T. Conant	2.889
Donald E. Near	2.889
William M. Crilly	2.778
Roy P. Mackal	2.778

HONOR RATE

Edwin F. Fischer	2.722
Robert R. Marichal	2.722
Paul A. Moote	2.722
John Teuscher	2.611
Robert T. Clayton	2.556
Richard A. Laubenstein	2.556
Laurence Luff	2.556
Eugene R. Mathews	2.556
William H. Nash	2.556
Robert C. Nelson	2.556
Charles P. Seibold	2.556
Richard L. Heinrich	2.556
Bruce C. Smith	2.50
Phillip C. Stark	2.50
Robert P. Benzinger	2.444
Robert S. Donaldson	2.444
Earl F. Stuckert	2.444
James H. Koch	2.389
Oral K. Hunsaker	2.333
Frederic B. Kohli	2.333
Joseph C. Mandelert	2.333
Charles E. Pain	2.333
Donald E. Porter	2.333
Bernard A. Century	2.278
Paul N. Drolsom	2.278
Harry L. Emerson	2.278
Richard L. Gausewitz	2.278
Thomas E. Lee	2.278

RADIO ANNOUNCERS

by Winnie Rennebohm

Lessons come before radio programs — is one way to avoid the conflicting radio program choice of your family. If the youngsters are smart enough to get their work out of the way before supper, then you'll have to have a family decision on who will listen to what and when. Young brother may forego his swing band for one night, and give way to father's news commentator.

Brother wins out in the end, though, because there are more swing bands than commentators and besides, he gets to listen to the corner juke box every afternoon from school's-out to supper, ogling or ignoring the feminine sex and being strictly on the solid side, Yah de dah, da de da de.

It's a tough struggle between Little Orphan Annie and Soooooperman, though Mussel'n Tussel loses out in competition with Pollyanna. Arf, arf. Quite following me, you wolf! (Can I help it if Itiskit, Itaskit is a child's game? Well?)

Will Les pass his draft exam? What was in the secret note Mary found slipped under the library door? Will Violet and Percy succeed in winning Lady Gottrocks to their side in the fight for happiness? Tune in tomorrow at this time, and if you get the answers, the sponsor will sure be surprised.

Little Pixie - Wixies, the superpopped, overblown, breakfast food —"Kind to your taste, it's made out of paste" — the cereal that ruins more champions than any other cigarette (whoops, pardon me, folks, wrong transcription).

Here is O. Gee Faultyhorn, bringing you the noose of the nation— and his neck right in it. That's the night news for tonight, folks. Listen tomorrow for the sound of the dying bed corpse.

•

POLYGON DANCE

The engineers turned out with their dates in goodly numbers, over 275 couples strong, to enjoy the Polygon Ball held November 19 in the Memorial Union. Don Voegeli's band furnished the type of music which satisfied everyone. The highlight of the evening was the rendering of several songs by the Singing Sewermen— Jack Nelson, Jack Scholbe, and Don Porath, senior civils.

John Halgren, Polygon president, is to be congratulated on the successful dance he directed as general chairman. The other Polygon members who assisted him as chairmen were Ed Kloman, publicity; Fred Graper, program; Bob Jirucha, finance; Bill Jacobson, tickets; and Walt Wollering, promotion.

PROF. JOSEPH F. OESTERLE

Professor Joseph F. Oesterle, formerly head of the department of mining and metallurgical engineering at the University of Wisconsin, died on Friday, December 17, 1943.

Professor Oesterle was more familiarly known as "Joe" to his students and associates alike. He was advisor for the senior students and one of their best friends as well. There is no doubt about the fact that he is one of the best-liked and most widely-known men on the campus.

Besides his work in teaching, Professor Oesterle was working with a Waukesha firm in the production of shot. This work was of direct and immediate use to the war effort.

In addition to this Professor Oesterle was affiliated with several national organizations of metallurgical engineers and professors. He had friends in every walk of life.

One thing is certain, Joe Oesterle —the little man with the big grin— is going to be greatly missed by all those who knew him.

CIRCUITS OF VICTORY!

THIS Signal Corps lineman and his comrades are building and keeping open the telephone lines that help to coordinate attack and defense in every battle zone. Not only on land, but also at sea and in the air, telephone and radio equipment made by Western Electric is helping to bring Victory closer.

This Company—for 61 years the manufacturer for the Bell Telephone System—is today a vast arsenal of military communications equipment. This field of Engineering for manufacture offers a wide range of opportunity to men who are interested in the technical problems of production.

★ ★ ★

Buy War Bonds regularly—from now till Victory!

Western Electric

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

ARMY E NAVY

ALUMNI NOTES

by

Arnold Ericsen, ch'44

Electricals

ACREE, GEORGE W., '42 was married to Doris Reynolds of Concord, N. H., on February 25, 1943. He is now working at the General Electric Co. at Schenectady, N. Y.

CUSTIN, THOMAS C., '42 is doing experimental work in connection with ultra-high frequencies at the General Electric Co.

DEERHAKE, WILLIAM J., '42 is working in the experimental field and laboratory work at the Radiation Laboratory of the Massachusetts Institute of Technology.

ELMERGREEN, LT. G. LESTER, '42 is now in England with the U. S. Army Signal Corps.

HEISIG, GARTH J., '43 is now attached to the Radiation Laboratory of the Massachusetts Institute of Technology.

KOVACS, FORREST, '43 has been doing field investigation work for the General Electric Co.

INGERSOLL, ALFRED C., '42 is located with the Linde Air Products Co. at Buffalo, N. Y.

LOGEMANN, HUGO, '42 is engaged in experimental work at the Radiation Laboratory of the Massachusetts Institute of Technology. He was married on November 6, 1943.

McNIGHT, BOYD E., '41 is now Assistant General Supervisor of Production Quality at the General Electric Co. located in Fort Wayne, Ind.

OLSON, VERLAND A., '43 is now at the Radiation Laboratory of the Massachusetts Institute of Technology.

OSTERHELD, LT. DOUGLAS C., '42 was married to Lindy Schneider on February 6, 1943. At present he is attached to the U. S. Army Air Transport Command.

PENDLETON, DAVID W., '43 is employed by the Navy Department Bureau of Ships and is doing service and installation work on special radio equipment.

PIPER, WILLIAM M., '42 is connected with the Bonneville Power Administration in Portland, Ore. He has a young son, Elmo II, who was born on September 16, 1942.

PREE, WALTER G., '42 has recently returned from England, and is now located in Boca Raton, Fla., where he is employed as a Field Engineer for the Western Electric Co.

ROBBINS, ROGER W., '42 is employed by the Submarine Signal Co. of Boston as a member of the Field Engineering Staff.

SCHNEIDER, HOMER J., '42 was married to Janet Bauer on May 26, 1943. At present he is employed by the General Electric Co. in Philadelphia.

SHENG, JUGEE, '42 is employed by the Sylvania Electric Products in Salem, Mass.

SUPITILOV, MICHAEL C., '42 is now on leave from M. I. T. to the Submarine Signal Co. as Assistant Supervisor of the Equipment Department. Mr. Supitilov is married and has a daughter, Janet Rae, who was born on February 23, 1943.

TOPP, LT. (jg) IRVIN H., '42 is supervising the installation of special radio equipment at the U. S. Naval Station located in New Orleans (Algiers), La.

WERDERMANN, ENSIGN FRED W., '42 is supervising the installation and servicing of special radio equipment at the U. S. Naval Operating Base, Tomkinsville, Staten Island, N. Y.

Chemicals

ALBRECHT, EDMUND H., '39 was a recent visitor to the Chemical Engineering Building. Since graduation he has been with the du Pont Co. at their Belle, W. Va., plant. At present he is in the Nylon plant where he is doing production work.

BARGANZ, 2nd LT. ARNOLD E., '41 is with the office of Flying Safety, Flight Control Division.

HASLANGER, R. U., '36 has recently reported to the American Institute of Chemical Engineers at the society's annual meeting on a paper of which he was co-author entitled, "Chemical Engineering Applications for Plastics."

LAUCK, FRANCIS V., '40 is employed by the A. O. Smith Corp. of Milwaukee where he is engaged in the manufacture of welding electrodes. He has also patented ideas pertaining to welding operations.

SMITH, SHEA III, '38 after finishing at Wisconsin went on to Harvard Business School, and is now associated with the Monsanto Chemical Co. at Everett, Mass.

VAN de ERVE, ARTHUR D., '41 was in Madison recently on his vacation. After graduation, he went with the People's Gas Light and Coke Co. of Chicago, and later to the Armour and Co. of Chicago, where he is at the present time engaged in the manufacture of a wide variety of organic chemicals.

Miners and Metallurgists

GIBBENS, DAVE, '42 has been working for Oliver Iron Mining Co. in Mt. Iron, Va., and at Eveleth, Minn., in the local O. P. mines. At a recent visit to the campus he noted that the fishing was especially good.

RYBARCHYK, RALPH J., '43 was married to June Gruenewald in Milwaukee on October 16, 1943.

SCHULTZ, JACK M., '42 has worked with the Aluminum Co. of America in New Kensington, Pa., since graduation and has recently been transferred to Phoenix, Ariz., with the same company as Assistant Production Planner in Tube Production. He was married to Dorothy Weaver on April 10, 1943.

WARTMAN, LEONARD, has been with Buick Motors Division of General Motors in Flint, Mich. He has had the position of Metallurgical Physicist in charge of sand and oil control, and has done research on aluminum. He also states that he has recently applied for a commission in the Navy on Naval Salvage.

Civils

STIVERS, BRIG. GEN. CHARLES P., c'13, has recently been promoted to major general. He is deputy chief of staff of U. S. forces in the Far East. He was personnel officer with Gen. MacArthur during the Bataan campaign and left the Philippines with him. He was awarded the distinguished service medal before the United States entered the present war.

Recent elections in the American Society of Civil Engineers sent two Wisconsin civil engineering grads into office:

HOLLISTER, SOLOMON C., c'16, dean of the college of engineering of Cornell University, is a new director, representing District 3.

GAMBLE, RALEIGH W., c'16, superintendent, Bureau of Street Construction and Repairs for Milwaukee, will represent District 7 as director.

JOHNSON, COMDR. ROBERT C., c'17, son of the first dean of this college and a veteran of World War I, is in command of the 104th Battalion of Sea Bees, which recently completed training at Camp Endicott. Comdr. Johnson spent two years building air bases in the Caribbeans and was later public works officer at the naval station at New Orleans.

BENNETT, J. GARDNER, c'18, returned recently from Robert College, Istanbul, and is now associate professor of civil engineering at the University of Wyoming at Laramie.

OLSON, ARTHUR O., c'21, assistant bridge engineer for the Wisconsin Highway Commission, has been seriously ill at his home for several months.

TSCHUDY, LIONEL C., c'23, is lieutenant commander with the 141st Naval Construction Battalion. He was in Madison on November 11 on embarkation leave. Tschudy was a cross-country runner during his college days, and, although there are now silver threads among the black hair around his ears, he is still able to set a stiff pace on a training hike.

LINDNER, CLEMENT P., c'25, has been commissioned a lieutenant colonel in the U. S. Engineer Corps, with which he has served for many years. He is still stationed at the Vicksburg office.

BEHM, WILFRED W., c'29, is reported to be in a Des Moines hospital with infantile paralysis.

STAEFFLER, MAJ. RICHARD P., c'31, until recently commanding officer at the Badger Ordnance Plant, is now with the army engineer corps at Camp Swift, Texas.

NAGTEGAAL, GERRITT P., c'33, is a transitman with the Santa Fe Railway, working out of the office at Fresno, Calif.

VILLEMONTE, JAMES R., c'35, assistant professor of civil engineering at Penn State College, has been granted leave of absence to accept a commission as lieutenant (jg) in the Naval Reserve.

LEHMANN, KENNETH F., c'39, who recently returned from two years of work on the improvements at Panama Canal, was "selected" and is now a private in an army aviation engineer battalion in training at March Field, Calif., near Riverside.

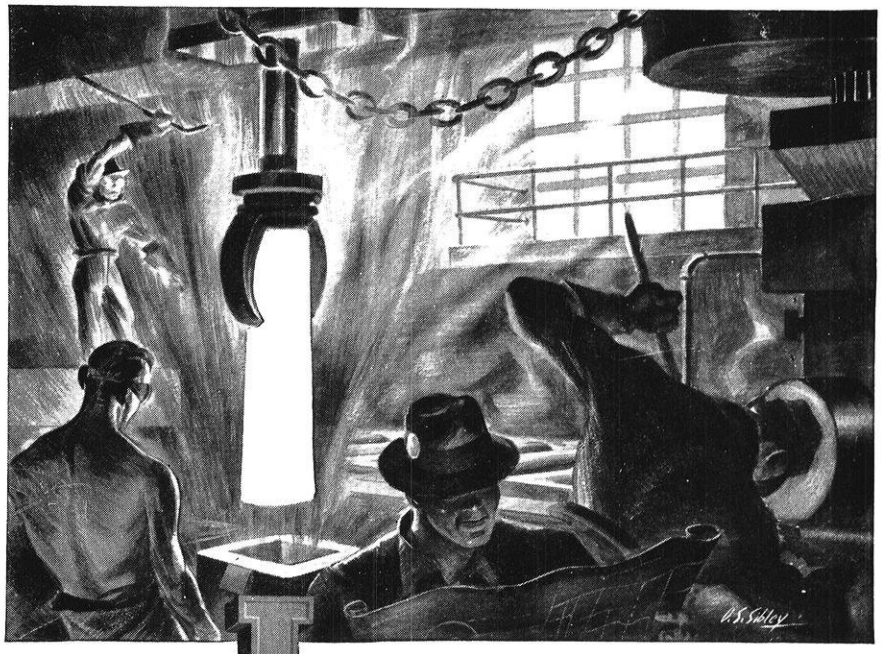
BARTEL, FRED F., c'40, a second lieutenant in the army air forces, was married on October 23 to Ann Elizabeth Staudacher at St. Louis, Mo.

MOORE, ARTHUR, c'40, has been commissioned a lieutenant (jg) in the U. S. Naval Reserve.

CARPENTER, LT. WILLIS A., c'41, is "down under" with the Marines, Co. A, 1st Bn., 18th Marines, 2nd Mar. Div., FMF, Fleet P.O., San Francisco. He writes: "At present I'm located in a good camp with hot and cold water, electricity, and a good liberty town nearby. Course the beer is no good."

BERZOWSKI, ENSIGN ROMAN C., c'42, after some time as an inspector of ordnance, has transferred to a diving school at the Navy Yard at Washington, D. C. He says, "We were given a bunch of small pipe sections and various fittings and had to put them together to form a square under water. I did that in twelve minutes, which is about average time."

NERO, ENSIGN MILTON A., c'42, is with the 131st Bn., NCTC. He was in Madison on October 21.



INGOTS GO TO WAR!

THE HARRISBURG STEEL CORPORATION produces thousands of tons of carbon and alloy steel each year, practically all of which is now used in the manufacture of materials of war for the Armed Forces of America and her Allies.

From Harrisburg's modern open-hearth furnaces, carefully controlled heats of molten steel are carried to the pits by huge ladles that pour it into giant molds. These molds form the ingots of precious steel . . . steel that is now "going to war" but will be used to make Harrisburg's famous Seamless and Drop-Forged Steel Products.

To make these quality products the steel itself must be right. That is why Harrisburg makes its own carbon, alloy and special steels. That is why Harrisburg products are right from the start . . . supervision begins at the open-hearth and ends only at the point of shipment.

Today Harrisburg sends its Steel Ingots to War but when Victory is ours these same ingots will again be used in the manufacture of peacetime products . . . products that have been sold in the markets of the world for over ninety years.

HARRISBURG MAKES: Alloy and Carbon Steel Billets, Seamless Steel Cylinders, Liquefiers, Pipe Couplings and Pump Liners, Hollow and Drop Forgings; Pipe Flanges.

Buy Bonds for Bombs and Bombers

HARRISBURG STEEL CORPORATION
HARRISBURG · PENNSYLVANIA

Summer Grads at Work

by

Arnold Ericsen, ch'44

Mechanicals

ARNES, LYLE L., is with Curtiss-Wright at Paterson, N. J.

BOSLEY, EDWARD J., is in Schenectady, N. Y., with the General Electric Co.

CLEVEN, LORCH B., has made application for a commission in the U. S. Naval Reserve.

CUNNINGHAM, WILLIAM W., is in the U. S. Naval Reserve.

DUDDLESTON, JAMES M., is located in San Francisco with the Standard Oil Co. of California.

JORGENSEN, JOHN F., is with the U. S. Naval Reserve.

LOEFFLER, ALVIN F. Jr., is with General Electric at Erie, Pa.

MUSSELMAN, RICHARD L., has made application for a commission in the U. S. Naval Reserve.

OURA, KAZUMI, is with the Kyle Corp. of Milwaukee.

PETERSON, E. WARREN, is with Nordberg Manufacturing Co. in Milwaukee.

QUANDT, CLIFFORD E., no report.

RATHER, NORVAL E., is with the Agricultural Engineering Department at the University of Wisconsin.

RAWSON, EDWARD R., is with du Pont in Harlem, N. J.

STOCK, HOWARD P., has a position with Lockheed Aircraft Corp. at Burbank, Calif.

STRUCK, HOWARD J., is in the Naval Reserve.

TAUSCHEK, MAX J., N. A. C. A., Cleveland, Ohio.

THOMPSON, ROBERT N., is with the General Electric Co.

VANHAVERBEKE, GEORGE, is in the Army Air Corps Reserve.

VELANDER, LEONARD Jr., is with Curtiss-Wright, Caldwell, N. J., where their Propeller Plant is located.

VERHAEGHE, ROBERT C., is in the U. S. Marine Corps.

WAGNER, HALE W., indefinite.

WATERMAN, CARL Jr., no report.

WILK, STANLEY H., is with the General Electric Co.

WILSON, ROBERT W., is with Curtiss-Wright at Paterson, N. J.

WITZEL, WILLIAM R., is in the U. S. Navy.

Chemicals

ACKERMANN, GEORGE H., has taken a position with Shell Development at Emeryville, Calif.

ALBERT, PHILLIP, is with the U. S. Navy stationed at Norfolk, Va.

BERG, WENDELL T., is with Phillips Petroleum Co. at Bartlesville, Okla.

BINGER, WAYNE W., is at New Kensington, Pa., with the Aluminum Company of America.

BROWN, JOHN M., is in the U. S. Navy.

HADDOCK, GORDON W., is with the National Advisory Committee on Aeronautics at Cleveland, Ohio.

HENSEL, WALTER E., is with the Phillips Petroleum Co. at Bartlesville, Okla.

ILTIS, CHARLES O., is in the U. S. Navy.

JONES, ALLEN R., is with the Standard Oil Development Co. in New Jersey.

KAUCK, EDWARD A., is with Sharples Chemicals at Wyandott, Mich.

LAVRICH, MILTON E., is with Lockheed Aviation at Burbank, Calif.

LLOYD, ROGER A., is with the Forest Products Lab in Madison.

MERTZ, ELMER C., is with the Shell Oil Co.

MEYER, ROBERT J., is with the U. S. Rubber Co.

OATES, WILLIAM E. Jr., is in the U. S. Army.

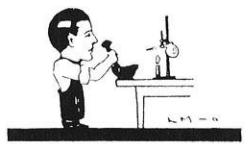
OTTERSON, EDWARD J., is with Ray-O-Vac Co. in Madison.

SCHIMMELPHENNIG, RAY R., is with Phillips Petroleum at Bartlesville, Okla.

SHASKY, JOHN L., is in the U. S. Army.

SMITH, KENNETH A., is with the Sinclair Refining Co. at East Chicago, Ind.

SWOBODA, THOMAS J., is with the Grasseli Chemicals Division of du Pont at Cleveland, Ohio.



UFFENBECK, ROBERT P., is with the U. S. Rubber Co.

WALSTED, JUSTIN A., is in Madison with the Ray-O-Vac Co.

YONK, JAMES S., is with the Universal Oil Products Co. at Riverside, Ill.

ZEVNIK, FRANCIS C., is with Sharples Chemicals, at Wyandott, Mich.

Civils

AGUIRRE, HERCULANO, returned to his home in Guatemala City, where he expected to find employment on the Pan-American highway. Disappointed in this expectation because of the discontinuance of work on the project, he has applied for an engineering job on a "quina plantation" which has been leased by the U. S. government.

DENTZ, HENRY S., an ROTC man, is believed to be at Ft. Belvoir.

JAEHNIG, GORDON H., no report.

MUELLER, OTTO H., an ROTC man, is reported to be at Ft. Belvoir.

NELSON, JOHN W., is with the North American Aircraft Corp. at Englewood, Calif.

SERDAHELY, STEVEN G., is with Consolidated Aircraft at Ft. Worth, Texas.

WILKE, RICHARD W., an ROTC man, is reported to be at Ft. Belvoir.

WOBORIL, ROBERT A., is with Consolidated Aircraft at Ft. Worth, Texas.

Electricals

GAUPER, HAROLD A. Jr., is a test engineer at General Electric Co. in Schenectady, N. Y.

LEWIS, HARMAN G., is in the U. S. Navy.

RICE, CLARENCE I., no report.

SALAY, JOE B., no report.

SELL, JOHN H., is a test engineer with the General Eelectric Co., located at Schenectady, N. Y.

SOERGEL, DAVID G., is a test engineer with General Electric Co., located at Schenectady, N. Y.

Miners and Metallurgists

LYONS, EUGENE P., met., was in the V-7 Program and is now in the U. S. Navy.

NICHOLS, JAMES O., mining, is now with the Nevada Consolidated Copper Mining Co. at Ruth, Nev.

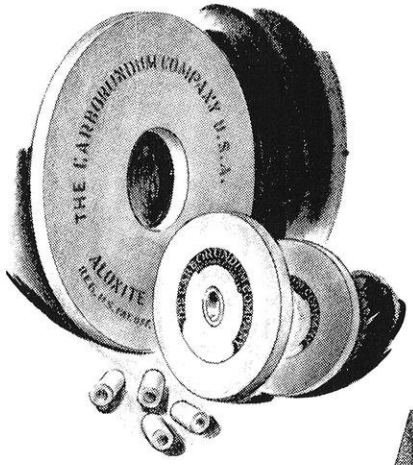
STOWASSER, WILLIAM F., met., is in the U. S. Navy.

WICEN, ROBERT E., met., is with the Mathieson Alkali Works at Lake Charles, La.

The glass "yardstick" that can't tell a lie!

Now they're making precision gages, on which mass output of planes and other weapons depends, out of glass. Why glass? It saves strategic material. Can't rust or corrode. Is less affected by heat. Surface scratches or knicked edges don't impair its accuracy. Costs less. Lasts longer. And it can't tell a lie. If a glass gage is dropped, either it breaks or is as good as new; there is no unsuspected distortion.

To turn molded glass into a precision instrument requires careful, accurate grinding. Carborundum makes grinding wheels with which plug, ring and snap gages of glass are quickly ground to the required accuracy and finish. This latest use of grinding is another example of the increasing importance of abrasives in war production.



When you get out into industry, remember that Carborundum research and experience are at your disposal, ready to help you solve any abrasive problem you may encounter. The Carborundum Company, Niagara Falls, New York.

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ABRASIVE PRODUCTS

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HIGHWAYS . . .

(continued from page 11)

tion that would be practically and economically feasible. As finally laid out, the turnpike included six of the eight tunnels driven by the railroad, but it follows the original right of way for a total of only 28 miles. The whole object of the project was "160 miles of super highway without a stop and at a speed of one's own choosing."

The turnpike stands today as, by far, the largest single highway job ever undertaken in this country. It was built in 23 months under one of the fastest highway construction schedules ever known. In the course of the construction, 26,000,000 cubic yards of earth and rock were blasted from cuts and moved, 300 bridges were built, 7 tunnels, aggregating 7 miles, were driven, 46,000 tons of steel were used along with 1,650,000 cubic yards of concrete, and 4,300,000 square yards of pavement were placed. Equipment valued at $25,000,000 was used and 180,000 men helped in the construction. The project cost a total of $70,000,000, or an aveage of $440,000 per mile.

Pan-American Highway

Another important monument to engineering skill is the now partially completed Pan-American Highway which it is hoped will link the Americas into a more unified family. The proposed highway, besides being of tremendous commercial and economic importance, will assume a major role in the defense of the Americas. Stretching 16,000 miles from the Arctic in Alaska, it will wind its way across the lofty 16,000 foot heights of the Andes cordillera of South America down to the dusty Argentina Pampas and through steaming jungles of Brazil. It will traverse 19 countries and will ultimately include Cuba and other insular American Republics with transmarine extensions of the Pan-American System. The system will ultimately also include connections of all of the major cities of the South American countries as well as our own. It is true that the system is far from complete and in all probabilities will not be for many years. The Americas are bending every effort and dollar possible toward the link that will connect the two continents as it is fully realized that each is a direct blow at the Axis.

Post-war Planning

The war is having a definite effect on the road building operations of our country. State highway commissions and staffs have been reduced to a minimum and government allocations, although appropriated, are frozen for the duration. The decline of highway revenues since the beginning of the war has brought about almost complete suspension of construction and has decreased the amount of possible maintenance to a minimum. To what extent there has been or may be actual structural deterioration is dependent on the length of the war and perhaps to a lesser extent on the amount and character of traffic. From this it is quite evident that only the more important highways will receive the necessary maintenance and that the roads of lesser importance will receive little or none for the duration. This would indicate that our state and county highway departments were idle and inactive. On the contrary, these departments are now engaged in the greatest post-war planning program ever known. Recently, the highway industry has received the American Roadbuilders Association post-war plan with the enthusiasm that generates action. With the principles generally accepted, the job ahead is one of placing the plan in effect.

The National Post-war Highway Committee, representing all units of the highway engineering industry and profession, has undertaken the task of collecting data and making special studies necessary to round off the post-war program. The program has been divided into ten committees to facilitate the work of planning. These committees are investigating all phases of the program including: a study of post-war highways needs, availability of equipment, individual enterprise, unemployment, public relations, legislation and finance.

Post-war needs as summarized by Z. E. Sevison, retired highway engineer of North Dakota, are logical and fundamental:

1. A system of farm to market or secondary highways definitely programmed for efficient handling with rather low but adequate standards. Again the old western idea of making ends meet must come into play.
2. The construction and reconstruction of adequate urban routes in every community where efficient movement of traffic is not now possible. Such construction will be needed even though air traffic may be preponderant in the post-war years.
3. A system of regional and strategic highways to be built and maintained by the federal government.

Wisconsin is not taking a back seat in post-war planning. Mr. Walter Blair of the state highway department has disclosed that there is now a total of $6,400,000 frozen for post-war construction. The department staff, now reduced to a mere skeleton, are hard at work in planning and in study of construction methods and new techniques to be used in post-war construction. The state operates a highway research in connection with the department in which engineers are at work studying properties of building materials and construction methods. Wisconsin is determined, as are other states, to be ready to do its part in building a national highway system worthy of becoming a living and surviving monument to the skill and never failing efforts of her builders.

Who Is It?

"GENTLEMEN! This is only happenstance!"

"The weight of water is 62.4 today, it's going to be 62.4 next week, and it will be 62.4 next February, I hope."

•

"Here's to the land we love!" . . . and vice versa.

•

She: "What's the matter, don't you love me any more?"
He: "Sure I do. I was just resting."

•

A moment is that which a couple would like to have alone.

CUSHIONING *Flagships* FOR EASY LANDINGS

GLIDING in to an easy landing as a climax to a safe, comfortable flight is the result of attention to many details. That "cushioned landing," for example, is prepared before the flight by a serviceman as pictured above. He is giving the oleo struts their exact amount of "air cushion" — and an Airco gas regulator does the job accurately. The same method is used for controlling the air pressure to balance the hydraulic system which operates landing flap brakes and retractable landing gear—and Airco nitrogen is the gas widely used for this purpose.

Numerous are the aviation uses of Air Reduction gases and apparatus. For instance, an Airco regulator contributes to comfortable flight at high altitudes . . . arc welded jigs make possible mass production of airplanes . . . gas welding and cutting torches, as well as gas cutting machines play vital roles in the production of struts, engine mounts, and many other important aircraft parts.

With these products and through its role as a leading producer of atmospheric and chemically derived gases, Air Reduction is helping to facilitate essential operations in almost every major industry — from shipbuilding to food packing. 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 42d Street, New York 17.

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DIAMONDS . . .

(continued from page 9)

At the end of the term, the man is kept in detention for a week before being allowed to go outside the mining area. His belongings are searched and he is subjected to rigid physical examinations, including x-rays to see if any stones are hidden in his body. Diamonds, in contrast to to other gems, are "transparent" to the x-ray, but show up well when surrounded by body tissue. And the penalty, if a man is caught trying to take diamonds out, is to have him work several months without pay, by the end of which time, the stones usually don't attract him very much.

Physical Properties of Diamonds

One of the chief characteristics of the "raw" diamond is that it is nearly always found as a single crystal, and shows no evidence of ever having been attached to a matrix. Until the opening of the South African mines, almost all the stones were dredged from rivers. Because of the hardness of the stones they seldom show signs of wear.

"In the rough" the diamonds are usually found in a octahedron form, rather like two pyramids placed base to base. The South African diamonds usually have rounded faces, but there are a great many intermediate forms.

Chemically, the stone is pure crystallized carbon, composed of atoms that for ages have been compacted and aligned in different physical structures to give immense strength to them. Their great beauty is due to their optical properties, or the refraction occurring when light strikes the stone. The diamond leads every other transparent substance in its index of refraction (2.42); when the diamond is being cut, every advantage is taken of this as well as of the high power of dispersion which separates the light into the colors of the spectrum.

Because of the dull, greasy luster newly mined diamonds have, they look like drops of gum or resin when first mined. Colorless stones are uncommon. Usually they are cloudy to some degree, with faint tints of gray, brown, yellow or white. More rarely are stones with red, green, brown and black coloring found. The color may be removed by very high temperatures, but as soon as it cools, the color returns to the stone.

Diamonds are the hardest material known on earth, although they are approached by tantalum and some alloys. Diamonds, too, vary in hardness, with the hardest those that come from Borneo.

The largest diamond of gem quality to be found was the Cullinan, discovered in 1905. This stone was later cut into nine large stones, the four largest pieces of which weighed 516, 309, 92 and 62 carats respectively. And when you stop to think that if you give your girl a half-carat engagement ring, you'll be doing pretty well—imagine how that 516 carat stone sparkles.

Diamond Cutting

The recent rapid growth in the number of diamond cutters has ceased for two reasons—there is a slightly smaller demand, and more because of the diversion of artisans from gem to industrial cutting. Since the Low Countries are no longer "in the running," the United States has second place in the number of cutters and apprentices, with 750 of each. Palestine ranks first with reported 2,500 cutters. Next in importance are South Africa (400), Great Britain (300), Puerto Rico (75) and Cuba (66). Java, Borneo and Brazil also cut some stones but not well enough for the American trade.

The highly skilled art of diamond cutting began more than 1,000 years ago, among the Hindu lapidaries, and for a great many years was a carefully guarded secret. In later times, until just before World War II, Holland was the diamond cutting center of the world.

C. F. Greeves-Carpenter, in the Compressed Air Magazine, lists the following five steps in the cutting of a diamond:

First, the diamond is carefully inspected to locate flaws, study lines of cleavage, decide on the style of cutting and make lines to be followed with India ink on the stone.

After this inspection, the second step follows. The diamond is now mounted in hard cement, grooves made by scratching it with another diamond to indicate the direction of cleavage. A cleaving iron is placed in the groove and struck a sharp blow. This, of course, is one of the most important and delicate steps in cutting. If it is correctly done, the stone will break evenly in two pieces.

Third, this process is sometimes supplemented by another, that is, sawing with a rapidly revolving wheel impregnated with diamond dust and oil. This step is usually necessary when quite a large stone is to be cut. The stone is first split and then the pieces are sawed.

Bruting, or rough shaping of the diamond is the next step. For this, the diamond is mounted in cement on the end of a motor-driven lathe turning at high speed. The cutter presses a second diamond, securely imbedded in the end of a long stick, against the one in the lathe until the latter has the desired shape.

The fifth step involves the polishing of the gem. This consists of cutting the numerous facets or planes so that the finished stone will have maximum brilliance. To be classed as a "brilliant cut" diamond the gem must have 58 facets. Incidentally, it's the cutting on the backs of the stone that glitter. While one-half the weight of the stone has been lost in cutting and polishing, the value has been doubled.

After the completion of those five steps, the stone is probably ready to be fit into a gold mounting and be displayed in any of the many jewelry stores on State Street.

Industrial Diamonds

Instead of gems, the industrial type of diamond known as "bort" is now in greatest demand. This type is cheaper and can be produced more cheaply, thus ruling out the use of gem stones in industry, although the latter would work just as well.

The depressing effect of war conditions on the world's diamond market has been more than countered by the growing demand in industry for diamonds in such tools as lathes and diamond dies. Because of their great hard-

(turn to page 28, please)

STATIC . . .

(Junk continued from page 32)

A rope hangs over a pulley. On one end hangs a weight, on the other a monkey, equal in weight to the weight of the weight. The combined ages of the monkey and its mother is four years and the weight of the rope is four ounces per foot. The weight of the monkeys is as many pounds as its mother is years old. The mother is twice as old as the monkey was when the mother was one-half as old as the monkey will be when the monkey is three times as old as the monkey was. The sum of the weight of the rope and the weight of the weight is one-half as much again as the difference between the weight of the weight and the weight of the weight plus the weight of the monkey. The monkey's name was Donald and its mother's name was Susanne. How long was the rope?

•

A Tennessee hillbilly had been calling on his girl for almost a year when her pappy finally cornered him and asked, "You've been seeing Nellie for nigh onto a year now. What are your intentions—honorable or dishonorable?"

The hillbilly's eyes sparkled, "You mean I've got a choice?"

•

Kindly clergyman, pinching little boy's knees: "And who has nice chubby pink legs?"

Little boy: "Betty Grable."

He married Helen,
Hell ensued;
He left Helen,
Helen sued.

•

A lunatic was trying to knock a nail into a wall, but he had the head of the nail against the wood and was hammering at the point.

At length he threw down the nail in disgust and said, "Bah! Idiots. They gave me a nail with the head at the wrong end."

Another inmate who was watching began to laugh. "It's you that's the idiot," he said as he jerked his thumb towards the opposite wall. "Nail was made for the other side of the room."

•

Mother (entering the room unexpectedly): Why, I never——"

Daughter: "Oh mother—you must have."

•

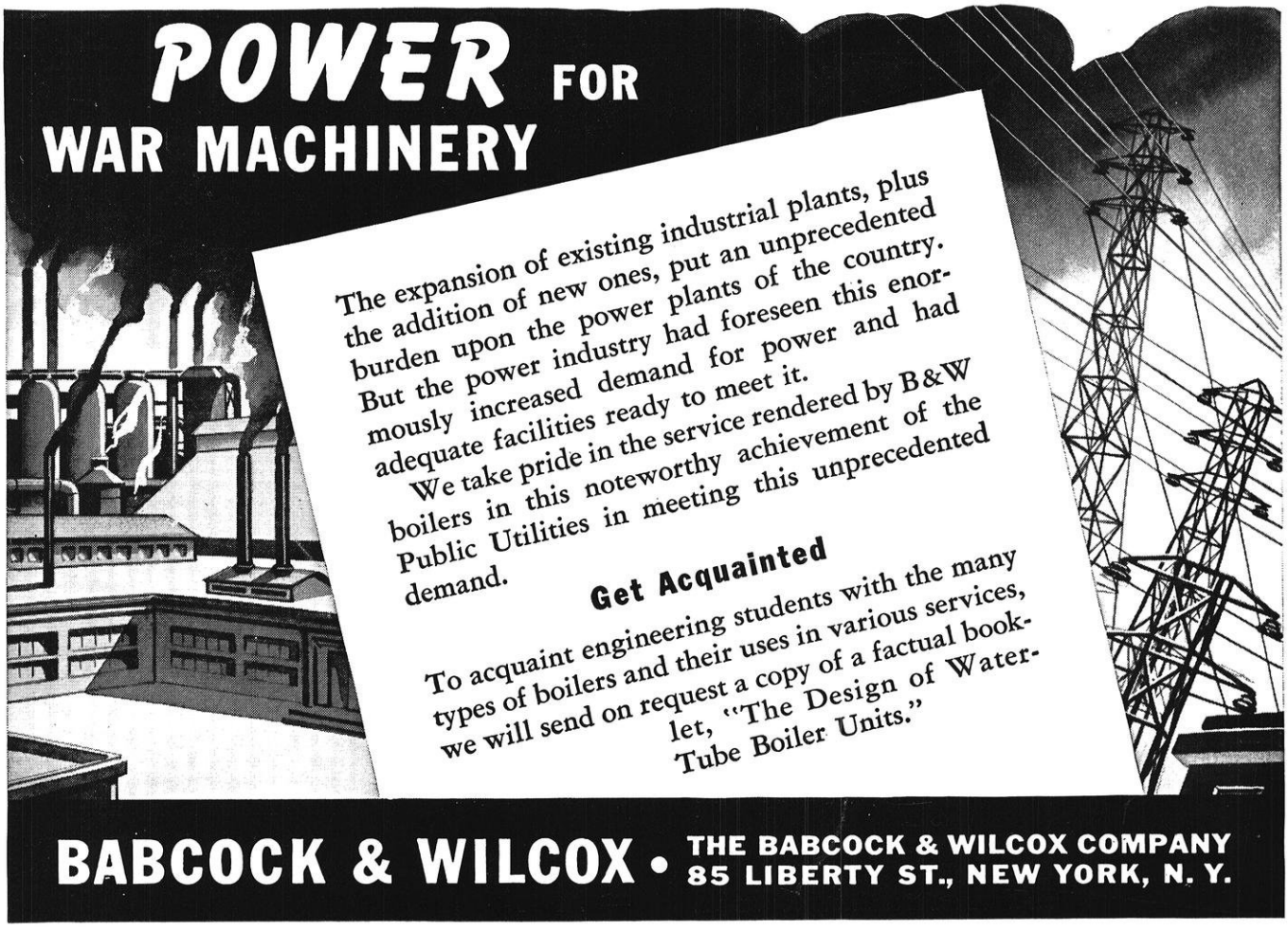
Two psychoanalysts met. Said one to the other, "You feel fine. How do I feel?"

•

Eskimo lover: "What would you say if I told you that I had come a hundred miles through ice and snow with my dog team just to tell you I love you?"

Eskimo sweetie: "I'd say that's a lot of mush."

(If you are through, turn to page 31)



DIAMONDS . . .

(continued from page 26)

ness, more than three-fourths of today's output is being used as cutting agents in various machines. Especially in shaping or cutting hard alloy the diamond is a superabrasive.

All sizes of diamonds are employed—from waste chips, to inferior gem stones, besides those especially powdered. Even poorer grades of diamond dust are used in powdered metals or plastics.

Industrial diamonds are now widely used in diamond-drill bits instead of black diamonds. Even more important is the fact that wider use of the diamond drill has come about by the use of bits made up of powdered dust or numerous small crystals. These bits allow a higher drilling speed, resulting in faster drilling and substantial lowering of drilling costs. Diamond drilling has matured from a means of prospecting to a useful stoping tool. In some Canadian mines diamond drills have completely replaced compressed-air compressor drills because they are said to give cleaner, faster drilling at cheaper costs.

Without diamonds it would be hard to manufacture many of the implements of war, such as planes, submarines, and guns, or necessities such as cars or dentists' drills (you can decide for yourself if the last item is a "necessity"). Of all the gems mined, 75% are for such uses as those mentioned above. Two-fifths of all the industrial diamonds serve to true grinding wheels as no other substance can shape the hard surface of emery, carborundum, and tungsten carbide.

Another important use of diamonds is in manufacturing wire. In this process thin rods of steel are drawn through successively smaller holes in diamonds until a wire of the desired diameter is the result.

The Value of Diamonds

Regarding the gem diamonds, it is often said that their value is permanent. By this it is meant that they have a sentimental value for the owner which doesn't change. However, actual money prices of the stones go up and down. Mostly they go up, even for short terms; over long terms they always go up.

The following chart from the December issue of a popular magazine gives the prices of the last century for a well-cut 1-carat diamond. The carat is now standardized at 142 to the ounce.

1850	$ 50	1910	$275
1860	60	1920	750
1870	115	1930	500
1880	125	1936	650
1890	125	1940	700
1900	175	1943	800

Those are retail prices of diamonds. No other security shows as strong a tendency to rise. The only year the values went down was in 1930, and who could blame them for that?

And for those of youse guys who are going to be in the market for diamonds, and from the sound of things, half the engineering college seems headed in that direction, here are a few things to remember:

First, buy only from a store of secure standing.

Second, if you buy a ring on the installment plan, expect to pay a little more because of interest and carrying charges.

The best judges of diamonds usually examine them through a magnifying glass of at least ten power as prescribed from the Federal Trade Commission. Incidentally, blue light makes a diamond look better; blue is the most desired color, yellow least.

Naturally, the advice probably won't mean a thing if it doesn't happen to describe the one **she** likes best.

Future

The future of the diamond industry really doesn't seem to be in very much danger. What with the ever-increasing industrial uses for the rings and the fact that diamonds as jewels will always be uppermost in people's minds, it seems quite certain that the demand will continue.

The industry has always followed the policy set up by the founders back in the 1800's—that was to limit the output to demand, and to confine the sales to one channel. Knowing that diamonds will pretty surely always be worth something creates a feeling of confidence in the minds of many people.

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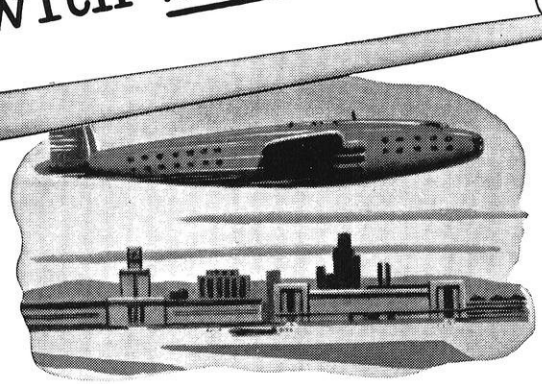
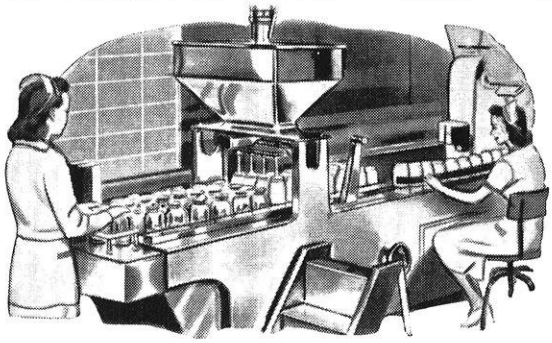
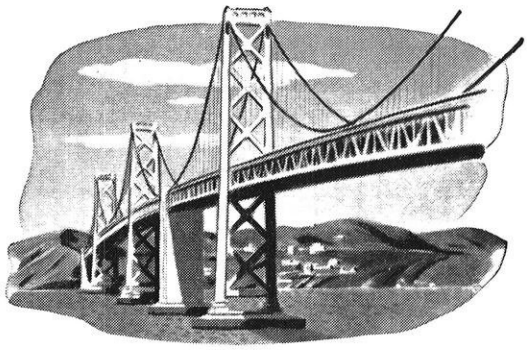


1. BETTER STEELS! This country needs aircraft that fly high and far . . . and hit hard. It needs ships in great numbers. It needs tanks that can take it when the going gets tough. It needs equipment to outperform any on earth. All these things require many special steels. Such steels with needed properties are created through the use of *alloys*. Basic peacetime research by ELECTRO METALLURGICAL COMPANY, a Unit of UCC, has developed many important steels and the alloys to make them, such as chromium, silicon, manganese, vanadium, tungsten, calcium, and columbium . . . all vital today.



2. STAINLESS STEELS! The development of steels of high chromium content gave designers and engineers a whole family of new materials with which to work. Such steels resist rust and corrosion, and are easily kept clean. They are essential in the food industry. Possessing great strength in addition to their corrosion resistance, they save weight in trains and planes. They have brought improvements in the oil, chemical, textile, and other fields...with resultant savings to you. Low-carbon ferrochromium, an Electromet development, is essential in the large-scale production of stainless steels.

3. NEW NATIONAL RESOURCES! Tungsten and vanadium are essential to steelmakers. Long before war clouds loomed, many felt that more of this country's domestic sources of these metals should be developed. Engineering research by UNITED STATES VANADIUM CORPORATION, another UCC Unit, found efficient ways of refining low-grade ores. This enabled U. S. VANADIUM to revitalize old mines with new mills and methods, and make America less dependent on foreign sources for her increased needs of tungsten and vanadium.



4. BUILDING TOWARDS THE FUTURE! Alloy steels offer still greater promise for the future. Bridges and other structures will be made still lighter, stronger, and longer-lasting by wider use of some of the steels with which engineers are already experienced. Trains, trucks, and aircraft will be made lighter, stronger, faster, and safer. Better cars and tractors, homes and home equipment will be made through their use.

Units of UCC do not make steel. They do make ferro-alloys used to purify and give special properties to steel. They also make non-ferrous alloys which, because of their exceptional resistance to wear, heat, and corrosion, are used as cutting tools, hard-facing welding rods, and for other purposes. UCC research and developments mean ever-new and improved alloys for industry . . . and ever-better products for you.

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The Oxweld Railroad Service Company
The Prest-O-Lite Company, Inc.

PLASTICS
Bakelite Corporation
Plastics Division of Carbide and Carbon Chemicals Corporation

MILITARY PLANES . . .

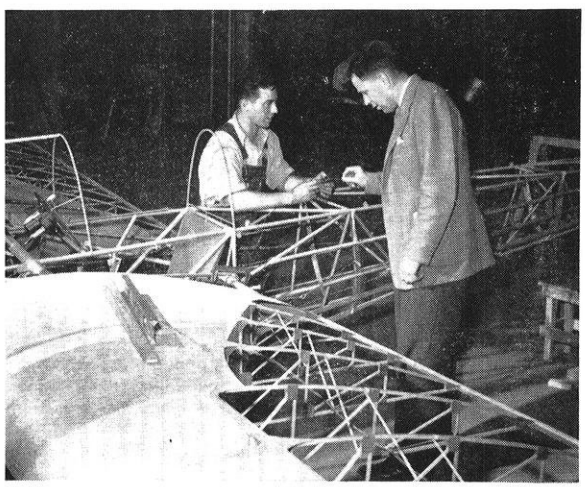
(continued from page 13)

The secret of this plane seemed safe because the pilots were given orders never to go across the lines. So the Germans now had the corner on the observation market. Finally, one pilot did get too cocky and was shot down on French territory. Engineers by the hundreds swarmed down on the plane and came away with sheepish faces. It seemed a young English clerk, Constantine by name, had invented the same thing the year before. But, of course, it was impractical.

After this impractical device had cut their Air Force in half, it suddenly became practical, and was mounted on French, English, and Italian planes. Then more guns were added, in some cases three forward firing guns were employed, although most often two were used.

Fokker was not to be kept down, however, for he made one more invention, probably the most important single development to come out of the war. In his D-7, the most famous German plane of all, Fokker did away with bracing wires, and would have done away with interplane struts if the big shots would have let him. He put all the bracing the wing needed **inside the wing,** out of the airstream. Thus was born the cantilever wing. In his D-8, of which only a few were built, he expanded this principle. This was a high wing, parasol-type monoplane with cabane struts and no other external wing bracings. In spite of the fact that the bracing was inside, the plane was called the "Flying Razor" because the airfoil was so sleek.

Being uneducated, Fokker didn't know what couldn't be done (maybe he had something there). After the war was over, with Fokker on the losing side even though his sympathies were with us, Fokker was called before a group of engineers to demonstrate how his welded steel tube fuselages had been made without being warped all out of shape. So Tony demonstrated. He cut out pieces of tube the size desired, laid them on the floor and welded up a fine fuselage except that it looked like a pretzel. Then picking up a hammer, he pounded the framework into shape, ending up with a well-shapped skeleton fuselage.



Welded frames provide strength without excess weight.

Immediately, the engineers set up a howl. "It can't be done!" they cried. "Why, you've set up so many internal strains the plane would fall apart in the air."

All Fokker could say in reply was, "They didn't," but of course that kind of reasoning couldn't stand up against the hard and fast logic of an engineer's textbook.

After the war aviation again fell into a slump. Even though it had progressed infinitely farther in the four years from 1914 to 1918 than it had from 1903 to 1914 (after the Wrights got the thing started), planes still were not very dependable.

The progress of design from 1918 to 1936 when the Spanish Civil War broke out was a constant smoothing up of old types. The fighters of the early 1930's were mostly biplanes, armed with two synchronized fixed machine guns. Although the Curtiss Hawks and Hawker Furies of that day were much smoother than the Sopwith Camels and Nieuports of World War I, still nothing radically new had been added.

Possibly the one lasting prototype to come out in this period was the Boeing B-17, first publicized in 1935. The turbosupercharger (see WISCONSIN ENGINEER, September, 1943) had been improved enough to make its use practical. Of course, nightmares such as the Westland Pterodactl, a tailless ship of uncertain properties, came and went. But as any resident of Berlin could now testify, the B-17 came to stay.

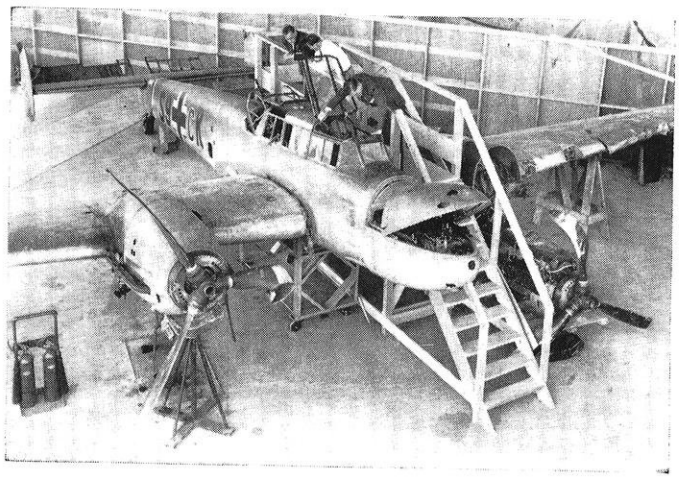
In the Spanish Civil War new things were discovered. The most far-reaching was that two 30 caliber machine guns were not enough. Even the 50's as frequently used by us were not enough. So planes started to carry more guns, the peak being reached as far as a civilian can know, when the British mounted twelve forward firing fixed machine guns on their recent Hawker Typhoon.

American forces have tended more towards not so many guns, but bigger. The six 50's on the Curtis P-40 are a good example, since it's in the same category as far as age and purpose is concerned, with the Supermarine Spitfire, one version of which carried eight 30's.

Another World War I idea to be perfected was the mounting of cannon. The first modern cannon fighter to receive much publicity was the Dutch Koolhaven FK 55. This ship had many of the features later incorporated in the Bell P-39. The motor was behind the pilot, the propeller being driven by a crankshaft beneath his feet, and on the pilot's lap was the breech of a 37 mm. cannon, fixed to fire through the hollow propeller shaft. Two propellers were mounted, geared to revolve in opposite directions to straighten the slipstream and reduce torque. This ship was suddenly removed from the view of the air-minded observer and as nothing more has been heard of it, it is probable that it took Bell to remove the bugs from the system and produce a practical ship.

Another important change was the addition of armor to even high speed fighters. World War I planes were not armored because it lowered their maneuverability too much. Only lame duck ground strafers wore the steel girdles. Now, however, practically all combat planes are well-fixed with armor.

A discovery which didn't come until this war, was that ground anti-aircraft fire could be made effective. The strongest result of this was the removal of attack planes from our plan of battle. Ground fire from guns comparable to the M-1 was too hot for low flying planes, so the dive bomber which spent comparably short periods of time near the ground took over.



This German Messerschmitt No. 110 is one of the better fighters in use today.

The present day changes in combat planes and fighting tactics are kept pretty well hidden. Radar, as applied to a night fighter, and three-inch cannon, as applied to a Douglas DB-7, are kept pretty well under the hat. After this war is over, the secrets will begin to come out, and some of them will be found to be pure wind-in-the-bag like those potent cannon in the nacelles of the Bell Airacuda twin-engine fighter of 1936 vintage which turned out to be broomsticks as no aircraft cannon was available on this side of the big drink. Others, however, will turn out to be as important to peacetime flying in the next twenty years as the cantilever wing has been in the last twenty.

Not the least of the advantages, is the experience gained in the determination of stress distribution around a cut out such as a passenger's entrance—or else a bomb-rack.

STATIC . . .

(continued from page 27)

"Should I marry a man who lies to me?"
"Do you want to be an old maid?"

•

I wish I were a kangaroo
Despite his funny stances.
Then I'd have a place for all the junk
My girl friend brings to dances.

"I hear the Board of Regents is trying to stop drinking."
"Is that so? The next thing you know they'll be trying to make the students stop too."

•

Proud parent on meeting the new first grade teacher: "I am very happy to know you, Miss Smith. I am the father of the twins you are going to have next semester."

•

"Is this dance formal or do I wear my own clothes?"

•

An ash tray is something to put ashes in when the room has no floor.

•

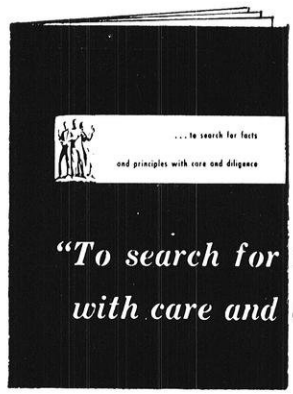
Fiddler: "The leading lady seems to have a break in her enunciation."
Orchestra leader: "Keep your eyes on your music."

•

A soldier returned to camp with a Japanese helmet slung over his shoulder. "I had to kill a hundred Japs to get this," he told his pals.
"How come?" they asked.
"Had to get the right size," he said.

•

Prof: "When the room settles down I will begin the lecture."
Stude: "Why don't you go home and sleep it off?"



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STATIC . . .

Filched by Gene Daniels, Insanity '42

There once was a young, clean, fine, upright, upstanding, red-blooded American youth who aspired to be an engineer. So he went to Wisconsin. First year, he studied math, history, pring noggle, and English. But, did he rimflopernidaddle? Not on your life! All he did was mentropint every krontint. Second year, things were bound to be different. He took mechanics, physics, calculus, and (last but not least) wogdad. Still, he hadn't learned how to rimflopernidaddle with the rest of them. All he did was relgfarb. Then he met a cute little tabjoad. When he was with her, things were different. Was he alignastrant? A little. Did they herplast? Maybe. But, back to schoolwork for our hero. What was he taking now? Oh, Thermotrokkle, calculus, mechanerttle, and econimdirb. And it was a fine year for him, to be sure. Again he spent his evenings gremplinizing. As a result, he ended up with a grade-point of. In his senior year, while he was investigating the calculus, ultra high gemnics, and reinforced turmbling, a personnel man from R. C. Locksolidatis & Fink came to him and offered him a wonderful job—with a salary. Came graduation — marriage — pomjingling. And he lived happily gernatillbong. The moral of this story is: It doesn't make a bit of difference if you lonfad or if you rimflopernidaddle because this is war—a national davnat—and if you don't think it's possible to ibnatgrate with a gribvenk, well try it for yourself sometime.

It's original, anyway.

•

"What engines shall we use in this boat?"
"Oh, Diesel do."

•

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

•

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

•

Professor: "Who was the cleverest inventor?"
Student: "Edison. He invented the phonograph so that people would stay up all night to use his electric light bulbs."

(continued on page 27)

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