The Wisconsin engineer. Volume 47, Number 5 February 1943

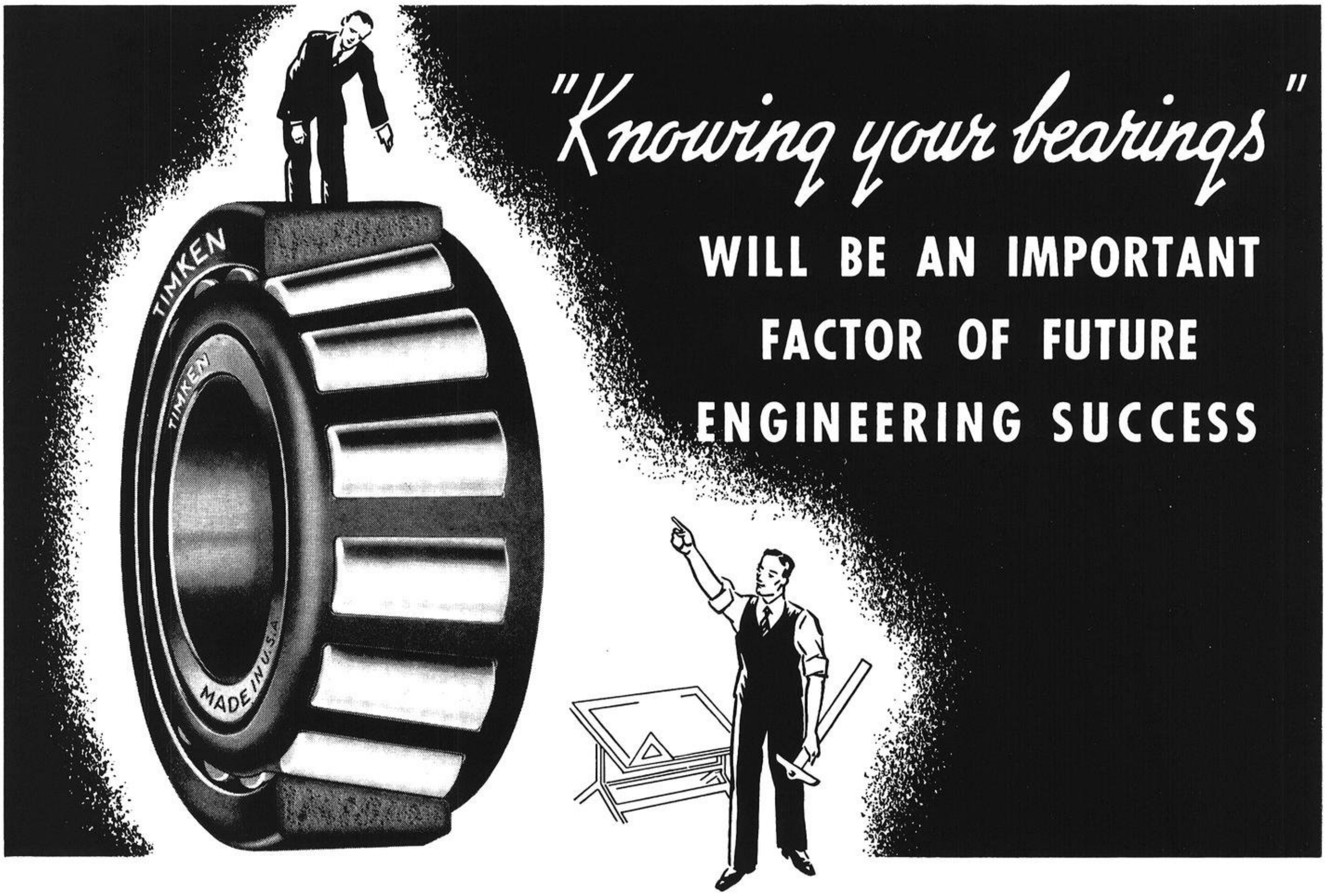
Madison, Wisconsin: Wisconsin Engineering Journal Association, [s.d.]

https://digital.library.wisc.edu/1711.dl/7P3DBZ6M5SIJV8I

WISCONSIN ENGINEER

February, 1943

MEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED



"Knowing your bearings" WILL BE AN IMPORTANT FACTOR OF FUTURE ENGINEERING SUCCESS

The terrific strain of modern war is testing American mechanical equipment of all kinds as it never has been tested before, but it is coming through with flying colors.

For, among other vitally important things, the designers of this equipment *know their bearings;* that is why so many Timken Tapered Roller Bearings are used in tanks, trucks, armored cars, guns, airplanes, warships and the machines that make them. Timken Bearings meet every bearing requirement because, in addition to eliminating friction they carry radial, thrust and combined loads and hold moving parts in correct and constant alignment.

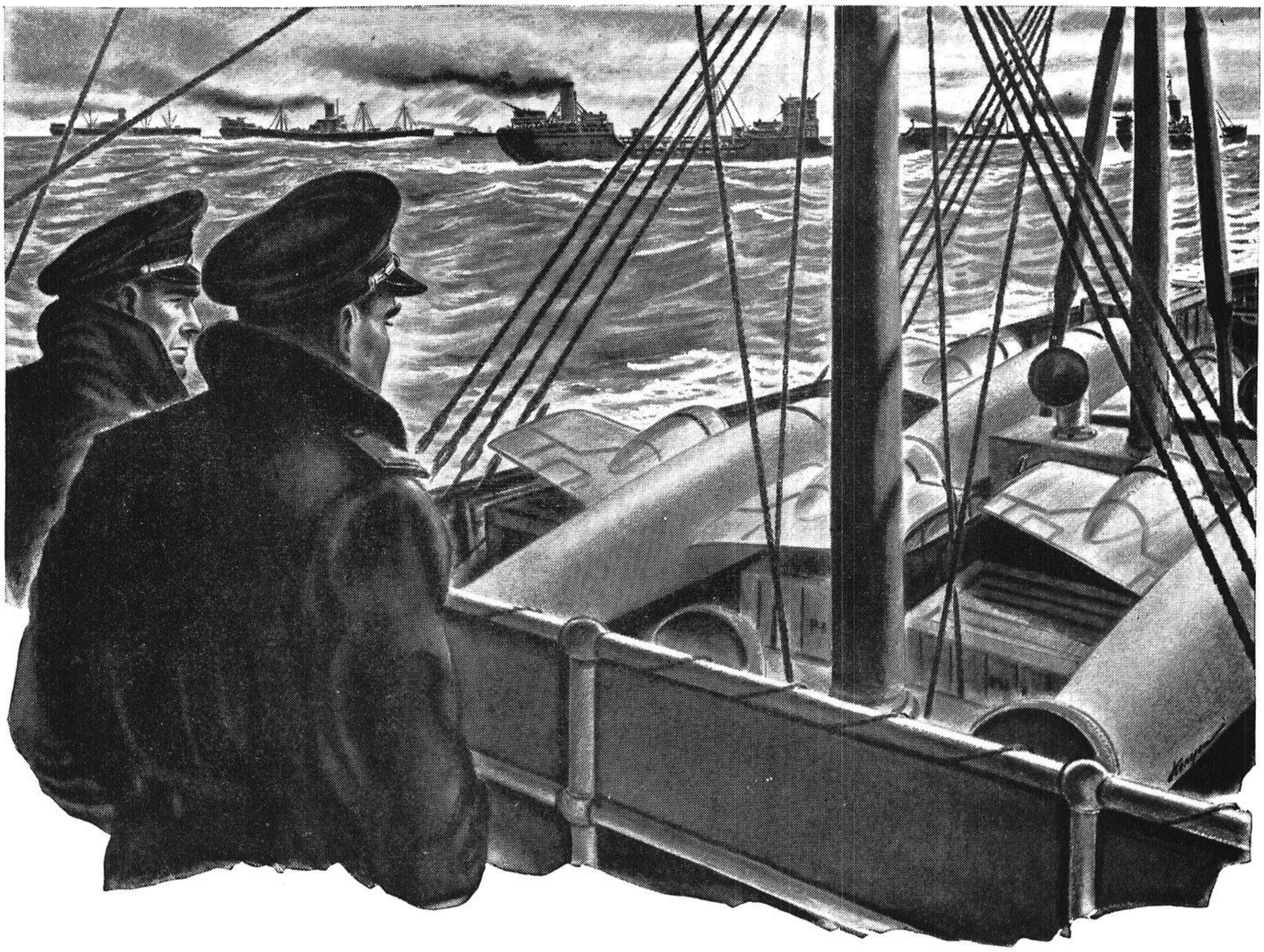
Timken Roller Bearings have been solving bearing problems in industrial and transportation equipment for many years—long before the first world war. They will be called upon more and more during the reconstruction period that will follow Victory for the United Nations in the present conflict.

That is why you should begin now to acquire a thorough knowledge of Timken Tapered Roller Bearings — their design and application. When you have this knowledge you will be able successfully to meet any bearing condition you ever may encounter. Our engineers will help you to get it. The Timken Roller Bearing Company, Canton, Ohio.

"All There Is In Bearings"

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.



This is the way to win a battle in the desert

Libya and North Africa made it clearer than ever: THIS IS A WAR OF SUPPLY.

In 1918, an American soldier could be equipped and maintained on 5 tons of supplies each year.

But today, for every soldier sent abroad, *10½ tons* of shipping space must be provided for *equipment alone.* And it takes an additional *18 tons of shipping to supply a single soldier for a year!*

Supply is a matter of *ships.*

And ships need electricity.

Vast quantities of electric power, for a thousand vital tasks that must be done to take a convoy safely across the seas...

Electricity to steer the vessels and operate the radios and signal lights.

Electricity to detect the approach of enemy subs and planes, to sound the alarm, to organize the defense.

Electricity to power great cargo winches, and delicate navigating instruments.

Electricity to make magnetic mines harmless, to provide invisible "black light" for reading charts at night. Electricity to keep food fresh, to cook it, to ventilate the ships, to provide comfort for the crews.

Electricity in every freighter, every tanker, every Navy escort vessel—to help win the war of supply!

We of Westinghouse take tremendous pride in building so much of the electrical equipment, so many of the great turbines and gears and electric drives, for the ships of America's Navy and Merchant Marine.

Into every piece of that equipment go all our "know-how," all our skill, all our determination to *do our share* in this war—and if possible, a little more.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pennsylvania.

Tune in the Westinghouse Program starring John Charles Thomas — NBC Network, Sunday, 2:30 P. M., Eastern War Time.

Westinghouse

PLANTS IN 25 CITIES — OFFICES EVERYWHERE

. . . and we made a Sapphire!

YOU'RE LOOKING at a sapphire being made in the incandescent heat of a specially designed furnace . . . a synthetic sapphire . . . better than the natural gem. It takes hours to grow one of these sapphire boules.

What's so wonderful about it? Sapphire is necessary for the security of this country. Out of this jewel stone are made hard, long-wearing bearings for precision instruments. The various precision devices of a modern battleship require more than 4,000 jewels; about 100 more are needed in fire-control mechanisms. Modern pursuit planes and bombers require up to 100 sapphire bearings in their instruments.

In 1940, this country was completely dependent upon Europe for sapphire jewels. The call went out for American-made sapphire to meet this nation's needs.

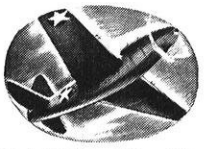
Because we at Linde are experienced in the production of gases and in the accurate control of high temperature gas flames, we volunteered to try to make sapphire. After two years of experimental research, we learned how to produce the high-purity raw materials needed and also how to make sapphire from those materials. Today, we make more synthetic sapphire than this country ever imported from Europe . . . enough to meet all industrial and military needs. Thus America need never again be dependent upon an outside source.

Right now, we make colorless sapphire because colorless jewels make harder bearings. No sapphire is available for anything but war production. In the future we stand ready to make ruby and other gem stone materials for the jewelry trade . . . and for you.

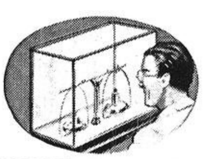
This research development by The Linde Air Products Company is paralleled by other recent achievements of Electro Metallurgical Company, Carbide and Carbon Chemicals Corporation, and National Carbon Company, Inc.—all of which are Units of Union Carbide and Carbon Corporation.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
GENERAL OFFICES: NEW YORK, N. Y.
Offices in Principal Cities

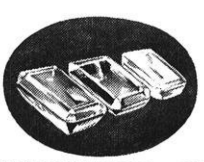
HIS BEARINGS ARE RIGHT—Chronometers, compasses, and other navigational aids must be rugged as well as precise. Sapphire bearings can "take it."



FLYING JEWELS—Pilots' lives and the success of their missions depend upon accurate instruments. Sapphire bearings assure continued accuracy.



LABORATORY WARRIORS—Delicate balances, time instruments, and other important precision equipment of the research worker need sapphire jewels, too.



YOURS IN THE FUTURE—Flawless gems . . . such as rubies, sapphires, and spinel . . . made by this same Linde process . . . will be available for jewelry in the future.

BUY UNITED STATES WAR BONDS AND STAMPS

WISCONSIN ENGINEER

Founded 1896

Volume 47 FEBRUARY, 1943 Number 5

MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

ROBERT L. TAYLOR, *National Chairman*
MONSANTO CHEMICAL COMPANY
St. Louis, Missouri

Arkansas Engineer
Cincinnati Co-operative Engineer
Colorado Engineer
Cornell Engineer
Drexel Technical Journal
Illinois Technograph
Iowa Engineer
Iowa Transit
Kansas Engineer
Kansas State Engineer
Marquette Engineer
Michigan Technic
Minnesota Techno-Log
Missouri Shamrock
Nebraska Blue Print
North Dakota Engineer
North Dakota State Engineer
N. Y. U. Quadrangle
Ohio State Engineer
Oklahoma State Engineer
Oregon State Technical Record
Pennsylvania Triangle
Purdue Engineer
Rose Technic
Tech Engineering News
Villanova State Engineer
Wayne Engineer
Wisconsin Engineer

National Advertising Representative
LITTELL-MURRAY-BARNHILL, INC.
101 Park Ave., New York

●

Any article herein may be reprinted provided due credit is given.

Entered as second class matter September 26, 1910, at the Post Office at Madison, Wisconsin, under the Act of March 3, 1879. Acceptance for mailing at a special rate of postage provided for in Section 1103, Act of Oct. 3, 1917, authorized Oct. 21, 1918.

●

Published monthly from October to May inclusive by the Wisconsin Engineering Journal Assn., 356 Mechanical Engineering Bldg., Madison

●

Subscription Prices

$1.00 PER YEAR . SINGLE COPY 15c

In This Issue . . .

Department of the Month, the

Electrical Engineers

by James Cockrell, e'43

THE red synchronizing lights flash on and off together—first rapidly, and now more slowly. "Watch it! Check the voltmeters! O.K.? . . . Now!!" And with the closing of the switch three more student electricals have gone through the mill of paralleling two separately driven a.c. generators.

Electrical engineering at Wisconsin offers two specialties, power and communications. For three years both progress together; taking the same prep courses in electrodynamics, d.c. machinery, a.c. circuits, and a.c. machinery. No distinction is made in the laboratory or in the class room. In his senior year, however, the student selects his field and at this point the two become widely separated.

Curricula

Before the war both the power and the communications courses were always well filled. But from the time the trouble started in Europe in September, 1939, more and more electricals have shifted to communications with the idea that this study would soon make them more valuable to Uncle Sam. Up to this time the power men took a number of special courses such as, "Photometry and Lighting," "Transients," "Meters, Relays, etc.," and advanced work in the dynamo laboratory. However, with the rush to communications most of these courses have had to fold up until the demand for them is greater.

So it's communications all the way now for the electricals. Starting out with simple vacuum tube theory, a succession of courses leads finally to a study of ultra-high-frequency techniques. This is the undergraduate's final class room step. For additional study along a selected line the student may take work under the direction of one of the faculty in the classification of "E.E. 180." This gives the student almost infinite possibilities and, depending on the student, can lead to much successful advanced work. On such projects this semester, there are three seniors, tackling such problems as, mass spectrometer study in the physics department, and high-frequency measurements of wood glues. These problems are unusually highly specific and tend to teach the student the scientific approach to new ideas.

Student Chapter A.I.E.E.

In an attempt to maintain a constant connection with outside electrical engineering, the students organized the Wisconsin chapter of the American Institute of Electrical Engineers in the fall of 1902. Since then meetings have been held at least once monthly, and many of these in conjunction with the local A.I.E.E. chapter. The student president, Ed Dickinson, '43, and his officers have done a fine job of acquainting the student with typical problems in the field and with men who figure prominently in the solutions to these problems.

E.E. Lab

Up until the war broke out in Europe, an E.E. building was under consideration, but since then paint has been added to the old building and the E.E.'s have just had to tighten their belts for the duration. Most of the E.E. classes are held in the M.E. building while nearly a mile away the laboratories are located in the same building with the Art Education facilities. There in the laboratories one will find excellent equipment for studying almost any of the many electrical fields; electrodynamics, d.c. and a.c. machinery, gaseous conduction, communications and radar. The university also maintains a Standards Laboratory which conducts standard testing for many institutions and utilities in the state. Much of the work in this laboratory is carried on by the students.

Faculty

Personalities on the E.E. faculty? We have them—but yes!!! "Smilin' Jim" (J.W.) Watson heads the list and the E.E. department. He and Professor Tracy are the mentors of the senior men, and it is their headache to make certain that all of the men will have their 146 credits at commencement time. Professor Price heads up the dynamo laboratory and it is largely he and Professor Tracy the power men see for their advanced work. No mention of the faculty could be made without including the quiet figure behind them all, Prof. Edward Bennett. A large share of the continued success of the electrical engineering department is due to this man's constant influence over a long period of years. The most overloaded man at present is Professor Koehler, who is shouldering the burden of more communications courses and many more students taking those courses. Helping along the way are many other men, including Professors Benedict and Larson, and even Bert Lloyd, the smilin' face in the instrument room of the dynamo laboratory. All of these men are carrying unusually heavy burdens because of the manpower shortage on the faculty.

The Ups and Downs In

ELEVATORS

by James Maloney, e'43

Illustrations Courtesy Mechanical Engineer

THE PERIOD of development for the modern elevator may be placed between the third century B. C. and the twentieth century A. D. In tracing the history, for convenience, this section will be divided into two parts, Motive Power and Safety and Control.

Motive Power

Ancient history tells us that Archimedes, the great Greek engineer, was the father of the elevator. One day when he was explaining his law of levers to the king he claimed that he could move the earth if he had a place upon which to stand. The king challenged his statement and pointed to the difficulty his men were having in beaching a large ship of the royal fleet. Archimedes then arranged a system of pulleys and cogs in such a manner that he alone, sitting at one end of the mechanism, was able to draw the fully loaded vessel out of the water onto the land.

The Roman General Marcellus had his galleys attack the Greek city of Syracuse. As they approached the walls of the city, great cranes dropped large stones on their decks and sank them, while others with large hooks raised the galleys out of the water, shaking them in midair and then crashed them against the walls of the fortification. Marcellus was frustrated and had to withdraw.

Thus, the hand powered cranes, windlasses and multiple pulley devices gave us our first hoisting devices. In the palaces of Caesar and Nero have been found remains which indicate that they must have had a system of hand operated elevators. A hand powered elevator was installed in the Convent of St. Catherine on Mt. Sinai about 600 A.D. In the 17th century, Queen Anne of England had installed an elevator in Windsor Castle, and about the same time a "flying chair" was used in Paris by Louis XIV. The flying chair employed a counterweight, and because of its high speed became a sensation. It was abandoned when the king's daughter was seriously injured on it.

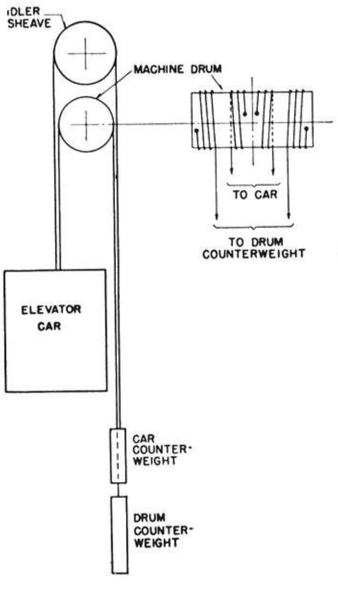
On the whole, up until this time, elevators were of the man power type. Many authorities point this out, and they also say that some hand powered elevators are still used in Europe today. This is interesting because we have a hand powered elevator on the University of Wisconsin campus in the Soils Building. It employs a system of counterweights and a flywheel to raise and lower a full sized elevator cage through four floors.

Following the man powered devices came the animal powered hoist. The first of this type was built in France in 1203, and it was run by a donkey in a large rotating cage-like wheel. In 1845, the first hydraulic crane was built in England. It was used to move stone out of a quarry. About 1860, the idea was brought to this country and became the basis for later high speed hydraulic elevator designs. Many high speed hydraulic elevators are still in use, but they have been largely supplemented in tall buildings by the gearless type of electric powered elevator introduced about 30 years ago. Hydraulic elevators require large and expensive power plants for each bank of elevators, and for that reason, their principal use today is confined to the low speed economical type such as those used in automobile service stations. Another type for slow speed, low lift application is the screw type with the shaft fashioned in the form of a screw and driven through a worm gear.

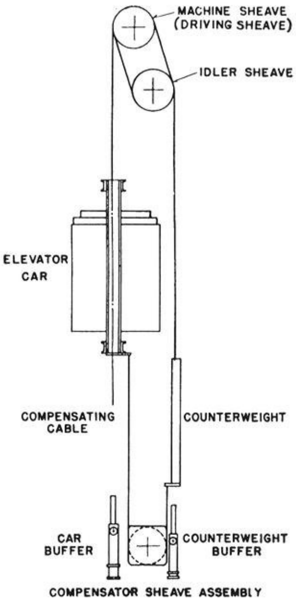
The Moore and Wyman Company of Boston built the first steam driven elevator in America in 1866. Upon completion, it was found that the engine did not have enough power to lift the car. However, the addition of a counterweight equal to the car weight overcame the difficulty. This experience led American manufacturers to the adoption of car counterweights as a standard practice.

In 1884, Wm. Baxter, Jr., built the first electric elevator in America. All of these early machines were belt driven and controlled by a hand rope in the car. The one exception to this belt driven arrangement (probably the first electric elevator) was a machine made in Germany in 1880. The electric motor and worm gear for driving the car were on top of the car and pinions from the worm gear meshed with vertical racks in the hoistway.

Since 1910 the traction drive has been used almost entirely as opposed to the drum type of drive. In a drum

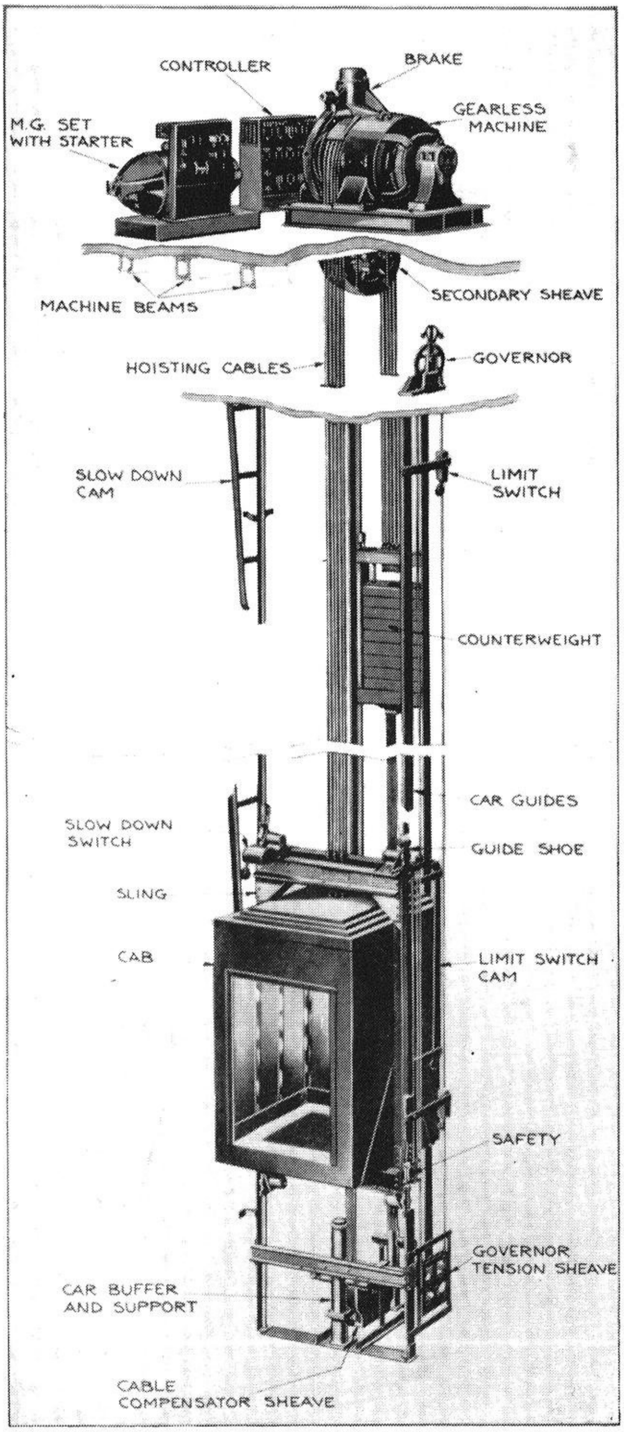


Drum Type System



Double Wrap Traction System

type drive the hoisting and counterweight cables are wound up like a thread on a spool, lifting the car when winding and lowering the car when unwinding. In the overhead traction drive, the hoist ropes pass from the car top to and over the driving machine sheave to the counterweight. Grooves in the drive sheave (one for each wire rope—usually 4 to 6 ropes in parallel) grip the ropes to give necessary traction and prevent slipping.



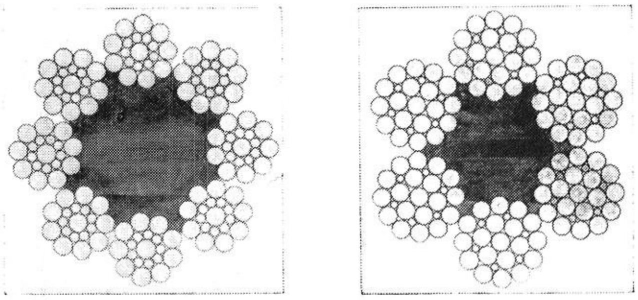
Typical Gearless Traction Passenger Elevator

If a sudden stop is made in the down direction, the drum machine cables cannot slip, and the passengers may be subject to injury. In a traction machine the cables will slip some, thus protecting the passangers. The inherent safety of the traction machine can be seen if the car should run through at either terminal landing. If a drum drive should fail to stop in the up direction, the hoist ropes might be pulled out of the top of the car when the car had travelled as far as it could go. With the traction machine, the counterweight would land on the bottom of the hoistway before the car could reach the top, thus relieving the tension on the hoist ropes and permitting the sheave to slip under the ropes thereby avoiding danger. When the car over travels in the down direction, with drum machines of certain designs, the drum counterweight may be pulled out of the rails and dropped down the hoistway—landing on top of the car. This has actually happened with disastrous results to the passengers.

The drum drive also requires that separate drums be provided for each different building height to accommodate the different lengths of hoist ropes. The traction drive requires but one size of sheave for all building heights because the ropes do not have to wind up on the sheave. For this reason, manufacturers are able to make standard traction machines for all building heights.

Hoist Ropes

The steel and iron hoisting ropes used today are very dependable and give excellent service, ranging from two to eight years depending upon the type of elevator and the service rendered. Steel ropes are generally used on traction machines; iron on drum machines, and for governor and compensation cables. Factors of safety for hoist ropes run from 8½ to 12. The hoisting ropes are usually subjected to a periodical inspection, and they are replaced when it appears they have lost 20 percent of their original strength.

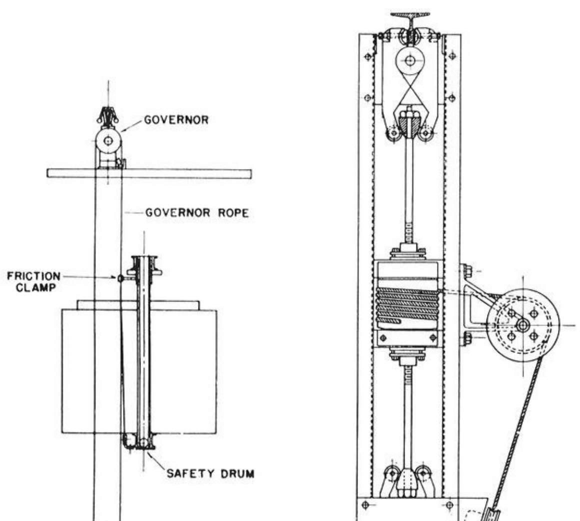


Traction steel hoist ropes consist of steel strands wound on a hemp center.

The compensation cable or chain device mentioned above is used for the following reason. As the car approaches the top floor, the effective weight of the ropes is transferred to the counterweight side with the result that the load on the motor is reduced by twice the weight of the ropes. This unbalancing of the load is corrected by the additional weight of the compensating cable which is fastened to the counterweight and passes through a tension sheave in the pit and then to the bottom of the car. Thus, as the weight of the hoisting cable is decreased, the weight of the compensating cable is increased. Another way to achieve the same result is to fasten one end of a chain to the bottom of the car and the other end to the center of the hoistway. When the car goes up, the weight of the chain will be added to the weight of the car.

Safety and Control

Eliza Graves Otis was the first elevator builder to recognize the seriousness of the lack of safety devices to protect the passengers against the danger resulting from a broken hoist rope. In 1853, he exhibited his rachet type safety. He would stand on the car platform and have the hoisting rope cut to demonstrate his safety device. It was a simple mechanism, pawls being held away from the teeth in the car guide rails by the tension of the hoisting rope. Parting of the hoist rope caused a spring to force the pawls into the teeth of the rails, thus stopping the car abruptly. Twenty-five years later, Charles R. Otis, a son of Eliza G. Otis, invented the car governor—the principal now used on all car safety devices. This device protected the car against over-speed in the up and down direction as well as against a broken hoist rope. With this system, the car governor cable normally moves up and down with the car, carrying no load other than its own weight and tension sheave. The cable is fastened to the top of the car and drives a governor in the machine room at the same speed as the car. If the car over-speeds excessively, a set of powerful jaws are clamped against the governor cable, thus stopping it. As the car proceeds in its initial direction, the governor cable is held still. This causes the rope on the safety drum to unwind and thereby apply the clamp to the rails. See figure below.



The left hand figure is an overall view of the elevator shaft and the wedge clamp safety device. The right hand picture is a detail view, as one looks up the elevator shaft, of the safety drum and clamps which are located on the bottom of the cab.

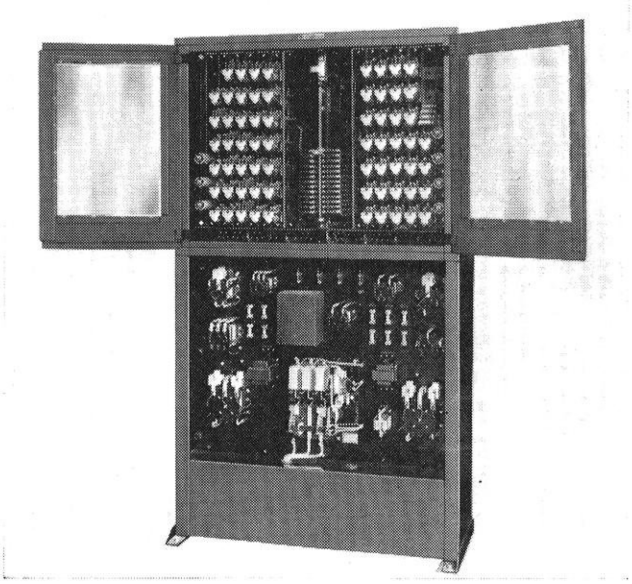
For protection against running into the pit at rated speed or at some speed under rated speed when out of control, buffers are used to stop the car when over-running in the down direction, and a counterweight buffer is used to give similar protection against an over-run in the up direction. The buffer consists simply of an oil compression chamber with a piston stroke varying in length with rated speed of car. For low speed elevators (under 200 f.p.m.) coil springs are used instead of buffers.

Automatic Control

The hydraulic and electric elevators of 1920 had reached a speed of 600 feet per minute (f.p.m.) and used a car lever or car switch to control the speed. Above 600 f.p.m. it became difficult to see floor numerals and to judge the correct distance of slow-down. Approximately 10 feet for slow-down or stopping distance is needed at 600 f.p.m. while a distance of 32 to 33 feet is required at 1000 f.p.m. Thus, the slow-down must be initiated about three floors away from the floor on which the car is to stop. A too rapid slow-down is unpleasant and overshooting the floor slows up the service. The limit for car switch control is 700 f.p.m.; above this it is imperative that automatic slow-down and leveling be employed.

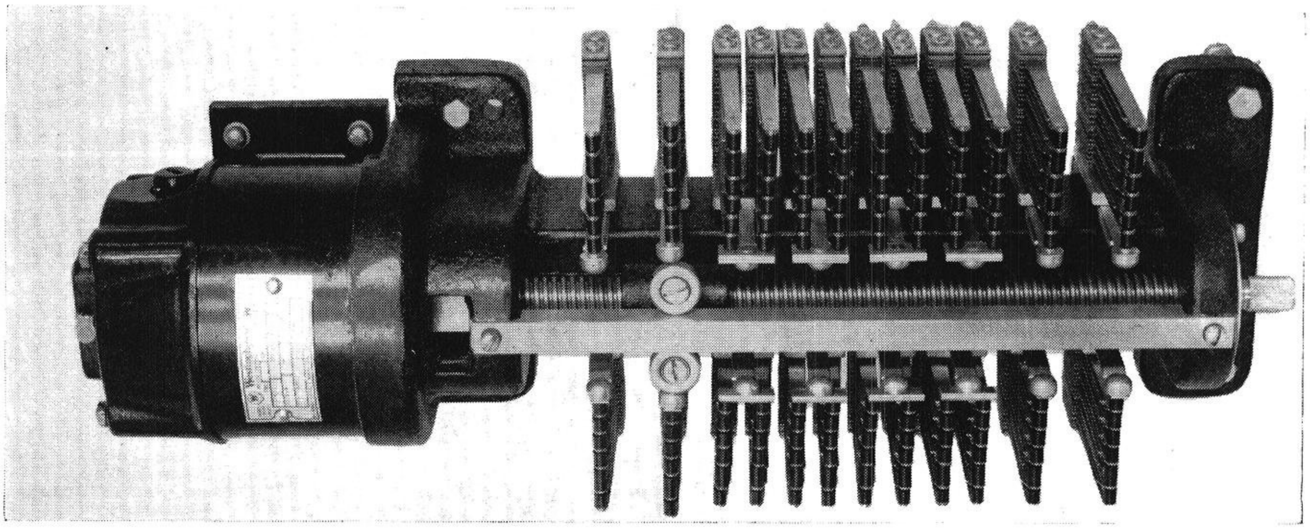
The natural type of motor for elevator use would be a D.C. motor with its inherent high torque and excellent speed control. The system of control invented by Ward Leonard made possible the modern method of automatic control of high speed gearless elevators. With this type of control, the car can be accelerated rapidly and smoothly and slowed down from a very high speed to a very low landing speed, regardless of the load in the car. Although this system was invented in 1892, and was used on mine hoists and rolling mill drives, it was not widely adopted to elevator use until 1924.

In 1924, automatic button control for high speed elevators was perfected. This method consists of stopping the car at the desired floor by pressing a button either in the car or in the hallway, and is known as the "signal control" because the buttons that were used to signal the operator to stop are the means actually used to stop the car. Where there is more than one elevator it is desirable that a signal



CONTROLLER FOR ELEVATOR

Upper cabinet contains the floor and auxiliary relays and floor selector while the lower one contains motor generator starting contactor.



FLOOR SELECTOR

There is a row of contacts for each floor, and the car position corresponds to the position of the rollers. When a corridor button is pressed, a floor relay responds, and the selector contacts are energized. When, because of car motion, the selector roller closes these contacts, the stopping mechanism on the car is energized and the car stops at the floor.

be given in the hallway to the waiting passenger indicating which elevator is going to stop.

The operation with this method of control is as follows:

(a) Pressing a hall button registers the call on the hall floor relay panel.

(b) The selector (one for each elevator in a bank) travels in synchronism and in advance of the car. It initiates the stop and cancels the registered hall call, at the same time permitting the selector of another car to pass by the same floor without stopping. The selector also advances the hall light and signal gong (if one is used) ahead of the car's arrival at the calling floor.

(c) The hall floor relay panel is connected to all selectors, thus permitting any selector of any car to answer and cancel the call of a waiting passenger.

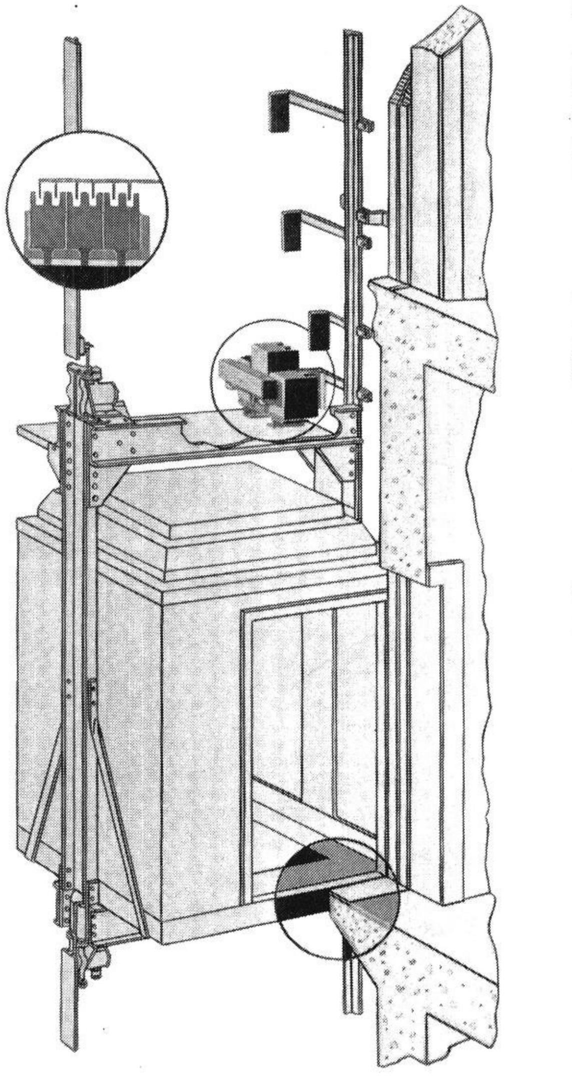
(d) Pressing a car button (in the elevator) registers the floor stop for the car directly on the selector—not on the hall floor relay panel. The stop remains registered after it has been answered and is not cancelled until the direction of car travel is reversed such as on upper and lower terminal landings.

(e) The car switch in each car is used by the operator to close the power operated doors of car and hall entrance, and the main controller starting circuit which cannot be closed until all car and hall doors are closed. Its function is to control the doors and start the car.

The inductor stopping mechanism is shown in the figure at the right. The iron plates in the shaft correspond to the floors. The floor selector contact energizes the coil in the iron plate. As the stopping inductor passes the eneregized plate, its own coil becomes energized, its armature moves and opens a contact which actuates the elevator controller to stop the car. If the car passes a stopping plate with the inductor coil denergized, no stopping action occurs.

Typical Modern Installations

The Field Building in Chicago, one of the largest and most modern buildings in the Chicago loop district, has the very best elevator service available today. It is the fourth largest office building in the United States and has



Inductor Stopping Mechanism Mounted on the Car.

(continued on page 24)

OUTSTANDING . . .

ENGINEERING ATHLETES

This month we present the senior engineers who have been active in athletics throughout their college careers. The following seven men have been standouts in their events since they were sophomores. All of them have won at least two major "W"s.

basketballer

Fred Rehm, senior chem, can be said to be the best known engineering student on the campus because of his athletic prowess and his many extracurricular activities. Fred has been an outstanding member of the varsity basketball team for the past three years, starting his brilliant play at the guard position when he was one of the N.C.A.A. championship winners in 1941. His back court work has been one of the factors in the team's success, although he has had to submerge his opportunities to be a high scoring man. His sophomore year here was the first time he had played the guard position, and it was his willingness to take advantage of this opportunity on the varsity team that meant so much to the team.

FRED REHM

When Fred attended Pulaski High School in Milwaukee, he was their star center for four years, and as a senior was all-city man in that spot, and the second highest scoring man in the conference. He was president of his class, salutatorian, and prom king in his junior year. He played soccer four years, and wrote "Sideline Slants" for the sport section of the school paper. An outstanding student on this campus, he has been elected to four honorary fraternities, Phi Eta Sigma, Pi Mu Epsilon, Phi Lambda Upsilon, and Phi Kappa Phi.

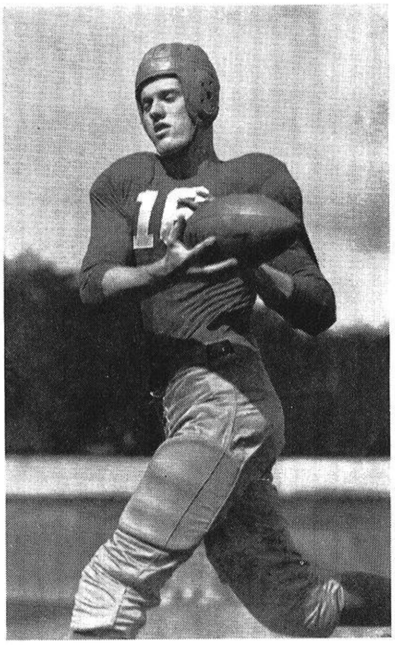
Fred has many other activities here aside from athletics. He has been president of his fraternity, Kappa Sigma, and is a member of the Student Athletic Board. He was Homecoming chairman last fall, and directed its related activities throughout the fall. He missed election to the senior class presidency by a narrow margin, and is at present a member of the senior council. For some time past a great deal of his time has been taken up by the pride of the Kappa Kappa Gamma house, Marty Parrish.

Fred has worked for the Wisconsin Electric Power Company on maintenance and construction for two summers, but last summer he attended the twelve week engineering session. He worked for a while at Truax Field as an insulation inspector. On graduation he will work in the B. F. Goodrich synthetic rubber program.

•

footballer

Eugene Patrick Lyons has been the mainstay at left end on the football team for the past three years. Although he is taking metallurgical engineering he has been able to devote quite a little time to football. During his sophomore and junior years he was first string end, captaining the Northwestern game during his junior year. Last fall it was doubtful that he would be able to find time to play but he managed to report after the season started and got in shape for the latter part of the gruelling ten game schedule.



PAT LYONS

At Horicon High School, redheaded Pat played football, basketball and ran hurdles in track. His stellar performance in the high hurdles enabled him to set the record in that event for the class "B" division of the State Track Meet in 1939. Athletics were not his only accomplishment, however, for he played the clarinet and was valedictorian of his class. Work and spring football practice have kept him from running the hurdles here at the University.

Mrs. Lyons, the former Jerry

King of Omaha, Neb., presented Pat with a red-headed baby boy on January 14. He was promptly named Timothy.

Pat has worked his entire way through school doing various odd jobs and working for his meals. The last two years he has been a helper in the foundry in the M.E. building. He has also been employed part time by the Madison Business Association and the Post Office. This past year he has been refereeing high school basketball games in nearby towns.

The last two summers Lyons spent working in the open hearths at Wisconsin Steel Company, South Chicago, as a sampler, lab assistant and a materials man who weighs up charges for the furnaces. He is interested in production work and expects to get into ferrous metallurgy after graduation next September.

•

sprinter

Dave Soergel, speed electrical engineer, has been the leading dash man on the track team for three years. At Washington High School, Milwaukee, he was city champion at 220 yards, and second in the 100. He garnered second place in both the 100 and 220 in the class "A" division of the State Track Meet in 1939. Back in high school he was vice president of the senior class, builder of public address systems, and the proud owner of a five meter short wave transmitter.

DAVE SOERGEL

At the University Dave stepped right into his studies and track work. During his freshman year he was initiated into Phi Eta Sigma and elected co-captain of the freshman track team. During his intercollegiate competition he has done best with the short dashes, having placed fourth in the 60 yard dash at the Big Ten Indoor Conference Meet last year.

Besides studying and running, he earned a good share of his expenses at school as a waiter at Elizabeth Waters. This semester he is teaching the Chem engineers their A-C theory and circuits in the Dynamo Lab. Dave has been elected to Eta Kappa Nu, Tau Beta Pi, and Phi Kappa Phi, honorary fraternities. He is a member of Alpha Tau Omega, social fraternity. His hobbies include tennis and portrait drawing. Soergel has spent two summers with the Cutler Hammer Company of Milwaukee; one summer on the test floor and the other in the engineering department. He enjoys a combination on research and development work and will be going with General Electric after graduation.

•

distance runner

Jerry Bauer, mechanical engineer, has been the leading distance runner among the engineers for several years. Three seasons of cross country and two of track have produced five letter awards for him. At the present he is earning his sixth in track. In his sophomore year the harriers captured the Big Ten title and went on to grab second place honors in the National Collegiate meet. Last fall Jerry captained the hill and dale runners. Of special mention during his sophomore track days was the pacing of Chuck Fenske to world's record in the thousand yards and the three-quarter mile.

Jerry graduated from Hartford, Wis., High School in 1935 and won the state class "B" mile that year. He enrolled at Marquette, but after one year in the pre-med school he dropped out to earn some money. After spending two years in a bakery shop he came to Wisconsin and took up mechanical engineering. Cross country claims his athletic interest in the fall, track in the winter and spring, and he relaxes with golf and tennis in the summer months. The mile and the half mile are his specialties in track. Jerry is a member of the Student Athletic Board and the Society of Automotive Engineers. As photography is his hobby, he has taken several courses in it.

JERRY BAUER

Several of his summers have been occupied with work for the National Canners' Association testing for vitamin C in tomato juice. Another summer was spent with Libby, McNeil and Libby doing lab control work and grading and sampling beets. Madison Kipp Corporation claimed his efforts last summer as an inspector of die castings. Bauer is enlisted in the Army Air Corps and will go on active duty when he graduates next June.

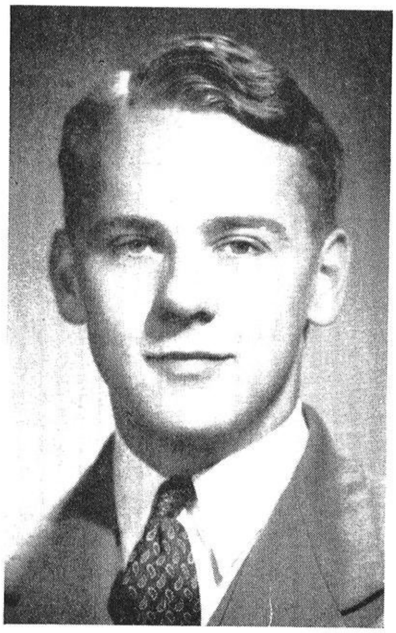
CREW

Three engineers, Jud Walstad, George Rea, and Jim Yonk, form a strong part of the Varsity Crew. They started out together as freshmen and have been competing for the past three years. At the present time the crew coach, Allen Walz, is in the service and it is doubtful if there will be a Varsity Crew this season. Besides, the transportation difficulties make it impossible to ship the shell anywhere for a race. There will be no Poughkeepsie this year. Their major race last spring was the Adams Cup Race of one and one-half miles at Boston in which five teams competed. They came in second to Harvard, which was undefeated last season.

•

JUD WALSTAD

Jud is one of the Chems who finds athletics an ideal campus activity. He has been crew coxswain and led our crew in the last Poughkeepsie Regatta in June, 1941. Jud hails from Bayfield, Wisconsin's northernmost city located on Lake Superior. In high school he was president of his class, sports editor of the school paper, a musician and a basketball player. During his summers he conducted a film developing business for the local drug stores. Living on the lake, Jud has a lively interest in water sports, including swimming, fishing and boating; he has an outboard runabout on Lake Superior. Skiing is his favorite winter sport.



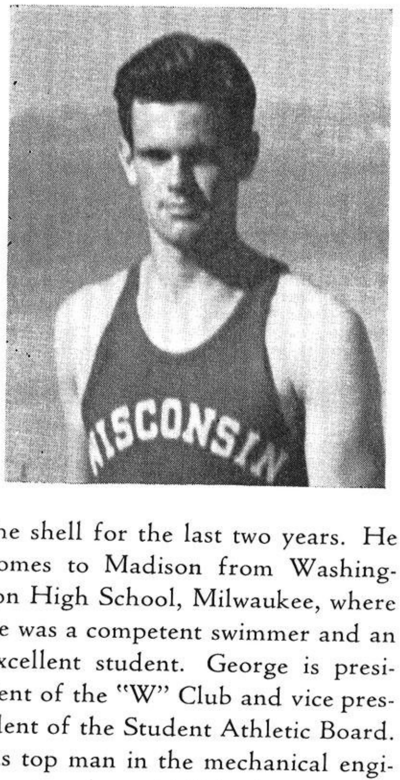
He is president of Conover house and is an officer of the Presbyterian Student Center. He also worked on orientation and is a member of the A.I.Ch.E. Jud earns a good share of his expenses as a waiter at Kronshage. Last summer he worked for Mason and Hanger at Merrimac as an engineer's aide and as a concrete inspector.

Jud expects to graduate in September and would like to enter either the metallurgical or petroleum industries. He hopes to get into production or application engineering and work toward an administrative job.

•

GEORGE REA

George Rea, mechanical engineer, has been holding down seat seven in the shell for the last two years. He comes to Madison from Washington High School, Milwaukee, where he was a competent swimmer and an excellent student. George is president of the "W" Club and vice president of the Student Athletic Board. As top man in the mechanical engineering class of '43 he has won numerous honors, becoming a member of Phi Eta Sigma, Pi Tau Sigma, Tau Beta Pi, and Phi Kappa Phi. Besides studying and rowing he found time to be pep rally chairman for Homecoming last fall. He is a member of Theta Delta Chi, social fraternity. This year he is a part time instructor in the Physics Lab and is doing his best to impress the wisdom of physics into the sophomore engineers.



Last summer he did production planning at the Falk Corporation, Milwaukee. He had to keep track of the orders and see that they went through the plant as scheduled. Design and research are the most intriguing fields to him. After graduation in June he will be a design engineer at Douglas Aircraft in California.

•

JIM YONK

Jim is a senior chem who has been an alternate on the crew for two years. He attended Wauwatosa high school where he was business manager of the school paper for three years, and was a star tennis player. His other activities included football, fencing, dramatics, and musical work. His sports interests have extended here also to his active participation in intramural athletics. Model building is another interest of his.

Jim is an Alpha Delta Phi and also is a member of four honorary fraternities. They are Phi Eta Sigma, Phi Lambda Upsilon, Tau Beta Pi, and Phi Kappa Phi. He is also a member of A.I.Ch.E. The past three summers he has spent at Socony-Vacuum in Milwaukee.

Jim expects to be a September grad, and would like to enter development work, particularly foreign service.

For This Only

by Harry Wolfe, e'26

This is an article written by a former Engineer editor. He asks, "Do we study engineering just for the money?"

FOR what purpose do we train ourselves to become engineers and for what purpose do we engage in our profession after we have received that training?

Twenty-five years ago in the grade school we were told of the advantages of continuing our education through high school. The superintendent of schools had a well prepared chart to show that those students who went on to high school would earn this much more money than those who only completed grade school. Somehow he failed to leave the impression that high schools have as their primary purpose the development of more useful citizens.

At high school there was a similar chart, somewhat bigger and better, to lead the way to college. But, again, the speaker placed so much weight on the greater income that the college graduate would enjoy that the point of developing abilities for public service was lost.

And in college there were even better charts for select groups to show that the members of such groups would earn still more than their fellow students. Somehow we missed the opportunity to learn that higher scholastic attainment was simply an indication of a greater responsibility to society.

Is Salary a Criterion of Progress?

It would be unfair to take the position that the teachers preached only the gospel of more pay because many of the teachers themselves were working examples of public service as contrasted with personal achievement. But the engineering college seemed to stress getting things done and the implications were that the progress of an individual would be measured by the size of his salary check. So we had much further to go in our schooling after receiving our engineering degree.

It was nice the first two or three years out of school to glance at the honor society's chart and see that our salary figure fell above the line. But gradually there came the realization that the measuring stick was lying. A better salary did not mean progress and even though the bank account and the insurance policies did increase in size the better salary did not mean security.

Because—back in 1928—long lines of men seeking employment indicated that there was no security of food and shelter for their families. So it began to be apparent that one individual or family cannot have security unless his neighbors and the nation have a similar security.

By then we had learned that plants and machines and investments were much less important than people and we were to learn that we could be most useful in helping plants and machines and capital to be servants of people rather than their masters. It was beginning to be clear that the engineer's job is to construct and operate industries, transportation, and utilities so that they will actually serve the people. And that the engineer's test of any action should be: Will it serve the best interests of all concerned—the workman, the investor, and the consumer?

Victims of a Technical World

A few years ago with food and homes needed for millions and many more millions without the modern facilities and conveniences that are—technically—so readily available, thousands of engineers were without jobs and many thousands more were working for less than an adequate salary. They were the victims of a society where plants and machines and capital are held to be more important than people, and of a society whose test of action is: Will it pay; what can I get out of it?

During this period the president of one of the large electrical manufacturing companies stated—at a Town Hall meeting in New York City—that his company had exhausted every possibility of caring for their employees but that, even so, and presumably with bleeding hearts, his company had been obliged to lay off ten thousand men. But at the same time he was bitterly opposing the feeble efforts of the government to care for these and many other thousands — all citizens of a government whose standard is "by the people, of the people, and for the people." Would not this man lead a happier life if he were serving the people instead of capital.

War Demand of Engineers

Today there is a great demand for engineers and a serious shortage exists. It takes a lot of technical skill nowadays to kill a man—or a child. Granted that our nation has drifted into a crisis where direct action must be taken, is not now the time to learn that this crisis is but one phase of a social order whose test is: Will it pay? Should an engineer be more ready and more willing to fight for his possessoins than for his personality. If he subscribes at all to the principles of the Carpenter of Nazareth it is not too difficult to see that happiness lies in constructive effort for the benefit of all people.

SPECTRAL ANALYSIS, *while you wait*

A Discussion of the "How" and "Why" of Modern Quantitative Spectrographic Analysis

by Doug Bainbridge, met'43

THE PHENOMENON of spectra has been recognized for nearly a century; however, the "whyfor," the "through which," and the "of what" still remain as dark a subject as light itself. Of course, it is true that numerous mathematical and physical assumptions have been developed which in many respects are correlated to experimental data, but ask the physicist to draw you a picture of a "quanta" or to describe the medium through which an electro-magnetic wave travels, and you have him stumped. Regardless of the answers to these questions, it is known that different specific degrees of light are emitted by an atom depending upon its energy condition, and this light constitutes a spectrum.

Kirchhoff and Bunsen, in 1860, were really the first to apply the fundamental principle of spectrum analysis. In the course of a study of the alkali metals, they observed spectral lines in some of their preparations which they could not associate with any of the known alkalis. Accordingly, they concluded that unidentified atoms were present, and an investigation was conducted to separate the suspected new elements. In 1861, caesium and rubidium, the fruits of their labor, were isolated.

A still more striking demonstration of the spectroscope's power came eight years later when Kirchhoff's explanation of the Fraunhofer lines served to prove the presence of numerous metals in the sun. Thus, the possibilities of spectrum analysis were brought to the attention of the scientific world.

Types of Spectra

Fundamentally, there are three types of spectra: continuous, bright line, and absorptive. In addition to this, there are the so-called band spectra which are, in effect, a series of groups of very fine bright lines so close together as often times to be indistinguishable, one from the other, except in a spectroscope of extremely high resolving power.

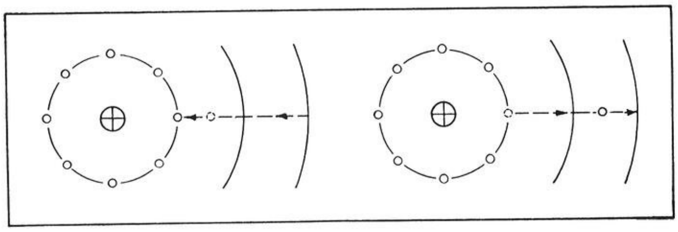


Fig. 1

(a) Emission (b) Absorption

This quantitative representation of the atom indicates the loss of energy in (a), emission, and the consumption of energy in (b), absorption.

Continuous spectra are formed by the light of a self-luminous body. In general, these spectra are considered to originate from a white-hot solid and consequently constitute a band of color extending from the extreme violet to the extreme red. All solids and liquids when heated to incandescence give off this same spectrum so that there are no characteristics available to identify the source.

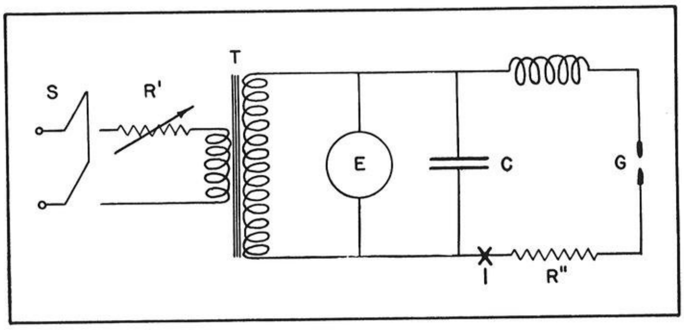


Fig. 2

Circuit diagram of a condensed spark source which will excite atoms sufficiently to yield line emission spectra. The diagram includes S, line switch; R', adjustable primary resistor; T, high voltage transformer; E, electrostatic voltmeter; C, condenser; I, synchronous interrupter; R", damping resistor; L, industance; G, spark gap with electrodes made of sample.

On the other hand, a luminous gas or vapor emits only certain frequencies of light depending upon energy conditions of the atom. According to Bohr's theory, the central nucleus of an atom is surrounded by electrons moving in orbits of different size. In any given case, only certain orbits are possible and each corresponds to a definite atomic energy. Hence, the orbits represent definite energy levels.

Should an electron now "jump" from an outer to an inner orbit (a higher to a lower energy state), energy in the form of an electromagnetic wave of a definite frequency would be emitted. Furthermore, this frequency is directly dependent upon the difference in energy levels across which this electron "jumps." According to this theory, it is now easy to understand why each atom emits particular wave lengths of light according to its characteristic grouping of orbital electrons.

The quantum hypothesis goes one step further and assumes that radiated energy consists of parcels of energy or quanta. These quanta are in turn proportional to the frequency. This indicates that quanta are of different sizes, the large energies being emitted at higher frquencies.

The band spectrum, as noted previously, appears to be a series of simple bright line spectra and apparently is characteristic of molecular structures. Simple atoms, as we know them, do not exhibit this banding effect.

A dark line spectrum results when particular wavelengths are removed from a continuous spectrum. The Fraunhofer lines, for example, are the absence of certain frequencies of light absorbed by the gases surrounding the incandescent sun. Returning to Bohr's theory, this absorption of energy would appear to be the result of electrons being knocked from their normal orbits to higher energy levels. Thus, the frequency of light corresponding to this difference in energy will be absorbed and appear as a dark line upon resolution of the beam. Since electron "hops" involve identical quantitative energy changes for a given atom, the line frequencies for both dark and bright line spectra would apparently be the same. The exceptions to this general rule involve the differences in excitation which affect the sequence of line group appearance.

Quantitative Analysis

When an element is present in a matrix or body of other materials in small and decreasing amounts, its spectral lines grow gradually weaker and disappear in a definite order. The entire field of quantitative spectral analysis rests upon this fact. However, the quantities of a given element which can be determined are necessarily limited to a range somewhere between 0.000001 per cent and 10 per cent. The upper limit is set chiefly by the difficulty of finding suitable analysis lines that do not reach a saturation in intensity at these higher concentrations.

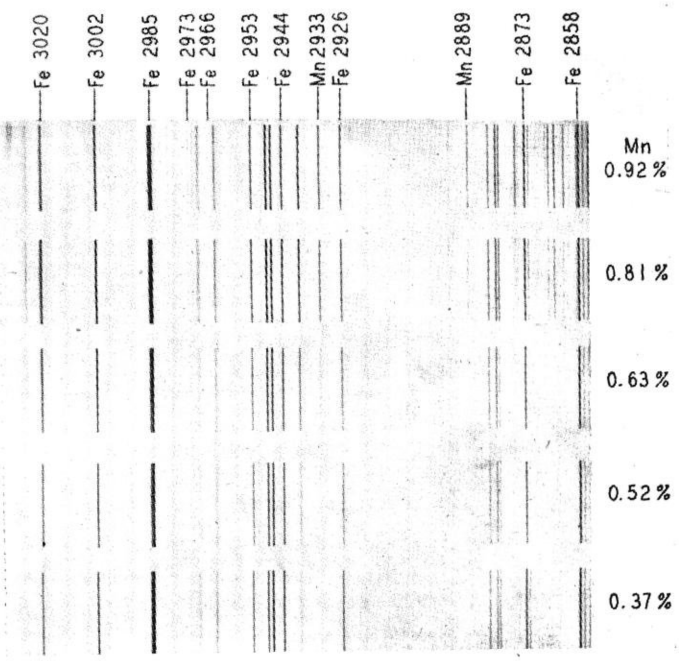
Prior to any operation, it is necessary to decide upon the excitation to be used. Naturally, some method must be employed which can be duplicated time and time again to assure consistent results. Both the electric arc and the electric spark offer possibilities. The electric arc is, of all sources, the simplest in construction and operation. In essence it requires only a connection to the direct source of potential, a regulating resistance, and an arc stand to hold the samples. It does, however, yield an objectional background and proves to be somewhat erratic as concerns reproducibility. These disadvantages have been minimized by Gerlich, Pfeilsticker, and others who used variously developed interrupted arcs on A.C. lines.

The simple condensed spark circuit has been frequently used in analysis and, as in the case of the arc, has been modified considerably. Vincent and Sawyer, for instance, succeeded in evenly damping the trains of discharges so that each spark was quite regular. This circuit is shown in figure 2. The synchronous rotary gap, I, permits sparking only at the peak voltage, and damping is effected by the resistance, R″, together with an air blast on the electrodes.

Various methods of subjecting the material in question to excitation by either spark or arc methods have been developed by numerous experimenters. Carbon electrodes with small pockets are sometimes used and the material is inserted in powder form with some cohesive substance. Solutions of the unknown may likewise be used to saturate the hot ends of the carbon rods, or, if the material be a conductor, electrodes may be cast and sparked directly.

Assuming that we have our sample satisfactorily emitting light, let us see what happens to this beam as it passes through a typical prism spectrograph. A slit is first provided to permit but a thin ribbon of light to pass through the spectrograph. This beam is then focussed on the face of a prism by means of the collimator lens and is subsequently resolved by one or more prisms of several possible shapes. Quartz or glass prisms are most common, the former being superior for shorter wavelengths. The spectrum thus formed passes through another lens which focusses the image on a camera.

Diffraction gratings have also been used to a limited degree in quantitative work. Scientifically they offer many advantages over the prism spectrographs, such as the possibility for great and practically constant resolving power for the entire grating spectrum. Concave diffraction gratings may also be made self focussing with subsequent freedom from all absorbing material. However, certain practical limitations have kept the diffraction grating from being readily accepted by industry. The gratings are very delicate and would be difficult to replace in the case of an emergency. Furthermore, there is some danger of spurious images although this trouble has been practically eliminated.



courtesy Metals and Alloys

Fig. 3

Spectrogram series of iron samples containing various quantities of manganese. Note the variation in density of the unsaturated manganese lines while the densities of the saturated iron lines are constant.

Regardless of which instrument is used, a photograph of the spectrum may be obtained with the desired lines sufficiently separated to permit distinct intensity measurements. The photographic material used for recording the spectrum should have high contrast, to give good concentrated sensitivity, and small grain size, to reduce intensity measurement errors. Uniform sensitivity and contrast over a wide spectral range is also necessary to permit subsequent density interpretations. The plate processing technique in any laboratory must also be carefully developed to assure consistent results.

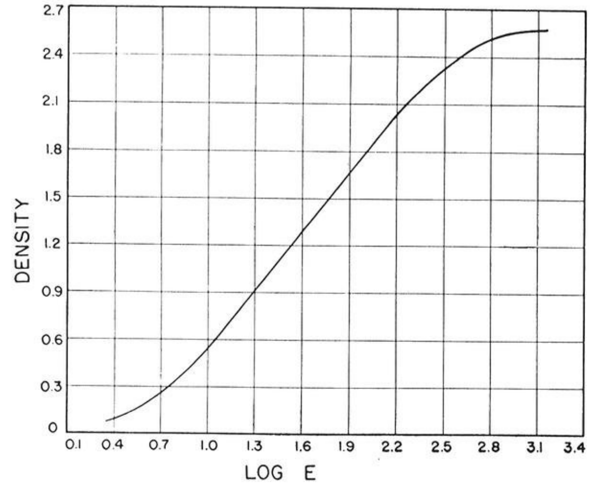


Fig. 4

Characteristic curve of a photographic plate showing proportionate increase of density with the log of the exposure while in the limits of proper exposure.

Quantitative analysis is now accomplished by measuring the ratio of intensities of a line of the analysis element and of a reference element. The content is then interpolated from a plot of this ratio against the concentration of the element to be determined. The reference line is chosen from an element that is either added as an internal standard or else is chosen from one of the saturated lines of the matrix. In either case, it should approximate the intensity of the unknown's line, it should be sufficiently close in wavelength to minimize variations in plate characteristics yet not be so close as to cause interference, and should have as similar an excitation function as possible. The density of such a reference line will always be proportional to the log of the exposure (within photographic limits) according to the particular plate characteristic (see Fig. 4). The analysis element line, however, is chosen so that its intensity will vary as its concentration. Thus, if density determinations C and D are measured on a photometer for the line pair, their log ratio can be immediately obtained by the difference of logs A and B. This intensity ratio is directly proportional to the concentration so that the quantity of the element present may be obtained from a predetermined relation such as indicated for manganese in iron, Fig. 5.

The density readings C and D are taken from the photographic plate by means of a photometer. This instrument employs a constant source of light which is passed through a slit about 3 to 5 mm. in length and 25 to 50 microns wide. This ribbon of light in turn passes through the spectrum line and is partially absorbed. The remainder of the beam serves to excite a photoelectric tube. The energy thus delivered to the tube is proportional to the density of the photograph and may be interpreted by means of a galvanometer.

Reliability of Spectrographic Analysis

The accuracy and reliability of spectrographic analysis is naturally open to discussion since it is of fundamental importance in industrial control. The University of Michigan has undertaken considerable research along these lines with significant results.

Silicon, being a metalloid and offering more trouble than common metals, was chosen to develop the limitations of the process. Reproducibility was first determined by having a series of operators run tests of a single sample on different days. From the theory of probability, it was found that the mean error of a single one of these determinations was 1.18 per cent of the amount present. The chance for there being an error of 5 per cent was one in a 1,000.

Other investigators have likewise obtained mean errors of less than two per cent for a variety of elements in quantities up to ten per cent. In short, it appears that a very handy tool for both science and industry has been developed.

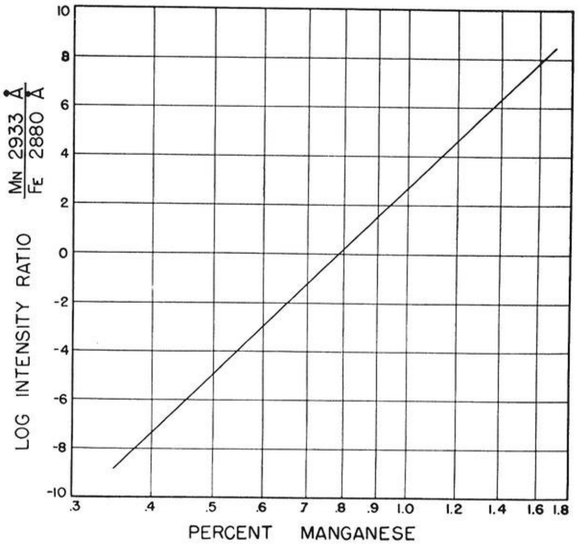


Fig. 5

Analytical curve for the determination of manganese in iron showing the relation between the log of the ratio of the intensity of the manganese line, 2933 A., to that of the iron line, 2880 A.

Spectroscopy in Industry

Several advantages of the spectrograph readily present themselves in the application of spectrum analysis to industry. Rapid determinations are possible together with considerable accuracy as previously discussed. The expense involved in operation is low since one man per shift can handle an exceptionally large number of analyses in a day. Photographic expenses are also slight and the depreciation of equipment negligible. However, the initial expenditure for equipment is fairly high and may prove to be a limitation of the spectrograph's application to small scale projects.

In foundry practice it is found that numerous factors contribute to the properties of castings. Of these, chemical composition is of prime importance since improvements in any of the other details cannot correct a faulty mixture. Today, the tolerance on this proportioning of elements has been narrowed to such a degree that precise analytical control must be had. Furthermore, these quantitative determinations must be available concurrently with a given melt; else not control, but merely inspection, would be accomplished as would be true were standard chemical analyses applied.

The modern spectrographic laboratory offered a possible solution to the above problems and was put to use by the Cambell, Wyant, and Cannon Foundry Company of Muskegon, Michigan. The rapid, economical, and accurate determinations thus made available to industry have since proved the spectrograph to be thoroughly worthwhile. Numerous installations, including an outstanding laboratory for the Ford Motor Company, have been developed throughout the country, and it would seem that the foundry has taken an important step in its application of science.

In the Ford foundry, test specimens are poured from each furnace and cupola at least once an hour. These specimens are small pins that cool rapidly, thus saving time and eliminating segregation. By means of pneumatic tubes the samples are then delivered to the spectrographic laboratory where their ends are ground to conical points. They are immediately inserted into the sparking apparatus and are charged with 40,000 volts for less than one minute. Since time is such an important factor, it is seldom that more than six spectra are recorded on a plate. Spectra from samples where speed is the least important factor are arranged to come first on the plate, leaving the latter spaces for special rush analyses.

The exposed photographic plate is then processed and dried with special equipment and the finished negative is turned out in four minutes' time. Examination then follows in the Ford foundry by comparison of the unknown elements to reference iron lines with the microphotometer.

courtesy of Metal Progress

Fig. 6

A modern installation of a microphotometer used to measure line intensities of spectrograms.

A specially constructed slide rule and chart serve to convert microphotometer readings directly into percentages so that determinations may be recorded in ninety seconds for five elements within the following limits:

Chromium	0.01	1.50%
Copper	0.10	4.00%
Manganese	0.15	1.50%
Nickel	0.05	2.00%
Silicon	0.10	4.00%

In actual practice, a rush sample may be sent through the laboratory in about six minutes. Samples handled in groups seldom fail to be reported in twenty minutes' time.

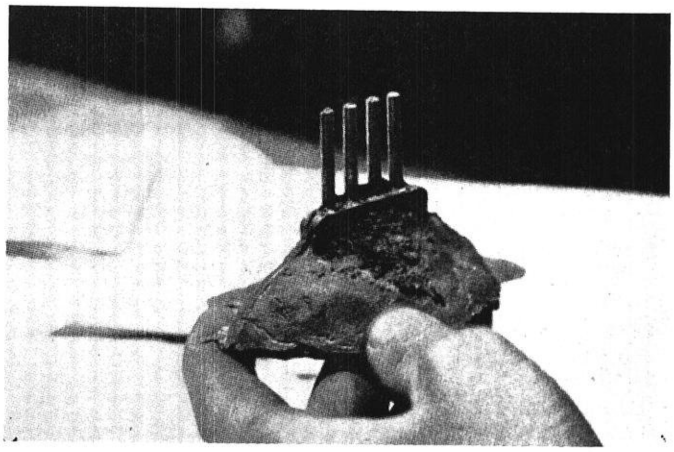


Fig. 7

courtesy of Metal Progress

Electrode specimens cast in the foundry for sparking and subsequent quantitative spectrographic analysis.

The open-hearth furnaces at Weirton have also proven the spectrograph to be an asset to their operations. Prior to the installation of a spectrograph, copper preliminaries were taken three to five hours before tapping time. This time meant that the composition of the tapped heat might change considerably from the original analysis and occasionally require diverting of a heat into an order for which it was not scheduled. Today, the spectrograph insures control in this plant with complete analyses for copper, tin, and chromium within twenty-five to thirty minutes of the sampling time.

As in the foundry and open-hearth, the application of the spectrograph might similarly be extended to Bessemer practice and the blast furnace industry. Miscellaneous applications, such as rapid analysis of molten metals in ladle cars to save heat pending determination of the metal's determination, are likewise to be expected.

It is true that the spectrograph has sprung into its own; however, this is but the commencement of many rapid developments. Astounding advances in both the science and in its industrial applications may well be expected in the not too distant future.

BIBLIOGRAPHY

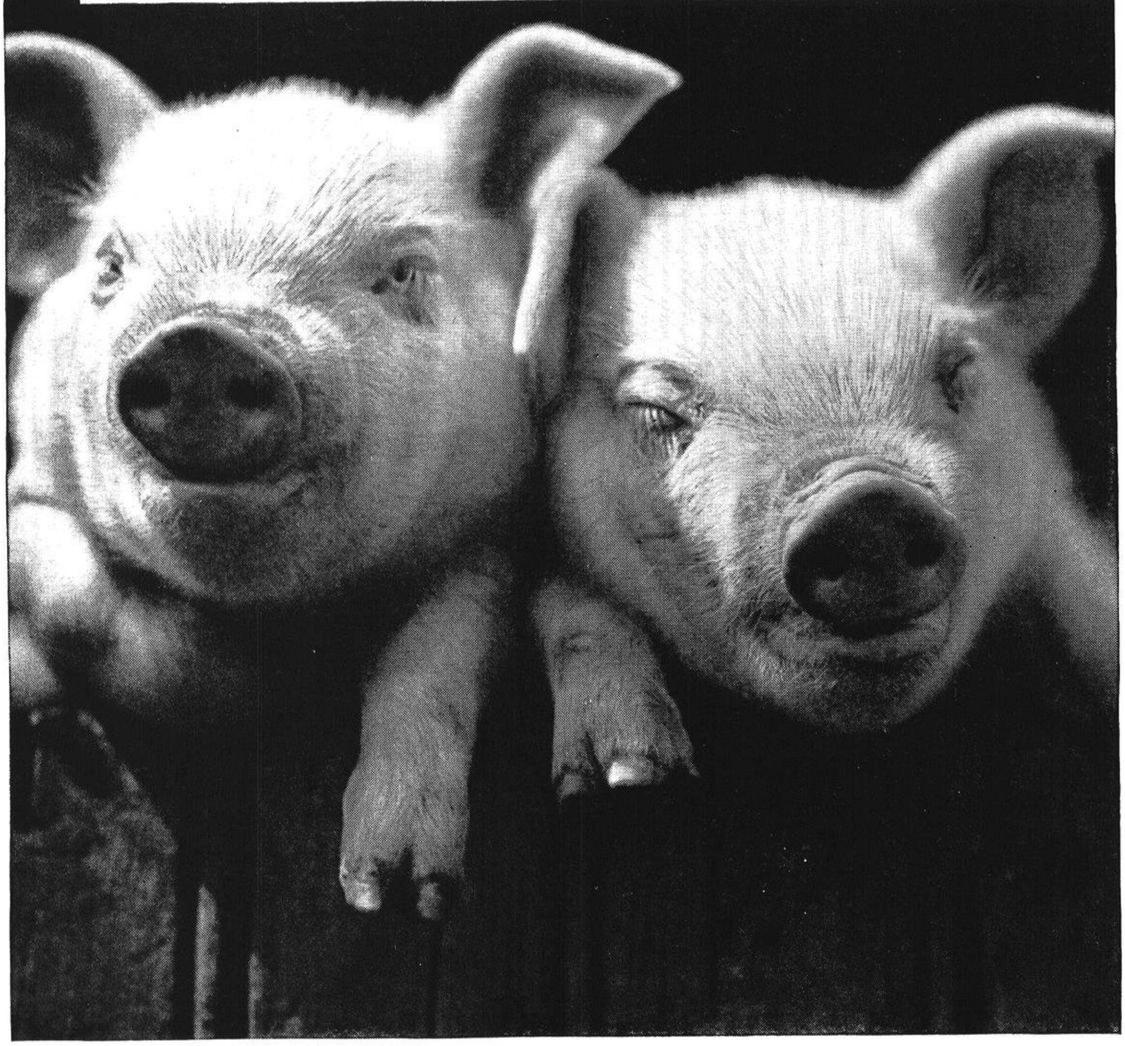
R. A. Sawyer, "Qualitative and Quantitative Chemical Analysis by Line Emission Spectra", Journal of Applied Physics, V. 10, No. 11, Nov. 1939.

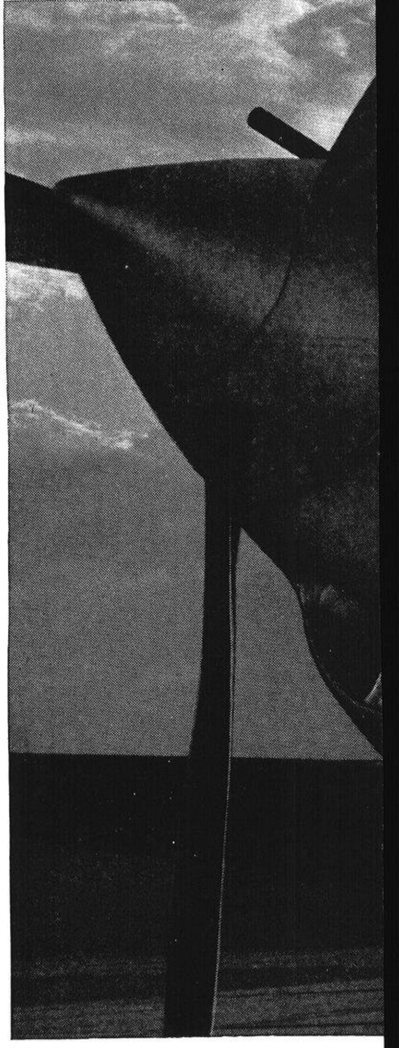
W. F. Meggers, "Spectroscopic Apparatus", ibid.

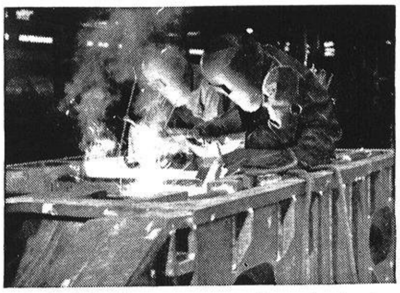
H. B. Vincent, "The Spectrograph in The Iron Foundry", Metals and Alloys, V. 9, No. 2, Feb. 1938.

J. T. Mireless Malpica, "Quantitative Spectrographic Analysis; Parts I and II", General Electric Review, Vol. 43, July and August 1940.

Fatter Porkers...Faste







A-C Welders now work exclusively on machinery for the war effort.

Allis-Chalmers farm and milling equipment helps produce corn for U.S. porkers and steers . . . wheat for 8 of every 10 bread loaves produced in the U. S. A.

Allis-Chalmers *industrial* equipment (more than 1,600 different capital goods products) works in every war industry . . . helps produce planes, tanks, ships, guns at a rate which must make Hitler shiver!

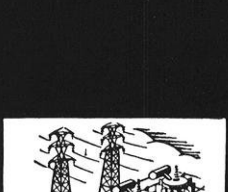
And Allis-Chalmers engineers—cooperating with plant engineers in every part of the country—are helping manufacturers *duce more*—not just with new machines, *with machines now on hand!*

Every Allis-Chalmers man and wor is working *all out* for Victory. Our one right now is winning this war. But from war work we are gaining rich product experience which will be invaluable to Nation when the war is over. We'll ready to help build a better peace!

Allis-Chalmers Mfg. Co., Milwaukee, W

ALLIS-CH

OFFERS EVERY MANUFACTURER EQUIPMENT AND ENGINEERING



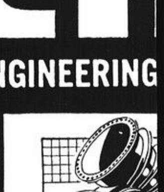
ELECTRICAL EQUIPMENT

STEAM AND HYDRAULIC TURBINES

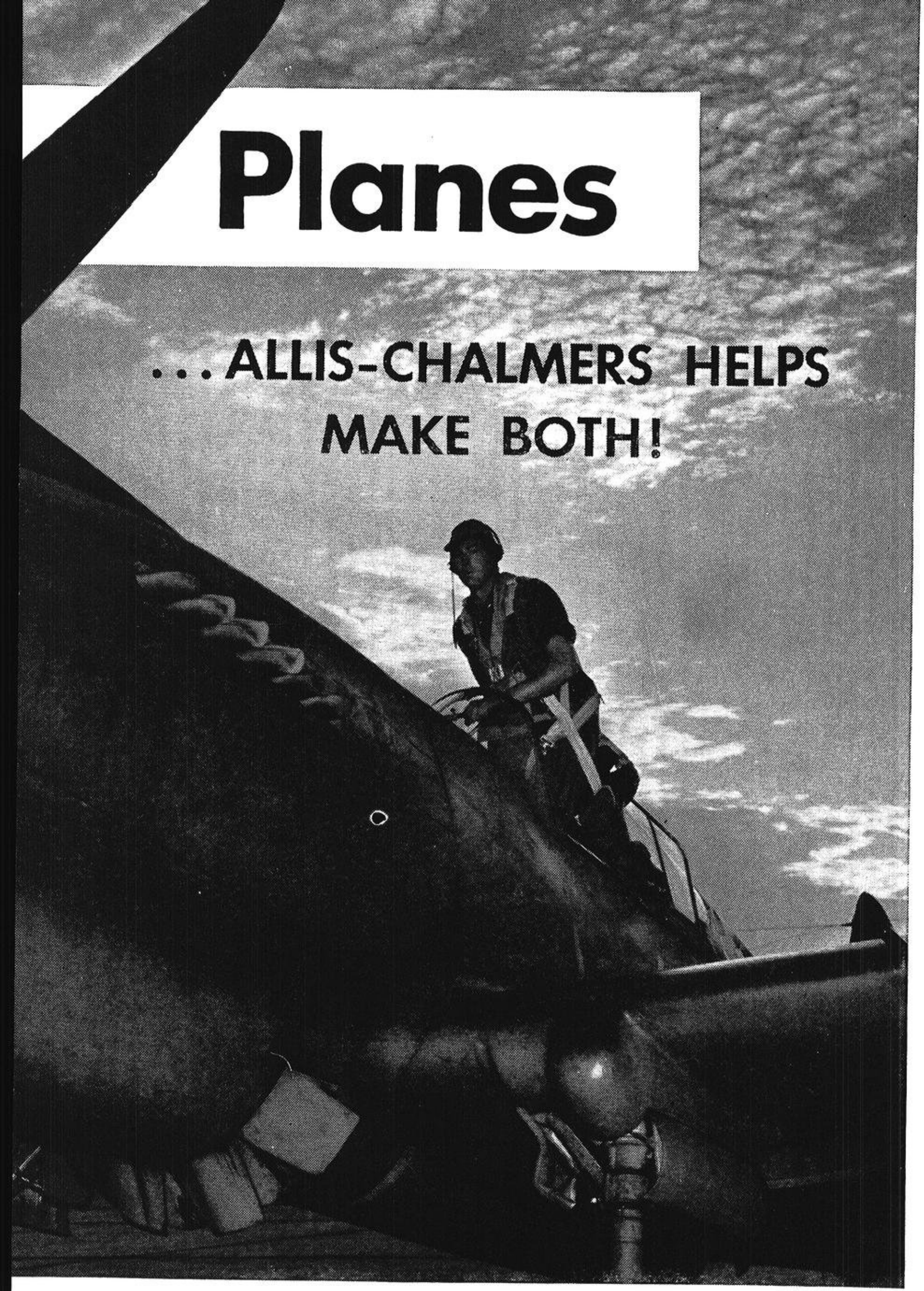
MOTORS & TEXROPE V-BELT DRIVES

BLOWERS AND COMPRESSORS

ENGINES AND CONDENSERS



CENTRIFUGA PUMPS



Planes

...ALLIS-CHALMERS HELPS MAKE BOTH!

s-Chalmers makes the greatest variety apital goods products in the world.

Rubber boats, tires, balloons are made with the aid of Allis-Chalmers equipment.

VICTORY NEWS

Inland Shipyards: Hundreds of A-C pumps, motors and V-belt drives are at work along the Great Lakes helping in the greatest shipbuilding activity this region has ever known.

Ore carriers, tankers, cargo vessels—even submarines—are being built here.

Tremendous expansion of facilities was required to meet the goals set—and equipment for the yards, as well as for the ships, has left A-C plants in great quantities.

YOU'LL WANT THIS HANDBOOK

Plain Facts on Wartime Care of Rubber V-Belts

APPLIES TO ALL MAKES OF V-BELTS

CONTAINS NO ADVERTISING

FREE!
Contains No Advertising

New 16-Page Book applies to all makes of V-belts—tells how to conserve rubber through correct V-belt maintenance: how to measure proper tension; what determines "life expectancy"; what to do about worn sheaves; much other useful information. Liberally illustrated. Ideal for training new men. Write for your free copy.

New A-C War Plants: Two big new Allis-Chalmers war plants are now in operation "somewhere in the USA"...the second in a record 90 days after the ground was broken.

To save time and critical materials, wood construction was adopted for the newest plant. Practically the only metal used was in caps for the ends of trusses and columns. These were cast in A-C foundries to save time.

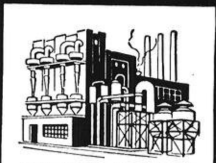
FOR VICTORY
Buy United States War Bonds

LMERS

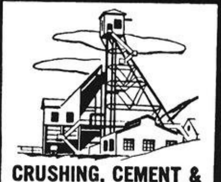
WE WORK FOR VICTORY
WE PLAN FOR PEACE

RATION TO HELP INCREASE PRODUCTION IN THESE FIELDS...

OUR AND SAW
LL EQUIPMENT



CHEMICAL PROCESS
EQUIPMENT



CRUSHING, CEMENT &
MINING MACHINERY

BOILER FEED
WATER SERVICE

POWER FARMING
MACHINERY

INDUSTRIAL TRACTORS
& ROAD MACHINERY

New Executives

On January 25 the Board of Directors of the Wisconsin Engineering Journalism Association chose the following junior engineers to direct the policies and fortunes of the magazine for the next two semesters.

DON NILES

Don Niles, mechanical engineer from Hartland, Wis., is the new editor. Don earned his spurs as Campus Notes editor and as a feature writer during his sophomore days, and as an assistant editor last semester. He also was staff photographer. Being an editor is nothing new for Don because he edited both his high school paper and the annual.

He enjoys all winter sports, especially skiing; last winter he was active in the Ski Troops on Lake Mendota. His other hobbies are model airplanes and kodachrome photography, besides composing and working crossword puzzles. The puzzle appearing elsewhere in this issue is a product of his handiwork.

Niles has the honor of being the first married man to edit the magazine in a good number of years. He was married to Loella Frederick, journalism student from Hartland, during the last Christmas vacation. Lou insists she is the power behind the throne, and that Don is only a competent dish dryer.

Last semester he was a part time drawing instructor, teaching the freshmen their fundamentals of drafting before they were drafted. In spite of his many hobbies and work on the magazine, he attained excellent grades and is a member of Phi Eta Sigma and Pi Tau Sigma, honorary fraternities.

•

BILL JACOBSON

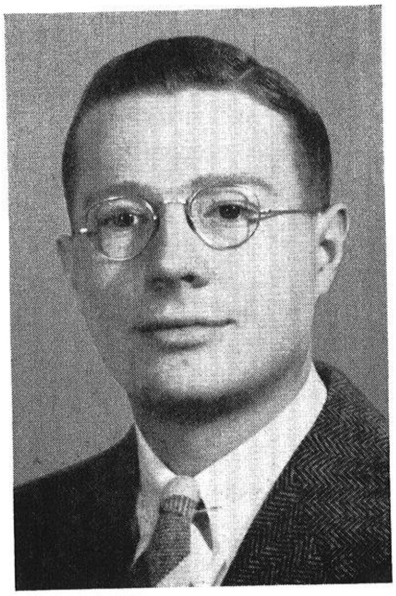
Bill Jacobson, chem engineer, has been promoted from assistant editor to associate editor. Bill has been active on the staff for the past year as a feature writer and interviewer. A product of Genoa City, Wis. (thriving metropolis of 700 staunch citizens adjacent to the Illinois border), he was very active in high school. He was business manager of the school paper, a basketball player, president of the senior class and valedictorian.

At the University Bill has engaged in numerous activities. He has been in charge of publicity for the A.I.Ch.E. for the past semester and was recently elected as their representative to Polygon Board. An excellent student, Bill achieved sophomore high honors and membership in Phi Eta Sigma, Pi Mu Epsilon, and Phi Lambda Upsilon, honorary fraternities. Jacobson has held several offices in Theta Chi, social fraternity. Other campus activities include Hoofers' Club and the Y.M.C.A. discussion groups.

•

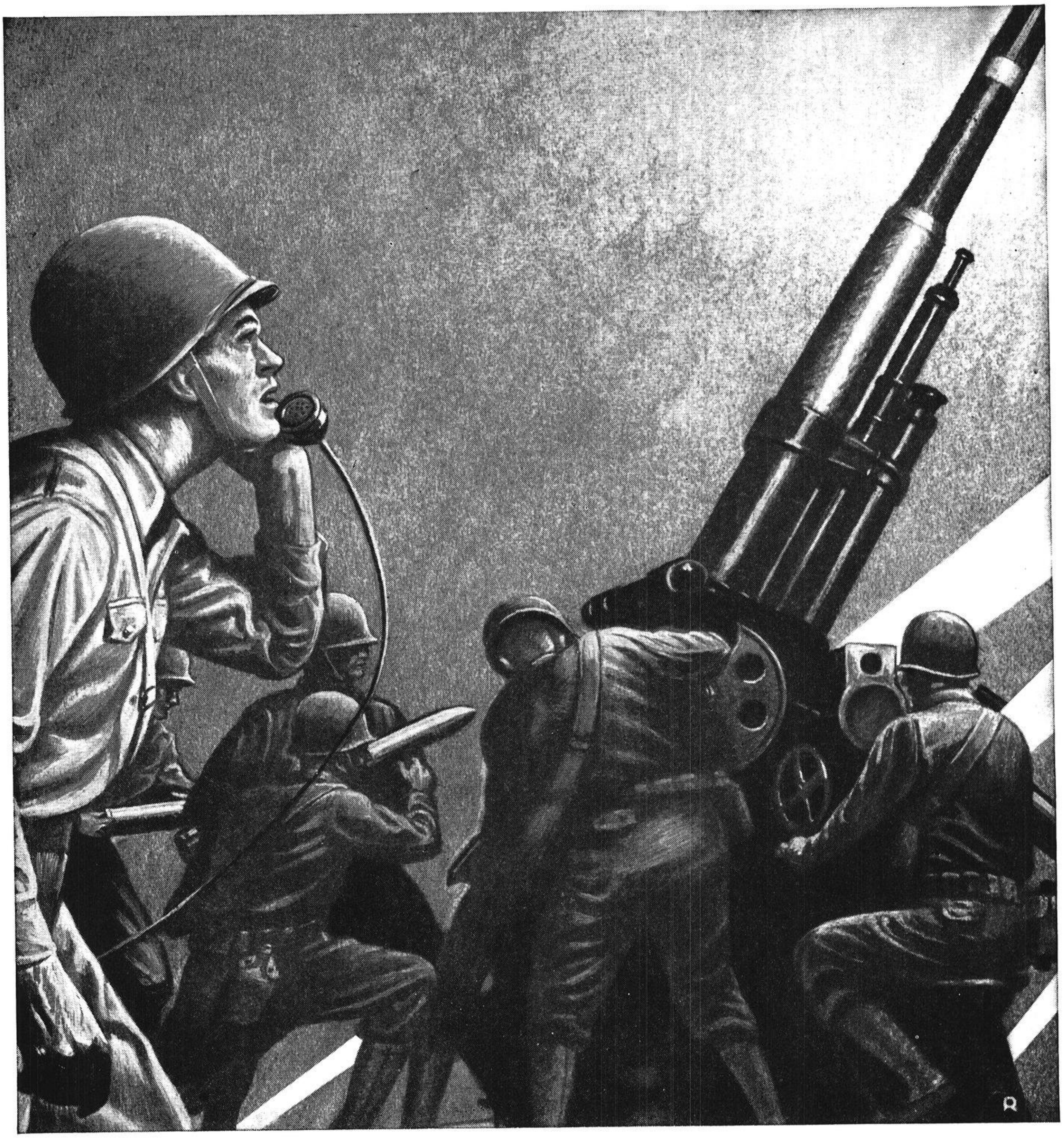
JOHN CALDWELL

John Caldwell, chem engineer from Columbus, Wis., has shouldered the financial worries of the business manager. He has worked on alumni circulation and subscriptions the last year and a half. John is proud of being a full blooded Scotchman and believes it gives him an inside track on financial matters. He is business manager of Chamberlin House, and was a member of their championship bowling team last year. An ardent collector of U. S. stamps, he has not been discouraged by the general postmaster's constant flood of new and special stamps. John enjoys both classical and swing music, playing the French horn in the University band.



Back in high school he played in the band and orchestra, was editor of the year book, an enthusiastic debater, and salutatorian of his class.

At the University he has hit the books, earning sophomore honors and election to Phi Eta Sigma, Pi Mu Epsilon, and Phi Lambda Upsilon, honorary fraternites. He is active in the A.I.Ch.E.


R

JANUARY '43 GRADS

. . . *on the Job*

Chemicals

CUTLER, JOHN M., has accepted a position with the Alumni Company of America, at Alcoa, Tenn.

HOEKSTRA, IRENUS A., is to be employed by the City Board of Health at Madison.

LANGE, MILTON R., is going into U. S. Civil Service.

LEVANDOSKI, EUGENE J., at present is in the Naval Reserve, and is awaiting call to active service.

OLSON, ROY C., is going into U. S. Civil Service.

SCHULTZ, JOSEPH F., is going to South Charleston, West Virginia, where he is employed by Carbide and Carbon Chemicals Corp.

SPIEGEL, WALTER H., is with the Lockheed Aviation Corp. at Burbank, California.

TIMM, GEORGE J. E., is also employed by Carbide and Carbon Chemicals Corp. at South Charleston, West Virginia.

•

Electricals

ARNESON, DONALD A., no report.

BAGUHN, ALFRED, is with the Allis-Chalmers Manufacturing Co. at Milwaukee.

BELLARD, MAX H., no report.

CHRISTENSON, DONALD L., is a design engineer for RCA at Camden, New Jersey.

DIEHL, ROBERT T., is in the U. S. Army Signal Corps.

GOODMAN, LOUIS A., is employed as an electrical engineer at the Hawthorne Station of the Western Electric Co. at Chicago.

HEISIG, GARTH, has gone to the M. I. T. Radiation Laboratory at Cambridge, Massachusetts.

KELAR, JOS., is in the Cathode Ray Development Laboratory of the RCA Mfg. Company at Harrison, New Jersey.

KNOPOW, HOWARD S., is a student engineer for General Electric Co. at Schenectady, New York.

KOVACS, FOREST, is a test engineer for General Electric Co. at Schenectady.

LOWER, J. W., is a development engineer for the Zenith Radio Corporation at Chicago.

MALONEY, HAMES E., is a student engineer for Westinghouse Electric and Manufacturing Co. at East Pittsburgh, Pennsylvania.

McINTYRE, RICHARD J., is a test engineer for General Electric Co. at Fort Wayne, Indiana.

MELLMAN, ELLIOT A., no report.

OLSON, VERLAND A., is at the M. I. T. Radiation Laboratory at Cambridge, Massachusetts.

REEK, DONALD C., is a test engineer for General Electric Co. at Schenectady, New York.

SAMZ, CHARLES L., is in the U. S. Army Signal Corps.

WALL, JAMES, is a test engineer for General Electric Co. at Schenectady, New York.

•

Mechanicals

BELGEN, MILO, is a junior engineer at the Cincinnati, Ohio, plant of the Curtiss-Wright Aeronautical Corp.

BERGSTROM, CARL V., has applied for a commission in the Naval Corps of Engineers.

BOUDA, FRANCIS J., is a junior engineer for RCA at Camden, New Jersey.

DROTT, EDWARD, is a research engineer at the Anacostia Station Naval Research Laboratory at Washington, D. C.

DUNDORE, MARVIN, is a Second Lieutenant in the U. S. Army.

ELLIOT, J. R., no report.

FINK, ROBERT W., is with Allis-Chalmers Mfg. Co. at West Allis, Wisconsin. At present he is enrolled in the Engineer-Graduate Training Course.

FISHER, HAROLD W., is a testing engineer for General Electric Co. at Schenectady, New York.

FOX, ORVILLE C., Ensign, U. S. Navy.

GILMORE, WARREN L., is a junior engineer for the Curtiss Wright Corp. at Paterson, New Jersey.

GODFREY, RONALD, is in the Naval Reserve.

HOLLER, HAROLD G., is a Second Lieutenant in the Engineer Corps of the U. S. Army.

HUBER, LAVERN A., is an engineer for Douglas Aircraft Co. of El Segundo, California.

JELINEK, DONALD, is a junior engineer with North American Aviation Corp. at Inglewood, California.

JENS, WAYNE H., no report.

KOCHA, JAMES R., is with Pratt and Whitney Aircraft Corp. at East Hartford, Conn.

KUBOW, ROBERT, is with Goodyear Aircraft Corp. at Akron, Ohio.

LOKKEN, ALDON V. is a research engineer at the Anacostia Station Naval Research Laboratory at Washington, D. C.

LYNCH, DONALD L., is with Thompson Products, Inc., of Cleveland, Ohio.

MILLER, DAVID H., is an Ensign in the United States Naval Reserve.

NARLOCK, RAYMOND, is in the design department of the Douglas Aircraft Co. at El Segundo, California.

REID, MARSHALL, works for the Goodyear Tire and Rubber Co. in Akron, Ohio.

ROSENBERG, EDWIN A. is a test engineer for General Electric Co. at Schenectady, New York.

SCHMIDT, GEORGE J., is with Douglas Aircraft Corp. of El Segundo, California.

SCHROEDER, ORVAL W., who is with Allis-Chalmers Mfg. Co. of Milwaukee, is in the Engineer Graduate Training Course.

SLADEK, LEONARD, is a junior engineer for Douglas Aircraft Corp. of El Segundo, California.

STEPHENSON, ROLAND, is a junior engineer for North American Aviation Corp. at Englewood, California.

STONE, SWEN H., is with the John Barnes Corp., Rockford, Illinois.

WATSON, JOHN D., is in training as a junior engineer for Douglas Aircraft Corp. at El Segundo, California.

WORWERK, VERNON, is a junior engineer for North American Aviation Corp. at Inglewood, California.

•

Civils

DENT, ARLIE R., has accepted a job with the Dravo Corporation at Pittsburgh.

LIPPERT, JAMES H., is also working for Dravo in Pittsburgh.

READ, ROBERT B., is in the U. S. Naval Reserve.

SIVLEY, WALTER S., has a job with the Dravo Corporation in Pittsburgh.

VOGEL, MERTEN M., has a position with an aircraft company in St. Louis.

•

Mining and Metallurgy

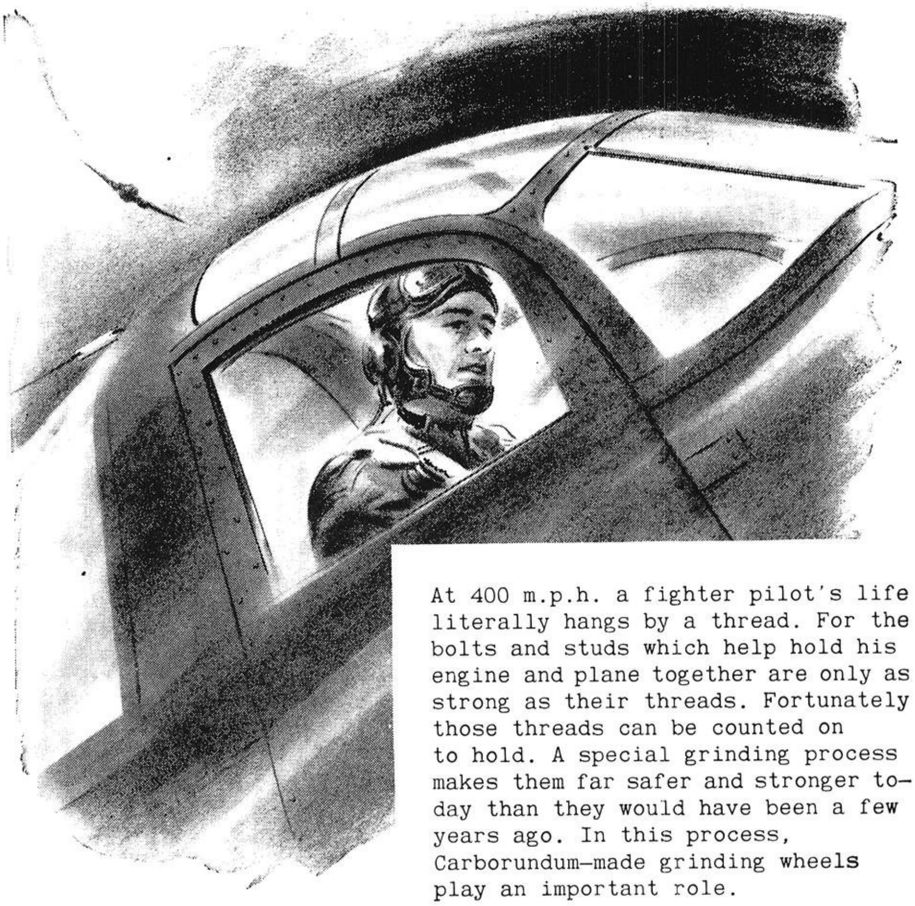
JUERGINS, RICHARD, graduate trainee with Allis-Chalmers.

KOLTUN, WILLIAM, is working with the U. S. Geological Survey.

RAMAGE, ROBERT, is now a Second Lieutenant in the U. S. Army.

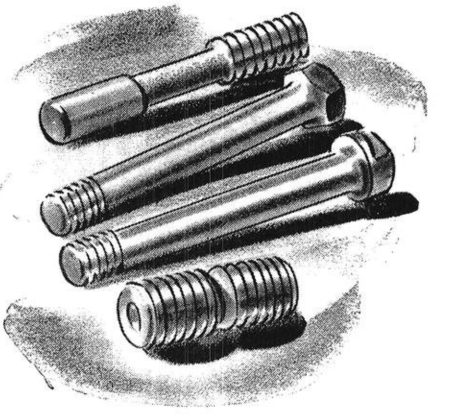
SHUTZ, HOWARD, is a research assistant for the St. Joseph Lead Co. of Pennsylvania.

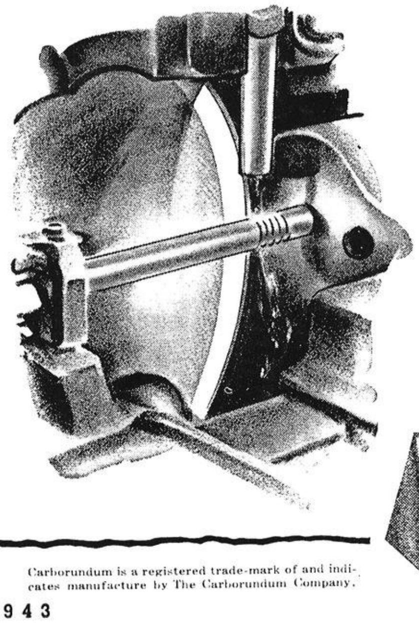
He flies a plane held together with threads!



At 400 m.p.h. a fighter pilot's life literally hangs by a thread. For the bolts and studs which help hold his engine and plane together are only as strong as their threads. Fortunately those threads can be counted on to hold. A special grinding process makes them far safer and stronger today than they would have been a few years ago. In this process, Carborundum-made grinding wheels play an important role.

The method of grinding produces threads of almost unbelievable accuracy, free from microscopic checks and cracks which might cause failure under stress. This greater accuracy justifies a smaller safety factor, reducing weight of dead metal. And in most cases, production is speeded and costs reduced.





Thread grinding is typical of the many ways in which products and processes developed by Carborundum are serving America's war industry. When you get out in the field and encounter a production problem that abrasives might solve, write The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
REG. U.S. BRAND PAT OFF
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

ELEVATORS . . .

(continued from page 9)

a floor area of 1,3400,000 sq. ft., a population of 6,000 and a rentable area of approximately 1,000,000 sq. ft.

It has 40 elevators arranged in five separate groups or banks, of eight each. The hoistways are completely enclosed. All the hoistway hall doors are electrically interlocked—thus all doors must be closed and locked before the corresponding elevator can move. The cars are completely enclosed, equipped with power operated doors and a quiet ventilating system. In front of the operator are buttons which have numbers on their faces corresponding to the respective floors. The operator presses the button for your floor, then moves the car switch over to close the hall and car doors. When the doors are closed and the car switch lever is all the way over, the car starts. After attaining approximately full speed, the car switch lever may be centered without changing the car speed. The stopping, leveling and door opening operations are all controlled automatically. This system is the signal control as previously described.

Each car has a dial telephone which the operator may use to call the starter, maintenance man, or other elevator operators in case of an emergency. There is an emergency exit panel on the top or the side of each car, which enables passengers to get out in case of stoppage between floors. Passengers may be removed by means of a ladder, or they may be transferred to an adjacent elevator.

The starting and stopping operations are very smooth and rapid. Practically all the deceleration is accomplished electrically. The speed is lowered from 1,000 to 15 f.p.m. before the large mechanical brakes are applied. Tests were made simulating failure in case of electrical failure. Each car was run into the pit at full speed (1,000 f.p.m.) with a full test load with no terminal electrical control. The load was then removed and the cars run in the up direction at full speed as far as it would go. All the equipment passed these tests satisfactorily.

Car Speeds

The highest elevator car speed used in Chicago today is 1,000 f.p.m. The tower cars at the Field Building run at that speed. The first installation of a high speed elevator was in the LaSalle-Wacker Building in Chicago. At that time a New York City ordinance prohibited car speeds in excess of 700 f.p.m. After the ordinance was changed, however, several New York buildings have gone to higher speeds.

Dependability

The high speed signal control equipment is very complex—hundreds of contacts, switches and circuits are required for each elevator. The system is reliable if properly maintained. The Field Building makes use of a number of new schemes to cut down on trouble and aid in their correction. The hall buttons are connected so that instead of closing a circuit, they open a circuit. Thus, if a button sticks or a poor contact is made, the car is sure to stop.

Costs and Productivity

The Field Building elevator equipment cost approximately $1,000,000. Maintenance costs vary from $700 to $1,200 per year per elevator. The productivity of these investments depend on the efficient operation and maintenance of the elevator plant. The power cost is very small; running only about one-half to one cent per round trip for the tower elevators. Each of the tower elevators runs about 10,000 miles a year. The total operating cost then, including depreciation, is about 35 cents per car mile. In terms of a round trip to a 500 foot tower the cost would be 2 cents without the operator and 6 cents with the operator. Actual maintenance costs alone for such a tower would be about 1.7 cents per round trip.

While the initial cost and maintenance of a signal control elevator is higher than a car switch machine, it is a much more efficient transportation unit if kept in proper adjustment. Even at 500 or 600 f.p.m. a signal control elevator should do approximately 20 per cent more work than a car-switch elevator of the same capacity.

Future Development

Some architects picture our future cities of great transparent towers made of glass; others conceive of blind, windowless structures artificially lighted and ventilated, with airplane landing fields on the roofs and three or four layers of streets above the ground level. Others point out that decentralization has been the mode of late, and more of it can be expected in the future.

Nevertheless, the nerve centers of our modern civilization will be centrally located, and the future development of the elevator is linked with the type of structures which will be constructed. Assuming that there will be tall buildings, these are the aspects which will determine the design of the elevator of the future: the first, "economic considerations"; the second, "human desires and limitations in vertical transportation"; the third, "elevator engineering developments which can satisfy the requirements of the first two aspects."

Economic Considerations

Taller buildings of the future will require higher speed elevators with greater utility and economy to compensate for the valuable floor space occupied by the hoistway. On the other hand, some consideration should be given to the service performed by the elevators in such tall buildings as the R.C.A. Building in Rockefeller Center, New York. It transports about 50,000 passengers on its 75 elevators each day. The elevators in the Merchandise Mart in Chicago can carry 150,000 passengers in eight hours. The Mart has over 4,000,000 square feet of floor space which is more than any other building of its type in the world.

Human Desires and Limitations

Elevator service is looked upon in much the same way as other means of transportation. It is largely a matter of how long people will wait without becoming impatient, and how long they are willing to ride. There is this one difference, though a person might wait several minutes for a train or bus, to wait even one minute for an elevator becomes intolerable. A minimum waiting and riding time coupled with producing a miximum of floor area is answered by more elevator trips in fewer hoistways—which means greater speed.

Speed Limits

About ten years ago tests were made to determine how rapidly the human body could be accelerated and retarded with comfort, and how fast one could travel vertically having reached full speed. There are the three human elements involved in elevator speed problem, viz., getting up to speed, running at full speed, and stopping.

Starting

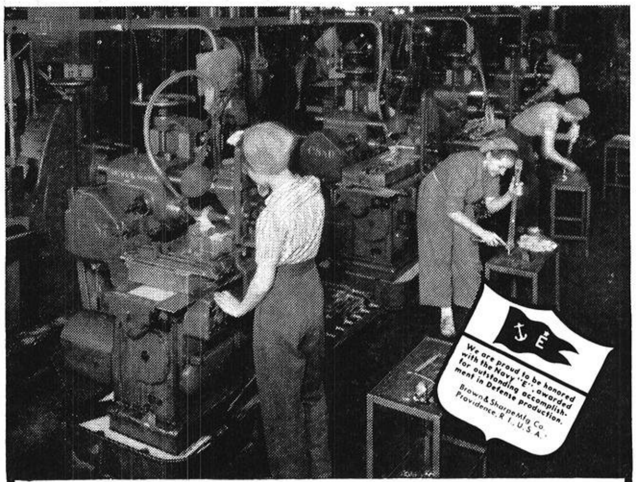
Our bodies are held to earth by the force of gravity, that is, we have a definite weight. If we lift a weight of 100 lbs. slowly we may not notice the instant that it is raised. However, if we raise it quickly, its weight appears to be greater than 100 lbs. Attach a scale between the weight and your hand and by jerking up quickly it may even register 200 lbs. for a moment. So the weight of bodies apparently increased because as they are moved from rest or changed from one rate of speed to another. A free falling body will fall 16 ft. in the first second due to the pull of gravity. If we now raise the same body at the same rate of acceleration so that it is forced upward at 16 ft. in one second, its apparent weight will be doubled. Its rate of acceleration is equal to that caused by the pull of gravity on a falling body. Twice the upward acceleration would increase the apparent weight by three times, and one-half gravity would only increase it 50 per cent. From actual tests it was found that the practical physiological limits of accelerating the human body upward is one-half the force of gravity. This apparent increase in body weight occurs during the starting period only. A naval aviator shot off the deck of a vessel by a catapult at five times gravity force apparently weighs five times as much as he did on deck. Such a rapid pickup in elevator speed would very likely injure the passengers.

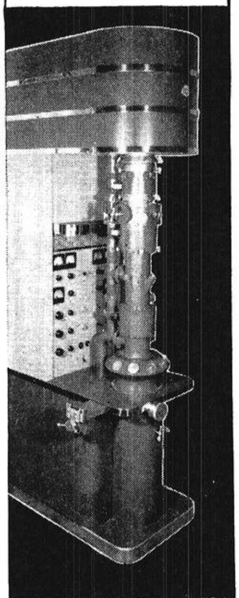
Accelerating the body downward produces just the reverse effect—our apparent weight is reduced. Again half of gravity, or 50 per cent, is the practical limit. The maximum rate of acceleration, beyond which it is not customary to go, is 11 feet per second.

Running

Traveling vertically produces quite a different sensation than traveling horizontally. One may be moved by a train at 100 m.p.h. or by an airplane at 200 m.p.h. without experiencing any physical discomfort. In contrast to this, the top elevator speed is 17 m.p.h., or 1,500 feet per minute (f.p.m.). This is about as fast as the average human body can be dropped, with the resulting increase in air pressure, and still not seriously discomfort the passenger. After dropping 400 feet at this high speed without a stop, it is necessary to swallow air to equalize the pressure caused by the increase in air pressure outside the ear drums. The more one uses high speed elevators the more he becomes accustomed to the changes in air pressure and often does not notice the change. However, the limit, which has nearly been reached, is now thought to be 1,500

(continued on page 33)





On The Campus

with Bill Haas, c'45

WRITING CONTEST

To stimulate further student interest in magazine article writing, the Wisconsin Engineer announces its student written article contest. It is a chance for every interested student in the College of Engineering to develop and display that skill of expression which means so much in becoming a successful engineer.

The contest rules are as follows:

1. All regularly enrolled undergraduate students in the College of Engineering of the University of Wisconsin, with the exception of the editors of the Engineer, are eligible for competition.

2. The articles may be of a semi-technical or non-technical engineering nature, similar to the articles which appear in the popular engineering journals. The subject may be of the student's own choice, but it is suggested that he consult in regard to suitability with the editors of the Engineer, 356 Mechanical Engineering Building.

3. Articles should be typewritten or written neatly in ink, and preferably between 800 and 1,500 words in length. Entries should be addressed "Article Contest" and will be due in 356 Mechanical Engineering Building on or before March 31, 1943.

4. The following items will be considered in judging the article:

(a) Reader Interest
(b) Writing Technique
(c) General Make-Up

The decision of the judges will be deemed final.

5. The first place award will be ten dollars in cash. Three other awards of five dollars each will be made. The winning articles will be published in the April and May issues. All entries will become the property of the Wisconsin Engineer.

6. The judges are L. F. Van Hagan, chairman of the department of civil engineering, and F. E. Volk, librarian of the College of Engineering.

BEARD CONTEST

Once again that time of year rolls around when Wisconsin engineers pay homage to their patron saint in the annual St. Pat's beard-growing contest. The competition will be culminated at the St. Pat's Ball when the winners will be selected by popular campus co-eds to be chosen by Polygon Board. This year the formality of registration has been dropped, and the prizes will be awarded according to the following rules:

1. The contest is open to all regularly enrolled engineering students except members of Polygon Board.

2. To be eligible, a contestant must have stopped shaving after February 10.

3. Judgment will be based on the general artistic value of the beard, giving consideration to length, originality of cut, and curliness.

4. Judging will take place at the 1943 St. Pat's Dance in the Memorial Union, March 19.

5. Judges will be designated by Polygon Board.

6. The decision of the judges will be final.

7. Prizes are as follows:

1st—$7.50 in trade at Brown's
2nd—a fountain pen from Jerry's
3rd — a General Engineering handbook from the Co-op
4th—$5.00 in trade at McNeill and Moore's

8. Shaves may be obtained immediately after the judging, the four prize-winners to receive theirs free.

A. I. Ch. E.

O. A. Storey, of the Burgess Battery Company, spoke on patents and patent licensing at the A. I. Ch. E. meeting in the Top Flight room of the Union on February 10. He is a Wisconsin graduate who has entered patent work from the technical side. His talk was very enlightening in view of the recent attacks made on our patent system by Thurman Arnold and his followers. He pointed out the customary terms of patent licenses and the reasons for them. He explained that the present regulations are necessary to provide the proper incentive for inventive research as exists in other countries.

Announcement was made of the A. I. Ch. E. award to Garry Gohlke for being the junior with the highest scholastic record for his first two years. Members were urged to campaign actively in the St. Pat election for Elmer Mertz, who had been chosen as candidate by the seniors in January. Bill Jacobson was elected as the new A.I.Ch.E. representative on Polygon Board. Refreshments were served after the meeting.

MINING CLUB

The Mining Club held an afternoon meeting February 10 in the Library of the Mining and Metallurgical Building. Pat Lyons, for three years an outstanding end on the football team, was unanimously elected St. Pat candidate for the Miners. Walter Wollering, junior, was elected to Polygon Board.

A. S. M. E.

The A. S. M. E. met on January 7 and had a group picture taken for the Badger. They also elected Stan Puidokas as senior man on Polygon Board. A publicity man was also elected, this position going to Rene Gehl, also a senior.

(continued on page 32)

The battery, a functional part of certain types of communication systems, might well be called a miniature powerhouse. It supplies the vital electric current. Recently battery builders have found in plastics an admirable material for many component parts as well as the battery case itself. STYRON (Dow Polystyrene) is now being used for these purposes because it provides all the essentials and, in addition, offers definite advantages over the materials that it supplants.

Exceptional electrical properties which make STYRON a remarkably effective insulating medium—extraordinary resistance to chemicals—high impact strength—light weight—these are some of the distinctive characteristics of this crystal-clear molding material that are of great assistance to battery makers. Thus in the field of electricity, as in many others, plastics are making a genuine contribution.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN
New York • St. Louis • Chicago • San Francisco
Los Angeles • Seattle • Houston
Styron is a Registered Trade Mark

DOW
CHEMICALS INDISPENSABLE
TO INDUSTRY AND VICTORY

ALUMNI NOTES

by Glenn Jacobson, ch'45

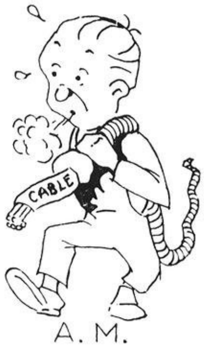
Electricals

COBINE, J. D., '31, who was an instructor in the Graduate School of Engineering at Harvard, is now teaching a Naval Communications Course.

ACREE, GEORGE W., '42, has been transferred to the Lynn plant of General Electric Co. near Boston.

Five members of the Class of '42 are engaged in work at the Signal Corps Radar Laboratory in Belmar, New Jersey. They are **HAROLD BAUMAN, MARTIN KAPLAN, TED RETZER, CLIFFORD SCHMIDT,** and **HARVEY A. SCHLINTZ.**

FISHER, PAUL M., '42, who is employed by General Electric Co., is now doing test work at Fort Wayne, Indiana.



GLEASON, R. F., '42, is in the Naval Research Laboratory at Washington, D. C., where he tests and installs direction finders aboard ships of the Navy.

HORNBERG K. O., '42, is also testing and installing direction finders at the Washington Naval Research Laboratory.

LUNDBERG, E. J., '42, is now at the Lynn plant of General Electric Co.

NETTESHEIM, HENRY, '42, a Lieutenant in the Signal Corps is overseas with the 26th Fighter Command.

Chemicals

MARSHALL, WILLIAM R., PhD '41, was married to Dorothy Robbins on Saturday, January 9, 1943, at Wilmington, Delaware.

ROWE, CHARLES, PhD '41, became the father of a son, Thomas MacLean Rowe, on January 14, 1943. Rowe is now with Standard Oil of California at San Francisco.

MASSIER, JOHN, MS '34, is with the Hot-Point Co. of Cicero. He is engaged in the manufacture of electrical appliances and other electrical products for use in the present war.

EDWARDS, DAVID, '23, is supervisor of experimental engineering for the E. I. du Pont de Nemours & Co. at Buffalo, New York.

MARTIN, WESLEY G., '26, who is with the A. O. Smith Co. of Milwaukee, is in charge of weld rod production and also heads research and development work on enameled steel products.

STERBA, MELVIN, '32, is with Universal Oil Products in Chicago. He is engaged in the correlation of laboratory and pilot plant data to such form that it can be used in process design.

At the recent Chemical Engineering Symposium at Chicago, Professor Ragatz of the Chemical Engineering Department contacted Ralph Koester, who gave him the following information about Wisconsin men, who are with the B. F. Goodrich Rubber Co. **RALPH KOESTER**, '40, and **ALFRED COOLEY**, '41, are foremen in the Clorine and Caustic Department at Louisville. Also at Louisville is **JOHN NELSON**, '39, who is general foreman of the Polymerization Department which is producing synthetic rubber. At Akron, Ohio, **JOSEPH C. GOULD**, '41, is foreman in the synthetic rubber plant; **CURTIS STUEBER**, '40, and **RAY PACAUSKY**, '39, are in the Rubber Reclaiming Department; and **HAROLD H. RADKE**, '40, is doing research work on industrial health hazards.

ZINSMEISTER, ROBERT H., '42, is engaged to Bernice Breit, a registered nurse. The wedding is to take place May 1, 1943, at Hartford, Wisconsin. Zinsmeister is foreman in the Hercules Powder Plant at Chattanooga, Tennessee.

Civils

SMITH, LEON A., '12, Waterworks Superintendent of the City of Madison, recently received the Veteran's Award of American Public Works Association. This is an award accorded to a member who has served one municipality continuously for a period of thirty years.

ZANDER, ARNOLD S., '23, general president of the American Federation of State, County, and Municipal Employes, has been elected president of the Eastern Labor Press conference.

THOMPSON, JOHN G., '28, street commissioner for Madison, has been commissioned a First Lieutenant in the Coast Artillery anti-aircraft, and left Madison late in January for Fort Eustis, Virginia.

BURMEISTER, ROBERT A., '28, since October has been in charge of the Physical Division of the Materials Testing Laboratory of the City of Milwaukee.

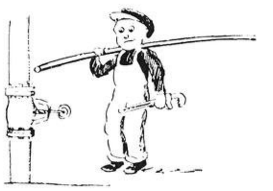
STAEFFLER, MAJOR RICHARD P., '31, is commanding officer at the Badger Ordnance Plant, which began production in January, ten months after the start of construction operations.

ZIBELL, JEROME W., '31, was elected in January to the position of chief of the fire department at Waterloo, Wisconsin. He is owner of the Zibell Hardware Company at Waterloo.

THOMPSON, WILLIAM E., '32, who was instructor in Civil Engineering at South Dakota State School of Mines for four years, has been engaged in private practice at Rapid City since June.

WAGNER, CLARENCE O., '33, is assistant sanitary engineer with Whitman, Roquardt & Smith of Baltimore.

PRICE, REGINALD C., '35, is hydraulic engineer with the National Resources Planning Board at Washington, D. C.



BAUM, CAPT. JOHN W., '37, after two years service in Alaska on airport construction, is at Fort Belvoir, Virginia, as an instructor in the engineer school.

DAVY, PHILIP S., '37, is Captain in the Corps of Engineers, Construction Division and post engineer at Fort Leonard Wood, Missouri. He is responsible for the maintenance of buildings, roads and grounds and for the operation of all utilities.

POLK, WILLIAM H., '37, is now instrumentman with the Milwaukee Road and is located at Terre Haute, Indiana.

EDELSTEIN, ALVIN, '38, was drafted and is in training at Camp Butner, North Carolina, for duty with the combat engineers. He is scheduled for officer's training.

BEDORE, CLIFFORD J., '40, is working for the Miller Co. of Indianapolis on the erection of power and communication lines for the Alcan Highway in Canada.

HERRIED, IRVIN C., '40, is with the Civil Aeronautics Administration with headquarters at Chicago. He is an associate airways engineer, doing survey, design and construction work on radio stations and airports.

COOPER, ROBERT G., '41, is doing military construction work at Fort Brady, Michigan.

TOWLE, CLAIR J., '41, who has been with the Illinois Central R. R. since graduation, has been accepted as an army aviation cadet.

ELLIOTT, ENSIGN JOHN F., '42, was married on December 24 to Elizabeth Alice Roberts of Kalamazoo, Michigan.

FISK, CHARLES C., '42, is an aviation cadet in the Army Air Corps. About the middle of November he began a seven month course at the University of Chicago.

GLENN, ALFRED H., '42, is an aviation cadet in training at New York University as a meteorologist.

•

Mining and Metallurgy

SHORT, ENSIGN ROBERT, '42, was married to Miss Roberta Tessman Jan. 2 at Washington, D. C. Ensign Short is an instructor at Dahlgren, Virginia.

•

Mechanicals

ROSE, R. A., MS '29, M.E. '37, who was recently promoted to the rank of Commander, has been named the commanding officer of the Naval Training School, at Richmond, Virginia.

BOARDMAN, CLARK C., '10, is now Resident Manager for the Dixie Ordnance Works at Sterlington, Louisiana.

NIKARA, LEO S., '36, former editor of the WISCONSIN ENGINEER, is now a Captain, U. S. Army, and is stationed at Washington, D. C.

HEGGESTAD, ARNOLD, '39, a Captain in the U. S. Army, was killed in action in New Guinea.

PIKE, KENNETH, '40, was married to Janet Handeland of Stoughton on Christmas Day. Pike is an engineer for the Wright Aeronautical Corp.

ERDAHL, JOHN M., '41, recently became engaged to Eunice Marie Price, who at present is a teacher at Reedsburg, Wisconsin. They plan to be married next summer.

HULL, CAPT. HERBERT L., '41, is now stationed with the 32nd Engineer Training Battalion at Fort Leonard Wood, Missouri.

DIBBLE, LIEUT. ROBERT, '42, was married to Lila Marie Kubly of New Glarus, Wisconsin. The ceremony took place on Sunday, December 27, 1942.

JAMES, RICHARD D., '42, who is employed by Curtiss-Wright in Paterson, New Jersey, was married to Jane Ploetz of Madison on January 28, 1943.

SOMMER, WARREN L., '42, was recently promoted to the rank of Captain in the Corps of Engineers. He is stationed at Fort Belvoir, Virginia.

STATIC ◆ ◆ ◆

Humor by Dick Roth, m'43

Cartoons by Bob Daane, m'43

A truly eloquent parson in the south had been preaching for an hour or so on the immortality of the soul.

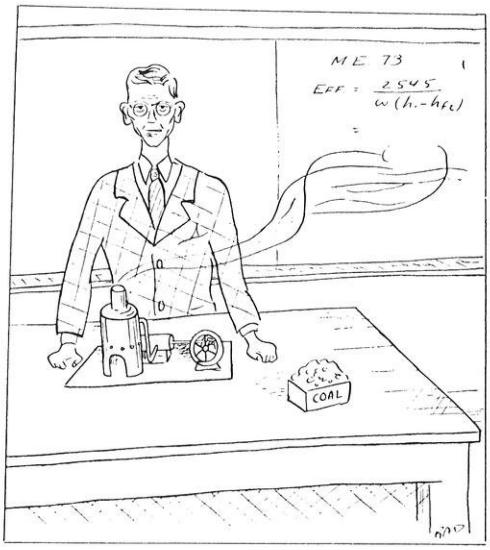
"I looked at the mountains," he exclaimed, "and could not help thinking, 'Beautiful as you are, you will be destroyed, while my soul will not.' I gazed upon the ocean and cried, 'Mighty as you are, you will eventually dry up, but not I'."

○ ○ ○

The young duckling must have been terribly embarrassed when he found that his first pair of trousers were down.

○ ○ ○

Problems never seem to floor them,
The railroad officials have brains.
The windows were stuck too tight for them
So they air-conditoned the trains.



Due to the recent scrap drive, we will use this model for our next experiment.

Jack and Jill went up the hill
Upon a moonlight ride.
When Jack came back
One eye was black,
His friend, you see, had lied.

"It's the little things in life that tell," said the co-ed as she yanked her kid brother out from under the sofa.

○ ○ ○

The codfish lays a million eggs,
The barnyard hen but one;
The codfish doesn't cackle
To show what she has done.
We scorn the modest codfish,
The cackling hen we prize,
Proving, that beyond a doubt,
It pays to advertise.

○ ○ ○

Definitions

Nudist: A person who goes coatless and vestless and wears trousers to match.

Man: The only animal that can be skinned more than once.

○ ○ ○

Who is the man who designs our pumps with judgment, skill and care?

Who is the man that builds 'em up and keeps them in repair?

Who has to shut them down because the valve seats disappear?

The bearing-wearing, gear-tearing MECHANICAL ENGINEER.

○ ○ ○

Skidding is the action
When friction is a fraction
Of the vertical reaction
Which won't result in traction.

○ ○ ○

Angry Father: "What do you mean by bringing my daughter in at this hour of the morning?"

Gay Blade: "Had to be at work at seven."

○ ○ ○

Toast

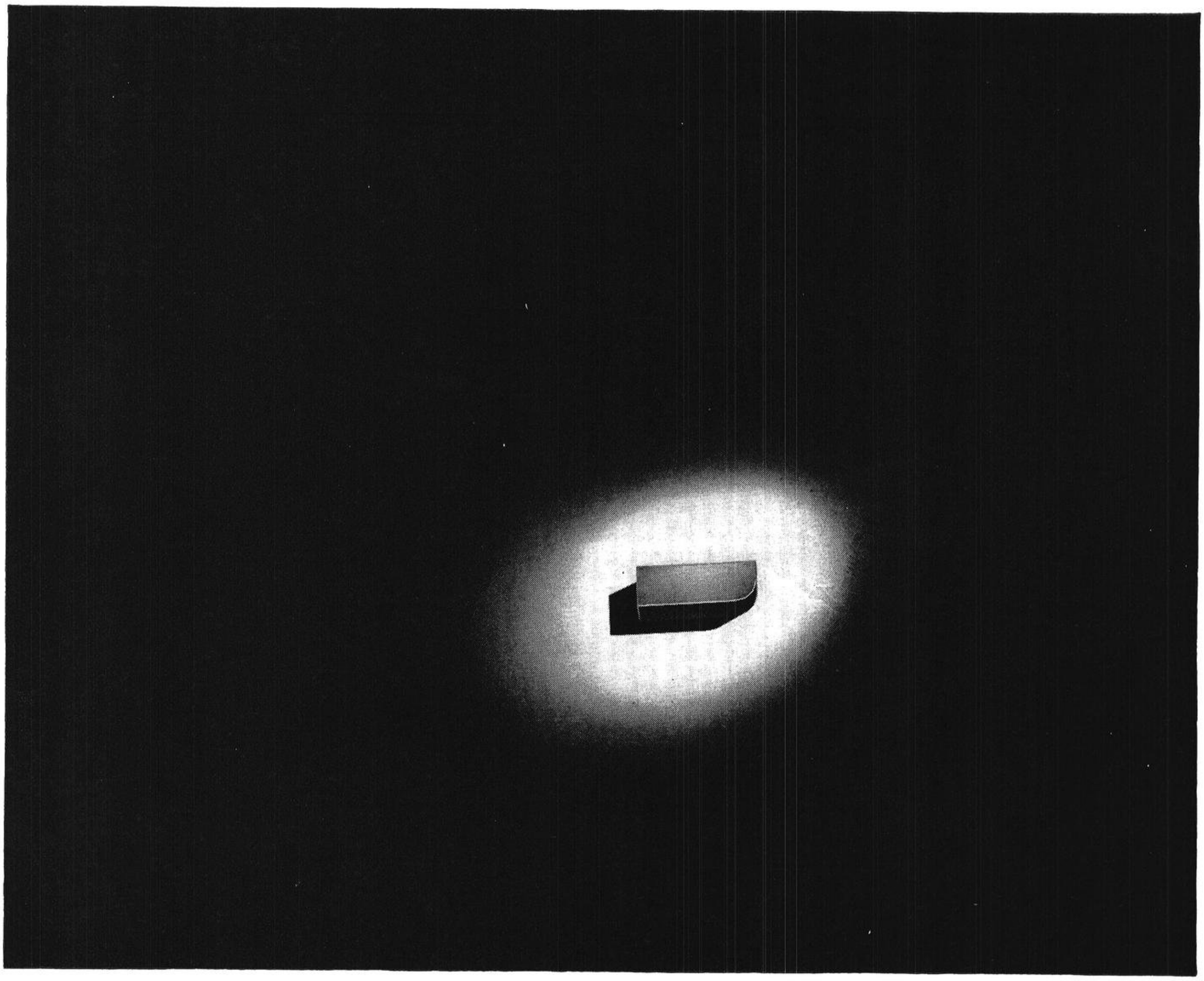
Here's to the stuff that makes a man see double and feel single.

○ ○ ○

"Pardon me, could you direct me to Henry Street?"

"Oh, you lucky girl, I am Henry Street."

(continued on page34)



"METALLIC VITAMINS" FOR INDUSTRY

So effective are relatively minute quantities of cemented carbides in stepping up—pepping up—production that they are often called the "metallic vitamins" of industry.

Because only small quantities are required per tool, Carboloy cemented carbides are measured in grams. A gram is 1/453rd part of a pound. A Carboloy tool tip weighing only 25 grams or slightly less than one *ounce* is a good size tip—enough to last for days, weeks—often months of cutting at speeds often higher than 4 to 5 times that possible with ordinary steel tools.

In terms of production, an ounce of cemented carbide can turn the turrets of dozens of tanks, or drill hundreds of guns, or turn as many as several hundred shell, or bore the cylinders of hundreds of "Jeep" cars. One ounce of carbide can do these and countless other crucial machining jobs faster and better than any other tool material.

These "metallic vitamins" also serve the cause of victory in many other ways. In masonry drills, they drill holes in concrete 75% faster for installing war production machinery. . . . In dies they speed up production of wire, cartridge cases, bullets, etc. . . . As wear-resistant inserts on vital machine parts, they keep machines running. As a matrix material, they conserve diamonds, shorten operating time on mine drilling, dressing of grinding wheels, etc.

The myriad of present uses for Carboloy—the "metallic vitamin" of industry—now helping to speed the day of victory, forecast the steadily increasing diversity of benefits for the years of peace to come. ★ ★ Carboloy Company, Inc., Detroit, Mich. District Offices: Birmingham, Ala. • Chicago • Cleveland • Los Angeles • Newark • Philadelphia • Pittsburgh • Seattle.

◆

CARBOLOY TRAINING FILMS

A series of six Carboloy Training Films now available covering detailed, step-by-step procedure on the design, brazing, grinding, use and manufacture of cemented carbide tools, 35 mm silent slide films. (Not motion pictures.) Available for permanent use at approximate print cost of $20 per set. Educational institutions may also secure sets on loan for single showings through selected college film loan libraries. Catalog and loan library listing on request. Write Carboloy Company Inc., Detroit, for Booklet "A".

CARBOLOY
TRADEMARK

CEMENTED CARBIDE
TOOLS • DIES • DRESSERS
MASONRY DRILLS • WEAR PARTS

On The Campus . . .

(continued from page 26)

A. S. C. E.

January 13, 1943

The local chapter of A. S. C. E. met to elect officers for the second semester. The following men were elected: President, Earl Maas; Vice President, Elroy Spitzer; Treasurer, Roy Ericksen; Secretary, Ed Korpady; Polygon Representative, Ed Kloman. A discourse on the trip to the Midwestern Regional Conference at the University of Illinois was given by the members who attended that conference.

February 10, 1943

The A.S.C.E. met at the Hydraulics Lab for its first meeting of the present semester. Plans for publishing an A.S.C.E. Chapter Yearbook were discussed. The matter of selecting a St. Pat candidate came up, with the honors going to Bill O'Brian.

After the business meeting, Col. Ray S. Owen presented a very interesting discussion of "Military Intelligence." He outlined the general scheme of American Army GHQ in World War I, and described the intelligence section in detail. He was able to illustrate the work he did as an Intelligence officer during the last war by showing literally hundreds of photographs taken in France.

•

MEs ELECT ST. PAT

At a joint meeting of the S. A. E. and A. S. M. E. February 17, the mechanical engineers elected Bill Cummingham, a junior from Kenosha, as their St. Pat candidate.

At this same meeting, A. S. M. E. also elected a junior man to Polygon Board, this position going to Fred Graper.

•

A. I. E. E.

On February 10, the A.I.E.E. met in the Old Madison room at the Union. The electricals elected John Cremer, a junior, as their St. Pat candidate. John Halgren, also a junior, was elected to Polygon Board. Two interesting movies, entitled "The Electron Microscope" and "War Activities on the Campuses," were presented by Kappa Eta Kappa, the EE's professional fraternity. An interesting program of meetings is being planned for the second semester.

•

"Pull over to the curb, buddy!"

"What's wrong, officer?"

"You just went thru a red light. Whatsa matter? Are you blind?"

"Yes officer, color blind."

"Not only that, you were doing fifty."

"I was not, my speedometer registered sixty."

"Let me see your license!"

"Impossible, I don't own one."

"Well, let me see your owner's certificate!"

"I am afraid I can't show you that either. You see I just stole this car.

"Stole this car! What's your name, buddy?"

"Napoleon!"

ELEVATORS . . .

(continued from page 25)

f.p.m. or 17 m.p.h. Mine hoists are operated at speeds of from 3,000 to 4,000 f.p.m. and occasionally workers ride these hoists at reduced speeds of 2,000 to 2,500 f.p.m.

Stopping

The effect of stopping in descending is the same as starting in ascending, with the exception that our minds are more alert and muscles are tense because the car is in motion. Here 100 per cent of gravity may be used (doubling our weight) without any ill effects.

Suddenly stopping the car when moving upward produces a different effect. Our internal organs hang from supporting tissues and are acted upon separately by the force of gravity. Stopping the car suddenly in upward motion causes these muscles to contract and these organs are crowded upward against the heart. Therefore, one-half gravity, or a loss of 50 per cent in weight, is the maximum practical limit.

So again a limit has been reached. The time to go from floor to floor varies as the weight of the load and the distance of travel between stops. Some effort has been extended along this line by using double decked cars or two cars in one shaft. However, these schemes have not been too successful, and the problem is not solved as yet.

Peak Period and Quota Control

During the morning peak period very few people want to use the elevator to come down. Therefore, when a car has discharged its last passenger at the twelfth floor, there is no need of the car going on up to the twentieth (top) floor before making the return trip. All the down calls can be handled by one elevator. In the interim, the cars are kept continually moving between the first floor and several floors below the top floor. The car doesn't go to the top floor unless called there. Lunch periods present a diversified rush of up and down traffic which can be handled satisfactorily with the cars constantly moving. In the evening, one group of cars handle the upper floors while another group handles the lower floors. Thus, passengers on the lower floor get just as good service as those on the upper floors.

Another method employed to assure any one passenger against a prolonged wait is the Quota Method. One car takes a maximum of three calls, the fourth call going to the third car. The first car passes up all the other calls and cannot change direction until all of its three calls have been dispatched. In this manner, the calls are answered as they are placed, assuring every passenger of nearly equal service.

Summary

The elevator of the future will be of the automatic button control type with automatically controlled doors. Eighty per cent of the elevators installed today have these features. As for the future, it can be expected that the cars will be equipped with radio, air conditioning, indirect lighting, insulation against sound and vibration, and the electric eye for safety devices. Apartment and small office buildings will have signal control automatic elevators, no operator being necessary. The larger buildings will retain operators because someone is needed to keep the traffic moving and to give assistance to aged or crippled passengers. Doors, as now, will be operated by springs with reversing devices operated by a shoe on the leading edge of the grate so the door will reverse if someone gets caught in the door. Electric eyes will also be employed for this purpose on some elevators.

In spite of the things still desired and which have to be done in the future in the interest of safety, elevators are one of the safest forms of transportation we have today.

Elevators—Masterpiece of Modern Progress by Charles W. Lerch.
Electric Elevators by F. A. Annett.

Doctor: "How is the boy who swallowed the half dollar?"

Nurse: "No change yet."

○ ○ ○

Freshman: "Why so downhearted?"
Sophomore: "I wrote home the other day for money for a study lamp."
Freshman: "So what?"
Sophomore: "They sent me a lamp."

STATIC . . .

(continued from page 30)

Prof: "When the room settles down, I will begin the lecture."

Student: "Why don't you go home and sleep it off."

* * *

Mother: "Quiet, dear, the sandman is coming."

Johnny: "O.K., Mom, I won't tell pop."

* * *

The girl I left behind me
I think of night and day.
For if she ever found me,
There'd sure be hell to pay.

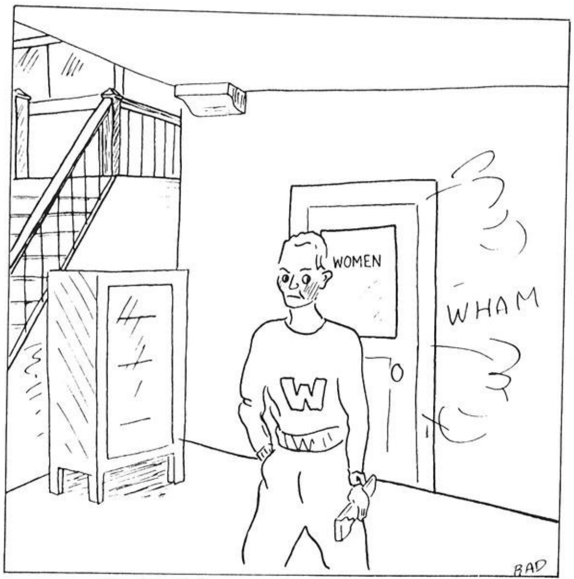
* * *

Cackle, cackle, little hen,
Thus you fool the wisest men.
How to know, they long have tried,
Whether you have laid or lied.

* * *

He: "Dear, I saw you taking a tramp over the hill Sunday."

She: "What do you mean, 'tramp,' that was my uncle."



Gosh! I forgot about those waves.

Yachtsman: "If this storm continues, I'll have to heave to."

Seasick Passenger: "What a horrid way of putting it."

* * *

"Yes," said the undertaker, "college boys are the easiest. They are generally stiff when I get them."

* * *

If dad is worried when daughter is out with a boy, it is because he has a good memory.

* * *

Freshman (finishing a letter): I'd send you that five I owe you, but I have already sealed the letter.

Landlady: "If you don't pay your rent, I want your room."

Student: "Oh, I'm sure you wouldn't like it here."

* * *

Joe: "What kind of oil do you use in your car?"

Moe: "Oh, I usually begin by telling them that I'm lonely."

* * *

Problem:

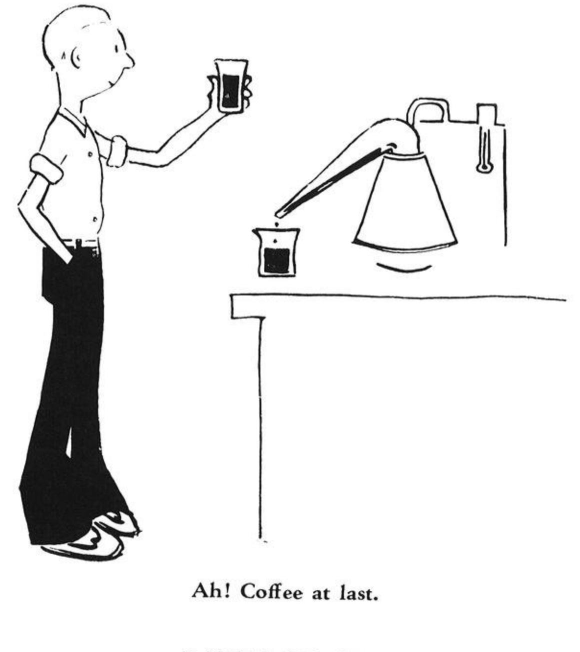
Maybe you think that being an engineer, you are too smart to waste time on simple puzzles, but you will at least be highly amused at how easily you can solve this one, considered hard by some people we have sprung it on.

There is a column of men, recently drafted engineering students, one mile long, walking forward at an unknown rate, and a man on a horse starts at the same time and in the same direction as the men, and is at the start even with the last man in the column. When he catches up up with the front man, he immediately turns around and goes backward and meets the last man again just as the last man reaches the spot from which the first man in the column started.

Question:

What distances do the men and horse travel?

(Answer in next issue).



Ah! Coffee at last.

PARTS OF OLE

A witness in a railroad case at Fort Worth, asked to tell in his own way how the accident happened, said:

"Well, Ole and I was walking down the track, and I heard a whistle, and I got off the track, and the train went by, and I got back on the track, and I didn't see Ole; but I walked along, and pretty soon I seen Ole's hat, and I walked on, and seen one of Ole's legs, and then over on one side Ole's head, and I says, 'My Gawd! Something muster happen to Ole'."

CUTTING TOOLS THAT NEVER DULL

FASTER than ever before—and with fewer delays—man shapes steel with the Airco oxyacetylene flame. There's no time out for sharpening or regrinding when this modern cutting tool is on the job. Here the Radiagraph—an Airco achievement—is depicted utilizing the oxyacetylene flame to perform a highly specialized cutting operation. So versatile is the standard machine that it does the job speedily, accurately without the aid of special attachments.

New, faster, better ways of making machines, engines, ships, tanks and guns result directly from using this "never dull" production tool. So varied is its application that, in addition to cutting steel swiftly and accurately, the oxyacetylene flame hardens steel to an easily controllable depth, cleans metal surfaces for longer lasting paint jobs, welds metal into a strong, lasting structure. To better acquaint you with the many things that this modern production tool does better we have published "Airco in the News", a pictorial review in book form. Write for a copy.

AIR AIRCO REDUCTION

General Offices:
60 EAST 42nd STREET, NEW YORK, N. Y.
In Texas:
Magnolia-Airco Gas Products Co.
General Offices: HOUSTON, TEXAS
OFFICES IN ALL PRINCIPAL CITIES

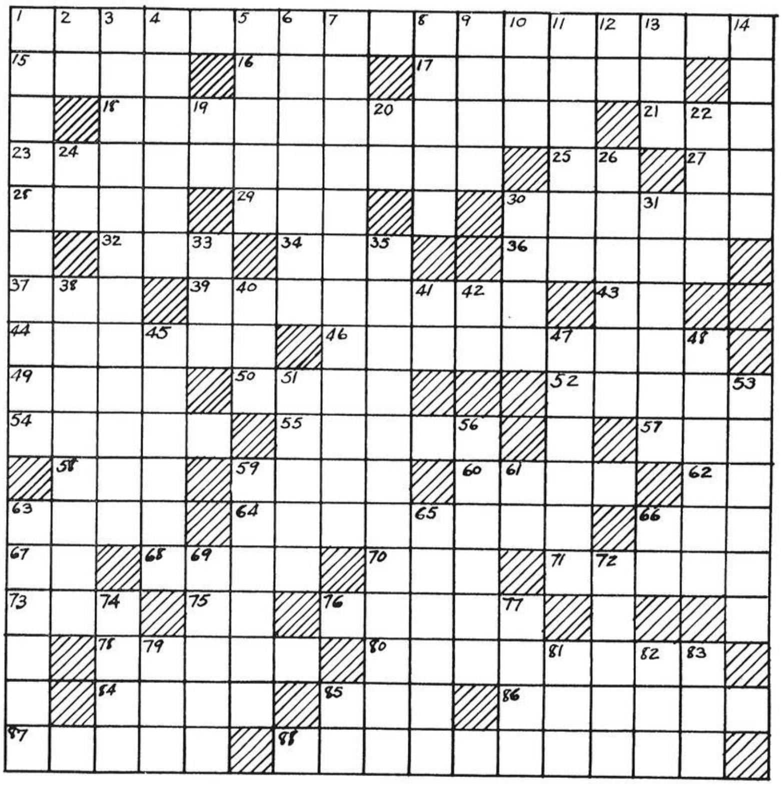
ANYTHING AND EVERYTHING FOR GAS WELDING OR CUTTING AND ARC WELDING

THE PUZZLE PATCH . . .

by Don and Lou

$100 Cash Prize

When you have finished the puzzle, send it in with the top of one 1943 Ford squad car. $100 to the first one in.



ACROSS

1. World's best magazine at 15c.
15. Initials of the Ag Engineer's professional organization.
16. Gaelic for John.
17. An Himalayan, no cud chewing sheep.
18. Not observing what's going on.
21. Lots of these around nowadays.
23. A fictitious lad who wanted a pair of silver skates.
25. That thing.
27. Prefix meaning twice.
28. Not out of.
29. Officers' new underwear (abbreviation).
30. Alcoholic extract used in treatment of dysentery.
32. Golf teacher.
34. Recede.
36. The old St. Pat's day parades.
37. A gazelle of the Tibetan plateau.
39. Numbers corresponding to logarithms.
43. Abbreviation of load.
44. Inane laugh.
46. Bane of an engineer's existence, source of all evil.
49. A kind of soup, also known as gumbo.
50. Not close.
52. Pretty bad.
54. Main detriment to study.
55. A rube in the funny papers who doesn't know when he's well off.
57. What a consulting engineer earns and a lawyer steals.
58. Ladies' Classy Thimbles (abbreviation).
59. A kind of flooring.
60. Long fish which sometimes acts in shocking fashion.
62. Abbreviation for leave.
63. A fountain drink.
64. Bivalent radical NHCONH from urea.
65. A mild liquor.
67. Forgotten engineer.
68. A precious stone.
70. A small number.
71. African city, recently in the news.
73. Genus of bivalves.
75. Symbol for alabamine.
76. Grave or sedate.
78. Liquor made of brandy and cherry kernels.
80. One who gets what is wanted.
84. Weight of eastern Asia, 28-70 grams.
85. Abbreviation of enlist.
86. Hang around.
87. Sour or bitter.
88. To stand out above others.

DOWN

1. The father of our country.
2. Form to be.
3. The first engineer, who designed (and built) a snake-killing device.
4. A fellow who can read other people's mail and get away with it.
5. Nickname for a very powerful and touchy explosive.
6. A light, smooth fabric.
7. That cannot be cleared of clouds.
8. To go in.
9. An Aryan of the Malabar coast.
10. ——st, a spook.
11. What an acid supposedly does when put in solution with water.
12. What your girl said last night.
13. Force of one dyne acting through a distance of one centimeter (of course, it must move in the direction of the force, courtesy L. R. Ingersoll).
14. Traditional harbinger of spring.
19. Symbol for alabamine.
20. Abbreviation for "No Kissing."
22. Musical instrument.
24. Any.
26. By-product in the cooking industry, animal fat.
30. United Magicians of South Carolina (abbreviation).
31. To take your hat off again.
33. Official Absentee's Excuse (abbreviation).
35. Reason why the Irish can flatter so well.
38. Science of household management.
40. One of President Roosevelt's first recovery programs.
41. The extent of what one SHOULD say when he hits his thumb with a hammer.
42. Government School (abbreviation).
45. One who samples food.
47. Past tense of a form of precipitation.
48. Girl's name.
51. First cousin to a Gremlin.
53. A type of simple machine.
56. To leave once more.
59. Mattock.
61. Half an em.
63. An optically impervious container utilizing the latent energy in illumination to so effect an halidic compound of argentiam, as to enable a chemical substance to make the effect apparent.
65. Likely.
66. American Kibosh (abbreviation).
69. The five days added at the end of the year by the Mayans to make out the 365 days of the year.
72. The girl who didn't live there anymore several years ago.
74. Poker stake.
77. Mexican surrealistic artist.
79. Means of locomotion in a row boat.
81. What supposedly is formed when a soluble salt hits water.
82. Extra Tipsy Neighbors (abbreviation).
83. To soak in water.
85. Suffix which often changes a verb to a noun.