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THE WISCONSIN ENGINEER

NOVEMBER 1934

MEMBER, ENGINEERING COLLEGE MAGAZINES, ASSOCIATED

In A Jointless-Minded World

Welding would prevail—and old methods of joining could not be restored to favor.

By **E. A. DOYLE***

If welding had become the standard method of manufacture before mechanical types of joints were introduced, it would be difficult, indeed, to convince manufacturers that they should redesign their metal products to use mechanical methods of joining.

NO RETREAT—pipe line constructors would never consent to a change from simple, portable welding equipment to the complicated devices essential to other methods.

Welding Gives Strength

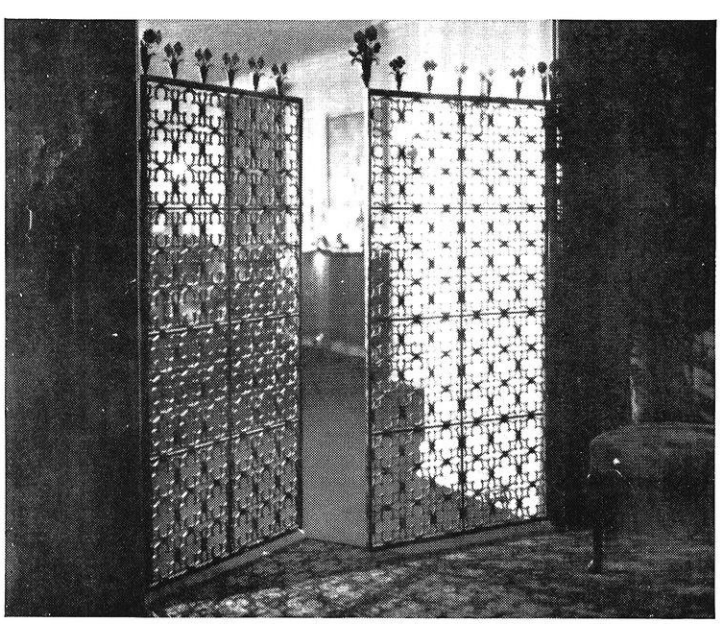
Strength would be a talking point for welding. The welded joint is strong as or stronger than the metal which it joins. The cutting of holes for screws or bolts would naturally weaken the structure. Appearance gives welding another vote. Joints made by welding are smooth in contour and have no depressions, bosses, projections or attachments as is often necessary in mechanical means of joining metals.

Costs Less to the User

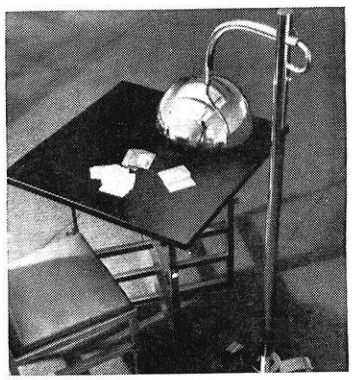
Cost would be another argument for welded joints. The greater amount of material necessary with mechanical joints, the increased weight, and the decrease in pay load or performance-to-weight ratio, would make welding the preferred method. Nobody would consent to a joint in piping, which might, through a tiny leak cost much more than the permanently leakproof welded joint. Nor should it be necessary to buy expensive machinery to make mechanical joints which welding can equal in performance, economy and adaptability with a minimum investment in metal fabricating equipment.

Modernizes Automobile Design

Automobile manufacturers would insist on welding rather than consent to a return to the design limitations imposed by mechanical joints. In face of a change from "teardrop" designs to the old boxlike bodies, with the attendant discomforts, with higher cost due to increased gas consumption and increased tire wear, with the fear of accidents increased by the lack of confidence in the joints, with appearance impaired and lacking the smooth surface for fine paint and lacquer finishes,—the automobile manufacturer would hesitate long before any but welded joints would even get a hearing.



BEAUTIFUL USEFULNESS—typified in this welded ornamental iron gateway. Every joint is strong, sound and was made inexpensively.



METAL FURNITURE—The welded joints in metal beds, chairs and other similar furniture assure a sturdy and rigid assembly.

In the Future

Farsighted industrial executives can appreciate that a completely "welding-minded" industrial world is not far off. They should use in their own manufacturing operations as many of the advantages of welding as possible. The welding engineers of The Linde Air Products Company can advise how oxy-acetylene welding could best be used in your plant. This service is obtainable without cost or obligation by application to any of the sales offices of The Linde Air Products Company located at Atlanta, Baltimore, Birmingham, Boston, Buffalo, Butte, Chicago, Cleveland, Dallas, Denver, Detroit, El Paso, Houston, Indianapolis, Kansas City, Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Phoenix, Pittsburgh, Portland, Ore., St. Louis, Salt Lake City, San Francisco, Seattle, Spokane, and Tulsa. Everything for oxy-acetylene welding and cutting—including Linde Oxygen, Prest-O-Lite Acetylene, Union Carbide and Oxweld Apparatus and Supplies—is available from Linde through plants and warehouse stocks, everywhere.

*Chief Engineer, Development Section, The Linde Air Products Company, New York. Unit of Union Carbide and Carbon Corporation.

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With the Contributors —

● E. L. Kaiser

Mr. Kaiser has worked with the briquetting of coal for over two years. His research in this field led to a "hobby" interest in the development of the coal consuming engine, the Rupa-motor.

● E. R. Shorey

Mr. Shorey, after graduation from the University in '08, spent ten years in mining and milling in Northern Minnesota and Wisconsin. Since 1919, he has taught at the University, at the same time engaging in the research of the flotation of Wisconsin ores.

● R. Paddock

Mr. Paddock, c'30, has since graduation been employed on various government projects. This summer he spent treking the untrammeled ways of northern Minnesota to find the shortest practical distance between two points.

The December Issue —

Mr. J. B. Kommers, Professor of Mechanics, and an international authority on fatigue stresses will discuss a new standard of stress for non-ferrous metals.

Mr. Irving Kraemer, m'35, one of the few men in the country who hunt with bow and arrow, will explain the science of archery, in the fashion that his four years of engineering training has prepared him.

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The WISCONSIN ENGINEER

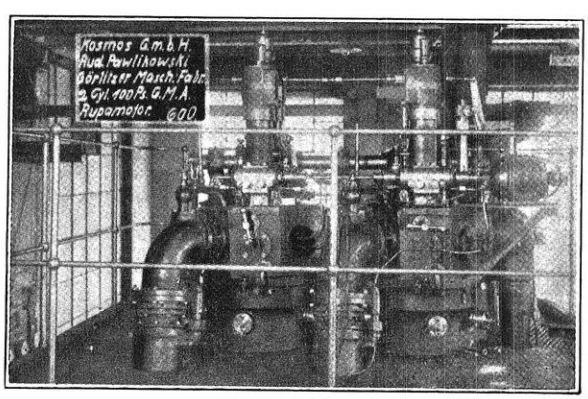
VOLUME 39, NO. 2 NOVEMBER, 1934

Diesel's Dream Materialized

By E. R. KAISER

IN our Engineering Library there is a little thin book which is a classic in engineering literature. Begun in 1879 by a young German engineer, Rudolph Diesel, it is the theoretical development of "The Rational Heat Engine" which now bears his name. If you will read it through and compare the ideas expressed and plans laid down with what has developed from them, you will agree that this inventor had a thorough training in fundamentals and a remarkable vision and courage in developing a novel design so great a departure from the practice at the time.

Instead of operating a spark ignition internal combustion engine with inefficient low compression on expensive, highly volatile fuels, he proposed to obtain high efficiency by compressing a charge of air to 500 pounds per square inch and introducing the cheapest available fuel, coal dust, into the cylinder at the peak of compression at which time the air would be hot enough to ignite the coal without the aid of an electric spark. A marvelous combination if it could be made to work!



Valve Mechanism of 100 hp., 2 Cylinder Rupamotor.

It would take a larger book to record the many disheartening interviews with manufacturers which followed. There were "practical" men of little vision in his day as there are in ours. Authorities "knew" without proof that an engine piston could not withstand 15 atmospheres pressure of hot gas. Finally in the summer of 1892 the Maschinenfabrik Augsburg took up his idea and had an engine built. Whatever doubt may have existed as to whether the fuel would ignite as Diesel proposed must have been dispelled on the day of the first test, because the engine promptly blew itself to pieces.

When the mystery which surrounded this early experimental work cleared away, this company manufactured a successful Diesel engine running on a low-priced fuel oil in place of coal dust — an alternative fuel suggested in the inventor's early plans. The difficulties accompanying the successful introduction of the coal against high pressures were never solved by Diesel. He had made a remarkable advance for which there need be no apologies. In 1913 when the worthy "Doktor Ingenieur" mysteriously disappeared while crossing the English Channel his engine was being made in several countries.

In 1911 Dr. Diesel's former chief draftsman, Rudolph Pawlikowski, an engineer at the Görlitzer (Germany) Maschinenfabrik took up the idea of the coal-dust engine. In 1916 his Rupamotor No. 1 made its first successful test run. It was a standard Diesel engine of 16½ inch bore, and 25 inch stroke delivering 80 horsepower at 160 rpm but fitted with a set of valves for introducing the coal-dust fuel. The 4-stroke cycle principle was retained. Six other engines have been built since that time; vertical, horizontal, single, and multi-cylinder units. A 2-stroke cycle machine has also been built to obtain higher horsepower per unit of engine weight and cost.

The major problem in the development work from 1911 to 1916 was to introduce the coal dust into the engine without briquetting and to keep the coal valves tight against a pressure of 430 to 700 pounds per square inch and a temperature of 2200° to 3300° F. The successful valve design for one of the earlier engines is shown in Fig. 2. It will be noted that in the engine of Fig. 1 a change in

valve proportion has been made, but the principle features are identical.

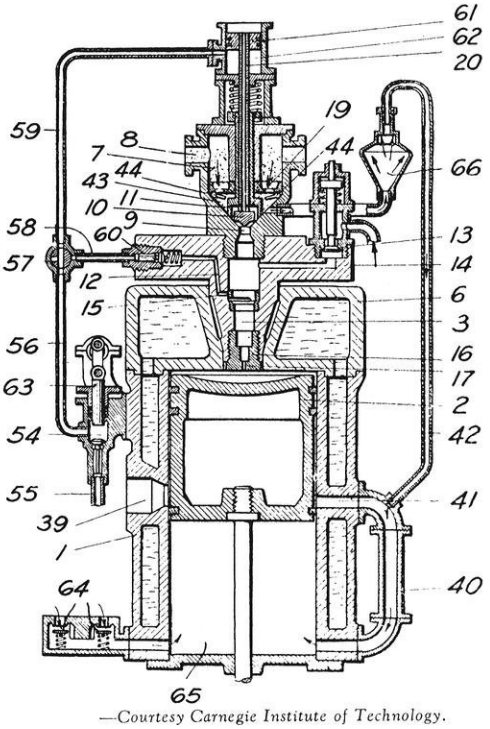
The 4-cycle Rupamotors operated efficiently with low grade coals and lignites. The slightly poorer fuel rate of a 2-cycle engine was greatly offset by the saving in manufacturing cost. It is this engine which will be described.

The two cycle engine has a compression stroke and an expansion stroke. When the engine piston moves upward in compression as shown in Fig. 1, fresh air is drawn into the lower part of the cylinder through the valves, 64. The partial vacuum created also draws air out of the pipe, 42, the bulb, 66, and the conical valve chamber, 43, causing a small quantity of coal dust to fall into the latter from the hopper above. Any fuel drawn into the tube does not pass farther than the bulb, 66, however.

The air under the piston is compressed during the time that the gases above are expanding until the piston rings uncover the intake port, 41, whereupon the fresh air rushing into the upper cylinder sweeps out the burned gases (from the power explosion) through the exhaust port, 39. At this time the coal valve, 33, in Fig. 2A, moves upward to its position in B allowing some of the scavenging air to force out the waste gases in the pre-combustion chamber, 3, in the direction of the arrows. Near the end of the stroke the valve, 33, rises further and picks up 32 (Fig. 2C, 2D) after which the coal dust surrounding the valve is blown into the pre-combustion chamber by the slight air pressure remaining in the upper pipe line; then the coal valve returns to its closed position. At the end of the expansion stroke, we find the working cylinder filled with fresh air and the pre-combustion chamber already containing the fuel dust in suspension with fresh air.

The rapid rise of the piston compresses this air to 500 pounds per square inch and raises its temperature to red heat. The air in the pre-combustion chamber ignites with the coal causing an explosion which drives the piston back downward on the expansion or power stroke. This same process is repeated every revolution of the engine crankshaft.

Governing is accomplished by means of an oil control of the coal supply through the coal valve in order that the engine speed will not vary appreciably, regardless of the load. The coal valve is raised by oil pressure acting on the valve piston, 61, the oil being moved by the pump, 63. A coil spring not shown holds the valve closed against the high cylinder pressures.



—Courtesy Carnegie Institute of Technology.

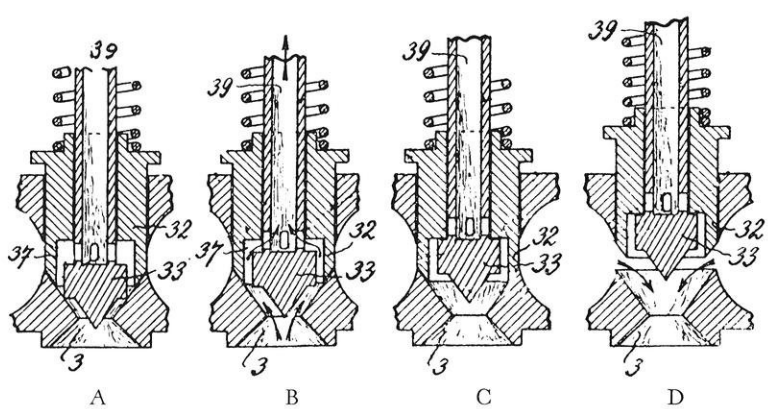
FIG. 1 — *Two Stroke Rupamotor with Fuel Injection Valve.*

As if not to be outdone by the record of other engines in burning more than one fuel, the Rupamotor will operate on fuel oil instead of coal merely by turning valve, 57. It has been run successfully on almost every conceivable combustible solid as well, from anthracite to lignite coals, peat, ground saw-dust, milled straw, rice hulls, refuse from the olive industry — yes, even on peanuts.

A 140 hp. engine delivers 31.5% of the heat energy of the coal as mechanical energy at the crankshaft, or in other words, 0.65 pounds of 13,000 B. T. U. bituminous coal per brake horsepower per hour. At a cost of $5.00 per ton of coal delivered, the fuel expense would be .165c per brake horsepower per hour, while in our latest 7000 hp. oil-burning Diesel engines the fuel cost would be doubled with oil at 6 cents per gallon.

As might be expected, the ash in the coal, although very finely divided, causes cylinder and piston wear in excess of what would occur with an ash-free fuel. This difficulty is not nearly as great as we would imagine. The engines are equipped with hard cylinder liners which are easily replaced and which will last for over one year of continuous operation. Slightly more lubricating oil is used with ordinary engines so that the dust concentration on the cylinder walls will be kept down. The added maintenance, including cylinder liner installation, of the Rupamotor over oil engine is approximately one-fourth the cost of the coal used. Considerable progress has been made in reducing cylinder wear since the first coal-dust engine. We may, therefore, look forward to seeing still further improvements as more engines are built.

Two companies, one in Czechoslovachia and one in Germany, are manufacturing the engines for use in large boats and stationary plants. The fuel oil problem is more acute in Europe than in the United States and therefore we may expect the development to take place there.



—Courtesy Carnegie Institute of Technology.

FIG. 2 — *Operation of Coal Injection Valve.*

Wresting Zinc from Nature's Grasp

A Recent Milling Development in Southwestern Wisconsin

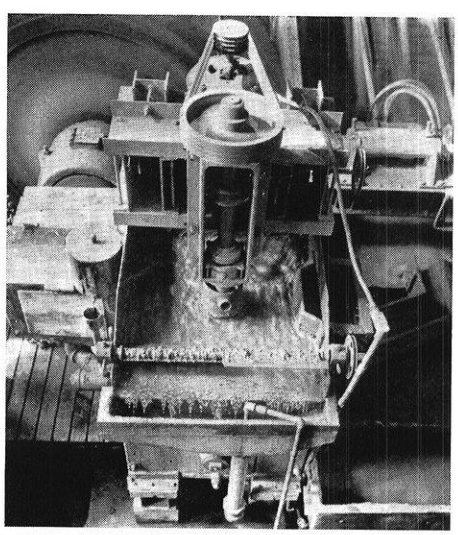
By E. R. Shorey

THE art of concentration, or "milling," ores preparatory to smelting has undergone many changes since the beginning of the present century. The earlier methods in extensive use may be grouped as:

a. Hydro-mechanical, in which specific gravity differences between minerals were the basis of the concentration effected.
b. Magnetic, in which minerals of high magnetic susceptibility were separated from those whose susceptibilities were low.
c. Electrostatic, in which difference in conductivity made some separation possible.

However, certain minerals, of different economic values possess nearly equal specific gravities and the use of hydro-mechanical separations to yield a clean product is limited. Few minerals have a marked magnetic susceptibility so magnetic separations had limited application, and conductivity processes were inadequate in many cases.

Near the close of the last century the peculiar tendency of small particles of certain metallic minerals to attach themselves to gas bubbles formed in an ore-water pulp, and to float away from particles of other and lighter minerals, was noted and a completely new art of milling developed rapidly.



Denver Unit Flotation Cell in Act of Frothing.

After much experimental work it was learned that this tendency called "flotation" could be accentuated and even developed by the use of certain reagents added in small amounts, and we have developed the art so far that, at the present time, one sulphide mineral after another can be floated from an ore in almost any desired order; oxides, carbonates, and native metals are floated with success; and non-metallic economic minerals are separated from each other and from waste rock minerals with comparative ease.

The ores of southern Wisconsin present an interesting example of the improved economies which the new art makes possible.

The writer of this article, with several associates, had conducted a series of investigations of the "flotation" process and its adaptation to Wisconsin zinc ores for a period of nearly ten years prior to 1929. In the spring of that year one of the large companies operating in the district requested the writer's assistance in solving its milling problem.

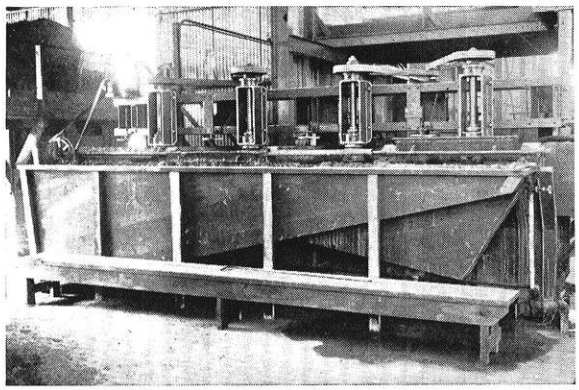
The mills it operated were jig mills in which the practice was essentially as follows: The ores were crushed to approximately one-half inch maximum grain size after which they were passed over jigs. Some fine material formed in crushing was segregated and sent to tables. Both processes involved were hydro-mechanical. Because the presence of small amounts of rock minerals in the final concentrates rendered them unsaleable to smelters, these operations were conducted to make a clean concentrate and as high a recovery of the zinc as was possible. Much zinc was lost, and in addition to the zinc sulphide the concentrates contained iron sulphide as well. Whenever barium sulphate was present in the ore, its high specific gravity caused it to report in the concentrates. The zinc sulphide-iron sulphide concentrates required a supplementary separation, and when concentrates contained barite, they could be sold only under heavy penalty.

The combined recoveries of the jig mill and the supplementary magnetic concentration were seldom over seventy per cent of the zinc in the ore.

The solution to the company's milling problem clearly lay in the adaptation of the new flotation process to the ores.

At this time Mr. L. W. Eastwood, min'28, Ph. D.'31, was working on the general problem of milling Wisconsin zinc ores, and a series of tests were run by him on ores submitted by this company. After several disappointments, these tests were successful and a concentration of remarkable purity which contained over ninety-five per cent of the zinc in the ore was obtained.

It was learned that results were best when the ore had been ground to pass a 200-mesh (0.074 mm.) screen and the following reagents were used for the purpose named; soda-ash to depress limestone, lime to depress iron, and sodium cyanide to depress zinc sulphide. Whatever lead sulphide the ore contained was floated off then with sodium "Aerofloat" (sodium-thiophosphate) as a "collector" and cresylic acid as a water contaminant which made persistent bubbles possible. After the lead sulphide had been recovered, copper sulphate was added to re-activate the zinc sulphide, more lime was introduced to finally depress the iron, and potassium ethyl xanthate was used to collect the zinc sul-



Four Cell Denver "Sub-A" (Fahrenwald) Flotation Machine.

phide. In this process iron sulphide, barite, and limestone were jointly wasted as tailings. These results were really remarkable, as lead sulphide, sp. g. 7.5, and zinc sulphide, sp. g. 4.4, were successfully floated in the order named from a pulp which contained them together with iron sulphide, sp. g. 4.4, barite, sp. g. 4.6, and limestone, sp. g. 2.6.

Following these tests the company built a mill to translate the results secured in the laboratory into commercial practice. In the new mill, jigging was assigned a minor role, and flotation was the principal method of preparing the company's product for the smelters. A study of the accompanying flow-sheet reveals the system finally adopted.

The mine-run ore was crushed in a Blake breaker and roll crushers to pass a one-half inch mesh opening screen. The fine material (less than 1/16 inch in diameter) formed in this crushing was removed at once by classifiers and sent to the head of the flotation section. The coarse fraction was jigged solely to eliminate as much clean limestone tailing as was possible — no attention was paid to considerable amounts of limestone in the jig concentrates. A small amount of coarse clean lead concentrate was taken from the first cell of the jig, and the jig tailings were wasted.

The rough zinc concentrate from the jig was dewatered, and with the thickened fines formed in crushing constituted the feed to the ball mill in which the final fine grinding was done. Here soda-ash, lime, and sodium cyanide were added, in order to provide ample time for each to attack the particular minerals it was added to treat. The product from the mill was classified, and those particles sufficiently small were passed on while those requiring further grinding were returned to the ball mill. Sodium "Aerofloat" was added in the classifier and cresylic acid at the pump by which the fine pulp was raised to the lead flotation cells from which the lead concentrate was taken. As the remaining pulp left the machine, copper sulphate and potassium ethyl xanthate were added and the pulp was pumped to the zinc flotation machine. The final zinc concentrate was recovered here, and the iron sulphide, barite, and limestone in the pulp joined the jig tailings and were wasted. The single concentrating table in the mill was a pilot table over which any of the mill's products could be run to enable the operator to judge the effectiveness of his work as the work progressed. The final zinc concentrate was dewatered, filtered to about 8% moisture, and sold.

Typical zinc concentrate analyses were as follows:

% Zinc	% Iron	% Lead	% Lime
64.1	1.74	0.06	0.36

Zinc, lead, and iron occur in the concentrate as sulphides.

Lead concentrates assayed 73.8% lead for the same period. Ninety-seven per cent of the lead and over ninety-four per cent of the zinc in the ore were recovered.

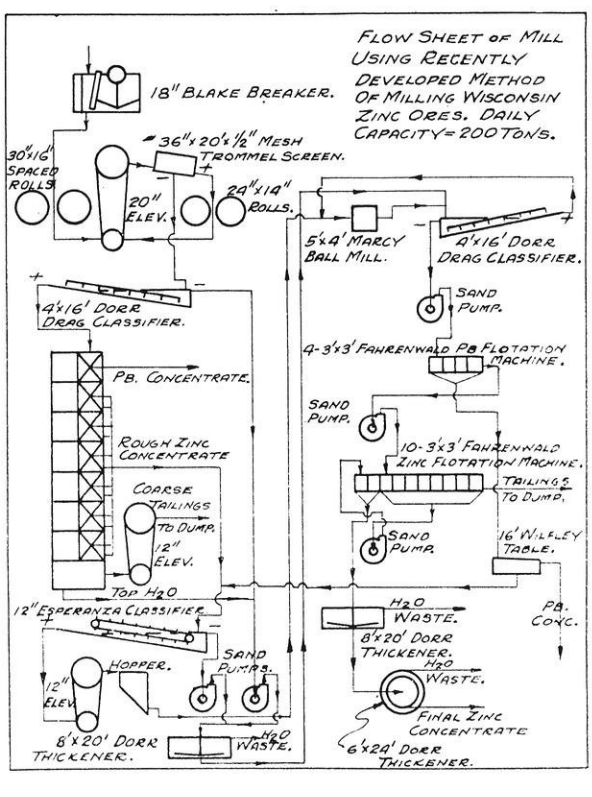
The various reagents and the amounts used in 1932 were as follows: Lime 6 pounds, soda-ash 2 pounds, sodium cyanide 0.30 pounds, potassium ethyl xanthate 0.30 pounds, sodium "Aerofloat" 0.20 pounds, cresylic acid 0.36 pounds, and copper sulphate 1.5 pounds per ton of dry solids.

Due to the shallow ore bodies and favorable mining and milling conditions in southern Wisconsin, costs are lower here than in many mining districts. Complete mining and milling costs for 1932 are given in the following table:

COST SHEET BASED ON ONE TON OF ORE

	At Mine	Jig Mill and Hoisting	Flotation
Labor	.2711	.0479	.0335
Superintendence	.0274	.0048	.0034
Misc. Labor	.0183	.0032	.0023
Power	.1346	.0513	.1057
Explosives	.0981	----	----
Reagents	----	----	.0445
Assaying	----	.0014	.0017
Gen. Operating Exp.	.1236	.0416	.0413
TOTAL	.6731	.1502	.2324
TOTAL COST PER TON OF ORE			$1.0557

Due to a protracted period of very low market prices — during which an all time low for zinc concentrates was established — this mill ceased operations late in 1932. The company is in possession of sufficient ore reserves for several years' operation and, believing that the worst of the depression is over, has plans under way to resume operations.



Truck Trails

Through the Timber

With the CCC

By Robert H. Paddock, c'32

Driving Piling for a 25-ft. Bridge with a Renovated Abandoned County Pile Driver.

THE construction of truck trails was among the first general type of project undertaken by the Civilian Conservation Corps under the direction of the U. S. Forest Service when the camps came into existence in April, 1933.

To those unacquainted with the terminology, a "truck trail" is Forest Service nomenclature for any vehicular route less than a forest highway. Such a route is located, designed, and constructed for either the administration or protection — or both — of the forest area which it serves. It is occasionally designed to further the recreational use of the forest by the public.

Truck trails are in no case intended as speedways; they are a service road only and as such, economy of construction is the objective. If they are so built that they permit average speeds of 15 to 20 miles an hour to be made over them, with occasional "turnouts" where two vehicles can safely pass, they accomplish their purpose.

It can be understood that in the construction of such projects as these, location of the route becomes a prime factor. In some forest areas of Wisconsin such trails can often be economically located in straight shots along section lines and, with a network north and south, east and west, of such routes, adequate administrative and protective needs are supplied. In the sand plains areas such straight lines are as cheap, or very nearly, as any other route that might be selected.

Such is not often the case in northern Minnesota in that area included in the Superior National Forest with the Mesaba Purchase Unit — one of the largest federal forest areas in the country. From the Mesaba iron range and the lake and forest area northward to the international boundary rock ridges, spruce swamps, stagnant muskegs, small lakes and ponds, rivers, sand plain oases, and aspen covered blue-clay areas are scattered about seemingly helter skelter.

A typical problem of 1933 consists of connecting two points — a distance of four miles. A trail between these points would break up an area of more than 30 square miles of inaccessible and high fire hazard area. No high points are available from which the area could be looked at; only a slow and painstaking reconnaissance on foot through heavy underbrush, over thick windfalls and down timber, around swamps and lakes, is satisfactory.

The reconnaissance followed by the actual staking out of the line present many problems to the foot-weary locator for these low cost projects.

Bare rock ledges must be avoided; likewise large and heavily-strewn boulder areas must be skirted or a crossing picked at the best place. The use of dynamite to remove such obstacles is expensive.

Swamps should be missed but if that cannot be done, the shortest and most nearly solid crossing must be located. There is always one place that a crossing will be the shortest but it is often very difficult to find.

The narrowest crossings of rivers and streams must be secured, if such narrow crossings are consonant with good approaches on either side of the stream and if the stream bed at the particular point appears favorable for timbered bridge construction.

Throughout the location period economical choices must be made constantly. If a gravel pit must be used to provide cover for a certain section of the road it is sometimes desirable to so locate the line as to bring it closer to the pit. Will it be cheaper to take a 400-foot swamp crossing than to add an additional quarter or half mile to the distance but secure a firm road base by so doing? Will it be better to have a curved approach to this bridge crossing and do away with a heavy cut on either side or will it be better to locate a straight approach with the consequent heavy cutting of the stream banks? Shall we follow this old tote road and thus eliminate a large amount of heavy clearing or shall we move the line 1000 feet to the east where the requisite clearing will be heavy but drainage and sub-soil conditions will be vastly better? Does the location break up the area to the best possible advantage for protection?

In the Mesaba area one learns that a jack pine stand usually means good going on high dry ground; that a stand of aspen may mean a dry route but that it usually accompanies a blue-clay sub-soil which delays construction in the early part of the season and increases subsequent maintenance cost due to the retention of moisture by the soil. Here, too, it must be remembered that a high percentage of fires each year occur in the spring before the foliage is out. Then, unfortunately, the roads are in the worst condition as they dry out slowly.

Every use must be made of contours to cheapen costs by aiding in the initial construction and assisting in drainage. The locator early learns to study carefully any available maps of the area before he goes into the field, even though

they be far from accurate. He can get at least some idea of drainage directions and use them if possible to aid his construction. Too often, however, drainage seems to be just opposite to the direction of his advance. In a region of small ground level variations and advantage he can gain is important. Areas that seem quite dry and firm in summer will turn out to veritable quagmires in the spring. Careful reconnaissance, however, will determine in these cases where short, but effective, off-take ditches can be placed to drain the water away from the road.

Location, then, becomes a matter of finding the cheapest, though tortuous, winding route around these rock ledges, across necks of swamps, along the dry edges of low, wet areas, hugging each bit of good going as long as possible.

No precise transit line is run but a picket line is established. A line through the brush is cleared by the locator's crew of two or three men, a picket being established every 75 or 100 feet and the line carried forward by lining up the advance picket with the ones already placed. Surprisingly accurate results are obtained by such methods in a region of erratic magnetic conditions. Tangents are often short; occasionally, a straight shot of several hundred feet may be obtained. With short tangents, short radii curves become essential and the locator must have a good idea of curve layout to take the best advantage of ground conditions.

Five Hundred Feet of Corduroy Required on Either Side of a 15-ft. Bridge Crossing.

In general 7 per cent has been established as a ruling grade on these truck trails with ten per cent allowable on distances up to 300 feet, and for shorter pitches grades as high as 15 per cent are permissible. Such top limits permit cheaper and shorter construction than would be possible if it were required to maintain a seven to ten per cent grade throughout the length of the project.

Such a large program of construction was desired during the summer of 1934 that an early start was made — an early start after a wet spring. The road had been cleared but powerful tractors and graders were of little use where the going was at all wet. This meant much hand ditching was required, followed by a delay until the soil dried out. With ordinary conditions three complete passes of the grader secured a satisfactory truck trail. Over swamps, corduroy had to be laid and covered. Low areas not requiring corduroy but not being satisfactory as they were, required a cover of gravel or sand. Otherwise the turnpiked job remained one of natural soil, uncovered and untreated.

Given the allowance of a road of rolling profile, with short tangents and curves, it was possible to keep construction costs low if location was carefully made. Locations were secured in the Mesaba area for which construction costs were less than $1,000 a mile; in a very few cases as low as $300 a mile; and in a considerable number from $600 to $800 a mile. Where rock and swamp conditions were more difficult and plains were scarce, construction costs even with the most careful location which took the greatest advantage of ground conditions ran as high as $5,000 per mile.

What kind of road, it may be asked, can be secured for $1,000 or less per mile? With good location and skillful construction the final result will usually be very good.

Under the peculiar circumstances surrounding the CCC movement in its early days and the haste with which it was organized, adequate supplies or equipment were not always available. Then camp superintendents became by necessity "chiselers." They chiseled abandoned county pile drivers, rebuilt them and used them for bridge construction; they chiseled iron and steel, chains, bars, and odds and ends galore for the efficient furtherance of the job. They chiseled the loan of the county graders or scrapers when new government equipment was slow in arriving. They experimented with apparatus and generally advanced the job for which Uncle Sam would eventually supply adequate equipment. In one case, snooping around an abandoned county highway garage and warehouse, needed equipment was discovered and permission for its use asked of the county, only to discover that the county was ignorant of the equipment's presence there.

At the time when most engineering work is of a detailed and exact nature, having to do with accurate blueprints and precise calculations and construction, the engineer who has the opportunity to engage in work of this nature for at least a short while has a better opportunity to see the basic steps in highway development than he probably will ever have again. It is one side of the job which will soon be but rarely known.

HYDRAULIC TRENDS

The ability of the modern engineer to make complete analyses of hydraulic structures in the laboratory without the losses and failures entailed in laborious hit-or-miss field experiments in construction types was demonstrated by Prof. Lewis H. Kessler in his experimental investigation of the hydraulics of drop inlets and spillways for erosion control structures, the results of which have just been published in an Engineering Experiment Station Bulletin No. 80.

Discharge and head characteristics of tentative designs were determined and as far as possible model hydraulic coefficients were compared with field results to determine accuracy. The tests also provided a basis for estimation of carrying capacity of the various designs and a basis for curves to be used in estimating the discharge for various heads on the field structures.

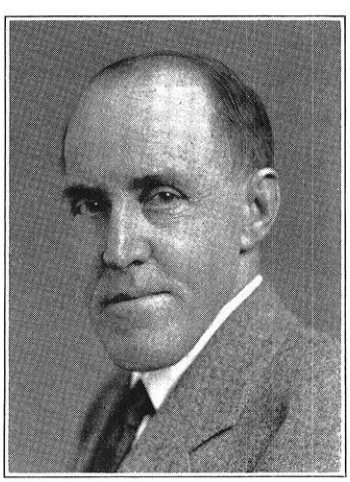
. . . A compass needle has never been to the North Pole, nor can it conceive of it, yet it testifies irresistibly to the existence of such a point.

Successful Badger Engineers

Olaf Laurgaard, c'03

OLAF LAURGAARD, Wisconsin '03, and city engineer of Portland, Oregon, since 1917, was recently elected president of the National Council of State Boards of Engineering Examiners. The organization, whose activities are of great importance to the engineering profession in this country, recognized and honored by its selection of Mr. Laurgaard, a long and effective service in the cause of engineering registration. He has been a member and president of the Oregon board of examiners since it was created in 1919.

The past sixteen years of Olaf Laurgaard's career have been crowded with activity. Under his direction, the City of Portland has carried out a vast program of public works involving the expenditure of about $55,000,000. The situation and layout of the city are such that its development presents unusual problems, and the city's various engineering undertakings have had much interest for engineers throughout the country and have received much attention fro mthe technical press. In the midst of such important technical duties, Mr. Laurgaard has been able to find time and energy for many other activities. As a member of the Oregon legislature in 1917 he prepared, introduced, and secured passage of several important bills, including the irrigation code and the highway code. He was a member of the City Charter Revision Committee, president of the Northwest Society of Highway Engineers, president of the Oregon chapter of the American Association of Engineers, and national vice-president of the same organization, and held an appointment as captain, U. S. Engineers.



—Courtesy Bushnell, Portland.
OLAF LAURGAARD

To round out his activities, he served as director of the Y. M. C. A. and as a member of the Boy Scout Committee. With a son in the university, he was made president of the University of Oregon Dads.

Laurgaard was born in Norway in the little village of Ekne, near Trondhjem, on February 21, 1880. When he was about five months old, his parents came to America and settled in La Crosse, where he grew up and attended school. After completing his high school course, he stayed out for a year and earned money to come to the university. At the university he confined himself rather strictly to the business of getting an education, such being the unenlightened practice of the times. The summer vacation periods were spent building sewers, locating railroads, and running levels for the U. S. G. S. He was graduated in 1903 with a degree in civil engineering.

He had taken a civil service examination for the U. S. Reclamation Service in the spring before he was graduated, and as soon as the school work permitted, he accepted an appointment as assistant engineer. The Reclamation Service was very active at the time, and for seven years Laurgaard was engaged in investigating, designing, and building irrigation and power projects in Oregon, Washington, California, and Arizona. He left government service in May, 1910, to become chief engineer for a private company operating in the same field. Three years later, he became engineer on construction for a power company in the Yakima Valley. This was a short engagement, for in June, 1913, he became project engineer for the state of Oregon on an irrigation project. In February, 1915, he opened an office for private practice in Portland. He continued in this practice until appointed city engineer in July, 1917.

The city of Portland lies on both sides of the Willamette River, which is spanned by the nine large bridges. The outstanding engineering problem of the city has been to open and widen the approaches to the bridges. For a program of widening about forty-five miles of city streets, it has been necessary to acquire much private property for public purposes. As a result of his contact with this application of the power of eminent domain, Mr. Laurgaard has become an authority on the subject, about which he has written extensively.

One of Mr. Laurgaard's assignments while with the Reclamation Service took him to Conconully, Washington, where a hydraulic fill dam was to be constructed for the Okanogan Project. Romance became entangled with engineering for he was married on November 29, 1908, to Goldie May Sherer at Conconully. They have two children. A son, Glenn, will return to Wisconsin in February.

THE CRITICAL ANGLE---

In Which Engineers Put Forth Their Comments of the Play on the Stage . .

TOPSY TURVY TIME The tables are turned. No longer shall hill students whisper archly of their superior social attitudes, of their ability to comprehend what the engineering student, dealing in things, not ideas, does not give evidence of understanding. For the opinion of the engineer of the TVA, presented to the engineering school lately, clashed and was diametrically opposite to the sentiments expressed in the *Daily Cardinal* editorial column of the same day.

Witness the differences! Dr. Morgan counselled the engineers that if they were in school solely to aid themselves in getting high individual incomes they were doomed to disappointment. "But," he added, "if you are in school to assist in raising the standard of living of the country, in adding to the measure of comfort enjoyed by all, you have a good prospect of seeing your dream fulfilled."

At the other end of the heap of this topsy-turvy realignment are the thoughts expressed in the *Cardinal* editorial "Your Safety First—Then Social Ideals." The burden of the article is thus: "Rather let this be taken as an expression doubting the wisdom of counselling the youth of the nation to think of the 'far distant future' when a more perilous condition immediately confronts them." In effect the writer says, "Get a job. Then think of social ideals." But if it were not for the social ideals being followed, however inadequately, in governmental circles, graduating engineers would have practically no jobs to grasp. The depression is not over; the contemplation of our house tumbling about our ears is not pleasant, but, as Dr. Morgan pointed out, if we persist in thinking in individual terms, dire disaster lies ahead.

Engineers are not blind to the difficulties in getting jobs. When practically the only graduating civil engineers who get jobs find their places in the ranks of the technical employees of the Civilian Conservation Corps or in the state relief activities, it becomes practical to think in social terms at once. A "more perilous condition" does confront us, but to fan the air with our hands as our clutches close upon a few scattered jobs will avail us nothing in terms of productive self-satisfying employment to raise ourselves and our fellowmen from the slough into which we have fallen.

. . . A man that is young in years may be old in hours if he have lost no time . . . And yet the invention of young men is more lively than that of old; and imaginations stream into their minds, better and, as it were, more divinely.

—*Francis Bacon.*

THAT BRASS CHECK AGAIN Again appears on the student horizon that perennial threat of censorship of student publications. Fortunately Wisconsin tradition, with its admonition that we "should encourage that continual and fearless sifting and winnowing by which alone the truth can be found," denies the advent of any such oppressive imposition upon Wisconsin publications. Only by encouraging questioning in university circles can we as citizens refute the charge of Irvin Cobb that "We will die for our country, but not think for it."

Certainly good taste should guide. The useless and inane flaunting of obscenity in the faces of intelligent people pays no tribute to the rights of free speech and free press. We may be right in explaining that "obscenity is subjective," and that "who sees the lily on the stalk sees not the dirt upon the stem," but the issues at stake are larger than that of the right of student publications to print articles of questionable morality.

The function of college journals is to inform their readers. Unlike the commercial newspapers, deriving most of their revenue from advertisers and forced to cater to the national low, average intelligence to attract readers for the advertising, the university news sheets are independent in their presentation of editorial opinion.

Colleges should awaken their student while censorship is prone to tag along at the coat tails of progress. As Justice Holmes pointedly remarked, "Free trade in ideas prospers a country," so the free interplay of student thought prospers a university. University publications should be given assurance of freedom from the heavy hand of impending censorship.

. . . All thinking being conducted by use of words, much depends upon the words which get prestige from the dominant activities to which they first apply. We shall, therefore, expect to find mechanical metaphors playing a great part in our social sciences.—*Hobson.*

DO YOU? "It was a most mortifying reflection for any man to consider, *what he had done,* compared with what *he might have done,*" observed Dr. Samuel Johnson.

Why are so many of us content with wandering about, gradually building our minds into a *Poole's Index of Engineering?*

Of how many pieces of classical music can you talk intelligently? Can you truly enjoy a stanza of good poetry — would you know if it were good? Do you find a feeling of appreciation and admiration welling up in you when you hear beautiful and finely formed phrases flowing easily and pleasantly from one who knows how to handle the English language?

Or do you think things like these need not occupy your attention?

Then why do some others (even some engineers) derive most enjoyment in life from the arts? Why, for centuries, has man fled the miseries of life, its little irksome duties, faults, pains, to refuge, comfort—yes, *life itself*—in poetry, music, drama, conversation, the arts? Do you, for a moment, imagine that yours will be a different, a new kind of existence? Will you some day find that you are not as other human beings are? — that your engineering formulae will give you comfort? — that the drone of a well tuned engine will soothe your inner turmoils? — that your soul will find repose and refreshment 'mid the cold steel of reason, proofs, and solution for problems?

Do you think that you can now see why there are, in this university, those which are called *extra-curricular activities?*

. . . Opinion is truth filtered through the moods, the blood, the dispositions of the spectator.—*Phillips.*

DISSIPATION OF NATURAL RESOURCES

Undoubtedly a subject of vast importance and significance, yet seemingly one to be discussed with a shrug of the shoulders, is the destructive exploitation of our natural resources. The Anglo-Saxon method of development, quick returns with no thought of the future, has left its mark on the resources of our country; a mark that will become more pronounced if we continue to exhaust our mines and forests.

In our frantic desire for wealth, we have denuded our forests and removed "paying" ore in such a manner as to cause irremediable loss of large reserves of poorer ore which would have provided a source for years to come.

The rapid and ruthless depletion of our forests has been tragic enough, but, by careful planning and conserving, they can be made a constant source of supply.

However, far more tragic have been the methods used to mine our minerals. Either through the press of competition, the desire for quick and large profits, or unduly high taxes imposed by some governments, only the richest minerals are mined. Unfortunately, in order to mine these minerals at the lowest possible cost, it often has been found that the easiest way is to allow the gangue to cave over the poorer ores in such a manner as to make these ores irretrievable.

Engineers have developed this method of mining and must be held partially responsible for this waste, even though they may have had no administrative powers in connection with the mining operation. It is a strange paradox that the engineer should, on the one hand, engage himself in the business of striving for better efficiencies, simpler complexities, and greater comforts, and on the other hand, be a party to the business of destruction and wastefulness.

The engineer should endeavor to remedy this condition. By using his influence and persuasion to discourage this form of demolition, he will be investing his talents and efforts in an undertaking that will pay enduring returns in dividends of satisfaction.

. . . We see things not as they are but as we are.—*Patrick.*

AN ADDITION TO OUR INFIRMARY

It seems very strange that, well equipped as our student infirmary is, there are no departments for dental or optical care. Many universities realize that the care of the students' teeth is one of the most important concerns of their health departments. Even high schools have dental clinics! Where is ours?

Our doctors assure us that many of our ailments are caused by poor and improperly cared for teeth. It appears sensible, then, to suppose that other branches of infirmary treatment would find themselves less inconvenienced, would be less an expense, were there some competent dentists in the infirmary to prevent on-coming diseases. Moreover, few students care to go to some dentist in Madison — treatment of the teeth soon becomes rather expensive. Too, in a place where many people are living in groups, mouth diseases can spread rapidly. Dishes cannot always be perfectly cleaned. The doctors in our infirmary will tell you that many of our students are troubled with mild cases of Trench Mouth, and that all the tooth pastes on this campus would not banish "pink toothbrush" — a characteristic of this easily attended ailment which gradually grows more nettling and painful.

And how many of us are continually suffering from eye strains of some sort or another!

Why, in an institution such as this, should we be bothered with such petty miseries as these?

True, no definite plan is offered here, but other universities have established workable and satisfactory arrangements for dental and optical care. Why can't we?

GENERALIZATION OR SPECIALIZATION —WHICH?

College professors are divided upon the question of whether generalization or specialization should be given the floor in technical education. That a broad, fundamental engineering training is proving adequate for an average graduate today is apparent, since special fields are the first to be the objects of retrenchment during an unprofitable era.

In a letter written to the editor by R. C. Muir, a Wisconsin graduate, who is the head of the engineering department of General Electric, he writes, "We do not look for a high degree of specialization; we prefer a high degree of understanding of the fundamentals in engineering, supplemented by some economic, cultural, and social education . . . we prefer the engineering graduate who is adaptable . . . we feel the high degree of specialization which is often necessary can be best acquired after he comes with us."

The letter speaks for itself. Then, too, in this tremendously increasing tempo of modern change of design and the supplanting of new methods for old, the problem of keeping text books and experimental equipment from lagging farther and farther behind the trend of the times is becoming very great. An academic institution is daily becoming less able to cover the widening field of specialization that is spreading throughout the country.

Unless public institutions constantly maintain their stethoscopes close to the industrial pulse from year to year, their values as institutions will sadly depreciate.

ON THE CAMPUS

ENROLLMENT INCREASE IN ENGINEERING COLLEGE

Riding high on the wave of the 10% enrollment increase, the highest in the post war history of the State University, the Engineering College records show a total enrollment of 915 for 1934-35 over 826 on 1933-34, a 9.7% increase. The compilation released by the Dean's office reveals the Mechanicals heading the list, with an enrollment increase of 36, followed closely by the Electricals with 30. The Chemicals and Miners follow in that order with the Civils bringing up the rear, having held their enrollment even with last year.

If figures can be relied upon, statistics reveal that the profession of chemical engineering has steadily gained prominence in recent years, since that college has increased its student body from 1932 up to the present time. The mechanical and electrical egineering courses continue the battle for supremacy, while the "bridge builders" and chemists are in close competition for third place. The mining school gaining added momemtum each year, looms as a worthy competitor in the near future.

SON LIKE FATHER

Not only do the engineers believe in the merits of their chosen profession but they encourage their sons to follow in their footsteps. This conclusion was arrived at after a perusal of the Dean's freshman files, which revealed that among the class of '38 are five sons of Wisconsin engineering graduates. John H. Woy, electrical, brings back to this campus a well known name, for his dad was F. P. Woy, c'03, professor of engineering administration. Hugh R. Rather, mechanical, plans to design machinery while his father, Maxwell Rather, graduated in civil engineering in 1913. Sumner P. Youngblutt, mechanical, is the son of F. C. Youngblutt, c'06. Paul M. Ketchum agreed to pursue engineering studies but entered the chemical phase while his dad is an electrical, '06. Louis L. Arnold matriculated in the civil college twenty-five years after his dad, Louis G. Arnold, c'09.

SIMPLICITY AND EFFICIENCY

The acetylene-oxygen welding laboratory, through the efforts of Mr. Dorrans, superintendent of mechanical practice, is the proud possessor of a unique, though simple, arrangement of its thirteen welding stations. Each torch is supplied with the proper proportion of the necessary gas from an overhead piping system, the operator controlling his apparatus by a diaphragm style feed regulator. The compressed oxygen is supplied from tanks at the end of the room and the acetylene is fed into the line directly from its generating plant in an adjacent room. The piping, extending the length of the shop, eliminates the necessity of equipment on the floor, results in greater flexibility in the use of the apparatus, and is of very low initial cost. It is claimed that this is the only installation of its kind in any college laboratory, in fact, in any shop.

RICHARD S. MCCAFFERY

PROF. RICHARD S. McCAFFERY

Sedate, reserved, exacting . . . distinctive, bushy moustache . . . scholarly appearance . . . yet a definite ruggedness apparent . . . inherited as a son of Erin . . . nurtured by long, active years in the open spaces . . . born in New York City . . . Mining degree in 1896 at Columbia School of mines . . . Went places in pursuit of career . . . New Mexico, Chili, Utah, Nevada, Virginia . . . Blew in from the Idaho Mountains in 1913 . . . accepted chairmanship of the mining College in 1916 . . . honorary member of Triangle, Tau Beta Pi, Sigma Xi . . . inventor of improvements on a process of Bessemerizing steel . . . contributor to technical journals . . .

Head of large family . . . four boys, two girls . . . one a lawyer, an architect, a social worker . . . Great on the out of doors . . . enthusiastic camper, true Izaak Waltonian . . . canoeing, yachting, motorboating expert . . . formerly vigorous in all . . . in step with current problems . . . well informed in American history . . .

Favorite sporting magazine is the "Rudder" . . . also Harpers and Scribners . . . Well known in local Boy Scout group . . . famous on campus for his ever present pipe . . . subject of many anecdotes . . . Alleged it can be heard gurling a half a block away . . . once offered a box of cigars in a trade . . . still smokes the pipe.

McCAFFERY AND MacKAY PERFORM RESEARCH ON CAST IRON

Showing promise of contributing substantially to an understanding of certain problems of foundry practice, a research project on the "Properties of American Malleable Cast Iron as Affected by Variations in Method of Manufacture" is being caried on in the Department of Mining and Metallurgy under the direction of Professors R. S. McCaffery and Scott MacKay.

A preliminary survey was undertaken in December, 1933, as part of the CWA program of the Department. The possibility of practical results attracted the attention of the Malleable Club of Milwaukee and this organization of ten foundries offered financial support to continue the work. At present the work of examining approximately 2500 individual cast samples taken at ten foundries under carefully controlled conditions and of correlating the data, is being carried on under a grant from the Wisconsin Alumni Research Foundation.

FACULTY BRIEFS

Prof. Lewis H. Kessler, of the hydraulics and sanitary engineering department, has been conducting experiments with erosion control structures in an effort to aid the farmers in their continuous battle against soil erosion. Annually, millions of dollars and thousands of acres of land are lost and destroyed by heavy down pours of rain which wash away the fertile top soil and ruin farms by the formations of permanent gullies.

Field work on Wisconsin farms was carried on with the testing of four types of concrete conduit flumes, and spillways used with earth-filled soil saving dams for erosion control. The structures were designed in the University laboratories and have proven efficient as to proper control and economy. Prof. O. R. Zeasman of the College of Agriculture and several other engineers aided Prof. Kessler in his project.

* * * *

The building industry, especially where reinforced brick columns are used as building supports, profits from the latest research efforts of Professor Withey of the mechanics department. Results of a series of tests to determine the properties of reinforced brick masonry columns were presented at the annual meeting of the A.S.T.M. The principle conclusion arrived at by Prof. Withey was that the columns should be safe under static loads up to one-fourth of their ultimate strength if careful workmanship included filled joints and good materials.

* * * *

The project, conceived with the idea of using relief labor, was brought to light when Prof. C. C. Barker of the mining engineering college was enlisted by the W. E. R. A. to investigate and report on the possibilities of peat as a fuel through the preparation of chemical assays and necessary experimentation on the material. According to Prof. Barker, the tests have been successful thus far and the project has been carefully launched.

Men are digging the peat out of marshes, transporting it to a brick factory donated for the purpose of processing the material through regular brick machinery and then cutting it into blocks. When the peat blocks have been properly dried, their heating value is equivalent to that of soft coal with the added advantages of clean handling and less soot than the ordinary fuel.

CLASS OF '36, CARRY ON

That the class of 1936 will be well represented among the engineers of the future is no idle prophesy, if the current nomination for the sophomore honors is the barometer. Of notable interest is the surprising fact that among these scholars are many men who have devoted much of their time and talent to extra-curricular activities about the campus. All of which merely proves that the activity man and the student are not of necessity to be placed in separate, distinct categories.

SOPHOMORE HIGH HONORS

	Credits	Gr. Pt. Av'g.
Civil Engineering		
Kutchera, Don Henry	70	2.642
Mechanical Engineering		
Cadwell, James Jay	70	2.671
Electrical Engineering		
Hertel, Roland Fred.	69	2.782
Meister, Melvin Wm.	68	2.779
Whiteside, Robert E.	69	2.753
Chemical Engineering		
Gordon, Donald H.	69	2.869
Halamka, Charles Jos.	72	2.902
Senkbeil, Earl Fred	85	2.835
Williams, Tom Joseph	70	2.642

SOPHOMORE HONORS

Civil Engineering		
Dithmar, Edward U.	70	2.142
Matthias, Clark D.	70	2.342
Wagner, Eldon C.	70	2.60
Mechanical Engineering		
Cole, Allan W.	69	2.565
Gross, Edward W.	70	2.20
Nikors, Leo Sabin	68	2.455
Electrical Engineering		
Scheer, Wilmer Paul	70	2.285
Utter, Frederic D.	69	2.159
Chemical Engineering		
Gillies, James A.	69	2.582
Hougen, Joel Oliver	70	2.242
Larzelere, Jack S.	68	2.426
Mohaupt, Alvin Alfred	71	2.169
Senske, William M.	74	2.418
Urschel, Joseph R.	66	2.363
Van Dyke, Richard J.	70	2.342
Wright, John F.	70	2.257
Mining Engineering		
Nieman, Gilbert Orval	71	2.521

ENGINEERING RESEARCH CONFERENCE

With Dean Turneaure delivering the address of welcome to an assemblage of 160 faculty members, students, and guests, the first research conference of the current year was held Tuesday, October 31, in the mechanical engineering auditorium. The general topic of Automotive engineering attracted the Rock River Valley section of the A. S. M. E. and the Waukesha and Beloit members of the S. A. E. Professor G. C. Wilson of the Steam and Gas department presented a paper on the "Winter Oils for Automotive Engines" in which he analyzed the market oils.

That definite progress is being made in preparing the foundation for the future development of the high speed Diesel engines was assured when R. A. Rose, also of the Steam and Gas department, outlined his research project "A Photo-electric Method for Indicating Ignition Lag and Combustion in High Speed Diesel Engines." Mr. Rose followed his talk with a laboratory demonstration.

HUMIDITY AND THE DANCE

Professor Larson may not pose as an exponent of dry humor, but he unwittingly pulled a fast one in steam and gas 105. Discussing the problem of air conditioning in auditoriums of large human capacity, he cited the test made in Great Hall during the Junior Prom some years ago. "Air conditioning in the Hall during an affair of the proportions of that Prom presents a difficult problem, for the heat generated by the dancers is tremendous!"

ENGINEERS INVADE LAW SCHOOL

Following the beck and call of St. Patrick, yet heeding the silver tongued invitation of Blackstone, three Senior Mechanicals, Fred Bechtel, Harold Albert, and Burton Zien have compromised by pursuing the six year engineering-law course. Striding fearlessly into the ancient brownstone building, law book clasped in one hand and slide rule in the other, the boys have defied all tradition and set a precedent for their brother engineers to follow.

A PUNT MY WORD!.

The slipstick experts are well represented among the leading candidates on the 1934 football squad. Captain Bender, Kummer, Lubinsky, Donaldson, and Budde uphold the honor of the Civil school, while Allen, Barlow and Lindner hail from the mechanical ranks. Parrott and Pohl, well known grid men, owe their allegiance to the Chemical engineers, and "Beef trust" Christianson is the sole representative of the miners. Evidently, the engineers prefer the hard physical contant of the grid sport to the speed and endurance requirements of cross country running for Evan James, electrical, and one of Coach Jones' ace-men is the college's lone color bearer.

« ALUMNI NOTES »

ELECTRICALS

QUIRINO., FELIX, '29, is an electrical engineer contractor with Philight, Inc., Manila, P. I.

PRATT, ROBERT H., '29, was married on July 27 to Dorothy Holt, '30, Edgerton. Mr. Pratt is an electrical engineer at the Globe Union Company of Milwaukee.

YONKO, BERT, '32, is an electrician at the Nekoosa Edwards Paper & Power Co., Port Edwards. He is living in Nekoosa.

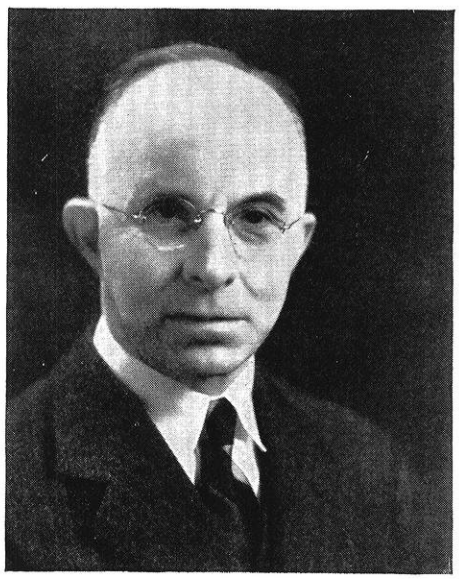
JOHNSON, EDWIN E., '24, is a distribution engineer with the Chicago surface lines.

CIVILS

ACHKI, FERIDUM, '33, of Stamboul, Turkey, was married on August 9th at Stamboul to Dorothy Krumholz, '30, formerly of Arcadia. Mr. Achki is the supervising engineer of a railroad crew in Kurdista, where the couple will live for a year. Later they will live in Stamboul.

KACHEL, JR., WILLIAM F., '33, was married on June 30 at Madison to Virginia Hovey, Madison. Their address is 276 East Wabasha Street, Winona, Minn. Mr. Kachel is a civil engineer with Merritt, Chapman & Whitney Corporation.

KUENZLI, DANIEL H., '29, is working in the La Crosse division of the Wisconsin Highway Commission and living at 115 S. 19th Street, La Crosse.



R. C. MUIR, e'05

His election to a vice-presidency of the General Electric Company was announced in the previous issue of the "Wisconsin Engineer."

FUHR, LAWRENCE, '32, is with the Milwaukee division of the Wisconsin Highway Commission, as instrument man and inspector on the construction of three bridges on Highway 42 north of Kenosha.

SALTZSTEIN, IRVING D., '26, is temporarily engaged as truck-trailer locator for the U. S. Forest Service in Southern Illinois. His address is Camp Eddyville, F4, Eddyville, Illinois.

DAHLMAN, JOHN H., '29, is superintendent of a U. S. Forest Service Camp at Eddyville, Illinois.

LUEDERS, CARL J., '11, is superintendent of gas operation for the Lynn Gas and Electric Co. at Lynn, Mass.

WHEELER, EARL W., '32, has been employed as senior engineer of the Gilmanton division of ECW flood control since August 1, 1933. He was married to Esther Litney of Beloit on September 17, 1933, and at present the couple is staying in Mondovi.

PELESKE, LEO W., '30, is on the staff of the U. S. Engineers in the Duluth-Superior district, acting as inspector on the harbor dredging work. Aided by three assistants, he must lay out the work and see that it is done to specifications.

KRUELL, GEORGE, '10, associate civil engineer in the U. S. Treasury Department in Milwaukee, and **KRIEGER, ELMER,** '25, are trustees for the International Federation of Technical Engineers, Architects, and Draftsman Unions, Local No. 54, which was organized in Milwaukee recently. The union is affiliatel with the American Federation of Labor.

WAGNER, AUBREY J., '33, is a civil engineer on the Muscle Shoals dam in Tennessee.

KING, MAX., '09, formerly with the J. G. White Engineering Corporation on irrigation work for the Mexican National Irrigation Commission, has accepted a position as construction engineer for the International Boundary Commission, U. S. section, at El Paso, Texas.

BETTS, CLIFFORD A., '13, formerly engineer on the Owyhee dam, is now in Washington on the technical staff of the Mississippi Valley Committee. His address is 4042 Interior Bldg.

ROGERS, LESTER C., '15, vice-president of Bates & Rogers Construction Co., and family have moved from Cleveland to 320 N. Sheridan Road, Highland Park, Ill.

JOHNSON, ROBERT C., '17, former director of the CWA in Wisconsin, has been appointed director of the investigation into the relief and tax situation in the counties of the state.

HUBER, WILLIAM G., '20, is a civil engineer with the Pennsylvania Water and Power Co., Lexington Bldg., Baltimore. He has been engaged recently upon the power development at Safe Harbor, between York and Lancaster on the Susquehanna River.

TRUE, HENRY A., '09, C. E.'12, is the land and lease representative of the producing department of the Texas Co. at Shelby, Montana.

SMITH, JUDSON P., '26, as chemical engineer for the Marathon Paper Mills Co., is working on paper mill by-product development, plant design, and research.

MINEAR, VIRGIL L., '23, is with the U. S. Bureau of Reclamation at Boulder City, Nev.

HUBER, WILLIAM G., '20, is civil engineer with the Pennsylvania Water and Power Co., Lexington Building, Baltimore, Md. He has been engaged recently upon the Power development at Safe Harbor, between York and Lancaster on the Susquehanna River.

SCHNEIDER, G. R., '22, is assistant engineer in the U. S. Engineer Office at Zanesville, Ohio. He writes that he is now engaged on hydraulic design work in connection with flood protection for the Muskengum River watershed.

MARGOLES, HARRY, '21, has been with the U. S. Engineering staff since 1931, and at present is construction engineer on the gigantic Fort Peck Dam project in Montana.

KALINSKE, ANTON A., '33, an assistant in the hydraulics laboratory, was married in September to Mildred Weber of Madison.

BARTSCH, LESTER W., ex'31, is working with the U. S. Bureau of Reclamation in the Denver office.

HAGESTAD, '32, has a position with the Starbuck Engineering firm in the Starbuck, Minnesota office.

PALMER, VERNON J., '33, is with the control staff on the Federal soil erosion staff at Coon Valley in western Wisconsin.

BERG, LOUIS L., '32, is in the Superior office of the Wisconsin Highway commission.

SHORE, FRANKLIN K., '28, writes from China, "I joined Messrs. Palmer & Turner, architects, surveyors, and civil engineers, Shanghai, as engineer in August, 1932. I was transferred to Hongkong to design the structure for the new Hongkong & Shanghai Bank building, Hongkong. The tower portion of this building has a height of over 200 ft. and is comparatively narrow. After completing the design, I was transferred to Messrs. Logan and Amps, consulting engineers and constructional managers, Hongkong, to take part in the design and supervision of the construction of the building." Shore, who is a Chinese, had four years' experience in the design of tall buildings in New York City before he returned to China in 1929.

SCHUYLER, PHILIP K., '21, president of the Federal Bridge Company and secretary of the American Toll Bridge Association, died at Walter Reed Hospital, Washington, D. C.

HURD, JOHN T., '01, died at La Crosse on May 8. He is survived by Mrs. Hurd and a daughter. At the time of his death he was city engineer of La Crosse, which position he had held since 1927. His experience included service as engineer for the Province of Isabella in the Philippine Islands and as resident engineer for the Canton-Hankow Railway in China. He was a captain in the engineering corps during the World War.

ERICHSEN, FRANK P., '32, formerly superintendent of the soil erosion control camp at Gilmanton, Wisconsin, has been with the U. S. Bureau of Reclamation at the Denver office since June.

MECHANICALS

ALBERTS, HARRY C., '24, is engaged in a successful patent law practice in Chicago. After graduation, Alberts received an appointment to the U. S. Patent Office as junior examiner, later leaving that position to complete his studies at the Chicago Law School.

WEBB, W. R., '17, is now business manager of the Webb Brothers Company of Sioux City, Iowa.

RICHTER, PROF. ARTHUR, '89, M. E.'91, a former professor here and dean of engineering at the University of Montana, died at Missoula, Montana, in September at the age of 70 years.

Professor Richter, while at Wisconsin, was elected to Tau Beta Pi and also gained distinction by graduating with the highest honors of his class. He continued his education at Cornell University where he received his M. M. E. degree. Returning to his alma mater, he became assistant professor of steam engineering and professor of experimental engineering. In 1908 he was named consultant engineer for the State Board of Control. He left this position and his professorship in 1909 to become dean of engineering at the University of Montana.

Professor Richter was the inventor of improvements for fruit sizing machines and appliances which he developed while president of the Fruit Appliance Company of Yakima, Washington. He was a member and past president of the Montana Society of Engineers and also a member and past president of the Wisconsin Alumni Association of Montana.

KRAUT, RALPH J., '30, has been transferred from the publicity to the accounting department of the General Electric Company at Schenectady.

KEHL, RALPH H., '32, was married on July 21 at Racine to Dorothy E. De Long, ex'34, of Racine. They will make their home at 203 Doty Apts., Neenah. Mr. Kehl is with the Kimberly-Clark Paper Mills.

RODRIGUEZ, SUMNER, '16, is now located in San Francisco as a sales executive with the S. O. Company of California. He is living at 1470 Alvarado, Burlingame, Cal.

BLOEDORN, C., '34, has a position with the Galland Henning Company of Milwaukee.

QUAST, G., '34, is working for the Harnishfeger Corporation of Milwaukee.

KARSTEN, WALTER F. R., '31, is engaged in commercial engineering for the General Electric Company. His address at the company is Room 315, Building 2, Schenectady, N. Y.

ZIMMERMANN, O. B., '96, M. E.'00, was presented with an honorary life membership in the Society of Automotive Engineers at the October 2 meeting of the Chicago Section of the society. The membership was given "for distinguished service rendered to the society.

MINERS AND METALLURGISTS

ERDMAN, EDWARD, '34, is continuing his education at the Milwaukee Extension Division where he is enrolled in the graduate class conducted by members of the faculty of the Mining and Metallurgy department.

MADISON, FRANK H., '13, and family returned to their Washington, D. C., home in August after a six weeks stay in Denver. Mr. Madison is chief of the mining section in the Bureau of Internal Revenue, and the Denver visit was made in the interests of the government.

CRAWFORD, H. DEAN, '27, recently with the Commonwealth Telephone Company at Wausau, Wisconsin, has returned to New Mexico where he formerly was associated with the United Verde Copper Company. This time he is employed by the Peru Mining Company at Deming.

CHEMICALS

DORMER, GEORGE G., '31, is with the Wisconsin Power and Light Co. in Beloit.

LAUTZ, HAROLD, '34, is with the U. S. Forest Service in Milwaukee.

TRELEVEN, ARTHUR, '33, who received a Master of Science degree in metallurgy last year has returned to the University to continue his studies.

CATLIN, JOHN, '30, who was elected Prom King in 1929, is working for the Kimberly-Clark Corporation in Neenah, Wisconsin.

ZUEGE, DAVD C., '21, who is connected with the Sivyer Steel Casting Company of Milwaukee, is chairman of the Milwaukee chapter of the American Society for Metals which held its annual Madison meeting on October 6. He has been listed as a speaker for a six weeks' course in metals to be given by the Society in the administration building of Marquette University.

LACHER, JACK H., '31, who was a former business manager of the "Engineer" is still with the du Pont Celophane Company, Old Hickory, Tennessee. He was married on May 12, to Miss Thelma Graham of Madison, Tennessee.

RIEBETH, THEODORE J., M. S., has been appointed an instructor of mechanical drawing on the engineering faculty of Marquette University. In addition to his mechanical instruction, Mr. Riebeth will be in charge of photographic research at the university.

« CAMPUS ORGANIZATIONS »

A. I. Ch. E.

The student branch of the American Institute of Chemical Engineers has emerged from several years of hibernation. Given an impetus by the new spirit in the engineering school, the A. I. Ch. E. held its first meeting on Tuesday evening, October 30. Prof. Kowalke gave a brief address pointing out the merits of student societies. He placed special stress on the benefits that may be obtained from programs prepared solely by students. Leslie Janett gave a short talk in behalf of the *Wisconsin Engineer*.

The following men were elected officers of the society for the ensuing year: Kenneth Wink, '35, president; Thayer Burnham, '35, vice-president; S. J. Robisch, '35, secretary; Don Gordon, '36, treasurer; and Joel Hougen, '36, junior representative to Polygon. Tentative plans were made for the next meeting on November 14 at the Memorial Union. Meetings are to be held regularly once a month. So, chemical engineers, watch for the happenings of the A. I. Ch. E. in the *Engineer!* Turn out for the meetings! You've paid your dollar, so why not make use of it and reap your benefits? An interesting program is guaranteed each time.

PI TAU SIGMA CHAPTER SPONSORS NATIONAL CONVENTION, NOVEMBER 22-24

The Wisconsin Alpha Chapter of Pi Tau Sigma fraternity will act as host for the annual convention of the organization to be held November 22 to 24. Delegates from schools throughout the middlewest are expected to attend the meetings which will be held at the mechanical engineering building. Officers of the local chapter who are in charge of arrangements are: William Van Ryzin, president; George Hausler, vice-president; Roald Amundson, secretary; C. Bradford Kniskern, treasurer; and William Hodgins, corresponding secretary. The convention business on Friday, November 23, will be concluded by the initiation of the following mechanical engineers into the fraternity:

SENIORS	JUNIORS
H. W. Alyea	J. J. Cadwell
C. L. Jasper	A. W. Cole
T. V. Johnson	L. W. Griffith
I. R. Kraemer	E. W. Gross
W. R. McMahon	L. S. Nikora
W. A. Pollock	
R. K. Smith	

Following the initiation a banquet will be held in honor of the delegates and new initiates at the Memorial Union. Professor G. L. Larson, who has been active in the organization for many years, will act as toastmaster for the occasion.

On Saturday, November 24, the delegates will be taken on an inspection trip through the Forest Products Laboratory after which they will attend the Wisconsin-Minnesota football game.

A. S. M. E.

At the first business meeting of the year, held October 24, in the auditorium of the mechanical engineering building, Prof. B. Elliott gave a short talk in which he outlined the methods and advantages of membership in the national organization subsequent to graduating from college.

The organization's plans for the year were formulated and committees were appointed. The program for the evening featured a discussion on "Archery and its Relation to Engineering," by Irving Kraemer, m'35. In his talk Kraemer traced the development of the modern bow from the old English and Turkish weapons. He showed how bows and arrows are designed with precision and how mathematics and mechanics may be applied to their construction.

POLYGON

Approximately 450 engineers attended the "Smoker" on October 31. This was one of the largest turnouts ever experienced by the engineering school in the way of social activities and speaks well for the success of the Polygon Activity Plan.

Prof. Mathews gave a very interesting talk on "Ballistics." His talk was followed by musical numbers by the Busse Trio and dancing by the Williamson sisters.

The beer and lunch following the main program, revealed rare accomplishments in the art of singing, eating and drinking — abilities never before suspected of an engineer.

The Polygon dance is scheduled for December 7. Because of the large number expected, Tripp Commons is being reserved along with the Great Hall for this event.

Two popular Campus Bands are booked for this all-engineering function and their identity will be revealed later.

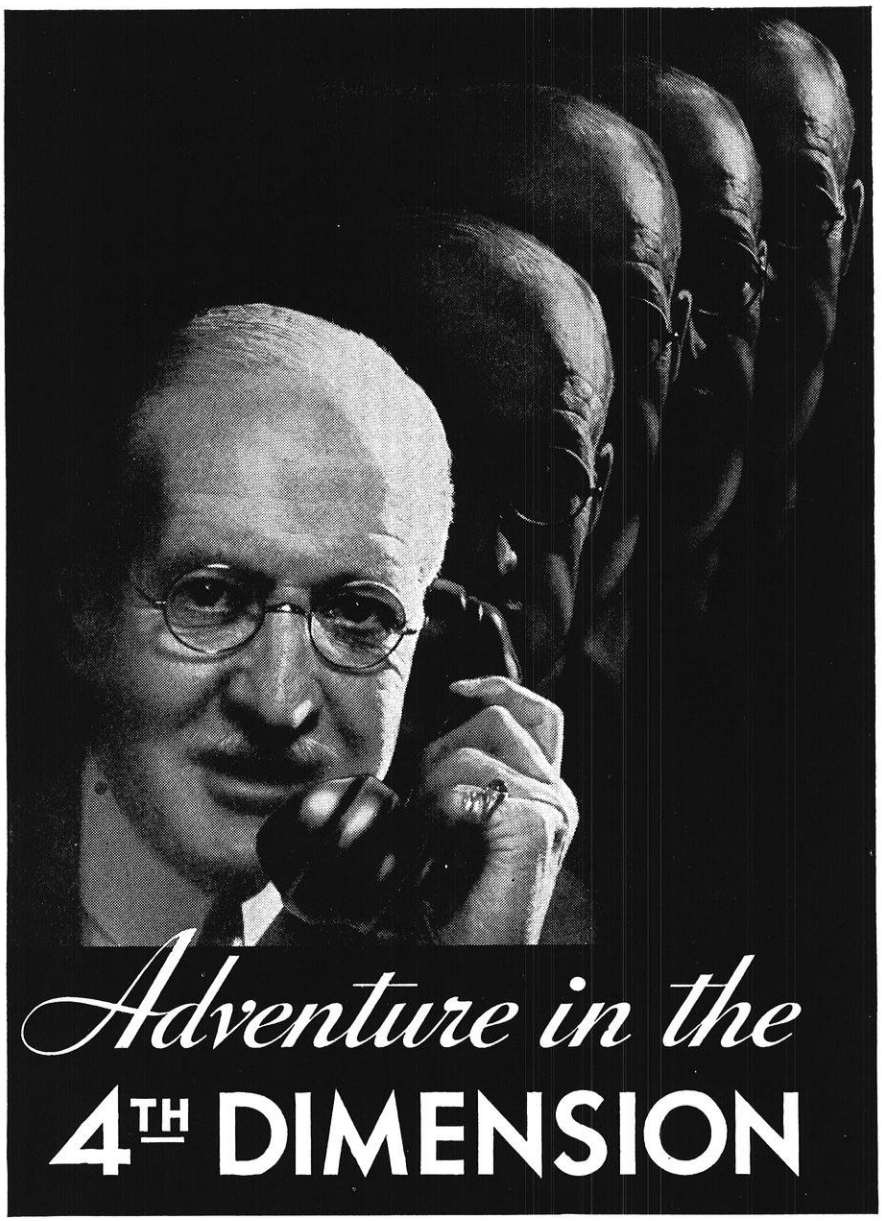
We wish to make this dance one of the big events of the semester both in numbers and pep, so be present. Plans for admission to this dance by your Activity Fee Card will be announced later.

A. I. E. E.

The student branch of the A. I. E. E. held its first meeting of the year on Tuesday, November 6, in Tripp Commons at the Union. About seventy men attended. Prof. Tracy spoke briefly on the structure and present status of the local chapter. An executive committee which was elected consists of L. Britzke and J. Kuzela, seniors; O. Welker and R. Oeting, juniors; and J. Schuele and Kirth representing the sophomores and freshmen.

Movies from the Bell Telephone Company were shown and refreshments were served.

. . . Human nature is so large, life touches life at so many points, and words are so elusive.—*Erwin F. Smith.*



Adventure in the 4TH DIMENSION

You speak into the telephone. Your voice, your personality, part of *you* is projected far and wide. In effect you are in two places and times at once—evening in New York, afternoon in San Francisco. Or you're in Washington today and in Sydney, Australia tomorrow—at one and the same time!

The telephone's power to put a person where he wants to be—at the psychological moment—proves tremendously valuable. In domestic and foreign business, in national and international affairs, in friendly social contacts, it permits a quick interchange of ideas and immediate understanding.

Why not drop in at home tonight — by telephone? For a lot of pleasure at bargain rates, call by number after 8:30 P. M.

BELL TELEPHONE SYSTEM

A SLICE OF "PI"

CALL B. 3.1416

By

KOKO-NUT
KREME

Engineers' Monickers a la Pi

● While returning from a swim one DAY in the muddy WATTERS of the creek, a young CHRISTIAN sought a WINK of sleep at a nearby CHURCH. The PARSON who had no HART WENDT after the GOODMAN with a BROOME who HEADed for the WOOD, HERTLEing DE ROSE BUSH which was near the PLACE, so he would not get RAPPed on the BEAN. He ran swiftly for many RODDs so the PARSON would not KETCHUM. He finally became MOOREd in the NEIGHBOURing MAERSCH. RATHER GRIEPed because he was in the BOGUE up to his ADAMS apple and far from HOLM, he asked the POWERS that be, to send a NOBEL MANN to his rescue or else he'd start KNAKEing his GLASS HEAD against a STONE. While he was watching a white BAIRD fly away from its RICE and BERRYs on the BEACH after being disturbed by a FOX who was chasing the big bad WOLFE, two GAY lovers came along from the EASTWOOD. He yelled at the boy as he was KISSINGER and again after he had KUESTER. The girl smiled and his yelling didn't seem to BERNER up at all. He offered them a FINN for a lift and a swig of LUECKER because he was getting COLE. When they just stood GAPEN at him he got in a SWETT and said "HOUGEN I get out, you SMART HEGGs?" Thinking that they had better not BURNHAM up any more, they said, "WILLOUGHBY here if we send a TRANE out from the BERG for you?"

He finally GOETZ out after they had left and TOCK himself home to his PARROTT and family. *The COOK, FULLER than usual, because she had been out on a BENDER with the BREWER let him in.*

● According to all reports, the civil engineers had quite a session up at Devil's Lake this summer. Baraboo is still in the process of recovering from the Saturday night invasions. The dinner table demonstrated that Darwin's principle of the survival of the fittest is still in force. Reach (the boarding house kind) was also a great asset in eating. Tommy Gilbert grew homesick every week-end and left for Madison whenever possible. Trester and Donaldson missed the fire run on July fourth and thereby received a free bath in the warm waters of the lake. Fire Chief Halverson tried using his foot as a pile driver and as a result nearly amputated his index toe on a rock. The departure of Wessely served as an incentive to finish reports, causing Frank Matthias plenty of extra work. More later - - -.

A Victory for Morpheus

● Two departments, who have boasted that a student never slept while attending their classes received a severe series of jolts recently. A man named Friday fell asleep Tuesday in his Shop 1 class and Frosh Lewis Arnold took the nod in Chemistry 2a lecture.

High Humidity

● "Speed" Faulkes, while out on a nocturnal saunter at Devil's Lake last summer, forgot where the pier ended and thus became wet.

Nota Bene!!

● We are happy to announce that the Millar who was recently in the midst of a football controversy, was not the Dean Millar of our own engineering school.

The New Science, Entrollopy

● Urschel, who has completed his plans for a steam ship which will automatically pick up speed while traveling toward the North Pole, is now working on a phase of Steam Engineering called as he states it, Entrollopy.

Contrast

● Vic Pape, civil, was seen entering Lohmaier's and Amber Inn one evening a short time ago clad in a pair of fastidious pajamas and a bath robe. He escorted a girl friend who was attired in formal dress. "It was only a dare," says Vic.

What HO! Roman!

● Bob "Seneca" Haslanger, noted student of Greek and Roman classics and also an engineer, gave an unillustrated lecture in Ch E 115 recently on the meaning and value of "M". According to him, the value of "M", instead of depreciating like Amalgamated Monkey Wrench stock, has increased from a thousand to a MILLION. Whether this was a gradual or sudden change, was not stated.

● Bill Gay, who has conquered most of natural laws of physics and chemistry, met his Waterloo the other day in the shape of the law of Gravity. Bill ascended a tree, for some unknown reason, probably in search of nuts, and failed to maintain equilibrium conditions. He found himself about a second later looking up at the place where he just was. Bill will now stuff the ballot box for any state candidate who advocates the repeal of the law of gravity.

Research Department

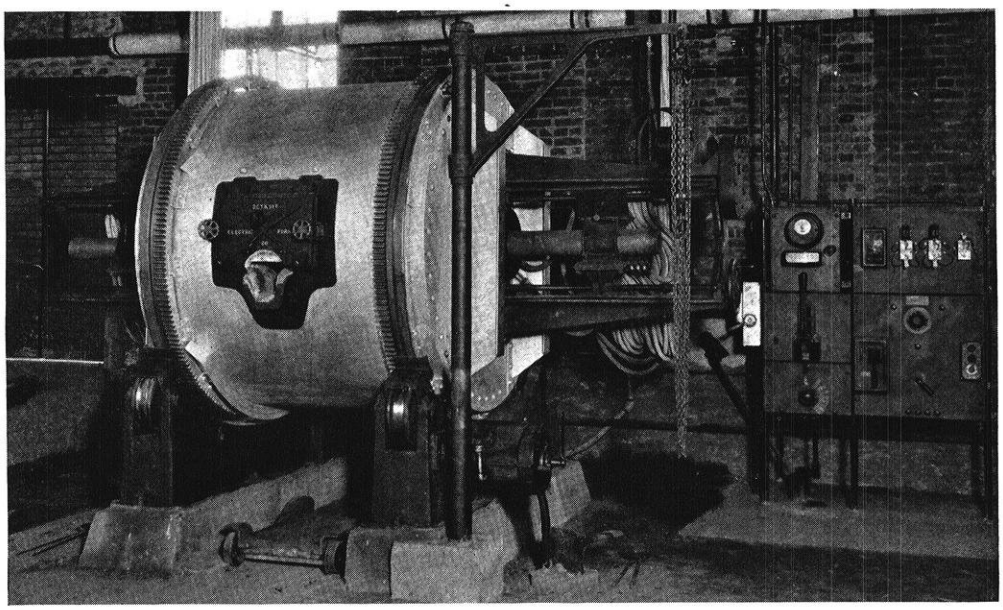
● Man, we find, contains fat enough for seven bars of soap, sulphur enough to rid a dog of fleas, iron enough for a medium-sized nail, magnesium enough for a dose of magnesia, sugar enough to fill a shaker, lime enough to whitewash a chicken coop, phosphorous enough to make 2,200 match tips, potassium enough to explode a toy cannon, and the entire collection of ingredients can be purchased for the sum of 98c.

ENGINEERING REVIEW

A Conventional Arc Furnace Finds a New Use in the High Strength Cast Iron Field

Recently the rocking type, indirect arc furnace has been adapted to the smelting of iron after having been used satisfactorily with non-ferrous alloys for some time. The arc in this furnace is maintained in the center of a cylindrical unit, thereby heating the melt in the lower part of the barrel and the refractory lining above by radiation. By rocking the furnace back and forth the heat of the lining is transferred to the metal giving a fairly good heat transfer.

The reasons for the delay in applying this type of furnace to ferrous uses were the lack of a suitable refractory for use with iron and the constantly fluctuating demand for any one type of high strength cast iron. The high temperatures required in the modern cast iron manufacturing practices of from 2950 to as high as 3000 degrees Fahrenheit can now be resisted by a new refractory of mullite mixed with a diaspore clay.



—Courtesy Metal Progress.

Indirect Arc Furnace (Rocking Type), 3000 lb. Capacity, in Carondelet Foundry, St. Louis.

Convention of Engineering College Magazines as a Link in the Technical Journalism Field

When the organization of Engineering College Magazines, Associated, held its annual convention at Rose Polytechnic Institute in Terre Haute, Indiana, last month, a group of 70 editors and business managers convened and in two days learned a good deal about this business of publishing an amateur publication. Inasmuch as the field of teaching technical journalism is still in the first stages of development, the engineering journalist is somewhat handicapped as compared with the student engaged in publishing daily periodicals, who is usually a student in a journalism department. The discussions at the convention, lead by Leonard H. Church, McGraw-Hill publication representative, were for the primary purpose of acquainting the delegates with the methods and means of combining straightforward engineering thought with accepted and conventional editorial and business policies.

Robley Winfrey, professor of civil engineering at Iowa State, and retiring chairman of the group, conducted the business sessions at which Leonard Church was elected chairman, Professor J. Doland, University of Illinois, with Professor R. Beckman, of the technical journalism staff of Iowa State, were elected vice-chairmen of the organization.

In the annual competition conducted between the twenty members of the group, the *Wisconsin Engineer* received two awards. The alumni notes section was awarded third place with the *Iowa Transit* and the *Iowa Engineer* carrying off first and second place.

In the competition for the best student written article, the article written by John Brennan for the May, 1934, issue received second place, an article in the *Tech Engineering News* of Massachusetts Institute of Technology receiving first place.

Delegates of the *Wisconsin Engineer* who attended the convention were L. G. Janett, W. H. Tock, and G. H. Cook. During the course of the sessions, four new magazines were admitted to membership after satisfactorily passing through a probationary period. The new magazines are: The *Villanova Engineer,* the *Washington State Engineer,* the *Arkansas Engineer,* and the *N. Y. U. Quadrangle.* To these magazines the *Wisconsin Engineer* extends a hearty welcome and best wishes.

A Motor with a Personal Touch

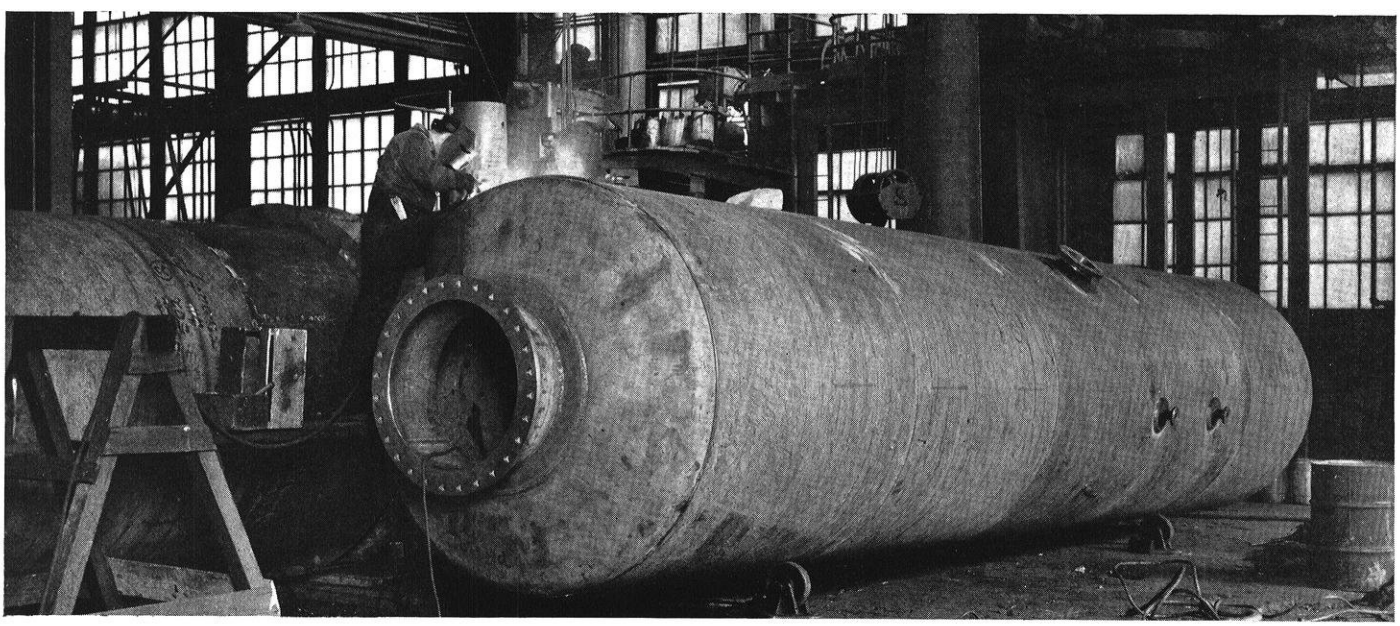
On certain mornings during the summer months a round-bottomed clumsy boat was heard and seen puttering across Lake Monona. Engineers of the Shop 7 class would have recognized the familiar noise. The staff in this course developed the one cylinder, two cycle, three-quarter horsepower gas engine, which every junior engineer has a chance to construct, into a neat inboard motor. Mr. Puddester was especially interested in this experiment. The motor with a two and one-half inch bore, a two inch stroke, and a rotary valve, when tested on the rack showed 2250 rpm, and in a brake test registered 1500 rpm at ¾ bhp. A shaft extended from the crankshaft, actuated a two blade, six inch propellor. On the average, inboard motors weigh from 27 to 133 pounds. This particular type weighed 38 pounds. An interesting feature was the deflection baffle located on the head of the piston. Since the motor was of the two cycle type, such an arrangement was necessary in order that the incoming fuel was not lost in the escaping exhaust. It is claimed that the engine can be easily adjusted for driving lawn mowers, cream separators, and small water pumps. Incidentally, every part of the motor was made in the University of Wisconsin shops.

Columbium - -

A New Alloy Metal in Stainless Steels

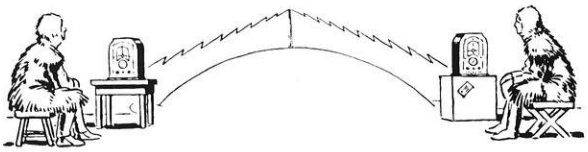
The stainless steel of great importance today is an open field for further experimentation to improve its already adaptable qualities. Known as alloy 18-8 because of its approximate composition of 18% chromium and 8% nickel, in addition to iron and carbon, the addition of a new element, columbium, has resulted in a better stabilized product.

Dr. John A. Mathews, in his recent second edition of *The Book of Stainless Steels* has found from his research that a ratio of columbium to carbon of ten to one produced a steel that did not disintegrate or show grain boundary attack when treated by a copper sulfate solution in sulphuric acid at from 600 to 1500° F. He also showed that a ratio of only four to one resulted in an alloy that was not appreciably attacked after treated with boiling copper sulphate for 220 hours. The use of 18-8 where corrosive conditions are extant is especially adaptable for fractionating columns of the type shown in the illustration.



Welding 3/8-inch Plates of 18-8 Stainless Steel in Construction of a Twenty Ton Fractionating Tower.

G-E *Campus News*



TWO POLES IN ONE

Radio entertainment and "airmail" have been sent to the Antarctic through General Electric's short-wave station W2XAF, ever since Rear Admiral Byrd arrived there last year. Recently, in conjunction with a Byrd program, another was sent out to Rockwell Kent and his son in the Arctic region—thus linking simultaneously Americans who are, in the matter of latitude, farthest apart. Governor McNutt of Indiana and other prominent Hoosiers spoke to the Byrd Expedition from Indianapolis in a program sponsored by the *Indianapolis Star.* Immediately afterward, the Coffee House Club, an organization of artists and writers to which Rockwell Kent belongs, sent music and greetings from New York to him on the island of Ubekjent, just off the coast of Greenland, 600 miles within the Arctic circle. Features of this program were special greetings from Mrs. Kent and her daughter, and a talk in the Eskimo language by Vilhjalmar Steffanssen, Arctic explorer, for the benefit of the natives. Both programs were broadcast over a coast-to-coast NBC network as well as by short waves.

GOOD-BYE, SMOKESTACK

For many years, the old central heating plant at Mt. Holyoke College in Massachusetts, with its tall, unsightly smokestack, barred the way to certain necessary improvements and landscape developments on the campus. This summer the old boilers and the smokestack were torn down. In one of the buildings of the old plant stand 120 General Electric oil furnaces arranged in circular groups of five. Fifty-two more G-E oil furnaces are installed in the smaller or more isolated buildings of the campus, operating singly, in pairs, and, in one instance, in a battery of 10. In the central plant, only as many groups of furnaces will operate as are necessary to maintain the required steam pressure. The remainder will be shut down, avoiding stand-by losses. The individual furnaces and small groups in distant buildings permit the abandonment of some of the longer runs in the underground steam-distribution network. The high efficiency of the system is expected to produce savings which will pay for the installation in five to seven years. In addition, as a result of the more careful regulation of temperature, it is expected that health conditions at the college will be considerably improved.

The main plans for the system were drawn up by C. W. Colby, consulting engineer. D. W. McLenegan, Wisconsin, '21, assistant engineer of the Air Conditioning Department; W. O. Lum, and H. R. Crago, Penn State, '18, both of the same department, handled engineering details for General Electric.

FLYING POWER PLANT

Gold was discovered in 1925 along the Bulola River in New Guinea, an island just north of Australia. Prospectors worked the richer veins by hand methods, and packed their "take" on the backs of natives through 40 miles of cannibal-infested and nearly impassable jungles to Lae on the coast. After the best veins had been worked out, it became apparent that placer operations on a large scale would pay if the necessary dredges and other machinery could be brought to the location. Land transportation was impossible, so a plane was sent in. The pilot found a spot to land, and a flying field was cleared off.

Four 875-kv-a. General Electric waterwheel generators were among the equipment ordered. When they arrived at Lae, they were transferred to huge all-metal Junkers freight planes and flown to the location piece by piece. The largest single pieces had a net weight of 6545 pounds. As the load limit of the planes is 7000 pounds, it was a tight squeeze. D. B. Gearhart, Iowa State, '27, of International General Electric, Inc., handled the order for the Company.

96-83DH

GENERAL ELECTRIC