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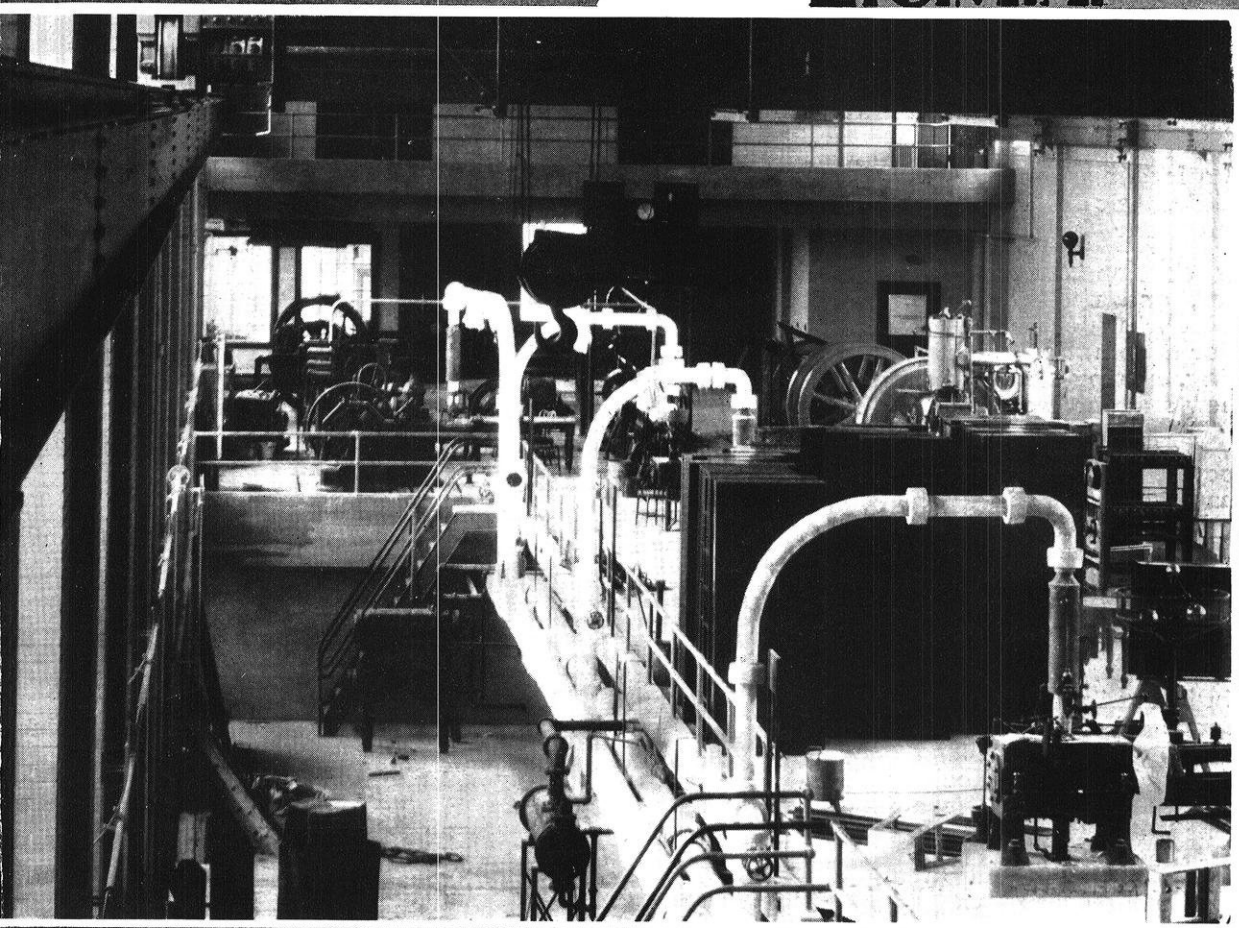
THE WISCONSIN ENGINEER

MEMBER E.C.M.A.



OCTOBER 1931

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The Wisconsin Engineer

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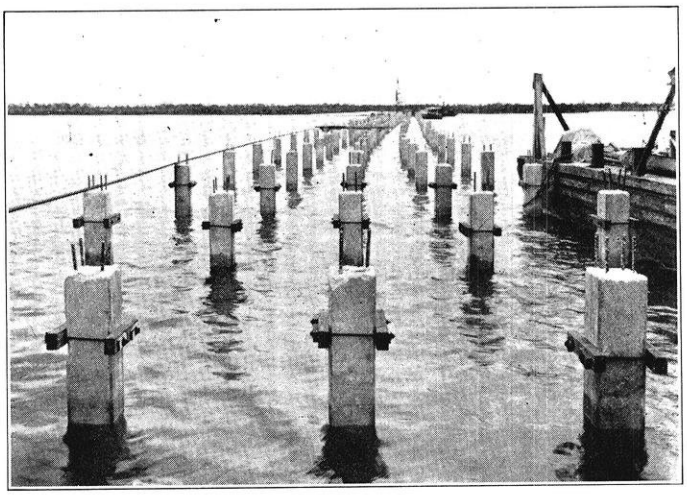
Deep Water Complicates The Task Of

Staking Out a Sea-Going Viaduct

Across Boca Ciega Bay

By Leslie F. Van Hagan
Professor of Railway Engineering

THIS story of the staking out of a sea-going viaduct, where the engineers had to lay out a curved structure in water and devise means for keeping the pile-driver on proper alignment during construction, is written for the entertainment of the students in civil engineering who must of necessity take the well-known course in "Curves". The story should give the student engineer a better perspective of the course and make apparent the necessity for understanding thoroughly the geometry of curves. The difficulties of dealing with curves are not confined to the computations; they include the practical problems presented by field conditions. In fact, the latter are much more difficult and interesting than the former, and call for much originality. The solutions for field difficulties cannot be reduced to a formula.



—Courtesy Raymond Concrete Pile Co.

The heavy concrete piles were driven accurately to curve in six feet of water.

The Boca Ciega Causeway is near St. Petersburg, Florida. It crosses Boca Ciega Bay and connects the mainland to a reef known as Long Key. It was built in 1927 by Pinellas County under the direction of the county engineer, C. E. Burleson (Tennessee). Mr. W. R. Kenoyer (Purdue) was the resident engineer. He has kindly furnished the details upon which this story is based.

The causeway is a concrete structure supported on precast concrete piles. In the center there is a two-degree curve 1005.8 feet long. Originally the water at the curve was one foot deep at mean low tide, but, for the convenience of the contractor, it was dredged to a depth of six feet early in the proceedings.

The tangents were run to an intersection at low tide, and the P. C. and P. T. were located by chaining, also at low tide. The work was checked by triangulation so that it was known positively that the P. I., P. C., P. T. and the intersection angles were correct. It was from this information that the final bridge plans were made.

Permanent markers made of 1¼-in. pipe were placed at the P. I., P. C., and P. T. They were accurately placed, the pipe being driven into the ground. The pipe had a coupling just above the ground or above tide water, as the case might be. When the point was not being occupied by the transit, a 10-ft. section of painted pipe was screwed into the coupling to serve as a sight.

The P. C. of the curve came in water too deep for the transit, so temporary wooden piles were driven and braced, and a platform was constructed for the instrument. This point was transferred to the bridge floor when that became possible.

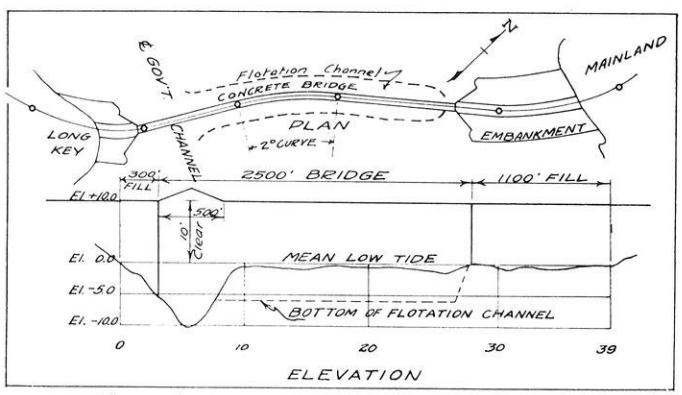
The plans called for five-pile bents to be located radially, with the center of the bent on the center-line of the curve. The original plan was to set a marker on a pile at

the center of the curve, run an outside offset curve far enough from the center-line to clear the bents, and set stakes for each pile by lining in between the offset curve and the marker at the center of the curve. In accordance with this idea transits were set up simultaneously at the P. C. and the P. T., right angles were turned from the tangents and a pile was spotted at the center of the curve. However, the dredging of the channel for the contractor's equipment caused a change in the plans and a new scheme was developed.

Briefly stated, the new scheme was to locate the outside pile in each bent by means of the transit and tape; then to fasten a floating template to the pile just set and to line in the template by sighting on the pile located at the center of the curve. The remaining four piles in the bent were then driven through slots in the template. The work was greatly facilitated by this template which was constructed by the contractor from details prepared by the engineers. It was made of heavy timbers and supported by steel drums. The slots for the piles provided one-half inch clearance on a side and were made two feet long to permit lining in on the curve. Movable blocking made it possible to spot the piles within one-quarter inch of the correct distance. A hinged joint through the templet, three feet from one end, permitted a section to be folded back so that the templet could be withdrawn after piles were driven.

The bents were spaced 24 feet center to center on the center-line of the causeway. The outer piles were fifteen feet from the center-line, so that the transitman ran in his curve using a radius fifteen feet longer than the proper radius for a two-degree curve. The chord lengths on this offset curve were 24.133 feet long. Curve notes were computed for chords of this length and for a curve of 2879.93-foot radius.

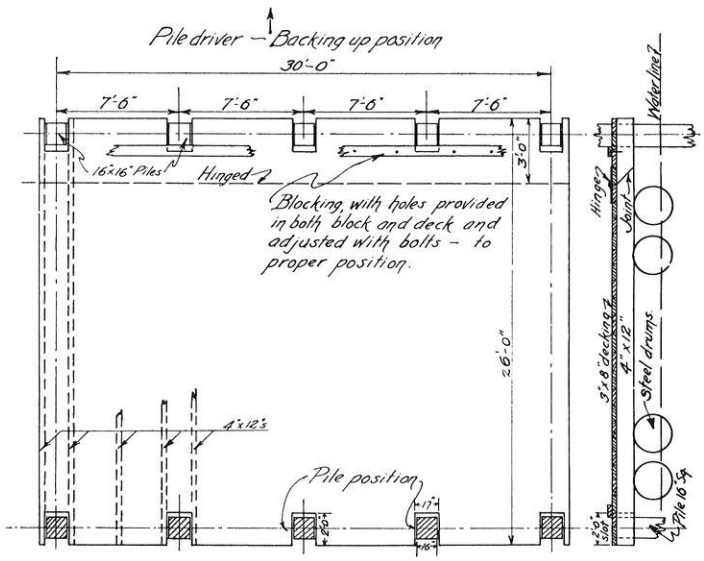
The pile driver backed up on the work so that the leads were at all times visible to the transitman. The procedure was as follows: One bent having been driven, the template was floated to the next succeeding span. This located very closely, sometimes exactly, the position for the piles in the next bent to be driven. The pile driver lifted a concrete pile from a barge and stood it in the leads ready for driving.



Plan and Elevation of the Boca Ciega Causeway at St. Petersburg, Florida.

A tapeman working on the floating template gave distance and the transitman gave line. As soon as a bent was driven, the chord distances to the outside and the inside piles were measured accurately and marked on the bent by the tapeman before the template was moved.

The work of cutting off the piles, placing the forms, and pouring the caps followed so closely behind the pile driving that it was possible to set the transit within a reasonable distance of the driver. An adjustable tripod for the transit made it possible to set up on either the finished cap, the forms, or a temporary platform built for the purpose.



A Floating Templet Facilitated the Spotting of the Piles.

THE OCTOBER COVER

This month's cover illustration shows the interior of the new steam and gas laboratory in the new Mechanical Engineering building. The big five-ton gantry crane which obviates the use of the familiar old chain hoist of the old laboratory can be seen along the top edge of the photo. The permanent engine mountings have been made in the north end of the lab, while the south end has been equipped with floor slots which permit temporary installations so that a large number of modern engines can be tested on a loan basis. The condenser pit which can be seen along the left side of the picture has large doors built in so that trucks can back into the pit to be unloaded by the crane. The main foundations have been separated from the rest of the building so that vibration during tests will be reduced to a minimum. The photograph is the work of Richard W. Coolbaugh, m'32 and Phillip Werner, e'32.

It is not the critic who counts; not the man who points out how the strong man stumbled, or where the doer of deeds could have done better. The credit belongs to the man who is actually in the arena; whose face is marred by dust and sweat and blood; who strives valiantly; who errs and comes short again and again because there is no effort without error and shortcoming; who does actually strive to do the deeds; who knows the great enthusiasm, the great devotions, spends himself in a worthy cause; who at the best knows in the end the triumph of high achievement; and who at the worst, if he fails, at least fails while daring greatly, so that his place shall never be with those cold and timid souls who know neither victory nor defeat.

— Theodore Roosevelt.

What the Class of 1931 Is Doing

CHEMICALS

Lacher, Jack H., is a student operator in the DuPont Cellophane Company's plant at Old Hickory, Tenn. At present he is taking a training course, getting acquainted with the various parts of the plant. His address is: Hillcrest Hotel, Old Hickory, Tenn.

McKee, Frank J., is back in school doing graduate work in Chemical Engineering.

Spicka, Edward A., is with the Colgate-Palmolive-Peet Company at Milwaukee, Wisconsin.

MECHANICALS

Gibson, G. W., is in the drafting department of the Kimberly-Clark Corporation at Neenah, Wis. He is working with M. F. Mortensen, '31.

Hopkins, Kenneth E., is in the farm implement department of the Freeman Manufacturing Company at Racine, Wis.

John, Herbert A., is an engineer for the Milwaukee Tank Works at Milwaukee. They make gasolene pumps and underground tanks.

Karsten, Walter F. R., is a student engineer with the General Electric Company at Schenectady, New York.

Miller, Donald J., is employed by the Cities Service Company at Denver, Colorado. He is a student engineer there.

Mortensen, M. F., is in the drafting department of the Kimberly-Clark Corporation at Neenah, Wis. In a few months he expects to go to work in the mill to learn the business.

Petersen, Alfred J., is a salesman for John Petersen, selling water softeners and tanks. He is located in Madison.

Parsons, Oliver L., is an assistant engineer of the A. O. Smith Corporation at Milwaukee, Wisconsin.

Penn, William, is a student engineer of the Aluminum Company of America. Address: c/o M. M. Anderson, Personnel Mgr., 2400 Oliver Bldg., Pittsburgh, Pennsylvania.

Rudolf, George A., is attending school at Stanford University in California.

Simpson, William D., is in the Engineering Department of the Buffalo Forge Company, Buffalo, N. Y. Address: 490 Broadway St.

MINERS

Mars, C. Victor, is a chemist of the Ansul Chemical Company at Marinette, Wisconsin. At present he is working on the manufacture of sulphur dioxide for refrigeration.

Ramsay, R. H., is a graduate at the Colorado School of Mines.

CIVILS

Adam, George H., is employed as a member of the plant superintendent staff of the Wisconsin Telephone Company, at Milwaukee, Wis.

Anderson, Delmar L., is a bridge inspector for the Wisconsin Highway Commission.

Bengs, Donald, is a Junior Engineer at the City Hall in Milwaukee. Address: 2847 N. 4th Street, Milwaukee.

Drow, John T., is a Resident Engineer with the Wisconsin Highway Commission at La Crosse, Wisconsin.

Ladwig, Frank, is an Industrial Engineer in the employ of the Phoenix Hosiery Company. Address: 3741 W. Michigan Street, Milwaukee, Wisconsin.

McDonald, Walter, is employed as Chief of Party for the Wisconsin State Highway Commission, Division Number One, Madison, Wisconsin.

Peterson, Eugene J., is an Instrument Man of the Wisconsin Highway Commission at Green Bay.

Wickesberg, Alfred, is working for Paul L. Clark, consulting engineer of Appleton, Wisconsin. His permanent address is Route 2, Appleton, Wis.

ELECTRICALS

Bell, A. LeRoy, is continuing his work in electrical engineering in the university this year.

Bischel, Harry W., is an assistant division engineer on the Plymouth Division of the Wisconsin Gas and Electric Company. Address: 114 Grove Street, Plymouth, Wis.

Bistline, C. H., is doing graduate work at the University of Wisconsin.

Cobine, James Dillon, enrolled September 25th as a graduate student in electrical engineering at the California Institute of Technology, Pasadena, Cal. Address: 1637 Oakdale St.

Curtius, Robert R., is back at Wisconsin doing post-graduate work. Address: 619 Lake Street, Madison, Wisconsin.

Fish, Leonard F., is in the Student's Training Course of the Chicago Central Station Institute.

Fredendall, Gordon L., was married to Miss Pearl Lillian Lockhorn of Madison on August 15, 1931. Mr. Fredendall is a fellow in engineering at the University of Wisconsin.

Gross, Harold L., is in the employ of Sears-Roebuck and Company as an electrical service man at their Madison store.

Hamilton, Leslie E., is attending the university and taking work towards a Masters' Degree in Electrical Engineering.

Ilker, E. C., is a student in the Chicago Central Station Institute at Chicago. His address is: 1847 Greenland Ave., Chicago, Ill.

Jaeger, Erwin F., is a student engineer at the Western Union Telegraph Company's office at Minneapolis, Minn.

Miller, George W., is a part-time freshman crew coach at Madison. At present he is interested in getting the new indoor rowing tank started.

Nelson, Dale H., is a student engineer of the Western Union Telegraph Company at Milwaukee, Wisconsin. Address: 820 East Wells St., Milwaukee.

Steckler, Norbert, is a student assistant at Yale University. He is also doing graduate work in Mechanical Engineering. Address: 400 Temple St., New Haven, Conn.

Taft, Bernard E., is a student engineer at the Vilter Manufacturing Company, Milwaukee, Wisconsin.

Woodford, A. G., is employed in the Research Department of the Allen Bradley Company at Milwaukee. Address: 117 N. Grand Ave., Waukesha, Wis.

A Graduate's Letter Gives Details of

Nitrate Mining in the Chilean Desert

By HENRY L. CLARK, m'26

THE property of the Anglo-Chilean Consolidated Nitrate Corporation lies on a bench or plateau between the coastal range and the Andes, at an elevation of about 4,000 ft., and 45 miles from the ocean. The population of the camp is slightly over 11,000, of which more than half are employed either in the mine or the plant. The others are members of the employees' families. The mine proper is divided up into twelve strips of ground about one kilometer long by one-half kilometer wide. Each of these strips is called a rajo (pronounced rä'-hō). A tier of rajos consists of about eight of these strips whose long sides adjoin. The permanent ore haulage tracks and electrical transmission lines run along the ends of a tier of rajos. The long dimensions of the rajos lie with the natural slope of the ground, which gives about a one per cent grade to the temporary ore tracks which run through each rajo from the permanent empty train track at the upper end to the permanent loaded train track at the lower end.

Each rajo is equipped with one 3-yard electric shovel and either one 3½-yard electric dragline or one 2-yard electric dragline, depending on the amount of overburden to be removed from the ore in that particular rajo. All mining is open pit of course. Ore is removed by mining "cuts" forty feet wide running the full length of the rajo directly alongside the temporary tracks. First the dragline removes the soft overburden, then hard overburden is drilled and blasted after which it is removed by a second trip of the dragline, and lastly the underlying ore is drilled, blasted and loaded into the cars, loading being done by the shovel. Drilling is accomplished with air drills and blasting is done with black powder which we make here on the property. Power is supplied to the shovels by a 2200-volt transmission line carried on portable towers. These lines tap off from the permanent lines at the upper ends of the rajos. Air for drilling is supplied by a 3-inch pipe line tapped off for each rajo from the main air line at the upper end. The pipe joints are all of the victaulic type, making a very flexible and easily moved line.

The accompanying letter, written to one of the professors in mechanical engineering by Henry L. Clark, m'26, gives a rather detailed description of the mining and manufacture of nitrates in the famous Chile nitrate fields. The nitrate is taken from the ground in open pits, and the equipment for removing it must be portable, even to the tracks upon which the cars are loaded. Transmission and power lines must be moved with the work.

Due to the recent popularity of South American jobs in the minds of romantic young engineers, the account of Mr. Clark's own duties on the job carries interesting information. Responsibilities ranging from the manufacture of ironing boards for the housewives of the camp to redesigning unsatisfactory parts of the heavy equipment make life varied and leave little time for worry over the present depression.

—EDITOR

Three hundred thirty-ton ore cars on one-meter gauge track are used to bring ore to the plant. Tractive power is furnished by 25 thirty-ton electric locomotives. Power is furnished by a 600-volt trolley on the main lines, and by storage battery in the rajos. This is where the 1% natural grade is a great help. (Too great sometimes!)

About one month is required to make a cut in a rajo. When a cut is finished it is necessary to move the temporary tracks, electric transmission line and 3-inch air pipe to make way for the next cut. All temporary tracks are laid on steel ties. A track gang unbolts the track at every other rail joint (joints are not staggered) and the dragline, equipped as a crane, picks up two sections of track by means of a special bridle and swings them into the new position where they are immediately connected up. In this way shifting operations may be started at seven o'clock in the morning and by three in the afternoon the full kilometer of track will be in its new location and ready for traffic again. The flexibility of the victaulic joints in the air line makes it possible to pull the piping over by hand a few sections at a time. The transmission towers each have two skids under them. The wires are left very loose so it is possible to shift the towers several feet without removing the wires. The towers are skidded over one at a time by mule team as far as the slack in the wires will allow. The final location is reached by moving the whole kilometer of line by stages. Two stages are usually sufficient, but sometimes three are necessary. By keeping both the shovel and dragline working in the same half of the rajo and shifting in the non-operating half it is possible to accomplish all moving with practically no delay to operations. The only delays are about an hour which is required to add the necessary pipe to the offset between the main air line and the 3-inch rajo line, and in moving the flexible cable which connects the portable tower line to the main transmission system. Track shifting causes no delays because, before a track is cut, a locomotive and twenty cars are spotted at the shovel. By the time the cars are filled, the track in the

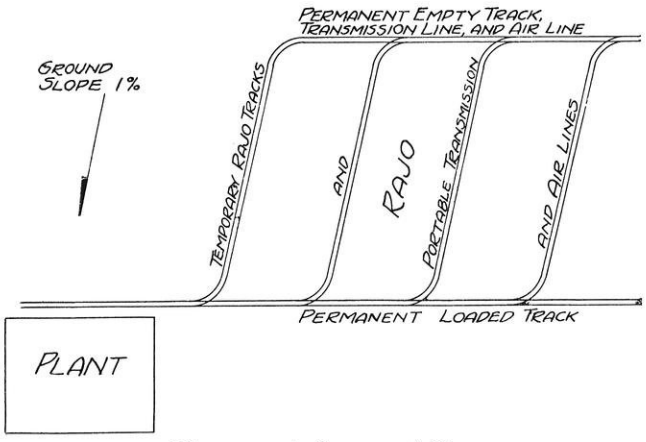
non-operating half of the rajo has been shifted and connected again.

The reduction process is very simple. A one-car-capacity revolving car dumper dumps the ore into a 72-inch crusher which reduces the ore to about six inches in size. The ore is then conveyed to the secondary crusher plant which reduces the ore to a maximum size of one-half inch after which it is screened and the fines resulting are conveyed to a filter plant for treatment. The coarse ore is conveyed to large vats holding about 2,000 tons each. Here the ore is covered with a warm aqueous solution of several common salts. A pumping cycle is then started which draws the solution from the bottom of the vats, passes it through heaters in which the solution is warmed by the exhaust gases from the diesel power plant, and finally returns the liquid to the ore vats. After a few hours the circulating solution has dissolved the nitrate out of the ore. The vats are drained and the residue is loaded into trains by clam-shell buckets and hauled to the tailings dump.

The nitrate-laden solution is pumped over ammonia coils. As the temperature is reduced, the nitrate crystallizes out and is carried in suspension in the liquid. The crystallized liquid is then pumped to thickeners where a large portion of the original liquid is removed by decantation. The nitrate and the remainder of the liquid is pumped out of the bottom of the thickeners. This remainder is in the form of a thick paste. The paste is conveyed to centrifugal separators or dryers which throw out the last of the original liquid and retain only pure crystallized nitrate of soda. The clear liquid from the dryers and from the decantation process is returned to the ore vats for another solution cycle.

Originally the crystallized nitrate was conveyed to a stock pile, from whence it was either bagged for shipment or shipped in bulk. However, this crystalline nitrate was quite hygroscopic. During the sea voyage from Chile to other countries the nitrate picked up considerable moisture. The damp salt packed very tightly, and often "set" almost like cement. Bulk shipments had to be broken up by explosives before they could be removed from the ship's hold, and in unloading shipments of bagged nitrate a large percentage of the bags were torn. The ship-demurrage charges were awful. The answer is "grained" nitrate.

Now the nitrate from the crystallization process is conveyed to the graining plant. Here it is compressed into briquets and fed into furnaces which are very similar to open hearth steel furnaces. The nitrate is melted in these furnaces and the continuously overflowing liquid nitrate is piped to heated tanks. From the tanks it is pumped to spray nozzles, located at the top of a monstrous spray chamber, which break the liquid nitrate up into small drops which, in falling a distance of about forty feet to the bottom of the chamber, solidify into spherical grains of from one thirty-second to one-sixteenth-inch diameter. These grains have a glazed surface and are not hydroscopic, though they are easily soluble in water. The grained nitrate is conveyed from the bottom of the spray chamber to large storage bins from which it is either shipped in bulk or drawn off to the bagging plant where it is automatically weighed into bags for shipment.



Diagrammatic Layout of Plant

Nominally I am "Mine Mechanical Engineer". I think the title was purposely made vague to cover plenty of territory. I have three major duties: First of these, and the one which demands the least of my time, is assisting in ironing out kinks in mechanical equipment. This used to take nearly all of my time, but it is pretty well licked now. When the shovels, which receive unusually severe service here, persistently demolish quantities of a certain part, the master mechanic and I go into a huddle like surgeons over an operating table, and when the huddle breaks up I come out with an idea for a brand new shovel part. The idea is put on paper and duly transmitted to the shop or foundry. At first I made beautiful drawings and got all swelled up over them. Now I make freehand sketches and save the swelling until the new part has been in service a few months. I have found the truth of Professor Hyland's sermon on the utility of the eraser as an engineering instrument.

Secondly, I spend about four or five days every month preparing requisitions for replacement parts for excavators, air drills, steel sharpening equipment, and electric locomotives. Three to five months are required for delivery of spare parts from the states. If we run short of parts my woes are many. If we become overstocked they are worse. The monthly expenditure for spare parts for the above mentioned equipment averages about six or seven thousand dollars.

Last but not least, I run the mine shop. The duties of the shop begin (unofficially) at making curtain rods, ironing boards, etc., for the camp's families and end with the construction of booms for 150-ton shovels. The shop proper employs about 110 men. We have two lathes, two drill presses, a shaper, a power hacksaw, four blacksmith forges, three electric welding generators, two acetylene welding outfits, four rock drill sharpening machines with oil furnaces and tempering baths, and a plentitude of air drills, riveting and chipping hammers, rivet busters and hand tools. The shop repairs broken and worn shovel parts, and rebuilds and overhauls shovel and dragline buckets and booms. It repairs and cleans the 150 rock drills used in the mine, and sharpens all the drill steel (about 1000 drills a day). It makes up all new drill steel necessary, which amounts to about three tons a month. It makes running repairs on the ore cars, and rebuilds all broken pantographs for electric locomotives. It

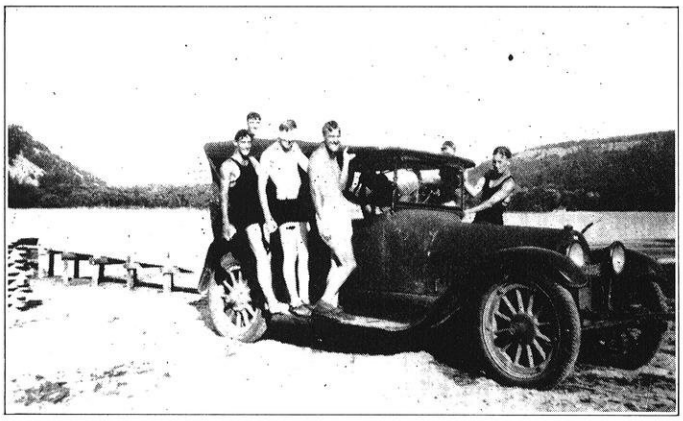
(Continued on page 18)

Again the Civils Enjoy Their Summer Vacation at

Azimuth City, the Civils' Summer Paradise

By R. L. VAN HAGAN, *Historian*

THE summer's activity at Azimuth City, the Devil's Lake center of engineering endeavors, got definitely under way on Friday, June 12th, shortly after the termination of the final in Econ la. The Big Buick, under the expert guidance of Frank Matthias, and loaded to the gills with everything including a few bed springs and Hodge,



The Old Buick Served as Truck, Church Bus, and Swimming Coach.

had to be coaxed gently over the last two or three hills, — a process which became quite a habit in the six weeks which followed — and we eventually careened down the last hill into camp. The Beebes and Mrs. Huntington had preceeded us, so that there was some semblance of civilization, but in the two days that followed there was a pipe line to establish, a wiring system to be set up, and 30 or 40 tents to be laid out and set up. Rollo Martin arrived with his team in the afternoon and helped us lay out the tent floors, but not without dire results to Verne Palmer's finger which suffered from too intimate embrace with one of the floors just at the moment when it should have been entirely free from such contact. However, we got the floors laid out, and still had enough energy left to climb into the noble old Buick and drive over to the south shore where we indulged in a little bathing clad in star dust and soap suds. By Sunday the hard work was done and the engineers had begun to drop in in appreciable numbers so that it was possible to sit down once in a while without being noticed.

Monday morning found all the tents set up and claimed, the pier in the process of erection, and a project in advanced hydrology in the form of an earth dam for the soft water system being built upstream from camp along Messenger Creek. The dam offered a serious problem since after a certain stage had been reached, leaks developed which required the whole time and skill of the shovel gang. Barefoot and stripped as far as an engineer's modesty would permit, we stood in the creek bottom with a shovel full of mud waiting for the next trickle of water to betray the presence of a new leak. When the trickle appeared, "slop!" went the mud against the face of the dam and we went down after the next shovel full to be ready for the next leak. By noon we had moved a considerable yardage of earchwork from the stream bed, but the leaks persisted, so it was with some doubts for the safety of the project that we retreated from the front and went to lunch.

By noon all of the stragglers were considered to have arrived, so we split into our sections, and while part of the camp started on a chase for submarine contours and others continued in their construction activities, the rest of us piled into the available cars and went over to the station to be instructed in the fine points of actual railway location.

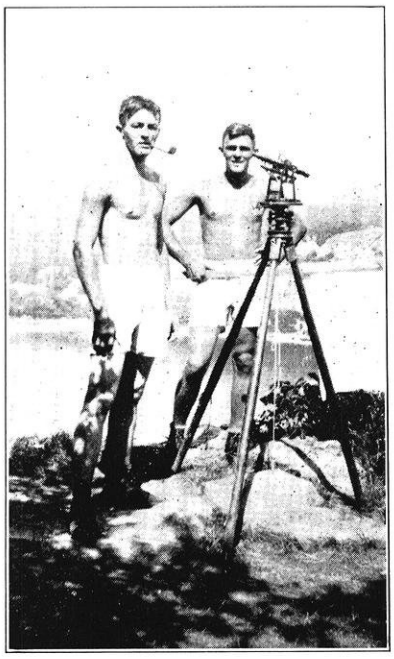
Tuesday morning we had become so involved in location that we lost all sight of the activities of the rest of the camp, and when we came to the hunt for that elusive and unapproachable animal, the grade contour, we got so involved that no one knew what his own party was trying to do. The woods rang with howled conversation and parties began crossing each other and getting rather snarled in an effort to follow the line marked by the small pieces of pink pajamas which the chiefs claimed to have tied to the trees and bushes along the grade contour.

As we ambled down the path through the grass to the pier Wednesday evening there were several scarlet backs and shoulders as a result of unjudicious clothes-shedding during the heat of the day. It was the first appearance of the color which appeared regularly on new backs as the later heat spells struck and more neophytes were introduced to sunburn. Incautious individuals like Norm Withey and Ed Bachowski could be heard to mutter to the effect that

The Tent Row at Camp Douglas.

they would like to be able to unburn their backs, and many of the boys spent sleepless nights trying to get adjusted o resting their weight on their stomachs instead of on the more conventional back. Later weeks found the first quota pretty well transformed into a more dignified series of mahoganies.

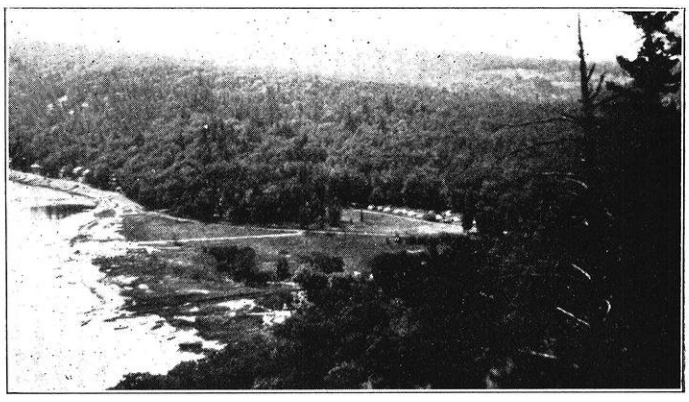
Evenings at camp were divided between playing baseball against Pay Haul Tacke, stabbing unwary moths onto the drawing boards, making maps to wear the corners off erasers, expeditions to the Grackle while the burnt fuses in the light system were replaced, and swimming in the exclusive membership of Red Davidson's B. A. club. The South Milwaukee contingent made rather frequent trips to Baraboo to return filled with a desire to play midnight ball and end up with demolishing the entire camp. They were deterred from the latter by the gruff resistance offered by the sleepy victims.



Lyneis and McMicken Get Down to Bare Facts Taking Hydrog.

Bob McMicken and Louis Marbes were the mechanics of the outfit, and their evenings were spent tightening the bearings in the patient Reo only to have the piston freeze just as they cleared the top of the hill Baraboo-bound with nine pleasure seekers. The frozen piston necessitated the return of the party, and by skillful coasting they were able to run the car back onto the blocks from which they had so recently removed it. Valve grinding compound and elbow grease smoothed off the worst of the scoring, and by the time it was necessary to leave for Camp Douglas, the Reo was once more in some sort of running condition.

Achki made himself the center of attraction for a fleeting moment the day that we lined up on the lower campus to practice turning right angles. His roving eye, aided by the magnifying power of the transit at hand invaded the privacy of a back-to-nature movement which seemed to be under way on East Bluff, and until the members of the cult reclothed and left, there was quite a line behind the gun waiting for a chance to see the beauties of nature.



Azimuth City in the Messenger Creek Valley.

Saturday the 28th, while Frank Erichsen was complaining that the flies ate red paint off his tracing as fast as he could trace the line, the first of the Camp Douglas mob hove into sight as Red Wagner and his Dodge cruised through camp with the information that the thermometer stood close to 100° F. and the boys were still working night and day to get finished. Sunday three more of the outfit appeared for breakfast, and by noon there were enough of them to make the election of prom chairman a matter of honor between camps. Thanks to the high powered persuasion of Bob Miller the latecomers were prevented from voting and the whole business ended up in a decision to have two co-chairmen, Mc Guire and Eastman. Sunday night we traded camps, and after due privation and struggle Harley Adams and Frank Matthias managed to get the Buick to the gates of the camp where the fifth tire let go. They left the car where it stood and walked the rest of the way.

The Camp Douglas layout was rather a contrast to the comparative luxury of the Devil's Lake home, and it was with some misgiving that we settled down for two weeks in the center of the great Wisconsin desert to stake out contours and battle deer flies, with occasional stories of Herby

Chasing Contours Over the Garbage Dump Area in the Great Wisconsin Desert.

Ferber and "Cheap Stuff", and horse back lessons in which the patient sergeant had the corner of his tent torn out. George A. "52-mile" Platz was the hero of the camp the morning that he routed a badger from its rather unusual refuge and imprisoned it in an unused garbage can. Foremost in the memories of Camp Douglas are the thoughts of the cast iron water, the carnivorous deer flies, and the breathless heat which resulted in our appearance even at meals in a strict minimum of clothing. Report has it that Skipper Schipporeit achieved the closest approach to Adam by cutting his clothing beyond that in which the savages of Borneo are pictured for the geography books.

The Fourth of July at Camp Douglas was just another day, aside from the firecraker battle held at dawn in the middle of the tent row. The affected area was marked with

(Continued on page 18)

Editorials

THE DEAN'S WELCOME

AT the beginning of another school year we are glad to extend to all engineering students, through the columns of the Wisconsin Engineer, a most cordial welcome. We are particularly desirous that all newcomers, freshmen and advanced students, may find their work under new surroundings both agreeable and profitable. The Engineering School is primarily an institution that furnishes the opportunity to gain a knowledge of the fundamentals essential to engineering practice, and experience has shown that such a knowledge can be gained in a school much more effectively and economically than by practice alone. But work in a school is only a beginning; it cannot produce a full-fledged engineer but only serves to give such a knowledge of theory and methods of application as will enable the graduate to enter the profession with a good chance to succeed. His progress thereafter will depend largely upon his ability to continue his education on his own initiative. Habits of systematic study formed in college are of great value in this most important post scholastic training.

F. E. TURNEAURE
Dean, College of Engineering

It is to be hoped that the present business depression will be over long before the incoming class leaves school, but whatever may be the condition there is no better plan to follow at the present time than the application to your work with energy and enthusiasm. Success in professional work is closely parallel to success in college. You will receive while here the best help the faculty can give and it is the hope of all members of this faculty that your career in the University and in later professional life will be creditable and truly satisfactory to yourself and to those with whom you come in contact.

"Freedom from poverty and sickness, freedom from ignorance and fear and other tormenting limitations, freedom to do the work one longs to do — such freedom we all ardently desire for ourselves and for our children."

—Arthur E. Morgan.

YOU DON'T SAY SO

Building houses of street refuse is a recent German idea. The refuse is burned and the ashes are pressed into bricks. During 1930, 187 houses were built of these bricks.

* * * *

A telescopic airplane wing has been successfully tested at Paris. The sliding wing offers a large wing surface for taking off and landing and a small wing surface for flight. It is the invention of Ivan Maghonine, a young Russian aviation engineer living in Paris.

* * * *

Recent tests on the effect of stream-lining locomotives and railway cars, made by Dr. Oscar G. Tietjens of the Westinghouse Research Laboratories, indicate that the railway train of the future will be a slinky-looking affair having little resemblance to the trains of today.

* * * *

A windowless building was completed this summer at Grand Rapids, Minn., by The Blandin Paper Co. for the manufacture of newsprint. It will be lighted by special units that do not screen out the ultra-violet rays. The chief reason for eliminating windows is to permit accurate control of temperature and humidity.

* * * *

Announcement was made in April of successful transmission across England and France by the micro-ray system of radio telephony. Three-quarter-inch aerials, ten to one-hundred-centimeter wave lengths, and one-half-watt power characterize the system. It is claimed that it will be possible, by the use of this system, to operate perhaps 250,000 stations without interference.

WISCONSIN GETS REGISTRATION

Wisconsin gets state registration of civil engineers and regulation of the practice of the profession after many years of steady and persistent effort. The recent legislature passed a bill amending the existing law, that provided only for "copyrighting" the term "architect", so that it covered both architects and civil engineers and provided for both registration and the control of practice. The law is not perfect; its administration will demand much good judgment. It is, however, a start in the direction of setting up standards for civil engineering that should, in time, increase the prestige of the profession substantially. It is to be regretted that the electricals and mechanicals felt impelled to withdraw from inclusion in the provisions of the bill. It is difficult to understand how legislation could injure them, and indications point to a possible attempt to modify the bill to include those groups at a later session of the legislature.

WE HAVE RUSHED The season of intensive fraternity rushing is over for another year, and the brothers are once more permitted to act normal, and wear what they please. The coat of artificiality is gone from the dinner table, and bewildered frosh no longer wonder what the heck it's all about. In other words, we have made our haul, and can resume our lives where we left them at noon on September 23rd.

And having let down, we wonder what good it does to "hang on the dog" and talk about grand opera and economic crises. Rushing is presumedly for the purpose of peering into the makeup of the rushee and also to impress the rushee, if he is the man we want, that we're a right swell bunch of fellas and would like to have him join. Knowing about how accurate his impression of fraternity life must be, we wonder just how accurate a judgment of his character can be made by the average man in the two or three hours of contact which they have before bidding. Having watched "swell dukes" turn out to be baby bandits and first class rounders while some of the "crazy looking punks" emerged later as campus leaders, we are inclined to gaze with reserved opinion on the whole affair.

Perhaps the freshmen do expect to be dazzled by the class and smoothness which they believe to be an inherent part of a fraternity, in which case they ask for what they get; and certainly the fraternities must make sure that they convince enough freshmen each year to uphold the financial end of the business, and hence must do their rushing as early and as rapidly as possible to get the men in demand before they have been snapped up by other houses. But why not let the freshmen see fraternities as they really are? Why not let them in on the free-for-alls in the lounge, the battles over trivial matters in the brothers rooms, and the whole-hearted informality and lack of composure which typify any fraternity except on certain occasions?

"A knowledge of the practical facts involved in any special field of human endeavor can be readily acquired from the myriad books now available — whenever the need arises — provided one possesses the proper traits of industry, clearness of thought, and a self-confidence gained through the successful solution of a large number of difficult problems."

—J. Hugo Johnson.

COUPON BOOKS A short time ago one of the men burst into the office, in considerable excitement, and shouted the information, "They've sold one! They've sold one!" Upon being calmed down, and asked to elucidate, he explained that the athletic department had sold a coupon book. While conditions aren't exactly that bad, there is a decided lack of interest shown by the student body when the matter of coupon books is mentioned; and we are rather inclined to believe there is a reason. To the bulk of us a coupon book means a seat at the football games; to a lesser portion the matter of the basketball seats is also represented; a few are interested in seeing the baseball games, and a very few are game for every intercollegiate match that is presented. However, one would suppose that the books were meant to appeal to the whole student body judging from the number of seats reserved for the coupon books at the football games, and in that case there is reason for alarm at the student indifference.

Why should we be expected to pay ten dollars for a seat to two Big Ten football games, and those basketball games which we may be able to attend? If one were to buy tickets to the two games, and all nine of the basketball games, the total expense would only be $5.50, leaving $4.50 unexplained. Certainly, they don't even plan on book-holders attending the swimming meets in a body, because if we did, where would they find room to swim? Imagine the concern of the athletic department if four thousand book-holders were to attend a fencing meet in the little room in the attic of the gym. Either we are bigger suckers than we think to stand for the ten-dollar price, or else the problem is one of higher finance and is beyond the comprehension of ordinary people.

THE GRADUATES RETURN While this year has seen a decided decrease in the undergraduate enrollment here, due, doubtless, to the current depression, the enrollment in the graduate school has increased visibly, due to the same reason. Graduates who have found it impossible to get employment have somehow found it possible to get funds, and are returning to school to get further education while the opportunity presents itself. The idea seems like a really sound one, since the higher degrees are rapidly increasing in the profession and are beginning to carry the same meaning that college graduation had just after the war. If a man finds it impossible to improve his time in a directly financial way, let him who can return to school and augment the education which he started in the first four years and which he will need later.

FORMULA ENGINEERING There is a famous formula known as the Engineering News pile formula which is much used in the matter of pile driving. According to this formula, the bearing power of the pile increases as the penetration of the pile decreases. A short time ago, one of the graduates returned with the story of pile-driving on one of the overhead bridges which are being built around the state. According to the graduate the piles were being driven through a soft loam which was underlain with sandstone. He rather suspected from the behavior of the piles that they were being driven completely through the soil onto the bedrock, but the other engineers were convinced that they were obtaining great bearing power due to the extremely low penetration which they were getting. The formula gave tremendous values for the bearing power.

Finally the opportunity presented itself to the graduate to have one of the piles removed, and they found that the last three feet of the pile had broomed badly due to its being driven against the bed rock. The formula gave great bearing strength, but actual examination showed the piles to have lost their action as piles. In school we are too apt to give unwarranted reverence to substitution in a formula, and when we get out we are likely to be disturbed to find that there isn't a formula in which to make substitutions for every occasion.

Alumni Notes

Among Our
Successful Wisconsin Engineers
is
Clifford Allen Betts

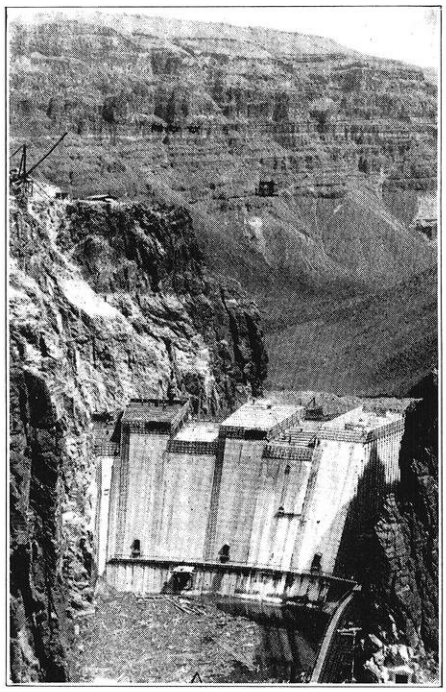
CLIFFORD A. BETTS
Engineer on Owyhee Dam

The great Owyhee Dam is under construction in the southeastern corner of Oregon, about twenty-five miles above the confluence of the Owyhee River with the Snake. It is impressive in its unprecedented height and important because of the acreage it will water, but its principal interest for Wisconsin men lies in the fact that Clifford Betts, Wisconsin '13, is engineer for the project.

Betts was born September 12, 1889, at Norwalk, Connecticut. The Betts, with a few other families, purchased the townsite of Norwalk from the Indians, the name Norwalk being suggested by one of the stipulations which fixed a point as far north as one could walk through the forest before sundown. His mother was Lila Malkin, daughter of an English father and a D. A. R. mother. His father, Albert A. Betts, was a lumberman until he retired from the business almost ninety years after it was organized by *his* father. He is now vice-president of the Norwalk Savings Society. It is recorded that in 1875, Albert Betts, then thirteen years old, sent some of the money he earned in his father's saw mill to the missionaries way out in Wisconsin. So close are we of this sophisticated university to pioneer times! Father Betts would have found it hard to believe that a son of his would some day go into that Wisconsin wilderness searching for education; but so it occurred.

Yale, only thirty miles from Norwalk, first attracted Cliff Betts, In 1911 he was graduated, with honors in English and the degree of Ph. B., from the Sheffield Scientific School. Following graduation, he went to work as an inspector on sewer construction for the City of South Norwalk in whose employ he had been during his summer vacations. When the sewer job was completed (1912) he joined the staff of a New York consulting engineer, James H. Fuertes, as a draftsman on plans for water works and sewage disposal plants. He also had charge of concrete building construction about this time.

A desire for new environment and further study in hydraulic and sanitary engineering drew Betts to Wisconsin in September, 1912. He plunged into his studies and research with enthusiasm, but also found much to interest him in the life of the university. He made the Rifle Team, was active in sports, and developed a strong loyalty for the university. He received the degree of *Civil Engineer* in June, 1913, and returned in the fall as scholar in hydraulics for further research.



OWYHEE DAM
Unprecedented for Height

His studies completed, Betts returned East where he engaged in municipal work at Norwalk and Bridgeport for several years. Then came a long jump across the continent to the State of Washington, where, in 1917, he made a survey for the Methow Valley Railway. There followed a period of service with the Commission of Public Docks of Portland, Oregon, as draftsman and designer. In 1918, he became chief engineer for the Cummings-Morberly Lumber Company, which was co-operating with the United States government in aircraft spruce production.

Denver was his next scene of action. He was with the U. S. Forest Service in 1919. Then he joined the

staff of the Denver Municipal Water Works as resident engineer on the Fraser River, Williams Fork, and Blue River projects. When the famous Moffat tunnel project became active, he was appointed office engineer for the Tunnel Commission and served in that capacity from start to finish, 1923 to 1928. Since May, 1928, he has been with the Bureau of Reclamation on the Owyhee Dam project, first as associate engineer and then as engineer.

During the years he spent in Denver, Betts devoted a considerable portion of his spare time to alumni matters. He served long and effectively as secretary of the Wisconsin Alumni Association of Colorado, was a director of the Wisconsin General Alumni Association, and was one of the organizers of the Big Ten Club of Colorado. His profession also received his support: He was a director of the Colorado Society of Engineers and for five years was editor of the "Engineer's Bulletin". He is a member of the American Society of Civil Engineers and held office in the Colorado Section of that society.

Betts has not confined himself to professional interests; he is a mason, a member of several social clubs, and served as president of a service club. He has been a scout master and a deputy commissioner of Boy Scouts of America. He takes his pleasures out of doors, enjoying hunting, fishing and golf.

Betts completed his Wisconsinization when, on January 7, 1915, he married Edna Cantril, Wis. B. A. '13, M. S. '14, Gamma Phi, and Mortar Board. His son, Allen, and daughters, Edith and Marjorie, have been trained in the Wisconsin tradition.

CHEMICALS

Agazim, Michael, ch'15, is conducting a manufacturer's sales agency in Chicago. His address is: 926 Wargate St., Chicago.

Griffey, Leon J., ch'26, is sales engineer with the Fisher Governor Co., of Tulsa, Okla.

Koresh, George, ch'25, is research engineer with the A. O. Smith Corp. of Milwaukee.

Watson, Kenneth M., ch'23, was granted a patent in September on apparatus for coating electrical conductors.

MINERS

Almon, Grover C., MS'31, is connected with the steam turbine department of the Allis Chalmers Manufacturing Company, Milwaukee, where his work has to do with the development of the reaction steam turbine.

Druse, J. Benton, MS'31, is with the engineering sales division of the Milwaukee Gas Company, Milwaukee, Wis.

Eastwood, L. W., min'29, MS'30, Ph. D.'31, has accepted a position as instructor of Mining and Metallurgy at the Michigan College of Mining and Technology.

Hagans, A. K., min'29, is registered in the Graduate School at Madison. He is in the Mining Department.

Hahn, Emily, min'26, has just published her second novel. The name is "Beginner's Luck" and deals with a colony of well-to-do idlers in New Mexico. The book is principally a study of various American characters. Miss Hahn published her first book, "Seductio Ad Absurdum", about a year ago.

Jourdan, Ralph L., min'21, is Assistant Manager of the Utah Division of the American Smelting and Refining Company. His headquarters are at Salt Lake City.

Krause, Daniel E., min'29, MS'30, who was Fellow in Metallurgy at the University of Wisconsin last year is Metallurgist at Brillion Iron Works, Brillion, Wis., and is engaged in the development of high test and special alloy cast irons.

Larig, Clarence H., min'24, MS'25, Ph. D.'29, has been Research Metallurgist with the Battelle Memorial Institute, Columbus, Ohio, for the past year. Larig spent one year as instructor in Metallurgy at Drexel Institute before going to his present work.

McCaffery, Phillip, min'30, who has been with the St. Louis Coke and Iron Company, has secured a leave of absence to do special work in the Department of Mining and Metallurgy at Wisconsin.

Pallanch, R. A., min'15, is the author of a recent U. S. Bureau of Mines paper, "Milling Methods at the Midvale Concentrator of the United States Smelting, Refining, and Mining Company, at Midvale, Utah".

Ray, Otto A., min'20, is the Western Representative of the Chicago Pneumatic Tool Company, Mining Machinery Department. His home is in Salt Lake City.

Riebeth, Theodore J., MS'31, is connected with the Research Department of the Allis Chalmers Manufacturing Company at Milwaukee, Wis.

Schmedeman, O. C., min'30, MS'31, is mining Geologist for Cerro de Pasco at Morrococha, Peru.

Sirelschikov, I. A., MS'31, is continuing graduate work in Metallurgy at Wisconsin.

Sparling, William J., MS'31, is connected with the Chain Belt Company, Milwaukee, as development research engineer.

Wittingham, P. P., MS'31, is located in Milwaukee where he has charge of the heat treatment department of the Traxon Division of the George H. Smith Steel Casting Company.

Yundt, Evan R., min'27, is Supervisor of Blast Furnace Practice at the Illinois Steel Company's plant at South Chicago, Illinois.

MECHANICALS

Jaseph, L. F., m,30, has resigned his position with the Western Electric Company and is now with the Rotary Lift Company of Memphis, Tenn.

Miller, Arthur H., m'05, water commissioner at Sheboygan, Wisconsin, is the author of a paper entitled, "Weather's Effect on Water Demand Discloses Sprinkling Load", that appeared in the Engineering News-Record for May 7.

Slezak, John, m'23, was recently appointed vice president and general manager of the Turner Brass Works of Sycamore, Illinois.

ELECTRICALS

Ackerman, Adolph J., e'26, hydraulic designing engineer for the Aluminum Company of America, at Pittsburgh, describes "Gate Handling at Calderwood Dam" in the Engineering News-Record for May 7. The dam is on the little Tennessee River near Knoxville.

Adam, Louis G., e'23, is with the A. T. & T, Co. at New York City.

Johnson, E. A., e'30, was married to Miss Ruth Hovey of Madison on September fifth. Miss Hovey graduated from the University of Wisconsin in 1931. They are making their home in Chicago where Mr. Johnson is employed by the American Bell Telephone Company.

Johnson, Stewart L., e'30, died due to burns received in a laboratory at Schenectady, New York, June 18. He was buried in Antigo, Wisconsin. Johnson was a member of Phi Eta Sigma, Tau Beta Pi, Pi Tau Pi Sigma, Eta Kappa Nu, Alpha Tau Sigma, and Lambda Chi Alpha while in the University.

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Campus Notes

MATTHIAS WINS STERLING DAY AWARD AS OUTSTANDING SENIOR

Franklin T. Matthias, former editor of the Wisconsin Engineer, c'31, was chosen last spring as the winner of the Kenneth Sterling Day award which is made annually to the outstanding senior who is high in scholarship, and has an interest in athletics and a high moral Christian character.

Matthias, who is now an instructor in the T. E. department, maintained an average of 2.2 points per credit during his four years in school, was a member of A. S. C. E.; Polygon; Alpha Tau Sigma; Chi Epsilon; Tau Beta Pi; Phi Kappa Phi; and Scabbard and Blade. During his four years here he was on the committee for the 1929-30 Military Ball, and chairman of the 1929 International week end. In his senior year he was president of the University Y. M. C. A.

SOPHOMORE ENGINEERS AWARDED SCHOLASTIC HONORS

Following is a list of the sophomore engineers who were awarded honors and high honors for their scholastic record over the first year. An average of 2.75 is required for high honors and 2.5 for honors.

Sophomore High Honors

	Credits	Points
Mechanical Engineering:		
Lambeck, T. J.	——75	199
Wood, Royal H.	——68	186
Electrical Engineering:		
Moe, Robert Ellis	——70	190

Sophomore Honors

Civil Engineering:		
Bayless, C. D.	——79	179
Bebb, Louise Harriet	—68	158
Ginsberg, Hyman	——68	176
Kalinski, Anton A.	—68	172
Morgan, Philip F.	——72	165
Ottensmann, C. W.	—68	175
Palmer, Vernon J.	——68	148
Wagner, Clarence O.	—68	159
Mechanical Engineering:		
Anderson, D. W.	——68	175
Evans, George A.	——68	170
Heger, Lawrence E.	—67	157
Kaiser, Elmer R.	——72	166
Kuehlman, N. V.	——68	164
May, Arthur Emil	—75	165
Paulsen, Milton R.	—68	147
Peck, Henry Edward	—68	150
Rieck, John Jacob	——68	157
Smith, Walter N.	——68	163
Wadsworth, A. L.	—68	172
Electrical Engineering:		
Anger, Ernest G.	——69	170
Bardeen, Thomas	——71	159
Derby, George W.	—70	157
Holmquist, Roy H.	—70	167
Kieckhefer, H. H. C.	—73	166
Langhammer, R.	——75	158
Schlueter, Clyde F.	—69	174
Wolcott, Harry E.	—64	147
Wyss, Wather E.	——73	181
Zilmer, Delbert E.	——78	182
Chemical Engineering:		
Grange, Raymond A.	—72	155
Hanson, Peter S.	——70	157
Kettner, Robert Otto	—70	163
Stoddard, L. L.	——70	159
DeVos, J. Wallace	—70	155
Walters, Roy H.	——70	165
Mining Engineers:		
Eisaman, Jack H.	——76	176
Grundman, W. E.	——83	202

MECHANICALS OCCUPY NEW BUILDING

The first step in the shifting of the engineering school to Camp Randall was marked by the migration of the mechanical engineers from the hill to their new home. The building was dedicated on June 22, and immediately came into service to house the annual meeting of the oil and gas power division of the American Society of Mechanical Engineers. As any mechanical will admit, the walk to the building is plenty long, but the relief from congestion of the steam and gas laboratory alone makes the walk worth while. From a crowded maze of pipes and machines the lab has been metamorphosed into an orderly row of apparatus. The shops have been moved into a glorified setting, and space has been made for new laboratories such as the heating and ventilating, and aerodynamics departments, as well as for individual research. In general, the entire design of the building shows a very good combination of thoroughness and beauty.

New M. E. Building from the Air.

FEW FACULTY CHANGES MADE

Three new instructors were added to the engineering faculty this fall, one professor has left, and another returned from a leave of absence. The steam and gas department has added another instructor in the person of Mr. O. C. Cromer. Mr. Cromer held a fellowship in mechanical engineering last year.

Mr. P. G. Ellis, who graduated with honors from this university last year, becomes an instructor in the chemical engineering department. Mr. K. M. Watson, last year an assistant professor in the same department, has resigned to do research work at the Universal Oil Products Co. laboratory at Riverside, Illinois.

Mr. Lewis H. Kessler, assistant professor of hydraulics, has returned from a year's leave of absence during which he designed the sanitary system at Williams Bay, Wisconsin. Employed last year by the General Electric Co., Mr. J. G. Van Vleet this year is a new instructor of mechanics. Mr. Van Vleet graduated from Wisconsin in 1930, receiving his degree in electrical engineering.

NEW DRAWING TEXT MAKES ITS DEBUT

Mechanical Drawing, by Orth, Worsencroft, and Doke appeared this fall in a good-looking red cover to assist the freshman in mastering the art of putting ideas into pictorial form. With the addition of forty pages last January, and of sixty more this summer, the book now contains two-hundred

pages, but is still printed in loose leaf form to allow the addition of more material. If the freshman thinks merely learning drawing is difficult, he should be interested in knowing that doing the sixty pages of material and illustrations added this summer required three months of hard work on the part of the authors.

The book consists of six parts: representation, delineation, dimensioning, working drawings, lettering, and problems. A distinguishing feature is the use of photographs of metal-working machinery to assist in teaching the various machining processes and the proper dimensioning of machine drawings.

The authors, Professor H. D. Orth, Mr. R. R. Worsencroft, and Mr. H. B. Doke, are members of the engineering drawing faculty of the university, and as such are able to get first hand information as to the material which should be included to teach the subject.

ENGINEERING SOCIETIES ELECT

The student engineering societies were organized for the purpose of giving the students practice in the presentation of technical papers, and for social reasons. A list of the present officers of these societies is given below, with the place of meeting. Revisions of this list will be published in *The Wisconsin Engineer* after each election.

American Society of Civil Engineers

Meetings are held in Room 229 of the Engineering Building unless otherwise announced.

Officers: Frank P. Erichsen, President; Leonard E. Angoli, Vice-President; Otto R. Herrmann, Secretary-Treasurer; Lawrence L. Krasin, Publicity Manager; and Herman T. Hagestad, Polygon Representative.

American Institute of Electrical Engineers

Meetings held in Room 204 Electrical Laboratory or Room 201 Engineering Building unless otherwise announced.

Officers: T. N. Racheff, Chairman; Mitchell Dack, Vice-Chairman; Olaf Vea, Secretary; Leslie T. Brueggeman, Advisory Committee; A. W. Brown, Advisory Committee; and Prof. Jansky, Counsellor.

American Society of Mechanical Engineers

Meetings held in A. S. M. E. room of Mechanical Engineering Building unless announced otherwise.

Officers: George Lorenz, President; A. B. Epple, Vice-President; C. M. Janishewski, Treasurer; and Philip M. Judson, Secretary (Not in school this year).

American Institute of Chemical Engineers

Meetings held in Chemical Engineering Building Auditorium. Officers have not as yet been elected.

HAS IT COME TO THIS?

For the first time in many years, if not for the very first time, the engineering building is housing instructors from other colleges of the university. With the removal of the mechanical engineering staff to the new mechanical engineering building, space for other faculty offices became available and was filled by several letters and science instructors. Curtis Merriman, professor of education, C. E. Ragsdale, assistant professor of education, and Ralph Linton, professor of social anthropology, are some of the new inhabitants. A number of engineering faculty members have also shifted their offices in the building.

ALL FROSH TO TAKE ENGINEERING ENGLISH COURSE

Apparently the engineering English course which was given to half of last year's freshman engineers was successful, for all of the first year engineers are to take the course this year. Originally the engineers took the same English course as was taken by the L. and S. students; however, this was felt to be unsatisfactory, as engineers need to study composition and grammar rather than classic literature. The English course is still in the Letters and Science department, but a special course is given to engineers. Last year a special study of *Men and Machines* was made by the students in this course.

"BOARD OF INQUIRY" CLASS TO CONTINUE

The board of inquiry method of conducting classes, which was introduced last year by Prof. Edward Bennett, is to be continued this year in the senior course in electric circuit theory. The method was used last year in a course in which there were three sections. One section operated under the new method and the other two operated under the usual class room procedure. The sections were of equal student ability. The rating of the section that used the new method fell between the rating of the other two sections insofar as final grades were concerned. Prof. Bennett states that he has reached two conclusions as a result of this experience: First, the new method is not adaptable to mixed groups of good and poor students; second, the results obtained with such mixed groups are about as good as those obtained with the usual method.

ENGINEERING STUDENT DESIGNS NEW NOZZLE

A new type of nozzle that will discharge a wide, thin stream of water and yet not clog, has been designed by Alvin H. Benesh, c'31, and was tested by him in the hydraulic laboratory as a thesis investigation.

Mr. Benesh is a son of Frank S. Benesh, of Marshall, Wisconsin. He is a member of Tau Beta Pi, honorary engineering fraternity, and was graduated with honors.

The new nozzle was designed by Mr. Benesh while in the employ of an industrial concern. It is used for the purpose of cleaning the screens that remove the debris from water in certain industrial processes. Mr. Benesh has been successful in overcoming the most troublesome effect in such nozzles, the clogging of the nozzle. Application for a patent has been made on the new device.

ENGINEERING ENROLLMENT REMAINS ABOUT THE SAME

Although the university enrollment as a whole has dropped off by about 600, the engineering college enrollment remained about the same, according to unofficial registration data secured from the office of Dean Turneaure. Following is a list of the registration of each class in each of the departments. This list is unofficial, but represents the approximate enrollment.

	CE	ME	EE	ChE	Min.	Total
Freshmen	62	80	69	46	12	269
2nd Yr. Fr.	19	14	13	4	1	51
Sophomores	55	80	80	38	13	266
Juniors	75	71	84	53	8	291
Seniors	51	45	56	27	9	188
Graduates	6	9	27	10	15	67
Total	268	299	329	178	58	1132

The effects of the depression are readily seen by the decrease in freshman enrollment and the increase in graduate enrollment. These two changes appear to offset each other to keep the number of engineering students about the same as that of last year.

NITRATE MINING IN CHILE

(Continued from page 9)

builds and repairs all the shanties used in the rajos for foreman's offices, tool storage houses and explosive storage houses. It paints all shovels, locomotives and mine buildings. It makes furniture for mine offices. When two locomotive drivers try to beat each other to the switch, the mine shop gets the sorry result and must work twenty-four hours a day until they are ready to take out and smash up again. I have manufactured a kitchen knife and have designed and built a new truck frame for a 2-cubic-yard shovel. Both of them are still in service and are giving satisfaction. I want to talk to the man who invented the notion that South America is an old soldiers' home.

AZIMUTH CITY

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shattered bits of red paper and burned spots on the tents, but aside from that slight diversion and occasional bursts throughout the day, there was no celebration and we sweat and thirsted just as on all other days. Stories reached us of the picnic at the Pewitt's Nest, and visits to the North Shore indulged in by the other camp, but we had no desire to prolong our stay by taking the day off. About the same time a letter arrived from the Devil's Lake camp telling of the latest casualties, including Mikula's broken arm resulting from a slide to second, Hermann's mangled stomach caused by inimical barbed wire fence, Gorder's scratched hand which marked him as an unappreciated bugler, and sundry cases of poison ivy. We had our own casualty list with Schaeffer laid up from an axe cut in the shin, and Eastman's hand bound up due to a mixup with the brush clippers.

To uphold the tradition set by the first section, and due to the fact that there was no bugler to blow taps at Camp Douglas, the last few nights were all-night sessions as we spent sleepy hours trying to keep the 940 contours from crossing the 955 and tying in on the 930, but by perserverance we kept them straight and when the orchestra started playing at the prom that Saturday we had all managed to get back to the lake to play Don Juan for an evening.

Aside from mention of the fact that we had the prom and that it was an entirely successful affair from every angle thanks to all concerned, the occasion forbids description because we all have our own private memories and no two would be in accord.

The last two weeks it fell our turn to row the boat and play nursemaid to the transits on their bluff ascensions, and with due engineering diligence we proceeded to make the Baraboo River flow upstream, and to put kinks in the lake shore that had never been seen by human eye before. We even contrived to have 15 feet of water standing over the land a considerable distance above the shore line. The discrepancy, we decided, was due to our watches since they were the only things which were beyond our control.

Further trips to the Grackle brought back stories from the other camp of Bob Merz taking topog lying on his stomach to dodge the machine gun bullets which were flying thick and low through the woods behind the range, and

the boys were taking to wearing their dinner pails for helmets in place of other head gear.

Bit by bit the Devil's Lake camp began to fold up as the unused tents came down, and the current meter rating apparatus was folded up until next year, and then the camp came to a glorious close with a real whoopee on the final Saturday night. For details on that episode information must be sought from the participants since it is not my duty as historian to pry too deeply into the extra-curricular camp life.

WORDS, FACTS AND THE TRUTH

Dr. George Otis Smith, chairman of the Federal Power Commission, speaking at the annual dinner of American Engineering Council, January 16, 1931, on the subject of "Words, Facts and the Truth", brought out that while words are of only passing interest to the engineer, facts are his guiding landmarks and truth his goal. Dr. Smith spoke as follows:

Words

Words are interesting things, even to engineers. We do not need to pretend to be philologists or even literary critics to like words for their own sake. Most of us, however, probably look upon words as useful chiefly to serve as handles to ideas, or perhaps tags to ideas. The best word is the one that labels one idea and only one; the poorest words for real use is one that tags so many ideas as to lead to nothing but uncertainty.

You engineers and scientists among yourselves can and do avoid uncertainty in your technical writings and discussions by using words of your own making that have exact meaning. Such a technical term is your logical choice because it is the label for only one idea, and that a very definite idea. Using such words among ourselves is like using instruments of precision in the laboratory, but we can carry our technical usage too far. When it comes to weighing hay or measuring cordwood, our weights and measures do not need to be certified by the Bureau of Standards.

Investigations

The poets speak of winged words, and the rest of us know that words are alive enough to change as the years pass. And one trouble with words is that too many of them possess both original and acquired meanings. As an illustration of this unfortunate tendency of words to change and thus to lose value as useful labels for thoughts, let me mention a good old word still extant—"investigate".

The word "investigate" has an honorable ancestry which, like that of many great men, goes back to a rural and even backwoods environment. The substance of the word "investigate" is the Latin word for foot-track, and so its original meaning was to follow a track. Thus this out-of-doors word, when introduced into polite society, came to have the meaning of search into; in fact, its meaning is not unlike that of the very high-brow word we respect so much —"research". When properly used the term "investiga-

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ALUMNI NOTES

(Continued from page 15)

Palen, Vernon W., e'25, is with the Metropolitan Edison Co. of Reading, Pa.

Sargent, J. A., e'28, was married to Miss Ruth Miller at Green Bay, on September twelfth.

Steel, B., e'25, Address: 1225 Giddings Street, Grand Rapids, Michigan.

CIVILS

Afflick, Herbert J., c'22, is living at 7851 Constance Ave., Chicago, Ill. with his wife and a dog. He is Superintendent of Construction at a new steel mill there. He says he has lived in Cheyenne, Denver, San Antonio, and Chicago since his graduation.

Bielefeld, Richard H., c'30, is with the army engineers at Milwaukee on a survey party that is working on the St. Joseph River, Michigan. During four months his party ran about sixty miles of traverse on the Elkhart River, about thirty miles on the Little Elkhart, and about fifty miles on the White Pigeon River. He writes: "The work consists of a stadia traverse of the shores and banks, supported by a level traverse. An azimuth check is made about every twenty miles by solar observation. Most of the computations are made in the Milwaukee office. We also gather a bit of information of the towns along the rivers, in regard to population and its increase from 1900, the number of banks and their size, and the principal manufacturing concerns, their size and number of employees. Information as to the condition and kind of equipment in the hydro plants along the rivers is also obtained."

Birkenwald, Edward, c'27, is temporarily with the Maine Highway Commission in the bridge office.

Gillette, Paul C., c'18, is district manager for the Empire Securities Company in New York. The company specializes in investments in oil royalties on producing tracts operated by some one of the major oil companies in Oklahoma and New Mexico. His business address is 11 W. 42nd St., Room 1640, New York City.

Goodell, Horace R., c'26, was married on September 6 to Lavone Patrick of West Ridge, Ill., also a Wisconsin graduate. Goodell is with the bridge department of the Wisconsin Highway Commission. The couple will live in Madison.

Gumprecht, Henry H., c'18, is with the Niagara-Hudson Power Company. He has been working recently on the design and construction of a 110,000-volt, 75,000-kva switching station. Gumprecht will be remembered by the younger generation of civil engineering students who are familiar with the movie depicting camp life at Devils Lake, as the instructor who led his bride down the lane of honor under the crossed stadia rods in one of the scenes in that epic.

Hudson, Alfred, c'25, and his wife were visiting relatives in Madison this fall.

King, Bernard F., c'30, city engineer of Watertown, Wis., who was seriously injured last June in an auto accident, is practically recovered and is attending to his official duties. Another auto, making a left turn on Highway 19, struck King's auto, about 9 p. m., and drove him into the ditch. He managed to bring the car back onto the highway but turned over. King suffered a skull fracture and a broken jaw.

Lindner, Clement P., c'25, former instructor in hydraulics at Wisconsin, has resigned from service with the army engineers and has registered in the Law School at Wisconsin.

Lovewell, Cecil E., c'30, field engineer in the New York and New Jersey district for the Common Brick Association, is the author of a paper on "Designers of Clay Products" that appeared in **Brick and Clay Record** for July 14, 1931. His illustrations show some interesting modern architectural and decorative designs wrought in common brick.

Saltzstein, Irving D., c'26, returned from a tour of duty in the Tropics in February, 1928, full of malaria and decided not to return. He writes: "My experiences there were, of course, thrilling and interesting, and I will never regret having spent two years in this manner. After spending a couple of months in ridding myself of the fever, which I am glad to say I completely succeeded in doing, I got a job as inspector of piling and concrete in Detroit. I worked at this for about six months; then was sent to Saginaw, Michigan, for ten months as assistant architect's superintendent on the construction of a large foundry unit for General Motors. After that I was architect's superintendent on two smaller factory jobs in Detroit. I was then sent to Edgewater, N. J., on the construction of a large assembly plant for the Ford Motor Company." His address at present is: First Wisconsin National Bank Building, Milwaukee.

Schmidt, Lewis A., c'23, is with the Emery, Peck & Rockwood Development Co., Austin, Texas.

Smith, Judson P., c'26, is with the Hooker Electro-chemical Co., of Niagara Falls, N. Y., as sales service representative.

Smith, L. S., c'90, CE'95, was in Madison with his wife this fall. Mr. Smith is doing city planning work in California. His home is at Redondo Beach, California.

Smith, Millard B., c'25, was married on September 12 to Catherine Alice Field of Racine, also a Wisconsin graduate. Smith is on the staff of the Wisconsin Telephone Company. The couple will live in Wauwatosa, Wisconsin.

Tashjian, Edward H., c'15, has returned to the United States after spending a year in Belgium and eighteen months in France. He was sent to Belgium in the fall of 1928 by the Battle Monuments Commission of Ohio to supervise the construction of a monumental bridge over the Scheldt to mark the crossing of that river in 1918 by the 27th American Division. He presents an account of the distinctive features of the bridge in **Le Genie Civil** of April 11, 1931, He states that he was able to develop a concrete surface that resembled white granite and that was free from the fine cracks that often mar a concrete surface. In France he supervised the building of a hospital. He gives his present address as 401 West 118 Street, New York City.

Trayer, George W., c'12, CE'22, senior engineer on the staff of the Forest Products Laboratory at Madison, is the author of a monograph on "Bracing Farm Buildings", published as Leaflet No. 77 by the U. S. Department of Agriculture during July.

Tschudy, Lionel C., c'23, is with the Emery, Peck & Rockwood Development Co., in Austin, Texas, with offices in the Norwood Bldg.

Walraven, Peter, c'21, received his degree of "Civil Engineer" in June. He is city manager at Stevens Point, Wisconsin. Press reports during the past summer announced that Walraven had ordered that roofing nails be sprinkled over new concrete to discourage people from driving cars over the concrete while it was still weak. He states that the plan was not put into effect because of the possibility of injuring barefooted children.

Van Hagan, L. F., c'04, has been appointed to the Examining Board for Architects and Engineers as provided for under the new engineers registration law.

Youngberg, A. F., c'22, is Wisconsin representative for Colas Roads Incorporated, a Chicago concern dealing in emulsified asphalt for highways. His temporary address is 150 Dunning St., Madison, Wis. Prior to his connection with this company, Youngberg spent two years in airport design and construction. His biggest job was the field at Joliet, Illinois, which was built in 1929 and which has just applied for an A-1-A rating. The airport engineer, he says, has been put out of business by the free service now offered by the government.

WORDS, FACTS AND THE TRUTH

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tion" carries the idea of thoroughness, painstaking care, detailed and systematic examination.

So it is that in the organic acts creating our Federal scientific bureaus "investigation" was the word commonly used in describing the type of scientific work to be undertaken. And this fundamental idea of thorough-going search for facts continues in the language of the legislation describing the scope of present-day activities. Run over the current appropriation items for two such scientific bureaus as the Bureau of Standards and the Bureau of Mines and you will note a keen competition in the number of times Congress in a single year has seen fit to use the words "investigate" and "investigation". My adding machine credits the Bureau of Standards items with the use of these words no less than 44 times, while the Bureau of Mines items contain these same words 28 times.

All this is apropos of the good usage in which the word "investigate" is employed in the dictionary sense. But besides this meaning of the word as used by scientists and engineers, there is a far too common use in labeling the so-called "investigation" that has a political purpose and adopts methods altogether alien to scientific or engineering procedure. Bishop Whately is his Rhetoric a century ago made the distinction clear between the original and the imitation in these words—"Not as an investigator of truth, but as an advocate labouring to prove his point."

Facts

Recently a popular philosopher has somewhat dogmatically asserted that science "begins with uncertainty and ends with a fact". I believe he correctly interprets both the purpose and the procedure of scientific investigation. May I then point out the obvious contrast with political investigation, which begins with certainty on the part of the investigator and far too often ends with uncertainty on the part of almost every one else.

I always feel that I am on safe ground when I speak of facts to an engineering audience. First of all I do not need to demonstrate to you the inherent value of facts—their essential importance, their everyday usefulness. Nor need I discuss before you the kinds of facts, except to comment on the careless usage of the lay public in speaking of "new" facts and "true" facts. No facts are new, and all facts are true. We discover the facts but do not invent them or make them. Neither hand-made facts nor machine-made facts will stand the test of usefulness, and least of all made-to-order facts.

Facts, however, are subject to great differences in their form of presentation. Some facts of ancient history or of present-day politics can be expressed eloquently and made most attractive when dressed up in adjectives and adorned with flowers of speech. But this is for public appearance rather than for everyday use. The facts that the engineer needs and that the business man needs—yes, and that the statesman needs—are facts expressed quantitatively. This means the use of plain figures rather than figurative language, tables of quantities rather than strings of adjectives,

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WORDS, FACTS AND THE TRUTH

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curves and diagrams rather than emphatic assertions. Of course quantitative expression has its dangers unless the engineer has the facts to express.

Fact-Finding

Fact-finding is the engineer's special task, but possibly the term "fact-hunting" better decribes the job. The finding of facts is not a hit or miss business; the best results come from a well-planned and earnestly conducted hunt. The true investigator is one who tracks down his facts, and often he has to follow a long, long trail, but only fact-finding of that painstaking kind will serve the purposes of the engineer or of the creator of any great project, whether industrial or civic.

Such, then, is my conception of facts as needed by those who are responsible for the marvelous development of this day and generation. By way of stating our need of facts, perhaps, I may mention what I believe logically follows fact-finding. If fact-finding is the engineer's first task, I would put fact-facing as the engineer's first duty. The truth can make us free only as we face the facts. The best definition I know of a pessimist is one who has done business with an optimist, and I would add that too often the optimist is one who hasn't faced the facts. The engineer must face the facts as he plans for the future, and to this audience I dare suggest that planning for the future is preeminently the function of the engineer.

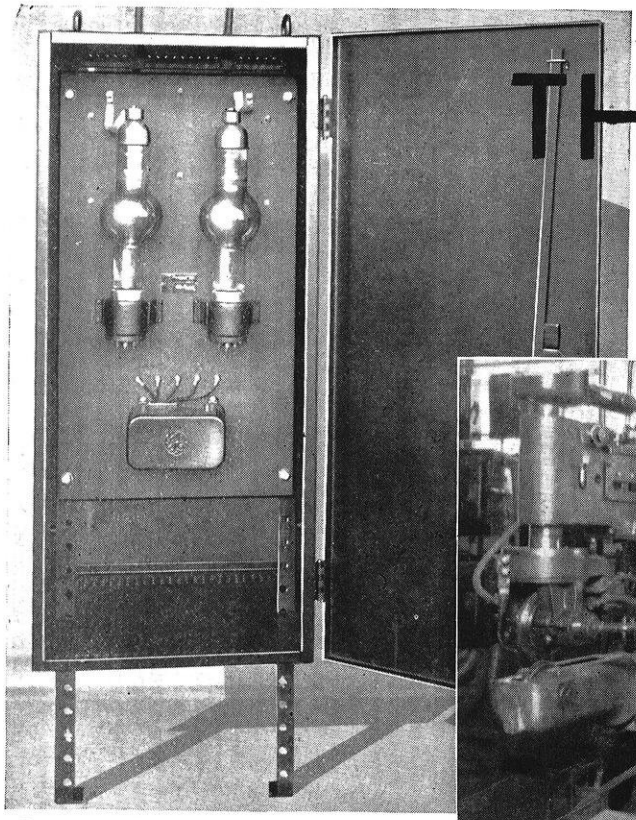
Fact-Facing

I realize that fact-facing isn't always popular. Negative conclusions following any investigation rarely meet with an enthusiastic reception. Indeed, fact-finding is sometimes discouraged, in the fear that the facts will oppose the project. But the facts must be faced: words expressive of facts must not be soft-pedaled, nor should facts be wrapped in the cotton wool of meaningless phrases.

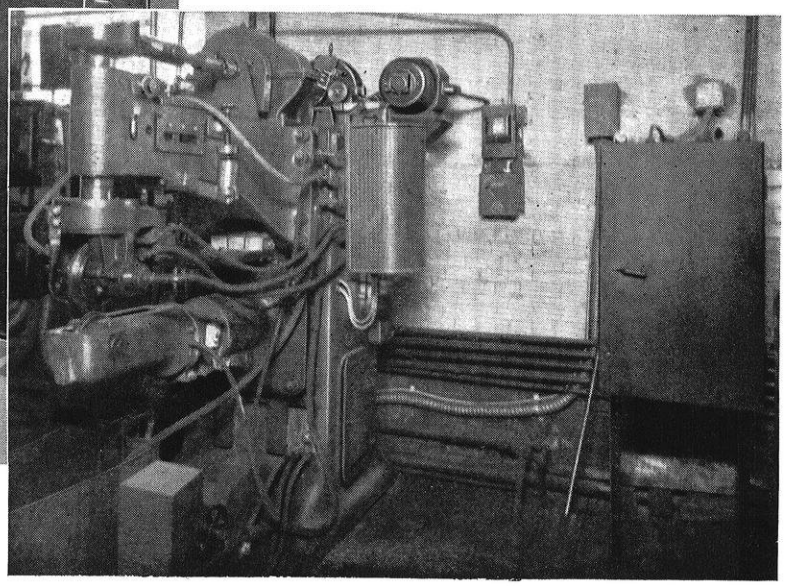
The engineer, then, not only finds his facts and faces his facts but follows his facts. "Man afraid of his facts" is no sort of a name for an engineer. Rather he is afraid of too few facts, and it is because of this fear that he introduces a factor of safety into his calculations—something unknown or at least unused by the investigator of the unscientific type.

The Engineer's Attitude

The engineer's attitude toward the truth is obvious: he is the accredited advocate for the truth. The mastery over the forces of nature that has been given to man by engineering has been won not so much by occasional flashes of spectacular genius as by the long-continued piling up of facts. Science, with its urge to know why, and engineering, with its urge to know how, have together contributed in generous measure to human progress. And this spread of scientific research and of engineering practice has been nothing more and nothing less than the spread of the truth. It is the truth that makes us free—there is no other route, and thanks to his type of training, to his mode of thought, and above all to his professional ideals, it is the engineer who surveys that pathway. To him words are of only passing interest; to him facts are guiding landmarks; to him the truth is the goal.



THYRATRON
THE OPEN DOOR



Close-up of a Thyratron control panel for high-speed welding applications

G-E Thyratron control equipment (in case) operates this line welder through a reactor

THE new electron tube, the Thyratron, is the most versatile servant developed in recent years. Already it has a host of applications. It will open windows, count anything that will interrupt a beam of light, operate welding machines, sort beans or buttons, operate drinking fountains as you bend over them, light buildings, windows, and theaters, and measure the intense heat of furnace interiors. And it has a thousand other applications.

Thyratron control has made possible high-speed welding machines, for no contactor-actuated resistance welder can approach the speed of several hundred interruptions per minute that are required. High-current Thyratrons interrupt the current in the welding transformers and swing the impedance from high to low, the welding rate depending on the speed of these changes. Thyratron control can be used for as many as one thousand interruptions per minute.

The name Thyratron comes from a Greek word which means "door". Not only does this tube act as a door, or valve, for electricity, but some scientists say that its possibilities are so great that its use will revolutionize the electrical industry. If these predictions are correct, the Thyratron is an open door of opportunity for young men now in college and for graduates already in the employ of the General Electric Company.

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