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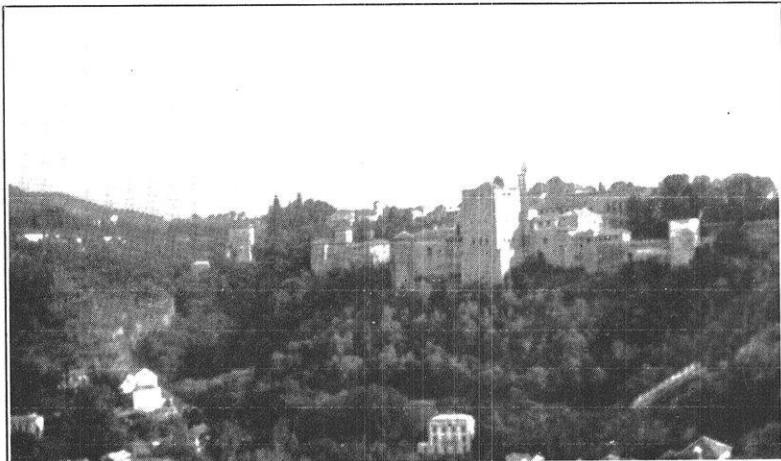
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THE WISCONSIN ENGINEER



« MEMBER »
E. C. M. A.

JANUARY
1933



A drybrush drawing of the portals
of Bascom Hall, University of
Wisconsin at Madison

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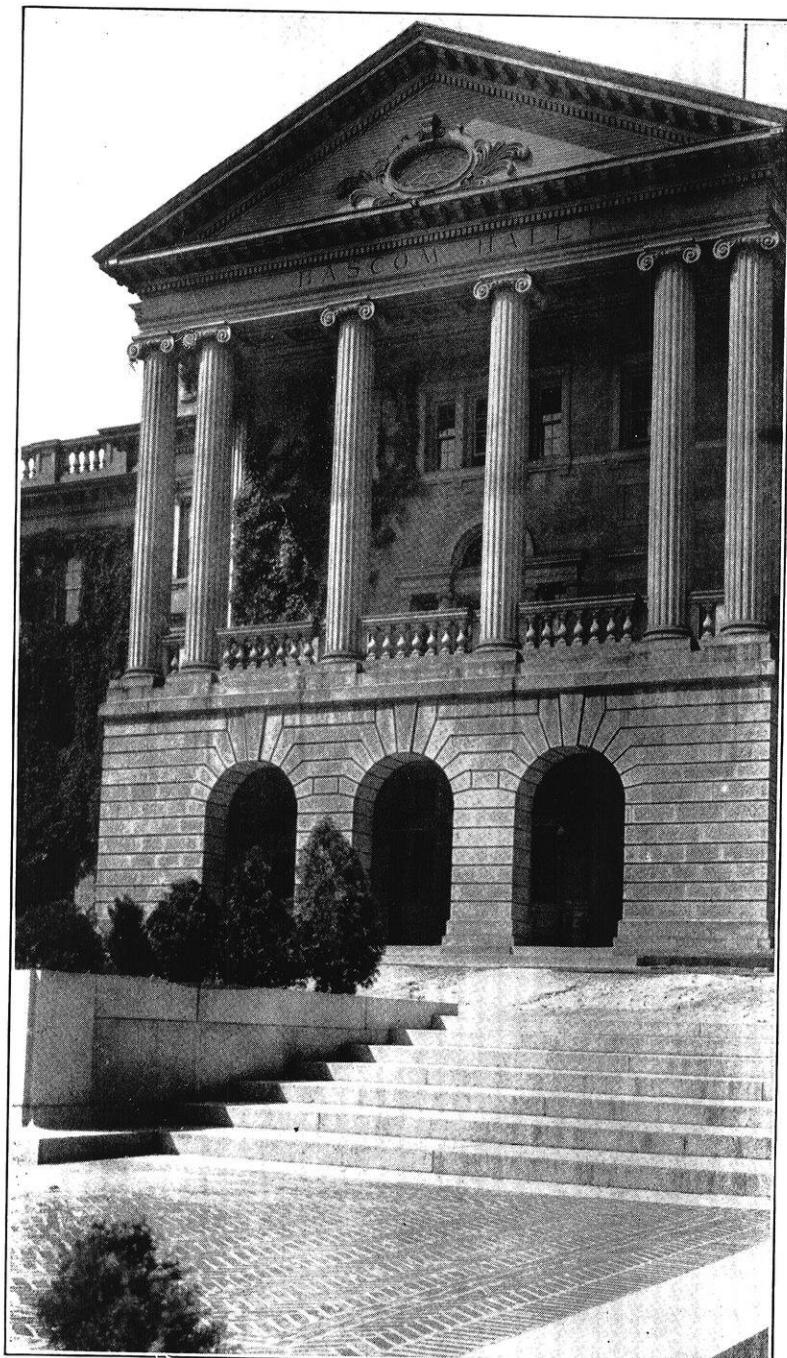
MR. ROBLEY WINFREY, Chairman, Engineering Hall, Iowa State College, Ames, Iowa

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BASCOM HALL

The WISCONSIN ENGINEER

VOLUME 37, NO. 4

JANUARY, 1933



*A Senior Mechanical Recounts
Some of His Experiences in*

Colorful Spain and Algeria

By PHILIP M. JUDSON, m'33

AUTHOR'S NOTE: This account will not attempt to picture the technical side of an experience in the foreign field, nor is it the endeavor of the author to depict the beauties, customs, and traditions of the several nations visited. He does not claim any great experience in the crushing and cement industry nor to be the official mouthpiece of the company for which he worked. It consists merely of the memories of a first real job and part of a year in Europe.

B EING by no means the son of a millionaire or of chosen gentry, the author found that after having completed four years at the University of Wisconsin, the depression made it a case of being able to live more cheaply at home in Paris than by galavanting around God's country out of work. This first time home in eight years brought an opportunity to do three months of field work in Spain and Northern Africa through an engineer father and a large American concern.

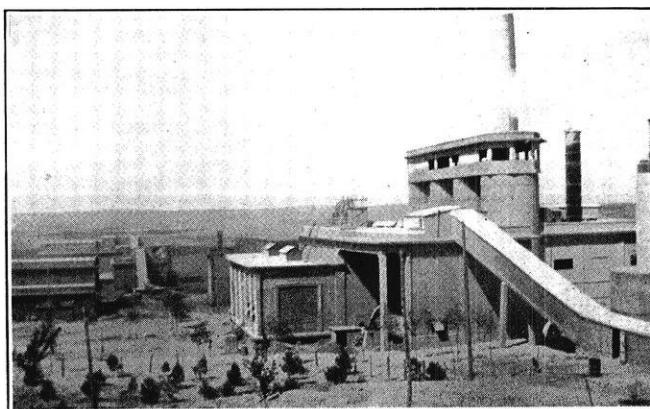
Leaving Paris on the Sud-Express late in July of 1931, for Spain, started the experience. These trains, the biggest in Europe, are quite as good as those in this country and perhaps a little faster, for although the locomotives are smaller the light weight of the carriages makes up for the deficiency in power. This particular road was electrified as far as Lyons. The sleepers are all compartment cars with one or two persons to each compartment and about 12 compartments per car.

So the trip was begun in a very comfortable manner.

Though leaving home so soon, it was somewhat of a pleasure to get away from the rain that had blessed Paris for the previous two weeks and to wake up under the sunny, azure skies of Biarritz and to see the beautiful Bay of Biscay. At Irun, on the Spanish border, a change of trains was made for Madrid, for although it was a through train, the military strategy and political anxiety of some European nations has caused them to change the gage of their railroads to prevent invasion in time of war. The Spanish railway systems have a much wider gage than those in this country. The French and English use practically the same as those in the United States.

A dusty arrival was made in Madrid about seven at night after a hot day through the arid mountain regions and green valleys of Northern Spain — the ancient battle fields of the Vandals and of Napoleon. Then another hour's ride by car was made to the south of Madrid in company of another American engineer — the man in charge — a young Spaniard and the chauffeur Julio, to Villaluenga de la Sagra in the province of Toledo.

This ride was through the country that has been immortalized by Cervantes in his amusing masterpiece "Don Quixote de la Mancha". This was the Mancha



Cement Plant at Villaluenga de la Sagra, Toledo, Spain.

and yonder were the blinking lights of the old Cervantes homestead that had taken so much time to read about in schools while in South America and in Wisconsin.

The arrival at dusk into the village and then to our quarters at the plant, a cement plant, three kilometers from the town meant an American meal, for, fortunately this engineer's wife was there, and she was a real cook.

The residence assigned to us dated back four hundred years, and some of the equipment must have at least equaled that, though still serviceable. However, the quarters were very comfortable, and better than any that could be found in the village. The plant is situated next to a hill near the house. A castle had topped the hill at one time, but now modern industry has supplanted it with a noisy cement quarry. Our quarters, at one time the home of many generations of caretakers to the feudal estate was the only vestige of the days of chivalry, except for the present caretaker, Pedro.

He has been watching that hill and the property, at present for the cement company, for almost seventy years, superseding his great-grandfather and father before him in



Spanish foreman and Algerian workers on one of the parts of the dismantled stone crusher at Oued Fodda.

turn, standing at his post almost like a statue, until the evening whistle blows, and always eating his beans and taking his siesta under the raised floor of our own little private office, which offered about all there was of shade in the midst of that desert like, wheat filled expanse called La Mancha.

The plant is fairly large, though not the largest this particular company operates in Spain. It is stretched out over an area much larger than necessary, "but then, Senor, that makes it look large." It is equipped entirely with American machinery, except for isolated pieces and accessories.

The output was at the time, at half capacity, equal to about 298.8 tons per day or 12.2 tons per hour on the last test run made. Due to business conditions, the incoming of the new republic and the general business depression, only half the total capacity could be used. The cement industry in Spain, as many of the other industries, is regulated and apportioned by the Government amongst different competitors so that everyone will have an equal share of business.

The plant was designed by an American engineer. He had to design it several times before his plans were accepted by the company. That, in his and in most other engineers'

opinions, is the reason for the difficulty in acquiring the proper production with the proper quality. His first design was the best, but his last suited his employers the best — Lord knows why — unless it was because the King dedicated it and they wanted to impress him and still not spend too much money. The plant seemed to operate very well up to the point where the finished clinker ran from the kiln to the storage pile.

This clinker, running from about one-half inch to about four inches in diameter, was run into a long pit approximately eight feet deep, which was eventually filled to make a pile about twenty feet high. The temperature of the clinker ran anywhere from 150 to 200 degrees centigrade on leaving the kiln.

The clinker in the ordinary course of operation should have time to cool down if the clinker pile is covered and stretched out so that the air can get at it. With the clinker massed as it was in the shape of a young mountain, it could not cool down sufficiently for grinding. Hence on entering the mill, after being charged with a certain percentage of gypsum, it was so hot that a coating of fine cement left in the mill from a previous run would stick to the compebs (grinding balls) and make it practically impossible to grind the clinker to the proper fineness. For proper grinding in this mill the clinker temperature should not be over 50 degrees centigrade.

The plant owners claimed that the fan cooling system was not doing its work properly and that furthermore, the dust collector showed that too much cement was being carried away by the fan system. It took two months to get the proper conditions, or rather permission to run a test under the proper conditions, that is, to spread out enough clinker for a twenty-four hour run or shovel it off the top of the clinker pile into the feed belts to the gypsum mixing and the load weighing chamber and then send it to the mill under temperature conditions that a correctly designed plant should have.

The results of the twelfth and final test were gratifying and proved the point that no mill using dry or wet grinding can grind at exorbitant temperatures. It also proved that the fan system was not at fault. To correct their condition it was recommended that the clinker pile be designed to give the air a chance to cool the material, to cover the storage pit so that the hot sun would be warded off, and if necessary use an overhead crane to transport the clinker to the feed intakes.

One of the great difficulties encountered was naturally the difference in language. The author alone spoke Spanish with any fluency and he being a "greenhorn" was at some disadvantage. Then those old Spanish and in fact European customs of haggling, crafty statesmanship, crooked politics, and intrigue had to be contended with.

Some of the duties on these tests were for example: filling out data sheets, computing results, screening cement and clinker samples, drawing up working curves for the mill in triplicate drawing comparison curves of temperature with regard to fineness for both the clinker and cement, in triplicate, working in twenty-four hour shifts, drawing a complete plan of the mills and their cooling systems, changing

the ball charges, checking with the company's readings, and last but not least swatting flies in the office and trying to master the art of drinking water out of a Spanish botija.

Despite many adverse things that may be said about the plant, such as lack of coordination and leadership, extravagance in the wrong direction, poor plant site (for the quarry gave out after one year), low wages for the laborers, fifty cents a day, the experience was enjoyed and much valuable information was acquired from this first field job. The Spanish are extremely hospitable and provided everything for one's comfort, including two servants, but no cool clinker.

We were entertained in Toledo and Madrid at bullfights, fiestas, were taken on historical sightseeing trips, and several evenings were spent in this village and neighboring ones as the guest of some of the foremen and clerks who would never let one pay for a thing and who were very adept at playing guitars and singing Andalusian songs under a Spanish moon in a manner thought only to exist in story books.

At the end of the first month our Chief came down from Paris and hauled us away to Algeria. Being just office-boy on this part of the trip, the author had more of a chance to just see things and enjoy the adventure. Madrid was left behind in the first rain seen since leaving Paris, the average temperature having been about 98 degrees F. all this time. At Alicante, one of the rather busy seaports of that portion of Spain on the Mediterranean and also a watering resort, a day was spent waiting for a French boat from Marseilles to take us to Oran in Algeria. Shopping, swimming, eating fruit and drinking ice water etc. were the order of the day in this town that reminded one of Panama City.

Our ship, the Gouverneur-Generale Laferriere, a turbine ship, quite modern, and loaded to the gunwales with Spanish emigrants, business men, Arabs, soldiers, and some tourists, finally churned away with its prow pointed toward the dark continent. The trip was made over night on a perfectly calm sea.

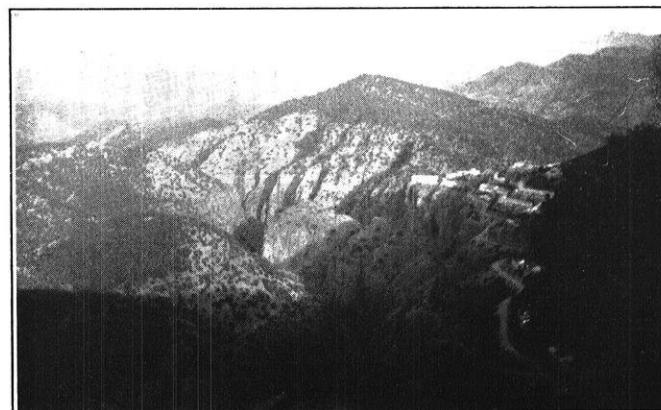
After having visited bazaars, seen legionnaires, and colonial French Africa at its hottest in the port of Oran, we proceeded to Oued Fodda (River Fodda). Oued Fodda is situated in the Atlas mountains, one might say in their foothills and almost at their Eastern extremity. The French government is building a series of dams with which to control the water shed of these foothills to irrigate the coastal plains in order to make that strip of North Africa, which has good soil, of more use to Madame la Republique than just a training grounds for troops, a haven of fruit orchards, and fat-tailed Biblical sheep.

The Oued Fodda dam now in construction is using some of the American company's crushing machinery to crush stone for use in the concrete of the dam. The trouble here did not seem to be production so much as the fact that the plant was grinding too much very fine material that could not pass the government specifications and was lost labor. To correct this, they could have done it themselves with a little initiative, the large gyratory crusher had to be dismantled and reset. This crusher stands about fifteen feet high and is thirty inches in diameter at the discharge end.

The job was slow and tedious, requiring chipping of the zinc which held the mantle on the mandril, heating and hammering the nut and mantle to loosen them, heavy hoisting work, repouring the zinc at a new setting, and cutting off a bit of the concaves to increase the size of the discharge opening at the bottom.

It was necessary to improvise a new discharge end plate for the ball mill to cause the product discharge to occur nearer the periphery of the mill, for at the center the product would now have been too floury still and hence useless. It was even necessary to align a transmission drive for them. They had complained about so many belts wearing out so soon, but it never occurred to them to check the alignment. It was found to be almost one inch off.

The value of this experience was that the work had to be done in the field where the proper facilities were not available. The results were good; and the drawings and designs made on the field checked exactly with those sent to Paris from the home office later in case our impromptu job could not stand the wear of continual service. The designs sent



Construction Camp on Oued Fodda Dam site in the Atlas Mountains in Algeria.

from America showed a stronger construction, and applied only to the ball mill. Again the job was hampered by poor organization, and also by a great diversity of languages—English, French, Italian, Spanish, and Arabic, but mostly French.

The people were very kind to us, though, and their chef and consequently the food, was very good. The accommodations were fair and offered a beautiful view down the valley and along the low, rangy foothills. There was a tennis court, and a small school for the camp where they also showed open air movies and held dances. During spare moments we inspected the diversion tunnel for the dam and watched the process of lining it with a cement injection gun work. A hike down the canyon to where the river opened up into the valley occupied a half day and gave us a rest from the confusion and the Babel of tongues in camp. Other visits to the Italian section of the camp, to the French section and the Arabic section, and up on top the mountain were all very interesting in giving an idea of the customs and so on.

After leaving Oued Fodda, a return was made to Oran. It was like going from hell to heaven to get out of the hot hills and to get sea breezes; to escape the discomfort of the

"sirocco" or African sand storm that blew in on us one day, though by no means with its habitual intensity; and to know that the laborers in the city did not have to have quinine in their tea to keep away malaria, though sun helmets were still necessary. A week was then planned to be spent in touring.

A trip was made through Sidi-Bel-Abbes, the headquarters of the Foreign legion, and the Spahi cavalry, to Tlemgen where we were fortunate enough to see a wedding of a noble Algerian and also a funeral. At this point could also be seen the remains and marks of four civilizations—an ancient native race, the Romans, the Mohammedans, and the present French influence. From there we traveled by train to Oudjda on the Moroccan border and traveled by bus to Fez, through the same country in which Abd-El-Krim and his Rifians had defied the French and Spanish only a few years before. Blockhouses could be seen every few miles, and many detachments of native troops and legionnaires working on the roads or at patrol duty.

Fez was interesting from the view of history and politics. It has an ancient university, many mosques, the palace of the Sultan, and the palace of the Resident-General of Morocco (French). The bazaars and markets were very interesting here and made one think very much of the Rubaiyat of Omar Khayyam. Here was the first real white man's hotel encountered since leaving Madrid. After a day and a half in Fez the sleeper was taken to Casablanca, a large seaport on the Atlantic. The arrival there was timed to a second with the fall of the English pound from the gold standard. It was also timed with our being out of French cash. American travelers checks could not be cashed. Nothing doing—neither Swiss francs, German marks, Japanese yen, or buffalo nickels were worth a cent on that day in Morocco. Finally, through the courteous aid of an old customer, a loan was negotiated to see us through to Tangier that night. The next day a crossing was made over the Straits of Gibralter to Algeciras, from where one can see the two pillars of Atlas, Gibralter just a few yards away and the large promontory only a few miles beyond on the African shore.

A journey through Andalusia was next, with its cork groves and small railroad stations where Spanish señoritas and damas sold us refreshments for supper. It took seven hours in a most uncomfortable train to cover approximately two hundred miles of mountain country immortalized by Irving in his many wanderings through Spain, to get to Granada. The next day, a tour was made of the Alhambra, the Generalife or summer palace of the ancient Moors, the cathedral, and the gypsy caves back in the hills. A stay was made at the Washington Irving Hotel where the American writer of that name, famed for his "Tales of the Alhambra", had resided over a hundred years ago.

Granada is a beautiful spot. Only a man like Irving could express on paper the atmosphere of those old Moorish relics and the palace of Charles the Fifth. While watching the reflection of the sun on the Sierra Nevada behind the town, as it sank in the west across a hazy plateau behind two promontories that were outposts for the old Ommiad Dynasty, one couldn't blame the last of the Moorish kings for

weeping as he stood in a like moment looking at his fallen kingdom, which Ferdinand and Isabella had taken from him, with one last parting gaze.

In the evening, we left for Madrid and Villaluenga again where finally the cold clinker was given over, though it was almost necessary to post sentries to keep it.

After cleaning up there, the return to Paris was made by the eastern route through Barcelona where a stop-over was made for business. The cement company's home office was located there. This town is the center of industrial and commercial Spain, it has also many interesting sights and historical points of view: the Ramblas, Paseo de Gracia, the fort Montjuich, and the view, a superb one, from the Tibidabo.

The next stop was at Carcassonne in southern France. It was a complete and living relic of the sixteenth century in twentieth century France with its moats and catapults, chapels and embattlements. Then through Toulouse to Paris and the Champs-Elysees, the Eiffel Tower, the glamor and charm of the French capital, the captivating city where all Americans are supposed to go when they die, according to the modern proverb.

CENTURY OF PROGRESS NOTES

Golden Pavilion of Jehol

Twenty-eight thousand pieces of wood, ranging in size from massive columns to hand-carved bits a few inches long have been fitted together like the parts of some intricate Chinese puzzle to reproduce the Golden Pavilion of Jehol, famous Oriental Lama temple on the grounds of the Fair. The temple was brought from China for Vincent Bendix of Chicago by Dr. Sven Hedin, famous Swedish explorer. The original was built by the Manchu emperors in 1767. It required 173 packing cases to transport the various parts. A Chinese architectural student assisted the American contractor in assembling the temple.

Sanitary System

Construction of a pumping system that will supply 28,000,000 gallons of water a day to the buildings and grounds of the Fair is rapidly approaching completion. A total of 13 miles of water pipe are required for this system which utilizes water from the mains of the city of Chicago. In addition to the water pumping system, a sewage pumping system to meet the requirements of 1,000,000 persons a day is being installed, with four pumping stations located on the grounds. Other general utilities including electrical power, the construction of roads and paths, storm sewers, illumination, and painting are being provided for.

United States Government Building

The United States Government Building is now under construction in juxtaposition to the Hall of the States on the grounds of the Exposition. The building which will cost approximately \$300,000 will be 620 feet long by 300 feet wide, with a rotunda 70 feet in diameter, surmounted by a 75-foot dome, around which will be grouped three fluted towers 150 feet high, typifying the three branches of government—administrative, legislative and executive.

(Continued on page 63)

The Saturation Curve of

A Well-Oiled Engineer

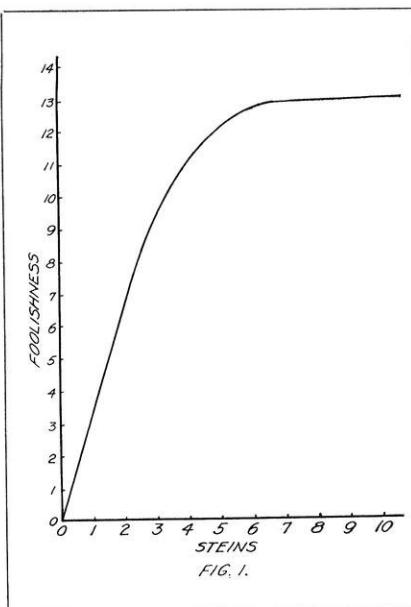
By W. H. FRITZ, e'33

The reader is cautioned upon entering this article that it deserves no more serious attention than would be given to any lecture on the hill since it is a product of the result of heavy demands made upon one of the would-be members of the honorary electrical fraternity.—EDITOR.

AN intense research of unusual character has recently been made in connection with the saturation curve of a well oiled engineer and some remarkable results have been obtained. The conclusions derived from the tests carried out prove conclusively that an engineer is remarkably like a piece of soft iron. By a unique combination of the application of the principles of magnetism coupled with psychological observations it was found that the softer the engineer the more closely did he follow the properties of iron. It is the object of this paper to set forth the conclusions drawn from the observations made.

A representative group of engineers was chosen that submitted more or less willingly to the different tests made, and the astounding experiment started. From the first test made the results may best be shown in graphical form. A curve was plotted using units of foolishness as ordinates and a new unit, the stein, as abscissae. The latter unit, little known or heard of in American engineering circles, has

been in use in Germany for years. This possibly accounts for the early development of science in that country. The curve in final form representing the average engineer is shown in Figure 1. Upon plotting foolishness against steins it was found that the foolishness increased in direct proportion to steins up to a certain point beyond which the proportionality no longer held. A point was



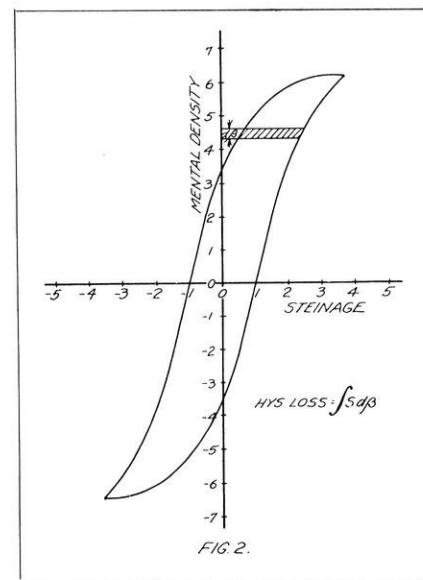
reached beyond which the curve was perfectly flat, and in most cases, so was the engineer. At any point below sat-

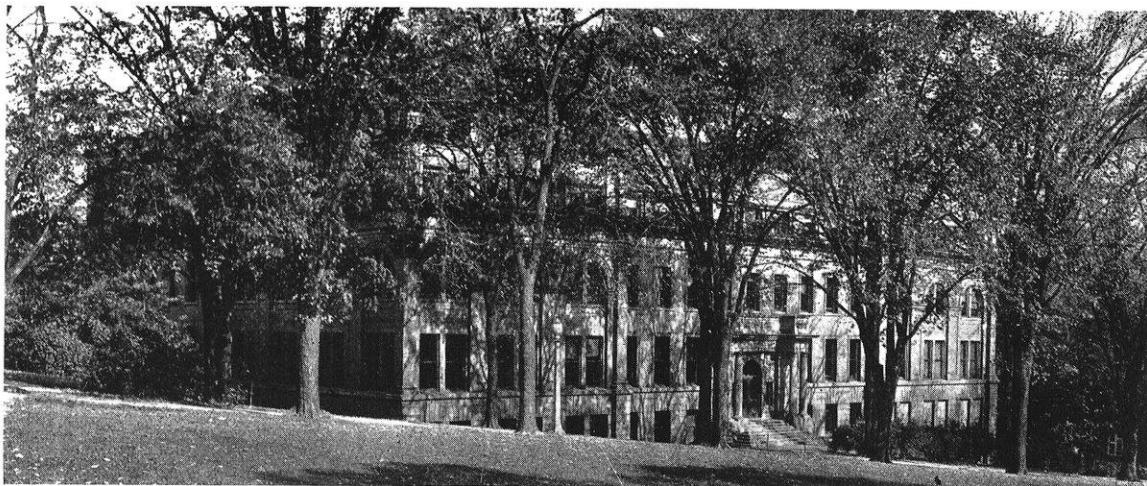
uration the ratio of foolishness to steins is engineer permeability and is designated by the greek letter mu. Were the tests continued to include animals, it is probable that in the case of kittens the mu would be constant.

Another test was made with even more surprising results! In this case also the results may be shown to best advantage by a curve. The engineer's mental density when plotted as a function of stein intensity resulted in the curve shown in Fig. 2. When plotted for a complete cycle the loop shown in Fig. 2 was obtained.

The name "hysterical loop" has since been assigned to it and from this, no doubt, comes the present connotation of the term "looping". The area enclosed by the loop represents the so-called "hysterical loss" and is a measure of the quality of the engineer tested. The greater the mental lag for a given engineer, the greater the hysterical loss. For an engineer of given density, the loss increases directly as the frequency of the applied steinage. For persons of exceedingly low reluctance the loop is extremely wide and the loss is terrific! From this it seems plausible to assume that lawyers must have very magnetic personalities, since the area enclosed by the hysterical loop would be very great indeed in most cases.

Thus we have seen that with perseverance and application, a seemingly insignificant phenomenon may be developed to a point where it is of vital interest to all. This simple analogy is only one of a great number of analogies that could be drawn showing the relation between man and inanimate objects. At present the writer is engaged in determining the relation between resistance and the damping factor in plotting the transient path of an engineer from no-load to full-load. Who knows what great discoveries will be forthcoming within the next decade?





« CAMPUS NOTES »

ELECT EIGHT SENIOR ENGINEERS TO PHI KAPPA PHI

Eight senior engineers were elected to Phi Kappa Phi, all campus national honorary scholastic fraternity, on December 17. Fifty-two seniors from 12 different departments of the university were elected. The engineers accorded membership in the fraternity were: Thomas Bardeen, e'33; Herbert H. Kieckhefer, e'33; Anton Kalinski, c'33; Claude Lyneis, c'33; Clyde Schlueter, e'33; Aubrey Wagner, c'33; Royal Wood, m'33; and Walter Wyss, e'33.

The local chapter of the Phi Kappa Phi was organized in 1920 and has as its purpose the fostering of high ideals of scholarship and leadership among students and faculty. Members are chosen from every college and school of the university, entrance requirements being at least an average of two grade points per credit and participation in at least three worth-while extra curricular activities. The students who are members of this organization can be identified with the many outside activity organizations on and off the campus and are offering their abilities and talents to make the university an essentially alive institution.

New definition of efficiency: "the former over the latter." For further information see Walt Wyss.

PROFESSOR MEAD BIDS FAREWELL

Professor D. W. (Danny) Mead bid official farewell to the University of Wisconsin and to his students in Contracts and Specifications with the last lecture of the course given on January 16. During the twenty-eight years that Professor Mead has been a faculty member he has held the whole-hearted and sincere respect of his students whose interests were his interests as well. The wit and humor which Professor Mead injected into his classroom was the kind which eliminated every vestige of that ever looming tedious aspect of education. His aim in promoting sound thinking among his students has met with no little success. He practiced the art of education to its capacity and attained results which placed him in the foremost ranks of educators.

Professor Mead had officially retired in June of 1932 but returned to conduct the course in Contracts and Specifications 101 upon special request.

It is quite fitting to reiterate the statement made by Professor L. F. Van Hagan last June when he wrote, "Professor Mead has set a high standard as a teacher, as an engineer, and as a citizen, and one which will long remain among the best traditions of our college."

SEWAGE TREATMENT COURSE OFFERED AT UNIVERSITY

A comprehensive course in sewage treatment was conducted during the week of January 9th by the university in cooperation with the state board of health and the league of Wisconsin municipalities.

The program for the course, as announced recently was divided into two general divisions, consisting first of practical work in the laboratory and secondly of demonstration lectures and discussions. Lectures were given by L. F. Warrick, state sanitary engineer; L. H. Kessler, assistant professor of hydraulic and sanitary engineering; M. Starr Nichols, chief chemist, state laboratory of hygiene; E. J. Beatty, assistant sanitary engineer, state board of health; and F. M. Dawson, professor of hydraulic and sanitary engineering.

A similar short course especially designed to aid plumbers and inspectors is to be offered from February 6 to February 11.

CANYON TRANSPORTATION

In order to get nine powerful shovels into Black Canyon so they could start work for the Hoover Dam, it was necessary to float them down the Colorado River on barges and set them ashore to dig themselves in.

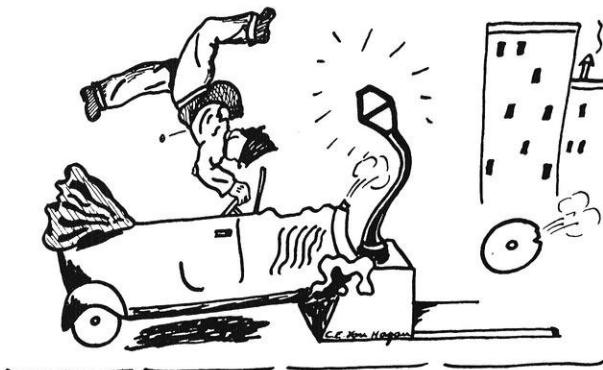
NEW SKI SLIDE BUT NO SNOW

The old wooden ski slide in back of the engineering building is now but a thing of historical interest with the completion of the new structure built with the consent of the board of regents by the Wisconsin Hoofer's Association. The Hoofers is an organization of students and faculty members who are interested in outdoor sports. After a lapse of three years the art of ski-jumping will again become an attractive sport on the campus.

The old slide, built years ago by students as a temporary structure, lasted until about three years ago when it became so rickety that it could not be used. Since that time the association has been engaged in raising funds with which to build the new slide, and finally with the help of the '32 graduating class enough funds were obtained so that construction could begin.

ENGINEERING DESIGN FEATURED IN SAFETY ISLANDS

The city of Madison has completed the installation of twelve safety islands in the city some of which are on University Avenue near the campus. The new concrete havens of safety for pedestrians are scientifically designed and approved by the National Safety Council. The old buttresses which have detained many a motorist have been replaced by a type of flying buttress which breaks up the force of impact of the colliding automobile into components, resulting in a reduction of the hazard. In twelve accidents occurring after the installation none of the colliding vehicles were seriously damaged. The new buttresses are also more easily discerned by the transient motorist due to the flood lighting of their bases. Hereafter, fewer motorists will be able to relate their experiences in shearing safety islands from their moorings.



ENGINEERS AT PRE-PROM

The sons of Erin evidently have a stand in with St. Nicholas inasmuch as quite a few had the two bucks necessary for a ticket to the Pre-prom. It was also noticeable that their brethren behind the scenes who were chasing the humidity in an effort to keep it under control got lost during the earlier part of the evening thereby causing some of the sons to wilt as they haven't wilted since they were up to summer camp at Devil's Lake. One of the sons, who evidently has a sense of humor and a keen perception of values, turned the lights out at the toastmaster's request, and then went to sleep all of which proves nothing except that they couldn't even exhibit the Prom Queen without an engineer having a finger in the pie.

AMONG THE INTELLIGENTSIA

Charles Otis (Co.) Clark, c'34, evidently did some research during Xmas vacation, but he picked the wrong man when he tried to tell Professor Withey in a Mechanics class that cast iron castings were frequently cooled off in a furnace.

After making a close scrutiny of the story on the Phi Kappa Phi elections, it will be noted that out of the eight engineers elected four and one half were electricals, Royal Wood being the one half since neither the mechanicals nor the electricals are willing to adopt him.



WE'RE IN THE ARMY NOW

Cadet (ROTC): "How do you get rid of these damn cooties?"

"That's easy. Take a bath in sand and rub down in alcohol. The cooties get drunk and kill each other throwing rocks."

HOLIDAY RENDEVOUS PROVES DISCOURAGING

In 1932 BH (Before Holidays), Warren "Mike" Mischler, e'34, grew a luxurious mustache — a Christmas present for his New York girl friend, so he said. The fair one seemingly evinced cold disdain toward his chivalrous efforts for he returned to school with his facial decoration somewhat in need of a trimming and the wearer not a little abashed.

EXTRA — ENGINEERS SHOCKED

Some of the civils in Seminar 1a will persist in sticking scareheads on their weekly news stories under the plea that they attract attention. To which Professor Van Hagan replied in a voice that woke everybody up "Well, one of the best ways to attract attention is to walk up Bascom Hill without your pants on, but somehow, it just is not done."

FROM THE GEOLOGY DEPT.

Fred L. Bush, c'35, is reported to have answered the exam question, "What are the soluble and what are the insoluble products of rock weathering?" with, "The soluble products of rock weathering are certain minerals and the insoluble products of rock weathering are certain other minerals." Dr. Lund opines that he will make a good diplomat some day.

Paul H. (Hezekiah) West got a bit worked up the other day in lab. when he identified 19 out of 20 rocks correctly and in his enthusiasm told the instructor that he "would have had a hundred, only the fellow ahead of me has too good a handwriting." However, the "Beer Baron" retained his 95.

THEN AND NOW

An outstanding phase of the comeback being staged by the American Merchant Marine, is the electrification of such vessels as the Manhattan. Shipping men say the contrast of comfort and convenience today with that of travel during the basque and bustle period of 50 years ago, is emphasized most strongly by the use of electrical equipment.

"An increase in human happiness must accompany the production of wealth if the creative force of American industry is to fulfill its highest duty and responsibility."

« ALUMNI NOTES »

CHEMICALS

Sindt, Erwin J., ch'25, is sales engineer for the National Aniline and Chemical Company of Chicago. He is living at 408 Ridge Ave., Evanston, Illinois.

Millington, Fred M., ch'23, is now superintendent of the Industrial Gas Department of the Wisconsin Public Service Corporation at Green Bay, Wisconsin.

Griswold, Frank L., ch'20, is living at 940 Prospect Place, Brooklyn, N. Y., where he is an instructor at the Long Island University.

MECHANICALS

Richtman, Wm. M., m'25, has left the Barber Colman Company at Rockford, Illinois and is now an assistant professor at the Texas College of Arts and Industries, at Kingsville, Texas.

Schubert, Wm. E., m'25, has been promoted to assistant general manager of the Wisconsin Michigan Power Company, at Appleton, Wisconsin.

Strate, J. T., m'21, has resigned his position at the University of Arkansas to become head of the department of mechanical engineering at South Dakota State College, Brookings, South Dakota.

Taylor, H. D., m'21, is with the Turbine Engineering Department of the General Electric Company at Lynn, Mass.

Rodriguez, Sumner, m'16, is with the Vacuum Oil Company at Melbourne, Australia. His address is 90 William Street, Melbourne.

MINING

Azcon, Ernesto, min'27, has returned to Mexico and is at Apartado No. 2, Esmaraldo, Coahuila, Mexico.

Haas, Oscar A., min'26, has been transferred by the Allis Chalmers Company to Tulsa, Oklahoma, where he is sales engineer for that company.

Hymer, Howard G., min'20, who is working for the M. A. Hanna Company, has been transferred to a new location at Buhl, Minn.

CIVILS

Dever, Harry C., ex-c'32, is reported to be working for a contractor on government work near St. Joseph, Mo.

Van Hagen, Robert L., c'32, former editor of the Wisconsin Engineer, was married on September 10 to Marjorie G. McKone of Green Bay, a junior in the L. & S. school.

Woo, William H. F., Ph. D. '31, resigned his position with the bridge department of the Wisconsin Highway Commission and returned to China during the past summer. He sends Christmas greetings from Yenching University, at Peiping.

Bielefeld, Eichard H., c'30, is now in charge of the government supply depot at Kaukauna, Wisconsin.

Druml, Frank, c'30, is working with the United States Engineer Office at Rushville, Missouri. He is doing inspection work on dikes being constructed on the Missouri River, just below St. Joseph. The purpose of the work is to straighten the channel of the river and to confine it within certain limits. The accompanying picture shows part of the construction—a mat-

Commission. "Ben" is a nickname reminiscent of the highschool days when he flew a kite in an attempt to obtain some lightning for closer observation and study.

Shuman, E. C., c'24, has left the Pennsylvania-Dixie Cement Corporation, where he was in charge of the Research Laboratory, to take a position as Chemical Engineer for the Deo. Hoering and Company, manufacturers of water treatments. He is also working on a carburetor that burns any fuel including furnace oil. He says that tests on it have shown it to be very successful.

Sogard, Lawrence T., c'24, is with the Acoustical Engineering Corporation at Milwaukee, in charge of sales and installation of acoustical and sound Control in that district. He is aware of the fact that most offices would like to have a little more noise right now—not less.

Kunesh, Joseph F., c'14, is the Department Engineer for the Board of Water Supply of the City and County of Honolulu. He says that the conditions in Hawaii are normal except that its three leading industries are suffering. Sugar is low in price, pineapple stocks have dropped from 65 to 4, and the tourists are few in number. His address is 4934 Mana Place, Territory of Hawaii.

Youngberg, G. E., c'14, is at Des Moines, Iowa, with the Pennsylvania-Dixie Cement Corporation.

Titus, Wm. J., c'13, who has been chief engineer for the Indiana Highway Commission for the last eight years, writes that 1932 was the largest and most successful year the commission has had. Approximately 600 miles of pavement was laid, and bridges at a total cost of \$4,000,000 were completed.

Wendt, Kurt F., c'27, instructor in mechanics, is the father of twin boys, Franklin and Richard, born October 21, 1932.



Laurgaard, Olaf, e'03, C. E.'14, city engineer of Portland, Oregon, was elected president of the National Council of State Boards of Engineering Ex-

aminers at the meeting in New York on October 1. He has been active in registration matters in Oregon and has served on the Oregon board for a number of years.

ELECTRICALS

Hovey, John, e'32, was married in Chicago, November 10, to Emily Simpson of Winetka, Illinois, a former student at Wisconsin.

Cobine, J. D., e'31, received his M. S. degree in E. E. last June, at the California Institute of Technology, and is continuing his graduate study and research work at the institute. His address is 1637 Oakdale St., Pasadena, California.

Jewell, R. G., e'29, is with the West Lynn Laboratory of the General Electric Company, at Lynn, Mass.

Stokes, Hugh L., e'29, was married to Ruth E. Phillips of Milwaukee, on December 14, 1932, at Milwaukee.

Sweet, Alva L., e'29, on October 15, was married to Marion Berning of Schenectady, N. Y. Mr. Sweet is with the Industrial Control Engineering Department of the General Electric Company at Schenectady.



Morack, Marvin M., e'28, and Miss Dorothy Bowers of Schenectady, N. Y. were married October 15, at Schenectady. Immediately after the ceremony the couple motored to New London, Wisconsin to visit Mr. Morack's parents. After attending the homecoming festivities here, they returned to their home at 2178 Fairview Ave., Schenectady. Mr. Morack is in the Power Rectifier Department of the General Electric Company.

Scheer, George H., Jr., e'28, married Nelda Starkey of Decatur, Illinois, June 30, 1932. He is now in the engineering department of the Webster Company, manufacturers of amplifiers and allied equipment, at Chicago. His address is 169 N. LeClaire Ave., Chicago.

Miller, Burton F., e'26, M. S.'28, Ph. D.'29, is now employed as a research and development engineer by the Royal Film Laboratories at Hollywood, California. He is Chief of the Sensitometric Department of that company. His address is 1355 N. Gardner Street, Hollywood.

Johnson, Floyd D., e'24, is the author of an article on "Testing and Adjust-

ing Network Protector Relays," which has been published as a serial in the June, July, and August issues of the Electrical Journal. Mr. Johnson is switchboard engineer with the Westinghouse Electric and Manufacturing Company.

Lamont, Dallas R., e'20, is patent counsel with the Socony-Vacuum Corporation, 26 Broadway, New York City.

Brewer, R. W., e'21, has just returned to China after a trip around the world, visiting in Europe and the United States. He saw Donald Bohn, e'21, in Pittsburg, and Robert Swift, e'21, in Waukesha. He spent some time visiting in Madison. Mr. Brewer is manager of the Ford-Hire Service, the largest taxi service in Shanghai. His address is 77 R. Vallon, Shanghai, China.



Moody, Ralph E., e'12, has been appointed vice president and general manager of the Wisconsin Michigan Power Company at Appleton. Mr. Moody is living in Milwaukee.

Van Hagan, Arthur E., e'06, has been appointed representative of the American Telephone and Telegraph Company in Washington, D. C. He will assist the federal government and the Associated Companies in matters concerning communication arrangements in federal establishments throughout the country.

Muir, Roy C., e'05, was elected first vice president of the Test Alumni Association of the General Electric Company for the years 1932-1933. He is employed at that company as assistant engineer of the Industrial Engineering Department.

Stieler, Frederick C., e'02, is a contractor with his office at 220 W. 42nd Street, New York City. He is living at 68 Horatio Street, New York.

Rosenstengel, Rudolph, e'94, died in New York on August 1, 1932. He was head of the engineering department of the Gettysburg College, Gettysburg, Pa., and was former head of the German department at Wisconsin.

According to an article by D. B. Prentice in the October issue of Mechanical Engineering, Wisconsin has 269 of its engineering graduates listed in the latest edition of "Who's Who In Engineering". With the schools listed

according to the number of graduates included in the volume, Wisconsin ranks sixth out of 284 colleges and universities of the United States and Canada represented in the book.

FROM OUR FILES

The "Wisconsin Engineer" of January, 1900, contains a lengthy article entitled, "The Automobile Vehicle." The students at that time no doubt read the article with considerable interest, but it is equally as interesting to review such a story today. In 1898 there were hardly fifty automobiles in the United States, but in the fall of 1899, according to the article, there were 106 companies incorporated in the United States for manufacturing automobiles. At that time these vehicles were classed into four types, those driven by electric power, by internal combustion engines, by steam, and those by a combination of electric and one of these other means of power.

The electric machine seemed to be the most promising to the author at that time. It was considered the safest because its storage battery could not explode, and there was no inflammable fuel necessary, such as gasolene. It was sometimes called the "fool's carriage" because of its simplicity and ease of operation. The electric car was also free from noise, vibration, heat, and fumes. The small capacity of this car's power supply, the storage batteries, was appreciated at that time, but the author predicted, "We may expect in a few years to see electric charging stations (gasolene unit will suffice) distributed over every ten to twenty miles of country roads." (It so happens that we now have a "few" filling stations instead). The gasolene vehicles were not considered of much importance, the field being lead by the electric and steam carriages. The electric cars had a maximum speed of from ten to fifteen miles per hour, and the most popular of the steam carriages moved at a maximum high speed of forty miles per hour. People enjoyed riding in automobiles with pneumatic tires, but because of their high cost and the trouble with punctures, most tires were of the solid type.

The author also expected a change in design. He says, "Whether we will see vehicles of different design it is hard to predict, but when we consider that the first railroad coaches were built after the design of the old road coaches, we can expect the vehicles which look right to us now will seem clumsy if it should become necessary to change their design." (In these thirty-three years since, there has been a perceptible change, much to our comfort and satisfaction).

« « EDITORIALS » »

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TECHNOCRACY BLOWS A TIRE "Technocracy" has swept the country during the month of December with the violence of the recent midget-golf fad and seems in a fair way to be deflated even more rapidly. Technocracy is the name adopted by a group of investigators formed twelve years ago for the alleged purpose of measuring and comparing industrial accomplishments. The meaning of the word has been extended to include a possible program based upon the findings of the "technocrats".

The main points advanced in the December "Living Age" by Howard Scott, spokesman for Technocracy, are as follows: the machine is here to stay; it has created conditions that make necessary radical changes in our social organization; such changes, if made in time, will create Utopia; our price system for exchanging goods is not suited to present conditions. "Technocracy proposes no solution."

Scott and all his works have been vigorously attacked by John H. Van Deventer, editor of Iron Age, who charges Scott with having been affiliated with the I. W. W. and with being an unscientific and unreliable propagandist. Scott, who is said to hold no university degree, has been stripped of his titles of "engineer" and "doctor". His figures have been controverted, and his conclusions have been challenged.

It is too early at this writing to say whether the fight will continue or whether we have witnessed a two-round knockout. So far, the honors are with "Kid" Van Deventer. The significant point about the whole affair lies in the eagerness of the people of our country to be saved from the Depression by a miracle. For a short time "technocracy" has been a conjure word. Technocracy was to get us out of the mess we have gotten ourselves into. Just how it was to operate we neither knew nor cared, just so long as we achieved Utopia without any more suffering or hard work. It looks now as though we will have to screw up our courage for another round or two with Old Man Depression.

CALL IT A PLATEAU

A recognized feature of the learning process is that it is not uniform but consists of a series of upward movements each followed by a period during which there seems to be no advance. The curve of progress when plotted consists of a series of rising portions and level portions, the so-called plateaus of learning. A person studying mathematics, piano playing, or golf discovers that at first he makes appreciable progress. Then follows a period of discouragement in which his efforts are not rewarded by satisfactory progress. Then comes another period of upward rush, and it, in turn is followed by a plateau of apparent stagnation. It seems probable that the plateaus are periods of assimilation and growth. The student absorbs his fill of the new subject during the upward swing of the curve. Then he must assimilate and master what he has learned and increase his capacity for further advancement.

Civilization seems to be on a plateau. For one hundred years mankind has been progressing scientifically and industrially at an accelerating rate. The upward rush of the past few years has been terrific. And now, without apparent cause, we have flattened out. If the depression continues it is obvious that scientific progress will be retarded, regardless of the pronouncements of Technocracy. Civilization seems to be in need of a plateau that will give pause in the upward sweep of progress and permit the assimilation and mastery of what has already been created. Perhaps the Depression is really a plateau.

"The engineer's gifts have been and may be grievously abused. Man was ethically unprepared for so great a bounty. In the slow evolution of morals he is still unfit for the tremendous responsibility it entails. The command of nature has been put into his hands before he knows how to command himself." — SIR ALFRED EWING, President, British Association for the Advancement of Science.

ECONOMIC ENGINEERING

One of the greatest benefits of the depression is the gradual birth and development of the Engineer of Economics. At no time in the past has there been any purposeful, directed research into the field of applied economics. Hundreds of millions of dollars have been spent for research in other fields, but it has never before been necessary to study this topic. Those who have studied the subject have been isolated individuals who had no power to carry out their ideas. As always, the gifted few have to wait for the sheep-like masses to catch up with them before anything is accomplished.

Many cities have already taken action and gone onto the eight hour day—five day week basis. It is expected that the federal government will follow suit. From a human viewpoint, this is a huge step forward. The next big job is to teach Mr. Average Man what to do with the extra leisure time he will get so that he will enjoy life more fully. Engineers have confined themselves in the past to the problem of harnessing the forces of Nature and making her do Man's dirty work so that he could run around and play. The engineers will now have to concern themselves with teaching him how to play, and also with the problem of preventing a few from swiping all the toys. It will almost certainly be necessary to place a limit upon salaries. Initiative and industry will probably have to be rewarded as it is in the army; that is, by greater authority, and the opportunity to use special talents, not exclusively for individual benefit, but to further the interests of the community at large.

"Most engineers question the average business man's fatalistic belief that depression is cyclical, like floods and droughts; they hold that business activity can be stabilized, but they do not agree on the method."

— EDITOR, *Engineering News-Record*.

WHAT IS ENGINEERING?

Engineering is an endeavor of man-kind other than physical labor to master the science and art of utilizing the materials and laws of nature for the progress of humanity.

This definition gives credit to the persons who conceived of such things as the wheel, the screw, and the pulley, and eliminates those who performed the tasks of factory hands and manual laborers.

An engineer will be thoroughly schooled in such fundamentals as Physics, dealing with the laws of nature; Chemistry, enabling him to work cooperatively with specialists; Metallurgy, perceiving of the operations of obtaining metals from the various crude ores; Mathematics, applying the science of solving the specific problems that he often encounters; Business Law, understanding the legal side of the project on which he is working. These subjects only help as they are being used. They are like tools that get rusty from lack of use.

For the primary personal qualification the engineer must have common sense, the ability to reason and see clearly through a problem. He must be skillful because engineering can not be done in a haphazard way. Skill will be ac-

quired through practice and experience. Experience does not prevent him from making mistakes, but it does help him to notice them soon after they are made so they can be corrected. An engineer needs sufficient courage to work out ideas that are considered out-of-place and useless by others. Along with courage he must have enthusiasm to perform the work and "see it through to the end". He must show interest and be devoted to his work, as well as cultivate the habit of looking at his work from the broadest point of view.

Students preparing to enter the field of engineering would do well to see if they measure up to the above qualifications of an engineer. — *Engineering Magazine*.

We have had a Stone Age, an Iron Age, and a Machine Age, but the present age is one in which the college graduates will keep on trying to sell magazines instead of switching to bonds.

THE ENGINEER

Who is the man that designs our pumps with judgment, skill and care,
Who is the man that builds 'em and keeps them in repair,
Who has to shut them down because the valve seats disappear?
The bearing-wearing, gearing-tearing mechanical engineer.
Who buys his juice for half a cent and wants to charge a dime,
Who, when we've signed a contract, can't deliver half the time,
Who thinks a loss of twenty-six percent is nothing queer?
The volt-inducing load-reducing electrical engineer.
Who takes a transit out to find a sewer to tap,
Who then with care extreme locates the junction on the map,
Who is it goes to dig it up and find it nowhere near?
The mud-bespattered, torn and tattered civil engineer.
Who thinks without his products we would all be in the lurch,
Who has a heathen idol which he designates Research,
Who tints the creeks, perfumes the air and makes the landscape drear?
The stink-evolving, grass-dissolving chemical engineer.
Who is the man who'll draw a plan for everything you desire,
From a trans-Atlantic liner to a hairpin made of wire,
With "ifs" and "ands", "howe'ers" and "buts", who makes his meaning clear?
The work-disdaining, fee-retaining consulting engineer.
Who builds a road for fifty years that disappears in two,
Then changes his identity, so no one's left to sue,
Who covers all the traveled roads with filthy oily smear?
The bump-providing, rough-on-riding highway engineer.
Who takes the pleasure out of life and makes existence hell,
Who'll fire a real good-looking one because she cannot spell,
Who'll substitute a dictaphone for a coral tinted ear?
The penny-chasing, dollar wasting efficiency engineer.

— Author Unknown.

« CAMPUS ORGANIZATIONS »

MECHANICALS FIND SHORT TALKS INTERESTING

Short talks of a technical nature held the attention of the members of A. S. M. E. at their meeting which was held December 6th. John Robertson spoke of the uses of thermostatic metals in the operation of electric switches,

Elmer Kaiser talked for ten minutes on the coal industry, and Tom Lambeck, who has done and is still doing considerable thesis work on viscosity of oils, spoke at length on the instruments and technique of his work. Carl Malischke spoke on the financing of the Chicago Fair for 1933, and gave a few words concerning the buildings and grounds.

A. H. Edgerton, personnel director of the university, was the speaker of the evening, speaking on vocational guidance and human engineering. His stories and anecdotes were entertaining and his suggestions upon obtaining jobs should prove to be extremely valuable.

At the Christmas meeting of the society, held December 20th, the night before vacation, Christ Hansen, Art May, and Gib Bayley gave short speeches and Carl Malischke also spoke, this time on the subject of oil cooling systems in motor vehicles. Two films on East Africa and India were also shown. The meeting was brought to a close with the serving of refreshments which consisted of beer and doughnuts.

The short talks by students have proven much more interesting and valuable both to the listeners and to the speakers than was anticipated. It is more or less of a speech course of their own and they have just reason to be proud of it.

PI TAU SIGMA

The last meeting of Pi Tau Sigma during the year of 1932 was purely a business meeting. Various suggestions for the improvement of functions and for the maintenance of a wide-awake and an up-to-date fraternity were made and several committees were appointed to carry out these suggestions. Those appointed on the committees were:

Initiation Committee: Geo. C. Schmid, chairman, C. K. Otis, J. E. Brennan, H. L. Mohn, and E. P. Hansen.

Records Committee: R. H. Wood, chairman, J. J. Ermenec, B. J. Schmid, S. C. Anderson, and D. W. Anderson.

Program Committee: J. E. Brennan, H. D. Bruhn, and N. V. Kuehlman.

Since election of officers will take place at the next regular meeting a nominating committee consisting of D. W. Anderson, R. S. Beverlin, and H. L. Mohn was appointed.

The major activities of the fraternity are being deferred until after semester exams.

Recent national news revealed that H. E. Degler, University of Texas, was appointed supreme secretary of Pi Tau Sigma and John V. Martenis of Minnesota, supreme president.

CHEMICALS HEAR MEAD

“A Geological Survey of the Great Bear Lake Region,” was the subject of a talk given by Professor Warren J. Mead of the geology department at the meeting of the American Institute of Chemical Engineering held Tuesday,

December 13. The lecture was well illustrated by a number of pictures taken by Professor Mead when he made the survey last summer.

At the same meeting, Thayer Burnham was given recognition for his scholastic attainments during his freshman year in the form of a A. I. Ch. E. pin presented to him by Professor O. L. Kowalke.

AN AID TO SUCCESS IN ELECTRICAL ENGINEERING

If or when the reader of this article receives his degree in Electrical Engineering, he will undoubtedly try to turn his years of study into cash by trying to get a job. All other things being equal, when an employer has a vacancy he will invariably hire a man whom he knows personally,

rather than a stranger. Bearing this in mind, it is easily seen that a student engineer can ill afford to lose any opportunities he may have of making contacts with men in the profession, with fellow students, and last but not least, with the national organizations representing the electrical engineering profession.

The above mentioned contacts can all be made in one operation. Merely come to the meetings of the U. of W. student branch of the American Institute of Electrical Engineers, take a part in the proceedings, enjoy an evening devoted to a variety of topics, meet practicing engineers, and eventually become associated with the organization that above all others is most advantageous for the student as well as for the practicing engineer to join. Some of the advantages of this membership are: Educational values of the meetings and papers presented, availability of technical publications, the professional contacts formed through the local and national organizations, the use of the employment and library service, and the prestige of being a member of the only national organization representing the electrical engineering profession in this country.

And then there was the young engineer who kissed girls merely as an excuse for determining their power factor.

“Well, how is your companionate marriage working out?”
“Terrible! I’ve lost my wife’s address.”

Baseball fan: “Babe Ruth walked twice today.”
Co-ed: “Gosh, she should be more careful who she rides with.”

CENTURY OF PROGRESS NOTES

(Continued from page 54)

The exhibits by the Federal government through its executive department, offices and establishments will illustrate the contributions of the government to the advancement of industry, the arts and peace and demonstrate the nature of our institutions particularly as they relate to the wants of the people.

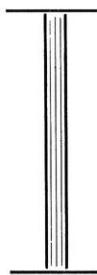
Approximately \$450,000 has been allocated for the preparation of exhibits in the United States Government Building. The departments and establishments that will participate in A Century of Progress are: the Departments of Agriculture, Commerce, State, Interior, Navy, Labor, Treasury, War and Justice, the Post Office Department, the

Smithsonian Institution, the Shipping Board, the Government Printing Office, the National Advisory Committee for Aeronautics, and the Panama Canal.

Concessions

The concessions range from the \$940,000 "Sky Ride" which will carry passengers in rocket cars suspended from cables over the Fair grounds hundreds of feet in air, to concessions for soft drinks, red hots and sandwich stands. They also include a system of motor bus transportation, restaurants, launches and rides in the lagoons, souvenirs, air transportation, the Chicago Hollywood, the Enchanted Island, the Abraham Lincoln replicas and a score of shows and thrill rides on the Midway, including the sensational "Flying Turns."

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ENGINEERING REVIEW

POWER PLANT COMBINES BOILER AND TURBINE

In the past few years boiler construction has undergone many changes and we have become accustomed to the ever increasing pressures and temperatures. The latest development in boiler construction is the consolidation of the component parts into a single unit. The tubes of the high pressure boiler, turning with the turbine shaft, eliminate feed pumps and draft fans.

The basis for this is a new method of operating the boiler, in which the heating surfaces are rotated at high speeds. The utilization of the resulting centrifugal forces in the water, and the gas turbulence attained by rapid motion of the heating surfaces, are a radical departure from accepted practice.

Experimental models constructed by the "Gesellschaft für LaMont-Kessel und Kraftwirtschaft m. b. H."—developers of this new type of power plant—were operated at 425 pounds absolute at 2200 r. p. m. Correct utilization of centrifugal forces in the rotating boiler makes it possible to supply feed water against high pressure steam without the use of a feed pump.

CHRISTIAN ENGINEERING

To the 257 varieties of engineering already on record, *Time*, in its issue for October 17, adds another, "Christian Engineering", in describing the work of Albert Lyon Scott, of Lockwood Greene Engineers, Inc., who is directing an inquiry into foreign missions at the instigation of seven U. S. Protestant denominations. Engineer Scott's investigation began a year ago, and his report is being issued in installments this winter.

The new title, although eye-compelling, is a misnomer. Mr. Scott is not attempting to apply engineering methods to the propagation of Christianity; he is applying his methods to evaluating the work of the missions and to attempting to determine proper policies for the future.

Mr. Scott, who is a graduate of Brown, brings to this particular task a sympathetic understanding. He is the son of a minister and has been a Baptist deacon and Bible class teacher.

DIESEL WILL CUT COSTS, SAYS RAIL EQUIPMENT EXPERT

The oil-electric locomotive will not only effect immediate operating economies but will positively pay for itself out of savings in as short a time as 18 months according to G. H. Froebel, rail equipment expert. Five million car miles and a hundred thousand locomotive hours in service have proven the Diesel-electric equipment to be the most efficient and economical tool yet devised in the field of transportation. The adaptability of the Diesel and its almost constant availability indicate revolutionary changes in railway practice.

"In switching service, terminal areas, and in lighter main and branch line service, oil-electric locomotives and rail cars have produced remarkable savings over steam operation. In industrial plants, where intensive studies have been made, savings of over 50% in operating costs have been recorded.

"One oil-electric locomotive in steel-mill service during the year 1931 operated 8345 hours at an availability of 96.3%. In this plant during the same period a steam locomotive was in equivalent service and cost comparison was accurately checked. The operating cost for the entire year revealed that oil-electric operating expense was only \$4.307 per hour as against \$7.80 per hour for steam service—a saving over the year of \$4.493 per hour—or based on actual operation of 8345 hours a yearly saving of \$37,500 was made on this one installation.

"Safety, silence, freedom from soot and reliability are the inherent characteristics of the oil-electric. It is adaptable to all forms of operation in all places. It is safe in tunnels and acceptable at terminals where safe and clean operation is desirable. It does a better job more quickly and more economically and, unlike the horse or the iron horse, it does not eat its head off in the stall. This type of equipment is, for the railroads, a

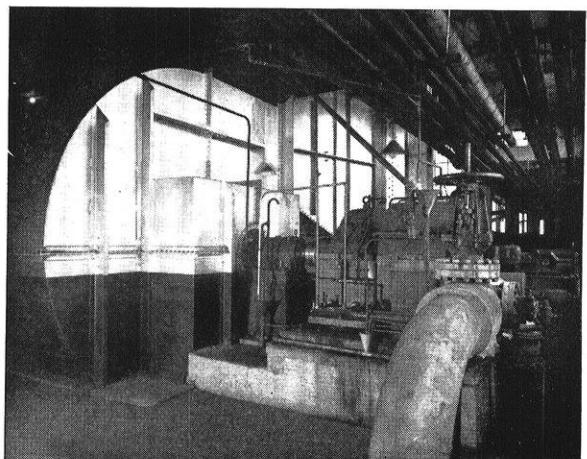
short-cut to real economy and a positive guarantee of a better operation ratio."

NEW HIGH PRESSURE TURBINES SAVE \$1000 DAILY

Fifteen new turbines contribute to the saving of \$1000 a day in steam costs, effected by the new steam plant installed in the Pennsylvania Sugar Company, Philadelphia, Pa. These turbines constitute one of the largest single installation of small turbines operating at 150 pounds back pressure in the country.

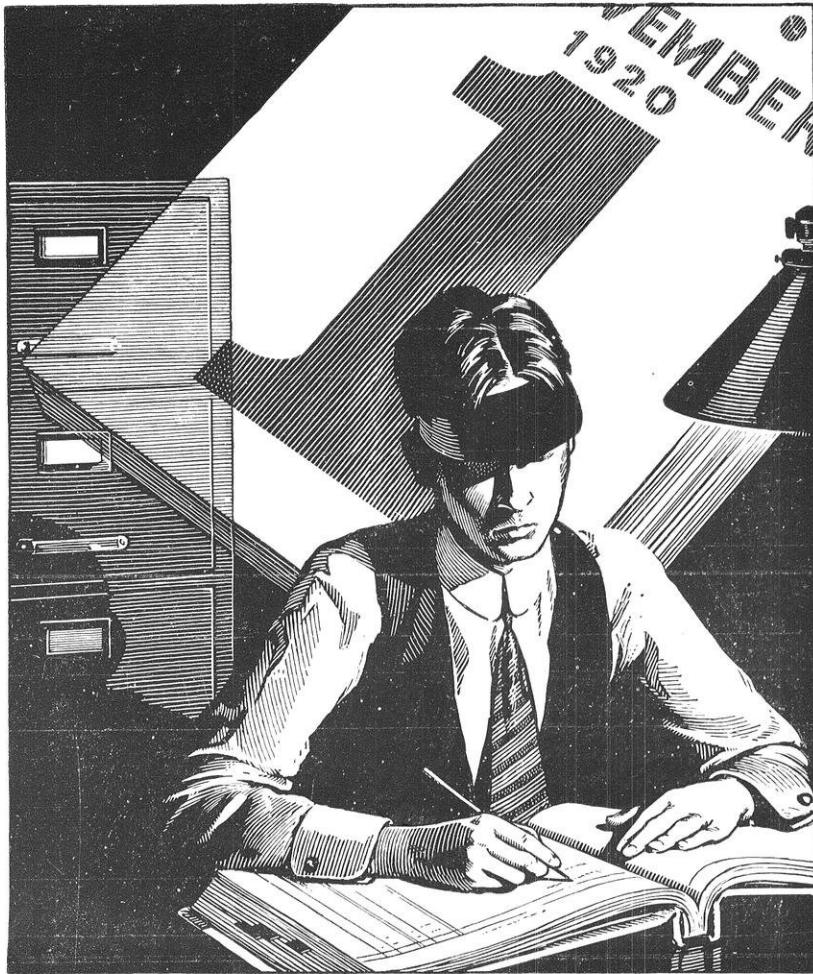
The turbines receive steam at 400 pounds pressure and 75 degrees superheat, and, exhausting at 150 pounds, supply steam for many processes throughout the plant. Three of the turbines, rated at 340 horse-power and 2550 rpm., drive the boiler feed pumps. Eight 100 horse-power, 860 r. p. m. turbines drive coal pulverizers. Two forced-draft fans, of 108,000 cubic feet per minute capacity each, are driven by two horse-power turbines; and two induced-draft fans, of 200,000 cubic feet per minute capacity each, are driven by two 730 horse-power turbines. The coal pulverizers and the fans are driven through reduction gears.

The plant can be started without any external source of power. At the difference between its cost of operation and that of the old plant, the new turbine installation is expected to pay for itself in two years.



—Courtesy Westinghouse Electric Co.

One of the 730 horse-power, 128-600 r. p. m. turbines and reduction gears powering an induced draft fan.



It *haunted* clerks for generations

"The first of the month" used to be a time of feverish activity for ledger clerks. But the Bell System accounting staff—breaking away from tradition—simplified the keeping of accounts and rendering of monthly statements to customers.

They applied a modern system of *rotation billing* to the telephone business which now spreads this work evenly throughout the month. In co-

operation with manufacturers, they devised special typewriters and bookkeeping machines. Thus they did away with inefficient rush and achieved greater accuracy, speed and neatness.

This is but one example of a point of view found throughout the Bell System. Even long accepted routine is constantly studied—it's always worth looking for the more efficient way!

BELL SYSTEM



A NATION-WIDE SYSTEM OF INTER-CONNECTING TELEPHONES

The shot ACTUALLY heard

round the world



"By the rude bridge that arched
the flood,
Their flag to April's breeze unfurl'd;
Here once the embattl'd farmers stood,
And fired the shot heard round
the world."

EMERSON



ON the one hundred and fifty-seventh anniversary of the Battle of Concord, a shot was actually heard round the world. Fired from a musket that was used in that battle, it was broadcast round the world from General Electric's short-wave radio station.

The sound of the shot made the 24,000-mile loop in one-eighth of a second, and on its return was loud enough to be rebroadcast over the longer waves of station WGY. To do this, the sound was sent out from station W2XAD, on 19.56 meters, to Holland, where it was relayed to Java, which in turn rebroadcast it to Australia, where it was relayed back to Schenectady, being received on 28.5 meters. The fact that the shot was sent out on 19 meters and returned on 28 meters is proof that it completely circled the world.

This dramatization of Emerson's lines was made possible because of research and developments in the electrical industry—developments that are largely the work of college-trained engineers. They are leading the way to even greater progress and are helping to maintain General Electric's leadership in the electrical industry.

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GENERAL  ELECTRIC