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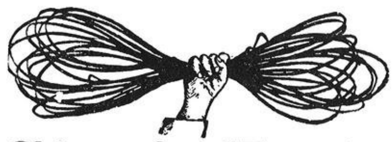

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The Wisconsin Engineer

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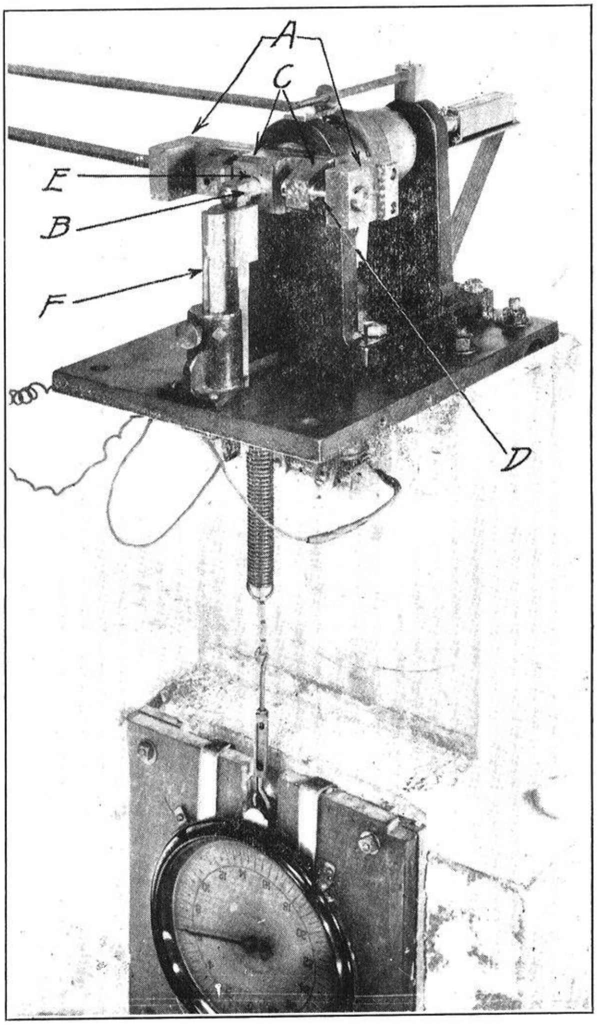
A NEW REPEATED-STRESS TESTING MACHINE

By JESSE B. KOMMERS, e '06,
Research Professor, University of Illinois.

In the 1916 Report of the British Association for the Advancement of Science, T. E. Stanton and K. G. Batson reported some repeated-stress results on steel, and showed some sketches of the machine they had used in getting their results. The method of stressing the specimen in this machine was unusual, and yet the machine itself was simple in construction. The writer had, for a number of years, been considering the design of a machine which would be fairly simple and which would not require the use of an expensive specimen. The specimen used by the British investigators was expensive, so that it seemed desirable to make use only of the kinematic motion as suggested by the British machine, and design the details of the machine as seemed most desirable, keeping in mind especially the matter of a cheap and rather simple specimen.

The illustration shows the new machine that is now being used. Part A is fastened rigidly to the driving shaft. Part C is in no way attached to A except by means of the specimen D which is secured to both parts by means of set screws and also by two nuts which are threaded to the specimen at either end. The load is furnished by a spring balance, and is transmitted to part C by part B which is shaped so that it will not interfere with part A when the latter revolves. At E there is a ball bearing which has its center line in the axis of the shaft. Part F is a guide for B and also serves to prevent the parts from falling when the specimen breaks.

In the illustration, B is pulling down on part C and is applying load to the specimen in such a way that the upper fibers are in tension and the lower are in compression. As the shaft revolves it turns part A and also part C which is attached to A through the specimen. When the shaft has rotated through 90 degrees, clockwise, the load will produce direct compression in the specimen. When it has rotated through 180 degrees the specimen will again be subjected to bending stress, but now



A NEW REPEATED STRESS MACHINE.

the side that was in tension before is in compression. The machine, therefore, subjects the specimen to reversed bending. A further movement of 90 degrees would subject the specimen to direct tension which is of no account compared with the bending stress of the cycle.

The specimen has a waist so that the maximum unit stress comes at the mid-point of the waist. The distance from the center of the ball bearing at E to the mid-point of the waist of the specimen is the moment arm of the load, and this is kept constant by making all specimens of exactly the same dimensions. The bending moment and the diameter of the specimen at the waist being known, the maximum unit stress on the outer fiber can be calculated.

The British machine applied the load by means of weights, but calculation showed that if the center of the ball bearing at E is not exactly true with the axis of the shaft, the weights will move up and down and may set up serious stresses in the specimen due to the acceleration effects. For this reason the new machine is designed so that the load is applied by means of a spring balance. If the ball bearing runs off center the spring balance immediately indicates, not only the presence of this condition, but also the amount of change in load. By inserting an additional coil spring between the spring balance and the specimen it was found that practically all vibrations were eliminated.

After a test has been started, the machine requires no attention since it will automatically stop itself when the specimen breaks. The machine is so designed that when the specimen cracks and allows the ball bearing at E to descend about one-sixteenth of an inch, an electric circuit is closed. The circuit actuates two electro-magnets, one of which opens the circuit of the driving motor, and the other throws a friction clutch against the belt pulley on the main shaft of the machine. The machine is stopped in about 20 turns from a speed of 1200 r. p. m.

A speed of 1200 r. p. m. is being used at present, but when the machine is put in running balance it is expected that a speed of 2000 or 2400 r. p. m. will be practicable. An eight place Veeder revolutions counter at one end of the shaft records the number of reversals to which the specimen is subjected before breaking.

The machine has been giving very satisfactory service, as is evidenced by a run of 42 days and nights with practically no stops.

METHODS OF MAKING FOUNDATION BORINGS

By Harold W. Mead,

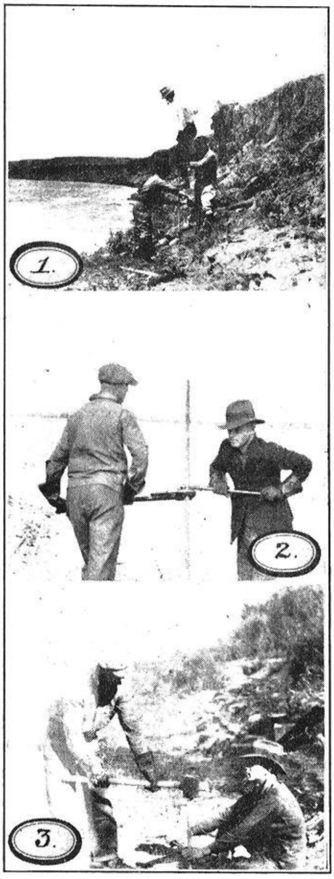
Senior Civil

The data given in this article are taken from the results of a survey of seven proposed dam sites on the Missouri River in South Dakota. This survey was made in connection with a report on the feasibility of power development by Mead and Seastone, Consulting Engineers, Madison, Wisconsin, for the State of South Dakota. The proposed dam sites are distributed along the river from Mobridge south to Wheeler covering about 250 miles.

In the preliminary investigations of the dam sites, it was necessary to make borings to determine sub-soil conditions at each site. Due to the inaccessibility of the sites and the distance that all material had to be carried, the equipment had to be very light and compact. As there was no definite information on making this type of borings, the first part of the work was largely experimental.

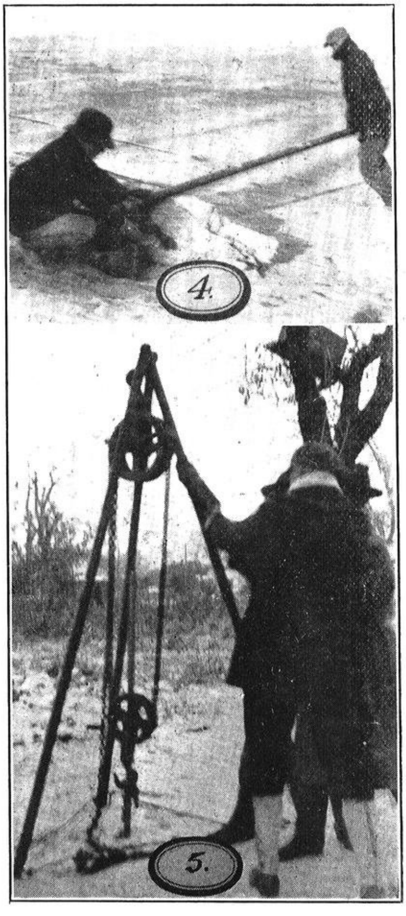
The first method attempted was to use two inch pipe, driven down to bed rock, as a casing and draw out the material with a two-inch dirt auger as the casing proceeding. The material that was used for this work was two-inch pipe cut in five feet sections, three-quarter inch pipe cut in ten-foot sections, a two-inch dirt auger welded onto one of the sections of three-quarter inch pipe, a log chain, a fourteen pound maul, and two pipe wrenches. This apparatus proved practically valueless in this case. We could not find a cap for the two inch pipe that would stand the force of striving; so that it was impossible to drive the pipe through the sand and gravel. In the investigation of the Mulehead site, this method was used with some success on the sandbar. For driving caps, one foot sections of two inch pipe were filled with lead and threaded at the end to be coupled to the pipe. A three inch cap was placed on the upper end and lead run around it so that there was a cushion of lead between the cap and the pipe. A platform consisting of boards laid across two wooden horses two feet high was used in driving the pipe. A depth of twenty-five feet was reached with this outfit and the material could be taken from the pipe; but the information given at so shallow a depth was not worth the work involved.

The next method of drilling that was tried was to put the tools down without the casing. This method proved more successful and was used in general throughout the investigations. A number of methods were used to sink the tools to the desired depth. When the pipe extended above the ground over five or six feet, two methods were used. One method was to force the tools down by the weight of a man on the pipe (Fig. 1). A wooden handle was bolted on the pipe on which a man would stand while the pipe was held vertical and turned with a pipe wrench. This method was used to the greatest advantage when drilling in clay or shale. The other method was to force the tools down, fastening two long pipe wrenches to the pipe and having a man at each one bear down on the wrenches as they walked around the pipe (Fig. 2). This last method was found the best for sand and fine gravel. When the pipe was not over six feet above the ground, the best method was by driving on the top of the pipe and turning it with a pipe wrench at the same time (Fig. 3). To protect the top of the pipe, driving pieces were made of the regular three-quarter inch pipe, cut about six or twelve inches long and threaded at one end so that they could be coupled to the pipe. This method could be used in practically all conditions so that most of the sections of three-quarter inch pipe were cut in five foot lengths to facilitate its use.



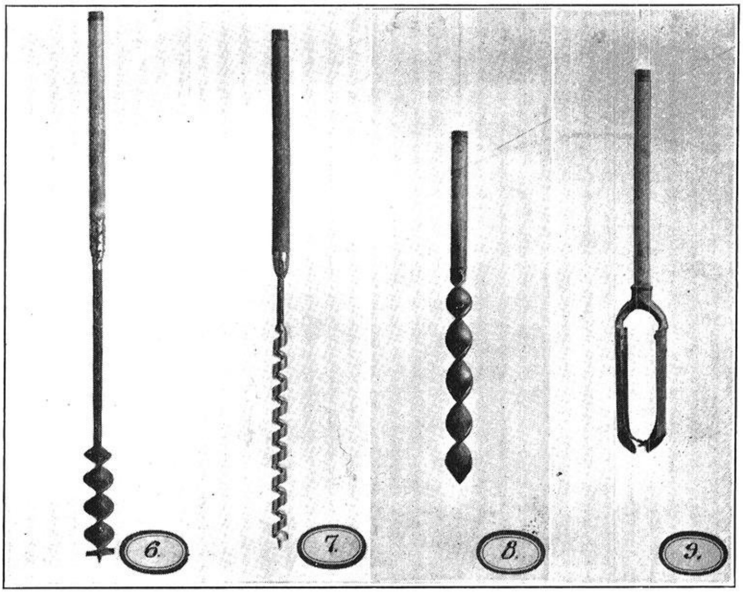
FORCING DOWN DRILL RODS
Fig. 1—By Weighting and Turning.
Fig. 2—By Turning.
Fig. 3—By Driving and Turning.

The apparatus that was used to pull the boring tools consisted of a lever, a tripod, and a differential hoist. The use of this apparatus developed from the great difficulty that was experienced when pulling the tools from quick sand and shale. The lever was the first method of pulling that was used (Fig. 4). The lever that was first used was a piece of two inch pipe ten feet long; but it was so easily bent that it had to be reinforced by placing one and one-half inch and one inch pipe inside of it. The lever constructed in this manner would stand any force that could be applied to the field. In many cases the lever would not pull the tools, so a one-ton differential hoist was obtained. This hoist was suspended from a tripod eight feet high (Fig. 5). The tripod was made of one and one-half inch pipe and constructed so that it could be taken down in four foot lengths. The one-ton hoist was found to be too light for the work so that a two-ton hoist was obtained which, with the lever, served all purposes. In some cases it was necessary to use the hoist and lever together. To do this, the end of the lever was fastened to a leg of the tripod and the hoist chain was fastened to the lever so that the power obtained from forcing down the lever would act through the hoist and pull the tools. When the lever was used alone, a fulcrum of logs was placed as close as possible to the hole. A log chain was used to hold the tools on the lever and hoist while they were being pulled. The chain was held to the tools by two half hitches or a clove hitch, and a loop was used to hold the lever or hoist. While the tools were being pulled, they turned backward so that the sample was forced off of the auger. To prevent this turning the tools were held with a pipe wrench.



PULLING DRILL RODS
Fig. 4—By Lever.
Fig. 5—By Chain Hoist.

A great deal of difficulty resulted from the loss of tools caused by the breaking of the pipe in the ground when considerable depths were reached. The cause of this breaking was the weakened condition of the joints. This was brought about from cutting deep threads so that the coupling would hold the pipe together. This pipe broke in many cases when the tools reached a very great depth or got into a very hard material so that a great amount of force was required to turn them. In some cases this breaking was caused by the twisting force of boring



TYPES OF AUGER
Fig. 6—Dirt Auger. Fig. 7—Ship Auger. Fig. 8—Blacksmith Auger. Fig. 9—Post Hole Auger.

and the shock from the maul in driving, but in most cases it happened while pulling the pipe. One inch pipe was tried to overcome this difficulty but it was not as good for this purpose as the three-quarter inch pipe. It would not stand the shock from the driving of the pipe with the maul, was no better to withstand the turning force, and was very heavy to handle. The three-quarter inch pipe with extra heavy couplings was tried and worked all right in most cases but still broke when a great amount of force was supplied. Extra heavy three-quarter inch pipe and extra heavy couplings were next tried. This was very successful and would stand any of the forces that were applied.

The threads of this pipe were cut for a longer distance on each end so that more threads could be screwed into the coupling.

For boring in different materials, various kinds of tools were used. The tools that proved the most satisfactory were four kinds of augers and two kinds of points. All these augers and points were welded onto short pieces of three-quarter inch pipe so that there was very little shank between the auger and the pipe. The augers that were used were the two inch dirt augers (Fig. 6), one to two inch ship augers (Fig. 7), one and one-half to two inch blacksmith augers (Fig. 8), and three inch post hole augers (Fig. 9). The points that were used were both made by a blacksmith from one and one-half inch round steel bars and differed only in shape. One was pear shaped and came to a sharp point and the other was chisel shaped. The points were used to drive through any material that could not be penetrated by the augers.

The augers were put down the holes made by the points and samples obtained. The dirt auger was used to the best advantage in clay, soft shale, sand, and fine gravel, but to obtain a good sample with this auger the hole had to remain open.

The ship auger would bring a sample to the surface even if the hole filled with loose wet material. The material in which this auger was most used was through heavy gravel. It would bring to the surface a sample of any of the finer materials.

The blacksmith auger was used in hard shale and soapstone and would bring a sample to the surface. It was also used where heavy driving was required. The post hole auger was very good for fine material but could not be used below the water level when the material was fine sand.

In quicksand it was impossible to use any of the augers to obtain a sample. The method used in such a place was to drive a three-quarter inch pipe to bed rock and enough materials would stay in the open end of the pipe to obtain a sample. In all the borings that were taken in this work, samples were obtained every five feet or as near to that depth as possible.

The junior civils, about 25 strong, with Professors Van Hagan and Withey, made an inspection trip to Chicago and vicinity from April 12 to 14.

Sample Boring Log for Dirt Auger on Sand Bar

Depth in feet	Hole 1	Hole 2	Hole 3	Hole 4	Hole 5	Hole 6	Hole 7
5	clay	sand and clay	sand	fine sand	Pierre shale	sand	sand
10	Pierre shale	sand and trace of clay	sand	fine sand	Broke 1 ton Hoist	sand	sand
15	Pierre shale	sharp sand	sand	fine sand	Pulled with lever	sand	sand
20	Pierre shale	sand and silt	16.5 ft. Pierre shale	broke 1 ton Hoist		fine sand	sand
25		struck boulder		trying to pull		fine sand	sand
30						fine gravel	fine gravel
35						fine gravel	fine gravel
40						fine gravel	fine gravel
45						fine gravel	fine gravel
50						fine gravel	fine gravel
55						Pipe	fine gravel
60						broke at	fine gravel
65						53 ft.	could not pull with lever

Sample Boring Log for Open End Three-Quarter Inch Pipe

Hole 1	Hole 2	Hole 3
Shale at 39 ft.	Shale at 17 ft.	Shale at 25 ft.

Sample Boring Log for Ship Auger on Sand Bar

Depths in feet	Hole 1	Hole 2	Hole 3	Hole 4
5	Clay	Clay	Sand	Fine Sand
10	Gravel	Gravel	Fine Sand	Coarse Gravel
15	Coarse Gravel	Gravel	Fine Sand	Coarse Gravel
20	Coarse Gravel	Gravel	Fine Gravel	Coarse Gravel
25	Gravel	Gravel	Fine Gravel	Coarse Gravel
30	Gravel	Gravel	Fine Gravel	Coarse Gravel
35	Gravel	Gravel	(Pulled)	Clay & Coarse Grav'l
40	Gravel	Gravel	(by)	"
45	Gravel	Gravel	(using)	"
50	48' Fine Gravel	53' Gravel	(both)	"
55			(hoist and)	"
60			(lever)	"
				Pulled with 2-Ton hoist and lever

Sample Boring Log for Post Hole Auger

Depth in feet	Hole 1	Hole 2	Hole 3
5	Sand	Clay	Brown Clay
	3' Sand		
10	10' Clay	Sand	Brown Clay .
	11' Clay and Sand		
		Alternate	
15	Quick Sand	layers	Brown Clay
		of blue sand	
20		and clay	Brown Clay
25		21' Coarse Gravel	Pierre Shale
30			Pierre Shale

Sample Boring Log for Blacksmith Auger

Depth in feet	Hole 1	Hole 2
0	Hard shale	(Dry sand and)
2	Hard shale	(dirt Used)
3	Soft shale	(post hole auger)
5	Soft shale	(From 5 to 10')
10		(very hard)
		(dry shale)

BELT CEMENT

In mending belting in a laundry or wherever belts are exposed to steam, it is not advisable to use glue. The only adhesive that will hold under these conditions is a pyroxylin cement, which being waterproof will withstand the steam and moisture indefinitely.—*Dupont News Service.*

TRACTOR STANDARDIZATION AND RATING

By Oliver B. Zimmerman, m '96, M. E. '00,
Advisory Engineer, International Harvester Company.

That there should be confusion in the methods of rating Tractor Engines at the present time is perfectly normal. The fact that there is no definite "uniformity" in the methods among the various manufacturers comes about from a number of very elementary reasons, a few of which will bear reviewing.

The first requisite of a tractor is its power plant, and, the field being comparatively new, technical and practical engineers from other fields, with engine experience, were drawn into the game, with the result that two main sources of experience were useful, —i. e., automobile engineering and stationary engine engineering. Men from both groups, though familiar with their own particular engine design requirements, bumped up against a new series of requirements quite different from the original ones, and re-adaption resulted so that both are merging into a distinct type of machine design that will ultimately be standard as gradual elimination of the undesirable features and the closer understanding and meeting of the specific requirements progress. The reflection of these two groups of engineers, is still strongly noticeable in the modern machines—the four cylinder high speed type and the two cylinder slow speed type.

Perhaps the next most pronounced influence upon engine design is that of the requisite of cheap fuel—kerosene being the basic fuel worked upon. Here the engine modifications had to fall in line with the natural characteristics of kerosene, which made necessary many changes and alterations in design, features, and attachments, it being early discovered that engine proportions differed greatly according to the nature of the fuel to be used. In addition there is a whole series of special requirements covering the power needed, which had to be applied uniformly at or near its maximum all the time, instead of being used at perhaps one-quarter of its maximum most of the time, as in the case of automobiles.

Again the factory test methods were under difficulties—one manufacturer proceeding on the theory that an engine should be rated at the maximum power which it could be made to develop for a short period of time, another reducing the rated horse power 5, 10, 15 or 20 per cent in order to allow for overload.

It, therefore, seems absolutely necessary that we get together for the best interests of manufacturer, dealer, and user to decide on some one standard method, so that uniformity may take the place of the chaotic condition prevailing to-day.

If all engines were properly designed there would be developed the same amount of power from a unit quantity of fuel mixed with the proper amount of air, and under the same conditions of temperature, operation, and altitude. This brings us to the simplest method of comparison in the four cycle type of machines, namely, that of cubic displacements of the piston. Investigation of this factor shows the widest difference between the various machines on the market, one rated horsepower ranging from 8,000 cubic inches of piston displacement per minute up to 20,000 cubic inches displacement per minute, the first being that of a machine which cannot possibly develop its rated horse power and the latter a machine which could be overloaded over 50 per cent without showing distress.

The experience of those long in the field, though still variable as to ratings, shows that a kerosene burning engine, under normal and ideal conditions of combustion and operation, will develop one horsepower for each 11,000 cubic inches of displacement of the piston, per minute. Obviously, there should be a normal overload capacity and an element in the rating to permit of certain variations in manufacture, such as less economical design, workmanship, material, frictional efficiency, changes of altitude, and differences in quality and grades of fuel, operation, and operator. With reasonable care the purchaser should be able to expect reasonable life of the machine and a reasonable uniformity in the maximum horsepower available during that life. It, therefore, develops that, after a careful review of available commercial machines and data, the conservative constant of 13,000 cubic inches displacement of the piston or pistons should be used as the manufacturer's nominal rating.

This gives a uniform rating, gives an engine a reasonable chance to develop its rated horsepower, and protects the purchaser. There is no discrimination in this factor in favor of or against any design or manufacturer, because he has full chance to advertise and guarantee overload capacities over and above this rating, and can bring the attention of the purchaser to all details of design to correspond to his refinements, efficiency, or capacity.

The formula for four-stroke engines, therefore, which can be easily applied to any tractor for comparison, follows:

Formula for Kerosene Burning Engine and Tractors.

$$\text{Rated Engine H. P.} = \frac{.7854\ D^2LRN}{13{,}000}$$

in which

$.7854D^2$ = The piston area in square inches.

L = Length of stroke in inches.

R = Revolutions of the engine per minute.

N = Number of cylinders.

D = Diameter of cylinders.

Therefore, in order to allow somewhat for general wear, mishandling, and improper adjustment, this simple, fair formula is conservative and best adapted for the rating of this type of engine at this time. It will also forestall the present perdicament of having the various states through their legislatures, adopt ratings which would, without question, be variable and cause hardships to all firms doing interstate business.

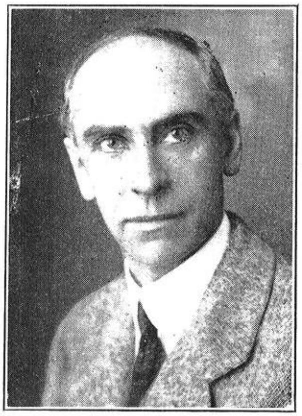
It is further recommended that the rating be made the nearest whole number, which figure can be actually attained by raising or lowering the rated engine speed after careful test, so that conformity can be secured within the usual average minimum allowable variation in a lot of machines in multiple manufacture.

The drawbar rating of a tractor is a far more difficult problem inasmuch as one has to deal with a complicated series of variables in gear reductions, bearings, numbers of same, quality of finish, quality of materials, rigidity, age of machine, condition of lubrication, and wear and tear. It is, however, quite common practice today to rate the drawbar horsepower at one-half the rated horsepower of the engine. The same argument as to efficiency above this rate holds true as with engine rating, covering in a way, also other variables, such as change of soil or footing.

While the above method is not as thoroughly scientific as is desirable, the solution is a sensible one from a practical standpoint at this stage of tractor development, and is far better than some of the present day methods of rating. Let us have a rating which will give the purchaser a safe and satisfactory method of comparing commercial outfits.

SUCCESSFUL WISCONSIN ENGINEERS—CHRISTIAN FREDERICK GRAFF

Out in the mountains of the west, two plants, one near Tacoma, Washington, and the other near Vancouver, B. C., are taking nitrogen from the air and converting it into forms suitable for use in agriculture and industry. These two plants are operated by the American Nitrogen Products Company, of Seattle, a $10,000,000 corporation at the head of which is C. F. Graff, a graduate of the civil engineering course of this university.



C. F. GRAFF

Graff, who was born of Norwegian parentage, at Wellington, New Zealand, began his engineering career in 1891 with the Great Northern Railway. After several years of varied experience, he felt the need of further education, and, although he was then 26 years old, married, and had a small daughter to look after, he decided to take an engineering course. Wisconsin drew him half way across the continent, and he applied himself so effectively that he completed his course in three years and was graduated with the class of 1904.

After graduation he spent two more years in railway work and then struck out for himself as general contractor. The first contract was for a retaining wall and amounted to $800. It was successful and quickly led to larger work. In each case sound engineering practice was followed in analyzing the job and planning the work and always the result was the same—success and profit.

In June, 1910, the first of a long series of important construction projects, was undertaken. This was the building of a $260,000 reinforced concrete storehouse at the Puget Sound Navy Yard. In the award of this contract the government rejected its own plans, all of the bids being above the appropriation, and accepted plans submitted as an alternative by Mr. Graff. The job was carried to completion two months ahead of the time limit, setting a record for speed and efficiency in the execution of navy contracts, and winning the contractor high praise from navy officials.

In 1911 the Graff Construction Company was incorporated with Mr. Graff as president and manager. The company broadened its field to include Canada and Hawaii as well as the western part of the United States. One of the most conspicuous examples of the company's work is the West 12th Street Trafficway in Kansas City. This is a $600,000 concrete structure, one-half mile long, that rises 120 feet above the ground and contains 35,000 cubic yards of concrete. In this instance the Graff Construction Company had to meet a strong field of competitors, but by this time it had established so good a reputation that it was able to secure the contract and to provide a bond of $475,000 for the satisfactory completion of the work. The time limit of fifteen months was considered so severe that many experienced men predicted failure in that respect; but the work was so carefully planned and so vigorously executed that traffic was passing over the viaduct before the time limit had expired. This job, during its progress, commanded the attention of engineers all over the country.

The high standing of the Graff Construction Company in the business world cannot be better exemplified, perhaps, than by mention of a certain bit of construction which the company did not get,—the great Interstate Bridge across the Columbia river between Portland, Oregon, and Vancouver, Washington. As the company in this case wished to bid upon the entire work, aggregating about $1,500,000, and as the guarantee bond required was in the full amount of the work, a sum so large that under our federal laws it required the co-operation and joining of practically all the bonding companies doing business in the United States to underwrite the contract, a special trip to New York was made at that time by Mr. Graff in order to effect the necessary arrangements. In this particular case what is known as a "bid bond," for approximately $1,500,000, was required to be submitted in a sealed envelope accompanying the tender, in addition to a certified check of $100,000, which the construction company was prepared to deposit in support of its judgment. Although the enormous bond required was from thirty to forty times the entire capital stock of the Graff Construction Company, so great was the confidence in the head of the corporation and in his ability to size up, figure upon and analyze a project or contract, and such was his reputation for good judgment, conservatism, integrity and executive ability, that it required only a half hour's interview with the president of one of the most powerful of the United States Steel Corporation subsidiaries in New York City to cause a wire of instructions to speed westward authorizing a joint and unconditioned bid with The Graff Construction Company on this stupendous work in its entirety.

Early in 1917, Mr. Graff and his associates, began the development of the nitrate industry in the United States. If, or perhaps we should say, when, they are successful, they will have contributed benefits to this nation of incalculable value. The food production of the nation is not keeping pace with its increase in population, due largely to the diversion of labor from agriculture to industry. The man on the farm must produce more. Machinery and fertilizer are needed and nitrates are the fertilizer. The development of nitrate plants in this country will make the nation independent in regard to a vital necessary.

THE BIG MAN KNOWS HOW TO HANDLE THE HUMAN ELEMENT

John Leitch, in his book, "Man to Man" says:

"The big man succeeds and the little man fails, although they may be alike in technical skill, because the big man knows how to manage the human element and the little man does not. If you will run over the roster of most of our big individual successes—Schwab, J. J. Hill, John H. Patterson, Ford, Marshall Field, Armour—you will discover that none of them founded success upon technical expertness as much as upon ability to persuade men to work with them. The greatest of men cannot do more than develop the co-operation of those with whom they come in contact."

Due to the efforts of the Mining Club, an All-University Hoover Club was organized at a mass meeting held April 27 in the Engineering Auditorium. Magnus Swenson, formerly U. S. food administrator for the State, spoke on "Hoover as a Man." About eighty members were enrolled, and Marcus Link, Mining '21, was elected delegate to represent the University in the college convention of Hoover clubs held in New York City on May 1st.

EDITORIALS

MISTER SENIOR

We fain would hold converse with thee.

You're a lucky guy. You step right out into a job with a fat salary. Employers were fighting for you.

You are one man in a hundred; you have had a college training. But you haven't paid for it,—it was given to you.

Folks who know you are watching to see how you take the gift. Will you show a generous appreciation of it, or will you take it as a selfish little brat takes a stick of candy, and sneak off by yourself to enjoy it?

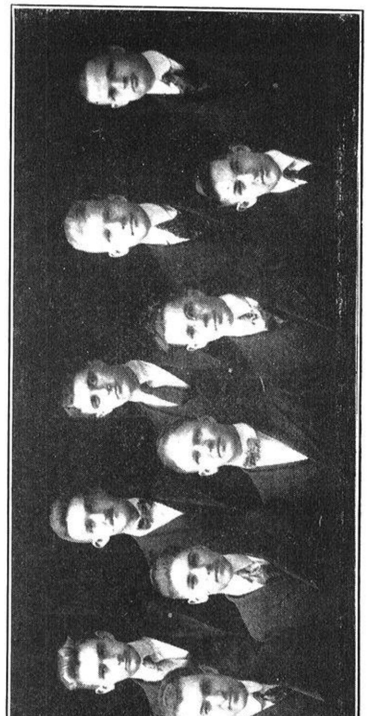
Will you maintain a lively interest in your almà mater and aid her in the training of the many who are to follow in your footsteps; or will you let your interest atrophy so that you gradually lose all connection with the university and its activities?

Foolish questions? Well, we hope so. But the proof of the pudding, Horatio, lies in the eating thereof. What's your ante?

We offer two suggestions: Drop in at the Alumni Headquarters on State Street, before you leave, and sign up for a membership. The Association is your opportunity to help Wisconsin effectively.

Subscribe for the WISCONSIN ENGINEER for next year. Do it before you leave school. You will be glad that you did.

Goodbye and Good Luck.



THE STAFF

TOP ROW:—Buese, Cirves, Gerhardt, Hamblen, Coomber, Schuyler, Walsh, Rheingans (Manager), and Kates.

BOTTOM ROW:—Erickson, Hahn, Hirshberg, Nelson, Thiel, Wiepking (Editor), Nolte, Trueblood.

THE WORK OF THE STAFF

This is the last number of the WISCONSIN ENGINEER for the school year. In spite of the difficulties that have beset publication this year, due to high prices, paper shortage, and labor shortage, the magazine has been issued regularly, and, we believe, has been up to the standard set by preceding volumes. The Board of Directors of the Wisconsin Engineering Journal Association thinks it fitting that the high grade, conscientious work of the Staff of the magazine deserves public recognition and takes this means of expressing its appreciation of that work. The staff was well organized and every man showed a willingness to do his best whenever he was called upon. The Manager and the Editor each leave behind an enviable record. Special mention should be made of the excellent work of Kates and Trueblood of the editorial department and of Hamblen, Buese, Thiel, and Drewry of the business department.

L. F. V.

SUGGESTED RE-ORGANIZATION OF S-F COMMITTEE

As it now stands the Engineering Student Faculty Committee is not an effective organization although there is a real need for some such board. What is wrong with it? Is it not too large and too general in its composition for really effective work? The present body is made up of five juniors and five seniors, one from each engineering course, and three sopohomores and two freshmen elected at large, but no two men from the same course in the same class. Cannot one man represent an engineering course as fairly as two or three when he is responsible to a certain group? Would it not be better, then, to have each of our five engineering societies elect one member to represent it, and then have two members-at-large elected to represnt the men who are not in societies. In this way we would be assured of getting men who are interested in college affairs, each man would be responsible to a particular group for any action taken, and, what is more to the point, for any action not taken. This is the organization of the Forensic Board and Agricultural College Committee, both of which are doing real constructive work for the bodies they represent. By this plan, too, the societies, which are the real boosters of Engineers' activities, would have direct representation rather than second hand representation as under the present plan. In any case let us take some action to meet this real need for a central controlling body in the Engineering College.

B. F. M.

SUMMER WORK

With such plentiful opportunities for summer work a man may pick and choose, and, where choice is possible, care should be exercised in making it. What is the basis of choice in the selection of a summer job? It must be one of two things: Money or experience. Money is desirable, and, for some of us it must be given the greater consideration if we are to complete our college training; but, if the two things, experience, at this stage in our career, is of greater importance, and the summer job should be chosen with that in mind.

DO YOUR CHOOSING EARLY

Few juniors ever think seriously of the choice of a subject for thesis. The course pursued by a goodly percentage of the senior class each year is to wait until about a month or two after the opening of the fall term, and then hurriedly to choose some subject from the list issued by the department. Summer work may offer many suggestions for thesis subjects if one is awake and ready to receive such suggestions, and the juniors should be seeking suggestions during the summer. Furthermore, if the subject is considered in the spring or summer, time is afforded to think it over and decide whether one has any real interest in it. Much more will be obtained from a thesis if the student has decided that he has an interest in the subject before beginning work. From the standpoint of the department, also, the choosing of a subject by the student is much more satisfactory than the suggestion of it by the instructor.

W. A. K.

"The information of the average man is like a turbid solution, the technology of an engineer is like a clean precipitate; the one is amorphous, the other crystalline."—*Rickard's Technical Writing.*

ALUMNI NOTES

By WILLARD A. KATES

ROBERT A. BAXTER, ch '18, who is engineer for the Consolidated Gas Co. of New Jersey, Long Branch, New Jersey, was married recently to Miss Alma Pett of Johnson Creek, Wisconsin, a former student in the school of Commerce.

ALFRED S. DIEHL, c '07, chief engineer for the Oliver Mining Co., in the Canisteo District, Minn., has been appointed Chief Engineer for the same company in the Hibbing District, and will assume his new duties about May 1.

H. L. EICHHORN, m '18, is Chief Draftsman for the Payson Manufacturing Co., Chicago.

WILLIAM R. FEILER, e '16, is an Insurance Adjustor with office in the Insurance Exchange Bldg. in Chicago.

ROBERT "SWEDE" FILTZER, c '17, who played tackle on the '16 football team, is now in the National Park Service at Yellowstone Park, Wyoming.

CARL R. FINDEISEN, e '13, Traffic Manager of the Chicago Telephone Co., gave a dinner at Henrici's in Chicago to Professors Gus Larson, John Price, and Pat Hyland on Saturday, April 24. Findeisen seemed in good health and prosperous.

HENRY FRENZEL, C. E. '18, resides at 5510 Ingleside Ave., Chicago. He is employed by the Corrugated Bar Co., Great Northern Bldg.

FRANK S. FROST, m '08, is in the Research Dept. of Sears Roebuck Co. His home is at 528 Oak Park Ave., Oak Park, Ill.

WALTER G. GIBSON, g '08, was married April 14 to Elizabeth J. Stouppe at Johnstown, Pa.

IRVING GOLDFEIN, c '16, is a Civil Engineer with the Sewerage Commission, Milwaukee. His address is 1309-14th St., Milwaukee.

ELMER GOLDSMITH, e '15, is a Consulting Engineer and Patent Lawyer. His address is 1210 Fletcher St., Indianapolis, Ind.

RALPH GRANT, m '17, is with the Allis Chalmers company in Milwaukee. His address is 485 28th Ave., Milwaukee.

HARRY HERSH, e '15, is employed as Electrical Engineer by the Signal Electrical Manufacturing Co., Menominee, Mich.

J. V. HEUSER, e '16, is Sales Engineer for the Cutler Hammer Co., in Chicago.

FREDERIC A. HOMANN, M. E. '17, is with the Johns Manville Co. at St. Louis, Mo.

HAROLD J. HOSLER, c '18, is a Valuation Engineer for the Baltimore and Ohio Railroad, at Gary, Ind.

LOUIS S. LOEB, ch '15, who returned to his home in Mexico City after graduation, has made a success as sales agent for a number of machinery and chemical firms. His address is Apartados 503, Mexico City, D. F., Mexico.

FREEMAN D. LOHR, ch '16 is in charge of the Benzol Department of the Seabord By-Products Company, Jersey City, N. J.

J. R. MCATEER, c '18, is with the Illinois Highway Commission at Springfield, Ill.

EDMUND MILLER, ch '17, is with the Federal Rubber Co., Cudahy, Wis.

CHARLES J. MORITZ, c '11, has a contract for several miles of highway construction in Illinois. His present address is Effingham, Ill.

ERNEST A. MORITZ, c '04, C. E. '05, who is with the U. S. Reclamation Service, has been appointed Project Engineer of the Flathead Project at St. Ignatius, Montana.

ERNEST B. MORSE, e '18, is at Ft. Atkinson, Wis.

R. C. NEWBURY, e '12, Secretary of the Doherty Training School at Denver, Colorado, visited the College recently in search of men.

HARRY M. OLSON, e '05, is general manager of the New York Central Iron Works at Hagerstown, Md.

R. H. PARKER, c '17, is now with J. C. Brodie & Co., General Contractors of Denver, Colo. At present he is Engineer in charge of some paving work for the town of McCook, Nebr. where he is located for the time being.

ROBERT T. PURCHAS, e '14, is Purchasing Agent for the Minneapolih General Electric Co., 15 Fifth Ave., South, Minneapolis, Minn.

MELBOURNE O. REED, e '14, is Industrial Engineer for the Management Service Co., 1118 Westminister Bldg., Chicago, Ill.

W. R. SCHMIDLEY, e '05, is superintendent and electrical engineer for the Janesville Electric Company, at Janesville, Wis.

FRED N. SCHUSTEDT, c '17, is promoter and salesman for the Municipal Paving Brick Co., of Portsmouth, Ohio. His district includes W. Virginia, Kentucky, and the southern part of Ohio. His headquarters are at Portsmouth.

ERNEST H. SCHWARTZ, min '18, is an open hearth operator for the Illinois Steel Co. His address is 340 Jefferson St., Gary, Ind.

EMIL STERN, m '19, has resigned his position with the Ellwood Tractor Co. of Madison, and is now with the Worthington Pump and Machinery Co. of Milwaukee.

ROBERT L. STILES, e '12, is Vice-President and Manager of the Tri-City Electric Co., Davenport, Iowa.

WALTER H. STIEMKE, m '15, is with the Tractor Engineering Co., 214 Stephenson Bldg., Milwaukee.

CHARLES W. STUART, m '16, is in the metallurgical Department, Dodge Bros. Motor Co. His address is 128 Lathrop St., Detroit, Mich.

CLINTON K. TEXTOR, c '14, is in charge of the Sulphate Mill of the Howland Paper and Pulp Corp. at Howland, Maine.

BEN. S. THAYER, c '07, is Construction Engineer with the Knoxville Power Co. at Alcon, Tenn.

W. M. TITUS, c '13, is Chief, Bureau of Bridges, State Highway Commission, Indianapolis, Indiana.

EDWARD B. TOURTELLOT, c '10, is City Engineer of Oelwein, Iowa.

"JAKE" TRANTIN, JR., ch '15, is now with the Estes Engineering Co., Consulting Engineers, Chicago.

HENRY TRAXLER, c '13, is City Manager of Clarinda, Ind.

EVERETT H. VANPATTEN, m '17, is with the Maryland, Oil Company at Ponca City, Okla.

HERMAN H. VEERHUSEN, c '11, is in the Commercial Engineer's Department of the A. T. and T. Co. at 41 Warren St., New York City.

RANDOLPH L. WADSWORTH, m '17, is with the Wadsworth Watch Case Co. at Fort Thomas, Ky.

GLENN F. VIVIAN, c '13, has been appointed a member of a committee of six of the A. A. E. to consider proposed changes to the constitution of that organization.

GLENN B. WARREN, m '19, who was Editor of the ENGINEER last year, has an article in MECHANICAL ENGINEERING for April on *Simplification of Venturi-Meter Calculations.* The method he developes makes it possible to compute the flow of gas by simple slide-rule computations.

JOHN H. WASSON, c '12, is with the Michigan Highway commission at Lansing, Michigan. His residence is 425 So. Chestnut St.

CLARENCE F. WATSON, c '10, is in the engineering department of the Neekoosa Edwards Paper Co. at Port Edwards, Wis.

F. E. WERTHEIM, m '17, is mechanical engineer in the Soda Fountain Department of the Liquid Carbonic Co. of Chicago.

RAYMOND P. WIEDENFELLER, c '10, has been appointed chief engineer for the Oliver Mining Co. in the Canisteo District, Minn.

CHAS. D. WILLISON, e '05, is cashier of the Farmers' Saving Bank at Palmyra, Wis.

V. E. WILLIAMS, e '15, is Sales Engineer for the American Blower Co., 140 So. Dearborn St., Chicago. He was married about six months ago and at present lives on the South Side, Chicago.

JOHN H. WOLFE, ch '12, is assistant to the Plant Engineer, Consolidated Gas, Electric Light, and Power Co., Spring Gardens, Baltimore, Md.

ROBERT M. CONNELLY, c '16, is said to have recovered fully from his airplane crash. He was recently made Dean of the Knights of Columbus Evening Schools at Fort Wayne, Ind. The school has quarters in the high school building of that city. The business office is at 311 Peoples Trust Building.

ARMIN ELMENDORF, M. E. '19, has been granted a patent for a fuselage formed of a plurality of veneer plies, the inner placed longitudinally, the second circumferentially, and the third longitudinally of the fuselage.

EDGAR R. HILL, m '17, is Production Manager for The American Ironing Machine Co. of Chicago, Ill.

OREN H. MARSHALL, m '19, is Cadet engineer with the North American Light and Power Co., Washington Court House, Ohio.

GEORGE L. WHITE, e '11, is Chief Draftsman for the Federal Pressed Steel Co., of Milwaukee. His residence is 1008-41st Street.

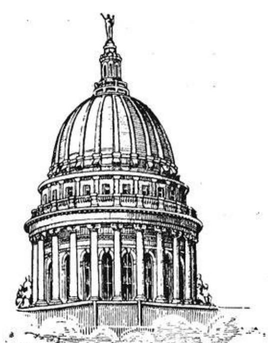
CUTRBERT P. CONRAD, c '15, was married to Beatrice Carroll Tabor, sister of Henry W. Tabor, c '16, on April 17, at Escondido, Calif. They will be at home after June 15, at 308 Prospect Avenue, Madison, Wisconsin. Conrad is an engineer with the firm of Mead and Seastone.

The engineers and architects of Madison organized the Technical Club of Madison, on May 3, and elected the following officers: president, Professor D. W. Mead; vice-president, C. L. McMullen, e '09; treasurer, L. A. Smith, c '12; secretary, Gordon F. Daggett, c '20. Among the directors are C. M. Larson, c '05, and W. B. Schulte, ch '10.

About once a year Brother Krippner, e '04, sits down to his little Ford typewriter and dictates himself a letter to us, which never fails to cheer us mightily no matter how much grief may be heaped about the shop. Says he, "Those who are responsible for the April, 1920, issue of "The WISCONSIN ENGINEER" are to be warmly congratulated. It has afforded me a couple of hours of interesting and enjoyable reading, and I am sending it on to one of our Wisconsin engineers who does not regularly subscribe. The Dean's letter, Johnson's experiences in Russia, "St. Patrick was an Engineer," and the plans of the College for future development are all highly desirable contributions." We'll tell the world that Kripp is one of the most highly cultivated and discriminating scholars ever sent forth from the portals of this institution. His taste is beyond repreach.

CHAS. J. BELL (formerly Belsky), e '10, is president and general manager of the Belsky-Cook Motor Co., of Dubuque, Iowa. He gives his residence as 2221 Jackson St., Dubuque, and also, Lemington Apts., 83—10th St., Minneapolis, Minn.

Returns from the Alumni Number of the ENGINEER have just begun to come in as we go to press. The indications are that a good many old Wisconsin men are going to renew their college affiliations.



CAMPUS NOTES

By Wilson D. Trueblood

Well, here's our last—

And we're as glad as you are.—

Anyway we scared the Bar Rats off their front steps.—

Another battle in which the better men won.

OUR SLOGAN

Stay for Summer School; it's a part of your University education. (For additional information consult the October Engineer.)

"Well," said the co-ed, as she waded into the Engineering Building through the debris* that littered the front steps, "Anyone would know that this is a man's building."

*Reference is to the inanimate and not to the human debris.

Professor Leonard S. Smith has been appointed by the Governor as state delegate to the Inter-Allied Congress on Housing and Town Planning, to be held in London, June 3 to 11. He will sail about the middle of May and will be accompanied on the trip by his family, including the two members who have been in Paris for the past year. He expects to be in England about three weeks where he may be reached at the American Union Headquarters, 10 Russell Square. About a month will be spent in Paris, where he can be reached in care of the American Express Company. He will return to Madison about September 1.

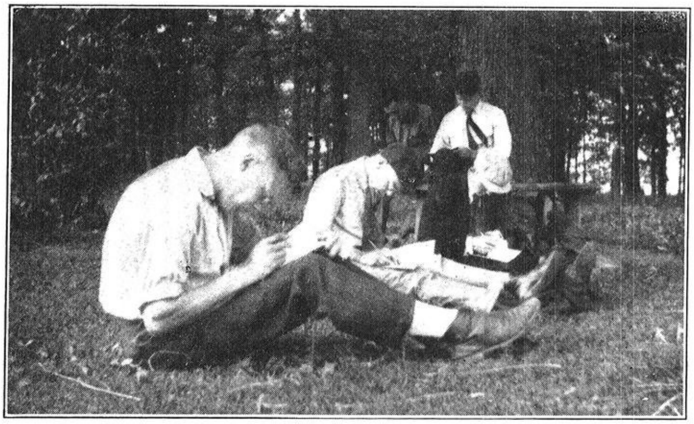
Major Ray Owen has recently received the Order of University Palms, Grade of Officier d'Academie—Silver Palms, which was awarded to him by the French Government. Modest-like, he refuses to give us the details of the heroic deed that won him the honor. But wait until ten years from now; with that pretty silver trinket as a stimulus and a proof, he will have a tale worth listening to.

The class in Engineering Seminar is always good for a few choice definitions. A senior thinks that a plebiscite is "a leader in religious circles." Another senior says that a hiatus is "a peak or other high object," whereas a fellow class-mate states that it is "a flower." Another man guesses that cursory means "a biting remark," another that atrophy is "a crime," and a third that spontaneity is "an explosion."

AS THEY PASSED THE LAW SHOP

She: (sniff, sniff) "What is that terrible odor?"
He: "That's fertilizer."
She: "Oh, for the land's sake!"
He: "Sure."

The Hydraulics lab was recently presented with a small bronze turbine runner by the Allis Chalmers Co. The runner is one of several miniature models of the 37,500 h. p. turbines installed at Niagara Falls,—the largest single runner turbine ever built.



THAT RAILWAY SURVEY
The Location Party Strikes a Curve

GLAD TO OBLIGE

"Watch your step, miss," said the street car conductor.

"It won't be necessary," returned the Girl from Chadbourne, as she elevated one knee almost to her dainty chin in an effort to climb aboard, "I'm sure these engineers behind me will do that for me."

The latest fashion from Paris decrees that a woman's whole attire shall weigh not over eight ounces. We infer that the garments are of silk. At this rate we'd better plant a few bushes around the campus to protect the ladies against an occasional dropped stitch.

IT HAPPENED AT LEHIGH

He took her rowing on the lake;
She vowed she'd go no more.
I asked her, "Why?" The answer came.
"He only hugged the shore."

—*Lehigh Burr.*

C. A. Wiepking, W. J. Rheingans, and C. P. Kidder have made a thesis study of the use of pipe elbows as flow meters, and find that, with a straight approach and with velocities of flow above 4 to 6 feet a second, ordinary pipe elbows equipped with a differential water guage will give the discharge within two per cent.

PROF. EDWARD BENNETT of the electric department spoke to the local section of the A. I. E. E. Wednesday, May 5, on "Abstractive and Selective Properties of Radio Circuits."

The Miners, in a recent quiz, were asked, What is fatigue? The prize answer was: "Fatigue gives a man delight and makes him happy at the end of a day's work; but it also reduces his energy for the next day and hence slows up production." You must have taken that idea of fatigue from some Commerce course, Buddy. Wait until the hoist takes you to the top at the end of a hard day's mucking and then give us a real definition of fatigue.

Frank Cirves claims he discovered the original hard-boiled engineer on the chemical inspection trip. The gentleman in question was a Turk who spent fifteen lively minutes every now and then in a coke oven at a temperature of 300° F. At this heat he perspired, sneezed, and expectorated superheated steam. The Hereafter can hold no terrors for that bird.

On Friday, April 30, GEORGE A. SPRACKLING, electrical, and SHERMAN B. GREEN, civil, were elected to the two freshman vacancies on the Student Faculty Committee.

Albert, the old standby of the electric lab, will celebrate his nineteenth year at the university this month by moving into a brand new shop provided for him in the remodeling of the shops. If you want to hear some spicy tales of the days when Jimmie Watson, Otto Kowalke, and Johnny Price were blundering frosh, why drop in to see Albert. He has seen the electric lab grow from a hundred square feet to what it is now, not to mention the growth of the aforementioned frosh.

Experiments on loss of head due to various types of U bends in pipes 4 to 8 inches in diameter have been made in the Hydraulic Laboratory this year by H. W. Tabor, Instructor in Mechanics, and Charles F. Sloan, Fellow in Mechanics. The experiments were undertaken to answer questions asked by practicing engineers concerning the nature of flow and loss of head in inverted siphons and similar apparatus. The work will be used for a graduate thesis and later written up for publication.

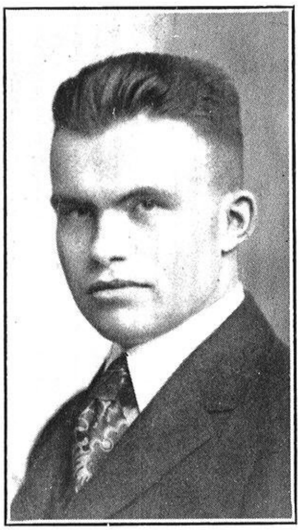
Several of the sophs, in order to reduce the H. C. L., have resorted to home made slide rules. Now, these rules are very interesting. For instance, on a nice sunny day $2 \times 2 = 4$, but on cloudy days $2 \times 2 = 4.5$, which error would make them impractical for any work on the Einstein theory. For your sakes, fellows, we hope that exam week will be bright and fair.

Professor Max Mason's lecture on the Einstein Theory given in the Physics Auditorium, April 13, was so well attended that he repeated the lecture a week later, for the benefit of those who were turned away the first time. Every one was more or less bewildered by the proportions of the theory—even Benny Snow lost his smile about ten minutes out.

The Extension department of the university has appointed F. H. Batchelor, formerly with the Burke Electric Company, Erie, Pa., as assistant professor of electrical engineering.

At a meeting of the Mining Club held on April 13 some changes in the constitution were adopted, one of which requires the application for entrance into The American Institute of Mining and Metallurgical Engineers Association of all members of the club by their junior year. Under this and other changes the club expects to hold the interest of the members better than ever, and still further advance its reputation as the most sociable club in the College.

A lively ball game took place between Prof. Berggren's two Steam and Gas classes on the lower campus last Saturday. The final score in round number, was 50—2 in favor of the "Nine O'clocks." With Berg himself as umpire, it is reported that nobody disputed the ump's decisions beyond an occasional howl. The game ended in a free-for-all, in which Berggren, Pollack, and all the kids of the neighborhood took part.



WILMAR L. MILLAR, instructor in steam and gas engineering was fatally injured Saturday afternoon, May 15, while working in the laboratory. His left arm was caught by a belt and torn from his body. He also suffered injuries about the head. He died four hours later without regaining consciousness.

Millar was graduated from the mechanical course at the University of Nebraska in 1919. He received his appointment at Wisconsin at the beginning of the present semester.

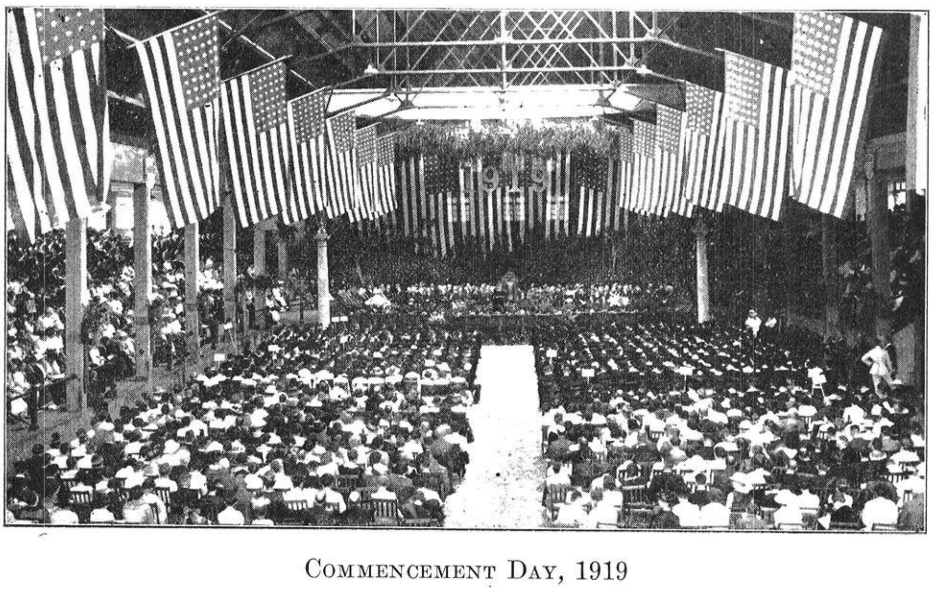
The new 18-inch diameter in-take for the University Pumping Plant was put into operation a few weeks ago. The pipe was laid on the ice during the winter months and gradually lowered into place by cutting the ice from under it. For the first time since the installation of the new fire pump, the University can use its entire pump capacity.

TAU BETA PI

The following juniors have been elected to Tau Beta Pi: Guerdon H. Head, Oscar B. Westmont, Robert J. Zaumeyer, and Alvin F. Pitzner, chemicals; Williard A. Kates and Herbert G. Lindner, electricals; Burton E. James and David W. McLenegan, mechanicals; and Lloyd M. Scofield, miner. The initiation banquet was held at the City Y. M. C. A. on the evening of May 6.

The members of the 9 o'clock section of Steam and Gas wish to announce to the public that, due to a lack of preparation, the class was dismissed on time.

For the benefit of those who will sometime be graduated from this University, and who will probably never witness Commencement ceremonies until they themselves take part in them, we print this picture of the commencement exercises of 1919. The Commencement Procession forms on the upper campus and lead by a band marches to the Stock Pavilion. When the weather is fine, and it usually is, the Commencement exercises are a fitting climax to four wonderful years.



COMMENCEMENT DAY, 1919

BOOK REVIEW

HYDROLOGY, THE FUNDAMENTAL BASIS OF HYDRAULIC ENGINEERING. —By Daniel W. Mead, Consulting Engineer and Professor of Hydraulic and Sanitary Engineering, University of Wisconsin. McGraw-Hill Book Co., Cloth, 6 x 9; pp. 647; illustrated.

By CLINTON B. STEWART

Hydraulic engineers have recently felt a new stimulus in their chosen field by the acquisition to the general fund of knowledge of much valuable data contained in the recent work on hydrology by Prof. Daniel W. Mead of the University of Wisconsin.

An understanding of the various laws and phenomena in connections with the circulation of water on the earth's surface is a prerequisite to the successful solution of practically all problems of hydraulic engineering. The author in the preface and opening chapter properly lays much emphasis on the fact that fundamental physical laws apply in all cases, but that owing to physical geological and meteorological differences, thorough investigations must in all cases be made before correct deductions can be drawn for the solution of any problem.

The methods of investigation that have been successfully used in many cases are described in considerable detail and the limitations as to the accuracy of results are pointed out. The gathering of these data from the experience of the author and of other professional men in a form where they can be preserved and compared represents a great saving in time to the members of the profession.

At the end of each chapter is a list of the more important literature on the subject which forms a valuable adjunct to the book.

The general appearance of the book together with the cuts and typography is excellent.


Roney
ChainGrate
Underfeed