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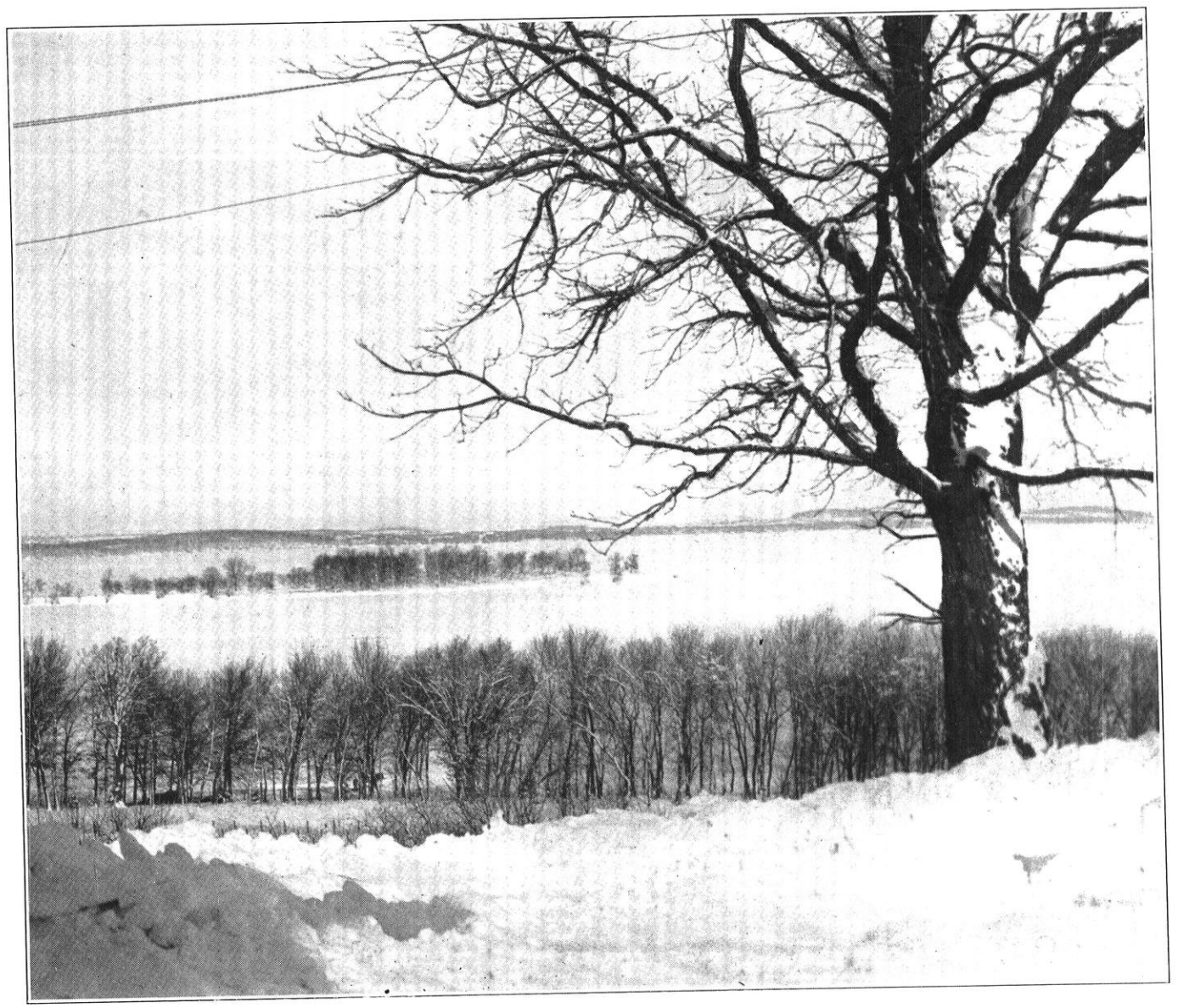

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The Wisconsin Engineer

UNIVERSITY OF WISCONSIN

VOL. XXVII, NO. 4 MADISON, WIS. JANUARY, 1923

THE ELECTRIC RAILWAY FIELD AND THE YOUNG ENGINEER

JAMES THERON ROOD

Professor of Electrical Engineering

The electric railway field offers today to the young electrical engineer one of the most interesting and effective possible lines of endeavor for his life work. Although the field is as old, or even slightly older than the fields of telephony, electric power generation and transmission, it has never drawn to its service either its proper percentage or proper grades of graduates from our engineering colleges. For one thing, courses in railway electrical engineering have not been given to any extent in the past in our engineering schools and, lacking them, our graduates have seemed to feel that they were without proper training for this line of work. They feel that they are well prepared to take up the common branches of electrical engineering,—design, testing, manufacture, power house, generation and transmission work, and, if necessary, that they could rather easily work up the required specialized knowledge for the work in the illumination or telephone fields; but Railway work, has seemed to them a strange, rather mysterious field of engineering activity, and, as such, one to be side-stepped, at least by the more conservative young graduate.

For another thing, the bid to enter the electric railway field has never been put to the about-to-be graduate in as alluring a way as has been the call to the other and more common branches of electrical engineering. The large electrical manufacturing companies, the telephone and other big corporations have persistently spread a systematic propaganda for getting engineering graduate recruits to their services. Every year many of these companies send to practically every engineering college groups of their older, able engineers to personally interview the engineering seniors with a view to getting them to join the given company upon graduation. The electrical railway companies, almost without exception, have been largely local corporations serving a rather restricted district, so they have lacked the larger incentive to go in person to our colleges and bid directly for the better grades of engineering graduates, especially since any given company might require only one or, at most, a few recruits in a given year. It has proven a short sighted policy on their part for which they are paying dearly, especially at the present time, but, unfortunately, it has always been true in railroading, particularly with our steam lines.

Again, since most of our graduates have been lacking in specific training in electric railroading, the operating companies have felt forced either to put the young graduate in some very subordinate position along with untrained, "practical" (?) men, primarily, I suppose, to see what he has in him; or else, as in the case of the Public Service Corporation of New Jersey, the Old Colony sytem of Boston, and the sytems of New York and Philadelphia, the companies have put the young graduates into a one or two year apprentice or training course, both of which seem to grate heavily on the minds of the young grad, especially where getting a well paying job, whatever its other characteristics, is demanded as a prerequisite to early matrimony. And yet one must not forget the kind of materials or goods that electric transportation is dealing with. It is jocularly said that a physician buries his mistakes, but seemingly electric lines are not so fortunate in that respect. They can trust their precious, human and other freight only to the hands of those tried and not found wanting, else they themselves would be buried past redemption. Thus they have been forced to give the would-be railway man a stiff training of some sort, either making him crawl up through various positions in the organization or else giving him training designed to render him sufficiently expert to be both safe and useful, however irksome either of these methods may be to the already-to-be general manger.

But, after all, the important thing is not what the young engineer does the first years after graduation, but what he is doing ten, twenty years after graduation, and, more than that, whether he is tempermentally at one with the work he is in, to the extent that it is a never failing source of interest and attraction to him. That, to most men, at least, is the real criterion of success in life work. The telephone Corporation preens itself upon the large percentage of the men they employ that continue with them. But it is large principally because, with their very wide range of type of employment, they rarely fail to be able to fit a not-too eccentric peg to a comfortably near fitting hole. But really to enjoy work in the electric traction field one must, at least in the common construction or operating end of the game, be able to take pleasure in an active, yes almost continuously strenuous life, one full of pulsating

ups and downs, one slamming up against you emergency problems of considerable magnitude requiring solution at once. You may never be able to wander far from the telephone, day, night, Sunday, holiday, without having left a note as to where you might be reached. You may never be able to say, as in some lines of engineering, just where you may be or what you will be doing two days, say, from now. But for the man of initiative, nerve, one who likes to make things move, it is a real life. The saying is "once a railway man, always a railway man", and it seems a true one. If, for any reason, such a man leaves the railroad service, he is indeed like the British soldier in Kipling's "Mandalay" who is always hearing "the East a' calling." It has always seemed to me a real tragedy that frequently men have been induced to take up work in certain electrical lines only to find it uncongenial to them because they there find no outlet for their more alert activities, their managerial powers. Often have I felt that such men would have found electric traction work a more congenial field for their prowess.

The City, Suburban and Interurban Line Field

The largest present opening in the electric railway field is that of the city and suburban trolley service. There is hardly a city in the United States of ten thousand population or over but that has its city trolley service, often with short connecting suburban lines, some times with interurban service. Here the engineering of equipment selection, operation, and maintenance may be fully of co-ordinate importance with the managing end. In fact, on many small systems the engineer is also the general manager. In many ways it requires him to be a sort of jack-at-all-trades, but it is an interesting, active life, generally in many ways, one of true service. His nose may be kept sharply to the grind stone of work, and frequently is, but he will be a man well known to the community, his light far from hidden, in touch with and in the current of all that goes on, and he may have much to do with the going life and health of his city. The salaries are not often large and the work is strenuous, but there are usually real compensations. In the larger city systems the work is far more specialized and a man may find himself having to do with a more restricted field of activity, but through it all will run the need for activity and alertness, as well as a real feeling of responsibility. Here the salaries are generally much better in the higher positions and the chances for experience as well as for specialization are better.

It may be objected that the field of city electric lines is not what it was before the war, and, in a way, this is true. Financially the roads are not in as good shape as they should and must be, but no one for a moment has any idea that our city trolleys are going to be done away with or even curtailed. In truth, quite otherwise, for never in the history of the United States has the demand for local transportation been as great as it is at present and there is every reason to deduce that this need will increase, even with Ford turning out a million cars a year. Our cities are spreading rapidly outward into semi-suburban districts and there is hardly a city that is not now from five to fifteen or even twenty years behind its present track mileage requirement. The demand for transportation is here. It must and will be supplied. The question of the jitney ,the autobus, the trolleybus may come to your mind. In regard to the first, it may be flatly stated that their chance for superceding the present trolley car service is nil. They have been tried and found wanting so far as general, quick, safe transportation is concerned. Their proper field of use is very narrow, one which the more expensive track service can not financially take care of, at least for the present. The autobus has considerable promise in certain directions, mostly as a suburban continuation or feeder to an established track line. No non-track system has yet been able to give the fast, safe, high-capacity service that our present track service can give, and it is being improved all the time. No one need shun the railway field on account of these seeming menaces.

Elevated and Subway Fields

In some of the larger cities, such as Boston, Philadelphia, New York and Chicago, there are at present extended elevated electric railway installations whose equipment, maintenance and operation call always for a high type of engineering ability and which offer, therefore, a splendid field for high grade engineers. It is practically certain, however, that the elevated has about reached the peak of its mileage and that no considerable extension will ever be made to the present lengths, although they will doubtless be used up to a higher maximum capacity through the use of faster acceleration, lighter cars, shorter headway and the like. The subway will probably be the means of extension of trackage in our larger cities rather than the present type of elevated with its expensive, noisy, darkening structure of limited operating capacity and with its high depreciation effect upon the values of adjoining properties. Unless the monorail type of construction is perfected and comes to the fore, which at this time seems hardly probable, the elevated system has reached its apex.

With ever increasing density of population of our American cities the subway will seemingly come to be more and more depended upon for the chief means for local rapid transit and their construction and operation will open up, in the not far distant future, a very considerable field of opportunity for the railway electrical engineer. The question is practically wholly one of relation between high cost of construction and the revenue to be expected per track mile. Boston, New York and Philadelphia show us what we can be expecting as to cost, maintenance and revenue, and it seems almost certain that extensions in these cities as well as considerable starting subway construction in Chicago will soon be required.

(Continued on page 75)

FINANCING HIGHWAY WORK IN WISCONSIN*

By M. W. TORKELSON, c '04

Engineer-Secretary, Wisconsin Highway Commission

Of the many problems affecting highway work the most important is among the least discussed by engineers. Problems of construction and maintenance are dealt with at length in our technical press and at engineering conventions, but very little is said about financing. Yet unless the funds with which to pay the cost of construction and maintenance, can be provided, everything must stop. It takes money to make the mare go in highway work as well as in other things, and, while the administration of the work—the planning and execution of construction and maintenance—are important, these are secondary to the main problem, which is to get the funds which provide the motive power for the various operations.

Another old saying is that nothing is sure but death and taxes. This voices the average man's antagonism to the process by which the government forces him to contribute his portion of the cost of public improvements. Our system of justice, our charitable and penal institutions, our schools, our highways, in fact, the entire vast machine which differentiates civilization from savagery, is taken as a matter of course, something we have always had and always will have. While the average man realizes that the cost of this machinery must eventually be paid by the individual, he generally feels that is much too great, and that a little larger share ought to be paid by the other fellow. And governments, to avoid the protests which taxes invariably raise, have, wherever practicable, resorted to indirect methods of taxation.

But this feeling, while perhaps natural, is not justified. It is in a measure, perhaps, a survival of the days when a visit from the King's tax gatherer was a day of terror. But if a man lives in a community where taxes are regularly levied and regularly paid it is the surest sign that he is living in civilization and is an active part of it. The purposes of government are twofold: To protect the safety of the individual, both as regards his life and his property; and to enable that individual to enjoy at public expense many things which no one could possibly possess if left to his own individual resources. And, if the taxes are levied within reason, and the funds collected are expended efficiently, the community is better off with the taxes moderately high than very low. Ample public funds mean adequate support for our charitable and penal institutions, our schools, our highways, and more complete enjoyment of them by the individual.

The entire justification for the levy of taxes against the individual is that he is a member of society enjoying the many benefits which are inseparable from living in the community, and it is, therefore, right that he should pay according to his ability. To attempt further justification of taxation on equitable grounds is difficult. Taxes must be levied as equitably as possible, but they must be levied where they can be collected, otherwise the levy will be useless. The whole theory and practice of taxation has been summed up in a sentence which says that we must go where we can get the most feathers with the least squawking. But the impossibility of levying taxes with exact equity need not prevent the levy of taxes and imposts which approach equity more nearly than a general tax levy. The great problem of any public work is to raise the funds, to secure in one manner or another, popular approval for the work undertaken to such an extent that the public is willing year after year to continue to produce the funds with which to carry on the work. This is true of every state activity. Highway improvement, while popular at the present time, has not always been so, and the present desire for a continuation of highway work on a large scale is the result of years of careful effort to keep the public informed regarding the subject and satisfied with the results achieved. In so far as our present knowledge of conditions in the state is an indication of true sentiment, we believe that the work done is approved and the public well pleased. The only limit to a continuation of the work is the ability of the people to pay.

Highway work is substantially at a standstill. The state aid work, which in the early days of organized highway work was the principal operation of the State Highway Commission, is now a small matter compared with other operations. The federal aid work carried out with the first appropriation of July, 1916, and February, 1919, by which approximately $21,000,000 were made available for highway work in Wisconsin, is drawing to a close. Additional federal aid allotted to the state, amounting to $6,600,000, approximately, is available and must be taken up or forfeited to other states. Something must be done by the legislature which convened on January 10th if the work is to continue.

In a previous article (November, 1922), a statement of the immediate needs of the State in the way of highway construction was made and is here repeated. These needs are as follows:

The continuation of federal aid work

The continuation of the maintenance of our present state trunk highway system and any additions thereto

A continuation of our state aid policy

An adequate sum for the proper supervision of the work.

Estimates indicate that the sum necessary for this work, on a scale comparable with the work done during the last three years, approximates $10,000,000 annually.

For a better understanding of the present situation a brief review of past state financing is necessary. As stated in the article already referred to, the State installed an advisory department in 1907 and in 1911 be-

*This is the third and last of a series of three articles on the problem of providing funds for highway work in Wisconsin.

gan the policy of state aid construction on the basis of 1/3 state, 1/3 county, and 1/3 local unit. In 1917 the state trunk highway laws providing funds for construction with federal aid and undertaking the maintenance of our State Trunk Highway System were put into effect. Each of these steps required additional funds on the part of the state. The advisory department, which operated for four years, from 1907 to 1911, was supported by an annual appropriation of $10,000. When the State Aid law of 1911 went into effect the appropriation for administration was increased to $40,000 and an appropriation of $350,000 annually was made for the State's share of construction. This sum was sufficient for the needs of the first year, but the work immediately became popular and the sum demanded to meet the State's full one-third share for the second year's operation was $800,000, or $450,000 in excess of the appropriation. The legislature of 1913 made an appropriation of $450,000 to meet the deficit in the appropriation for the previous year and increased the annual appropriation to $1,200,000. The sum available as State Aid for highways for construction in 1912 and 1913 aggregated $700,000. The sums provided out of the state treasury in the years 1914 and 1915 aggregated $2,850,000, a multiplication by four.

The legislature of 1915 was elected just after the time of the collection of the first high taxes, and there was a very ugly feeling toward road work. Perhaps some of the readers of this article will remember conditions in January and February, 1914. It is not necessary to go into the cause, but it suffices to say that the taxes levied in the fall of 1913 and collected in the early part of 1914 were much higher than any in the previous history of the State. The campaign of 1914 was made largely on that issue. The explanations of the reasons for the high taxes were able and eloquent. Among others, Prof. T. S. Adams added to his fame by quoting Walt Whitman's "barbaric yawp" expression. The average taxpayer was not acquainted with Whitman and ascribed the statement to facetiousness on the part of the professor, with bad results for the various explanations. But be this as it may, the legislature, elected in the fall of 1914, reduced the annual appropriation for state aid for highways to $785,000, at which figure it has since remained.

So far, the funds for highway improvement had been provided out of the general revenues of the State, except during the years 1914 and 1915 when tax levies of $1,650,000 and $1,000,000 respectively were made.

The legislature of 1917 was confronted with the necessity of providing funds to match federal aid allotted to Wisconsin by the act of Congress of July, 1916. This act appropriated $75,000,000 for co-operation with the states in the construction of rural post roads, of which $5,000,000 was to be expended the first year, $10,000,000 the second, $15,000,000 the third, $20,000,000 the fourth, and $25,000,000 the fifth year. The fund was distributed among the states one-third in proportion to area, one-third population, one-third mileage of rural post roads. The total amount allotted to Wisconsin under these first appropriations was $1,913,205, which would require a like amount from the state.

In considering legislation to meet the requirements of the Federal act it was felt by the legislature of the state that the federal program was very moderate, that the expenditure of a joint state and federal fund aggregating $4,000,000 approximately over a period of five years which would be the minimum under the federal statute, would be a very moderate program and that the state could very well afford to expend more money. It was therefore decided that instead of providing the minimum amount for federal aid in Wisconsin, the federal aid would be doubled, and the work done with funds provided 1/3 by the Federal government, 1/3 by the State, and 1/3 by the Counties, analogous to the old state aid plan. The joint federal and state fund was apportioned to the counties one-third in the ratio of area, one-third assessed valuation, one-third total mileage of highways, and the counties were required to provide an amount equal to one-half the amount allotted from the joint fund, and the old ratio of one-third for each thus continued. This program, though in excess of minimum requirements, would not have imposed a hardship on any part of the State with the federal appropriations then made. The northern counties of the State, which are large in area and require a large amount of road construction, received relatively large allotments from the joint state and federal fund, and the appropriation of local funds was no more than fair in view of the benefits received.

In considering the source from which the necessary state funds were to be provided the legislature naturally turned to the automobile. Direct state taxes had been the exception for many years and the legislature is always averse to levying them. Automobiles had become numerous and there was a widespread demand for better roads. The legislature felt, and rightly, that the automobile owner should and would be willing to meet the cost of the improvements contemplated by the legislation enacted in connection with the acceptance of federal aid. The only change made was an increase in the automobile license fees from a flat rate of $5.00 per car to $10.00 per car, which was very moderate and provided ample revenues for the expenditures required by the original federal aid program. But in February of 1919 additional federal aid appropriations were made. Everyone remembers the urgent need felt for providing employment for discharged service men, and road work was the favorite method of providing this employment. In pursuance of this object Congress, in an act approved February 28, 1919, made $50,000,000 available immediately, an additional sum of $75,000,000 available for the fiscal year ending June 30, 1920, and an additional $75,000,000 for the fiscal year ending June 30, 1921. This increased the federal appropriation available within the five years contemplated by the original act of July, 1911, from $75,000,000 to $275,000,000,

and increased the allotment for Wisconsin from $1,913,205 to $7,004,280, a multiplication almost by four.

This later federal legislation occurred while the legislature of 1919 was in session. It was a period of inflation; prices were still high, everybody prosperous and anxious to continue the work on a large scale. The registration of motor vehicles had increased considerably, and after considering all phases of the problem the legislature left the act of 1917 unchanged in so far as the disposition of federal aid funds was concerned and provided the increased state funds necessary through a tax levy of $1,700,000 annually for three years, collected in 1920, 1921, and 1922.

Following this there came the period of depression of 1921 and 1922. While it did not affect the state seriously, the provision of the state law requiring the counties to provide one-third of the cost of federal aid construction was a very severe burden of some of the northern counties. The levies necessary under the original federal aid appropriations would not have been serious, but the multiplication, practically by four, imposed a severe burden. The state Highway Commission foresaw this situation and made recommendations to the legislature of 1921, among which was a provision relieving the counties from the necessity of providing any part of the funds for federal aid construction. Another recommendation was a further increase in motor vehicle license fees such as would have made complete provision for financing all of the state's highway activities from this source, including provision for matching expected federal aid. But this legislation failed and the State remained on the same basis as in 1919.

Only one of the reasons for the failure of this legislation need be mentioned. The legislature of 1919 had made provision to meet all the federal aid then appropriated and any argument for a state appropriation to match further anticipated federal appropriations was met by the reply that such appropriation might never be made. Shortly after his inauguration President Harding in one of his messages was rather pessimistic on the subject of federal aid. He called attention to a vast amount of federal aid construction which was not receiving proper maintenance, and was, to say the least, not enthusiastic about further appropriations. But the federal aid idea had apparently come to stay and Congress, in the acts of November 9, 1921 and June 19, 1922, made available $265,000,000 to be distributed on the same terms, as the previous appropriations. There is a slight variation in the percentages allotted to the various states from year to year, but on the basis of the previous allotments Wisconsin's share of this sum is approximately $6,700,000.

The state trunk highway idea is immensely popular in Wisconsin, and its fame has extended beyond her borders. Every village and city in the state is jealous of its position on the State Trunk Highway System. Every district and every community in the state desires to be served, and there are some communities in the state that consider additional state trunk highways an absolute necessity. With the improvement of the State Trunk Highway System, traffic has increased largely over previous years and the public is coming to demand better maintenance. We have within the State certain areas whose highways are highly developed but these are connected by highways of inferior types. No one questions the necessity of connecting these districts, and all of these improvements, which are so desirable must be paid for if we are to have them. The only problem is, how can this best be done; in what manner can this money be raised most equitably, and how can it be collected with the least disturbance?

In so far as some of our counties are concerned, the problem has been solved through a county bond issue. In these cases the counties have laid out a system of improved highways, specifying the exact highways to be improved and the type of improvement on each portion. The costs of this work have been estimated and the question of issuing the bonds necessary to pay for these improvements submitted to the voters of the county. Such issues have been approved as follows:

Brown	$2,500,000
Dodge	5,400,000
Douglas	1,500,000
Fond du Lac	4,500,000
Green	300,000
Green Lake	900,000
Jefferson	2,000,000
Ozaukee	1,500,000
Rock	1,500,000
Racine	2,650,000
Walworth	300,000
Waukesha	3,800,000
Washington	2,000,000
Wood	1,500,000

This is a total of fourteen counties with aggregate bond issues of $30,350,000. Construction with these funds is nearing completion. Milwaukee county, which has roughly one-fifth the assessed valuation of the state in 1/250th of its area has been able to pave practically all of its main roads without the necessity of a bond issue.

All these counties are wealthy and they have been able to provide the funds necessary for the improvement of all of their main roads through bond issues. And there are a few others in that class which have not yet bonded, and some of these are considering the advisability of securing the immediate improvement of their roads in this way. But many of the remaining counties, whose needs in the way of highways are great and whose deficiencies if their road needs are not properly taken care of will be a damage to the remainder of the state, have not sufficient wealth to provide for the improvement of their highways to a degree commensurate with their necessities. The only method which seems in any way feasible is for the State to concentrate as much federal aid work as pos-

sible within these counties so as to complete those roads which are most important from the state standpoint. And as a matter of justice to the counties which have have proceeded to construct similar roads at their own expense these counties should be reimbursed by the State until the state has paid them an amount equal to the state aid contributed to like improvements in other counties.

As already stated, this problem was considered by the legislature of 1921, and the solution that was proposed was rejected. It likewise confronts the legislature of 1923, and it appears that some sort of a solution cannot be longer delayed. A serious effort has been made to work out a plan, which will be practicable and equitable, largely through the initiative of Mr. R. W. Davis, of Bangor, the chairman of the County Board's Association of Wisconsin. A committee of that association, assisted by representatives of the Good Roads Association of Wisconsin and the State Highway Commission, has made an extensive study of the needs of the State in the way of highway improvement, and the possible methods of meeting these needs. The needs have been stated; a brief summary of the proposed method of meeting them follows:

The committee is unanimously of the opinion that any increases in the way of appropriations for highway improvement must be met through increased levies of one nature or another against the motor vehicle. The justice of this appears axiomatic. The demand for large improvements in our highways came largely as a result of the motor vehicle, and their construction is undertaken to meet that demand. While the total amounts raised through the proceeds of motor vehicle license fees are large in the aggregate, they are only a small percentage of the total expenditures for highway improvements within the state, as the table herewith, which represents the best estimates available of amounts raised for highway improvements in the year 1922, will show.

Unit of Government and Purpose	Source of Funds	Amount	Sub-total	Total by Units of Govern't
Federal Funds:				
Federal aid road construction	Federal Taxes	$1,697,000	$1,697,000	$1,697,000
State Funds:				
Federal aid road construction	Direct state tax	1,700,000		
Federal aiid road construction	Motor vehicle fees	*711,200	2,411,200	
State aid road construction	General Fund	785,000		
Special large bridges	General Fund	100,000	885,000	
State highway maintenance	Motor vehicle fees	2,051,100	2,051,100	
State highway commission	Motor vehicle fees	168,000	168,000	5,515,300
County Funds:				
Federal aid road construction	Direct county tax	1,695,200		
State aid roads	Direct county tax	3,214,700		
State aid roads	Bond issues	‡9,211,700	14,121,600	
State highway maintenance	Direct county tax	371,900		
Co. highway maintenance	Direct county tax	1,374,100		
Co. highway maintenance	Motor vehicle fees	976,800	2,722,800	
County aid, roads and bridges	Direct county tax	1,035,800		
Machinery, supervision, mis.	Direct county tax	1,471,400	2,507,200	19,351,600
*Town Funds*s				
State roads	Direct town tax	694,000		
County aid roads and bridges	Direct town tax	1,035,000		
Town road construction and maintenance	Direct town tax	8,600,000		$10,329,800
Grand total				$36,893,700

It will be noted that this table does not include the amounts raised for improvements within cities. Other figures compiled by the State Tax Commission indicate that the total amount, with these city expenditures included, is in excess of $54,000,000. Of this sum the $3,907,100 provided by the motor vehicle is a very small proportion. It does not seem that any good reason can be advanced why it should not be greater.

The plan proposed contemplates levies against motor vehicles in proportion to the use of the road by the vehicle, the damage done, and the ability of the owner to pay. The details of this plan are discussed in a pamphlet published by the association. It proposes a number of minor adjustments, but the major recommendation consists of three levies: The first, a graduated license fee based on weight; the second, a valuation tax; the third, a gasoline tax.

The damage done by a motor vehicle depends very largely on the impact it may produce, and this is in direct ratio to its weight and in a greater ratio to its speed. The speed, of course, is variable, but the weight is a constant which can readily be determined. The license fee proposed by the association is 50¢ per hundredweight for passenger cars, and $1.00 per hundred for vehicles using the highways as common carriers. No one can question the justice of a higher tax against this latter class. They use the highways distinctly for commercial purposes and compete with the railroads, who are obliged to furnish and maintain their own roadbed as well as the rolling stock.

The owner's ability to pay is very closely in relation to the value of the car he drives, and the application of this principle is nothing new. But it is thought that the motor vehicle, which is a statewide agency, should be taxed by the State so as to insure a uniform rate all over the state. Under the present system taxes on cars of the same value, which often times traverse the same territory to a very large extent, will be on widely different bases. Furthermore, under our present system many cars escape taxation altogether. The bulk of purchases occur after May 1st, the date when taxes are assessed. Many escape the notice of the assessor; and in some cases, where the owner is something of a transient, the assessor purposely avoids levying the tax. To do so would subject the local unit of government to the liability of paying the personal property tax assessed against the automobile to the county, even though the tax should actually be uncollectable. To require the owner to pay this tax at the time of securing the license fee would insure that none escape.

The tax upon gasoline represents nearer than any other factor that can be utilized the benefits derived from the actual use of highways. The consumption of gasoline is a fair indication of the relative weight of motor vehicles and their loads and speed, and the mileage traveled. The use of gasline measures the actual

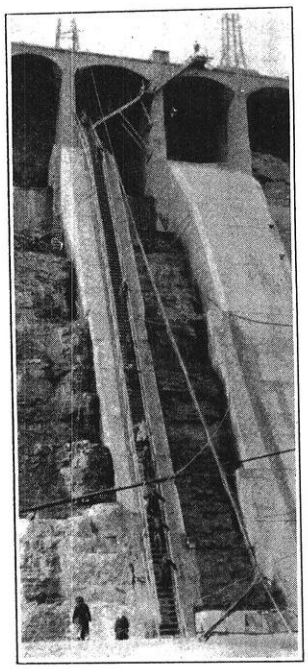
(Concluded on page 70)

THE EASTERN INSPECTION TRIP

N. E. FRENCH

Senior Electrical

The first eastern inspection trip since before the war was made during the nine days from November 17 to 25. Thirty senior electrical and mechanical engineering students elected to make the trip, which was under the supervision of Professors Rood and Spieth.



A 200-FOOT STAIRWAY AT HYDRO." *Going down was not so bad, but then, going up was not so good. It was a mean climb.*

Our pilgrimage to the industrial Mecca began on a Friday—but not the thirteenth—with all of us in good spirits, and both good and bad spirits in some. The class B moron who names collars, breakfast-foods, suburban real estate additions and Pullmans had labeled an otherwise respectable sleeper, "Bayberry." According to Mr. Webster—who, by the way, is not connected in any capacity with Stone and Webster—the Bayberry is a tree, native to the West Indies, from the fruit of which a green and fragrant wax is obtained. Our Bayberry was green, but even a sheep herder would not have called it fragrant. The label was libel. Q. E. D.

On the first stage of the journey, Bayberry was a part of the special train to the Wisconsin-Michigan game at Ann Arbor and, if "coming events cast their shadows before," the shadow of the Wisconsin defeat must have been dangerously anaemic, for the gaiety of the crowd was in no way dimmed.

We went on into Detroit in the morning and visited the Ford factory where the full meaning of the phrase "mass production" was made graphically clear. If there is one thing that impresses the casual visitor to the Ford plant it is the wonderfully complete system of conveyors. Every component part of the product from motor block to the finished car travels by conveyor—and keeps moving.

We returned to Ann Arbor in the early afternoon, and after the game was finished, roamed about the campus and the town until it was time to climb aboard Bayberry.

Although the little excursion to the "flivver foundry" inaugurated the wild revel of sight-seeing, we felt as though the real orgy began with the two days' stay at Niagara. Sunday and Monday were horrible nightmares of feverish activity. We arrived at the Falls early Sunday morning and were awakened about seven-thirty or eight, or some such unholy hour, by the cold-blooded insistence of Professor Rood and "Benny" Spieth—our chaperones. We tumbled out and rustled some breakfast, munching toast to the steady rhythmic drone of the Falls.

The famous Gorge trip was scheduled for the morning, with a stop-over at Queenstown to see some remarkable features of "Hydro," the newest development of the Ontario Power Commission. The car travels along the top of the bluffs on the Queenstown side and the hydro-electric plant is at the river level. About two hundred feet separate the top of the power house from the top of the cliff and the way down is via narrow wooden steps built upon one of the penstocks. The descent is very nearly perpendicular. Going down wasn't so bad, though complicated a bit by the consideration that a slip meant freedom from future worry over steep and narrow steps. There were side rails to anchor to, and it is a safe bet that the gallant "two-by-fours" moaned in pain at the fervidly earnest grips of thirty budding engineers—and two instructors. Going down was not so bad, but then, the going up was not so good. In the argot of the day, it was a "mean climb," and we all were taught to glance with respect and appreciation at the Otis Elevator advertisements. The visit was worth the fatigue incurred, for in many respects "Hydro" was one of the most interesting of the many interesting places we were privileged to see.

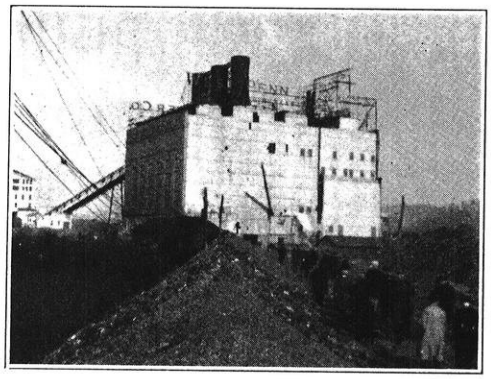
Returning to a well earned lunch we learned that the afternoon's entertainment would be provided at Power House No. 3, of the Niagara Power Company. The announcement was greeted with a marked lack of enthusiasm until we learned that the place was thoroughly equipped to handle the vertical transportation of its visitors. Even then the cheering was feeble.

The only distinction between Sunday and Monday were that we turned out earlier and trekked to different

A FEW OF THE THIRTY WHO MADE THE TRIP.—*The party traveled in a special car labeled and libeled "Bayberry."*

points of interest. Hydro-electric plants on the Canadian side claimed our interest in the morning, although some of the crew thought they might be intrigued by certain frothy beverages until a disillusioning pint of Canadian beer brought home the fact that Ontario (the province, not the lake), is probably drier than the State of New York.

We covered a lot of ground in the afternoon. The



SPRINGDALE PLANT OF THE WEST PENN POWER CO. *One of the new "mine mouth" power plants.*

Carborundum Company of America was our first objective, and on leaving the place we were accompanied by half a ton or so of the glittering carborundum crystals in the pockets of the souvenir hunters.

Power Houses One and Two of the Niagara Power Company were next in order. These two were among the very earliest developments, and hold considerable historical interest. The equipment is almost antique and offers striking contrast to the modern machines of the Queenstown plant. Perhaps the most curious feature is found in the arrangement of the turbines and generators. The latter are placed at ground level while the turbines operate at the bottom of great pits or wells cut into the solid rock. A hundred and seventy foot hollow steel shaft connects each pair of machines. The water comes in at approximately ground level, drops a hundred and seventy-odd feet to the turbines and is carried away in tunnels under the city to a point of discharge below the Falls.

The last concern to which we paid our respects while in Niagara Falls was the spic-and-span establishment of the Shredded Wheat Company. While there is nothing much of a purely engineering interest to be seen here, it is one of the show places of the Falls and should not be missed. In one respect, at least, it is worth going miles to see.

We all remarked, with deep concern, the total absence of pretty girls in the "Power City"; in our wanderings about the town—and they were many—not a girl did we see whom anyone but the most loving of mothers would consider even good-looking. When we had finished with the little luncheon, which the company politely tenders its visitors, and were shown the room where many girls pack the biscuit into the cartons, we discovered the reason for the apparent dearth of feminine pulchritude. The Shredded Wheat Company had a corner on all the beauty in town. The gentleman of Follies fame has overlooked a bet; if Ziegfield ever learns of this brigade of bewilderingly beautiful biscuit packers the labor turnover of the Shredded Wheat people in the ten minutes succeeding his first glimpse will be in the neighborhood of ninety-nine and forty-four hundredths per cent.

We stayed as long as we dared. We stayed longer; and grudgingly we came away. It is rumored that some of the more ardent Romeos returned at five-thirty, which is quitting time, you know, but the deadly beauty of these sirens had so befogged their brains that they waited patiently at the main entrance while the delectably dimpled darlings departed through an employees' passage at the rear.

An hour's ride Monday evening took us to Buffalo where we spent the rest of the evening in looking the town over. Tuesday morning we got an early start—we were always getting early starts, but darned late finishes—for the Pierce-Arrow factory. Here we saw the exact antithesis of the Ford system of mass production. The two manufacturing methods are diametrically opposed, yet both are successful. The Pierce-Arrow cars are built, not assembled, and infinite pains are taken to see that every operation, no matter how small or insignificant, is carried out with precision. The plant is large and the number of employees is large, but the daily output of cars is surprisingly low. It requires time and money to build as these cars are built.

When we were ready to leave the Pierce-Arrow works, a fleet of the company's closed cars was ready to give us transportation to our next stop, the steam power plant of the Buffalo General Electric Company, located a short distance outside the city. This central station, the first steam-powered generating system we visited, was of particular interest on that very account, and we climbed miles of steel stairs and walked over miles of steel gratings in an attempt to miss nothing of importance.

We returned to Buffalo to a late and hurried lunch, for our bus was waiting to carry us to the Bethlehem steel mills at Lackawanna. The balance of the afternoon was employed in watching the various processes of the steel mills. These were probably the most spectacularly interesting sights of the trip.

The bright lights of Buffalo claimed us Tuesday evening until midnight, when we limped wearily to the station. An "upper" in "Bayberry" was a heavenly refuge, but our twenty-five-cycle-snores were cut short at six o'clock the next morning by the stern voice of duty—with Spieth magnificent in the role of Duty.

We arrived at Cheswick, a suburb of Pittsburgh, in a semi-comatose condition induced by impending starvation, but representatives from the Colfax plant, who were there to meet us, guided us to a little restaurant where a substantial ham-and-eggs breakfast received earnest attention. The Colfax people are certainly hospitable and if all their visitors are as royally treated as

(Continued on page 74)

THE ENGINEER AS A SALESMAN*

By William T. Ennor
Senior Chemical

Among the phases of industry to which engineers have been attracted of late years is the field of the saleman. The opportunities in this field are many, and the demand for salesmen who can produce results always exceeds the number of men available. This is even more true now that economic conditions are getting back to where they were before the war than it was in the abnormal war times. Real competition is again to be met in every industry, and all efforts must be bent to the task of marketing the output whatever it may be. Under these conditions it is evident that if the engineer has any qualifications that will give him an advantage in selling any article, corporations will not be slow in detecting this advantage and securing it for their product.

Technical Training Applied to Selling

The engineer has neither the inclination nor the qualifications to rival the general salesman, selling with beautiful impartiality any article from silk hose to mousetraps. The training of the engineer makes his field much more highly specialized. If he is to capitalize his engineering training as a salesman, it must be in handling some article with the manufacture and use of which he is familiar thru his technical knowledge, usually an article the use or construction of which is confusing and little understood by the ordinary man.

This field is much larger than might be imagined at first thought, for it embraces such great industries as the manufacture and sale of metal and wood working machinery and all factory equipment, practically all electrical equipment, mining machinery, the automobile industry, structural material, and chemical apparatus.

The engineer, when acting as a saleman in any of these or similar industries, is more than a mere order taker for his company. He becomes the technical expert for his customers, advising the type of equipment to install and its proper use and care, and acting as a consulting engineer whenever trouble is experienced in his particular field. Service of this kind has been found to pay big dividends in the satisfaction and good will of the customer, for the salesman with technical training and experience will often save his customers large sums of money by advising the proper equipment to use. He will be perfectly honest with them if he knows his business and serves a first-rate company, and will not urge the installation of equipment if he is convinced that it will not meet the particular demands of his customer.

This line of reasoning has appealed to many companies, causing them to organize their sales forces to carry out these orders. Some advertise this service widely, as, for instance, the Goodyear Rubber Co. does its belt service. Most electrical supply houses and many of the chemical industries use technical men as salesmen.

In an article in Engineering News, S. T. Henry, who has had wide experience in the sale of machinery in foreign fields, places engineering training in first place as a requisite for a salesman in foreign countries. In his opinion, the salesman must be able to show that the machinery will increase the plant efficiency, and to give advice as to proper installation and use. He would rather employ a man with technical training and no knowledge of his customers' language, than an accomplished linguist who had no engineering qualifications. Where he finds the greatest difficulty is in securing men with technical knowledge and at the same time a commercial sense; that is, an ability to judge commercial situations.

Training vs. Natural Ability.

This brings us to another phase of the subject: What other qualities besides technical knowledge must an engineer have in order to succeed as a saleman? Granted the importance of engineering training in many sales fields, will this alone carry the engineer to success? The answer seems to be decidedly in the negative, for it has been found that a large percentage of men with unquestionably high technical knowledge fail miserably as salesmen. So it must be admitted that an engineer has no certain key to success in the selling game. He must have the same abilities and knowledge of sales principles that are required of any salesman—in fact he must have more than the average abilities, for positions as outlined in the preceding paragraphs require men of much higher caliber than the ordinary general salesman. The engineer as a salesman must see things from the business standpoint He must see the the profit and loss columns in his customers books when he analyzes his needs. He may have to convince his customer that the article that he is selling will pay sufficient extra dividends to merit its installation, so a knowledge of at least the fundamental principles of economics and accounting and the ability to apply them are required.

A great deal of interesting and instructive, but, it must be admitted, somewhat contradictory material has been written on this subject of the requirements of a good salesman. Many believe that a first class salesman is born only at infrequent intervals and that training has little to do with the matter. Others think that a knowledge of the theories of salesmanship combined with only ordinary abilities will produce better results than will high natural abilities without training. It is probable that natural sales sense, personality, training, and experience combine to make the successful salesman in any field; and therefore, that the abiities

(Concluded on page 74)

*Prepared for the Alpha of Wisconssin chapter of Tau Beta Pi, Nov. 27, 1922.

EDITORIALS

A NEW SEMESTER AND A FRESH START

By the time this magazine reaches you the first semester will be almost ended. It has been a fairly successful semester, though there is nothing outstanding about it. Most of us will be glad when it is over, for the end of a semester means to most of us mountains of work and hours of frantic searching thorough texts in pursuit of knowledge that should have been acquired previously. It is only a minority who always have their work in order and up to date, and who do not look upon an examination as a lion and upon themselves as a Daniel.

Usually all are glad when the semester ends, for it means the end of the first lap and the beginning of the second, with a short breathing spell in between. There is something about a fresh start which puts new life and ambition into one.

The new semester should not be looked upon as a long resting period during its first part and another mad rush during its final part; it should be looked upon as a new opportunity to correct the mistakes of the previous semester, not only as regards one's personal affairs, but also as regards the University.

We have said that the past semester was rather a mediocre one for the University. The Engineering College was unusually quiet and did not demonstrate any outstanding greatness of spirit. But it can in the new semester if everyone will hold the thought.

May each engineer resolve for his own benefit, for the benefit of the College, and for the benefit of the University, to help give the College the best and most worthy four months it has ever had. The ways and means will present themselves if we stand ready to seize the opportunities as they come.

In the large view the world has made distinct economic progress during the past year, and the conditions are very favorable to continued progress during 1923.—Herbert Hoover.

AN OPPORTUNITY WORTH SEIZING

The students of this college have an unusual opportunity for contact with professional engineers and architects. Madison boasts a large and vigorous club composed of the engineers and the architects of the city and known as the Technical Club of Madison. On the first Monday of each month the two hundred and fifty members of the club and their guests meet at six o'clock for supper and entertainment. The meeting ends at 7:30 p. m. The atmosphere of the meetings is delightful. The members are easy-mannered and friendly. The programs are arranged to appeal to the diversified interest represented in the club and are not allowed to become overly technical. They satisfy.

Membership in the club is open to students, and the expense in connection therewith is nominal. There are no initiation fees and the dues are moderate,—three dollars a year. Supper usually costs seventy-five cents. A few wide awake students are already members; more should take advantage of the opportunity. Speak to some friend on the faculty about this. The chances are that he is a member and will be glad to handle your application.

THE COACH RESIGNS

The recent resignation of the football coach, John Richards, was a complete surprise to most of the college world. There had been rumors—promptly denied—during past years that all was not harmonious in the athletic department, and it is quite understandable that the coach and his temperment may have been an uncomfortable combination for his superiors in the department to get along with. The proverbial "hog on ice" had nothing on "Big John" for independence of spirit. There may or may not have been something in the talk. Also, there were some faculty members who didn't approve fully of his methods of discipline. Such disapproval, of course, was to be expected. Most people will grant that a coach's problem differs from that of the average faculty member and may demand sterner measures. It is also recognized that few people approve of other people's methods of discipline. Mayby some prof hurt John's feelings by criticizing him. And then again maybe John just wanted to practice law. Quien sabe?

Many kind words have been written about the coach since his resignation. His work as a coach has been praised in spite of the lack of championships during his regime. The praise is deserved for we always had pride in the teams he produced for us. They lost some games that we thought they should have won, but they also won some games that we thought they were going to lose. All in all, they were fine, clean, fighting teams, thoroughly respected by their opponents.

All the praise that has been uttered for his coaching has been deserved, but we do not wish to dwell upon that. We would add another strain to the anthem,—a strain based upon the coach's affection for and loyalty to his alma mater. John Richards stands high among those sons of Wisconsin who, appreciating deeply the great gifts they have received from the University of Wisconsin, have given freely in return of their time and worldly goods. It was not needful to him to come

to Madison each fall and subject himself to the worries of coaching and the criticism that was bound to go with the job unless he won a championship. Why did he do it? When the Memorial drive was on and full-time professors swelled out their chests as they made out a hundred dollar subscription, Coach Richards, a part time man, gave a thousand dollars,—and the fact wasn't broadcasted either. Why did he do it? He did these things, which are typical of his attitude toward the university, because of an unselfish desire to serve the alma mater he loved. The University of Wisconsin will be great so long as she has sons and daughters who will serve her as whole-heartedly and generously as John Richards has done. He is an inspiration to us all.

EXAM WEEK Should examinations be abolished? Every one admits their disagreeable features. They have a disturbing effect upon the equanimity of the student, causing mental distress, loss of sleep, and interference wtih social activities; and they worry the prof who must try to find ten questions that his class can answer and then grade the papers, which is a task that he hates. Yet we go on semester after semester, in our conservative way, requiring examinations and deliberately making people unhappy twice each year.

The only fellow with a smile at this time is the virtuous individual who has done his work from day to day in a conscientious, intelligent, and perfectly inhuman way. Raus with him!

Now is the time for good resolutions. Before the new semester starts, let us arise, hold up our right hands, and solemnly resolve to emulate the fellow with the smile and do our work day by day, and then in every way we'll grow better and better.

A BIG WISCONSIN ENGINEERING PROJECT A big and interesting piece of engineering work is being carried steadily forward at Milwaukee. The city has undertaken to construct port facilities on a large scale and the work is well started. It will be watched with interest by engineers and other men of affairs in all parts of the country. The WISCONSIN ENGINEER hopes to be able to present its readers with a description of the Milwaukee Harbor Project in an early issue.

STATE ARCHITECT AND UNIVERSITY PROFESSORS CO-OPERATE IN DESIGN OF NEW GENERAL HOSPITAL

Working like dogs in the frozen regions of the North, pulling together to reach their goal, was the simile used by Mr. Peabody ,state architect, speaking before the student chapter of A. S. C. E. on the evening of December 6, to describe the co-operation between himself and Professors Kinne, Price, and Larson of the College of Engineering in designing the Wisconsin General Hospital now under construction at Mendota.

"When architects and engineers co-operate in the design of a building," said Mr. Peabody, "the architect is usually privileged to plan the lines for the structure, and the engineers must provide adequate strength and other engineering features within the limits of these lines. On the other hand the architect can frequently incorporate as an architectural feature some projection or portion of a building which is an engineering necessity.—*B. F. Ahrens, c '23.*

KIRCHOFFER DEVELOPS NEW METHOD OF SEWAGE TREATMENT FOR SMALL INLAND TOWNS

A new scheme for disposing of the sewage of small communities remote from bodies of water was described by William G. Kirchoffer, a graduate of Wisconsin, class of '97 and a practising sanitary engineer of the city of Madison, in a talk to a group of engineering students in the class in sewage disposal on November 28.

The modern tendency in sewage disposal, Mr. Kirchoffer explained, is the utilization of aerobic bacterial action; that is, the reduction of wastes to stable forms by means of bacteria able to exist in the presence of oxygen. This method is inapplicable, however, to small plants because of the expense. Mr. Kirchoffer's scheme is a modification of the aerobic process which is simple and cheap and will, he believes, prove successful.

The scheme employs the ordinary Imhoff tank, a two-chambered affair with one chamber above the other. The raw sewage passes slowly through the upper chamber and the solids settle and pass through the hopper-shaped bottom of the chamber into the lower or digestion chamber. The effluent from the upper chamber is discharged into a dry run and the natural agents care for it in a satisfactory manner. The solids, instead of being kept in the digestion chamber for six months (the usual practice where Imhoff tanks are used) giving off disagreeable odors while the anaerobic bacteria reduce it to mineral forms, is kept constantly in motion by pumping air into it. At fifteen minute intervals the sludge is pumped out of the lower chamber and dumped into the stream of raw sewage at a point fifty feet above the tank entrance. Aerobic conditions prevail at all times and no opportunity is given for the disagreeable septic action.

The reduction of the sludge to the stable mineral form goes on rapidly and completely, and the mineralized sludge is pumped out of the tank to a point of disposal as soon as it has made a sufficient number of cycles through the system to render it harmless.

Two plants of this type are now in operation. Their successful operation will open the way to a satisfactory solution of the sewerage problem in the small town.

E. C. Meyers, c '23

A PROPOSED RECLASSIFICATION OF ENGINEERING COURSES*

By Arnold S. Rufsvold

Senior Electrical.

Most of the suggestions for the improvement of the present engineering courses contain the idea of lengthening them to a period of five or six years. With the existing division of engineering courses into civil, mechanical, electrical, chemical, and mining, the addition of one or two years to the curriculum is perhaps the only solution. However, Professor Bennett of the University of Wisconsin has proposed an entirely new scheme. He suggests that a reclassification of the engineering courses might prove to be a decided step in the improvement of engineering education. Professor Bennett's plan consists in changing the classification from the civil, electrical, mechanical, chemical, and mining courses to the following:

Course in Engineering Research.
Course in Engineering Design.
Course in Operating Engineering.
Course in Maintenance Engineering.
Course in Construction Engineering.
Course in Sales Engineering.

Professor Bennett has given out no details in connection with this new scheme of classification. However, there is no reason why the details of the plan could not be worked out satisfactorily, although the problem would be far from a simple one. It might be well at this point to suggest how the new courses might be arranged.

It would be well if the first year's work consisted of the study of cultural subjects, such as history, language, and art. During this first year, the instructors could study carefully the aptitudes of the individual students, and by the application of certain tests, be able to predict for each student in which type of work he would be most apt to meet success. Of course a certain percentage of the students would require no assistance in choosing a particular course to follow, but for the undecided ones suggestions from the instructors would be of considerable value.

The separation of the students into the various courses would come in the second year. In each of the courses there would be options, such as the mechanical option, the electrical option, and so on. All subjects from which the student would receive no direct benefit in his particular pursuit would be omitted from the course. This would allow room for greater specialization, but a too highly specialized course should be guarded against. Throughout the entire curriculum, the study of such subjects as English, economics, government, and law should be included in order to broaden the vision of the student.

Such a reclassification of the engineering courses would have its advantages. In the first place, employers would be better able to choose engineering graduates for particular jobs. The nature of the demand for engineering graduates seems to be based on the proposed classification rather than upon the existing one.

Secondly, the proposed reclassification would make possible a technical training which would be more concentrated along the particular lines of engineering work. Greater specialization would be possible, and if the plan were properly worked out, the student would receive a broader education at the same time.

In the third place, the student would be better able to choose a particular engineering course. A prospective student, studying an engineering school bulletin, usually finds it difficult to decide whether to take the electrical course, the mechanical course, or one of the other courses The bulletin tells him nothing of the nature of the work to which a particular course may lead him. But if the courses were reclassified as proposed, the student would know that a course in construction engineering would lead to the more rugged outdoor work, and that the research course would lead to laboratory work and experimental work. And not only would the student be in a better position to choose a particular course, but it would be possible for the instructors to advise him intelligently which line of work he should follow.

The adoption of such a plan of reclassification would mean a sweeping change in our engineering schools. The fact that the present engineering courses are so well and widely established would make a plan of this kind seem out of the question. However, the scheme deserves the consideration of engineering educators, and its merit would be proven only after its adoption in one of the existing technical schools.

*Part of a Paper prepared for Tau Beta Pi.

WASTE IN THE COAL INDUSTRY

There are 8,000 bituminous mines with an annual capacity of 850,000,000 tons, 300,000,000 capacity beyond our national needs. The over-capacity in the industry results not in the permanent closing of some mines but in the operation of all of them more or less intermittently. Thus the working personnel is held attached to each mine in daily hopes of employment. In the best year of their history the bituminous mines operated an average of only 249 days in the year, out of a possible 308, whereas in most years the average is about 210, as against about 295 days in England and over 300 in Germany. If we subtract the mines which are operating regularly for certain metallurgical and railway supplies, we find that the situation is even worse, for the remainder of the bituminous mines are probably operating an average of less than 180 days or over 120 days lost time out of the year.

There are 2,500 too many bituminous mines and 200,000 too many people in the business.

ALUMNI NOTES

H. K. von Kaas

CIVILS

J. E. Kaulfuss, c '08, has recently assumed the office of secretary of the North Dakota State Good Roads Association. He has been extensively engaged in highway work since his graduation from this University, and was also associate professor of civil engineering at the University of Maine. Previous to his appointment to his present position he was assistant to the chief engineer of the North Dakota Railroad Commission.

J. E. Kaulfuss

E. M. Barnes, c '22, who is with Engstrom & Knapp, engineering contractors at Wheeling, visited the college on January 5. C. F. Sloan, who was instructor in structural engineering last year, is with the same firm. Ernie had a large number of photographs of work that he had been connected with and in which he seemed to have great interest. We induced him to part with a couple which we present herewith.

Ray E. Behrens, c '19, who was formerly with the Wisconsin Highway Commission, has been appointed County Highway Engineer of Waukesha County for the year 1923. Addresss: 400 E. College Ave., Waukesha, Wis.

J. R. Vernon, c '18, has resigned his position as assistant division engineer for the Wisconsin Highway Commission at Lancaster, and has entered the employ of the Johnson Service Company, manufacturers of temperature control systems, and can be reached at their Chicago office, 177 North Dearborn St.

A. E. Nance, c '15, is a sales engineer for the Johnson Service Co., at Pittsburgh, estimating and designing automatic temperature control installations, and handling contracts.

Melville Hall, c '15, is with the Engineering Division, Bayway Refinery, Standard Oil Company, at Cranford, New Jersey.

W. P. Bloecher, c '14, is with Stone and Webster, Inc., engineers and contractors.

J. F. Kunesh, c '14, is in hydraulic work. Address: Travaux Publics, Port-au-Prince, Haiti.

Harold S. Ofstie, ex c '14, and former end on the Varsity, is with the Department of Physical Education at the Mississippi Agricultural and Mechanical College at A. & M. College, Miss.

John G. Hirsh, c '08, CE '11, is principal assistant engineer with the Benham Engineering Company, at Kansas City, Mo.

O. F. Wasmansdorff, c '00, is treasurer of the Lakeside Malleable Casting Company, at Racine, Wis.

CHEMICALS

Stacey L. Brown, ex-ch '18, who was gassed during the war and has been fighting for health ever since, writes, "I am maintaining my status quo, for which I am thankful, and hope I can report something better next year." Undoubtedly Brown will be glad to hear directly from any of his classmates who are not too busy to write. His address is Cottage Sanatorium, Silver City, New Mexico.

Edward H. Carus, ch. '12, has a daughter, Mary Louise, born July 28, 1922. Carus is a chemist at La Salle, Ill.

Clarence E. Cooper, ch. '17, announces the birth of a son, Robert Huntington, on August 17, 1922. Cooper's address is 612 Lafayette Ave., Palmerton, Pa. He is with the New Jersey Zinc Co.

E. E. Miller, ch. '17, is director of the Pneumatic Truck Tire Division, Federal Rubber Company, at Cudahy, Wis.

A. G. Canar, ch. '16, formerly of Denver, Colo., has moved to 3900 Broadway, Chicago, Ill.

Perry Foote, ch '21, is with the American Appraisal Company, Stroh Bldg., Milwaukee, Wis.

R. A. Baxter, ch. 20, is connected with the Colorado School of Mines, as a fellow in Chemistry.

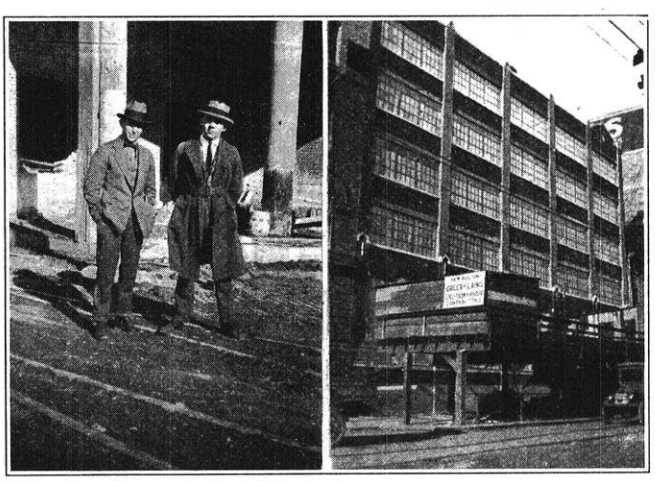
R. I. Drake, ch '20, is with the Western Electric Company, at Chicago, Ill.

R. W. Cretney, ch '21, is with the Southern Illinois Gas Company, in connection with the erection of the new water gas plant at Du Quoin, Ill. Address: P. O. Box 60, Du Quoin, Ill.

Paul Schmidt, ch. '18, is director of the Tire Construction Division of the Federal Rubber Company, at Cudahy, Wis.

ELECTRICALS

W. W. Truran, e '17, is assistant engineer of the New York Telephone Company, engaged in special studies of transmission lines. Address: Care of the New York Telephone Company, 104 Broad St., New York, N. Y.



C. F. Sloan and E. M. Barnes and the Concrete Warehouse Which They Have Helped To Construct at Wheeling, W. Va.

Donald Nethercut, e '17, is with the Ohio Public Service Company, at Mansfield, Ohio.

W. C. Raube, e' 15, is application engineer with the Central Electric Company in the P. and M. engineering department, at Schenectady, N. Y.

C. O. Bickelhaupt, e '11, EE '14, is tool traffic engineer with the American Telephone and Telegraph Company, New York City.

W. F. Lent, e '10, EE '11, is manager of the Milwaukee Moulded Products Department of the Cutler-Hammer Company, at Milwaukee, Wis.

H. H. Force, e '10, is plant engineer with the Continental Motors Corporation, at Muskegon Heights, Mich.

Thomas Holt, e '07, is signal engineer for the Chicago Union Station Company, at Chicago, Ill.

A. J. Goedjen, e '07, is with the Menominee and Marinette Light and Traction Company, at Menominee, Mich.

S. B. Severson, e '07, is general superintendent, Empire Gas and Fuel Company, for Kansas, with headquarters at Eldorado.

L. A. Terven, e '02, EE '04, is with the West Pennsylvania Power Company, at Pittsburgh, Pa.

Louis W. Olson, e '99, was recently made a director of the American Foundrymen's Association, and is at present factory manager of the Ohio Brass Company, at Mansfield, Ohio.

MECHANICALS

A. M. Samp, m '22, is with the Vilter Manufacturing Company, of Milwaukee. Address: 227 13th St., Milwaukee, Wis.

Thomas Norberg (Schulz), m '22, is a draftsman for the Pelton Water Wheel Company, at San Francisco. Address: 5743 Herman St., Oakland, Cal.

Earl Hanson, m '22, can be reached Care Chile Exploration Co., Chuquicamata, Chile, S. A., (via Antofagasta.)

Gustav Slezak, m '22, gives his new address as 2832 Ridgeway Ave., Chicago, Ill.

B. E. James, m '21, is the author of "Restoring Worn Railway Motor Frames and Axle Bearing Caps," which appeared in the October issue of the Electric journal. "Butts" works in the motor engineering department of the Westinghouse Electrical and Manufacturing Company.

J. P. Pederson, m '17, is a manufacturing engineer residing at 1838 Crawford Road, Cleveland, Ohio.

Mr. and Mrs. **W. S. Bemis**, (m '15), announce the birth of a son, Rodney, in June, 1922.

E. R. Wiggins, m '08, formerly Technical Editor of the Chilton Tractor Journal, is now with the Western Advertising Agency, and will be engaged in work connected with farm implement and equipment research covering every phase of merchandising to farmers.

P. B. Rogers, g '05, is secretary and treasurer of the Wetmore Mechanical Laboratory Company, at Milwaukee, Wis.

Bertram Adams, m '02, can be reached at 1426 Lunt Ave., Chicago, Ill.

R. E. Baus, m '00, is with the Studebaker Corporation at Detroit, Mich.

MARRIAGES

James M. Gillet, ch. '15, who is with the Lamberson Japanning Company, at Chicago, Ill., was married to Miss Alda C. Carpenter, at Milwaukee, Wisconsin, on November 4, 1922.

Miss Lillian Taylor to **Robert Usher**, c '08, CE '17, on September 2, 1922. They reside at Winnetka, Ill.

Miss Frances Tucker, to **David Blattner**, e '19, on June 21, 1922. Blattner is with the American Appraisal Company, at Milwaukee.

Miss Mildred Rufsvold, to **Presley Holmes**, ch '20, on August 7, 1922. They reside at 4319 Bryant Ave., Minneapolis, Minn.

Miss Goldie Davis, to **Ernest Lunda**, e '22. Lunda is supervisor of efficiency in the railway department of the Wisconsin Public Service Company, Green Bay, Wis.

Lyle Clifford Harvey, ch '21, was married to Doris Shumway, of Aurora, Ill., on September 6, 1922. Address: 317 Park Street, Shawnee, Oklahoma.

Jerome Roger Butler, c '22, was married to Eleanor Ann Troost, of Minneapolis, on January 10.

Martin A. Powers, ch '17, was married to Molly Dorothy Finnerty, of Kingston, N. Y., on September 20, 1922. Address: Palmerton, Penna.

Milton J. Shoemaker, ch '21, was married to Anna Maude Porter, of Evansville, Wis., on September 2, 1922. Address: Linnwood Heights, Penna.

FINANCING HIGHWAY WORK

(Concluded from page 62)

use of the road more accurately than it can be done in any other way. The justice of a tax of this character cannot be questioned. It possesses the further merit of giving travelers from neighboring states an opportunity to contribute to the construction and maintenance of the system of highways whose enjoyment is one of the principal reasons for their entering the state. The gasoline tax is no novelty. It is already in effect in sixteen states and is considered by many others.

The best estimates available as to the revenues derived from the motor vehicle taxes proposed indicate that an annual revenue of about $10,000,000 will be returned, the sum estimated to be necessary to carry on the necessary highway activities of the state during the next three years. Whether the legislature will see fit to adopt the recommendations of the committee, either in whole or in part, cannot be foretold. Some other plan may meet with more favor and be adopted; but that this legislature will adopt some plan of financing which will enable highway work to go on and by which the highways of the state will continue to be improved cannot be doubted.

IT'S A GREAT LANGUAGE

A certain engineering Beau Brummel takes great pride in his ability to play the Canadian pastime known as la crosse. One day after a hard practice session at his favorite game, he took a turn on the ice. While he was cutting figure eights he saw a damsel loop the loop and land sitting in a daze. So he did what any good man and true should do; he went to her assistance and raised her to her feet. He was so awkward about it that he thought it necessary to murmur in explanation, "I'm a little stiff from La crosse." "Oh, are you?" said she brightly, "How nice! I'm from La Crosse myself."

NEW METHOD OF PAVING BRIDGE FLOORS

In order that the probability of fire on the great Victoria bridge, Montreal, Quebec, might be reduced to a minimum, it was decided in reconstructing the floor, to surface it with two inches of sheet asphalt. In addition to reducing the fire hazard, the maintenance cost, as compared with the old wooden floor, has been greatly reduced. This novel method of treating a bridge floor is proving quite popular in Canada.

CAMPUS NOTES

EARL L. CALDWELL

HAPPY NEW YEAR

Happy New Year to Everybody! And say, it was rather good to get back, wasn't it? Did you notice how good and savory a bowl of stew or a hamburger tasted right after you got back? Ma's pies and cakes are good for a splurge now and then, but for steady diet give us the staples aforementioned.

That applies to our Madison girl also. As things stand now, we can't go home till next Christmas for reason of the feminine excitement. A year from now we can get off the train in safety and expect to live a week. But our Madison girl is dumb and those back home—well, they are dumb too, but, as Al Jolson says, "They aren't dumb enough." Thus our vacation developed several warpings of the heart, ours and otherwise, and the burning deck would be a cool spot just now. Yes, fellows, they're dumb here, or they are so wise they are dumb, a condition giving a delightful sense of fake security. Snap into it—the weather's clear and the track's fast. Play the favorite and win!

You need spirit now, anyway. There isn't a man of you who isn't just a little blue about back work for instance. Remember this is a new year, and anything may happen. If you don't write that report tonight, a flivver may bump you off tomorrow, and chances are against report paper in Heaven. Catch up and clean up. Many a poor devil has reclaimed himself on the final. Catch up and clean up. Be able to say without laughing, "Every day, in every way, I am getting better and better," but remember it's an idle boast if you laugh.

Luck to everybody on the finals. Keep your rabbit's foot handy, your fingers crossed, and above all, work like —.

HAPPY NEW YEAR!!!

Professor Charles I. Corp, of the hydraulics department, was elected president of the Technical Club of Madison at the meeting held on January 8. C. M. Larson, chief engineer of the Wisconsin Railroad Commission, and a graduate from the civil engineering course of the class of '05, is vice president; Leon A. Smith, superintendent of waterworks for Madison and a graduate from the civil engineering course of the class of '12, continues as treasurer; Gordon F. Daggett, engineer with the Wisconsin Highway Commission and graduate from the civil engineering course of the class of '12, is a new director; Professor L. F. Van Hagan continues as director.

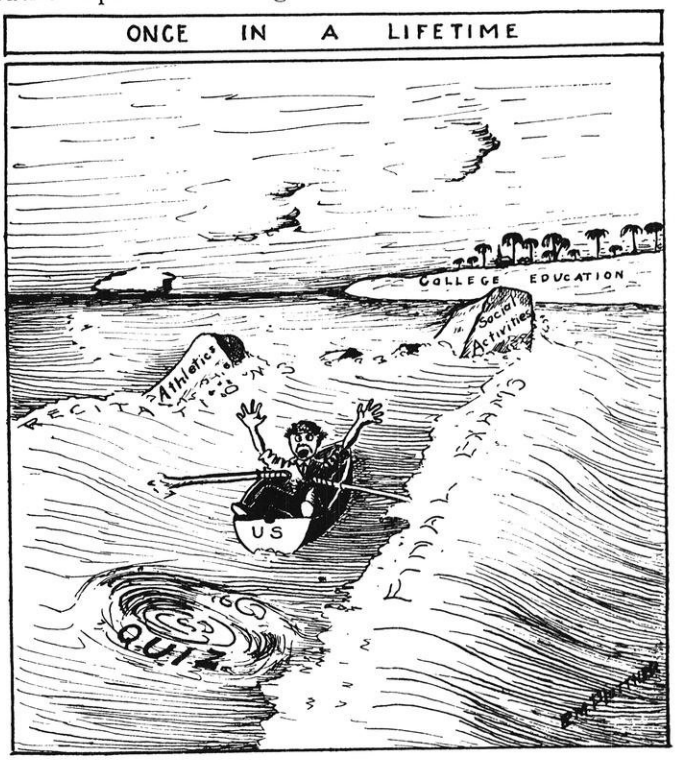
Mr. Wiepking, of the Mechanics Department, is conducting an extensive test on the strength of five-gallon jugs. It is high time somebody secured good data on these modern essentials. The number of cellar casualties increases each week, and jugs have become high in price. When the allowable unit stress is known and the yeast properly proportioned, there will be no further terrible explosions down by the furnace in the silent night.

We were approaching the gym to hear Mish Elman recite. There was the usual crowd of last minute men clamoring at the box office.

"My," she said, "Aren't WE lucky to have seats."

And WE was right, too, because I called HER up after six had turned me down, and I had two SEASON tickets in my pocket!

How times change! Not only are the engineers rather apathetic in regard to the Law Shop across



OH, MR. COUE! YEW-HOO! H-A-L-P!

the way, but now comes Mr. Woy who sends his class in engineering administration across the campus to study cases in the law library. If the law faculty reciprocates, we may have the Blackstones over in our reading room delving into the laws of Newton and Ohm. Just imagine a lawyer, with his cane

hanging on the back of his chair, studying peacefully and contentedly next to an engineer with a slip stick protuding from his hip pocket!

Mr. E. S. Cooper, instructor in drawing, announces the arrival of a new son, Arthur Eugene, born January 2.

WHY PROFS GO MAD

"The system is piped in small pipe which is too small to tap and put pressure gages on so that accurate results may be obtained." Breathe now.

Spelling like this:

Ruff for rough,
Vice verses for vice versa,
Collumns for column,
Murcury for Hg.

And spasms like this:

Weir Experiment

Object: The object of this experiment is to determine the coefficient of a **hook gage.**

Pitchers Only Need Apply

"The second cube was improperly molded and **was thrown out.**"

"What a Tangled Web We Weave"

A junior wrotes this in a report. He is on the wrong side of the hill; he should be a lawyer, for he writes much and says little. To-wit:

Method: The same as any tension test we have had with extensometer.

Test 2. Compression test be careful to have specimen axially loaded or a shear plane is set up in the specimen and all of the load recorded is not compression. (Breathe.)

—AND NOTHING BUT THE TRUTH!

"God's most beautiful and inscrutable and most incomprehensible creation was a woman. She is the Creator's masterpiece. Man's most inscrutable and most incomprehensible creation was an automobile engine; it is man's masterpiece. What we know about both is as zero is to infinity. They both furnish the broadest field for speculation and the greatest subject for enthusiasm and radiant praise, and both properly belong in the field of doubt and speculation. When they will, they will; and when they won't, they won't; and it would seem, therefore, that we can best approach a serious discussion of a gas engine cycle by first getting our minds in a highly speculative mood."

But anyway, a gang of us went to the first mixer, seeking to sort some wheat from the tares. While the threshing was going on, I isolated a tall blond brunette who looked strong enough for the third dance. We made a round, laying out seven couples, and had just begun to hit on all four, when some chap announces, "Refreshments will be served under the balcony."

Says she to me, "Had we better go over there?"

Says I, "That's up to you, Miss. Shall we?"

Says she, "I wonder—I don't know."

Says I, "A shot o' coke would go good now."

Came the dawn, then, and blushes. "Oh," says she, "I thought he said 'all Freshmen under the balcony!'"

A Point of Distinction

"Hello, hello; is Mr. Dudley in?"

"No, he isn't. He's gone to church."

"Oh, pardon me; I mean the younger Dudley!"

And there was a girl (of course, always), with shining honey-colored hair and jerked eye brows. Her rouge was shaded with all the delicacy of a Kewpie's cheek. I loved her the instant that she spoke, for she said to me: "I wonder if girls take English Survey? I've never seen a girl on the hill with surveying instruments!" Rock me to sleep, mother; rock me to sleep!

There is a current idea that the present generation is mighty gol-darned slick. We prate on theories about matter with more conceit than a Broadway actor, and what is worse, we really think we have done all or most of the thinking. But listen to this selection about matter:

"An atomie is a mote flying in the sunne. Anything so small that it cannot be made lesse."

That's from a definition dated 1616, and it's every bit as tangible as any other definition hereabouts!

Question in T. E. Quiz: Explain use of pins in breaking chain.

Answer: Pins are handy when men measuring with chain in case a link in chain breaks.

"Oh, is he dumb? Oh, is he dumb?"

The old gentleman who hauls trunks from the station to the hotel at Devil's Lake, says that the Great Glacier, which left the moraines that impound the lake, was "before my time, but grandfather saw it and told me all about it when I was a kid."

A recently issued circular of a co-educational college contained this statement: "The student body embraces young women."

On the bulletin board of the women's section of the college the instructress in astronomy had posted this notice regarding the evening star: "Anyone wishing to look at Venus, please see me."

According to one of our soph civils, "a radian is the angle **suspended** by an arc equal to the radius."

We are willing to believe most of what Professor D. W. Mead says, but he taxes our credulity when he tells us, "In power systems in the West, men have been killed **several times** by a spurt of water discharged under high heads."

ATHLETICS

By L. T. SOGARD

TRACK MEN AT WORK

With the close of the football season, track and basbetball, together with many minor indoor sports, have begun work in earnest. More than forty track men are working regularly in the annex in preparation for the indoor season which opens early next semester. Despite the losses by graduation, the material on hand holds fair promise if the ineligibility jinx keeps off. The frosh team of last year was exceptionally good, which gives further hope for the coming season.

Ralph Spetz, senior civil, will captain the squad. Spetz is the third consecutive engineer to captain a varsity track team, following, as he does, in the footsteps of Nash and Knollin. His work in the dashes in the last two years has given him a conference-wide reputation. Johnson, also an engineer, and Irving Wade, both veteran sprinters, are working with Spetz on the dashes. In the long distance runs, Tschudy and Jerry Wade, of the cross country team, should make an excellent showing. In the pole vault, Hamman, junior civil, and Tomlinson are the only men of last year's squad who are back.

BASKET SEASON OPENS WITH DEFEAT

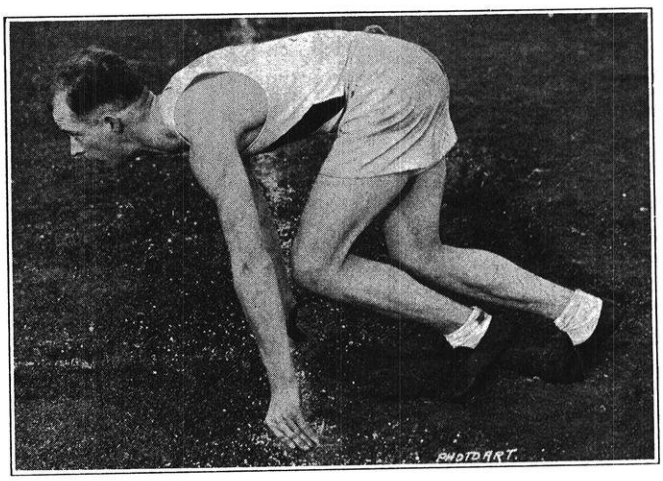
Captained by Gus Tebell, the varsity basketball team pried the lid off the 1922-1923 season, Friday evening, December 15th, losing 20 to 13 to Pat Page's Hoosier huskies from Butler College, Indianapolis. For two seasons, now, Butler has beaten Wisconsin, Illinois, and Chicago in preliminary games, pouncing down on the undeveloped teams early in the Big Ten season. Despite the fact that it was beaten in the opener, Meanwell's squad holds great possibilities for the coming conference season. Rollie Williams and Gus Tebell, both of whom made a wide reputation last season as guards, are back. Gage and Elsom are being used in the forward positions and Gibson is jumping at center.

On the night before school reopened, January 3rd, more than 2000 fans saw Marquette come from behind the short end of an 8-6 score and, in the last minute of play, win by the almost unheard of low score of 9 to 8. Inability to shoot baskets seems to be the chief trouble thus far this season; the team put up a wonderful defense, forcing Marquette to wild, lengthy shots.

In the opening game of the conference season, the Badger jersey clads took the measure of their old rivals, Northwestern, Saturday evening, January 6, in the Patten gym, Evanston. Wisconsin's close guarding featured the game, but, again, inability to put the ball in the basket limited them to a low score. Gage placed seven free throws in nine tries.

TANK SQUAD PRACTICING IN NEW POOL

The old, concrete pool in the gym with its green opaque water is no more. During the past summer and fall a new, tile lined pool has replaced the old. The new tank has been cut down to a length of sixty feet, but still remains 20 ft. in width. New showers have also been installed. Joe Steinauer started his tank teams practicing immediately with the re-opening of school after Christmas in preparation for a heavy schedule. In addition to two meets with the Milwaukee Athletic Club, there will be five conference dual meets and the All Conference meet at Chicago in March.



CAPTAIN RALPH SPETZ

RICHARDS RESIGNS

The resignation of John Richards, Badger football mentor for the past five seasons, has created no little stir in western football; it came as a complete surprise to everyone. Richards, it is said, intends to practice law. There has been a great deal of conjecture as to just who will be chosen for the coaching job. The loss of Richards is keenly felt, and the athletic council intends to do considerable scouting before selecting the man to take his place. Wisconsin has many alumni who are capable of filling the bill, and it may be that an effort will be made to get one of them.

Richards won renown as a full back at Wisconsin in the early '90s captaining the varsity for two seasons. Although he has never won any conference pennants, his teams have played consistently and with comparatively few defeats, making a reputation as the most feared team in the conference.

TRAVIA REPRESENTATIVE TALKS TO ENGINEERING STUDENTS

An example of the successful application of road oil to a Dane County road was described by Mr. G. E. Martin, of the Barrett Company, who spoke to a group of engineering students on January 10. Mr. Martin, who at one time was a faculty member at Purdue, is an honorary member of Triangle fraternity.

The new gravel road between Madison and Sun Prairie was the one to receive the treatment. Although less than a year old, it was already becoming rough and dusty. As an experiment one mile was given the following treatment: The old gravel road was scarified and the crown reduced to about four inches on the twenty-seven foot roadway. The road was kept open to traffic for the purpose of compacting the gravel, but great care was taken to keep the surface smooth by means of a grader. The surface was finally swept clean with a power sweeper, and a priming coat of about one-sixth gallon of Tarvia B per square yard was applied, after which the road was opened to traffic to iron out irregularities and make the surface smooth for the main application. One-third gallon of Tarvia B per square yard was then applied and immediately covered with a thin coat of clean coarse sand. After a few hours another coat of sand was applied, making a total of about fifty yards for the one mile of road. This was just enough sand to keep the surface from bleeding. The road was opened to traffic the day after the Tarvia and sand were applied.

The total cost of the treatment, including the patching for a period of sixty days, was $1,366. The experiment has proven such a success that Dane County will treat twenty-five miles of roads in the same way next summer.

A. J. Rabuck.

THE ENGINEER AS A SALESMAN

(Concluded from page 65)

of a salesman can be much improved by education and training along the proper lines.

The Proper College Training

In view of the importance of the field of salesmanship, it seems pertinent to determine whether our technical schools are fitting men for this work, and if not, how improvements could be made. The combination of work in commerce courses with a large amount of technical work at once presents itself as the most logical solution of the problem; and it is found that more and more men are combining such courses in their college work, and that more courses along business and economic lines are being prescribed in the standard engineering courses. Engineering faculties are learning that while technical knowledge is important, being the real excuse for the existance of the engineer, still commercial relations and problems will probably be as important to the graduate as technical matters. This being true for all engineering students, it must apply even more strongly to those who are considering entering the sales field. The engineer-salesman should, of course, have a good command of English and knowledge of history, the sciences, and other cultural subjects, for he will have to mix with other men in his business and he cannot afford to appear ignorant on subjects with which all educated men should be familiar. This is quite an imposing array of material for four year college course, but in most technical courses a good deal of material of specialized rather than general interest could be omitted from the requirements without difficulty; or, if this is thought inadvisable, a five year course could be given. Much of the cultural material spoken of as desirable can be as easily obtained from a judicious selection of books read during leisure time as from college courses. In fact, it seems ridiculous to expect to cover all the desirable fields of knowledge in a college course of four years. It is certain that this cannot be done by a man desiring a complete training in a combined engineering and commercial field.

It is an old statement of faculty members that we all are required to sell something, if it is only our own services. The originator of a new process or mechanism must sell his idea, the consulting engineer must sell his knowledge and service, and almost every engineer, even if he is not a professional salesman, is accasionally called upon to sell some product or piece of equipment. As this is true, it becomes evident that instruction in basic economic principles and the psychology of selling is important to all engineers, and that commercial subjects should be introduced into all engineering courses.

THE EASTERN INSPECTION TRIP

(Concluded from page 64)

we were, their bill for ham-and-egg breakfasts must form a staggering item on the overhead charge.

The morning at Colfax was one of the most satisfactory of the entire trip. Every phase of the installation possessed a degree of excellence and a refinement of detail found in no other central station on our itinerary.

It was well after noon when we started for Springdale, about a mile from Colfax. Here we were given into the charge of engineers of the West Penn Power Co., who took us out to a splendid dinner—not to mention the "smokes." We of the middle west will have to "pull in our necks" a bit on our vaunted hospitality for we have nothing on these Pittsburgh folk.

A short visit to the Springdale plant of the West Penn Power Co. followed our dinner and then we were given slickers, rubber hats, and electric torches and taken down into the nearby coal mine which supplies the Springdale boilers.

That evening, the Pittsburgh alumni gave us a smoker at the Fort Pitt hotel. It was pleasant to meet the older men from Wisconsin, and there were many of the younger fellows present whom we knew well.

Thursday morning we visited the factories of the Westinghouse Electric and Manufacturing Company

at East Pittsburgh, the true Mecca of our pilgrimage. We were guided through as much of the place as could be crowded into the morning, and then taken to lunch at the company's cafeteria,—a cafeteria that serves more people in an hour's time than any other in the world. It is a big place and the regret was that we had so little time to spend there.

After a visit to K. D. K. A., the country's pioneer radio broadcasting station, we crowded into a jerky little trolley car and rode to McKeesport, the home of the National Tube Co., a subsidiary of the United States Steel Corporation. This was much like the steel mill at Lackawanna, but in many respects more interesting.

Friday morning found us in Cleveland. Nela Park was our objective. This "university of industry," as it is called, was unique among all the places we saw. In reality the general offices, research laboratories, and experimental workshops of the National Electric Lamp Works of the General Electric Co., it appears to the casual observer more like some great educational institution. Grounds and buildings carry out the illusion perfectly, and it is only after one steps inside that evidences of a great industry materialize.

While at Nela Park, we were made to feel that the place was ours. Everything possible was done to make our visit pleasant. A dinner in the beautiful cafeteria, motion pictures, and a radio concert contributed to our comfort. And cigars and cigarettes were always within reach. Nela Park, and the gentlemen who made our day there so delightful, will certainly be remembered by all who made the trip. Frank Hyer went to sleep on the street-car going out, and rode to the end of the line, but while at Nela, was as wide-awake as the rest of us. Neither were Smart's eyes focused on infinity. (Ask Hyer.)

As a fitting close to a strenuous week, the Wisconsin-Chicago game completed our physical fatigue by tiring out the vocal chords,—about the only chords left to us capable of functioning.

ELECTRIC RAILWAY FIELD

(Concluded from page 58)

Steam Railway Electrification

While at present the local, suburban, interurban, elevated and subway installation outweigh by far the electrification on existing steam railway lines the possible future extent and value of such electrification, particularly of trunk lines, is so great as to be almost unthinkable. Experience of the New York Central, the New York, New Haven and Hartford, the Piedmont, the Pennsylvania and other systems, and especially of the Chicago, Milwaukee, and Saint Paul line, show the tremendous possibilities of such electrification. Again it is largely a question of first cost and of the resulting revenue per track mile, but power development is expanding at present in such a way that a very considerable amount of electrification may come at a rather unexpectedly early date. The proposed superpower development and the Saint Lawrence waterway development with its enormous electric power proposition if carried through will exert a tremendous pressure towards the electrification of possibly thousands of miles of present steam line trackage. These proposed, stupendous power developments will depend for their final accomplishment upon the return of a free money market, which should accompany the reviving prosperity here in America, which, in turn, will depend to a considerable extent upon the return to normalcy of conditions in Europe. Should these conditions come to pass it is impossible even to estimate the extent to which the field of employment for the electrical engineer in transportation will be increased. This will be equally true for the civil and mechanical engineer, for it will mean a practical reconstruction of our present steam lines.

Steam Railway Terminal Electrification

The smoke nuisance, the necessity for quicker and more frequent commutation service has already resulted in the electrication of several steam railway terminals, notably the Forty-Second Street, the Hudson and the Pennsylvania terminals in New York City and the Pennsylvania terminal in Philadelphia. The South Station at Boston and the Union Station at Washington were built so as to permit of easy future electrification. The Illinois Central railway is now about to start the electrification of its Chicago terminal after a long delay due to the war. It is only a question of time when terminals in other cities must follow suit. This will open up an excellent field of employment for the railway electrical engineer, but it will be rather of a more transient nature in each case, since the need of a large engineering force passes as soon as the main construction work is completed, only a relatively small operating force then being maintained. One of the pleasures in most electric traction employment has been that it commonly permitted the engineer to establish a real home, if he cared to do so. The employment usually being of a somewhat permanent nature, the tendency to move about from place to place, from job to job, has been rather less than in most other lines of electrical engineering, the work on terminal electrification being an exception to this. It is, however, a very interesting field of traction engineering and one most certain to widen within the next decade or so.

Trunk Line Electrification

The greatest potential possibilities in the field of employment in electric traction lie in future electrification of existing steam trunk lines. A number of steam railway systems have had for a number of years fully matured plans for the electrification of parts of their lines. Among these are the Pennsylvania, the Lehigh Valley, the Delaware, Lackawanna and Western, the New York, New Haven and Hartford. Some of these would have been in electrical operation by this time had the war not intervened. The newspapers have just carried the announcement that the Chicago, Milwaukee

and Saint Paul is planning an early electrification of the section of its main line between LaCrosse and Minneapolis. This will be their third section electrified, giving them over one thousand miles in total. The proposal is to draw the power from hydro-electric generating stations to be erected along streams in the northeast section of Wisconsin. This will involve the expenditure of millions of dollars and years of time. When completed it will be one of the most effective demonstrations of electrification in the United States.

Again it is largely a question of the money market, possible decreased operation costs, insistent demand for higher use of existing steam trackage, together with an already present, tremendous demand for more and better freight transportation. This last has been seen this fall and winter in the almost complete breakdown of our steam lines in the transportation of coal alone, giving us our present coal shortage, terrible in its potential menace.

Such development as here merely outlined will require a greatly augmented staff of electric transportation engineers of the highest type. Of course a large number of the present steam line engineers will be taken over into the new work, as has always been the case, but this will not suffice by any means to take care of the demand for such engineers. Most of the present steam line engineers have not had the requisite training and many of them are of the old school of practical experience alone. Affiliation with such work commonly means, through the system of advancement common on most steam lines, the staying with the given system for a period of years or even a working life time, unless called to some larger system.

The work may be no more interesting, perhaps, than that on local trolley service, possibly really less of a personal service, but it usually gets a great hold on one, if only from the tremendous size of the problem. While local transportation and trunk terminal electrification will have to do largely with motored cars, trunk line electrication will have to do with electric locomotives, possibly of sizes hardly even dreamed of now. New developments in the art, such as better motors, higher direct current voltages, possible large stationary current rectifiers and similar improvements are bound to come with widening steam line electrification. All of these will tend to speed up and extend the scope and field of electrification of existing steam trunk lines. What the next twenty-five or fifty years will show is now only conjecture, but it will certainly be great, possibly beyond all present vision.

Railway Signaling Field

There is at present a small, rather specialized field of employment and service in the application of electricity to railway signaling. Though narrow, it is a field of tremedous importance and value and this will grow with the increasing electrification and use of our present trackage. Greater speed and shorter headway will demand this. As a field for the general engineering graduate it has not had much attraction in the past and relatively few have entered it, though its returns at times have been more than excellent. The technical man has here been mostly concerned in the working up and testing of ingenious signal systems for both single and double track service. The less highly trained man is commonly used for the installation and operation of these systems. It is therefore largely a line of work for the special few only. Every railroad system of any size employs such a staff and there are several large corporations manufacturing signal equipment.

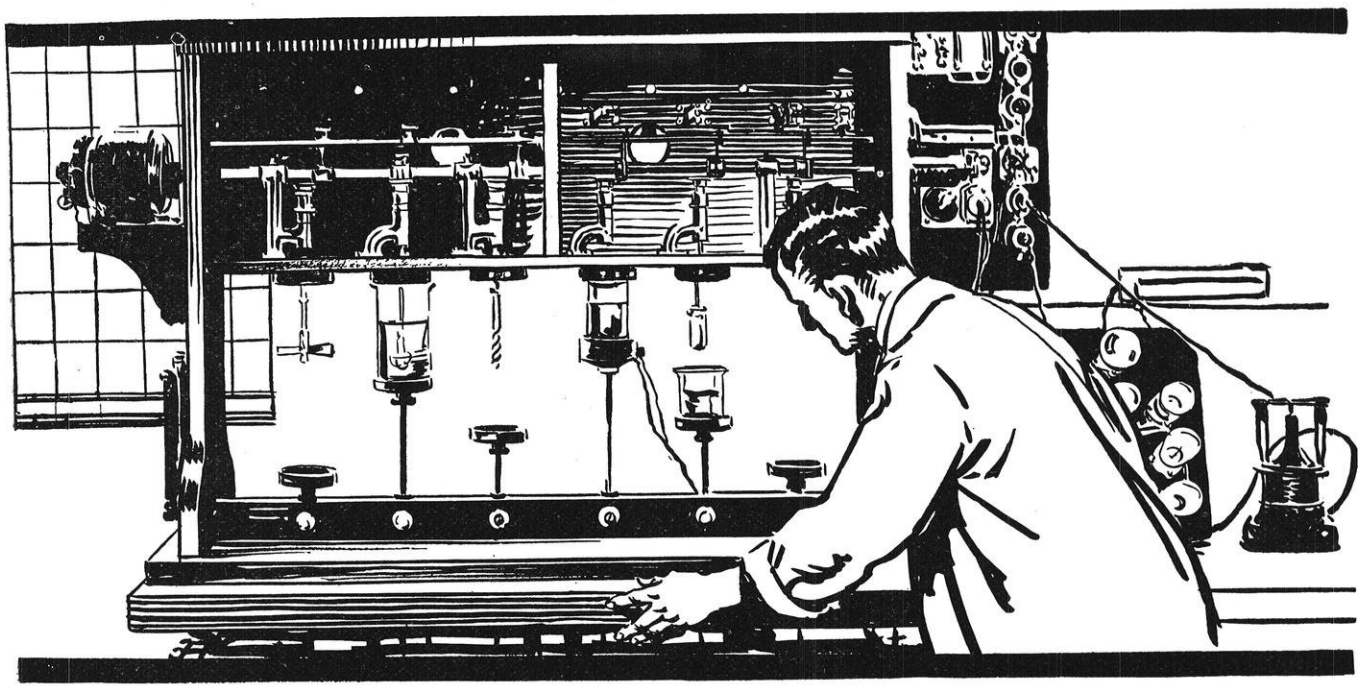
The Electric Traction Field for the Sales and Theory Man

It may seem that of the five main types of activity in engineering, design, manufacture, sales, installation, operation,—the electric traction field is concerned almost wholly with the fourth and fifth,—installation and operation. In the main this is true, though there is a slight incursion into the field of design, as concerns the original layout of an installation or system. From this point of view it appears that the field of railway engineering should be entered only by that type of engineer who by mental makeup is primarily attracted by these types of activity. In a large measure this is true. Never the less, there are a number of very considerable fields of good openings in the traction game for men who by instinct are chiefly attracted to design, manufacture, or sale of apparatus. With the expanding of electrification this field is bound to widen very greatly. In fact it has already started to do so. The orders for electric railway equipment coming in to one company alone during the year 1922 amounted to over one million dollars per month. Yet it must be freely admitted that while prosperity has improved greatly here of late, general, country-wide prosperity is not yet with us, so that a rising activity surpassing this may certainly be looked for in this field.

The General Field

With the coming of general activity and prosperity, with the settling of European troubles, all branches of electrical engineering are certain to increase. Greater power development, especially on the hydro-electric and mine-mouth side, great increase in the use of motor drives, more and better lighting, wider interconnection of transmission systems and networks, all these will come with reviving activity. With them will certainly come a tremendous concomitant development in electric transportation, both local and extended. Present conditions demand it. All this will open to a large group of engineers of proper inclination and training a most attractive field of life endeavor, one of great value to the country and to humanity, one of great appeal and fitting reward to those fitted by nature for its type of service.

LITTLE, BUT LONG.—Many a man thinks he is overworked just because he takes all day to do a three-hour job.—*Baltimore Sun.*



Blazing Trails for Progress

Curiosity may have killed the well-known cat, but it has been underneath most of the hard-won developments that lastingly benefit mankind. Once in a great while, perhaps, accident has been the spark that has lighted the torch of achievement; but much more frequently—always, nearly—accomplishment, especially in the field of science and invention, has grown out of the insatiable curiosity that seems to be the heritage of us all. Mankind wants to know—and is slowly finding out. Curiosity, the complement of imagination, knows no appeasement.

This is, however, no essay on the vague subject of idle curiosity. There is a vast difference between that and the organized, untiring, well-planned activity which, as an integral part of Westinghouse organization, searches continually for the answers to problems which intelligent speculation sets up. This, if you please, is curiosity in its highest and most intensified form; and it is a fundamental thing in the Westinghouse operations.

Research, as we know it, is the guiding hand upon the purely creative activities of business. Constantly it brings to light new aspects of known laws, new visions of laws yet to be uncovered. But the search for these is not haphazard nor whimsical; it is organized and planned as carefully and thoroughly as any other business activity. Whether chemical, electrical, or physical, it is engineering; and it follows engineering methods and tradition.

Many great engineers have been wholly at a loss in this specialized activity. For research, in a sense, reverses the usual order. Its endeavor is to discover unknown laws in the known facts—a thing which is quite at variance with ordinary engineering practice. Yet there is a fine type of engineering mind which finds its great opportunity in this kind of work. And to that type of mind, and that type of man, research beckons with an unmistakable hand. It is engineering pioneering, it blazes trails for progress, to new triumphs, in a wilderness into whose outskirts man has scarcely penetrated.

Westinghouse

ACHIEVEMENT & OPPORTUNITY

WESTINGHOUSE ELECTRIC

INDUSTRIAL BUILDINGS SHOULD BE WELL LIGHTED.

From the employer's viewpoint, the big difference between men who work out of doors and those who perform tasks inside the building, is the factor of light. Daylight furnishes sufficient illumination outside during the daytime working hours for men to pursue their tasks efficiently and safely. But the proposition of getting enough daylight into the interior of industrial buildings, requires some thought.

It is not a difficult problem by any means, and any employer can take advantage of daylight and utilize it for lighting his building during the daytime, if he desires. It is an excellent light, especially suitable for the eyes, reducing eye strain and eye weariness to a minimum, and has the great economic advantage of costing nothing.

To utilize daylight to the utmost, we must first provide means for allowing daylight rays to enter the interior of buildings in sufficient quantity—namely, proper and adequate windows and skylights. Many excellent instances of buildings designed with a due regard to the importance of daylight lighting can now be seen in many of our industrial cities. Such buildings present the appearance of being practically all windows—"window walled," as they are termed—and this type of daylight construction is coming rapidly into favor, because it constitutes a more healthy building for large numbers of employes, both from the lighting and ventilation standpoints.

Among those who have constructed this type of modern industrial building may be mentioned: The Shredded Wheat Co., Gillette Safety Razor Co., Lyon & Healy Piano Co., H. J. Heinz Co., Corona Typewriter Co., Skinners Macaroni Co., Grape Juice Co., Dodge Bros., Nelson Valve Co., Piston Ring Co., Remington Arms Co., and a great many others.

The Larkin Co., Philadelphia, has erected a building almost entirely glass, 85% being windows, and the Loomis Breaker, operated by the D. L. & W. R. R. Co., Nanticoke, Pa., is literally a glass house, being 93.5% of glass. The new buildings of the Winchester Repeating Arms Co. have an average glass area of 58%.

An investigation covering 18 buildings constructed by the Aberthaw Const. Co., Boston, shows that the average window area is 57.5%.

These figures indicate how important the subject of lighting is now considered by employers of industrial labor, and how well the idea has been carried out by the architects and engineers, in order that all parts of a building may receive sufficient daylight. But, in addition to providing ample window space, there is another factor which is equally important, and that is, equipping the windows with the proper glass.

The bright direct rays of the sun should not be permitted to strike the eye, and we must provide a means for reducing the glare to rays which will not be too bright. This is accomplished by glass especially manufactured for industrial windows, known as Factrolite. This glass possesses the property of breaking up the intense rays of the sun and diffusing the light into the interior of the building in proper portions, solving the problem of sun glare.

If you are interested in the distribution of light through Factrolite, we will send you a copy of Laboratory Report—"Factrolited."

MISSISSIPPI WIRE GLASS CO.,
220 Fifth Avenue,
St. Louis. New York. Chicago.
No. 4.