The Wisconsin engineer. Vol. 27, No. 2 November 1922

Madison, Wisconsin: Wisconsin Engineering Journal Association, [s.d.]

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WORDS OF WISDOM

In a recent address to the juniors and seniors of the
niversity of Illinois, Dr. Ira O. Baker, of that institution,
ayed technical training that has as its object the mere
cumulation of facts in declaring that lack of social
aces, conversational ability, and broad knowledge of
neral matters marks the engineer as an ignorant man
matter how many degrees he may hold.

The cultivation of intellectual power and not the ac-
uisition of technical ability is, according to Doctor Bak-
, the most important purpose of an education, even
ough it be an engineering education. For this reason
eadth of knowledge, with insight into the fundamental
lationships of life—economics, politics, social welfare,
vernment, the relations of capital and labor, law and
man nature—is an essential part of an engineer's train-
g. Initiative gained by attacking the harder problems
et in the daily grind of an engineering course, coupled
ith a broad knowledge and aided by technical ability
ill produce a superior engineer. Executive ability, call-
g for an understanding of men, is to be cultivated by
rticipation in student activities. "Infinite good," said
octor Baker, "will result from rubbing elbows and ex-
anging views with fellow students, and work on com-
ittees will train the student in executing duties."

The final element in engineering success, Doctor Bak-
thinks, is clear and forceful speaking and writing.

Coming from a man of long experience in training stu-
nts and studying their performance after graduation,
ese views should mean much to the undergraduate.
e fact that they have been expressed before and will
ar repetition again adds greatly to their importance.
ey may well be considered by the young engineer at
ch for he is just a little inclined to scoff at ideas such
these and to place altogether too much confidence in
e value of his degree.—Tech Engineering News.

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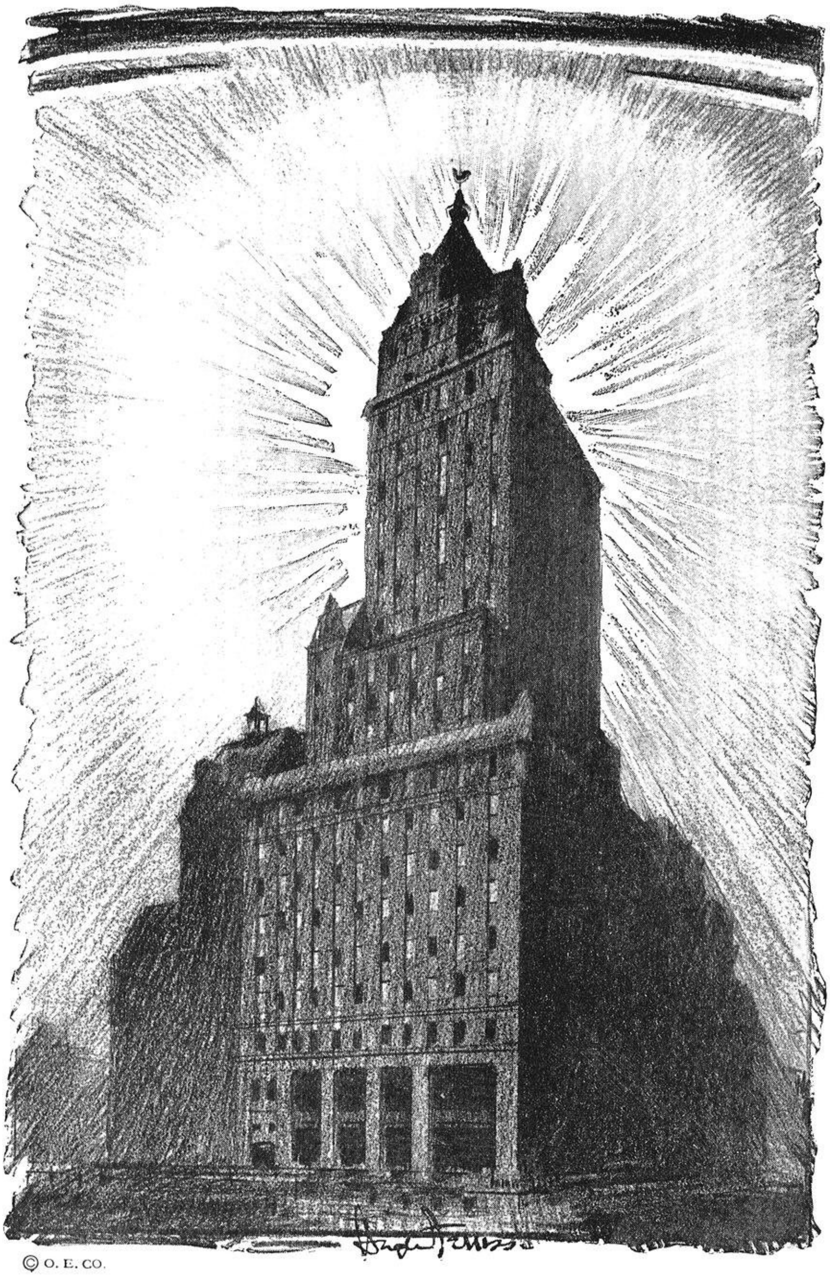
The WISCONSIN ENGINEER

Published by the Engineering Students of
THE UNIVERSITY OF WISCONSIN

VOL. XXVII — MADISON, WISCONSIN, NOVEMBER, 1922 — NO. 2
Member Engineering College Magazines, Associated



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The

WISCONSIN ENGINEER

Founded 1896

Published monthly from October to May, inclusive by
THE WISCONSIN ENGINEERING JOURNAL ASSOCIATION
306a Engineering Building, Madison, Wisconsin
Telephone University 177

25c A COPY

$1.50 A YEAR

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The Wisconsin Engineer

UNIVERSITY OF WISCONSIN

VOL. XXVII, NO. 2 MADISON, WIS. NOVEMBER, 1922

PIPE LINE TRANSPORTATION OF PETROLEUM

By Herbert Glaettli, c '19

Engineer with the Prairie Pipe Line Company

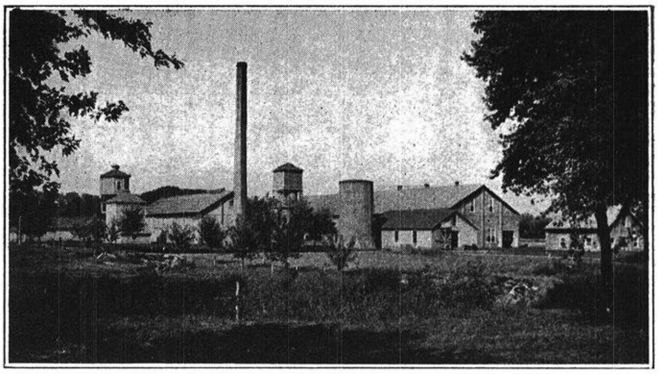
The purpose of this article is to give the reader an adequate conception of the extent and the importance of the pipe line transportation of petroleum, without paying particular attention to the technical problems involved. The transporting of crude oil from the wells where it is produced to the refinery where it is distilled presents a unique problem.

In the early days of the oil industry, the oil was put into wooden barrels at the wells and transported by horse-drawn trucks to the nearest railroad, where the barrels were loaded on flat cars to be carried to the market. Because of excessive leakage, the method was unsatisfactory. Later, vertical wooden tanks holding about 2,000 gallons were built on flat cars to carry the oil. Shortly afterward horizontal steel tanks mounted on railway trucks made their appearance. These first tank cars had a capacity of 2,000 gallons. The tank cars as we see them today have a capacity of about 8,000 gallons. The tank car still plays an important part in new and in small fields which do not justify the expenditure necessary to construct a pipe line, but they carry a very small percentage of the oil from the larger fields.

The first successful pipe line, four miles in length, was constructed in 1865. The *present* system of pipe lines in this county makes possible the transportation of crude oil by pipe line from the Mid-Continent Field in Kansas, Oklahoma, and Texas to the Atlantic seaboard. A line to connect the Wyoming fields with the eastern market is now contemplated. It will connect with existing lines in Missouri and will be approximately 1000 miles in length.

Pipe lines provide an economical means of furnishing the refineries with a continuous and dependable supply of crude oil. The advent of the automobile and the internal combustion engine has created an enormous demand for the product of petroleum, the gasoline consumption in the United States during the month of July of this year exceeding 20,000,000 gallons daily. The pipe lines of this country handle over 500,000,000 barrels of crude oil annually.

A pipe line system is divided into two branches: The gathering lines, and the trunk lines. The gathering lines serve to carry the oil from the wells to some point on the main or trunk line. The trunk lines serve to carry the oil to the refineries. The oil from the wells is first put into stock or storage tanks. As these tanks become filled the oil is "run" by the pipe line company. A gauger, employed by the pipe line company, opens the valve which allows the oil to enter the company lines. Under favorable topographic conditions the oil "gravities" to a gathering line station; otherwise it is necessary to pump it, either by a steam pump at the stock tank on the oil lease, or by a suction pump at the gathering line station. After the oil is run, the gauger closes and seals the valve on the tank. The



General View of a Trunk Line Station. *Trunk line stations are from twenty to fifty miles apart and are connected by pipe lines from 6" to 12" in diameter. The monthly capacity of a station of this size may exceed 6,000,000 barrels.*

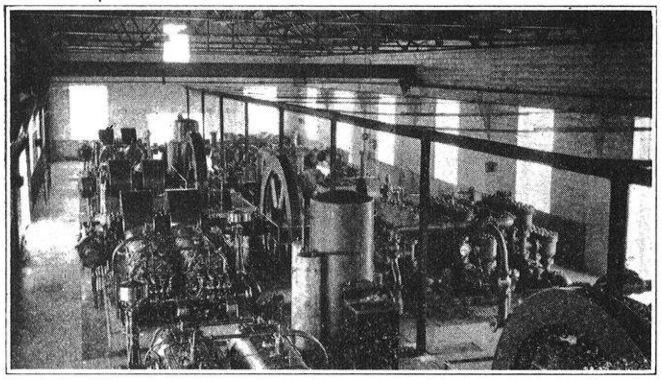
amount of oil run is determined by measurements of level taken by the gauger before and after the run. The tanks are never completely emptied into the line because of the water and settlings at the bottom of the tank. When a tank is first erected it is "strapped." This consists of taking measurements on the tank and preparing a table which gives the number of barrels in the tank for different depths of oil.

The gathering line stations are situated in the oil fields and are usually of a temporary nature because they are abandoned when the territory they serve becomes depleted. The location is usually such that the oil from the various properties can gravity to the gathering line station. The equipment usually consists of a suction pump and one or more discharge pumps. Power is furnished by boilers or by small oil engines of the

Diesel or semi-Diesel type. The lines in the gathering field range from two to six inches in size.

Trunk line stations are permanent. The older stations were usually equipped with boilers and triple expansion pumping engines, but the new stations are equipped with oil engines of the Diesel type. The fuel for the boilers may be coal, fuel oil, or oil taken direct from the pipe line. Some of the larger trunk line stations have oil engines which develop an aggregate of 3,000 horse power. The monthly capacity of a station of this size may exceed 6,000,000 barrels. In addition to the larger oil engines, which range in size from 400 to 660 horse power, a trunk line station has a smaller unit which is used to drive auxiliary equipment such as suction pumps, generator, and air compressors. The suction pumps are used to suck out lines. The generator is used to furnish current for lighting and for other electrically driven isolated units such as water pumps, ice machine, and machine tools. The air compressor is used to furnish compressed air for starting the large oil engines.

Trunk line stations are from twenty to fifty miles apart and are connected by lines which range from six inches to twelve inches in size. The station pressures in the lines vary from 175 to 700 pounds per square



INTERIOR OF A TRUNK LINE STATION. *This station is oil operated. The new stations are equipped with oil engines of the Diesel type. Some of the larger trunk line stations have oil engines which develop an aggregate of 3,000 h. p.*

inch, depending upon the amount of oil to be transported through the lines. The oil is pumped from large storage tanks at one station into similar storage tanks at the next station. These storage tanks are built of steel and are usually of either 35,000 or 55,000 barrels capacity. The pumpings are directed from a main office by an oil despatcher who issues orders by telegraph relative to working pressures, lines, and pumps.

The route of a pipe line is determined by local conditions, but the shortest route is usually the most economical. Sharp bends must be avoided. Creek and river crossings, towns, dwellings, railroad crossings, and local water supplies are deciding features. After the line is surveyed, right of way is secured by easement. An oil pipe line is a common carrier and is under the jurisdiction of the Interstate Commerce Commission. In may states the pipe line companies possess the power of condemnation. When the right of way has been secured the pipe in "strung," i. e., the joints of pipe are hauled along the proposed line. Then the line is ditched, either by hand or with a ditching machine. The joints of pipe are then connected and the line is lowered into the ditch and covered. On the newer lines the pipe is coated with asphalt paint before it is buried, to protect it from the corrosive action of the soil. Nearly all the present lines are made of screw pipe in sections of approximately twenty feet. This year the first welded oil line of any consequence was completed. It is an eight-inch line 140 miles in length, and it has proven to be a satisfactory method of construction.

All main lines are patrolled by a line walker whose duty it is to discover leaks in the line when they occur. The lines are cleaned by means of line scrapers which are forced through the lines by the oil pressure to remove any coating which may form on the inside of the pipe.

The nature of the industry is such that telegraphic communication between the stations and the office is imperative.

Trunk line stations are operated twenty-four hours a day by three shifts of eight hours each. Homes are provided on the station site for many of the employees.

The pipe line transportation of petroleum is an industry in itself, and without it the petroleum industry would be seriously handicapped.

BUYING CONCRETE ON A STRENGTH BASIS

"Concrete should be purchased as a finished product," said Col. Boyden of the Portland Cement Association, speaking before the student chapter of the American Society of Civil Engineers on the evening of October 19.

"The manufacture of concrete is now on a scientific basis," continued Col. Boyden, "and it is possible to *design* concrete so that it will have a specified strength at the age of 28 days. If contractors are permitted to select materials, proportions, and methods of handling, placing, and curing the concrete, with the sole restriction that the finished product shall have a specified strength, the result is going to be better and less costly construction. This plan has been used successfully on several large jobs in the east."

Somebody, somewhere, sometime this fall bespoke himself concerning a course in Blacksmithing in the University. Why pick on us? This is not a trade school. Blacksmithing is a worthy and noble trade—an art, in fact—but it is a practical art, and needs several years of good solid practice for its development in any beginner. There should be more and better blacksmiths, but they should be taught in a trade school—and theory cast aside.

WISCONSIN HIGHWAY DEVELOPMENT AND PROBLEMS

By M. W. Torkelson, '04

Engineer-Secretary, Wisconsin Highway Commission

Wisconsin faces the problem of providing adequate funds for its program of road construction and maintenance. It is a problem that will command the attention of the legislature that will convene in Madison next January; it is a problem that will be discussed by the owners of motor vehicles and other tax payers throughout the coming months. In this article—the first of a series of three—Mr. Torkelson sketches the highway situation in Wisconsin and the various sources of revenue that are available.

Prior to 1907 there was nothing in the state of Wisconsin that could be called systematized highway work; nothing more than the township system of road work under which the pathmaster once each year called out the taxpayers to work on the road. These annual affairs were quite successful socially but accomplished little in the way of highway improvement. The legislature of 1907 passed two County Aid laws, substantially similar, which provided that any town could, by providing an appropriation for highway improvement, coerce the county to provide a like amount. These improvements must be carried out by a county highway commissioner on a county system. The same legislature provided an advisory State Highway Department. A constitutional amendment ratified in 1908 made it possible for the state to aid in the improvement of highways but a State Aid law providing an appropriation was not passed until 1911, when a statute was passed which has remained on the books unchanged in fundamentals ever since. Previous to the passage of the State Aid law only a limited number of counties had worked systematically under the County Aid law, but they all came in shortly after the State Aid law went into effect and by 1916, after five years of operation, about 5,000 miles on the various county system of prospective state highways had been improved. These improvements consisted principally of grading and macadam surfacing. Milwaukee County began constructing concrete roads in 1912 and by the end of 1916 had constructed approximately 75 miles, and there were a few isolated pieces of concrete and other high type pavement in other parts of the state. Under the State Aid law the initiative and the selection of the location of the improvement was with the towns and villages, and these early improvements were naturally selected for local purposes, radiating from the market towns. There was nothing that could be called a state system.

During the early years of highway improvement the word "automobile" was anathema. Motor vehicles of all kinds were regarded as interlopers on the highway, having no rights that must be respected. They were practically nonexistent in 1905, only 1,600 being registered in the state. In 1910 there were 14,500, in 1916 130,000, or one for every four families. With this increase came a demand for a system of highways which would make real use of these vehicles possible.

The realization of this demand was made possible by the first Federal Aid law passed in 1916 and resultant state legislation by the legislature of 1917. The Federal Aid law provided an appropriation of seventy-five million dollars to be distributed among the states, one-third in proportion to area, one-third in proportion to population, one-third in proportion to mileage of rural post roads. The states were required to provide an amount equal to the amount received from the Federal government. This amount was increased to a total of $275,000,000 by subsequent appropriations. The total amount allocated to Wisconsin under this distribution was $7,004,280.67, and the state, in addition to providing an equal amount, required the counties to provide another equal amount, and the state and the counties jointly provided additional sums for the purchase of right of way, which was not permitted with federal funds, so that the total provided for Federal Aid in Wisconsin as the result of Federal Aid appropriations prior to November, 1921, is $21,021,766.70. The construction carried out with this sum is practically complete.

The legislature of Wisconsin provided that the Federal Aid funds must be expended on a State Trunk Highway System interconnecting all county seats and cities with a population of 5,000 or more, and that this State Trunk Highway System must be marked, with a standard design uniform on all parts of the system except for the number designating the particular route, and maintained beginning May 1, 1918. As originally laid out in 1917 the system included 5,000 miles, which was increased to 7,500 in 1919. In addition to the sums expended on the State Trunk Highway System under the provisions of the Federal Aid law other large sums provided by the State Aid law have been expended on it. The Wisconsin system of marking and signing, including the numbering of the state trunk highways to correspond with the numbers on a key map, which has since been adopted by many other states, was invented and installed on the State Trunk Highway System at this time, and the Wisconsin system of combined patrol and gang maintenance was also instituted and put in operation beginning May 1, 1918. The improvements now on the State Trunk Highway System consist of about 975 miles of concrete paving, almost all of which is eighteen feet wide, 4200 miles of macadam and gravel and 600 miles of inferior light surfacings. In addition to this, gang maintenance has put approximately 1000 miles more in fairly good condition so that Wisconsin now has a system of highways which has been the subject of much favorable comment. A traveler can pass in safety and comfort without danger of losing his way anywhere within the state for eight months of the year, and in certain parts of the state twelve months in the year. The record of improvement is one of which the state may well feel proud, but it is not sufficient for our present and future needs. Rapid as has been the development of our highways, it has been surpassed by the increase in traffic. In the year 1916 the Highway Commission undertook to estimate the probable increase in motor vehicles. It was thought that the state could not possibly absorb more than 270,000 more vehicles and that the point of saturation would be reached in 1926. This date is still four years away but we have already more than 400,000 motor vehicles, a figure fifty per cent greater than our most daring venture. And with the improvement of our highways this increased number of vehicles has gone more and more on the roads with the result that the present improved system is as inadequate for our present day requirements as our highways of 1910 and 1912 were inadequate for the requirements of that day. We are facing the problem of keeping this traffic moving over the roads and making provision for the increased traffic which we know must come.

The experience of the State Highway Commission has resulted in the elimination to a large extent of all but two types of surfacing, concrete paving and gravel. The experience has been that concrete paving properly constructed of acceptable material is a success. There are certain portions of the state where high type bituminous penetration roads may be built to advantage, but in the vast majority of cases Portland cement concrete paving is certainly equal, if not the superior, of any pavement that can be constructed at reasonable cost and is the only type practicable to construct for heavy traffic under usual Wisconsin conditions. Under average Wisconsin conditions the cost of eighteen foot concrete paving, excluside of grading and culverts, is about $20,000 per mile.

The next type is the crushed gravel surfacing. The pit run material is passed through a reduction crusher and screen so that the resulting material has a maximum size of one inch. On first class construction this material is spread for a width of twenty-six feet with a thickness of eight inches in the center and tapering to a thickness of two inches at the edges. Preferably, it is placed in two layers and allowed to compact under traffic and by the aid of a road machine or road planer. A road of this type, excluding grading and culverts, under average Wisconsin conditions costs about $6,000 per mile. It is very satisfactory under patrol maintenance, costing about $250 per mile per year for traffic not exceeding four hundred vehicles per day, but under heavier traffic, particularly in dry weather, it is impossible to keep a gravel road in a condition for safe and pleasant travel by means of patrol maintenance, and experiments have been made to determine the possibilities of two types of surface treatments. These consist of calcium chloride and tar. Acceptable results have been secured by two applications of the calcium chloride at an average annual cost of $620 per mile. Excellent results have been secured by the use of a refined tar at an annual cost of $1,000 per mile of eighteen foot width. But in either case the expense approximates the interest on the increased cost of a concrete road, and the resulting road surface is unsuitable for the heaviest traffic. All of our experience points to the need of surfacing all of our main roads with concrete or an equal type paving as soon as the funds can be provided.

The latest Federal Aid enactment, that of November, 1921, requires Federal Aid to be expended on a system of Federal Aid highways which shall not exceed seven per cent of the total road mileage in the state. Three-sevenths of this Seven Per Cent System is a primary system on which not more than sixty per cent of the Federal Aid must be expended, the remainder a secondary system. Though this system has not been selected for Wisconsin, it means the early development of a system of heavy traffic highways interconnecting all parts of the state, and independent of any requirement of the Federal statutes the same necessity exists. The development of improved highways in Wisconsin has not been uniform over the state. There are certain highly developed areas near the most important centers of population. The connections between these centers include long stretches of inferior type road passable with difficulty during several months of the year, and not passable at all for certain limited periods. The requirements of modern traffic demand that these roads shall be put through with a minimum of delay. It may be necessary in some instances to construct an inferior surfacing of gravel or other materials locally available in order to pull the road out of the mud at the earliest date practicable. But until these roads are paved in such a way as to be fully as dependable as the average railway we cannot be said to have a modern highway system. This means a surfacing of concrete or other equal material. Nor is this high class paving program on the main thoroughfares all of the problem. There are many other roads of much local importance which must be built in the most appropriate method, and the whole State Trunk Highway System, and many other local roads adapted by the counties, must be maintained. The problem is so large and the considerations affecting it so complex and uncertain as to make impossible the development of a single comprehensive plan. But the State Highway Commission believes that the state and federal funds should be concentrated on the development of the important through lines of traffic with a view of opening them as rapidly as possible. One of the most important, State Trunk Highway No. 15, has already been completed from the state line near Kenosha to Green Bay and beyond. Much concrete paving

Continued on page 37

A NEW FORMULA FOR COMPUTING PIPE LOSSES

By Charles I. Corp

Professor of Hydraulic and Sanitary Engineering

When water flows through a pipe energy is lost due to friction. This loss of energy causes a fall in the direction of flow. The total fall or drop in pressure head will depend on the length of the pipe, the roughness and nature of the interior pipe surface, the diameter of the pipe and the velocity of flow.

If the velocity were uniform across the pipe section it is probable the loss of pressure head due to flow would vary as the square of the velocity and we would be able to say;

$H = \frac{k}{d} v^2$ where H = loss of head per 100 feet of pipe, v = velocity of flow, d = the diameter of the pipe and k = a numerical constant depending on the roughness of the interior pipe surface.

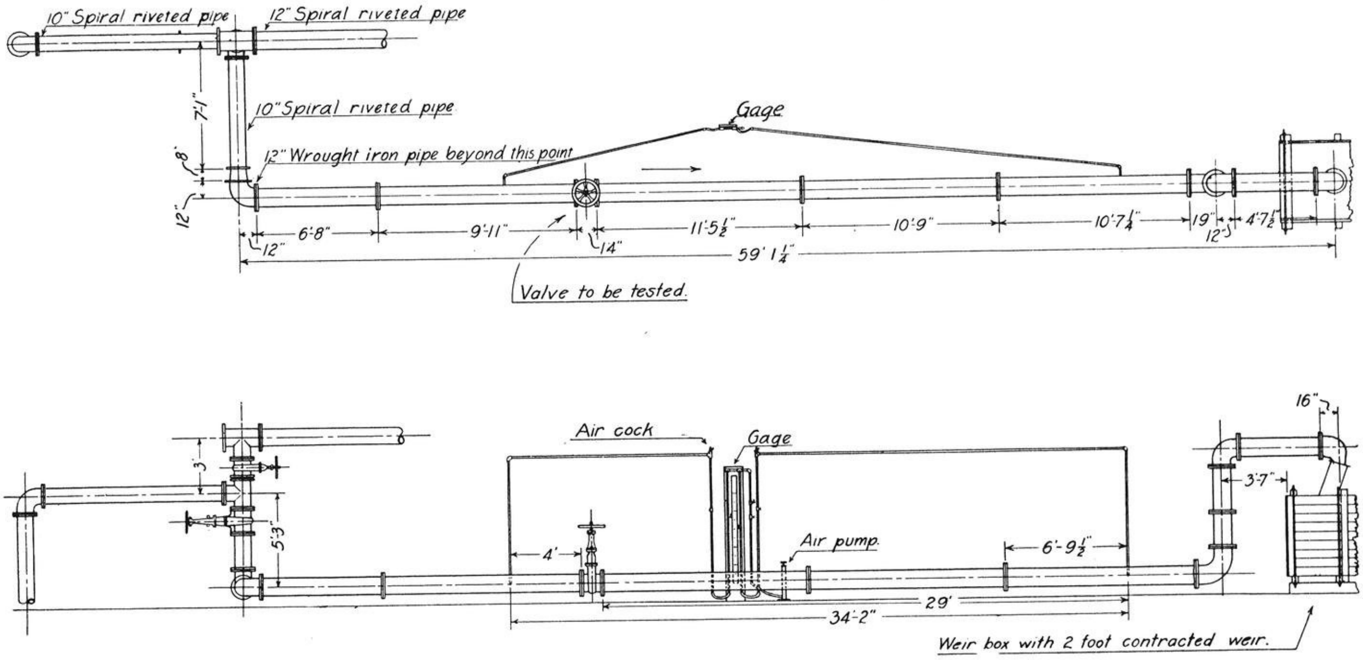


Fig. 1. Arrangement of Apparatus for 12-Inch Pipe Test. *Valve marked "Valve to be tested" was removed and pipe brought together with companion flanges. Similar set-up used for the other pipe sizes.*

Since the actual velocity of flow varies across the pipe section, being a maximum at the center and a minimum at the pipe surface, the loss of head does not vary exactly as the square of the mean velocity but as some power of this velocity which will depend on the conditions. Interior pipe surface conditions influence the variation of the velocity across the pipe section so that we find an equation of the form $H = m v^n$ is best suited to express the actual experimental results. In the equation H and v are as before, n has different values depending on the pipe diameter and the nature of the pipe surface, and m will vary according to some power of d other than one.

There have been a number of empirical formulae for pipe loss developed and used, each being founded on experiments which were limited in scope.

They are therefore limited in their application to conditions analogous to the experiments on which they were based and will differ in a material way in the loss they give for a given diameter and length of pipe.

The variation of m in the formula, stated above, with the diameter of the pipe has been studied by a number of writers, but the experimental data have been too meager to obtain more than a rough relation.

It has been found a numerical constant divided by the diameter to the 1.25 power may be substituted for m to give an expression applying closely to certain classes of pipe. Some writers have decided, with the meager data at hand, that the above value may be applied in a general formula and have taken d to the 1.25 power and given different values to the numerical co-efficient for the various types of pipe.

* In conducting a series of experiments in the Hydraulic Laboratory of the University of Wisconsin for the loss of head caused by valves it became necessary to obtain the loss due to flow in wrot iron pipes. These data cover experiments on pipes ranging in diameter from ½ to 12 inches and therefore furnished an excellent experimental basis for the study of the effect of diameter on the loss of head. While in most

* "Experiments on Loss of Head in Valves and Pipe of One-half to Twelve Inches Diameter," by Charles I. Corp, assisted by R. O. Ruble. A bulletin of the University of Wisconsin, Engineering Experiment Station now in press.

cases only one sample of pipe of any given size was tested, the conditions of the test were such as to eliminate, largely, losses due to causes other than pipe friction. Fig. 1 illustrates the general method of set up

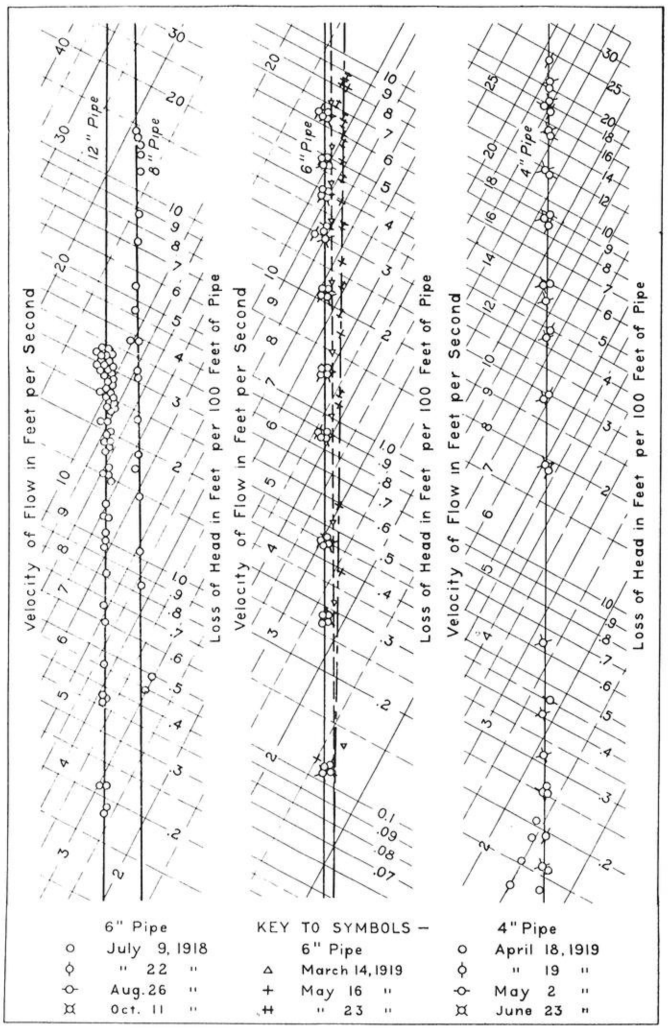


FIG. 2. LOGARITHMIC PLOTTING OF PIPE LOSS FOR DIFFERENT VELOCITIES OF FLOW. *Shows results from 4, 6, 8, and 12-inch pipe.*

used for all of the sizes tested. For obtaining pipe losses the valve shown in the gage length was removed. For the sizes above 4 inches in diameter the discharge was measured over carefully calibrated weirs. For the smaller sizes the discharge was obtained by direct weighing with tank and platform scales. The head gage used consisted of two glass tubes 5½ feet long, joined together at the top and with their bottom ends connected with the piezometer openings in the pipe. Where the ends of the glass tubes were connected at the top provision was made for supplying compressed air by means of an ordinary auto-tire pump. The purpose of this was to depress the columns of water in the gage glasses to a convenient point for reading.

The pipe was either new or in good condition. The gage length for sizes below 2 inches was approximately ten feet. For the larger sizes it varied but an endeavor was made to have approximately 40 pipe diameters of length in each case. There was but one joint in the gage length in all cases except that of the 12-inch pipe which is shown in figure 1.

Figures 2 and 3 are plottings of the data on logarithmic paper. It will be noted the experimental points fall very closely on a straight line for each size of pipe tested. Attention is called to the middle diagram of Fig. 2, which is for 6-inch pipe. The 6-inch pipe tests were carried on at intervals for a period of about one year. The data for each period is distinguished by special symbols. Rusting and other aging effects of pipe have caused the curves to shift along and to be inclined at different angles. For purposes of comparison the curves have all been assembled in Fig. 4. Table 1 gives the equation of each of these lines. The value of the exponent n of v varies between the limits of $n = 1.805$ and $n = 1.985$, a rough average value being $n = 1.90$. By changing the slope of the different straight line curves so that n will $= 1.90$ in each case, values of m can be determined that will give reasonable agreement between the equations and the experimental points. Such values of m have been determined and are tabulated in Table 2.

In Fig. 5 the values of m of Table 2 have been plotted logarithmically against the actual pipe diameters. They

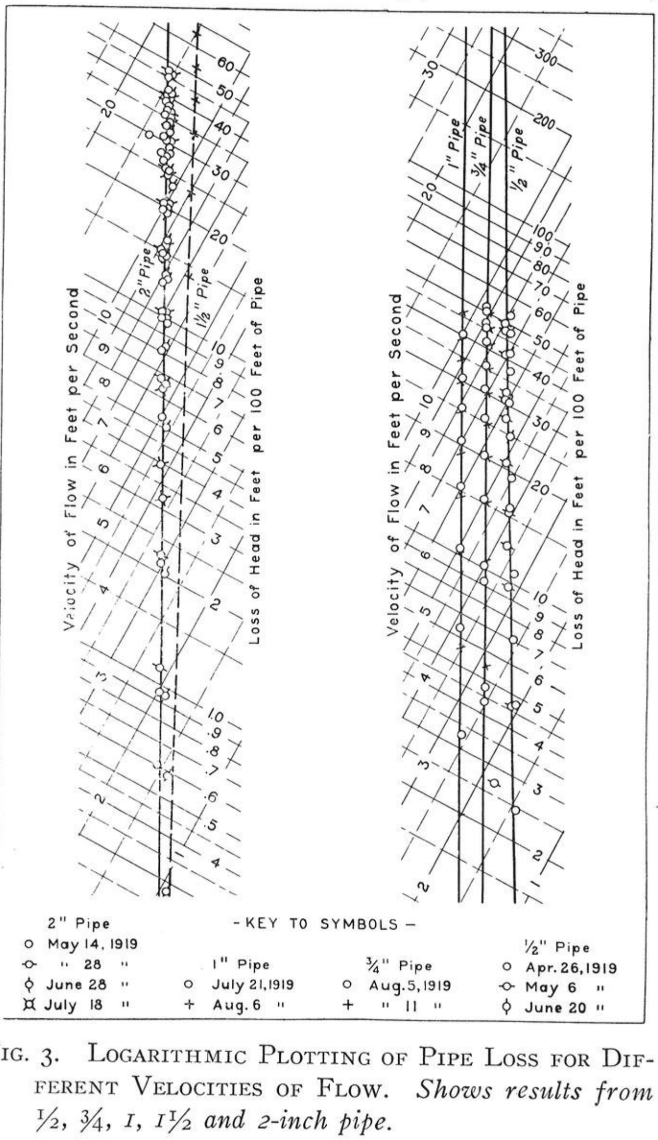


FIG. 3. LOGARITHMIC PLOTTING OF PIPE LOSS FOR DIFFERENT VELOCITIES OF FLOW. *Shows results from ½, ¾, 1, 1½ and 2-inch pipe.*

fall very closely along a straight line whose equation is $m = \frac{.0319}{d^{1.16}}$. If we substitute this expression for m in the equation $H = m v^{1.9}$ there results $H = \frac{.0319}{d^{1.16}} v^{1.9}$.

This formula for the loss of head in wrot iron pipe fits very well the losses actually determined for the sizes of pipe tested. In order to compare this formula with other wrot iron pipe experimental data and with some of the formulas used in estimating pipe friction, Fig. 6 has been constructed. In Fig. 6 the circles are experimental points, being the results for 1, 2 and 12-inch diameter pipes. It will be noticed Weston's and Hazen and Williams' curves for 2-inch nominal diameter pipe fall on opposite sides of the new formula and the experimental points. Hazen and Williams' values show more loss and Weston's values less loss for any given velocity of flow. The group of curves and experimental points for 1-inch pipe are for exact diameters, and differences are in part due to size. The curve from Saph and Schoder's 1-inch galvanized iron pipe shows more loss for a given velocity than any of the other experiments. From the pipe friction studies of F. E. Giesecke at the University of Texas and from

TABLE 1

Equations for Loss of Head in Pipe From Logarithmic Plotting of Experimental Results on Figure 4

Pipe Diameter In Inches	Formula
½	$H = 1.205\ v^{1.805}$
¾	$H = .736\ v^{1.90}$
1	$H = .5133\ v^{1.892}$
1½	$H = .317\ v^{1.978}$
2	$H = .271\ v^{1.87}$
4	$H = .0995\ v^{1.867}$
6	$H = .0621\ v^{1.906}$
8	$H = .0494\ v^{1.923}$
12	$H = .0254\ v^{1.985}$

TABLE 2

Values of m in $H = m v^{1.9}$ for a Series of Pipe Friction Curves Having a Fixed Slope of $n = 1.9$

Nominal Diameter of Pipe in Inches	Measured Diameter in Feet	m
½	.0501	1.0330
¾	.0675	.7215
1	.0877	.5150
1½	.1342	.4065
2	.1723	.2510
4	.3346	.1225
6	.5122	.0580
8	.6752	.0516
12	1.0000	.0310

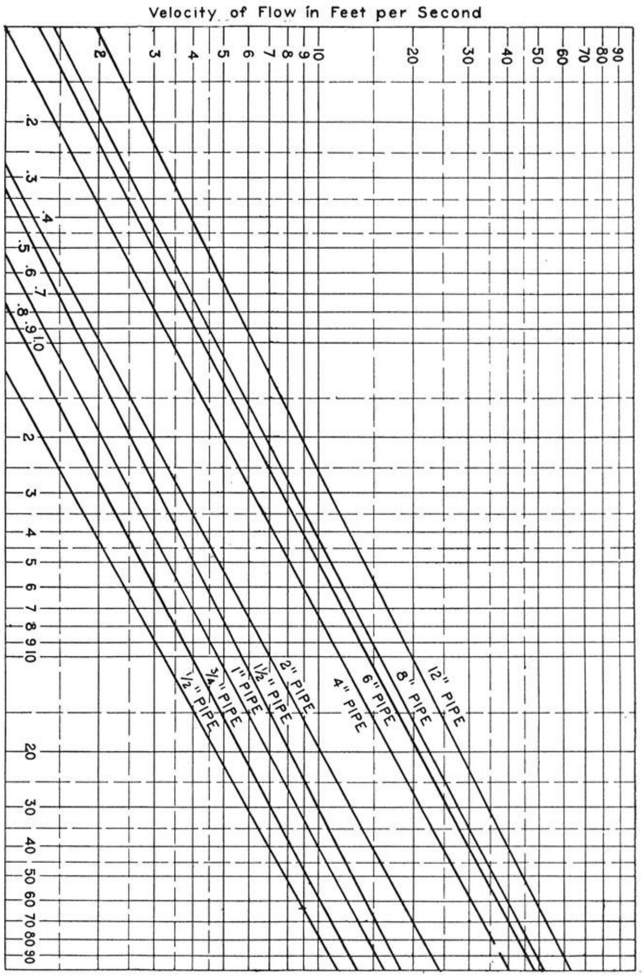


FIG. 4. LOGARITHMIC CURVES FOR ALL SIZES OF PIPE TESTED. *Shows loss of head for different velocities of flow.*

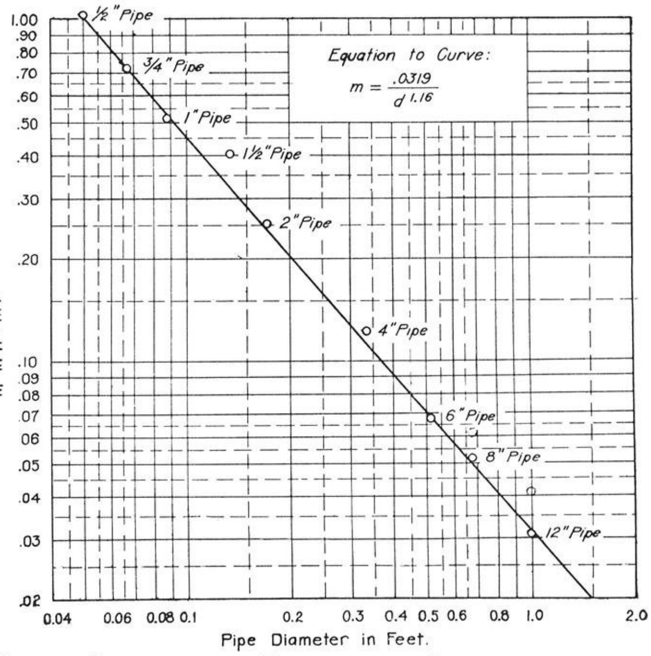


FIG. 5. LOGARITHMIC PLOTTING OF COEFFICIENT M AND DIAMETER OF PIPE. *If d were raised to the 1.25 power the straight line would pass approximately through d=.07 and m=.9.*

Concluded on page 37

THE 1922 SUMMER COURSE IN CHEMICAL MANUFACTURE

BY WILSON D. TRUEBLOOD
Senior Chemical

Four minutes to eight! I snatch another crumb of Lawrence's buttered toast, slap the munificent sum of fifteen cents upon the counter, and dash into the line of eight o'clock stragglers on State Street. A quick sprint and the yellow brick front of the Chemical Engineering Building looms up ahead. "Hamilton—Hanks—Hanson—" the stentorian notes ring out just as I round the stairs. "Tough luck! Why doesn't my name begin with and 'I' instead of an "E'."

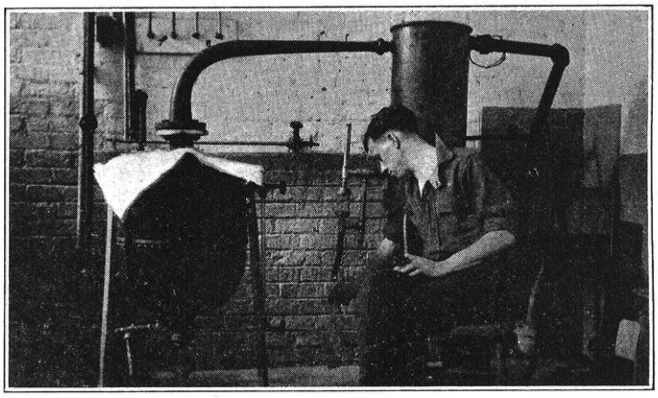
1922 SUMMER COURSE IN CHEMICAL MANUFACTURE

Chemical manufacture is not so bad when there is plenty of raw material and a happy crowd. The bunch this year was the largest in the history of the department, and so even if there were no important contributions to the vast field of science (with the notable exception of Bennett and Hentzen's melting point determination of soap) we may truly claim the name of "record breakers."

The course started on the Monday following final exams and was characterized by a wild dash for the libe. The following Thursday, after Watson, Nixon, and Ames had completed their reference work and the rest had enjoyed a few days of love and leisure, the assembly was again called together for real work. At the close of the lecture at eight o'clock we filed into the basement and started a five weeks' attempt to put to some practical use a three years' accumulation of facts learned from Cohens', Tredwells, Proms, and inspection trips. The cool recesses of the basement now took on new appearances. Pipes, sheet iron, and a few bolts assumed the shape of condensers, evaporators, and other worthy chemical appliances. Sweet alcoholic and ketonic vapors floated down the hall and invigorated all. The transformation was on.

The scramble for equipment was one of the features of the course. Pipe wrenches were ever in demand but never in evidence. The man who was fortunate enough to locate a wrench or a pan always swelled with pride while the unlucky ones sought the sympathy and the advice which was always in abundance at Frank's office. No day was complete without a little excursion over to store "C" for a burette, a flask, or, perhaps, a few minutes' conversation with "Bertha." Orders left with the plumbers and tinners in the service building were generally ready about a week later than they were promised.

Regardless of all the commotion, construction moved right along, and after about three days the manufacturing plants began to perform. Ryan and Huegel, with their rotary kiln, calcined waste plaster of Paris. After sawing up most of the lumber in the building, the



GEORGE TESCH AND HIS STILL. *The Tesch brothers concluded that drip oil from the gas mains is leaner in benzol than formerly, due to the new 530 B. T. U. standard.*

Continued on page 36

EDITORIALS

TRAINING THE MEMORY "The mere acquisition of technical facts has little or no educational value; power is what counts; develop it," said a recent lecturer. The statement, while absolutely correct, is a broad one and is liable to be misunderstood.

We are interlarding our editorials this month with some extracts from a short article by Halbert P. Gillette, which appeared on page 410 of the May 3 number of Engineering and Contracting this year. They bear upon this matter of training the memory and present the case favorable thereto. Gillette's article is well worth a few minutes of any engineer's time. We recommend it to your attention.

Why do educators decry memorizing? In the language of Mr. Post, of Battle Creek, there must be a reason. It seems fairly obvious. First, there is an erroneous belief among people at large that the possession of a large mass of heterogeneous facts constitutes intellectual power. This belief is evidenced by the advertisements of publishers of encyclopedias which recite the imaginary triumphs of some conversational dumbbell who reads the encyclopedia and at once blossoms forth as a clever talker and marries the girl. There is a difference between a collection of miscellaneous facts and a collection of *usable* facts. Educators have had to hammer this exaltation of miscellaneous information out of the heads of the people who come under their influence.

Second, it is easier to memorize facts than it is to learn to use them. A student who learns to state glibly that among the properties of the circle is that equal chords subtend equal angles at a point of the circumference of the circle, may be completely unable to understand the application of the property in laying out circular curves with a transit, not to say anything about his power to *discover* such an application. Educators have had to stress the development of power as opposed to the memorizing of facts and principles.

The part of wisdom is to train the memory to hold as many usable facts and principles as it can, and to acquire the power to apply those facts and principles to the problems that arise.

During the past 20 years there has been a growing tendency among educators to belittle the memorizing of facts and to exalt the cultivation of the reasoning powers. It seems not to have occurred to such educators that reasoning itself may be only a kind of remembering.—Halbert P. Gillette.

THE POLICY OF HUMBUG A student in journalism recently submitted a theme upon the subject of "Humbug" in which he proved to his own satisfaction that the policy of humbug is the policy upon which the activities of the present day world are based. Said he, "I am athletic editor of the Blank newspaper. Do I know anything about athletics? I do not; and yet I get by." Q. E. D., so far as he is concerned.

Copied in the Colorado Engineer. Jan 1923

The Get By policy has been strongly in evidence of late, not only upon our campus and among college men, but also in society at large. Another result of the war perhaps. Many people who should know better have fallen for it. Our journalistic friend has plenty of company in his belief. But is it a policy that can be adopted and followed by any large proportion of society with success? Answer: It can not.

Let's take a slant at the policy from a new view point. Suppose that the farmer adopts that policy and, instead of raising spuds and grain raises his voice at the village postoffice all through the growing season. We can't live on wind. The farmer, at least, must make good.

Suppose the medical student adopts the policy and, instead of learning the idiosyncrasies of the liver and lights he spends his time in college collecting data on movie stars. A strong bluff on the part of the doctor will not pull his patients through a violent attack of epizootic. The doctor, also, must make good.

Suppose the engineering student adopts the policy and, instead of learning the laws of nature which will enable him "to direct the great sources of power in nature to the uses of mankind," he lizards away his study hours and bluffs his way in the class room and lab. He won't be able to fool Nature after he gets his degree as an engineer. The engineer is another who must make good.

Extend the list as you will. A certain percentage of bluffers can be carried by the real performers, but it is an insignificant percentage. If the proportion of bluffers, humbugs, get-byers increases beyond what the real performers can stand up under, there will be a crash in society that will prove the fallacy of the humbug policy and bring men and women back to their common sense.

In the commonest forms of deductive reasoning it can be readily seen that the inference or conclusion is nothing else than a remembered attribute looked for expectantly.—H. P. G.

INTERNATIONAL POLITICS The armistice that marked the end of the World War also marked the beginning of another war—a war filled with bitterness and distrust if not with bloodshed. This war is the international political war which rages today with just as much vigor as it did in 1919. The causes of this struggle were the results of different opinions regarding reconstruction, some of which opinions were advanced by men desiring to help the world back on its feet, others by men who sought only to aid themselves.

Often the bitterest struggles came between factions and men of honest desires, and the lesser struggles usually between those seeking personal gain. These struggles are still continuing, and will do so for considerable time to come. The only way the ordinary citizen of a country involved can distinguish between the honest and dishonest efforts is to follow more or less closely the developments from day to day. He owes a knowledge of the various international relations both to himself and his neighbors, for he no longer lives in the isolation of the eighteenth century.

The most deplorable phase of the whole situation is the college man who so buries himself in college activities or studies that he loses all contact with affairs of the world. He lessens his chance to become a useful citizen, and deliberately throws away opportunity after opportunity to learn from the mistakes of others that which he should avoid. He probably will not find himself in international politics, but international politics contain many valuable examples for a man regardless of his pursuits. Smart

*Every class of reasoning, even inventive reasoning, is a subclass or kind of memory. * * * Granting it to be so, some startling conclusions flow from it. For example, it follows that many of our educational methods are based on an incorrect theory, in that they decry memory when, in fact, correctness of deduction depends upon the breadth and accuracy of memory.*—H. P. G.

HONORING AN ENGINEER In naming the new engineering building at Bozeman, after William Milnor Roberts, the University of Montana will express the state's appreciation of the work of a great locating engineer,—of the man who located the line of the Northern Pacific Railway from Lake Superior to Puget Sound. This recognition of an engineer is a fine thing; it makes a strong appeal to us. And, naturally, our thoughts turn to home affairs and we wonder what name we would like to see engraved across the front of E. B. here at Madison. Vinsky

There are many teachers who teach that only broad general principles need be memorized. If they were to study the workings of the minds of a few successful business men, engineers, and inventors, they might change their opinion as to the desirability of not memorizing narrow principles.—H. P. G.

LET'S HAVE A CHRISTMAS SONG FEST A big song fest, in which the students and faculty of the College of Engineering will get together and celebrate the end of the first part of the semester and welcome the Christmas holidays, has been suggested by Professor Millar.

The idea is an attractive one, and suggests interesting possibilities. It would be an excellent means of ushering in the Christmas season, and of creating a feeling of good fellowship among the engineering students.

Undoubtedly the various engineering groups will lend all possible aid in carrying out this idea; and each individual student should make it a point to be on hand for the event with lungs full of air and larynx well greased. Rusch

The highly successful engineer or inventor is usually a man whose mind is a marvelous storehouse for usable facts.—H. P. G.

PROFESSOR IRA O. BAKER DISCUSSES FACTORS IN ENGINEERING SUCCESS

Declaring that lack of social graces, conversational ability, and broad knowledge of general matters marks the engineer as an ignorant man no matter how many degrees he may hold, Dr. Ira O. Baker, of the University of Illinois, speaking to the juniors and seniors of this college on October 18, flayed the technical training that has as its object the mere accumulation of facts.

The cultivation of intellectual power and not the acquiring of technical ability is believed by Dr. Baker to be the important purpose of an education, even though it be an engineering education. For this reason breath of knowledge, with insight into the fundamental relationships of life—economics, politics, social welfare, government, the relations of capital and labor, law, and human nature—is essential in the training of all but "the hewers of wood and the drawers of water." Initiative is aided by a breadth of knowledge and can be cultivated and strengthened by the formation of good habits during the school career. A student who is unafraid to attack the harder problems he meets in his daily grind and draws upon all his previous knowledge to effect a solution, will not lack business initiative. Initiative based upon broad knowledge and aided by technical ability will produce a superior engineer.

Executive ability, calling for an understanding of men, is to be cultivated by active participation in technical societies during the school career. "Infinite good," said Prof. Baker, "will result from rubbing elbows and exchanging views with fellow students, and work on committees will train the student in executing duties."

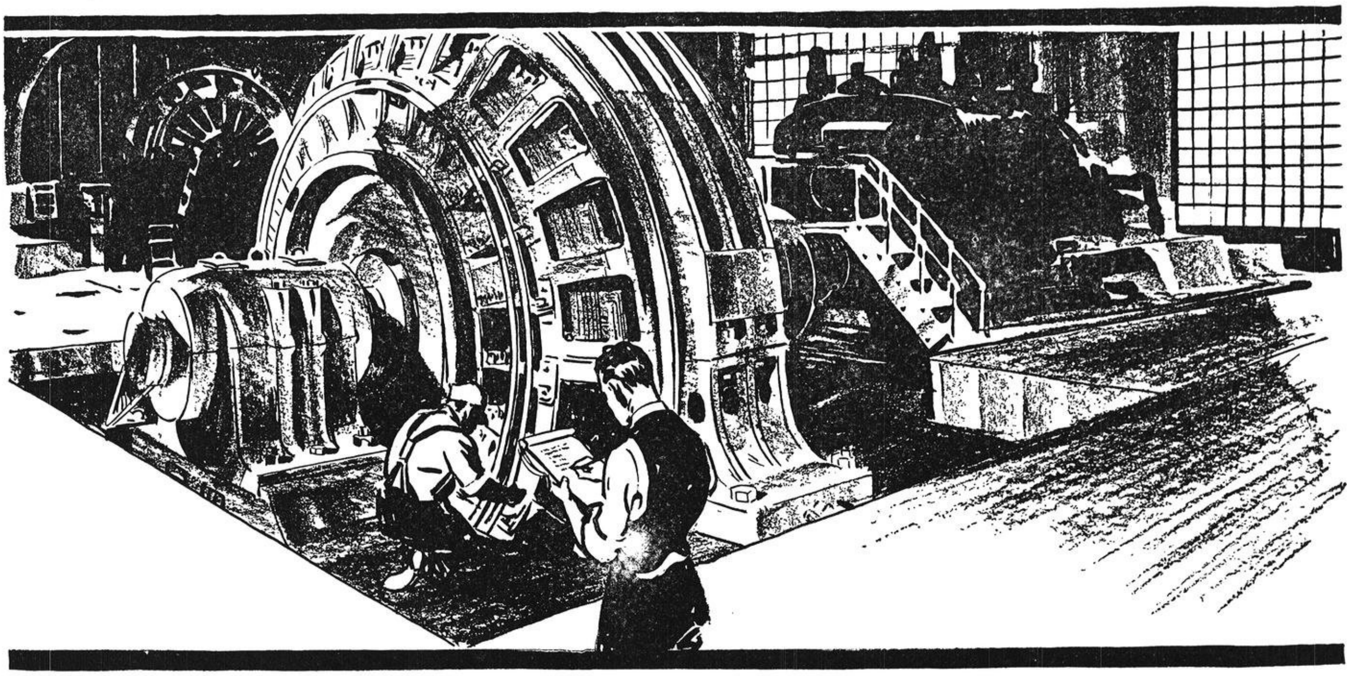
The final element in engineering success, Mr. Baker thinks, is clear and forceful speaking and writing.

The speaker's long experience in training students and studying their performance after graduation gives importance to his views; his message may well be considered by the young engineer who expects soon to begin his upward climb to success.

Everett C. Meyers,
Senior Civil.

The fellow who isn't fired with enthusiasm is apt to be fired with enthusiasm.

Copied in Colorado Engr Jan 23



ATHLETICS

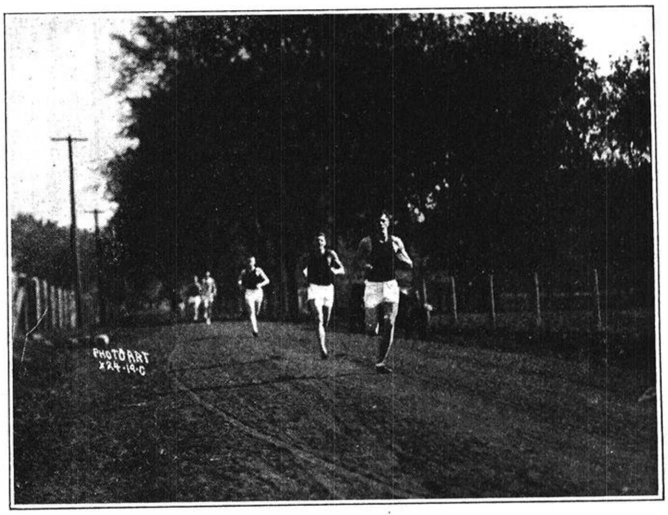
L. T. Sogard

Another of the corduroy clan has come to light in the realm of athletics. Lionel Tschudy, a senior civil, has been breaking the tape at the finish of cross country runs this fall, and subsequently has been breaking into print in the Cardinal sport headilnes. Lean, long, and lanky, with multitudinous angles in his make-up, Tschudy is built for speed. His rangy strides have carried him at the head of the pack continuously in the fall tryouts. Although a new man on the cross country squad this fall, Tschudy has consistently shown his heels to the rest of the harriers. On October 7th, in the preliminary try-outs for the Varsity team, Tschudy breasted the tape an easy winner; he repeated his performance the next Saturday afternoon. In the meet with Michigan, October 21st, over the Wisconsin three and one-half mile course, Tschudy finished second only to the veteran Isbell of Michigan. In a hotly contested race, the invading Wolverines won by a single point, the score being 27 to 28, with Michigan low score and winner. Despite the defeat, Wisconsin's cross country outlook is good.

Fall and Football go hand in hand. Ever since the first practice at Camp Randall in September, the gridiron has been the center of interest of Wisconsin sport. Three times since then, the Badgers have battled invaders at Camp Randall and three times have been victors. The opener, on October 7th, was played with Carleton College, Minnesota. In this preliminary contest, Coach Richards tried out most of his men in an endeavor to see what "they had." The outcome was a 41 to 0 victory.

On the next Saturday afternoon, the Cardinal eleven met the South Dakota College before one of the largest crowd that ever turned out for a non-conference game, winning by a 20 to 6 score. Of thirty attempted forward passes, Wisconsin completed eighteen, gaining a total of 231 yards by the aerial route. The Aggies, who came fully expecting a victory, would have returned scoreless had not the Wisconsin defense loosened in the last minute of play, allowing Shutte to break through for a fifty yard run across the Badger goal.

The Conference season, here, opened October 21st, with Indiana as our opponents for the first time in a dozen years. The day was ideal,—a little warm, perhaps, for the players. The crowd that turned out was a fair indication that football is king. During the first half neither team scored; Indiana put up an almost impenetrable defense. Only once did Gibson break through for a long run, and on that occasion the ball had to be brought back because Wisconsin was offside. In the second half Wisconsin opened up, scoring two touch-



Tschudy Leading Cross Country Squad

downs via the forward pass route and one on a recovered punt. When Hanney, Indiana half, dropped back to kick the ball into Wisconsin territory, he waited just a bit too long. Tebell blocked the punt with the region about his solar plexus; on the re-bound, he scooped up the ball and scampered ten yards for a touchdown. The final score was 20 to 0.

FOOTBALL SCORES

October 7—Wisconsin, 41; Carleton, 0.
October 14—Wisconsin, 20; South Dakota Age, 6.
October 21—Wisconsin, 20; Indiana, 0.
November 4—Wisconsin, 14; Minnesota, 0.

ALUMNI NOTES

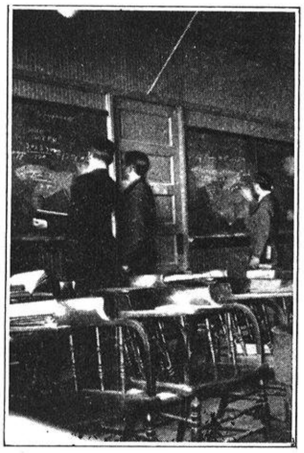
H. K. von Kaas

CIVILS

Leon E. Chase, c '22, who has been at La Crosse, is now assistant city engineer at Beloit, Wis.

F. W. Krez, c '21, is at 1212 N. 4th St., Sheboygan, Wis.

Clarence A. Willson, c '21, is engaged in structural engineering. His address is given as 901 University Ave., Madison, Wis.



'22 AT PLAY

'22 AT PLAY

Rather do classroom work than real work? Sure, but those reports, —#&%()?!!

Remember Jenswald, m '20, '21, '22, etc., who got as far as Junior without a slipstick, but no farther? Campbell is next, and then Mr. Neff.

Mr. and Mrs. **Francis H. Schmitt**, c '21, announce the birth of a future Wisconsin Engineer, Francis, Jr., on April 18, 1922, at Milwaukee, Wis.

W. J. Seler, c '21, gives his address as 358 McKee Place, Pittsburg, Pa. He is with the McClintic-Marshall Company of that city.

Eugene (Bes) Bespalow, c '21, who is with the U. S. Bureau of Public Roads, with headquarters at South Chicago, writes, "Horace Greeley said, 'Go west, young man, go west," and Professor Lenny Smith always said, "Get married, young man, get married." I could not follow Horace Greeley's advice, so I tried to follow Lenny Smith's and have partly succeeded." He announces his engagement to Margaret Ruppa, of Milwaukee.

Bill Rheingans, c '20, recently returned from Holyoke, Mass., where he had been doing turbine test work for the Allis-Chalmers Company, the picture of prosperity, having toured the distance is a newly purchased "light car of a popular make." His address continues to be 234 Queen Anne Place, Milwaukee.

Frank K. Quimby, c '20, is city engineer at Antigo, Wis., where a good deal of curb, gutter, and sewer work is being done. He was recently married to Miss Wilda Grimm, of Sturgis, Mich.

Lewis R. Sherburne, c '20, who is a resident engineer at sewer construction, Huntingberg, Ind., recently announced his engagement to Miss Mary Rebholz, of Piqua, Ohio.

Ray E. Behrens, c '19, has changed his address to 255 13th St., Apartment 42, Milwaukee, Wis.

Paul Huntzicker, c '19, was recommended to the regents for a fellowship in civil engineering at Wisconsin, by the faculty of the college on October 23.

Adolph W. Meiselwitz, c '18, writes: "I do not know whether you have heard or not, but I have forsaken the ranks of the civils. For the past two years I have been connected with a sash and door concern. I started as an industrial engineer, doing cost and efficiency work, and for the past year have also had the superintendent's job. Am getting some valuable experience and in a short time I intend to take up just the industrial work again. My engineering work has helped me wonderfully and in my opinion is the only course to take. Would take the same course if I were to go to school again with probably some electives in the Commerce School."

Charles F. Loweth, CE '15 (hon) has been nominated for the presidency of the A. S. C. E.

Walter Philip Bloecher, c '14, has recently applied for admission in the A. S. C. E. He is at present located with Stone and Webster, Inc., at New York City, on a special assignment.

George H. Connolly, c '14, lost his life in an accident which occurred on September 13. He was superintendent of the distribution department of the Wisconsin Gas and Electric Company at Racine, Wis. While he and two workmen were in a pit that carried gas mains under a river, attempting to discover and repair a leak, they were overcome by the gas. Men at the surface lowered a rope and Connolly secured it to one of the men who was hauled to safety. The other man climbed part way up a ladder before he was overcome. Fortunately his legs caught and prevented his falling. He was rescued. Apparently Connolly also attempted to climb out, but was overcome and fell to the bottom. He was dead when taken out. He leaves a wife and two children.

Bill Witt, c '10, is a structural engineer specializing on concrete work, at Seattle, Wash.

Patrick H. Connolly, c '85, for many years city engineer of Racine, died on May 15. He was the father of George H. Connolly, c '14, and Robert Connolly, a senior civil.

CHEMICALS

Aruthur J. Huegel, ch '22, is with Albert Trostel and Sons, tanners, at Milwaukee, Wis. His address is 654 Island Ave., Milwaukee, Wis.

B. M. Larsen, Ch '21, is at 5011 17th Ave. N. E., Seattle, Wash.

Chester M. Kurtz, Ch '21, is at 729 Stowell Ave., Milwaukee, Wis.

H. C. Knapp, Ch '21, is at 376 15th Ave., Milwaukee, Wis.

Oscar B. Westmont, Ch '21, is in the Research Laboratories of the Carborundum Company, at 414 11th St., Niagara Falls, N. Y.

M. Mitchell, Ch '21, gives his address as 2377 Grand Blvd., Detroit, Mich.

H. F. Zabel, Ch. '14, is at 84 Ella St., Bloomfield, N. J.

MECHANICALS

Edward L. Cox, m '22, after entering the University as a graduate student this fall, withdrew to accept a position with the Kimberly Clark Co., at Neenah, Wis. His address at present is care of Y. M. C. A., Appleton, Wis.

Willis Terhorst, m '21, is at Donnybrook, N. Dak.

Delmar W. Nelson, m '20, was married to Elizabeth Miller, '20, on July 17, 1922, at Madison. Nelson is a designer in the aeronautical department of the Goodyear Tire and Rubber Co., at Akron, Ohio. His address is 1407 Goodyear Ave., Apt. 10.

Lawrence F. Campbell, m '20, is with Dodge Bros. His address is 36 E. Forest Ave., Apt. 10A, Detroit, Mich. He writes, "There is a live group of Wisconsin Alumni here

and they have some interesting meetings. Was at a banquet and smoker recently and of course the main topic was the Michigan-Wisconsin game. I surely hope Wisconsin can win it."

Ed. S. Schrank, m '18, who has been engineer of tests at the Watervliet Arsenal for some years, is now with the Wisconsin Securities Company, and is at present acting as steam engineer for the Cosolidated Water Power and Light Company, of Wisconsin Rapids. He gives his headquarters as care of Wisconsin Public Service Co., Green Bay, Wis., or 805 Doty St., Green Bay.

A. G. Peter, m '13, is the author of the article, "Putting the Metal Cutting Plant on a Profit Making Basis" which appeared in the August number of Engineering and Industrial Management. An account of his history after leaving, which heads the article, states that he has since been exployed by the Chain Belt Company, of Milwaukee, Wis., except when in service, when he was commissioned as major. He is now assistant production manager of the company.

W. A. Roth, m '12, is assistant sales manager for the Pacific Coast Steel Company, at Seattle, Wash. He is married, and has a 4-year-old son. He visited the University on October 26, 1922.

E. R. Wiggins, m '08, who was formerly Technical Editor of the "Chilton Tractor Journal," is now with the Holt Manufacturing Company, at Periaa, Ill. Address: care of Holt Manufacturing Company, Peoria, Ill.

A July issue of the Milwaukee Journal stated that **Wm. S. Harley,** '07, rode a motorcycle of his own manufacture in a group tour of motorcyclists into northern Wisconsin.

Elmer G. Hoefer, m '05, M. E. '15, who has been professor of mechanical and electrical engineering at the University of Wyoming, resigned last June to take a position as associate professor of mechanical engineering at the University of North Carolina, at Chapel Hill, N. C.

ELECTRICALS

Fred J. Singer, e '22, is with the American Telephone and Telegraph Company, at New York City. He is working on the development of equipment to be used on the new long distance cable circuits for sending ten telegraph messages simultaneously through one set of wires. His address at present is Room 1627, care of Development and Research Dept., American Telephone and Telegraph Co., 195 Broadway, New York City.

T. V. Bittner, e '22, has changed his address from 206 Wagner St., Oshkosh, Wis., to 2129 Washington Blvd., Chicago, Ill.

Goldie R. Olson, e '22, is with the Utah Power and Light Company, as operator of a generating station, at Grace Station, Grace, Idaho.

Willard A. Kates, e '21, is at 409 South Ave., Wilknisburg, Pa.

H. S. Day, e '20, has changed his address from 786 12th St., to 494 53rd St., Milwaukee Wis.

Clarence W. Schmidt, e '18, has changed his address from 2623 Prairie St., to 1590 23d St., Milwaukee, Wis.

Brooks L. Conley, e '18, M. S. '20, is electrical engineer with the Hoover Suction Sweeper Company in charge of motor design. His address is 405 Second St., N. W. Canton, Ohio.

Ernest Geltch, e '11, is with the State Engineer, in the Capitol, at Madison, Wis.

Henry M. Ford, e '09, has recently returned from Los Angeles, Cal., where he was with Bent Bros., Engineering Contractors. He is at present with the Nekoosa Edwards Paper Company, and gives as his address, P. O. Box 46, Port Edwards, Wisconsin.

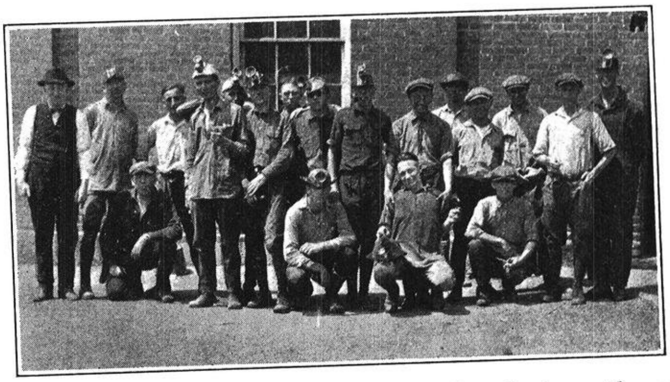
J. G. Zimmerman, e '04, E. E. '15, visited the college recently. He is manufacturing a filament known as the "Acmestat" for radio purposes.

THE MINERS' 1922 WESTERN TRIP

By Clive Scadden

The Miners' western trip began with a rush on June 8th this year. Most of the party wrote examinations that morning and we were rushed in getting our various affairs settled and making ready to leave at 3:00 p. m. on the Illinois Central.

Gilbert (Gib) Grieve, Clive (Scad) Scadden, Wesley (Pal) Gericke, Merwin (Mike) Howes, Sherwood (Buck) Buckstaff, Edward (Eddie) Elstad, Carl Larson, John Maugold, Joseph (Joe) Woschutz, Otto Herbener, Ed (Slim) Wolters, Ed Kloser, Milner (Hawkshaw) Hawkins, C. H. Lorig, "Walt" Baley, "Wallie" Field and "Mitch" Garron comprised the party which, with Prof. Shorry, was given a send off by Professor McCaffery and Mr. Barker who came down to the depot.



Miners All. *In working clothes they look as though they mean business.*

Omaha was our first point of interest. After breakfast "Pal" and "Wallie" discovered an Army Store which was raided for haversacks which saw hard service during the balance of the trip. We spent our day in Omaha in inspecting the lead smelter of the American Smelting and Refining Co., where we were very cordially received, and where the various processes were shown in practical operation. Several members were tempted to carry away as souvenirs silver ingots from the refinery, but, as the Company's truck was not available, the ingots had to be left behind.

On entraining that evening three of us who had stopped too long at a lunch room reached the gates just as the train was leaving. Another followed in five minutes and we overtook our party at Lincoln.

We changed at Edgemont and finally reached Lead, doing the last few miles in a narrow gage street car which we packed until its sides bulged and which was decorated by our baggage which hung out on all sides.

After finding rooms—some of them were vacated after the first night's experience with the Black Hills type of small insects, we took a geological hike out into the country to pacify the rock-hounds. It seems that the main idea was to walk fourteen miles, pick up a rock, and hold an all around guessing bee as to its nature. Then Buck would climb down from some cliff to which he had been hanging by an eyelash and stop

Concluded on page 35

CAMPUS NOTES

E. L. CALDWELL

The rising generation appears to be more at home with insulators than insects, judging by a recent story concerning the small son of a well-known electrical engineer. When visiting in the country he unhesitatingly picked up a hornet to inspect its mechanism more closely. When his father hurried out to discover the cause of the commotion which immediately broke the peace of the summer day, the little lad was ruefully sucking a thumb while tears streamed down his face.

"Why, what is the trouble, son?" he asked.

"It was that bug," he managed to explain between sobs. "I think his wirin' is defective. I touched him, and he wasn't insulated at all."—*Journal of Electricity.*

DEDICATED TO

The dismal dumb-bells; like—

The canary who said he'd been working on an osculating Corliss engine—the one with the head and tail ends,

And who then asked Rose for a quilt for the engine bed;

And who thinks butt plates were made to sit on, and that Danny Mead lectures on "hydrophobia" developments;

And that Bull Montana is a mining town.

Copied in the Colorado Engineer, Jan '23

CHEM ENGINEERING CLUB HAS ATTENDANCE OF 160

Talks, plays, novelties, and eats furnished the entertainment for the 160 people at the open mixer-meeting of the Chemical Engineering society last night.

"You know me Al," a sketch by Prof. O. A. Hougen, played by nine club members, proved to be the spiciest number on the program.

Prof. O. L. Kowalke in a talk on the opportunities of the chemical engineer, outlined briefly what the possibilities for a chemical engineer will be 10 years after graduation and what requirements must be met in order to make use of these opportunities.

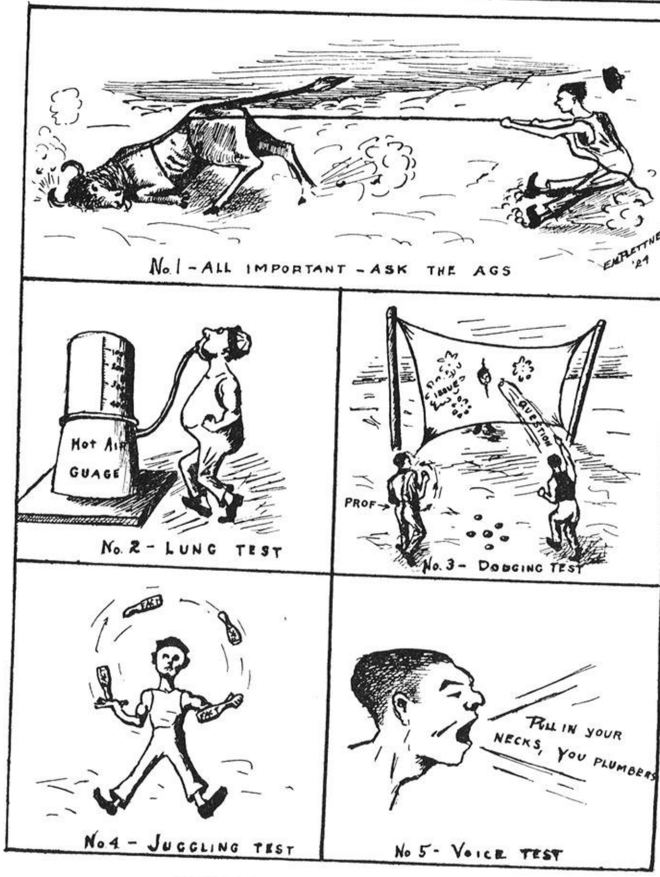
Ray Owen has a story of a stude who asks, "What's the object of doing that problem? Just to see if you can?"

Why else should you do it, George? But just the same, that question is often asked. He who asks it needs a "shot" of courage and a brushing up of his faith. Most of us couldn't do much at home and this is the place to find out what we can do—and it takes work—not silly questions, to learn anything. "Crown" the next guy who pops that question!

Mr. Steffen, the electrical laboratory mechanic, says that unless the fellows are more economical with Mica Axle grease during "The Brake Test of a Rotary Transformer," it will be necessary to increase the lab fee from six to nine dollars.

The way some guys sleep at school would make you think the E. B. was a dormitory.

ENTRANCE EXAMS ACROSS THE CAMPUS



THE LEADING LADY

"I am going to kiss you as soon as I stop," he said, as he prepared to slow up at a secluded spot.

"I know it," she giggled.

Later he wondered by the brake linings were burned out.—*American Legion Weekly.*

TRY TO CUT THIS ONE

Mr. Brecky: "What is a 'V' thread?"
Stude: "A 'V' thread is a 'U. S. S.' thread."
Mr. Brecky: "What is a 'U. S. S.' thread?"
Stude: "A 'U. S. S.' thread is a 'V' thread!'

MINERS' 1922 WESTERN TRIP

Concluded from page 33

the argument by sôlving the mystery. Joe lost himself on the return from the trip, and Prof. Shorey was just organizing the searching party with the aid of the town police, when he came wandering in.

We spent a week in this region visiting the mines and mills of the Homestake and the Trojan Gold Mining Companies, as well as one or two properties not in operation. The Homestake is the largest underground operation we visited, and while in the mine we saw the banquet room where about one hundred members of the Black Hills Editorial Association had been banqueted just before our arrival.

The operations were full of interest, especially the tri-monthly gold clean-up at Homestake which we were lucky enough to witness. Due to the restraining presence of a few reformed gun-men, who were employed as watchmen, no one made any attempt to help himself to the valuables.

The scenery around Lean was wonderful, especially that of the feminine variety, and several hearts, broken by previous unhappy experiences, received treatment during our stay. The hospitality was marked, so much so that when two of the boys took two young ladies out to dinner, the young ladies paid for the meal.

Editor's Note:—We understand that ?????? ??

We met the boys from Minnesota while in Lead, just as their trip was being finished, and a fine bunch of fellows they were.

We visited the Sheridan-Wyoming coal fields of the Peabody Coal Co. next. Although they were inoperative due to the strike we secured an interesting insight into coal mining operations from the local manager and his superintendents. The strikers spotted "Mitch" Gorrow as a strike breaker, and but for timely assistance, would then and there have made a "good" strike breaker of him.

One evening several of us, Prof. Shorey included, decided to do some riding Western style around Sheridan. We all enjoyed it immensely, particularly Prof. Shorey and "Hawkshaw," who had patently been there before. "Gib's" and "Scad's" enjoyment was more marked when we stood up to eat our meals. "Gib" said he would learn to ride or die trying. He was doing well both ways when we left Sheridan.

Our trip then took us to Butte where the Y. M. C. A. Hotel assigned us to a dormitory where the worst that happened was the strange occurrence of calcium carbide between our sheets and the tendency of several beds to give way suddenly at bed time. A few of the more plutocratic members of the party, having single rooms, were immune to that phenomena.

After our arrival, we assembled in a street car and left for one of the Anaconda Company's mines where we visited one of the warmest spots seen on the trip —and one of the coldest. We recommend to the boys next year that they include a large electric fan and a bathing suit in their equipment.

It was in Butte that Eddie, the lightfooted social lion, undertook the esthetic education of "Walt" Baley. If anyone who enjoys dancing contemplates visiting Butte soon he might see Baley about dance tickets, as I understand he has a surplus.

We visited a large number of mines and mills in Butte, each of which illustrated a new problem and the manner of solving it.

REMAINS OF THE PACKARD. *The car suffered the most, fortunately for the miners.*

Anaconda and its mammoth mills and smelters came next. Here we lost "Gib" Grieve to one of the technical departments where he is doing nicely.

On our way to Wallace, Idaho, most of us stopped at Deer Lodge, not at the request of the state, however, but to witness a big western "round-up" which all agreed was well worth seeing.

After visiting a number of lead mining, milling, and smelting operations in the Souer d'Alenes, and a gold dredging operation in the heart of the mountains at Murray, the party broke up.

On the return trip nine of the party plunged over the bank of a creek and came to rest with a twi six Packard on our necks. However, there were no injuries other than a few torn trousers and an occasional scratch.

Due to the brisk demand for miners, and because no work was available in Canada, most of us went to work in the Coeur d'Alene. Prof. Shorey returned east via the lake country. "Buck" left for Madison to join the Geological Survey and Pal went to the University of Washington to do research work.

The trip was invaluable, because of the mining experiences gained by visiting so many different operations, where every attempt was made to assist us, and because of the wonderful scenery enjoyed in every neighborhood visited.

THE PASSING HORSE

I laughed out loud—for I remembered, you see, how the coeds disport themselves hereabouts on horseback.

The prof was commenting upon the past popularity of the horse.

"And now," said he, "we never see a horse except under the most unfavorable circumstances."

And, as I said before, I laughed out loud.

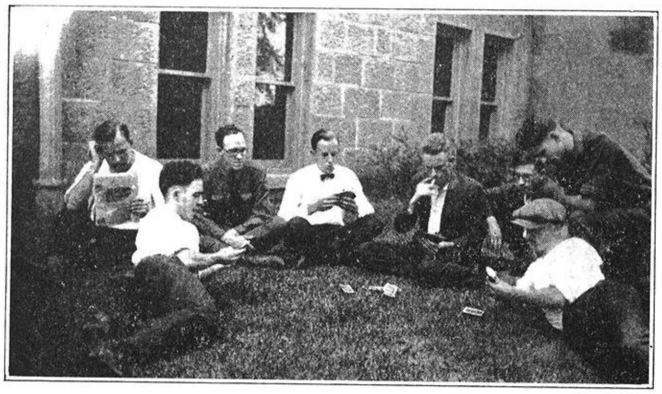
COURSE IN CHEMICAL MANUFACTURE

Continued from page 28

Tesches, Gus and Klaus, and Wallie Pfleger, succeeded in erecting a leeching tower for washing spent oxide from the gas works. "Slew" Fanning and Johnny Roberts cornered all the stone jars in the building so that they could manufacture enough lithopone to redecorate the Sigma Nu house for the coming season. The evaporators, the stills, and the crushers all worked to full capacity although sometimes only under encouragement of good engineering profanity.

Several problems offered unusual opportunities for original work. Among these may be mentioned the regeneration of waste plaster of Paris where Ryan and Huegel achieved notable success. The product which they obtained compared favorably with the fresh material. The production of gasoline from oil shale was tried by Becker and Millington with satisfaction until some vandal spilled the distillate. The Tesch brothers concluded that the drip oil from the gas mains was leaner in benzol than in former years, due, no doubt, to the fact that under the 530 B. T. U. standard less benzol condenses than under the old 600 B. T. U. standard.

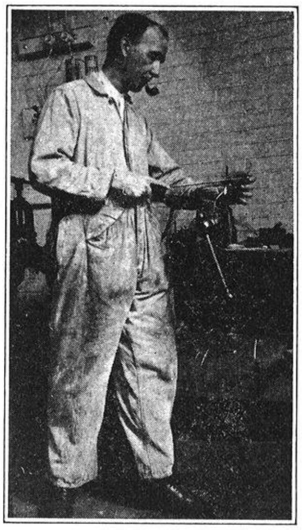
Two weeks later the novelty had worn off and the natural course of events was pretty well settled. The glassware was all out of the stock room and locked up in someone's desk. Slew Fanning dropped around once in a while to see how the boys were getting along. Most of the products were in solution, waiting to be evaporated, while library work was growing more and more popular. When, however, Mr. Kowalke announced that he had several summer jobs awaiting the faithful, industry took a new spurt.



FIVE HUNDRED. *Kaasa-McGraw v. Hamilton-Pfleger fighting it out to see whether seven hearts or eight clubs will get the bid.*

Baseball was the popular sport in leisure hours. A genuine C. P. chemical league was formed with four teams, the Aliphatics, the Aromatics, the Atoms, and the Molecules. Messrs. Hartwig and Hougen acted in the capacity of umpires. Practice was held at noon; the games were called at five and generally lasted until after supper. After a strenuous season and with an aggregation of stars including Morey, the slugging fielder, Kaasa, the noisy shortstop, and Ryan, star fielder, Frank Kuboshe's Molecules triumphed over Tom Bogumill's Aromatics and clinched the pennant on a percentage of .750. Second only to baseball was the well-known game of Five Hundred. Nearly every noon hour would find the standard combination, Kaasa-McGraw vs. Hamilton and "Frank" on the front lawn fighting it out to see whether seven hearts or eight clubs would get the widow.

Time passed quickly. June soon swung into July and the end came into sight. Since four problems seemed to be the accepted standard, those that were behind put on an extra burst of speed. It is said, also, that some typewriters pounded in the wee small hours on reports that should have been in weeks before. The last week! Monday —— Tuesday —— Wednesday —— Thursday —— at last our manufacturing adventures had come to an end and we began laying to rest the familiar implements which had been the cause of our successes and failures. The summer's accumulation of tar and other deposits were removed from the glassware at the expense of much benzene and hard labor. Grease covered, the retorts and pans were laid into their old berths to sleep for another winter. The stream of apparatus gradually poured back into the stock rooms, and the basement changed from a thriving industrial plant to a deserted factory.



FRANK EISELE

Friday morning saw the last events. "Frank" was called upon to wipe some mythical dust off the lecture table and found, instead, a box of La Palinas. The box of cigars was a small gift, but it carried with it the appreciation of every man in the crowd. "Frank's" unselfish labor and mechanical skill have long since

Concluded on page 37

THE DISADVANTAGE OF POOR LIGHTING.

As thousands of our industrial plants are operating to-day with poor lighting and in some cases with extremely bad facilities, it would seem that the importance of the subject of lighting has not been given the serious consideration by those responsible for such conditions.

Poor lighting is one of the most serious handicaps under which a manufacturing establishment can operate. First of all, poor lighting is the cause of a large number of accidents in industrial plants; and it is singular that accident reports do not yet properly classify the hazards of poor lighting, which in many cases is the primary cause of an accident attributed to what is really a secondary cause. Safety engineers and other officials who make accident reports should always consider the condition of the lighting when working up a report of accident causes, for it plays an important part in a great many casualties and is apt to be overlooked. All accidents due to poor lighting are accidents of neglect, and are preventable. The poor lighting accident hazard is clearly chargeable to management and not men. It is a difficult matter to make such progress with Safety First in a plant which has neglected to provide one of the fundamental requirements of accident prevention—good lighting.

Probably no one single factor connected with the equipment of a plant so directly affects the efficiency and inefficiency as the quality and quantity of the lighting. The curtailment of production of all working under the disadvantage of poor lighting represents a big loss each day; the poorer the lighting the less able is the working force to function efficiently. Quality and quantity both suffer, representing a preventable loss wholly removable by improving the lighting.

Under poor lighting condition, we cannot expect and rarely do we find an orderly, clean factory. Darkened places encourage careless habits and workers are often led to deposit discarded articles or material which should be deposited elsewhere. The eyesight of those who attempt to use their eyes continually in insufficient light, below nature's demands, is often affected. Too much light, such as is furnished by bright, unprotected lights, is as harmful as too little illumination; both are fundamentally wrong. Nature's own illuminant, daylight, is unequalled for our requirements of lighting.

The eye is best suited to daylight in the proper quantity. Sun glare should be avoided, and in the darkened hours proper artificial illumination provided. Daylight should be utilized to the fullest extent. It is supplied free in abundant quantity for our use. Modern invention has supplied a means whereby the interior of buildings can be lighted by daylight, and all the advantages secured which is furnished by good lighting at the smallest cost.

Industrial buildings should have as much wall space as possible devoted to windows fitted with Factrolite Glass, which insures the maximum amount of daylight and which prevents the direct rays of the sun from passing through as it properly diffuses the light.

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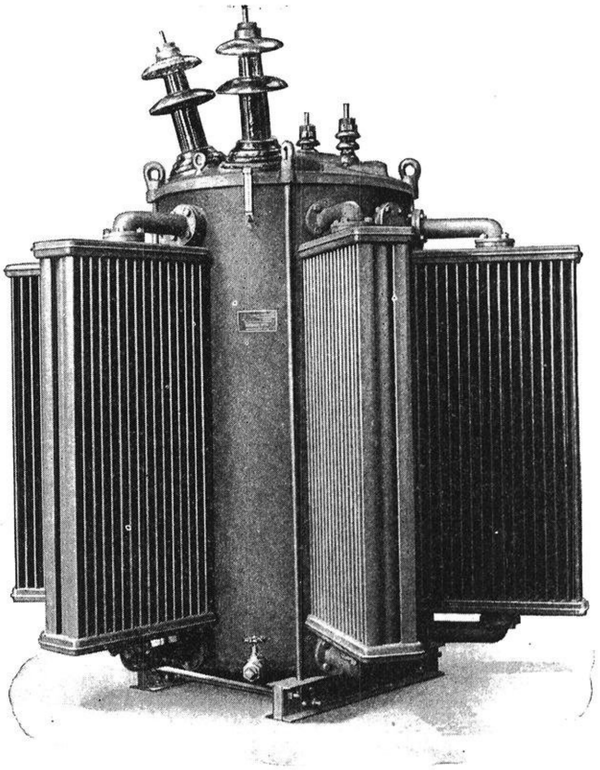

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Centrifugal Pumps	Power Transmission Machinery
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Course in Chemical Manufacture

Concluded from page 36

made him indispensable to the department, and the first day of the course he was unanimously elected a life member of the Order of Good Scouts.

The final act was a lawn party with ice cream, under the trees at the north of the building, and a penny pitching contest on the front sidewalk. Mr. Kowalke and Frank Kubosch were the big winners while Rutherford gained a small fortune on pennies that rolled out of bounds. After saying good-bye to Watson and the other unfortunates who were detained for a few extra days, we gave four skyrockets for the instructors and "Frank." Thus the Summer Course of 1922 passed into history.

Computing Pipe Losses

Concluded from page 27

data obtained in the Hydraulic laboratory of the University of Wisconsin it appears that galvanizing slightly reduces the diameter and increases slightly the pipe friction as compared to clean new black pipe. Published results on friction in wrot iron pipe above two inches in diameter are so meager it was not considered of sufficient value to warrant complicating the figure by introducing the new formula curves for sizes between 2-inch and 12-inch diameters. The three sizes selected give the degree of agreement between the formula and experimental data.

It should be noted that the effect of joints was largely eliminated in this series of experiments and the formula therefore gives pipe friction alone. Where screw points or other disturbing factors are present allowance should be made for their influence.

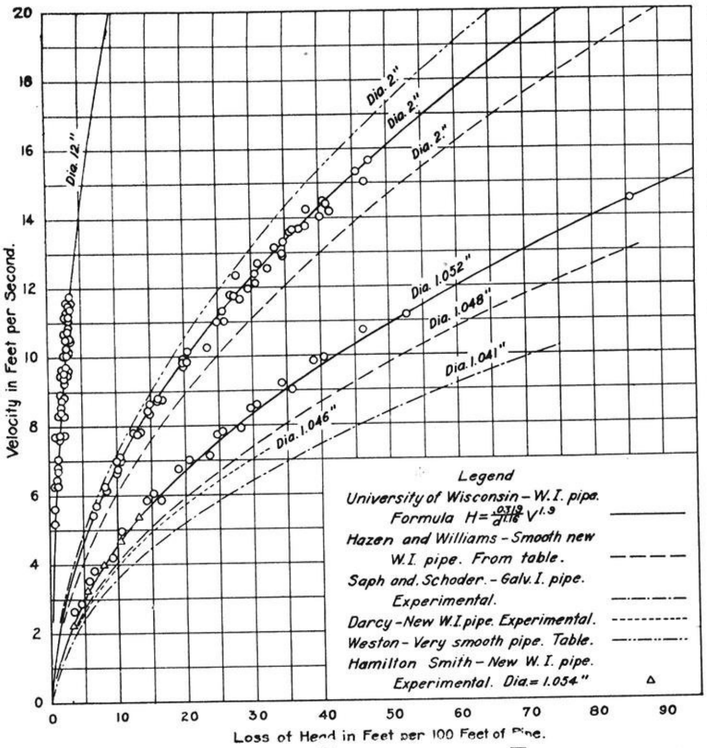

FIG. 6. COMPARISON OF FORMULAS AND EXPERIMENTAL RESULTS ON WROT IRON PIPE. *Circles are Wisconsin experiments; triangles are Hamilton Smith's experiments. Legend gives meaning of the different lines.*

Wisconsin Highway Development

Concluded from page 24

has been placed on two important roads between Madison and Milwaukee. One of these must be completed in the very near future and there is agitation for the construction of an all weather road from Madison to La Crosse. With the development that has already taken place the people of the state have come to realize the need and demand the completion of the system. Some of the most pressing needs, in addition to those already enumerated, are the construction of an all-weather road from Hudson, opposite St. Paul, Minnesota, through Eau Claire to Milwaukee, where there already exists a connection to Chicago; a road from the important center of population around Lake Winnebago to the northwest part of the state; a main artery north and south through the center part of the state; and several others that might be named. The work in sight is such as to absorb all of the funds than can reasonably be made available for many years to come.

The greater portion of the concrete paving now being constructed is by counties which have issued bonds for that purpose. Sixteen of our seventy-one counties have bonded for an aggregate sum of thirty-six million dollars for the construction of concrete pavements, and in addition Milwaukee County, which has one-fifth of the entire taxable valuation of the state, has constructed practically the entire State Trunk Highway System within its limits from direct tax levies. In these counties the State Trunk Highway System will be largely constructed without the application of State or Federal Aid, leaving future Federal Aid funds free for the construction of roads in other counties. But to permit the backward counties thus to profit at the expense of the forward looking and progressive counties would be an injustice which the State Highway Commission believes ought to be rectified by the provision of a bonus to be applied annually toward the retirement of the bonds issued for construction of concrete roads on the State Trunk Highway System, without state and Federal Aid.

The immediate needs in the way of state highway construction include: (1) a sufficient fund to match Federal Aid funds available through the appropriation of November, 1921, aggregating about six and three-quarters millions. (2) A sufficient fund to maintain our present State Trunk Highway System and any additions that may be made, and the county maintained roads, and a proper reimbursement to apply to the retirement of concrete roads built without State or Federal Aid on the State Trunk Highway System. (3) A continuation of our present policy of State Aid for secondary highways and special bridges. (4) An adequate sum for the proper supervision of the execution of this work. Estimates that have been made indicate that the sum annually necessary for the prosecution of this work amounts approximately to ten million dollars.

This is a large sum of money, but it can be justified. We have in the state of Wisconsin more than 400,000 motor vehicles traveling an aggregate mileage within the state not less than one billion eight hundred million miles. This represents an aggregate investment of not less than two hundred million dollars, and the reasonable utilization of this investment depends entirely on the highways over which they are operating. These are admittedly inadequate, and unless we proceed to improve our roads to the utmost of our ability we will fall far short of realizing the possibilities in the way of transportation that we have with the equipment already on hand. An annual charge of ten million dollars represents twenty-five dollars per motor vehicle, which is but a small fraction of the annual cost of operation, and without the road the vehicle would be useless. Few men who have had experience in the operation of a motor car will question the advisability of such an expenditure. And since this need has arisen through the development of the motor vehicle it is no more than fair that the motor vehicle should bear some part of the expense. That "he who would dance must pay the fiddler" is an ancient adage, but it is just as applicable now as when it was first spoken. And this is only a minor fraction of the total expenditures within the state for highways. It has been estimated that the total expenditure for highway purposes in Wisconsin in 1922, exclusive of improvements within cities, aggregated $36,893,000, of which $1,697,000 was provided by the Federal government, $5,515,300 by the state, $19,351,600 by the counties, and $10,329,800 by the towns. Of this amount approximately $4,000,000, or one-ninth of the total was provided by motor vehicles, the remainder by taxes on property. To increase the levy against automobiles to the point where they will bear something like 30% of the total instead of 11% is, we think, not going beyond the bounds of reason and justice.

Various means of levying this increased tax have been proposed along lines that are already in effect in other states. The present automobile license fee in Wisconsin is $10.00 per car, irrespective of age, condition or size, with a maximum of $25.00 for trucks. It seems fair that the amount charged against any motor vehicle should be in proportion to the ability of the owner to pay and the use he makes of the road. This would indicate that the larger and heavier cars and trucks, which are the most expensive and which, presumably, make the greater use of the road, should pay the most. It means a graduated license fee such as is in effect in many other states. The result is the same whether the graduation is made on the basis of weight or horsepower, but one problem which must not be overlooked is that of administration. The State Highway Commission believes that weight is more easily determinable and less subject to dispute than horsepower, and with the charge per unit of weight properly fixed the result should be the same and more easily determined. The factor which determines the ability of the owner to pay more nearly than any other is the value of the car. Automobiles are now subject to taxation as personal property but many escape such taxation, being purchased later than May 1st, the date of assessment. Many escape on account of the income tax offset, and others escape through the failure of the assessors to include them in the levy. The State Highway Commission believes that there should be a valuation tax collected directly by the state at the time of licensing the motor vehicles. A motor vehicle is not like other forms of property in that its location and use are not confined largely to one place. Most motor vehicles circulate over a wide area and use the roads beyond the immediate confines of their ownership. According to the present method of taxation a touring car which operates over a wide radius may be taxed at a rate of 1½%, while a similar vehicle in another town a short distance away would be taxed 2½%, and others even more. There is no reason for this lack of uniformity. The levy and collection of this tax by the state would reduce the number escaping to a minimum and would insure that uniformity which is logical.

A third appropriate source of revenue for highways is through a gasoline tax levied against gasoline used in motor vehicles with use for other purposes exempted from taxation. There is perhaps no method by which the use of the road by any motor vehicle can be so fairly gauged as by the consumption of gasoline, which increases with the weight and mileage of the vehicle. The gasoline tax is in effect in several states now and it is believed that it will be put in effect by all of our neighbor states at the forthcoming session of their legistures. The imposition of such a tax in Wisconsin would put us on a basis of parity with our neighbors and would also make it possible for the many visitors from outside states who come to Wisconsin, "The Playground of the Middle West", to return us some slight token of their appreciation of our highways whose praises they have sung long and loud. It is estimated that the annual revenue produced by such a tax would be about a millian and a quarter dollars per cent per gallon.

These are all problems which must be considered by the legislature which convenes in January, 1923. That there is a widespread demand for the continuance on an increased scale of our program of highway improvement is not doubted by anyone conversant with the situation. The legislature will be faced with the problem of reconciling the demands made upon it with the revenue produced through practicable methods of taxation. We believe it may fairly be said that no activity of the state is in higher favor with the people at large than the construction of the highways, and the State Highway Commission feels confident that this activity will be dealt with fairly and that road work will be continued on an adequate scale.


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