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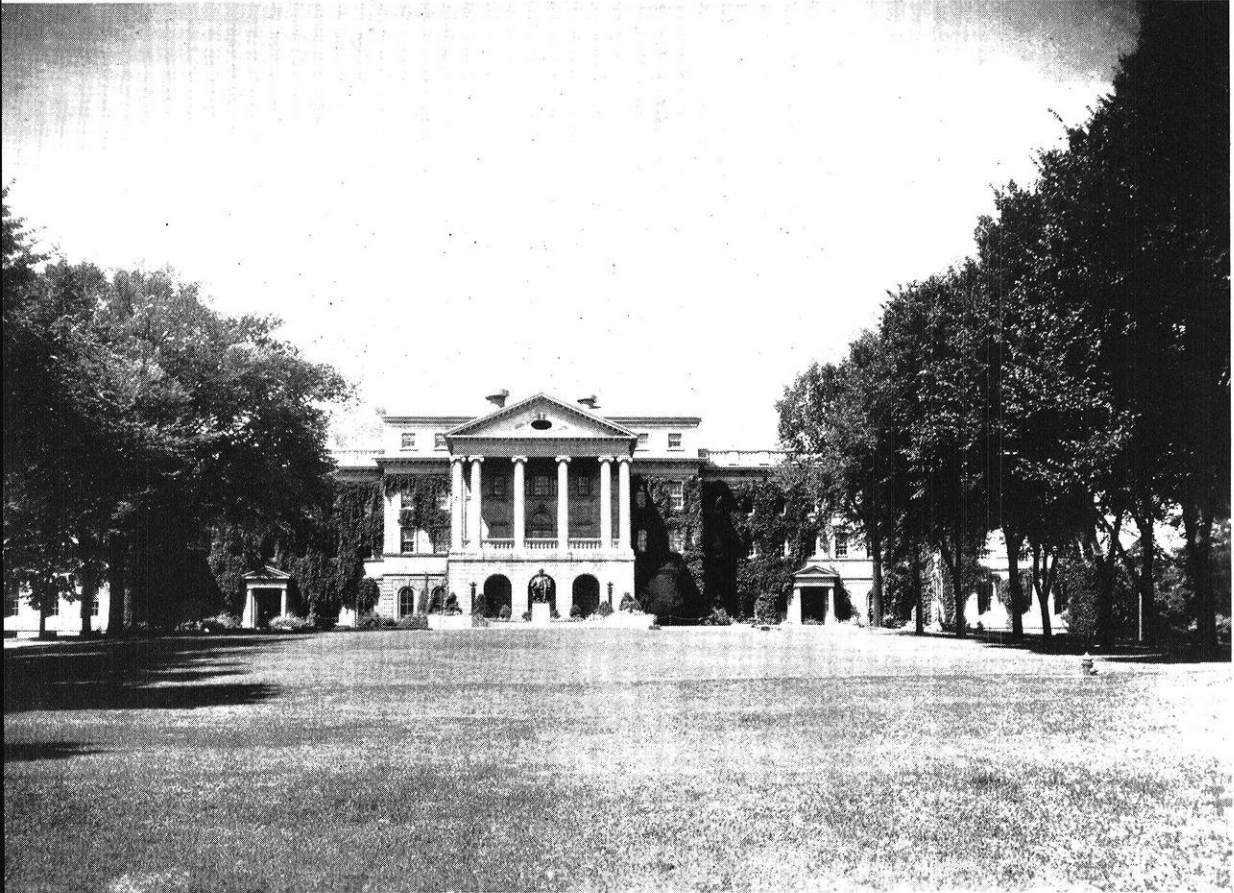
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**THE**

# **WISCONSIN ENGINEER**

**MEMBER  
E.C.M.A.**



**MARCH  
1932**

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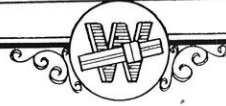


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# The WISCONSIN ENGINEER

VOLUME 36, NO. 6

MARCH, 1932



*Simplification of Highway  
Maintenance by the*

## Use of the Mud Jack\*

By ALBERT T. BLECK

*Assistant Division Engineer Wisconsin Highway Commission Division 2*

DURING the last decade or so the construction of the so-called rigid types of pavements have had their greatest impetus. This state alone has some 3500-4000 miles of concrete pavement on its state trunk highway system, to say nothing of the millions of square yards of this type laid upon the city and village streets. The development of this type of pavement introduced a new problem of maintenance to the authorities in whom was vested the duty and jurisdiction of providing a safe and reasonably smooth surface for the modern high speed vehicle to travel over. True it is that the constructors of these pavements exercise the greatest refinements and care to provide the most desirable qualities of surface in these pavements, the specification for which very often tolerates not more than one-eighth to one-fourth inch variation from a true line in a distance of ten feet.

In the grading work, most states have seen fit to write and enforce rigid specifications pertaining to the construction of embankments in their endeavor to secure a stable foundation for the pavement slab, yet when these have been paved, the seemingly inevitable settlement will occur, producing a sag with a consequential bump to vehicles traversing the same. In our own experience, within the last year or two's construction, despite the most stringent precautions such as placing the fill in 8" to 12" layers, and attempting to secure the most thorough compaction by the use of various types of heavy rolling equipment on each layer prior to placing a succeeding lift, serious settlements have resulted in every variety of soil or materials used.

The problem of the highway engineer, and very often of the city engineer, is to provide the paving or surfacing during the same year as the grading, and in the case of cities the underground work is done as it would very often result in serious inconvenience to traffic if the surfacing were done in later years, or if a temporary surfacing were placed the cost of the same would very often be prohibitive. Even though surfacing were deferred until a year or two after the grading had been completed, the problem would not be solved, as fills and backfilling in trenches are known to have a period of settlement covering in some instances a great number of years. Thus the difficulty of maintaining a smooth surface would still not have been solved.

This is borne out somewhat in railroad practice, where the problem is comparatively simple, requiring the additional placing of a certain amount of ballast periodically, as these changes in smoothness, if you will call it so, occur. The application of this method to a pavement presents a graver situation, as it is virtually impossible to tamp ballast material under the slab and to raise the same by so doing.

### *Methods of Restoring Pavements*

There are, however, several methods by which the pavement might be restored to its original condition, some of which have been used with varying degrees of satisfaction and economy. We shall briefly touch on some of the methods used so as to present as complete a picture as possible of the various ramifications of the problem.

One attempt that we know of had been made about nine or ten years ago to raise a sunken slab on a bridge approach by means of underpinning and raising with jacks, backfilling the void with a very lean cement grout. The prepara-

\*This paper was presented at the convention of the Engineering Society of Wisconsin on February 18, 1932, and will appear in the bulletin of that society.

tory work, as well as the actual work involved to accomplish this, was quite extensive and the subsequent costs, \$692.00 for about 100 sq. yds., were such that no further experiments along this line were considered.

In a great many instances, however, the sunken slabs were brought back to grade by means of placing patches of bituminous material of varying depths over the depressions. This method proved in a measure successful for certain types of depressions, in others it could probably find no application at all.

Similarly, in a large number of cases, the old pavement was removed, the grade brought up by additional fill material, and a new pavement placed. We shall not attempt to burden you with detail cost figures on this as it is evident that the cost of such replacement is considerable, being around \$3.50 per square yard, particularly because of the fact that only comparatively short, isolated spots have to undergo this treatment, and that therefore only small equipment and hand labor methods are applicable for this work.

One other serious drawback to all of this work is that no matter what method is used to bring the slab back to grade, subsequent settlement is apt to occur, and additional work must again be done to maintain the proper surface.

There still remained the question of developing a method which would embody most of these functions, namely restoration to original surface, back-filling the void under the slab, economy of application, and adaptability to the correction of subsequent settlement.

The engineering profession is familiar with the laws of hydraulic pressure and their application to engineering problems, and based on these laws, Mr. John Poulter, associated at the time with the Iowa State Highway Department, experimented with various devices in attempting to apply these laws of nature to the problem of raising pavements. We understand that the first attempt consisted of grouting a tractor valve guide into a hole of a concrete floor, pouring mud into the guide, inserting the valve stem, and applying pressure by a man standing on the valve.

From this beginning, a machine was developed which would perform this work readily and economically. This machine is made up of the following principal parts:

A hopper for receiving earth, cement, and water. A mixing chamber very similar to a continuous mortar mixer or pug mill.

A chamber for holding the mud and delivering it to the pump cylinders.

A two cylinder reciprocating pump.

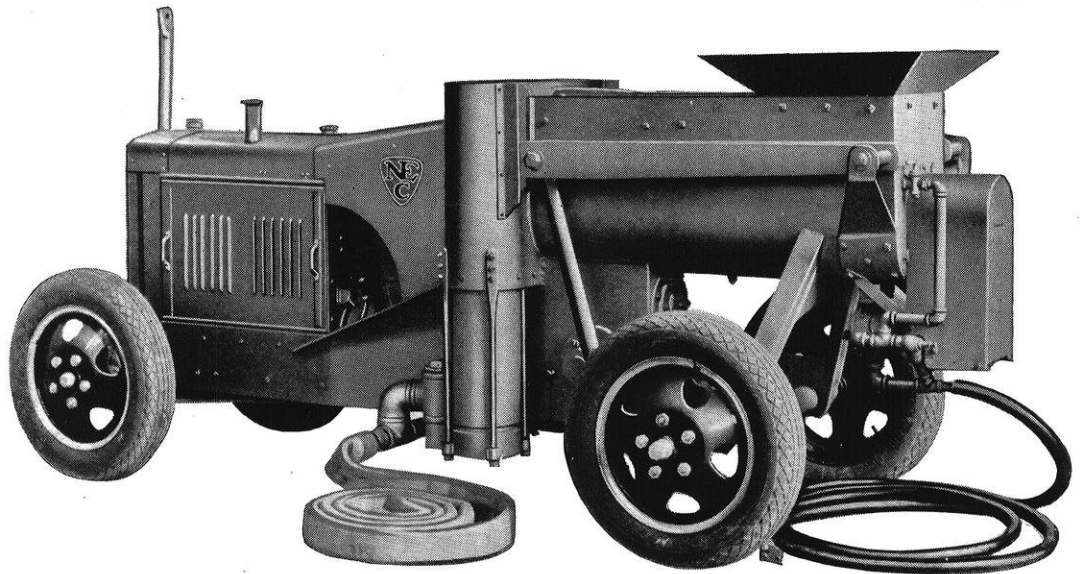
An outlet hose.

A power plant consisting of a 20 H. P. gasoline engine.

The actual raising of the slab is a simple process. First, a 4" expansion is cut across the pavement at one end of the settlement. This is done to prevent a binding action when the slab is raised. Next, 2½" holes are drilled through the slab, some near the edge and some near the center joint. The holes are spaced from 4' to 10' apart, depending upon the location of the cracks in the slab. This work is done with the ordinary compressed air jack hammer and pavement breaker.

After the slab has been prepared as outlined above, the mud pump is put into operation. Earth is brought to the pump in trucks; black top soil or loam have proven most satisfactory. Sand wears the cylinders too fast and does not flow readily, gravelly soil clogs the valves and heavy clays do not readily form the creamy grout necessary.

Portland cement is added to the earth in the proportion



—Cut courtesy National Equipment Corp.

A Modern Mud Jack Showing How the Hopper, Mixer and Outlet Hose are Mounted.

of 1 to 25. The primary reason for adding cement is to cause the grout to set up quickly after it is pumped. This "setting up" is not a typical cement set but is an action which produces the same effect as a slight drying out of the mixture. It was early found that under certain conditions the mud pumped in one hole would escape from the other holes or from under the edge of the slab and no pressure could be built up. It was found that by waiting for an hour or two the mud would stiffen sufficiently so that pumping could be resumed. The addition of 1 part cement to 25 parts earth has reduced this waiting time from one or two hours to from fifteen to twenty minutes. Laboratory experiments were carried on, using various proportions of lime, cement and plaster of paris, and the 1 to 25 proportion, using Portland cement, was established as the most satisfactory mix. These experiments also showed that the addition of cement reduced the shrinkage. The shrinkage of plain earth and water mixture was found to be 10%,

while the shrinkage of the 1 to 25 mixture was found to be only  $3\frac{1}{2}\%$ .

The hose leading from the pump is a high pressure  $2\frac{1}{2}$ " fire hose. This is reduced at the outlet to a 2" steam hose, which has some elasticity. This outlet hose is placed in the hole in the pavement and when the pump is started the pressure of the mud passing from the  $2\frac{1}{2}$ " hose to the 2" outlet expands and holds it tightly in the hole.

The cement is usually spread over the earth in the truck, and the earth and cement are shoveled from the truck directly into the receiving hopper and water is added. The materials pass from the receiving hopper to the mixing chamber, which resembles the old style continuous concrete mixer. When the material enters the pump it is a soft grout, the moisture content of which is about 45%.

No figures are available as to the exact amount of pressure built up by the pump. The weight of the slab, of course, is only about  $\frac{3}{4}$  of a pound per square inch but fairly high pressures are necessary in order to break the slab loose. Once it starts, little pressure is needed to raise it. Some difficulty has been experienced in starting the slabs but none have been encountered that could not be raised. Some of the older outlet hose has blown out. It is estimated that in some cases a pressure of 50 pounds per square inch has been built up.

The fact that a considerable quantity of water is introduced into the subgrade is not considered to be a serious matter. While the mud as pumped has a moisture content of about 45% and while the mud which has been under the pavement for two weeks in the fall of the year still contains about 43% moisture it is not believed that serious harm will result therefrom. The earth as delivered to the pump has a moisture content about the same as the average subgrade, or approximately 25%.

While cost figures from one location might not be strictly applicable to other locations because each job presents its own problems, we believe that some figures, which we take the liberty of quoting from cost records kept by the Iowa State Highway Commission will be interesting. During one season they raised 200 settlements varying from 3" to 13", comprising 9,992 lineal feet or 18,584 square yards at a cost of \$18,896.53 or at a unit cost of \$1.02 per square yard. They used about 1,911 cu. yds. of soil and 2,299 sacks of cement. It is also interesting to note that 899 cubic yards of this went to do the actual raising of the slab and the balance or 1,012 cubic yards, or 53%, to fill the voids under the pavement.

During the past season some of this type of work was done in Wisconsin, particularly in Milwaukee, Ozaukee, and Washington counties. As stated before, costs vary with the individual jobs, depending upon the amount of settlement, the length of haul of the material, the cost of the raw material, etc., and while exact cost figures are not available, these approximated from 40-85 cents per square yard. Probably an account of the working force and rate of progress will give a clearer record of performance than actual costs.

Two or three trucks, depending upon length of haul, and size, are generally required to keep a constant supply of material at the machine, otherwise delays will result; about three men loading trucks at the pit, one man at the clutch to be constantly available to start or stop the operation as required, one man at the mixer, one man at the nozzle, and one man to flag down the traffic on heavier traveled roads, as it is not necessary to close the road to traffic during this work, and one man at the air compressor drilling the holes, etc.

It has been found that with this organization it has been possible to raise a depression 6" deep by 150' long in about ten hours. On another dip of the same length but  $2\frac{1}{2}$ ' in depth, the time required was about  $2\frac{1}{2}$  days. Another application of this method is the superelevating of curves originally built flat. One curve approximately 250' long was superelevated 1 foot in a day's time.

#### *Problems Met Up With*

As stated previously, each job presents its own peculiarities. There may be a crust of packed earth adhering to the bottom of the slab, and the actual cavity formed underneath this. Sometimes it is difficult to get the initial movement of the slab when pressure is applied. This has been somewhat overcome by inserting the air hose from the compressor and loosening the slab by building up an air pressure. In some instances about an inch off of a stick of dynamite has been inserted into the drill hole and detonated, the jar not being sufficient to injure the slab, but the loosening had been accomplished.

The mud may be forced out at the shoulder line, then it will be necessary to pack some material at this point. Incidentally, the shoulders should be brought up along with the slab.

At times it may be necessary, especially on higher lifts, to bring these up in increments, and allow a period of time in which the grout will have an opportunity to take a set between successive lifts.

One point, which we believe important in this work, is not to attempt to force the lifting action too rapidly at any one point or hole, but rather, as soon as a raising is noticed, to go to work on another hole, and to continue this procedure so that the entire settlement will be brought up uniformly throughout the entire operation, or serious cracking of the pavement may result.

The cost of this work can be reduced, if when in the construction of pavements some of the places where settlement is apt to occur, such as over trenches, or bridge approaches, can be anticipated, and the holes for the admission of the mud be built into the pavement by the insertion of pieces of pipe long enough to go through the slab at the required intervals. These pipes can be filled with clay so that no water will seep through them onto the grade, which clay is easily removed, when necessary. It often happens that considerable settlement has occurred under a pavement and quite a void has been formed before the pavement itself

(Continued on page 119)



# Engineering Society of Wisconsin Holds Twenty-fourth Convention

Harold C. Webster of Milwaukee, who is engaged in private practice in the field of municipal engineering, is the new president of the society for 1932. He says that he appreciates the honor, even though it interferes with his annual trip to Florida. President Webster was born at Columbus, Wis., October 29, 1885. He spent two years in civil engineering at the University of Wisconsin.

\* \* \* \*

Gustav L. Larson, professor of steam and gas engineering at the University of Wisconsin, is the new vice president.

\* \* \* \*

John J. Degen, city engineer of Burlington, and Harold F. Janda, professor of highway engineering at the University of Wisconsin, were elected trustees for a term of two years.

\* \* \* \*

The convention was shortened to two days in honor of the well-known Depression. The first half day was devoted to the surveyors, the second half day to the civil engineers, the third half day to the mechanical engineers, and the last session to general topics and a little business.

\* \* \* \*

Luncheon meetings were held both days at the University Club and brought out an overflow attendance and much lively discussion.

\* \* \* \*

The idea of holding the banquet with the Technical Club of Madison on the night of the first day of the meeting proved a wise one; out-of-city attendance made a new high record. In the past, there has been a tendency for the out-of-town to go home the night of the banquet without attending.

\* \* \* \*

A suggestion to merge the Engineering Society of Wisconsin with the American Society of Municipal Engineers was laid before the society and caused something of a sensation. This plan is to make the Wisconsin society a local chapter of the national organization.

\* \* \* \*

The suggested merger with A. S. M. E. would mean jumping the dues from \$4.00 to \$7.50.

\* \* \* \*

The question of merging with the national society is to be placed before the membership with a fair presentation of the arguments pro and con, and a letter ballot is to be taken sixty days before the next convention.

R. M. Smith, E. F. Bean, and R. M. Connelly constituted the committee on resolutions.

\* \* \* \*

G. E. Heebink, L. F. Van Hagan, and A. M. Boley as committee on nominations surveyed the field carefully and prepared the official slate of candidates.

\* \* \* \*

Registration was much better than was anticipated. Those who checked in numbered 138 or about 40 per cent of the membership.

\* \* \* \*

Many students attended the sessions. Classes were excused and assignments made that permitted the students to see what an engineering convention is like.

\* \* \* \*

Chi Epsilon, honorary engineering fraternity, was in charge of the registration desk. Students who assisted in this work were: Senn, Ginsberg, Kalinski, Lyneis, Weston, Buehler, Palmer, Dever, McMicken, White, and Herrmann.

\* \* \* \*

Secretary Owen reported that the society gained 13 new members and lost 19 old members, making a net loss of 6, which is a fairly satisfactory showing under present conditions. The present paid-up membership is 357.

\* \* \* \*

The finances of the society were reported in a healthy condition. There is a surplus of about \$2,000.

\* \* \* \*

Unemployment among engineers, the new law requiring the registration of engineers in Wisconsin, and the proposal to amalgamate with the American Society of Municipal Engineers were pointed out by President Walter Pierce in his address as the three most important matters before the convention.

\* \* \* \*

A. L. Hambrecht, who presented the 1932 program of the Wisconsin Highway Commission, pulled a nifty when he explained that the last three national administrations represented the Three Graces: Harding's administration was an era of Faith, Coolidge's of Hope, and Hoover's of Charity.

\* \* \* \*

The symposium of unemployment, held at the Thursday luncheon, was a revelation of intelligent charity. E. E. Parker of Madison, G. E. Heebink of Beloit, A. L. Boley of Sheboygan, R. W. Gamble and E. L. Knebes of Milwau-

kee, and W. A. Pierce of Racine explained how their various cities are providing work for the unemployed.

\* \* \* \*

Park work for the unemployed is favored because it requires the minimum outlay for material and permits most of the available funds to be expended on labor.

\* \* \* \*

The platting law is still unsatisfactory and came in for severe criticism by Hans Peterman. L. P. Atwood pointed out that the fundamental purpose of the law is to protect the interests of the lot buyers. The convenience of the engineer is subservient to the basic purpose of the law.

\* \* \* \*

As usual, the greatest interest in the discussions centered about those matters that were closest to the experience of the audience. Both the surveying problems and the making of concrete stirred up the speakers.

\* \* \* \*

Guy Larson, engineer in the materials laboratory of the Wisconsin Highway Commission, reported that the state saved \$322,560 on pavement construction during 1931 as the result of work done in that modest laboratory. This was the result of refinements in the practice of making concrete that permitted the amount of cement to be reduced without reducing the strength of the concrete.

\* \* \* \*

The mud jack, which has proven so successful in raising sunken pavement slabs, has also been used with success in raising street railway track in paved streets, according to E. J. Archambault, of T. M. E. R. & L. Co.

\* \* \* \*

L. F. Warrick, state sanitary engineer, reported that Wisconsin now has 299 municipalities or communities provided with public water supplies. The typhoid death rate in the state during 1931 was down to 0.7 per 100,000.

\* \* \* \*

That a diesel engine had been operated for two minutes on molasses and three minutes on whipping cream was the declaration of R. A. Beckwith, superintendent for Koehring Co., who discussed developments in that type of power plant. A diesel engine, according to Mr. Beckwith, considers discarded crank-case oil as choice diet.

\* \* \* \*

The fact that the diesel engine has no electric ignition system makes it especially suitable for airplane purposes as it causes no interference with radio.

\* \* \* \*

Wisconsin is not likely to enjoy the use of natural gas because the cost of such gas piped in from the nearest fields is greater than the cost of artificial gas, according to Stanley B. Sherman, general superintendent of the Wisconsin Gas and Electric Co., at Racine, who spoke on the subject of "Gas Manufacture and Distribution", on Friday afternoon.

The vertical oven with detached producers is becoming dominant in the field of gas manufacture, according to Mr. Sherman, because the vertical oven can be steamed and produces the maximum amount of gas per ton of coke, about 26 thousand feet. The detached producers use part of the coke, which has become a drug on the market since oil fuel became popular for domestic use.

\* \* \* \*

The directors of the society were instructed by resolution to consider a mid-summer meeting in cities other than Madison. The membership is to be circularized on this matter.

\* \* \* \*

The president was instructed to appoint a committee to make a state-wide survey of unemployment conditions.

\* \* \* \*

The society went on record as favoring the early completion of the topographic mapping of the state, two-thirds of which is still unmapped. The directors were instructed to support all measures tending to the completion of this task.

\* \* \* \*

Letters were received from Henry H. Tubbs, city engineer of Watertown, and C. V. Kerch, honorary member, expressing regret for their absence. Illness interfered with attendance in both cases. Mr. Tubbs is one of the oldest, if not the oldest, practicing civil engineer in the state.

\* \* \* \*

The new Board for the Registration of Architects and Civil Engineers reported, through one of its members, L. F. Van Hagan, that it is now receiving and passing upon applicants for registration.

\* \* \* \*

General T. H. Jackson, president of the Mississippi River Commission, who spoke at the joint banquet on Thursday night, criticized rather freely the economics of the Mississippi River flood protection work. He also punctured numerous public fallacies about floods and their causes.

\* \* \* \*

General Jackson's figures indicate that the protected region is going to have the most expensive population in the United States. Counting interest on the investment and depreciation on a straight-line 3-year life, which is the estimated life of the levees, the U. S. government will spend \$5,000,000 for every life that is saved by the work. That must be very near a record price.

\* \* \* \*

When the district is protected and good roads are built, more lives will be lost each year as a result of automobile accidents than are now lost as a result of floods.

\* \* \* \*

A small boy driving a cow could keep ahead of the water that comes through a break in the levee, according to General Jackson. The water from a crevasse travels slowly; it does not rush over the country in a devastating manner. There is no wall of water.

# Alumni Notes

## CHEMICALS

**Schulte, Walter B.**, ch'10, an official of the Burgess Battery Co. in Madison, has moved to Freeport, Ill., with a branch of that business.



**Clark, Manley H.**, ch'22, is the western manager of the LeRoi Co. of Los Angeles. He is living at 2529 North Marengo Ave., Los Angeles, California.

**Hainer, Fred W.**, ch'20, has presented the university with a specimen of wooden gas pipe which has been found in Fond du Lac, Wis. Wooden gas pipes were installed over half a century ago to extend service to the residents of the community. A few months ago when new paving was put in, a section of this old wooden pipe was removed. The section of white pine is in a perfect state of preservation. It has an outside measurement of  $5\frac{1}{2}$ " square, and has an inside diameter of 3".

Mr. Hainer writes: "Facts concerning the old type of installation were unearthed in letters written at that time by the manager of the Gas Plant to his employer in St. Louis. These daily letters reveal the fact that he was alarmed at the competition he was receiving, and was particularly concerned because electricity was gaining in popularity for the lighting of homes and streets. In these letters the fact was also mentioned that collections were poor and he expressed concern as to whether he could collect enough for the pay rolls."

The section of pipe was sent to Professor O. L. Kowalke, and is on exhibition in the museum of the Chemical Engineering Department.

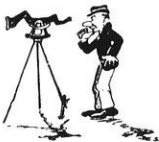
Mr. Hainer is with the Wisconsin Power and Light Co. at Fond du Lac, Wis.

**Helfrecht, Aaron J.**, ch'15, chief engineer of the Burgess Battery Co., of Madison, died at Freeport, Ill., on January 23rd. He had been ill about ten days. After his graduation from the university, Mr. Helfrecht became associated with the Burgess company doing metallurgical and battery work. He has been with the engineering department of the company since 1917 and at the time of his death was one of the directors. He was recently transferred to the Freeport plant, but maintained his home in Madison. He is survived by his widow and three children.

## CIVILS

**Gilchrist, W. Mac Neil**, graduate in civil engineering during 1930-31, has re-entered the college for the second semester. He has been working for Alford, Burdick, and Howson on a sewer job at Racine from September to February.

**Titus, William J.**, c'13, chief engineer of the Indiana Highway Commission, writes: "The Construction division of the Commission handled \$13,750,000 of state road and bridge work in the past year in addition to supervising \$2,000,000 of county road and bridge construction." Address: Kirklin, Indiana.



**Hall, Merton G.**, c'04, and **Withington, Arthur H.**, c'13, constitute the firm of Hall and Withington, engaged in municipal engineering at Centerville, Iowa. Both are residents of Centerville.

## ELECTRICALS

**Zia, Yussuf**, e'24, is the technical director of municipal affairs at Istanbul, Turkey.

**Schrage, Charles T.**, e'21, is doing personel work with the American Telephone and Telegraph Co. in New York City. He is living at 10 Boulevard, Glen Rock, N. J.

## MECHANICALS

**Ashman, Robert G.**, m'31, is with the Ashman Construction Co. of Appleton, Wisconsin. Bob reports that his father's business is pretty good. Bob was seen at the basketball game of February 8. His home address is 206 Memorial Drive, Appleton, Wis.

**Lindemann, Walter W.**, m'30, is associated with the Allen-Bradley Co., Milwaukee, Wis. Address: 359 Beverly Rd.

**Schefe, F. K.**, m'30, is associated with the American Sheet and Tin Plate Company, Gary, Indiana.

**Daniels, Charles J.**, m'30, is with the Chicago Bridge and Iron Works, 1305 W. 105 Street. He hopes the depression will soon lift. Home address is 10887 Prospect Ave., Chicago.

**Schroeder, Ralph R.**, m'30, is with the Wisconsin Bell Telephone Company, Milwaukee, Wisconsin.

**Willis, Newton**, m'30, is associated with the Waukesha Motor Company, Waukesha, Wis., designing internal combustion engines. His home address is 224 Hartwell Ave.

**Teckemeyer, Oscar W.**, m'25, who was formerly with the Austin-Western Machine Company, has joined the sales force of the Hunter Machine Company of Milwaukee, and is now in charge of their Madison office.

**Anderson, Edward**, m'18, is now Dean of the School of Petroleum Engineering at the University of Tulsa, Tulsa, Oklahoma.

**Risteen, H. W.**, m'24, was recently appointed assistant professor of mechanical engineering at the Michigan College of Mining and Technology, Houghton, Mich. Professor Risteen has served in the aeronautical testing division of the naval air craft factory at Philadelphia, and as experimental engineer with the Comet Engine Corporation at Madison, Wisconsin.



**Phillips, Harry A.**, m'22, is a member of the firm of H. A. Phillips and Co., Room 599-844 Rush St., Chicago. The firm specializes in refrigeration control systems.

**Schulz, Thomas N.**, m'22, is manager of the production department of the Akers Mek. Verksted, Oslo, Norway. The concern is constructing ships and diesel engines and employs about 1100 men. He was formerly with the Pelton Water Wheel Co. of San Francisco, California. His home is in Oslo, Norway.

**Morgan, E. K.**, m'13, is a designer with the Ingersoll Milling Machine Company, Rockford, Illinois.

**Sewall, Fred A.**, m'14, is chief inspector at the J. I. Case Threshing Machine Company, Racine, Wis.

**Williams, Lynn A.**, m'00, is a member of the firm of Williams, Bradbury, McCaleb and Hinkle, Patent Lawyers, 1315 Monadnock Block, Chicago, Illinois.

**Gesell, Walter B.**, m'15, is a rate engineer with the Byllesby Engineering and Management Corp. of Chicago, Ill.



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cast the changing requirements of the public for telephone service. They estimate the probable future demand for new services, such as radio telephony to foreign lands and ships at sea. They keep the executives advised as to current progress towards the objectives thus carefully determined.

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# Editorials

**A NEW STAFF** With this issue, a new staff takes over the reins of the magazine to guide it through another year. The retiring staff has worked hard for the past year to give the engineers a publication worthy of the name Wisconsin. We will endeavor to follow their example and carry on to the best of our ability during the next year.

In the past it has been the policy to present articles which are of interest to all engineers as far as it was possible, to give "complete campus coverage" of interesting engineering news, and to give a summary of recent alumni events. This policy will be continued without any immediate radical changes with the exception of the revival of the "Engineering Review" column.

This column has been revived by popular request, for the express purpose of giving the work burdened student an easy way to keep in touch with the recent engineering and scientific advancements. We are open to criticism on this and other parts of the publication and urge any of our readers who have constructive suggestions to make to drop a note into the box provided for that purpose.

**ABOLISHING THINGS** From the recent faculty meeting has issued a rumor to the effect that serious consideration is being given to the idea of abolishing compulsory gym training at Wisconsin. For many years there has been a continual student gripe at having to put on professionalized underwear and cavort around on the lower campus. Now it appears that the faculty for some reason or other has decided that such conduct is unnecessary to the health of the student.

Gym training has reached the same illogical conclusion that all other sane ideas reach when left unwatched in the hands of the mob. From an effort to induce people to take necessary exercise without running the risk of personal damage to themselves, gym has become a highly professionalized business of telling folks what and when they can play. Men have come to college and spent good money getting a degree so that they will be qualified to stand before the rest of the people and tell them that they must wait their turn and then take their exercise according to the latest ideas of what constitutes exercise. People, instead of being left alone to take their physical diversion at the time and in the form that happens to suit their passing fancy, are told that at 3 p. m. on Monday, Wednesday, and Friday they must spend one hour in mechanized arm-waving and knee-flexing. If they are good little boys and do as they are told, the promise is held up to them that they will be developed into veritable Sampsons, and will never have to worry about their physical condition.

Just why it should be necessary to have a man draw down a handsome salary for his services of dubious worth is a

rather vague question. Just why we should pay out our good money to some man who counts aloud so that we may keep in time with the rest of the class during our weekly hours of bending at the hips and running in place is beyond our comprehension. If we have lived all our life in the ease of wealth with motorized transportation and salaried servants to take our exercise for us, there is no apparent reason why three hours a week spent in capering about in underwear is going to change our physique radically. If we have lived a hard life of long walks, axe swinging, and violent exercise, those paltry three hours won't remove the restlessness of inactivity.

The average student at Wisconsin gets nothing but inconvenience from his compulsory gym training. He feels that the exertion of a three-minute dash from above the bend in Langdon Street to an eight-o'clock on the fourth floor of Bascom is about all the exercise he needs for the time being. Like puppy dogs, if the students get restless from lack of exercise they usually end up in a free-for-all that lasts until they feel sufficiently tired out. The students don't need the nominal exercise that they get thrust at them in gym. Compulsory gym serves no purpose, is inadequate, and decidedly without favor in the student body. Why not do away with it?

R. L. V.

**DEMOCRATIC STUDENT GOVERNMENT?** Recently the elections board was petitioned to establish a polling place which would be more convenient for the petitioners. After "careful consideration" the elections board decided that the new polling place was not necessary.

At the last Spring election, 1931, 1004 votes were cast and the maximum number of votes cast for any one candidate was about 780. According to press reports this was a record vote, being exceeded only once in ten years. These facts prove conclusively that student interest in elections has been very meager.

Still, when 300 independent students, about one third of the total number of voters at the last election, express their desire to participate in campus politics if a convenient polling place is provided, their request is refused. The mere fact that these students showed interest should be reason enough to establish another polling place.

Probably the elections board, which is controlled by fraternity men, does not want increased interest in elections—especially independent interest. That sort of interest might defeat some of the brothers on Langdon Street.

This is just another incident which tends to show that true democratic student government does not exist on the campus and that a small group of politicians govern student affairs.

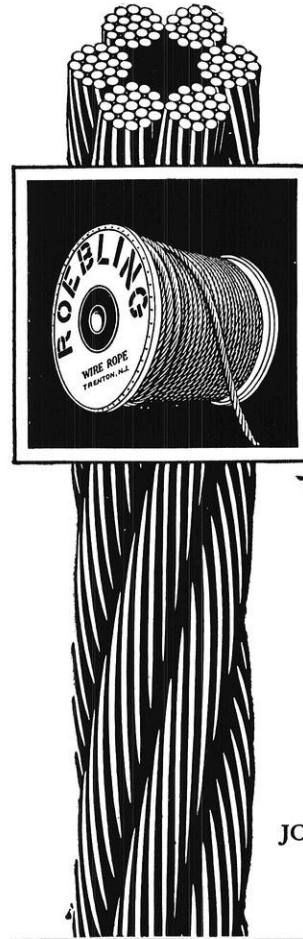
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# Campus Notes

## FRESHMAN HONOR LIST

The following is the honor list of freshman engineers for the first semester, 1931-32. An average of 2.75 is required for high honor rate and 2.25 for honor rate.

	Points	Credits
<b>High Honor Rate:</b>		
Bechtel, Frederick J. ....	48	17
<b>Honor Rate:</b>		
Kuehn, Frederick J. ....	46	17
Goldberg, Harold .....	43	16
Knake, Robert J. ....	48	18
Van Ryzin, William J. ...	45	17
Lund, Nean .....	37	14
Schmitter, Carl H. ....	47	18
Burnham, Thayer W. ....	44	17
Fiedelman, Charles .....	44	17
Carow, John .....	46	18
Comer, Reginald G. ....	43	17
Dietrich, Arthur B. ....	43	17
Matzat, Arnold R. ....	43	17
Mercer, Robert .....	43	17
Neroda, Edward K. ....	43	17
Ryden, Llewellyn A. ....	43	17
Anderson, Gordon R. ....	40	16
Kaska, Robert C. ....	42	17
Albright, Charles B. ....	41	17
Norton, Horace W. ....	41	17
Reynolds, William F. ....	41	17
Henry, J. Everett .....	40	17
Soule, John W. ....	40	17
Bennett, Robert M. ....	39	17
Gay, William W. ....	39	17
Guilfoyle, Edward J. ....	39	17
Moore, Albert M. ....	39	17
Rhodes, James A. ....	39	17
Sturdy, Olaf T. ....	39	17
Wendt, Harry C. ....	39	17
Wiegert, Lester O. ....	39	17
Davis, Robert .....	34	15

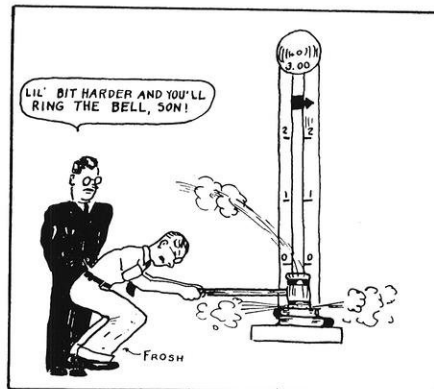
The following students, although not working at the honor rate, are in the highest 15% of their class:

	Points	Credits
Brown, Erle S. ....	38	17
Field, Arthur C. ....	38	17
Hartman, William R. ....	38	17
Jansky, Maurice M. ....	38	17
Jones, Richard D. ....	38	17
Kniskern, Charles B. ....	38	17
Koch, Philip L. ....	38	17
Mc Mahon, William R. ...	38	17
Rosten, Philip W. ....	40	18
Wink, Kenneth R. ....	33	15
Bidwell, Laurence E. ....	37	17
Gapen, Clark C. ....	37	17

## C. R. MOORE ADDRESSES STUDENT A. I. E. E.

Possibly the following news item suggests the influence of the modern daughter over her father. At any rate, Mr. C. R. Moore, of the Bell Telephone Laboratories came from New York to deliver a talk to the student branch of the American Institute of Electrical Engineers on "Electrical Engineering Only?" Mr. Moore is the father of Miss Rosalind Moore, c'32.

Mr. Moore's talk was intended chiefly to show that an electrical engineering job may entail work along



many lines quite remote from electrical theory. To illustrate his point, he showed pictures of research projects being carried out by Bell Laboratories. A humorous event of the evening was the hurried exit of about ten Haresfoot candidates after getting their rooms mixed up and sitting down with the E. E.'s.

## ENGINEERING SOCIETY OF WISCONSIN HOLDS ANNUAL CONVENTION

A number of talks were delivered by faculty members at the annual convention of the Engineering Society of Wisconsin Convention on February 18 and 19. On the first day, Professor Ray Owen, head of the topographical engineering department, told of a "Latitude and Departure Computer". Professor L. R. Van Hagan described the details of the Registration Law. This is a proposed law to require the registration of engineers in the state in a manner similar to that in which doctors and lawyers are registered. On

the second day of the convention, Prof. G. L. Larson led the discussion on a paper by R. A. Beckwith, "The Diesel Engine". Prof. O. L. Kowalke led the discussion on "Gas Manufacture and Distribution", a talk which was presented by S. B. Sherman.

One of the main addresses given by other than faculty members was that by General T. H. Jackson of the U. S. Army Engineers Corps. Gen. Jackson's subject was "Flood Problems of the Mississippi River". His talk was given at a joint meeting of the convention and the Technical Club of Madison.

Many students attended the convention to hear the addresses. Members of Chi Epsilon and the A. S. C. E. assisted in registering and welcoming the visiting engineers.

## PENTAGON GIVES DINNER DANCE

The Pentagon Club provides further evidence (if any is necessary) that the instructors and professors who hurl formulas and assignments at us in class have their gay moments just as do we students. Pentagon is an organization of wives of members of the engineering faculty, and was formed many years ago for social purposes. Pentagon gave a dinner-dance on March 15 in the Memorial Union which was attended by about fifty couples. Mrs. A. V. Millar, Mrs. G. L. Larson, Mrs. R. E. Ramsey, and Mrs. W. S. Cottingham formed the committee in charge of arrangements, Mrs. J. W. McNaul being the chairman.

## PROFESSOR WITHEY AND DEAN TURNEAURE HONORED BY CONCRETE INSTITUTE

As a result of their work on the strength and design of concrete for structural purposes, the Board of Directors of the American Concrete Institute has voted distinctions for two faculty members, Dean Frederick E. Turneure, and Professor Morton O. Withey.

"In recognition of his service through research and writings for the advancement of the knowledge of the use of

(Continued on page 120)

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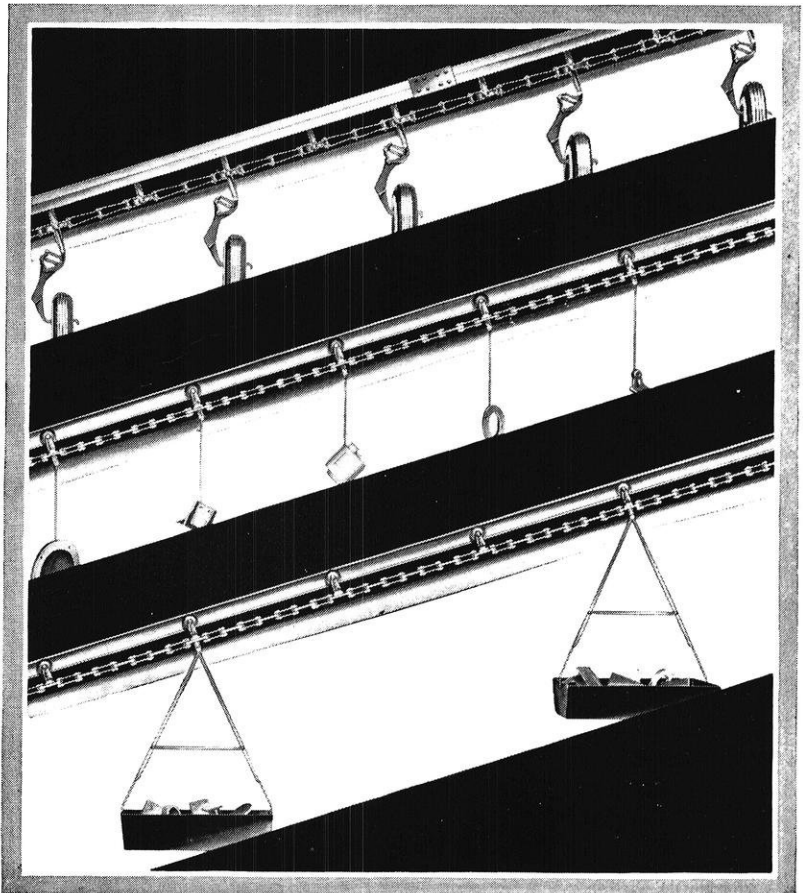
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# Engineering Review

## NEW ALLOY BOON TO WATCH- MAKING, IMMUNE TO PERMA- NENT MAGNETIZATION

For the first time in the history of watchmaking the need for a temperature compensating device has been eliminated. This simplification of watch mechanism and enhancement of its accuracy has been made possible by manufacturing hairsprings of Elinvar, the nickel steel alloy invented and developed by Dr. Charles Edouard Guillaume.

As its elasticity remains constant regardless of temperature variations, Elinvar brings to the hairspring the quality heretofore most needed to assure uniformity of conduct under any temperature in which a watch might be used. And not only to watches, of course, but to every sort of precision instrument requiring a hairspring or a part that should be impervious to temperature variations.

A second quality of Elinvar of special importance to the engineer is its behavior when brought within a magnetic field. It cannot be permanently magnetized. As it has rendered unnecessary the use of the bimetallic split balance wheel, it also permits making this part of non-magnetic metal.

Watches equipped with Elinvar hairsprings and solid rim, non-magnetic balance wheels, when exposed to magnetic fields up to 3600 lines to the square inch, stopped only when in the field and resumed running on withdrawal therefrom. This, despite the fact that all the other parts of the movement than the balance assembly had been permanently magnetized. Watches with carbon steel springs and brass balance wheels, were so materially affected in fields of magnetizing strength somewhere between 36 and 360 lines per square inch, as to be useless as timekeepers. In a field of 3600 lines per square inch, their hairsprings and balance wheels were permanently magnetized, while Elinvar equipped watches, as stated, began running again as soon as taken out of the field, showing only a slight alteration of rate—about 6 seconds a day—which was easily remedied by adjusting the regulator.

Elinvar is also rust proof in the conditions under which a watch hairspring is normally used. Its three outstanding qualities: Immunity to permanent magnetization, indifference to temperature changes and resistance to rust, combine to render innocuous the conditions most potent in interfering with the accuracy of watches and precision instruments.

## NEW TYPE DIESEL

A new type of Diesel engine has recently been developed by F. B. Stearns, prominent automotive engineer. It differs from the orthodox Diesel in that it has eight cylinders and sixteen pistons. The cylinders are arranged in the shape of a diamond; that is, they are arranged in much the same manner as two V-eight engines would look if one were placed on top of the other with the open ends of the V's together. The cylinders have no heads, the fuel entering a cavity between the two pistons. Upon explosion, the two pistons are forced apart and the motion transmitted to two crankshafts, one on the top and the other on the bottom of the engine. Each crankshaft takes care of eight pistons and both are geared to a common transmission.

The engine is rated at 150 H. P. at 1500 R. P. M. and weighs 1800 lbs. Demonstrations have shown a quick response to the throttle for speeds between 500 and 1500 R. P. M. with practically no vibration.

## STRESS ANALYSIS

It is not always possible to forecast the results of imposing loads on members through a theoretical knowledge of the stresses in the members.

"Stress Analysis", an article in the February issue of *Civil Engineering*, by H. J. Gilkey and E. O. Bergman, is of interest to the student interested in the strength of materials. The authors have described the various methods used in attacking problems of strain distribution. In addition to the more common methods of determining the effects of stresses, they have used polarized light for several of the determinations.

## NEW FUEL INJECTION SYSTEM FOR AVIATION ENGINES

A new fuel injection system, the development of the Pratt and Whitney Co., has been successfully tried out on their radial type engines. The new system eliminates carburetor, pre-heaters, and hot-spot. A valve of the butterfly type replaces the carburetor and hot spot, and is used to control the air entering the cylinders at speeds from idle to full throttle. This system involves the use of fuel injection pumps and it is claimed that, in addition to the advantages accruing from the absence of the carburetor and its attendant accessories, that the motor will develop 10% more power with the new safety fuel.

## PIPE LINE TRANSPORTATION

The last five years has seen an enormous development in this new utility. New methods of pipe production together with an increase of knowledge in the art of welding have lowered the cost of construction until this type of transportation has become a serious competitor of the railroads.

"Pipe Line Transportation", an article in the February issue of the *Mechanical Engineer*, by J. H. Pound, is an interesting discussion of the problems encountered in the planning and construction of pipe lines. He has divided the problems into two divisions; the economic, and the engineering.

The economic problem concerns the competition encountered in pioneering this new method of transportation. In order that the reader may have some idea of the size of some of the present installations, the author has collected data concerning the largest of the lines into tables and comparisons can readily be made. The distances over which the pipe lines can be operated at a profit are also discussed as part of the economic problem.

The planning and construction of the pipe lines enter into consideration in the discussion of the engineering problems. The laying out of the best possible route requires the services of the civil engineer while the production of the pipe enables the mechanical engineer to show his wares.

**THE USE OF THE MUD JACK**

(Continued from page 109)

actually settles, and it is in such instances, we believe, that if these voids are pumped full of mud before settlement of the slab actually takes place, that most satisfactory results will be obtained.

While this method is comparatively new, the process is simple, and comparatively inexperienced men can readily be trained for it, and it is our opinion that a greater adaptation of it will be made in the future, for we believe that as this method lends itself very readily to doing the work of raising pavements by stages, these depressions should be corrected as they occur, and before they have reached serious dimensions, because, as we say, "A stitch in time saves nine".

**MODERN FASHIONS**

Said a golfer to his partner: "Just look at that girl dressed like a man. What are her parents thinking of, anyway? I think it's disgraceful."

"That, sir, is my daughter," replied the partner.

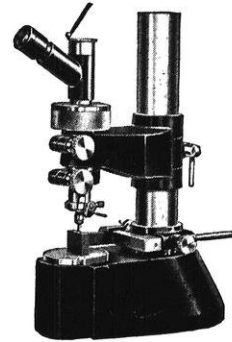
"I beg your pardon, I didn't know you were her father," was the apologetic reply.

"I'm not, I'm her mother." And the golfer wilted.

— Kablegram.

**BAUSCH & LOMB FOR PRECISION**

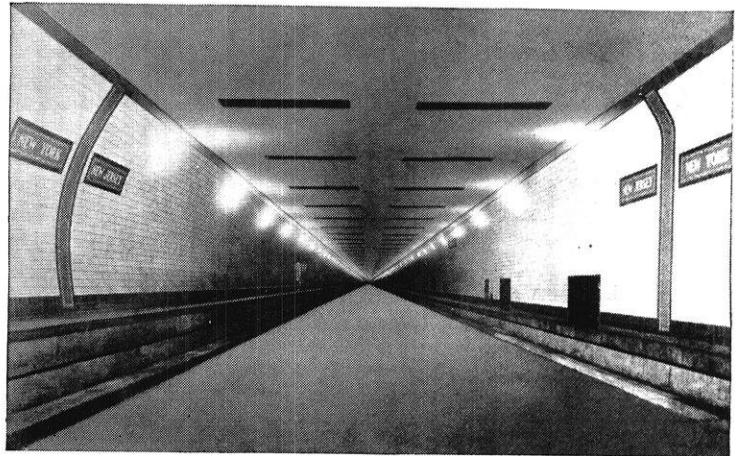
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## CAMPUS NOTES

(Continued from page 116)

reinforced concrete," Dean Turneure was elected to honorary membership in the institute. Professor Withey's distinction was the receiving of the Watson research medal for his paper on "Long Time Tests of Concrete" which was presented to the institute in 1931. The two journeyed to Washington to attend the annual convention of the concrete institute and received the awards on March 3.

### WAGNER HEADS SCABBARD AND BLADE

Aubrey Wagner, c'32 of Madison, in addition to his distinction as a topographical engineering instructor and member of Tau Beta Pi, Chi Epsilon, and Phi Eta Sigma, has recently become the captain of Scabbard and Blade. Scabbard and Blade is the honorary military fraternity composed of officers in the R. O. T. C. Lorenz A. Leifer, e'33, another engineer, became the first lieutenant of the organization. Shirley G. Blencoe, e'32, retired as second lieutenant.

The first chapter of Scabbard and Blade was installed at Wisconsin in 1904. It has grown very rapidly, for at the present time there are about one-hundred chapters in the United States.

### PROFESSOR HOUGEN BECOMES AN AUTHOR

*Industrial Chemical Calculations* is the title of a book recently published by Olaf A. Hougen, professor of chemical engineering at the University of Wisconsin, and Mr. K. M. Watson, a former instructor. To quote from a review of the new book in *Chemical and Metallurgical Engineering*: "In this book the authors have attempted

to bridge the gap between the usual courses in physics and physical chemistry, and the study of chemical technology and the unit operations. In the reviewer's opinion, they have succeeded admirably."

Among the subjects covered in the book are pressure-volume-temperature relationships of gases, elementary thermodynamics, vaporization and condensation phenomena, thermo-chemical calculations, chemical equilibria, distillation equilibria, and weight and heat balances of combustion processes and chemical processes.

### CHALMERS BAYLESS DIES

Chalmer D. Bayless, a junior in the civil engineering course, died at a Madison hospital on Monday, December 29th. Bayless was 31 years old. Surviving him are his widow, his mother, three sisters, and a brother. The funeral services were held at Jacksonville, Illinois.

### ESTIMATING CONSTRUCTION COSTS

For the benefit of men interested in preparing estimates of construction costs, a new course of study has been introduced by the University of Wisconsin Extension Division. In 20 assignments, this course, called "Estimating Construction Costs", will be offered to students in any state by correspondence study. It is intended for contractors and others doing construction work, estimators, engineers, architects, and designers.

Professor H. E. Pulver, of the department of civil and structural engineering, who conducts the course, says the emphasis is placed on correct methods of estimating the various types and kinds of materials, labor, and

equipment required in construction work.

"The student is taught how to prepare estimates from charts given in the text and supplementary material," said Professor Pulver. "He is also taught how to construct the charts so that he may be able to draw charts for his own cost data. This method of estimating, while comparatively new, is believed to provide a means of estimating construction costs with least effort."

Topics treated include transportation and handling of materials; excavation; piling, concrete, wood construction; brick, tile, stone; structural steel; lathing, plastering; roofing, flashing, water-proofing; pipe work and heating; plumbing; electrical work; painting and glazing; paper-hanging; machinery and its erection; overhead; estimating; prices of construction; and construction management.

### DIPLOMACY

"Half the City Councilmen are Crooks," was the glaring headline.

A retraction in full was demanded of the editor under penalty of arrest.

Next afternoon the headline read: "Half the City Councilmen are not Crooks." —*Kansas Engineer.*

### AH HAH!

A little boy from Canada who had never seen a negro was riding with his father in New York when he saw a colored lady.

Junior: "Why does that woman black her face?"

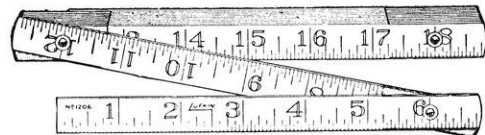
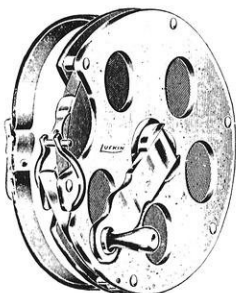
Father: "That's her natural color."

Junior: "Is she black like that all over?"

Father: "Yes."

Junior: "Gee, Pop, you know everything, don't you?" —*Kansas Engineer.*

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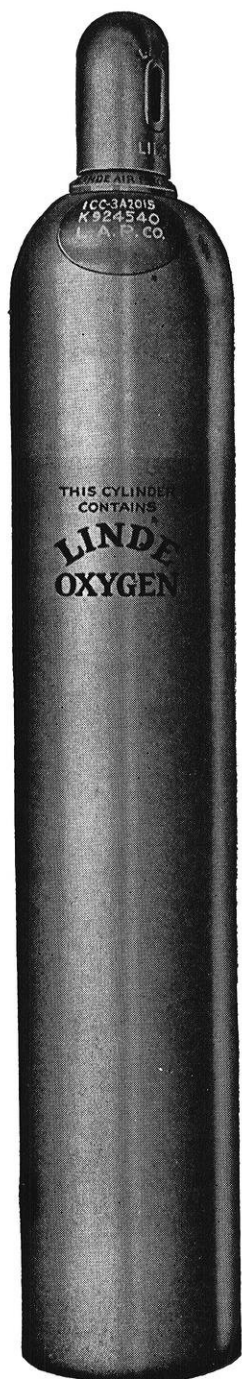
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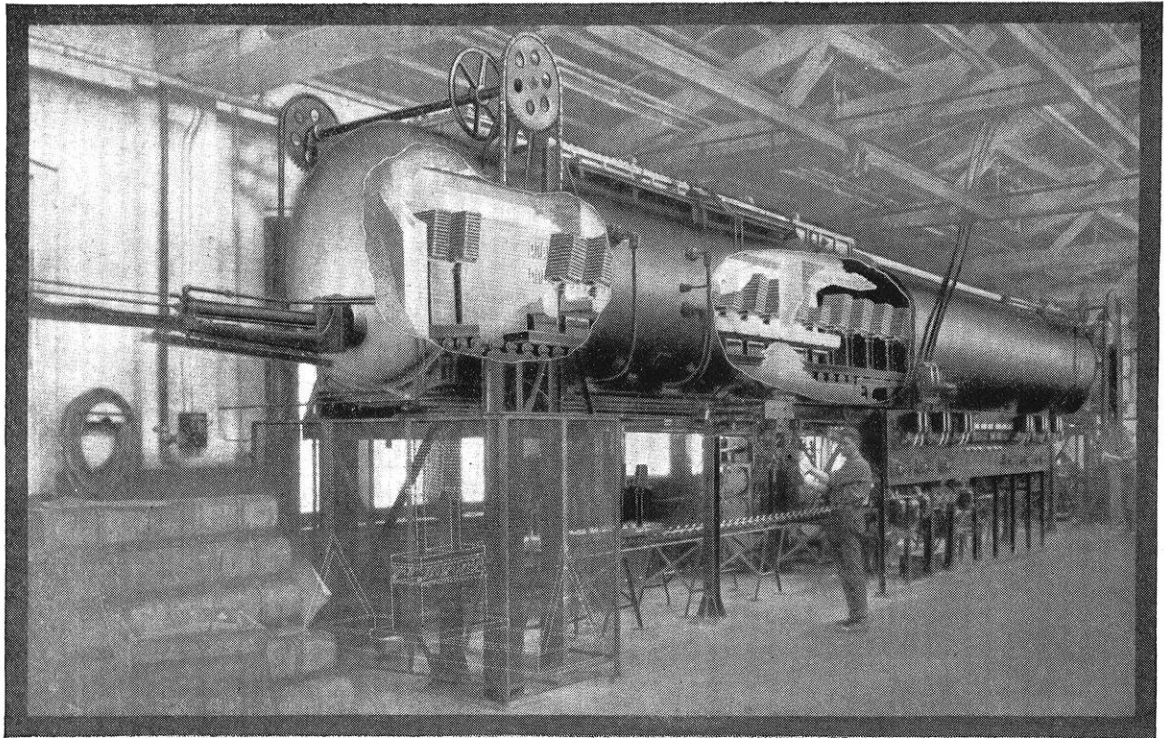
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As a controlled atmosphere at very high temperature must be used, the electric furnace is important to the process. At brazing temperature, the molten copper wets the clean steel and flows into the

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Such furnaces are used in the manufacture of G-E refrigerators, where hundreds of evaporators are hermetically sealed daily.

These developments in industrial heating are largely the achievements of college-trained General Electric engineers. Newly graduated young men obtain in the Testing Department practical experience which fits them for future positions of responsibility.

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