



LIBRARIES

UNIVERSITY OF WISCONSIN-MADISON

The Wisconsin engineer. Volume 37, No. 7 April 1933

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

<https://digital.library.wisc.edu/1711.dl/7P3DBZ6M5SIJV8I>

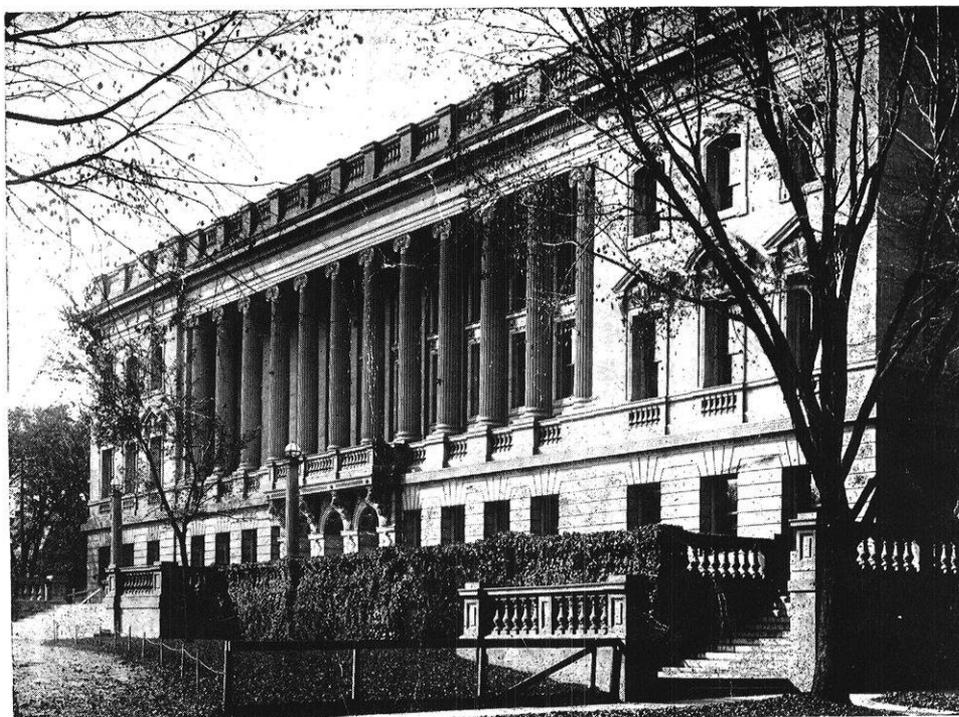
<http://rightsstatements.org/vocab/InC/1.0/>

The libraries provide public access to a wide range of material, including online exhibits, digitized collections, archival finding aids, our catalog, online articles, and a growing range of materials in many media.

When possible, we provide rights information in catalog records, finding aids, and other metadata that accompanies collections or items. However, it is always the user's obligation to evaluate copyright and rights issues in light of their own use.

THE

WISCONSIN ENGINEER



« MEMBER »
E. C. M. A.

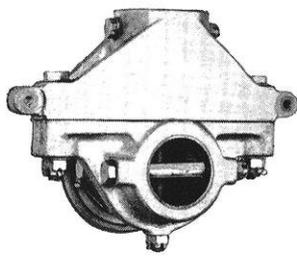


A P R I L
1 9 3 3

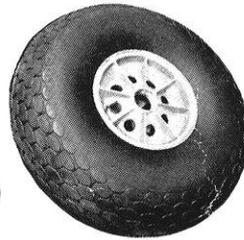
DOWMETAL

ideal for aircraft manufacture

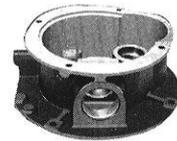
★ LIGHT ★ STRONG ★ DURABLE ★



This airplane wheel support assembly by the Northrop Corp.



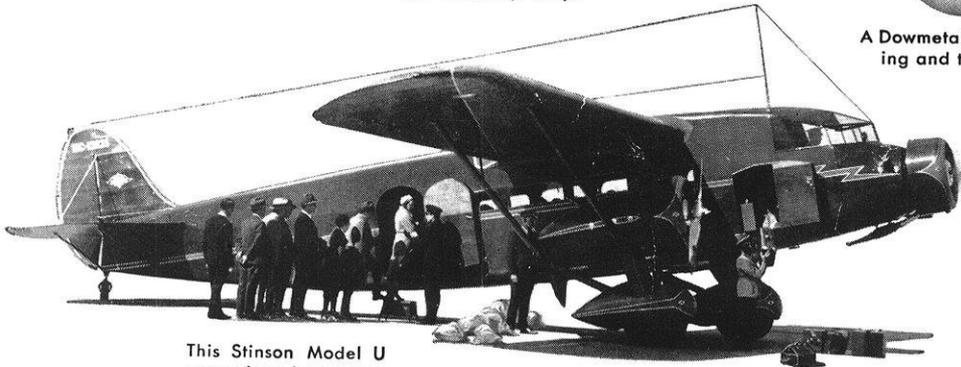
Airplane landing wheel of Dowmetal



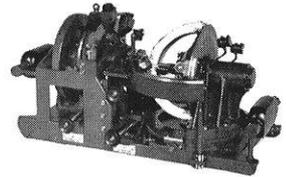
These Dowmetal castings are manufactured by the Eclipse Aviation Corporation in building their starter equipment



A Dowmetal yoke casting and tail wheel



This Stinson Model U monoplane has a number of Dowmetal parts



Dowmetal Navigation Instrument



THE lifting power of aircraft motors has increased every year. Present interest centers in the problem of utilizing this power to lift pay load instead of dead weight. It has become increasingly evident that dead weight pays no profit.

Dowmetal, lightest of all structural metals, is finding increasing favor with airplane designers and builders. Taking out a few pounds of dead weight here and there is resulting in greater pay load capacity and lower operating costs, without loss of strength or endurance.

The Stinson plane shown has a number of Dowmetal parts. Motors, instruments, wheels and starting equipment in other planes have been made much lighter with Dowmetal. Greater weight savings will be made

in the future by a wider use of this lightest metal, since it is so easily machined and may be had in the various forms of die castings, sand castings, forging, sheets and extruded shapes.

Dowmetal in its various forms will be found equally useful in other industries where weight reduction is an important factor. Write for the Dowmetal Data Book, which gives full information.

NOW YOU CAN MAKE IT OF
DOWMETAL
 MAGNESIUM ALLOYS

DOWMETAL DIVISION • THE DOW CHEMICAL COMPANY • MIDLAND • MICHIGAN

The WISCONSIN ENGINEER



Published monthly from October to May, inclusive, by the Wisconsin Engineering
Journal Association, 219 Engineering Bldg., Madison, Wis.,

Telephones University 177W · 277

Founded 1896

VOLUME 37

APRIL, 1933

NUMBER 7

CONTENTS

FRONT COVER — *Historical Library.*

MECHANICS OF SOIL FREEZING — H. F. JANDA, R. H. PADDOCK	99
ST. PAT REINSTATED AT WISCONSIN — R. H. PADDOCK	101
CAMPUS NOTES	104
EDITORIALS	106
ORGANIZATIONS	108
ALUMNI NOTES	110

Member of Engineering College Magazines, Associated

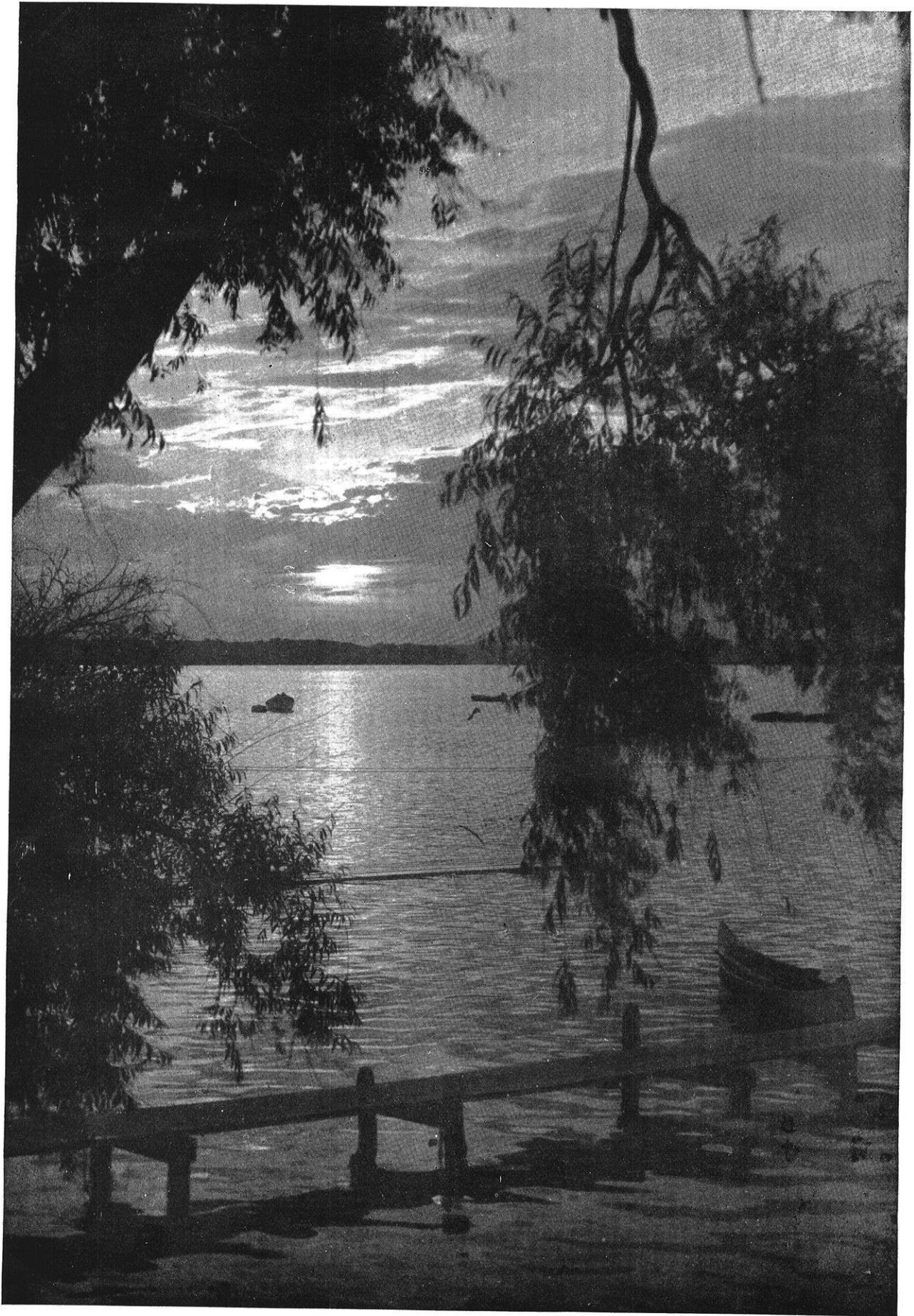
MR. ROBLEY WINFREY, Chairman, Engineering Hall, Iowa State College, Ames, Iowa

Auburn Engineer	Kansas State Engineer	Pennsylvania Triangle
Colorado Engineer	Marquette Engineer	Purdue Engineer
Cornell Civil Engineer	Michigan Technic	Rose Technic
Illinois Technograph	Minnesota Techno-Log	Sibley Journal Engineering
Iowa Engineer	Nebraska Blue Print	Tech Engineering News
Iowa Transit	Ohio State Engineer	Tennessee Engineer
Kansas Engineer	Oregon State Technical Record	Wisconsin Engineer
	Penn State Engineer	

College Publishers' Representatives, Inc., 40 East 34th St., New York

Copyright 1932 by the Wisconsin Engineering Journal Association. Any article printed herein may be reprinted provided due credit is given. Entered as second class matter September 26, 1910, at the Post Office at Madison, Wisconsin, under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized October 1918.

SUBSCRIPTION PRICES: \$1.50 PER YEAR; SINGLE COPY 25c

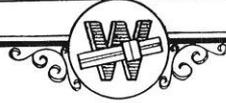


—Courtesy Blied Printing Company.

The WISCONSIN ENGINEER

VOLUME 37, NO. 7

APRIL, 1933



The Mechanics of Soil Freezing

By H. F. JANDA, *Prof. of Highway Engineering and City Planning,*
and
R. H. PADDOCK, *Assistant*

THE occurrence of those highway conditions commonly known as "frost heaves" and "frost boils" is due to definite mechanical phenomena in the underlying soils, phenomena which until only recently were but imperfectly understood.

Such road conditions are usually most noticeable on unpaved highways where the heaving of the subgrade and subsequent soft conditions in milder weather are unrestrained, but those conditions are also frequently evidenced on concrete pavements where a like heaving of the subgrade may cause serious break-ups in the pavement and even a considerable heaving of the concrete itself.

An example of the effects in the soil of such freezing action resulting in frost heaves is shown in the accompanying picture of state trunk highway 73 in Wood County, Wisconsin. This view, taken during the winter of 1931-1932, shows the presence of heaves in the grade of the highway, varying from 18 to 24 inches, measured from trough to crest. As a result of such conditions automobile speeds during the winter season on this road were necessarily reduced to about 15 miles per hour.

Similar conditions have frequently been observed on concrete highways as well as on earth or gravel roads. Serious, occasionally fatal, accidents have occurred due to motorists, unaware of these pronounced heaves in the concrete, striking such spots in the highway at speeds ordinarily not considered excessive on the given road.

Prior to the investigations made in recent years by Prof. Stephen Taber, of the University of South Carolina, and by others, it was believed that such heaving of the subgrade was due merely to the ordinary phenomenon of expansion which occurs when water turns to ice. However, it was early realized that such an explanation was

not sufficient to explain frost heaves of 18 to 24 inches, such as have been reported throughout Wisconsin, for the ordinary freezing of water without a change in temperature causes an increase in volume of about nine per cent. But most soils do not contain more than 50 per cent of moisture so that if all the available moisture in the soil were frozen the change in



Highway 73, Wood County, Showing Heaves of 18 to 24 Inches.

volume would probably not exceed five per cent.

The freezing of the moisture in the soil may be considered as taking place in an "open" system inasmuch as moisture can enter or leave the column of soil below the frozen layers. This is in contrast to freezing in a "closed" system where nine per cent is the maximum expansion obtained, a case in which no moisture enters or leaves the container where freezing takes place.

It would at first be expected that a sample of frozen soil would indicate a more or less uniform distribution of ice particles throughout its structure. Such is not the case.

The actual studies performed by Taber and others show that distinct layers of clear ice are formed in the soil.

(See Fig. Below). This is not only a fact established by laboratory experiment but has been found to hold true in the case of large pieces of frozen soil removed from a road subgrade that has been subjected to frost upheaval.

There are contained in the soil two types of water, one, free water, or that held in soil pores larger than capillary dimensions. This water will freeze at normal or slightly less than normal freezing temperatures of -1° to -4° C. The second type of water is that held in soil pores of capillary dimensions. This water, it has been found, will resist freezing at temperatures as low as -70° C.

It is this second type of water which in the proximity of the ground-water table is the chief cause of upheaval. Ordinarily, the first type does not occur in great enough quantities in the immediate subgrade supporting soil to cause serious trouble. But its contact with the second type is important. For example, a particle of this free water freezes at approximately normal temperatures. This frozen particle, experiment shows, has the ability to draw to itself from the adjacent fine capillaries the small particles of the second type of moisture, which would not freeze at ordinary temperatures. But, when drawn to the existing ice crystal, they freeze and on adhering to it increase the size of the original particle.

This process continues as long as there is a supply of water through the fine capillaries and until the work that must be done in supplying this water becomes too great. This work factor increases as adjoining voids tend to fill gradually with ice, and the water no longer has as many capillary avenues or reservoirs as formerly. "When this resistance becomes too great the flow of water to this ice layer stops and a new layer of ice begins to form near the bottom of the zone of frost penetration."¹ During this process heat is conducted away from the ice crystal in one direction while the available water supply is in opposite direction. As a result, the lens growth is in a single direction and the heave which results is vertical.

Ice layers, or lenses, so formed, tend to be thicker at the bottom than those formed near the top inasmuch as the rate of cooling is much slower at the bottom and there is a longer period for formation of the lens before the resistance becomes too great. Layers, or lenses, half an inch in thickness have been found in certain frozen soils.

It is this type of freezing which produces a heave equal to the sum of the thicknesses of the ice layers formed in the soil, and may amount to 60 per cent of the depth of freezing as compared with a five per cent expansion noted in the case of a "closed" system of freezing.

Inasmuch as the thicknesses of the lenses so formed is dependent to some extent on the size of the soil capillaries with which they are in contact, and, as the height of rise of capillary water varies inversely as the size of the capillaries, it can readily be seen that those soils that are finely divided, such as the silts, may be expected to heave to a greater extent than the coarse soils.

"Coarse soil is not conducive to the formation of ice layers, for with this type of soil it takes longer for the water molecules to attach themselves to the growing ice crystal, and because of this greater length of time, freezing might extend below the soil particle and include it in the ice, thus checking the growth of ice crystals.

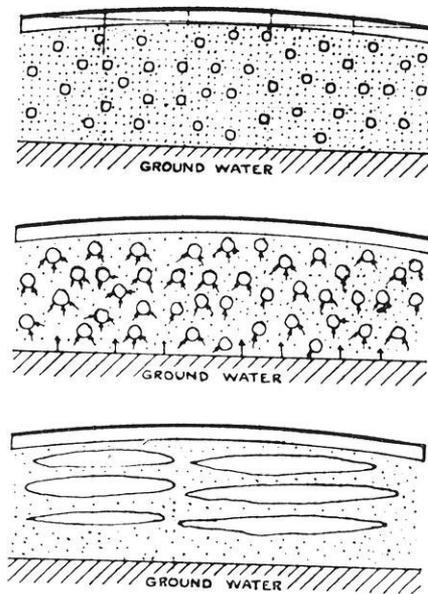
"When certain mucks and gumbo soils are frozen they do not produce excessive heaving. One might believe that this class of material, when frozen, would heave badly because of the very fine texture, but it is probable that they contain a large percentage of colloids which prevent the drawing up of the water from below."²

Excessive heaving is due not only to the type of soil present but also to the amount of moisture available for the freezing. The presence of a fine soil does not necessarily result in ice heaving but when, at the same time, an adequate supply of moisture is present and available in the soil, due in some cases to the fact that the ground water table is high enough to permit the capillary zone to extend into the supporting subgrade and freezing zone, then excessive heaving is very likely to result. In such cases the zone of capillary moisture extends upward into the zone of freezing. In contrast to this, when, due to rains, the soil is saturated from the freezing zone downward to the normal capillary fringe, similar conditions obtain.

As a corollary to the phenomenon of soil freezing and the resulting frost heaves there is the so-called frost boil which is the result of a thawing of the frozen soil.

Thawing may take place from the top downward or from the bottom upward. The former occurs when the air temperature is well above freezing, the latter when the air temperature remains just below freezing for a long period of time, and the heat conducted from the interior of the earth tends to thaw the lower soil layers and permit the downward passage of water.

Ordinarily both of these processes occur in varying degrees, though the former is the more serious in its effects on highway conditions. The top layers of ice are thawed but cannot drain through the soil below which still re-



Diagrammatic Sketch of Frost Heave.

Upper: Circles represent water particles of size freezable at normal freezing temperatures. Dots represent water particles which fail to freeze at normal freezing temperatures.

Middle: Shows frozen water particles (circles) growing by drawing to themselves the small unfrozen particles (dots) and the flow of capillary moisture from the ground water to fill the soil pores vacated by the small unfrozen water particles.

Lower: Resulting layers of ice which cause the road surface to heave.

¹ Freezing and Thawing of Soils, Stephen Taber, *Public Roads*, V. 1, 11, No. 6, August, 1930.

² *Subgrade Soils Study in Wisconsin*—H. F. Janda, (1931) page 21.

(Continued on page 111)

St. Pat Reinstated at Wisconsin

By R. H. PADDOCK

THE complete awakening after a four year slumber of the venerable Saint Pat—for long the patron saint of the engineers—proved to be the event of the year for Madison and university crowds when, leading a parade never before exceeded on any similar occasion, the engineer who drove the snakes out of Ireland marched triumphantly through the streets of Madison on the first day of April.

Never before in the history of the traditional event had there been such a large turnout of engineers; never before such a large and successful band; never had so many floats and individual competitions been entered; never had the parade been so well handled; while no parade—at least since depression days—has even drawn such tremendous crowds to the city's streets.

For four years the traditional Saint Pat parade had lain dormant — since the unmo-
lested march of 1929 with John Cullinane, c'29, as Saint Pat. The revival of the parade and all that it means in the school life of the Wisconsin engineer may be traced to *The Wisconsin Engineer*—guardian of engineering traditions.

Shortly after the appearance of the March issue of the magazine with its full page cartoon of Saint Pat lifting the law school bodily and driving out the snakes he found beneath, and a recital of tales of historic parades, the magazine was posted in its entirety on the law school bulletin board by an individual who, according to reliable information since obtained, is a member of the staff.

The reaction and handiwork of the law school was no less pointed or delayed. Students climbing the hill on Saint Pat's day—March 17—were greeted by the artistry of the lawyers displayed on the sidewalk in front of the engineering building. For everybody's enjoyment a life size sketch of one of Chic Sales' specialities had been painted with the caption—"An Engineering Product." Draped to nearby trees were sheets and rolls of green toilet paper, while the steps of the building were painted with the lawyers' affirmation that Saint Pat was a lawyer.

Engineers retaliated in the wee small hours of the next morning with a closet bowl suspended from a tree in front of the law building, and to it were attached such signs as

"This Ought to Hold the Lawyers," "These Uncanny Lawyers," and "Will the Lawyers Pull the Chain?" To the law school steps were added the appropriate painted decorations and a bit of doggerel to the effect:

"Folks cast your lamps,
On the campus bowling champs."

Effective and pointed as was this sally, it was destined to but a short life, for the shyster janitors arrived early on the scene, and but for the paint, which required university employees some hours to remove, the important evidences of the event were quickly dissipated.

But the engineers were not to be beaten so easily, and accomplished on the following Monday morning what was undoubtedly the cleverest stunt of the whole war. It must have been clever when even the lawyers admit it, and an item concerning it reached some of the New York papers.

This again was attributable to the wit of a staff member of *The Wisconsin Engineer*. And here's how it happened. The engineers padlocked the law school!

When janitors and hopeful lawyers reached their building Monday morning, they found a chain holding the front door shut, while to the windows of the doors were affixed signs done up in legal manner informing all of the official padlocking.

And the lawyers had to use the basement door until

nine o'clock that morning—after service station men had filed the chain in two!

But here's the best part of it—the chain was put in place and sealed with a link or pin of soft lead, lead so soft that the chain could have been pulled apart! But those who finally opened the school for the lawyers proceeded to file through one of the steel links!

This is the sign that met the eyes of the lawyers that morning:

KNOW ALL MIN BY THESE PRISINTS, THAT

WHEREAS: The shyster inmates of this here asylum unjustly dubbed themselves as my cohorts, and

WHEREAS: The aforementioned inmates have conducted themselves in a verra stinking manner, and

WHEREAS: The aforesaid inmates have dared to molest and attempted to degrade my faithful followers, the *Engineers*; the time for decisive action on my part has there-



St. Patrick's Regal Hack.

fore become imperative. Now, therefore, I, Saint Patrick, an Engineer, do hereby padlock this asylum for an indefinite period.

In testimony whereof I have set me mark and caused to be affixed me great seal, this twentieth day of March, in the year of our Lord, the Nineteen Hundred and Thirty-Third, and me sojourn to the University of Wisconsin, the Thirtieth.

(To which was affixed the great seal of Saint Patrick, and "Erin Go Bragh," University of Wisconsin.)



The Traditional Float.

Not content with this victory, engineers immediately started plans for the resumption of the Saint Pat's parade, an affair with which no member of the present engineering generation was acquainted, and at a mass meeting on the following Wednesday evening, March 22, such plans were definitely put under way.

The movement for a parade was largely instigated by a few of the older engineers who had seen one or two of the affairs and under their leadership the organization meeting was carried on. The civils nominated as their candidate for Saint Pat, Harold Smith, '33, captain of the 1931 football team; the electricals chose John Schneller, '33, while the chemicals selected Wayne Neill, '34.

Walther Wyss, c'33, as president of Polygon, became general chairman, but most of the work fell upon the shoulders of Aubrey Wagner, c'33, and Harrison F. Thrapp, c'32, who were appointed assistant and advisory chairmen respectively.

Other chairmen appointed at this time included Robert Schiller, c'34, parade; Zenno Gorder, c'33, elections; Herbert Kieckhefer, c'33, publicity; C. O. Clark, c'34, and Ed Bachowski, c'34, prizes; Royal Wood, m'33, finances; Al Brandlhofer, ch'33, floats; Thomas Lambeck, m'33, judges.

As notice to the lawyers that the engineers meant business, enterprising plumbers turned off the heat supply to the law building immediately following the meeting and later posted challenges on the law school bulletin boards for a snowball fight the following morning at 10:00 o'clock.

The vanguard of the engineers advanced across the snow-covered campus at 9:50 a. m. No lawyers appeared to give battle save a few hardy souls. But soon the lawyers' strategy became evident. From an upper window they shot a stream of water onto the approaching engineers, while from the rear issued the main force of the lawyers—with a case of eggs procured between eight and nine o'clock

after reading the challenge to a *snowball* battle. The engineers were taken entirely unawares, and but for the awkwardness of the lawyers who had planned to decoy the engineers closer to the building, might have been more severely dealt with. The stream of water, intended by the shysters to hold off the engineers while the egg attack was in progress, was successful only in drenching some of their own men. In spite of the odoriferous fruit hurled by the lawyers, the plumbers held their ground and retreated but slightly from their most forward position. When the campus snow had cleared away a week later the mute witnesses of the battle—egg shells—revealed themselves most plentifully sprinkled on the lawyers' half of the hill.

During the fight one engineer came from behind the shysters and was successful in destroying much of their egg supply before he was discovered. Another entered the enemy's front door and shut off the stream of water before he was discovered. Then he made his way from the building with wrench in hand to protect himself from the irate lawyers.

The engineers' shock troops, seriously egg-splattered, retired to their respective domiciles after the battle, little suspecting that another fight, partly provoked by engineers unacquainted with the first one, was to take place between 10 and 11 o'clock classes. This time only snowballs were used, but the lawyers far outnumbered the engineers and drove back the attackers to their own sidewalk where hand to hand fighting, bloody noses, and wrestling matches in the snow delighted the passing non-combatants.

In the time that intervened between this Thursday battle and the parade an almost constant guerilla warfare took place between individuals on both sides. Lawyers and engineers contrived novel schemes to bring about the discomfiture of their rivals, some being successful; others not.

Both sides immediately rushed the local hatcheries and within a short time had cornered most of the valuable egg supply. Then, on Tuesday night, while N. P. Feinsinger, associate professor of law, warned the engineers in front of their own building not to cause any property damage, Richard C. Upson, c'33, did a steeple-jack stunt and hung a green flag from the top of the law school.

During this time the election for Saint Pat had been taking place among the engineers with pep meetings and campaign talks being the topics of the day. Harry Cortright, c'32, appointed himself campaign manager for "Smitty" and though for one day the electricals put their candidate, Schneller, ahead, when the smoke of battle cleared away "Smitty" had been elected to represent Saint the parade. The final vote stood:

Harold Smith, 341,700; John Schneller, 224,600; John Brennan, '34, the belatedly chosen candidate of the mechanicals, 80,200; and Wayne Neill, 73,800. With votes at a penny a hundred and stout "billy clubs" being given with every block of 2500 votes, the supply of shillalabs was soon exhausted. To Cortright went the credit of getting contributions from engineers in the city and state employ, as well as from the faculty. One capitol employee put in his "two-bits" on Cortright's guarantee that the parade would go around the Square, and Harry was even success-

ful in getting Roundy Coughlin to come through to the tune of "six-bits."

An important meeting was held Thursday night, the 30th of March, as authorities became fearful that the parade might assume serious proportions and cause even worse property damage than the historic affair of 1925. With the deans and student leaders of the two schools in session, a decision was reached to ban all eggs from the parade, the lawyers agreeing to make no attempt to hinder the parade, the engineers agreeing to carry no eggs in their floats and to limit their jibes at the lawyers to one float. The official statement read:

"The law school pledges itself to interfere in no way whatsoever, whether by the use of missiles or otherwise, with the engineering school parade Saturday. The engineering school will eliminate from the parade all floats and signs pertaining to the law school except a single float, which has been traditional. Both schools will use their best efforts to see to it that no further use of missiles or chemicals will be made whether in connection with the parade or thereafter."

Signed: F. E. TURNEAURE
L. K. Garrison

Both lawyers and engineers spoke in praise of the manner in which Dean Turneaure maintained at the conference that the parade should go on. In his own quiet but assuring way the dean won the hearty approval of even the belligerent lawyers for his firm stand.

As a result of this agreement the lawyers canceled contracts and plans for chemicals which they had been assured would, if used, make State street untenable for eight hours thereafter. Arrangements for smoke and tear gas bombs, for barbed wire, for fruit, and for other missiles in addition to the henfruit were dropped.

An engineering meeting Friday morning, at which the dean explained what had happened and what had been promised for the parade, assured the leaders that the engineers were heartily behind the parade, better even than had been expected.

With more than 20 floats entered in the competition for approximately \$200 worth of prizes garnered from local merchants by Clark and Bachowski, the engineers either changed the direction of their sallies or combined them on one big float on the longest truck trailer in Madison—a 30-foot one. Schiller obtained in Middleton an ancient but regal hack which was to be Saint Pat's carriage. Kenneth (Moose) Kruger, c'33, organized an adequate police force, well armed with the green-painted shillalaha, while Paul Corp, m'33, and Jerome Zibell, c'32, enlisted the largest band ever to head a parade in honor of Saint Pat.

The engineering building and the hydraulics building were the scenes of such activity Saturday morning as the floats took form that at about 2:00 o'clock that afternoon, the procession was able to get under way. For the previous two weeks the route of march had been advertised as up State street to the Square, around the latter and thence down Langdon to the lower campus. Permission had been granted by the police, and the parade was to go on in spite of three attempts of the lawyers during the preced-

ing week to obtain injunctions to prevent it. During the entire time engineer leaders had planned to reverse their line of march, and though many other secrets leaked out, this was one which proved inviolate and a surprise even to the police. Its success was attested by what happened later on in march.

Among the many floats which strung out behind each other for almost half a mile, there were a number of cracks at the Rambler, the but recently removed scandal monger of the Daily Cardinal, the Badger, Doc Meanwell's Fieldhouse, The Daily Cardinal, the L and S school, the Home Ec mixers, and on the one large float—the Law school. Among the individual and two man stunts were amusing Irishmen, Diogenes looking for an Honest Lawyer, two entrants arrayed as a camel—"Out for a Bier," Irish scrub ladies, and Girl Scouts.

As the parade turned up Langdon, the crowds—the largest seen in Madison for many years—swarmed over from State street and filled the sidewalks and streets to the very edges of the floats.

The first eggs, reputedly thrown by a commerce student, hit the parade at Langdon and Henry streets, but the engineer police were quickly in pursuit and had the offenders in hand to turn over to the police. Youngsters threw occasional eggs as the parade continued up Langdon.

A halt was made at the corner of East Washington avenue and the Square while the band played "Erin Go



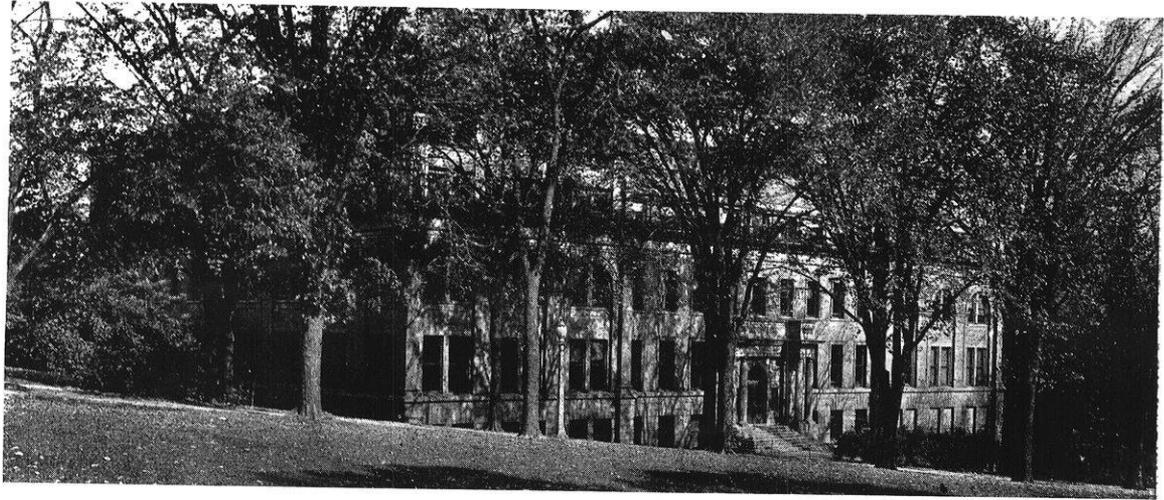
Mob Watching Engineers Kiss the Blarney Stone.

Bragh" for the crowd and Saint Pat made a personal appearance.

As the procession neared the campus district on State street engineers were expecting and got a more serious attack than that on Langdon. Madison police had previously combed the roofs of nearby buildings and the egg attack did not come until Saint Pat reached the corner of State and Lake, where one well-directed missile knocked off his top hat. "Smitty" was out of the hack in a second, attended to the egg-hurler in another second and was back in the hack. His attendants, John Schneller and Richard Haworth, e'34, riding atop the carriage, also took part in the melee, while the team of spirited percherons hauling the carriage seemed but little disturbed.

Having taken adequate care of the attackers, the parade

(Continued on page 112)



« CAMPUS NOTES »

FELLOWSHIPS AWARDED

Fellowships for the year 1933-34 were voted by the engineering faculty on March 27 to Charles G. Watson, Madison, James G. Van Vleet, Madison, and Walther E. Wyss, Medford. The selection was made from a list of 112 candidates from 52 colleges and universities.

Charles C. Watson, son of Prof. James W. Watson, was graduated from the course in chemical engineering at Wisconsin in 1932 with an average grade for his four year's work that is the highest on record. He has been doing graduate work on a fellowship during the present year.

James G. Van Vleet, originally from Milwaukee, was graduated from Wisconsin with honors in 1930 from the course in electrical engineering. For the past two years he has been an instructor in mechanics.

Walter E. Wyss will be graduated from the course in electrical engineering in June, 1933. He has been largely self-supporting while in the university, but has been able to win scholastic honors and to devote considerable time to college affairs. He was president of Eta Kappa Nu, honorary electrical engineering fraternity, recording secretary of Tau Beta Pi, and president of Polygon.

ENGINEERS ELECTED TO PHI ETA SIGMA

	Credits	Grade Points
Carow, John	18	46
Halamka, Charles J.	17	50
Williams, Tom J.	17	50
Gordon, Donald	16	47
Gillies, James A.	17	48
Hertel, Roland F.	17	46
Whiteside, Robert E.	17	46
Wagner, Eldon C.	17	45
Wright, John F.	17	45
Senske, Wm. M.	17	44
Larzelere, Jack S.	17	43

The initiation will be held in conjunction with the national convention of Phi Eta Sigma which will convene here on April 14 and 15.

FENCING ENGINEERS

Fred Judson, agricultural graduate, and Phil Judson, m'33, are upholding the engineer's standard in the field of fencing, the ancient sport of nobles. The fencing team visited Milwaukee, and while there, defeated both the Country Day School team, and the Boucius, an athletic group. A return match is planned with Boucius. The team also conquered Northwestern and Chicago, taking fourth place in the conference; Fred Judson obtained third place in the use of the "epee" or broadsword.

HEY RUBE!

John T. Dibble, c'35, Orville B. Thompson, c'34, and William Hodgins, c'35, form the nucleus of the Wisconsin Player's stage crew this year. As usual, "John T." got to be foreman on the job, so that he now tells the others how to do the work. The innate modesty of the true engineer is evidenced by the obvious reluctance with which the above gentlemen have taken inadvertent curtain calls a few times in recent productions.

"John T.", aspiring to the better things, secured a part in the Player's latest production, "Caesar and Cleopatra". In the earlier portions of the play, Mr. Dibble portrays the part of an Egyptian thoroughly scared by a Roman soldier offstage. In the latter portions of the play, he portrays the part of the Roman soldier, previously offstage, who scared the Egyptian. Mr. Dibble anticipates adding a personal touch of realism in the first instance.

Frank Weinhold, e' graduate, has charge of the sound apparatus used by the Players in the presentation of their foreign films. He has been pleasantly surprised several times lately when the apparatus actually worked.

The revolving stage constructed by Elmer Van Lare, c'34, a year ago, is

still functioning nicely. The only fault with the revolving stage is that, at the time of construction, the Players were short of funds, and steel castors were placed under the stage. Naturally, these create quite a racket. The theatre stage covers two ventilators which open directly to the audience. These ventilators are excellent megaphones and help keep the audience informed concerning movements backstage. Mr. Dibble has lately taken to wearing slippers backstage.

WASHBURN OBSERVATORY REJUVENATED

The mounting of the 15.56 inch telescope at Washburn Observatory, which has been used for 54 years, is being torn down to make way for a new and modern mounting. The new mounting will have a part concrete and part cast iron pier instead of an all concrete pier as heretofore. The new mounting will be fitted with new controls and governors specially designed to promote ease of maneuvering. The new controls were built in the university machine shops.

Washburn Observatory was the scene of some of the earliest work on the measurement of star distances and has lately figured in the latest work on the same subject. The latter work consists mainly of correcting and checking previous data on star distances. A new device to measure the amount of light received from the distant stars was invented by Dr. Albert E. Whitford of the physics department. The device is a modified form of the photo-electric cell.

FACULTY MEMBERS SHOOT BALL ON ALLEYS

The Faculty Bowling League held its Spring Sweepstakes recently, and the 'Sons of Erin' in the League cleaned up on the boys and walked off with the majority of the cash prizes. The individual scores for the three game series are given below:

Member	Score	Prize
L. A. Wilson	520	\$1.25
G. H. Barker	558	1.00
R. R. Worsencroft	414	.75
J. W. McNaul	508	.50
A. V. Millar	459	.50
K. G. Shiels	503	.50
J. J. Novotny	440	.50
E. D. Ayres	423	
B. Bridge	472	
L. F. Van Hagan	395	Rubber crutch

ENGINEERS PLAY IMPORTANT ROLE IN MILITARY BALL ARRANGEMENTS

Ted Weems and Maurie Sherman will provide the music for the 1933 Military Ball to be held on April 28, according to Lorenz A. Leifer, e'33, assistant chairman in charge of publicity. The date of the ball was changed from April 21st as announced in the last issue of the Engineer so that Weems could be obtained.



L. A. LEIFER, e'33 to furnish some of the best music and entertainment ever presented on the campus," said Clyde F. Schleuter, e'33, assistant chairman in charge of arrangements.

"These orchestras can be relied upon



Military Brawl

This is the first time that the ball, the second most important social event of the school year, is practically directed by engineers. Other engineers who are assisting general chairman, Oliver A. Grootemaat, '34, are: Orville B. Thompson, c'34; Aubrey Wagner, c'33; Arthur Treleven, ch'33; and Edgar Krainer, e'33.

MECHANICALS vs. CHEMISTRY

Mr. M. L. Holt, instructor in chemistry, had just finished drilling the class in the reactions resulting from the addition of nitric acid to tin.

Mr. Holt: "I'll bet that within twenty minutes someone in this class will tell me that the end product is tin nitrate."

Thomas Murphy, m'37: "I'll take you on that for a nickel."

Ten minutes later Mr. Holt collected the nickel from Murphy for writing "tin nitrate" at the end of his own work.

POTENCY OF BLARNEY STONE UPHELD

Arthur B. Magidson, c'34, was declared the winner in the finals of the D. B. Frankenburger Oratorical contest staged Wednesday evening, March 8th, in Bascom theatre. As winner of the contest, Mr. Magidson will be awarded \$100.00, and is given the privilege of representing the University of Wisconsin in the Northern Oratorical League finals that are to be held this year at Iowa City on April 6.

HOT AIR

Professor Kinne reports that his student days at the University were also plagued by the courses now known as "Steam and Gas". "In fact," he said, "we liked the courses so much that we reverently referred to them as 'Thermogoddamics'."

EARTHQUAKES

The recent southern California earthquake had no connection at all with the previous San Francisco quake according to Mr. Sharp, seismologist, stationed at the University. The San Francisco quake occurred along what geologists term the San Andreas fault, and the component of motion parallel to the fault was approximately sixteen feet. It was this motion which severed the water mains laid across the fault, and made the damage done by the fire following the quake so extensive.

The recent quake occurred on a fault plane located about half way between Long Beach and Catalina Island, the zone of greatest disturbance centering around Long Beach. It was not a very large quake in comparison to others which have occurred in the past few months. The western Nevada quake of December 21 was more than twice as violent, and the Japanese quake of March 2 was over ten times as violent a disturbance.

The final results on the recent California quake are: 144 killed, 5,000 injured, and approximately \$35,000,000 worth of damage done. It was extremely fortunate that the quake occurred at night, for many school buildings suffered severe damage, and it is certain that the list of dead would have been augmented had schools and other such activities been in session.

« « EDITORIALS » »

STAFF

C. O. CLARK, c'34, *Editor*
H. H. KIECKHEFER, c'33, *Advisory Editor*
L. G. JANETT, ch'35, *Assistant Editor*
R. L. ENGELHARDT, c'34, *Campus Editor*
J. N. KLEIN, c'33, *Alumni Editor*

W. K. NEILL, ch'34, *Business Manager*
R. H. WOOD, m'33, *Advisory Business Manager*
C. A. LYNEIS, JR., c'33, *National Advertising*
H. E. MEYTHALER, c'34, *Local Advertising*
W. N. VOLK, c'34, *Mail Circulation*
J. A. LISKA, c'35, *Local Circulation*

BOARD OF DIRECTORS

G. F. TRACY, Electrical Engineering Department, *Chairman*
J. B. KOMMERS, Professor of Mechanics
F. E. VOLK, Librarian, College of Engineering
R. S. McCAFFERY, Professor of Mining and Metallurgy
F. T. MATTHIAS, *Faculty Advisor*

C. O. CLARK, c'34, *Editor*
W. K. NEILL, ch'34, *Business Manager*
O. L. KOWALKE, Professor of Chemical Engineering
G. L. LARSON, Professor of Steam and Gas Engineering
L. F. VAN HAGAN, Professor of Civil Engineering

SURE 'N' IT'S ONLY FUN, COLLEEN The most heart breaking event of the whole St. Patrick's parade occurred when one of our biggest engineers, who missed his calling when he took engineering instead of police duty, had to stop his skull-cudgelling long enough to explain to a pretty Irish miss that St. Pat wasn't as much of an excuse for a parade as for a good fight. There never was anything quite as effective as a solid fist in the eye for knocking out a few worries about bank failures and Thermogoddamics. The biggest regret is that there were not more of our less beloved instructors on the side of the opponent.

It's been a long time since the university has had as much fun as it has had lately. The most hearty laugh we've seen for years was on the face of an engineer coming into the building with an egg in one ear and another in his shoe. That snowball fight was much more relieving than the baseball games of the past years. And it is very doubtful if any of the bystanders were injured any more by the stray eggs than they might have been by pop bottles or sailing straw hats. The only kicks about the parade that we've heard have come from a few individuals who found that the shoes we handed out fitted, making their feet look too much like hams to meet with their approval. Is it our fault if people bring themselves in line for a rap by acting like hams?

There was a great deal of truth in those floats. But we only had shells on the floats; some of the organizations rapped have the real stuff in them. Admittedly the humor was broad and obvious. It was also indiscriminant. Indeed it conformed well to the campus standard set by the Daily Cardinal except that in no case was it malicious.

In building the floats Saturday morning or in remodeling them after the edict of the previous day, and in the excellent management of the entire affair, the engineers

set standards to be coveted by later organizers. If the parade was a free burlesque matinee for the public of Madison, it served well. If it caused you to roll in the aisle and split your sides, so good; if it caused you to squirm in your seat and get red behind the ears—well, maybe you'll learn.

WHAT IS REPRESENTATION? In a recent editorial of the *Daily Cardinal* another attempt has been made to bring together a student council to aid in crystallizing student opinion and to bring about co-ordinated action on student problems. The article suggests that the ten members of the council consist of the heads of various student organizations on the campus. Of these ten representatives suggested, the presidents of the Men's Union, the Forensic Board, W. S. G. A., the Interfraternity Council, and the Senior Class, respectively, are members who secure their offices in whole or in part through winning student elections. Until student elections evolve to the point where they are fair approximations of genuine student opinion, the offices mentioned cannot be construed as being filled by representatives of the student body as a whole. Of the remaining five members of the board, the Cadet Colonel of the R. O. T. C., the president of L. I. D., and the president of the "W" club are men who represent distinct individual organizations whose membership is limited. If these latter group of members be chosen there is no reason why student religious groups, music and dramatic organizations, student professional organizations, and a host of other extra-curricular activities should not be represented in the list.

What, then, does represent student opinion? If one would represent seven thousand students one would try to reach the students. Every student can name a few of his colleagues in his own school or college who are primarily well-known, respected, and capable students. If those truly representative students from each college and school could be organized as a council they would command the

vital attention of the entire student body. Until the students become acquainted with the men who represent them, one cannot expect student recognition of the actions of these boards and councils. This council could be chosen by the faculty members of each department of the university with the express purpose of enlisting those students who are natural leaders and who have the friendship and moral support of their classmates. There are many young members of the faculty who are far more capable of judging the student pulse than are the pseudo-politicians in this university.

If true representation is to be attained, either all extra-curricular organizations must be represented or the council must consist of representatives from the several departments of the university.

LOST: SIXTY MINUTES TWICE EACH WEEK If you ever have an hour in the morning and not a thing to do during that time; if it is sixty minutes to be completely wasted, let us suggest to you that you look into one of the little red time tables and find out where there is an econ quiz section being held that period. Avail yourself of the opportunity of visiting the depression solvers for the hour; your time will be effortlessly but completely wasted. You will not in any way be exposed to the possibility of learning anything nor will you leave with any doubt in your mind as to how thoroughly your time has been wasted.

A great many funny things can happen in a course that is poorly organized. Did you see any of those funny grading curves for the last hour exam that was given in Econ 1a? The curve for the whole course really wasn't so bad, after adjustment by the sliding scale, because the grades were adjusted to make the curve look about right, but the adjustment didn't improve the curves for the sections any. It may be perfectly possible to have a section of thirty or more students who are of such calibre that, given the same instruction, one section will blossom forth with a large number of A's, B's, and E's with few C's and D's, while another has absolutely no marks above C, but we're from Missouri. Such a thing might be possible if one section were entirely composed of dumb engineers, but when each section is a cross-section of the entire campus, one needs a blindfold and a dark night to see it clearly.

We remember another course over there in Sterling Hall that was a waste of time, too. The instructors there probably knew their field well enough but they surely did not know how to keep their sections talking about it nor how to get it across in lectures. That was the Physics department. We thought then that when they got around to re-award the fellowships some of the poorer instructors would leave, but our successors tell us that such has not been the case. They still hear a detailed discussion of the Einstein theory when they are having enough trouble trying to understand Newton's third law.

Perhaps the faults of the courses do not lie in lack of organization. Nevertheless, the impression is left with the students that the instructors do not know what they are talking about; the confidence for the teachers is lost. A PBK key on the watch chain of a tongue-tied instructor doesn't help at all to instill confidence in flunking students. Perhaps if there is nothing wrong with the courses they could be held after midnight in dormitories where there are some soft beds. At least the time spent in going to them would then be of some use.

UNDERCURRENTS About eight months ago a young man was hauled out of one of our northern rivers, having narrowly escaped drowning. When he came to sufficiently to discuss his adventure, one of his first statements was, "I didn't realize that the undercurrents were so strong. In fact, from the surface, one would not realize that there were any."

A good university rests on a foundation of undercurrents, too. Its reputation among the colleges of the nation rests jointly on the quality of the graduates it presents to the world and upon the quality of the research carried on in its laboratories and libraries. Most of the discoveries of this university find their way to the public through the university bulletins. From the laboratories of Wisconsin came what has been called "the greatest contribution to the American farmer," the Babcock milk test. Although all of the university undercurrents may not be as significant to the mass of our people, the real import or total contribution of our experimentors cannot be exaggerated.

During the past few months the legislature has been engaged in reducing the educational budget in this state. While a good many of the legislators know how a large university operates, the statements made by some have shown that they regard the university as a kind of luxury which affords added education not absolutely necessary. We do not wish to criticize the actions of the legislators adversely, but we wish to remind them of the dangerous results which may follow the damming of the undercurrents of the university which cannot be measured by the surface rah-rahism of modern collegiate life.

"It was President Hoover's function to conduct the rear-guard action of conservatism against the forces of indiscriminate upheaval and by his choice of ground for battle to determine the character and direction of the changes which he, and every other intelligent member of his Party, knew were both necessary and inevitable."

—Jay Franklin in *January Vanity Fair*.

"In Britain, as in the United States, high nominal wages are maintaining living costs at an abnormal level, while lack of employment is causing actual wage-earnings to be abnormally low, and the wage-workers as a body are anything but prosperous."

—December Letter, *National City Bank of New York*.

« CAMPUS ORGANIZATIONS »

SAMP EXPLAINS MONEY SITUATION TO MECHANICALS

Declaring that the present embargo on gold as established by the federal government is of vital necessity to the welfare of the nation as a whole, Mr. Edward J. Samp, the Republican candidate for State Treasurer last fall, pointed out to the student members of the American Society of Mechanical Engineers Thursday evening, March 16, 1933, that an inflation of currency by a re-establishment of the value of gold in its relation to the American dollar is one of the ways of ending this depression, and that the concept of the idea that gold is a medium of exchange must be substituted for the idea that gold is a medium of control before the re-defining of the dollar can be satisfactorily accomplished.

Before going into a detailed discussion of the present depression, Mr. Samp prefaced his talk with a brief review of the various panics, both major and minor, which have occurred in these United States, and showed the similarity between the present world-wide conditions and those which existed during the major panics of 1837, 1857, 1873, and 1893, all of which, he claimed, were due to an over-expansion of the credit structure of the country, and all of which occurred with startling regularity. Preceding each panic, including this present one, business experts and leading economists have declared, "there is no similarity between this business boom and those which preceded the other panics; conditions are entirely different and the country is stabilized," only to find that an after-analysis proved that each one followed the same trends of its predecessors.

Digressing a little, Mr. Samp, with a smile, then gave the following advice to would-be speculators:

1. Do not buy on margin; buy outright.
2. Do not watch the stock market pages of the newspapers.
3. Sell when the front page gives notice that all people are buying.
4. Buy when the front page says that people have been selling for a long time.

He then predicted that each speculator would, sooner or later, have the opportunity, for better or for worse, to benefit by his own experience.

The stimulation of business, declared Mr. Samp, after each depression can be accomplished by the necessary replacement of stock, by a war, by the development of a new industry, or by governmental action. In former years, the individual helped himself, developing this so-called "rugged individualism"; at the present time, this charac-

teristic is lacking, and the majority of the people await governmental action in spite of the fact that the Farm Stabilization Board and the R. F. C. seem to have accomplished merely a smoothing and lengthening out of this period of price and credit deflation.

"According to sociology," said Mr. Samp, "the productivity of man has increased from just what was necessary for existence, to ten or twelve times his saving capacity and consequently he can borrow no more than ten or twelve times this capacity without going into debt. Right now the public loan exceeds 100 times this saving ability or is about nine times the normal ability. To reduce this loan, three paths are open: inflation, repudiation, and revolution. The most preferable of these is inflation, because it can be accomplished, legally, by a re-defining of the relation of gold to the American dollar."

KAISER CHOSEN TO REPRESENT MECHANICALS

Elmer Kaiser, m'33, was unanimously chosen to represent the Wisconsin student branch of the American Society of Mechanical Engineers at the student branch conference to be held in Chicago, April 28 and 29.



The selection was based on the outcome of an open competition in which papers were presented by members of the organization. Mr. Kaiser's paper on "Progress in Coal Briquetting" was judged to be the best, and he will have the oppor-

tunity to enter it at Chicago against winners from other student branches in the middle-west. There, cash awards of \$50, \$25, and \$10 will be offered, and it is understood that the Wisconsin representative has been warned not to return without the \$50 prize.

Cris Hanson was awarded second place in the local contest, and was presented with a cigarette box of beaten silver. His paper was on "Progress in the Prevention of Smoke and Atmospheric Pollution". Papers were also given by Theodore Eserkahn and Thomas Lambeck. Professors Jansky, Larson, and Elliot acted as judges.

The following officers were elected for the coming year:

President ----- Joseph Ermenc
 Vice-President ----- Lawrence Allen
 Secretary ----- Felix Gnauch
 Treasurer ----- Robert Stoessel
 Polygon Representative ----- Royal Thern

Arnet B. Epple is the retiring president.

(Continued on page 111)

TAU BETA PI

John E. Brennan, m'34
 Robert L. Engelhardt, c'34
 George M. Hausler, m'34
 Arnold J. Hoiberg, ch'34
 William H. Horton, min'34
 D. Robert Howell, e'33
 Robert G. Matters, ch'34
 Henry L. Mohn, m'34
 Philip C. Rosenthal, min'34
 Melvin W. Stehr, e'34
 Robert F. Stoessel, m'34
 Joseph W. Zack, c'34



It takes *resourcefulness*...

Time and again, Bell System engineers have demonstrated their pioneering bent in working out unusual telephone construction problems.

For example, they laid a huge conduit under the Harlem River. They dredged a trench in the river bottom, lowered enormous sections of iron pipe, sent down divers to join the sections, encased the finished tube in concrete. Through this they ran telephone cables forming one of

New York's main lines of communication. Across the Gila River in Arizona they constructed a catenary span 2373 feet long. To bridge oceans, they developed radio telephony. They have built telephone lines over mountains, across deserts, through swamps.

Their resourcefulness in getting through, over or under natural barriers makes possible telephone service that is practically world wide in reach.

BELL SYSTEM



SAY "HELLO" TO MOTHER AND DAD
...RATES ARE LOWEST AFTER 8:30 P. M.

« ALUMNI NOTES »

CHEMICALS

Coleman, E. D., ch'22, who is now in the research department of the Nubian Paint and Varnish Co. of Chicago, made us a visit in March.

Popkin, H. R., ch'30, after spending the winter in Florida, has returned to Superior, Wis., to help his father.

Garvens, Howard L., ch'29, seems to have found his connection with the Aluminum Corporation of America, at Milwaukee, sufficiently profitable and secure because he embarked upon the sea of matrimony, sailing on February 25. The bride was Ruth Nashland of Kenton, Mich. The couple is at home at 1429 Martha Washington Drive, Wauwatosa.

Giles, Ralph W., ch'25, is now working with the Smith, Kline, and French Laboratories, Philadelphia, as development engineer. His address is 209 Lantwyn Lane, Narberth, Pa.

Boehmer, H. R., ch'15, who is working for the Standard Oil Co. at Sugar Creek, Mo., writes that he is grooming his son to enter Wisconsin soon.

McNaughton, George C., ch'09, C.H.E.'15, who was formerly located in Savannah, Ga., is now connected with the Everett Pulp and Paper Co. at Everett, Washington.

MECHANICALS

Conry, Clifford E., m'28, one of Wisconsin's great centers during his days in college, visited the campus on March 28. He has left the J. P. Marsh Co., and is now with the George B. Smith Chemical Works of Springfield, Ill.

Niederman, Philip H., m'25, c'26, of Milwaukee, is engaged to Mary Wade of Oak Park, Ill. Miss Wade was formerly a student at Wisconsin.

Hanson, Earl, m'22, who recently returned to the United States after an 18,000 mile expedition through the mountains and jungles of South America for the Carnegie Institute, is now planning for adventures of a different type. He intends to apply for a place in the balloon which Prof. Auguste Piccard expects to send more than ten miles into the stratosphere over Hudson Bay. Hanson is acquainted with the Hudson Bay region, for in 1929 he made surveys of the flying conditions there.

Greiling, David J., m'24, is an engineer with the Apex Electric Manufacturing Company at Cleveland, Ohio. His address is 1809 Roxford Road, East Cleveland.

Maurer, H. J., m'24, is working with the Reinke Sheet Metal Works, 904A N. Market Street, Milwaukee.

Hansen, Clarence F., m'20, is now designing engineer for the EL Segundo Refinery of the Standard Oil Company of California. He was formerly plant engineer for the Pasotex Petroleum Company in Texas.

Edmund, H. W., m'11, is now located in San Francisco, working for the Standard Management and Operating Corporation.



—Courtesy Steel.

C. W. BENNETT

Bennett, Charles W., m'92, was recently named acting president of the American Sheet and Tin Plate Co. of Pittsburgh. He has been with this company for the greater part of his 41 years in the steel industry. After graduating from Wisconsin in 1892, he was employed by the Illinois Steel Co., and after five years was made mechanical engineer of the Ellwood, Indiana plant of the American Tin Plate Company. Shortly afterward the American Tin Plate Co. became a part of the newly formed company he is now heading. At first Mr. Bennett was district manager of the Indiana plants of the company, with headquarters at Ellwood. From 1906 to 1925 he was assistant to the president, and in 1925 was made vice president in charge of operations of the company. On January 1, 1933, the president, Mr. Parguy, obtained a year's leave of absence and Mr. Bennett was named to take his place.

ELECTRICALS

Prideaux, Gwilyn F., e'22, has recently been awarded a Charles A. Coffin Foundation Award from the General Electric Co. Mr. Prideaux, who is in the Incandescent Lamp Department of the General Electric Co. at Cleveland, was cited for his development of the photoflood lamp which makes possible indoor movies and still photographs by amateurs. He found that the 64-volt, 100-watt Mazda train lamp, when used in the ordinary 110-volt home circuit, would last for about one hour and produce light equivalent to a 750-watt general-service lamp. With modifications, this lamp was later placed on the market as the photoflood lamp.

Sumnicht, H. A., e'10, has been transferred by the General Electric Co. from Cleveland to St. Louis where he is now manager of the St. Louis Lamp Works of that company.

CIVILS

Henrickson, Ralph, c'31, is station attendant for the Standard Oil Co., in Madison. He is living at 607 Clemons Ave., Madison.

Kikuchi, Kaworu, C. E.'26, has just recovered from a long illness that followed his return to Japan, and is now superintendent of construction for Ohbayashi Gumi Limited on the new Osaka station of the government railway. Kikuchi was married a year ago to Ayako Tsuchiya, who holds a degree of M. A. in sociology from Columbia University.

Wheaton, Herbert H., c'22, who is Associate Member of the American Society of Civil Engineers Freeman Traveling Scholar for 1932, is the author of an interesting article, published in the February issue of "Civil Engineering", describing the model built in London predicting conditions at the mouth of the Rangoon River, Burma, in British India. The model is arranged to complete a tidal cycle in 76 seconds, so that a week's operation will represent ten years. All the natural phenomena of tides, currents, winds, and flow are to be reproduced by mechanical means. The model when first built will represent the delta of the river as it was in 1877 and will be operated long enough to indicate the conditions expected in 2000 if no improvements are made.

FROST BOILS

(Continued from page 100)

mains frozen. The super-saturated condition of the soil which results is what then becomes known as the "frost boil."

The freezing and thawing processes may not be completed at any one time. During winters such as are frequent in Wisconsin, and more particularly in the early spring, thawing and refreezing of the top layers may frequently occur. From such causes more serious heaving of pavements may result inasmuch as the soil, upon thawing, is left in an unconsolidated state and, as has been shown by Taber, the heaving from soils in an unconsolidated state is much more serious than from those in a compacted condition.

The general nature of the phenomena causing frost heaving and frost boils is far from a completed story. While the results of the experiments and theories of various laboratory investigators and the results of other field observers appear to be reasonably satisfactory in the explanations thus provided, it is not at all unlikely that further investigation may reveal that the present theory but partially explains the observed conditions.

The practical application of this information forms the basis of the subgrade studies now being carried on in connection with highway work. Examples of the benefits and economies obtained by these methods are numerous, not only in Wisconsin, but in these other states of the nation where subgrade investigations are being made. A few examples of Wisconsin results may be cited to show the nature of the findings.

Considerable trouble had been experienced with the concrete paving of S. T. H. 57 in Milwaukee county which had been paved with concrete for several years, but had cracked badly in one stretch. A few years ago this patched section was patched with new concrete, but this, too, cracked. Repaving was necessary in 1932 at which time soil surveys of the subgrade material, made after the slab had been removed, showed that under the cracked pavement areas there was a layer of black, gummy marsh type of soil, varying from 12 to 18 inches in thickness which had been placed over the lower sandy fill material. This material was absent or was but an inch or two in thickness at places where the pavement slab had been cracked but slightly.

On S. T. H. 13, at a point about eight miles north of Wisconsin Rapids, a six-inch winter heave is regularly reported. Investigation revealed that, though the road was generally higher than the surrounding country, at the point of heaving a sandstone ledge below the surface blocked the drainage of water trapped in a 10-inch layer of wet, sloppy fine sand.

Numerous examples have shown that where a road follows the foot of a hill, especially where water bearing sandstone exists in the hillside, serious subgrade disturbance is likely. This is the more likely to be true when the subsoil of the road is of a silty or silt-loam type. Such condition is due to the downward percolation of underground water in the hill to the foot of the slope where it then finds its way into the subsoil of the road.

At times a road is found to be so located that half of its subgrade is of sand, and half of a clayey type. Where the sand carries water, heaving will result, inasmuch as a case of blocked drainage occurs.

Likewise, silts, or silt loam soils, lying over a stratum of water-carrying gravel often give trouble from frost action because they possess a high capillarity and pull water upwards for a considerable distance.

Strange as it may seem, roads have actually been found where springs had their outlets underneath the road's surface. It is inevitable, with almost any type of soil, that under such conditions surface failure will result. But subgrade surveys have frequently been necessary to bring such matters to the attention of those in charge.

Surveys carried forward in the state have revealed, in addition to those points already mentioned, that frost heaves and frost boils are most likely to occur where the road grade crosses a contact between sandstone and limestone, in rock cuts, near the mouth of any soil cut, in cuts through drumlins and moraines, and where a lower stratum of the subgrade is of a "quicksand" nature.

To the location and solution of these and similar problems, subgrade investigators have directed their efforts, realizing that, as with any structure, a road is no stronger than its foundation.

ORGANIZATIONS

(Continued from page 108)

PI TAU SIGMA

Mr. F. H. Dorner, of the engineering department of Cutler-Hammer Co., Milwaukee, was made an honorary member of the Wisconsin chapter of Pi Tau Sigma at its spring initiation last month.

Eight junior mechanicals were initiated into the active chapter: Donald B. DeNoyer, Douglas N. Evans, George M. Hausler, Luverne F. Lausche, Salvatore A. Mollica, Joseph J. Peot, Robert M. Rood, and Robert F. Stoessel.

ETA KAPPA NU

The following electrical engineering juniors will be initiated into Eta Kappa Nu on Thursday evening, April 20: August O. Bartel, Shirley A. Heider, Karlton A. Krasin, Alvin O. Lund, James C. Lyke, and Harry G. Sellery.

CHI EPSILON

Chi Epsilon held its spring initiation March 22nd in the Beefeater's room in the Memorial Union. The men initiated are: Reginald Price, Harold Trester, Arthur Lemke, Richard Dittman, Eugene Gradt, and Lloyd Dysland. Captain Remington Orsinger, Assistant Professor of Military Science at the University of Wisconsin, related some of his experiences in the World War. Professor Kinne officiated as toastmaster at the banquet. Officers in charge of the initiation and the banquet which was well attended by faculty members were: J. Kaysen, A. Freas, R. Engelhardt, P. Morgan, and W. Lefevre. The interest which was shown by the faculty is sincerely appreciated by the chapter.



Bill Purnell *says*
**Tailored for
College Men!**

...these suits are made the way college men like...with the proper tailoring details that bespeak conservative taste...an excellent showing at...

\$18.50

Others at \$23.50 and \$28.50

The CO-OP

STATE at LAKE

Thesis Time!

Let us remove that worry by typing that thesis or topic.

Our work is guaranteed!

REASONABLE RATES

The College Typing Co.

720 STATE STREET (Rear)

ACROSS THE CAMPUS FROM THE LIBRARY

Phone Badger 3747 — Open 7:30 A. M. to 9:00 P. M.

ST. PAT REINSTATED

(Continued from page 103)

continued after this brief halt to the lower campus where a few of the Saint Pat certificates were awarded and the ceremony of kissing the blarney stone was shown to the crowd. The mob was so huge and unruly, however, that the presentation of the certificates and the ceremony were completed at the engineering building. In the meantime, a general mixup in which some engineers and a nondescript crowd of those looking for a good fight, took place near the Memorial Union on Langdon street. One case of eggs stolen from the engineers' hiding place took part in this affair. One freshman engineer, as a result of the mixup, found temporary lodging in the city bastille. Six students, who refused to give their names, were temporarily detained by the police as a result of the State and Lake fracas but no serious damage was reported in the course of the afternoon.

Those in charge of the parade were satisfied that the lawyers had lived up to their agreement insofar as it was possible and that serious trouble had thus been averted.

The all-engineering float with its jibes at the law school was awarded the grand prize of a 32-gallon barrel of 3.2 per cent beer, to be delivered after April 7.

Among the many slogans and epigrams contained on the floats were included a number of slaps at the Rambler. One privy was entitled "A Century of Progress, the Birthplace of the Rambler."

Among the engineering organizations, the Ag engineers won first with their ensilage cutter which shredded copies of the Cardinal and blew them into a manure spreader labeled, "Daily Cardinal, Editorials, Ramblers, and Other Misc. Junk."

Second place went to Pi Tau Sigma, while third was awarded the *Wisconsin Engineer*, which with its two robots, entitled Nit Wit and Half Wit, took a crack at the "economists supreme." Fourth prize was awarded Chi Epsilon.

In the independent group, the entry of the sanitary engineering department won first with its "Royal Flush" which showed modern plumbing, five in number, supporting the lower half figure of five men entitled L and S, with a picture of a pansy, Doc Meanwell's Field House, the Cardinal, the Badger, and the Memorial Union.

And so another, and the best to date, engineering parade has passed into history. Standing triumphant over their ancient enemies across the hill, while admitting that for lawyers they lived up to their promises quite honorably, the engineers have given the present college generation something they were about to miss. They gave Madison an entertaining afternoon while enjoying themselves tremendously. All those who took any part in the activities found they had widened their acquaintances both among the students of other groups in the college and among the members of the faculty, the feeling being that the parade was an eminently worthwhile affair, successfully carried out under the immediate initiative and enterprise of the students.

Good Printing . .

GOOD PRINTING steps right up with the dynamic assurance of a star salesman, and has its "printed say." . . . Good appearance is as necessary to the printed piece as to the personal salesman. . . Each has its duty to perform, its impression to make, its message to deliver. . . Isn't it as ridiculous to expect success from a shabby mailing piece as from a stuttering, tramp-like salesman? . . We can clothe your sales literature with the same dignity and authoritativeness as your personal representative. And yet *good* printing costs no more.



114 East Washington Avenue

BROCK ENGRAVING CO.

Engravers for
The Wisconsin Engineer



Fourth Floor, State Journal Building

Madison, Wisconsin

G-E Campus News



COUNTING COSMIC RAYS

We hear a lot about cosmic rays, but know little about them. Some believe the rays are the birth cries of new matter, photons, which are like light rays. Others believe they're electrons, the death rattle of matter as it radiates itself away. But whatever the rays are, they come to us from every direction, night and day.

One of our engineers, Chester Rice, a '10 grad of Harvard, didn't think cosmic rays were so mysterious. He even perfected a device to count them. Imagine — counting cosmic rays! He counts them with a nickel cylinder detector that is suspended in a low-pressure tube. It's shielded by a housing of lead, 4 in. thick, to keep out the effects of radioactive material. The rays, passing into the cylinder, initiate corona discharges, which are fed into an amplifier, then through a radio loudspeaker. The rays can be heard as distinct clicks. The small cylinder has a count of eight rays per minute.

DNEPROSTROY

On October 10th last, the largest masonry dam ever built was dedicated in Russia. It's part of the tremendous Dneprostroy hydroelectric development.

There, Charles Thomson, who completed his engineering course in '13 at the South African School of Mines, Johannesburg, Transvaal, was honored by the U.S.S.R. He received the Order of the Red Banner of Labor for his skill. His had been the job of erecting all the

electric apparatus. And some job it was!

As a construction engineer for General Electric, he spent 18 months in Russia. He put into operation the nine enormous 77,500-kv-a. generators, five of which were built by G.E. They're the largest water-wheel generators ever built. Incidentally, it was some achievement, considering the enormous weights, to ship the G-E generators and transformers nearly 6000 miles—and then to put them into operation successfully. Even engineering veterans were astonished.



MEET THE PHANOTRONS

Boston, proud guardian of the Beans and the Cods, has been harboring another celebrated family, lately. The name is Phanotron; present condition—that of lusty infancy; job—rectifying alternating current.

Housed in the Salem Street substation of the Edison Electric Illuminating Company in downtown Boston, this equipment is changing alternating current at 13,800 volts, 3-phase, 60 cycles, into direct current at 238 volts. Listed advantages: no moving parts, silent operation, high efficiency, economy in floor space. Six tubes, with a combined rating of 600 amperes, are employed. They are an outgrowth of the vacuum tube used in radio sets but have a current capacity 100,000 times greater.

The Phanotron rectifier, a highly desirable neighbor, comes from good old G-E stock, incubated in the Research Laboratory in Schenectady. Incidentally, Harry Stein-

er, a University of Kansas grad of '26, is largely responsible for its engineering and design development.



HELLO, WATERWORKS

Two pumping stations which supply the Baltimore water system have no personal attendants, but they are able to give a complete report of conditions existing at the plant when called on the telephone. If you know the telephone number (and the code in which the station elects to talk back), you have only to dial the station. The G-E audible indicating equipment in the station signals how well the pumping equipment is operating, what the water level is, the pressure, etc. It gives prompt, complete, and—if you please—courteous service. The public telephone system is used, but conventional house-to-house conversations in and around Baltimore are in no way affected. Operating officials delight in demonstrating the equipment to the uninitiated, letting them listen as the pumping station makes its report. "Amazing!" is the now familiar remark.

Arthur Johnston, a '25 grad of Oregon State College, is largely responsible for this development. He also did much to develop telemetering and the electric scoreboard.



95-987DH

**GENERAL
ELECTRIC**

The Wisconsin Engineer