The Wisconsin engineer. Vol. 29, No. 3 December 1924

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

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

The WISCONSIN ENGINEER

Published by the Engineering Students of
THE UNIVERSITY OF WISCONSIN

VOL. XXIX MADISON, WISCONSIN, DECEMBER, 1924 NO. 3

Member Engineering College Magazines, Associated

The
WISCONSIN ENGINEER
Founded 1896

25c A Copy

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

$1.50 A Year

CONTENTS

VOL. 29 DECEMBER, 1924 NO. 3

 Entered as second class matter Sept. 26, 1910, at the Post office at Madison, Wis., 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 21, 1918.

The
WISCONSIN ENGINEER
UNIVERSITY OF WISCONSIN
VOL. XXIX No. 3 MADISON, WIS. DECEMBER, 1924

STREAM FLOW AND OTHER HYDRAULIC PROBLEMS SOLVED BY MODEL EXPERIMENTS

By CHARLES I. CORP
Professor of Hydraulic and Sanitary Engineering

RIVER flow control, power development, pump or turbine design, and other hydraulic problems frequently involve conditions in which it is difficult, if not impossible, to determine by calculation just what may happen.

Small scale models offer a method for solving such problems or of confirming conclusions based on calculations. Engineers are coming to recognize that relatively small expenditures for experimental work with models will assure the correctness of a particular design or determine the proper form or type of structure to use.

This article gives several examples of the use of models for solving actual problems and the methods for magnifying or transforming results from models to the conditions of the actual stream or structure.

Theory — Consider first two orifices, A and B, B being N times the diameter of A and having a head H equal to N times the head h on orifice A. Let the two orifices be in every way similar and the vessels from which they discharge in every way similar except vessel B has every lineal dimension N times that of A.

Further let

v = velocity of stream from A.
V = velocity of stream from B.
q = theoretical discharge of stream from A.
Q = theoretical discharge of stream from B.
a = area of orifice A.
A = area of orifice B.

Then

$$v = \sqrt{2gh} \text{ and } q = a\sqrt{2gh}$$
$$V = \sqrt{2gH} \text{ and } Q = A\sqrt{2gH}$$
$$= \sqrt{2g(Nh)} \qquad = N^2 a\sqrt{2g(Nh)}$$
$$= N^{1/2} v \qquad = N^{5/2} q$$

Or we may say for similar orifices where friction is neglected:

1. The velocities are to each other as the square root of the ratio N.

2. The discharges are to each other as the five halves power of the ratio N.

Analogous reasoning will show, if friction be neglected, that the velocities and the discharges for similar weirs, pipes, or open channels will vary respectively as the square root and the five halves power of the ratio N.

It is evident for exact comparisons that the effect of friction must be taken into account. In many practical cases sufficiently accurate results are obtained by using the theoretical relations in which frictional differences have been ignored.

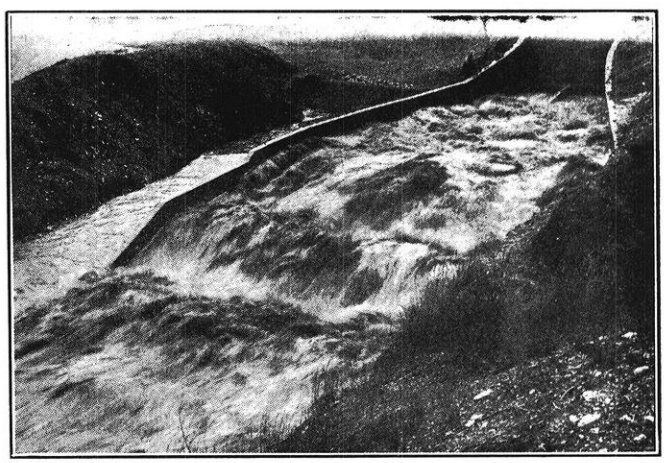


FIG. 1. FIRST TEST OF MIAMI FLOOD CONTROL WORKS
Shows first flood passing through tunnel outlet of Germantown dam in spring 1920. (Engng. News-Record May 13, 1920.)

For open channels when the nature of the model and actual channels are the same, Manning's formula may be applied to the Chezy formula as follows:

$$v = \frac{1.49}{n} r^{2/3} S^{1/2} \text{ and } q = a \frac{1.49}{n} r^{2/3} S^{1/2}$$

$$V = \frac{1.49}{n} (Nr)^{2/3} S^{1/2} \text{ and } Q = N^2 a \frac{1.49}{n} (Nr)^{2/3} S^{1/2}$$
$$= N^{2/3} v \qquad = N^{8/3} q.$$

or the velocities will vary as the two thirds power and the discharges as the eight thirds power of the ratio N.

Examples:- In Ohio at points on the Miami River and its tributaries, retention reservoirs have been built to protect Dayton and other cities from floods such as that of March 1913. Some $30,000,000 have been

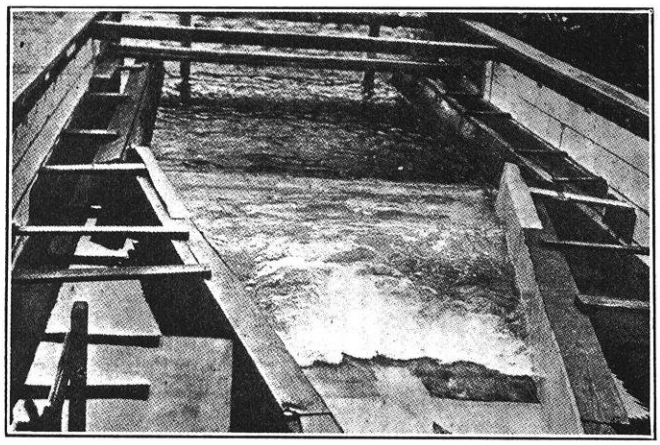


FIG. 2. VIEW SHOWING OPERATION OF MIAMI CONSERVANCY DISTRICT OUTLET MODEL AS FINALLY ADOPTED

Discharge of three second feet corresponding to an ordinary freshet. A small jump is formed. (Miami Conservancy District Technical Report Part III.)

spent on this work which is just now nearing completion. One of the important problems met was the reduction of the velocity of the water issuing from tunnels through the earth embankments from 50 to 60 feet per second down to a rate which would not destroy the earth channels of the natural river bed. In the summer of 1915 at the request of Prof. D. W. Mead,

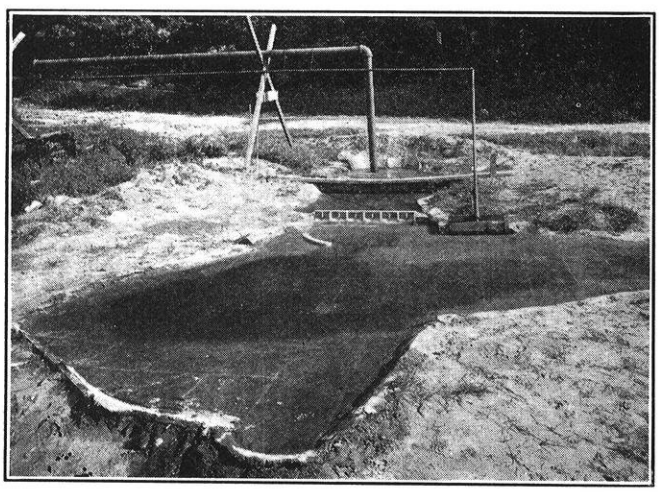


FIG. 3. MODEL OF WISONSIN RIVER FOR DEFLECTING WALL EXPERIMENTS

The large area in the left foreground corresponds to the eroded area. Dam in rear. Downstream channel at right.

then acting chief engineer of the Miami Conservancy District, the writer designed and assembled an experimental plant which was used to test numerous models of proposed velocity reducing devices and to check experimentally the work of Prof. S. M. Woodward who had made a theoretical study of the possibilities of the hydraulic jump as a velocity reducing device. From the results of the model tests the actual structures were designed and experience with them during floods has confirmed the calculations based on the model experiments.

Figure 1 is taken from a photograph published in the Engineering News Record of May 13, 1920. It shows the Germantown dam outlet in action under flood conditions. Figure 2 is a photograph of the model

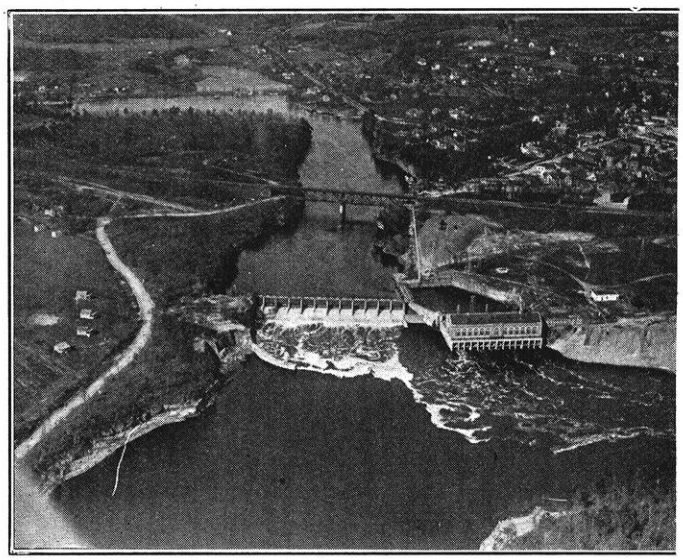


FIG 4. AIRPLANE PHOTOGRAPH OF KILBOURN HYDRO-ELECTRIC PLANT SHOWING DEFLECTING WALL IN ACTION

River is at normal stage and deflecting wall shows well above water line. It is submerged at higher flood stages. Eroded area in foreground.

experiment as finally adopted. The whole study is thoroughly treated in a bulletin issued by the Miami Conservancy District being part III of their Technical Reports.

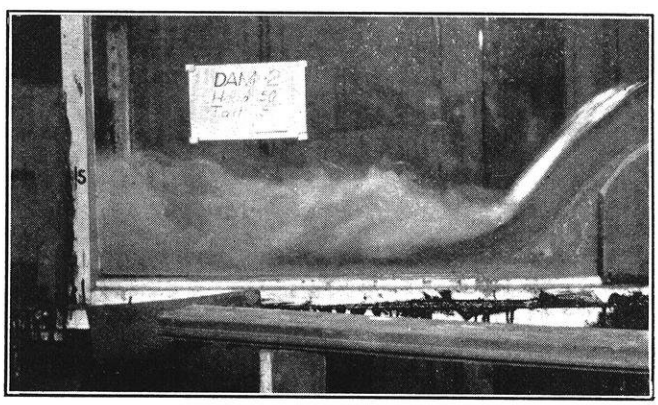


FIG. 5. MODEL OF FORD DAM WITH STANDING WAVE BELOW TOE OF DAM

Tailwater level is not great enough here to force standing wave up to toe of dam.

Another example was a test on a model of the hydro-electric plant of the Southern Wisconsin Power Company and of the Wisconsin River just below the dam. The model was constructed in 1922 just west of the Hydraulic Laboratory.

The river, since the construction of the dam in 1908, had been cutting away the outer bank, at flood stages, until an area some 8 to 10 acres in extent and from 10 to 50 feet deep had been eroded. Further erosion threatened an important state trunk highway and other valuable property. Mead and Seastone, consulting engineers for the company, advised model experiments and the work was carried out under their direction by the writer assisted by R. O. Ruble, instructor in Hydraulics at the University of Wisconsin. From a hydrographic survey a model to the scale of 1 to 100 was made of concrete. The dam was made of wood to the correct scale and imbedded into position. Water was conveyed to the model through a four inch pipe terminating in a baffle chamber up stream from the dam. A miniature flow corresponding to the power house discharge was obtained through a 1-inch pipe. A venturi meter in the 4-inch pipe was equipped with a scale reading directly river flood stages so that the desired equivalent to any flood could be quickly obtained

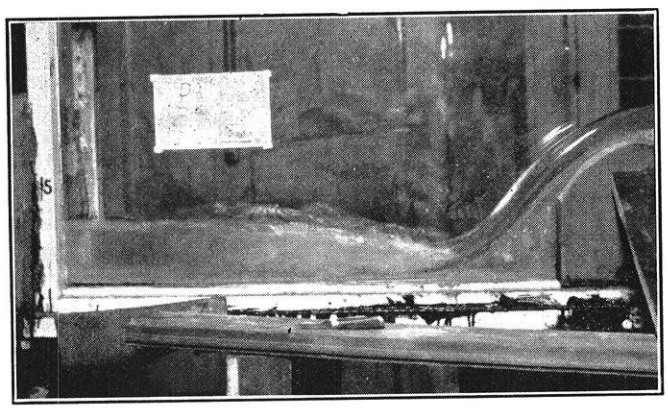


FIG. 6. MODEL DAM WITH STANDING WAVE JUST AT TOE OF DAM

The region of standing wave disturbance is clearly shown in this photograph. Note the clear stream at left of photograph where stream of low velocity and uniform flow has been established.

through the model. A water meter in the 1-inch pipe also made it possible to readily adjust its flow to correspond to the normal outflow from the turbines. The surface of the concrete was marked off into one foot squares by lines of white paint. Small floats were used to trace the currents, and their rate of travel at different points was timed with a stop watch. Sawdust sprinkled into the stream made visible the general currents and the scouring action near the bottom. Trial deflecting walls were constructed of Plaster of Paris. A number were tried, and the one finally adopted is shown in the photograph of Figure 3. Figure 4 is an airplane photograph of the plant at Kilbourne taken after the construction of the deflecting wall. In the model experiments it was found that the top of the wall should be submerged several feet during the higher floods to counteract the whirl set up in the pool. The deflecting wall has proved very effective, — no cutting having occured since its installation in the fall of 1922. Checks made on the direction and velocities of the currents during a flood in 1923 showed close agreement with the results predicted from the model.

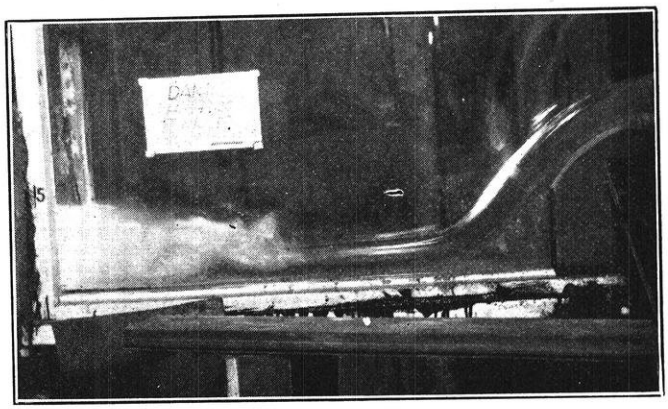


FIG 7. MODEL OF DAM WITH HIGH HEAD AND HIGH TAILWATER

Note violent disturbance that extends a considerable distance down stream.

During the winter of 1923-24, one of the thesis studies in the Hydraulics Laboratory of the University was on a model of the Ford dam recently constructed on the Menominee River. This dam acts as a spillway during flood stages of the river, and as the river bed below is is of material that erods easily, it was necessary to extend the apron to a point where the velocity of flow would at all times be below the scouring point. A tail water level of sufficient height would throw the formation of the standing waves always at the toe of the dam and thereby shorten the length of the apron that would otherwise be needed. In the design it was necessary to determine where this would always occur or to provide means of producing such a result.

The model of the dam used in the thesis studies was constructed of concrete and placed in a channel with glass sides so that the point of formation of the standing wave could be observed for a given depth of flow over the dam and for any tail water level. Figures 5, 6, and 7 are photographs of the model.

Results with the above mentioned models and with others used for investigations in the Hydraulic Laboratory bear out, by actual experience, the fact that many hydraulic phenomena can be studied on a miniature scale and the results, by proper conversion, applied to full sized structures.

TURNEAURE AND RUSSELL REVISION PUBLISHED

The third edition of "Public Water Supplies," by Dean F. E. Turneaure and Dean H. L. Russell of the University of Wisconsin, has recently been published.

A REVIEW OF THE WESTERN TRIP

By ROBERT R. YEHLE
Senior Electrical

ALL of the senior Electrical and Mechanical engineers who did not take the Eastern inspection trip congregated at the Public Service Building in Milwaukee at 8:00 A. M. the Monday after Homecoming. The previous week-end celebration was hard on some of us, but the majority of the group was all ready to start seeing Milwaukee at the zero hour. It happened just as Gus Larson had prophesied, for a check-up showed that Jimmy Gumstad and Dick Rhode were missing.

The guiding lights of the party were Pat Hyland, Gus Larson, and Russ Purner for the Mechanicals, and Johnny Price and "Pa" Jansky for the Electricals. A very reliable staff these guiding characters made, and they reduced the probability of our going astray.

Through the courtesy of the T. M. E. R. & L. Co., private cars were furnished for all of the inspections in Milwaukee. We had real service too, and it saved lots of shoe leather.

The plants we visited were usually in the suburbs, and such was the case of the Allis-Chalmers Company. This plant was one of the best that we visited while in Milwaukee. The plant is most impressive because of its large machinery and the size of its products. The main shop is divided into six sub-shops, the first four of which are used in the construction of big machinery like blast furnaces, and steam and water turbines. These shops are used for casting and finishing the various parts used in their products. The huge rotors for the steam turbines are also balanced in these shops. In the last two departments, the Allis-Chalmers electrical apparatus is made. The process of making the gigantic 132,000 volt, 15 KVA, single phase transformers, for which they have just received an order, was of special interest to the intellectual Electricals. These transformers are among the largest self-cooling transformers ever built. Each department of electrical work is under the direct supervision of an expert electrical engineer whose duty it is to investigate and to do research work for the advancement of his department. Many efficient industrial processes have been developed in this way.

The Allis club invited us to lunch, and while waiting for the eats, we were greatly amused to see the office force try to get out of the snow. After giving them a resounding Skyrocket, we sang *On Wisconsin.*

The Westinghouse Lamp Company was the next plant. Here we were introduced to the process of making the tipless lamp. The principal feature of this plant was the development of automatic machines from man operated ones. The first department scored a hit with the "cake eaters," as one bright boy put it, because it was the frosting department. It is here that all the colored sign lights are frosted. "Skinny" Thiemann's sudden disappearance almost gave us a scare. We found him, however, inspecting the photometric room. It may be of interest to note that this plant produces 82,000 lamps daily and employs only 500 girls to do the work. Of course Thiemann was interested in the shining lamps.

At the Falk Corporation we were shown the famous Fall herring-bone gears and the Falk flexible coupling. These herring-bone gears are used in the manufacture of their speed reducers. The three articles mentioned are the chief products turned out by Falk. The casting and finishing is done entirely in their own plant. The Falk coupling, which consists of a wave arrangement of spring steel wound back and forth between the flanges of the separate shafts, serves a very important need in reducing the power loss in bearings that is caused by poor alignment.

We next visited the Thirty-sixth Street Sub-station. This sub-station is entirely automatic. After being "stepped down" the high voltage power which comes to the transformers is distributed among the feeders. If a feeder from this sub-station is shorted, a circuit breaker is blown, and a relay automatically restores the circuit. The relay will restore the circuit three times, and then if the line is not clear, an automatic distress signal is sent out from the sub-station to the central station.

At the Lakeside Power Station we saw for the first time a practical demonstration of the pulverized fuel plant. Because of the lack of lines, its present capacity is limited to 85,000 KW. The ultimate capacity of the plant will be over 300,000 KW. This is the most successful powdered fuel plant in the world, and produces one kilowatt hour for each 15,750 B. T. U. fired. The closest approach to this economy comes from another pulverized fuel plant where one kilowatt is produced by 17,000 B. T. U. The Lakeside generating units are of the General Eectric turbo-generator type, and they operate at 200° C. with superheated steam of 250 pounds per square inch pressure. The switch room is almost an exact duplicate of the actual wiring diagram, and furnishes a remote control for all of the high tension lines from the plant. The whole Lakeside Station is typical of the purposes for which it was designed — continuous service, safety of maintenance and operation, ease and simplicity of control, and economy of operation. This modern plant presents quite a decided contrast to the old Commerce Street plant with its wasteful vertical machines and with its coal consumption of 35,000 B. T. U. per kilowatt hour.

Having had our fill of power stations, we journeyed to the Riverside Pumping Station and sampled some of Milwaukee's water. The present capacity of the station is a matter of 69,000,000 gallons per day. When completed, this new pumping unit will have a capacity

(Continued on page 59)

THE EASTERN TRIP

By VERNON W. PALEN
Senior Electrical

THE tramp of feet by day, the rumble of car wheels by night, blisters, insomnia, and what-not, all contributed toward an unforgetable week at Niagara and thereabouts.

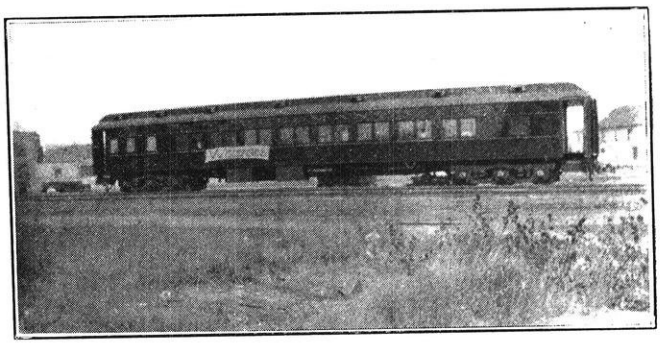
Hardly having finished a somewhat disheartening Homecoming, and yet too full of the famous vim, vigor and vitality to say die, the assemblage at the Northwestern station began to assume real proportions at 1:00 o'clock Sunday afternoon, November 16th. Our Pullman, the *Chenango,* was ready for occupancy and most of us were quite ready to get started. After the signal for departure had been given and Andy Carroll had yelled almost frantically at Min Minshall (in what seemed like a vain effort to keep Min from missing the train), we watched Madison disappear in the distance. From that time on we were constantly reminded that Min had not missed the train, for when Andy called "Oh! Min!" there was always the unfailing reply, "Oh! Andy!", even though the time be 3 o'clock in the morning.

The train ride from Madison to Niagara was a long one, of course, and from the time we left Madison at 1:30 Sunday noon until 8:00 o'clock Monday morning there was ample time to display any aptitude for poker, craps, or crossword puzzle,—depending on the mood one happened to be in. The depot agent at Madison donated a box of apples, and Prof. Rood furnished the cigarettes so everybody was happy. Our Pullman had all the earmarks of a car coming directly from the factory, — fresh paint and everything; our porter was of the gently-sunburned variety and was not at all stingy with his services nor with his smiles. I think the trip was as novel to him as it was to most of the gang.

Everyone was late in retiring that first night on the sleeper, and by the time the porter had rigged bunks for thirty-four of us, the wee small hours were well at hand.

At 7:00 o'clock Monday morning everyone was up (no doubt with some regret) and waiting for the first glimpse of the Falls which was expected about 8:00 o'clock. The weather had taken a decided change for the colder during the night, so that most of the overcoat collars were in the "up" position. Cameras were everywhere in evidence. Now and again Min was rescued just as he was about to wade out into the rapids so as to obtain a realistic picture of himself at Niagara.

Monday was spent inspecting the Canadian hydro-electric stations at Ontario, Toronto, and Queenstown. Lunch was taken at noon on the Canadian side, where



THE PULLMAN "CHENANGO"
The Chenango faithfully carried the engineers on their Journey. It was a stateroom on wheels.

Firpo Hudson offered us constant worry because he insisted on imbibing Canadian beer. The Canadian division of the Burgess Battery Company presented each member of the party with a goodly sized flashlight, and thus the day was made worth while. Of course, the dry agents were on duty as we passed across the boundary, but Firpo chewed a bit of Sen-Sen and avoided all suspicion. Some went to a dance, while others went to various shows that were available Monday night in Niagara.

Tuesday we gave the United States hydro-electric plants the once over, and were considerably impressed by the immensity of the new 70,000 horsepower units at the Gorge plant of the Niagara Falls Power Company. These units are famous for being the largest in the world. Before bidding goodbye to Niagara, we also visited the Carborundum plant and the "Home of

(Continued on page 58)

"INSPECTIONS" ON THE EASTERN TRIP
The picture was taken at the new Colfax steam turbine generating plant which is situated on the bank of the Allegheny River. This plant generates power for the Duquense Light Company of Pittsburg.

EDITORIALS

One death from tuberculosis in Wisconsin every five hours! That's the cold story that official figures tell for the year 1923, a tragedy doubly pitiful because it is unnecessary. Tuberculosis is a preventable disease — and curable, and yet last year 1,819 Wisconsin people died of it, most of them in the bloom of youth; many of them young mothers and fathers; some of them little children. Sixteen thousand active cases of tuberculosis in this state, a conservative estimate based on wide surveys in all parts of the country.

The Christmas season is here and with it the penny Christmas seal, the little stamp that has saved so many lives, has brought happiness to so many homes; that pays for the health education campaign conducted by the Wisconsin Anti-Tuberculosis Association in its fight against tuberculosis and for better health.

Sixteen years ago, when the organized campaign against tuberculosis was begun, there were 107.7 deaths from tuberculosis for every 100,000 people. In 1923 the rate had been reduced to 66.7 with a total of 1,819 deaths from this disease. The fight has been a successful one, but tuberculosis has been so many centuries in the making that it will take a long while to control it completely. The battle must go on. The Wisconsin Anti-Tuberculosis Association is an educational institution and its purpose is to fight tuberculosis by teaching people how to prevent it, and it is financed by the sale of penny Christmas seals.

There is no truer test of a man's qualities for success than the way he takes criticism. The little-minded man cannot stand it. He crawfishes. Then when he finds that excuses won't take the place of results, he sulks and pouts. It never occurs to him that he might profit from the incident. —*Selected.*

ON ENGINEERING ELECTIVES

"What subjects am I going to take next semester?" When a freshman enters the Engineering college, he knows to a credit how much of this or that subject he will take, and when.

Yes, we admit that the engineering neophyte has a few electives. And is is the average engineer's misuse of those few electives which leads us to believe that it is best, after all, that the rest of his schedule is filled out for him. It is the matter of those elective L and S credits that we wish to speak about. In the midst of a highly technical, and very much in earnest engineering course, such flippant superficial subjects as Harmony and Poetry seem incongruous. Cultural? — yes. Refining, too, but when we only have a few paltry credits to invest in the liberal arts, it seems a shame to squander them. We know that the Engineers need more culture and refinement and all that high-brow stuff, but let them get it at the opera, or reading "Vanity Fair."

More than anything, we believe, the Engineer needs English. And we don't mean poetry, or appreciation, but just plain composition — theme writing. That is a sensible art, useful in any and every branch of engineering. The works of Shelley or a verbatim knowledge of "Pippa Passes" will probably never land you a job, but the ability to write clearly and forcibly will never come amiss in later life.

In a similar manner we can justify an accounting or economics course. So inextricably interwoven are Engineering and modern business that the Engineer should not consider his education complete until he has acquainted himself with the economic aspects of his profession. And engineering projects somehow always seem to require an outlay of money, to be tied up with capital in a strange and inexplicable manner. So do you think it irrelevant if we recommend a casual acquaintance with the fundamentals of Money and Banking to the incipient engineer?

Speech should come in for its share of approbation at this point, but we don't feel that the courses given on the hill in the speech department are effective in lending poise and fluency to the would-be orator. For the engineer who wishes to be able to address an assemblage and do himself justice, and that is a very laudable ambition indeed, we feel that membership in one of the forensic societies will prove more profitable than a formal course in Speech. Perhaps we are wrong; perhaps we are doing the Speech department an injustice; but this is our present impression.

After you feel that you have rounded out your engineering education with enough English, and Economics, and perhaps Speech, and only then, it is an excellent and wholesome idea to pursue a few cultural subjects.

There is no man so good, who, were he to submit all his thoughts and actions to the law, would not deserve hanging ten times in his life. —*Montaigne.*

Those who are greedy of praise prove that they are poor in merit. —*Plutarch.*

EXTENSION NOTES

MILWAUKEE DISTRICT

A class of forty employees of the city pumping stations and power plants has been organized by special resolution of the city council for a course in Combustion and Smoke Abatement to be gven each Wednesday from 3:00 to 5:00 P. M. in the Civil Service Room of the City Hall by Prof. Ben G. Elliott.

A course in Combustion, sponsored by the Real Estate Board, for Janitors and custodians of schools, apartment houses, etc., is meeting each Thursday afternoon. This course is conducted by the University Extension Division.

Great interest has been aroused in the organization of the Literary Society among the day students at the Extension Division. Two political parties, "The Pioneers" and the "Bow-Wows," were organized, each with a list of candidates for officers of the society. Preceding the election, intensive campaigning was carried on by both parties. The "Pioneers" gave a booster and campaign dance for the student body on Thursday evening, November 13, in the assembly room. It was largely attended and greatly enjoyed.

The following students were elected as officers of the Literary Society for 1924-1925, at the election held November 17:

President — Albert Bollow '26.
Vice-President — Ted Blazel '27.
Sec'y — Ethel Straka '27.
Treas. — Walter Wegner '26.
Sgt. at Arms — Edgar Huth '27.

On Friday, November 7, Professor Lathrop, Chairman of the English Department, visited the Extension Division in Milwaukee. The students and the faculty were pleased with the very sincere and friendly interest which Prof. Lathrop showed in the class work and other activities being carried on.

Hans A. Christensen, correspondence student in Structural Engineering, has returned from Denmark to accept a position as a designer in New York.

A. L. Kotz of Wasica, Minn., correspondence student in Reinforced Concrete, is Assistant County Highway Engineer.

Prof. C. M. Jansky of the Electrical Engineering Department accompanied the Electrical and Mechanical Engineering Seniors on their annual inspection trip during the week of November 17.

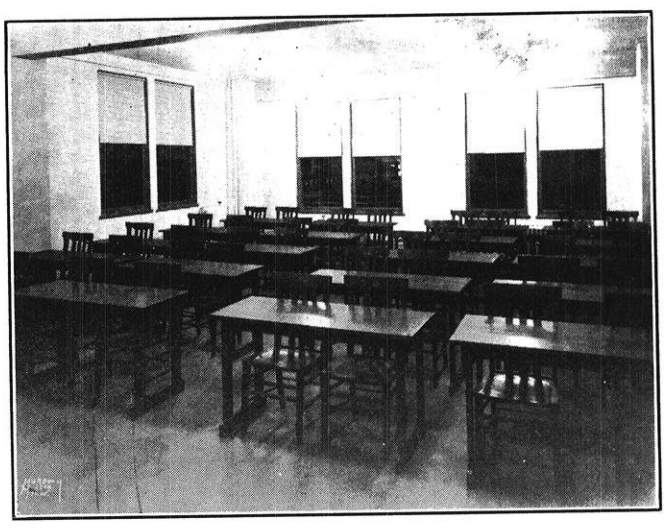
W. E. Schulz, correspondence student in Structural Engineering, is Assistant Building Inspector in Memphis, Tennessee.

Several one-day institutes on Domestic Heating will be conducted by the Department of Mechanical Engineering during December and January. These institutes are the result of a demand for instruction and information on home heating.

That some Extension Students work under extreme difficulties is evidenced by the following extracts taken from a letter recently received from M. M. C. David, student in Electrical Engineering living at Mapastepec, Chis., Mexico.

"Just received your favor dated the 8th, of October, and was very glad to know that you are still carrying my name on your records in spite of my faults in keeping up with my studies. I am certainly thankful and wish to be pardoned for the long silence. The last uprising started in this country in December of last year and because this section was one of the centers of revolutionary activities, I was compelled to abandon my ranch here and run away to central America, where I spent several months waiting normalization of conditions here. When I thought I was safe, I returned but found everything on my place in a sad condition and was forced to straighten things up and overwork myself while still surrounded by groups of bandits, against whom we had to be on guard all the time. This is still going on up to the present day and has forced me to abandon my former plans for completing my courses of studies as I had desired. You certainly will agree with me that under conditions such as stated above, it is not easy for any man to concentrate on studies no matter how easy the subject might be.

As my house was entered by the bandits and all belongings carried away by them, some of my lessons were lost, especially those on Radio Receiving. I would appreciate the favor of mailing to me a set of lessons to commence from the beginning again. I will be glad to pay the price, if any be charged, and wish to be advised as to the remittance."



ONE OF THE CLASS ROOMS — UNIVERSITY DIVISION — MILWAUKEE BRANCH

Mr. Truman R. Spooner, Secy. and Treas. of Jefferson Wood Products Co., Jefferson, Wisconsin, called on us Nov. 3rd in regard to courses in Architectural Drawing. Mr. Spooner recently completed course 243A, and was in Madison looking after several building operations in which he is interested.

ALUMNI NOTES

M. B. SMITH AND R. T. HOMEWOOD

CHEMICALS

R. W. Cretney, ch '21, is a chemist with the Thermatomic Carbon Co., Box 1299, Monroe, La. His wife, Beatrice Shear Cretney '22 accompanied him here for Homecoming. Following a brief visit they left for Mrs. Cretney's home in Washington, D. C. to spend Thanksgiving.

R. H. Manthey, ch '24, and **H. D. Kitchen,** ch '23, are with the National Carbon Co., Cleveland, Ohio.

J. A. Rutherford, ch '24, is with the Sinclair Refining Co., East Chicago, Ind.

CIVILS

John T. Buser, c '09 has recently been re-elected county surveyor of Grant County. He is also in the employ of an abstract company at Lancaster, Wisconsin.

H. B. Fisher and **W. E. Witworth** are in the Systems Development branch of the Research Laboratories of the American Telephone and Telegraph Co., and the Western Electric Co., New York City.

Roy D. Foxon, c '24, gives his present address as 9 Second St., Tunkhannock, Penn. His permanent adddress is 207 Bridge St., Northampton, Mass. He writes: "Since the first of June I have been working with the Pennsylvania Department of Highways in the capacity of inspector. Shortly after entering the department I was detailed to supervise the construction of a thru truss highway bridge, span 165 feet, under the advice and guidance of the district engineer and his assistants. This work has given me a good opportunity to study construction methods and also to apply some of the principles learned in my course at Wisconsin. I have enjoyed it. I am working out of the district office No. 12, located at 332 N. Washington Ave., Scranton, Pennsylvania."

J. G. Hirsch, c '08, is assistant mechanical superintendent for the St. Joseph Lead Co., P. O. Box 690, Bonne Terre, Missouri.

B. J. Jelinek, c '09 is a construction engineer with the Milwaukee Construction Co. Address 1021 Sixth Street, Milwaukee, Wisconsin.

Joseph T. Kunesh, c '14, gives his present address as Lock Box 151, Villa Grove, Illinois. He has recently returned from Haiti where he was chief hydrographic engineer for the Department of Public Works.

Penn P. Livingston, c '22, has been transferred from the Chattanooga office of the United States Geological Survey, Water Resources Branch, to the Honolulu office. His new address is 25 Capitol Bldg., Honolulu T. H. Livingston was married on July 15 to Miss Evelyn Kendall of North Carolina.

Juan Macaraeg, c '11, is division engineer with the Bureau of Public Works, Manilla, Philippine Islands.

W. W. Mathews, c '08, is assistant engineer with Alvord, Burdick, & Howson, 1417 Hartford Bldg., Chicago, Illinois.

Anton Mathy, c '24, gives his present address as 217 East B Street, Iron Mountain, Michigan. He is employed by the Ford Motor Co., and says of his work, "Until about three weeks ago I have been working with one of the railway location parties connected with Ford's proposed railroad between Iron Mountain and L'anse, Michigan. I started out as rear chainman on one party — there were four parties on the line — and after that I was given a chance at all the positions on both transit and level parties. I was acting as chief of party by the time the survey was completed. They have not yet decided to continue work on this proposed line; so I was transferred and now hold the position of conveyor designer. Just now I am trying to find a way to separate the sawdust from the chemical wood as it is carried along on a chain conveyor."

O. W. Melin, c '10, is structural engineer for Western Electric Company with offices in New York City. His home address is 45 Fairfield St., Montclaire, N. J.

Geo. O. Plamondon, c '10, has moved to 319 E. 49th St., Portland, Oregon.

Fred A. Rankl, c '20, is engaged in structural engineering in Milwaukee. Address; 1237 Lloyd St., Milwaukee.

William R. Reuter, c '21, is a Resident Engineer with the Milwaukee Sewage Commission. Address; 821 17th Street, Milwaukee, Wis.

ELECTRICALS

H. F. Alfery, e '24, is occupying a responsible position with Dwight P. Robinson Company in connection with their work in the Pittsburgh district.

Harold Brown, e '21, is electrical engineer with the Wisconsin Traction, Light, Heat and Power Co., Madison. He was married on August 21 to Eleanora Hermsmeier, '24.

Harold W. Holm, e '23, is with the Philadelphia Suburban Power & Light Co.

F. P. Hyer, e '23, is making an exceptionally fine record with the West Penn Power Company, Pittsburgh. He is working under F. A. Mahoney, Commercial manager, an old Wisconsin grad.

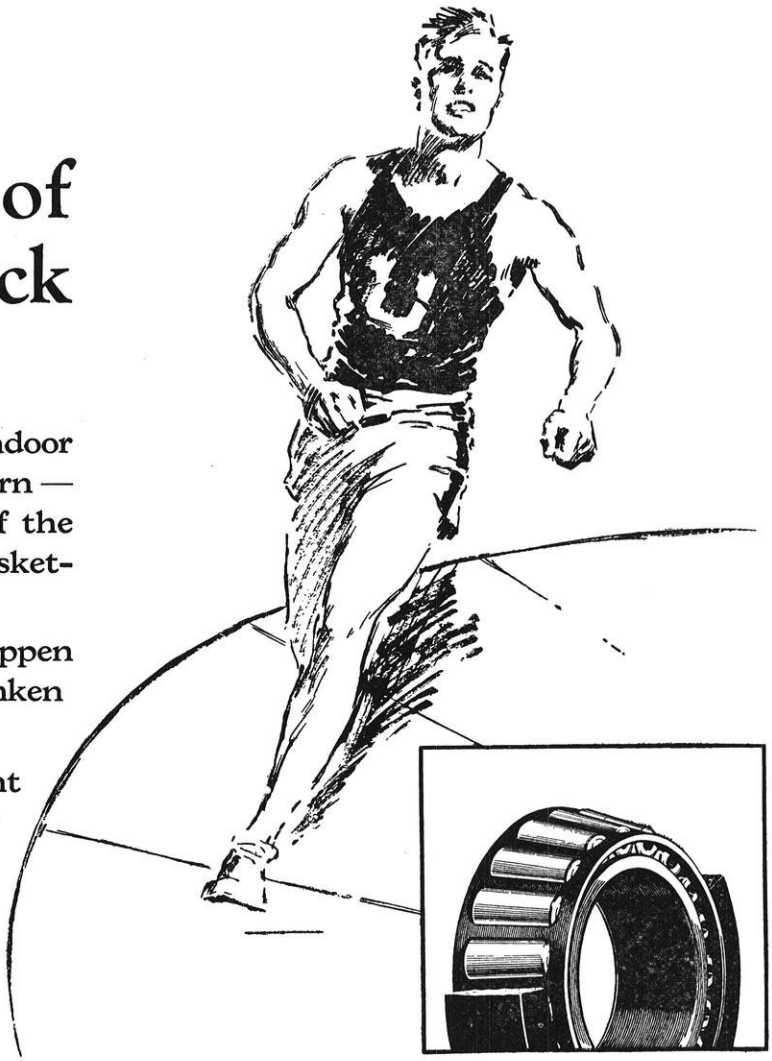
Ray Hoyt, e '05, is electrical engineer with American Telephone & Telegraph Co., New York City.

P. Huntzicker, e '19, gives his address as 1231 Walnut St., Boulder, Colo. He has been one of the engineers on the new Valmont generating station which his company is about ready to turn over to the Public Service Company of Colorado for operation. This is a pulverized coal plant using Combustion Engineering coal preparation machinery, Biglow-Hornsby boilers, and Westinghouse the rest of the way. The first unit is 20,000 kw., 80% p. f.

Forrest Krueger, e '15, is consulting engineer for the National Sinline & Chemical Co., New York City. He was married on August 30 to Florence Motske. They reside at 9448 120th St., Long Island.

W. A. Kuehlthau, e '23, fell or was knocked from the N. Y. C. embankment at Erie, N. Y. on Sunday, June 9. He fell about twenty-five feet onto a concrete roadway, and was seriously injured. The latest report is that he has just left the hospital after his final reconditioning operation. At the time of his accident he had been sent by the Westinghouse Company to one of their plants near Erie as a part of his work in the salesman's course. It is rumored that when he returns to the company to complete his course he will have a bride with him.

So the Turns of an Indoor Track are Banked



DOWN the stretch of an indoor track, then 'round the turn — what would happen to a runner if the turn were perfectly level, like a basketball floor?

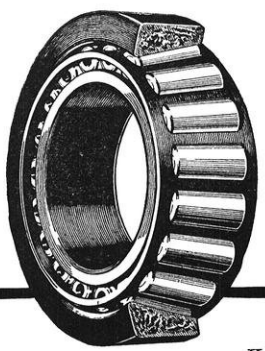
The same thing that would happen to a Timken Bearing if the Timken Bearing were not *tapered.*

When you sharply turn the front wheels of a moving motor car, for example, the same thing happens as when a runner dashes round the turn of a track. The front wheels direct the car around the turn. Momentum, however, tends to throw it sidewise — in the same direction that it previously was traveling. The result is a heavy side load or "end thrust" on the bearings in the front wheels.

The bank of the track keeps a runner from feeling the effect of side-swing as he rounds a curve. A similar device — the taper — enables a Timken Bearing easily to withstand "end thrust" from any source.

In bearings that are not tapered, heavy "end thrust" must be cared for by a separate "thrust" bearing. A Timken Tapered Roller Bearing withstands heavy "thrust loads," as well as all other loads, with equal effectiveness.

THE TIMKEN ROLLER BEARING COMPANY
CANTON, OHIO



TIMKEN
Tapered
ROLLER BEARINGS

Paul H. Kurtz, e '21, is doing student work at the Western Electric Co. in Chicago. Address; 4838 W. 23rd Street, Cicero, Illinois.

J. F. McManus, e '21, is one of the Chicago agents for the Chevrolet but drives a Pierce-Arrow on the side.

C. M. Morley, e '21, is with a large advertising firm in Pittsburgh.

F. W. Nolte, e '22, has left the employ of the West Pennsylvania Power Company of Pittsburgh and has become assistant purchasing agent for one of the local power companies of Wisconsin.

Raymond Paulus, e '22, is employed in the hydraulics department of the Allis-Chalmers Co. in Milwaukee. Address; 953 Island Avenue, Milwaukee.

A. S. Rufsvold, e '23, is with the Engineering Department of the Westinghouse Company at East Pittsburgh, Pa.

Herbert Sanford, e '07, is secretary and manager of the Sanford Electric Co., 111 W. B Street, Ontario, California.

Waldemar P. Schoenoff, e '23, is with the Street Division of the Commonwealth Edison Company, Chicago. His address is 2949 Eastwood Avenue.

H. M. Sharp, e '22, is with the Engineering Department of Nela Park. With his marriage he has lost the name of "Sheik of Nela Park." He and Mrs. Sharp are regular attendents at the bi-weekly dances at the Big Ten Club, Cleveland.

M. E. Skinner, e '15, son of Professor Skinner has recently been advanced to Commercial Agent of the Duquesne Light and Power Company, supplying power to the entire city of Pittsburgh. With F. A. Mahoney holding a similar position with the West Penn Power Company, supplying power to the district around Pittsburgh, this puts these two most important positions in the hands of Wisconsin grads. These two companies practically control the power situation in Pittsburgh and vicinity.

K. A. Staehle, e '22, who has been since graduation with the Engineering Department of Nela Park, Cleveland, suffered a nervous breakdown the latter part of June. He is resting at his father's home and expects to return to Nela Park as soon as he gets back in shape.

G. B. Tjoflat, e '24, is in the Patent Office Department of the Westinghouse Company at East Pittsburgh. He has been selected as one of a small group from the two-hundred new Westinghouse men of 1924 to take the special engineering course under the company's best engineers and specialists.

Out of fifteen hundred applications made during 1923-24 to the Westinghouse Electric and Manufacturing Company for student engineering positions, only two hundred received appointments. Records kept by the company show that appointments of men from Wisconsin have ranked high with the best of the other engineering colleges, here and abroad, and better than some of the most highly touted colleges of the East.

MECHANICALS

C. C. Boordman, m '10, has been manager of the Sterling Plant of the Thermatomic Carbon Company since February, 1923. His address is Box 1200, Monroe, La.

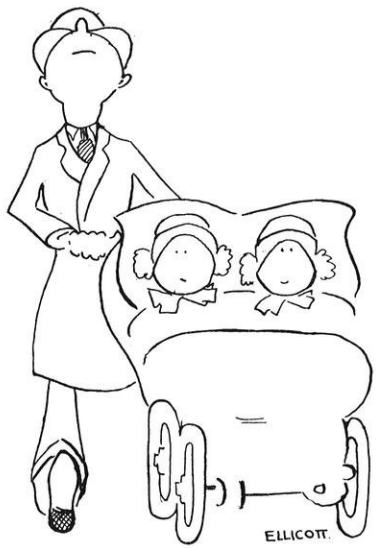
Earl Brandau, m '23, is with the American Radiator Co., Milwaukee. Address, 884 48th St., Milwaukee.

Richard Corbett, m '19, is in charge of the order department of the Chain Belt Company, Milwaukee. He has for several years been in the engineering department of that company designing elevating and conveying machinery.

F. E. Downey, m '20, was recently elected president of the Wisconsin chapter of the American Society of Heating and Ventilating Engineers.

Oscar Hagen, m '17, was married on July 22 to Frances McNulty. They live in New York City.

H. W. Edmund, m '11, announces that he is the proud father of twin girls. He is in the employ of the Jiffey Water Heater Co., St. Louis, Mo.



A PROUD FATHER OF TWINS

Fred Erbach, m '22, is mechanical engineer for Lipman Refrigeration Co., Beloit, Wis. He was married on August 25 to Frances Wright, ex '24, of Sparta. They reside at 1255 Nelson Avenue, Beloit, Wisconsin.

Einar Isdahl, m '23, writes an interesting letter from Holenestrand, Norway, where he is now located as an assistant engineer in the Aluminum plant. He says, "Here we have a sheet mill and make all different kinds of plates and big tanks. These latter mostly for the breweries; so I contribute my small share to a worthy and honest industry which benefits the people. . . . Of the trip could be said much. We had 48 to 58 degrees C in the engine room for two continuous weeks. This with a modest expression I call Hell. Add to this liquid margarine acting like castor oil, and the doubtful pleasure of five weeks association with German ex-submarine men many of which bragged about having torpedoed Norwegian ships.

"In Kristiania I have met many of the old inhabitants of that well-reputed place: the Norwegian House. Finn Aanesen is working in his father's business. Alf and Joe Ihlen are both manager's in their father's iron works at Shrommen. At present they are very busy changing their melting ovens from coal to electric power. Schjalberg is making electric fish drying plants in Bodo. Brinck is making standards for the iron industry. We have all had a few very successful reunion parties in Kristiania where we have entertained the different restaurants with Wisconsin songs, and emptied many good drinks to happy memories from Madison. . . I am sending my best regards to all I know at the university."

Arthur E. Liebert, m '20, is with the Bucyrus Co. in Milwaukee. Address, 685 Holtan Street, Milwaukee.

Herbert E. Linderman, m '20, is with Vollrath & Co. of Sheboygan.

Thomas C. Nichols, m '24, gives his address as 635 Fifty-Second Street, Milwaukee, Wis. He writes, "Have been out to see some of the games this fall and I must say I have been somewhat disappointed by the showing of the team. I expected more from the material on hand but it seems they have not been able to get a combination that works together very well." Watch us go next fall, Tom.

William A. Ouweneel, m '24, is with the Miller Heating Co., Milwaukee. Address, in care of Merchants & Manufacturers Bank Building, Milwaukee.

ENGINEERING REVIEW

J. P. SMITH

FREIGHT TRAFFIC ON THE GREAT LAKES

The important place held by Great Lakes commerce in the industrial life of the nation is not generally appreciated, — even by engineers. The volume of traffic is greater than the foreign commerce of all the sea ports on the coast of the United States, and is four times that of the Panama Canal, while the ton mileage of freight is one-sixth that of all the railroads in the United States. During last year the iron ore carried from mine to furnace amounted to 65,000,000 tons, coal to the amount of 34,000,000 tons was sent to the west and northwest for distribution, and over 11,000,000 tons of grain were floated to market on Great Lakes water ways. A necessary link in this system of transportation is the St. Mary's Falls Canal on the American side of the St. Marys River and the Sault Ste. Marie Canal on the Canadian side, each provided with locks having a lift of 20 feet to overcome the St. Mary's Rapids through which must pass all freight to and from Lake Superior. Through these canals, which for commercial purposes may be considered as one, there passed last year 75 per cent of the iron produced in the United States on its way from the Lake Superior mines to the furnaces. It flowed through the locks at the average rate of 10,000 tons an hour throughout the entire navigation season. No further comment is necessary to indicate the vital dependence of the steel industry upon the continuous service rendered by this waterway. The result of a prolonged interruption is comparable to the breaking of the main conveyer belt in a manufacturing plant.

OLD BANK BUILDING REPLACED BY NEW WITHOUT INTERRUPTING BUSINESS

The Citizens' Savings Bank of New York has occupied the same corner for over sixty years. Recently the old four-story brownstone building was replaced by a new eight-story granite structure while the bank continued its business as usual. Through the ingenuity of the architects and engineers the bank was not closed a single day.

The method followed by the builders was unusual but effective. The first step was to remove the upper two stories of the old bank and roof over the lower two. Then the footings were established for the new building. Because one of the New York subways ran through the street on the north side of the building it was necessary to carry the footings below the subway and also to underpin the subway. The footings completed, the next step was to carry the steel columns up through the part of the old building still standing. The construction of the new building was begun at the roof of the old and completed before any work was done below. A large dome made the handling of material a delicate problem.

When the upper part of the building was finished the brown stone walls on the corner of the old structure were removed and the granite walls built up from the street to meet those already completed. The banking equipment was moved over to the completed portion of the building and a room boarded off. Then the remaining section of the old structure was torn down and the building completed.

The exterior of the bank is finished in Barre Granite and the interior in Famosa Marble, imported from Germany. The building is 80 x 75 feet and rises to a height at the top of the dome of 110 feet above street level. The building consists of one large bank room with a few extra rooms just below the dome which are to be used for offices.

This piece of work was done by the William L. Crow Construction Company, the contractors, Clarence W. Brazer, the architect, and Gunwald Aus, the engineer for the architect. The Citizens' Savings Bank job is the second that this company has done of this nature. A year ago it built the new home of the Roosevelt Savings Bank using the same general methods.

Engineering and Contracting.

FORTY-ONE ADDITIONS TO ZONED CITIES THIS YEAR

Forty-one cities of the United States have adopted zoning since the first of this year, bringing the total up to 161 and the population affected to 24,000,000, according to a supplementary list published in August by the Division of Building and Housing, United States Department of Commerce. Among the large cities included in the new list are Boston, Cincinnati, and Minneapolis. New Jersey leads in the number of zoned places, having 66 in August of this year. Next in rank come: New York, 41; California, 33; Illinois, 25; Massachusetts, 24. The complete list of zoned places, also an analysis of use and height regulations in 16 cities, and a standard zoning act for use by state legislatures, may be obtained from the Washington Division named above.

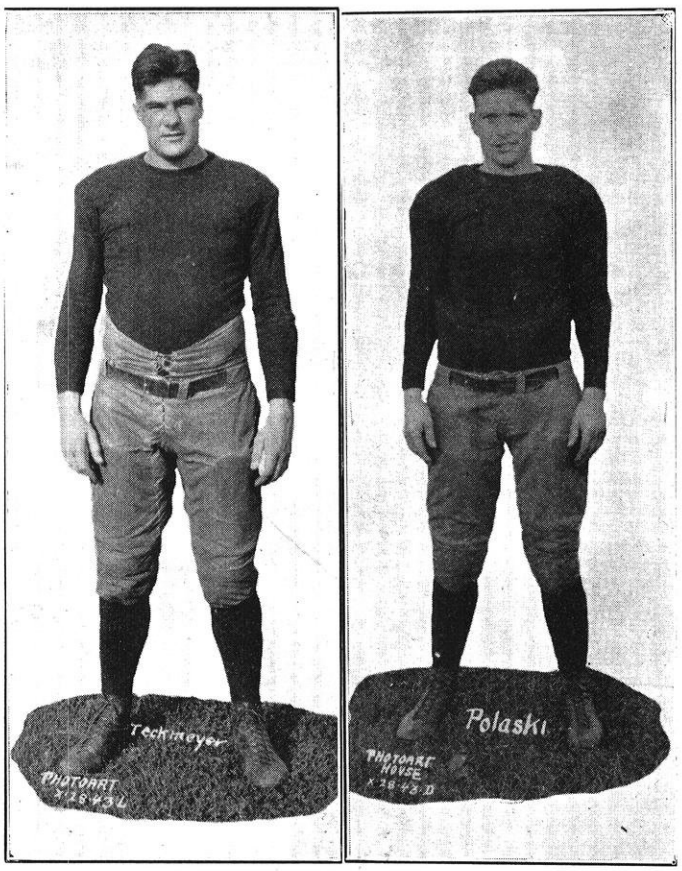
Engineering News-Record

ATHLETICS

G. H. ABENDROTH

FOOTBALL

After a rather hectic football season, we can look over our accomplishments and point to a tie with Chicago, the conference champions, as the one redeeming feature of a rather dismal record.



"TECK" AND CAPTAIN "STEVE" POLASKI
Two of our engineer grid heroes

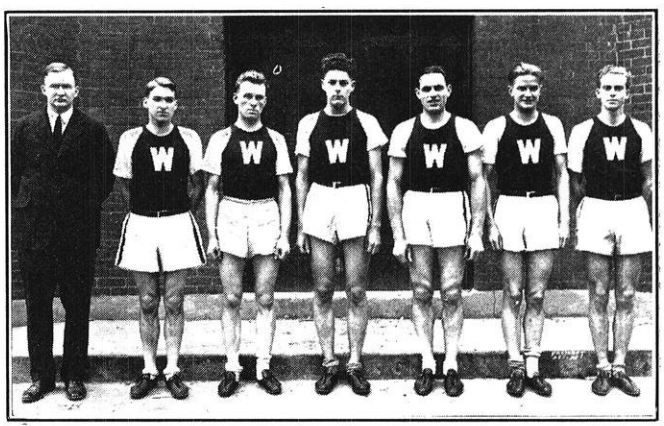
The Chicago game marked the last appearance of Captain Harris, who demonstrated his great line plunging ability. In this game Bieberstein, who could not do his best this year because of injuries, and Miller who showed up equally well at both ends and guard, were also seen for the last time. Although Ryan will miss these men he will have plenty of material to take their places and should have a real team next year.

One important matter that we must not forget is the fact that next year will see an engineer as captain of the football squad. Polaski, who all year showed that a married engineer is equal to, or superior to any single man, was elected captain of the 1925 Varsity squad. Polaski always held up his end of the line and invariably got his man. When they'd passed Steve they knew they had done a real man's job. Polaski broke into prominence by nabbing a pass in the Michigan game two years ago and scoring Wisconsin's only touchdown. After staying out of school a year, Polaski started right in where he had left off and played his best all the time he was in the game. Many were the times when some end run was broken up before the runner had crossed the line, and when the players disentangled themselves Polaski would be found at the bottom of the heap.

If Teckemeyer returns to school next fall the engineers will be represented by two veterans in the line. Teckemeyer, Bieberstein, and Miller formed a center wall which the opposition found it difficult to break through. Bieberstein and Miller will be lost to the team, but if "Teck" is back Ryan will have something on which to build.

CROSS COUNTRY

Although our football team failed to bring home any championship for Wisconsin, the cross country team took its share of honors. Four victories in dual meets and the conference championship were the trophies collected by the team. Marquette, Minnesota, Michigan, and Chicago were the victims of our successful team which was well balanced in every sense of the word.



COACH BURKE'S CONFERENCE CHAMPIONS
Left to right: Coach Burke, Kubly, Petaja, Link, Piper, Perry, Bergstresser.

Chicago may have tied us in football, but oh boy, what we did to them in cross country. After Bourke, the Maroon captain, had crossed the line nothing more

(Concluded on page 57)

CAMPUS NOTES

HONORARY FRATERNITY ELECTIONS

TAU BETA PI, honorary engineering fraternity, announces the election of:

SENIORS

Donald H. Corey, Floyd I. Fairman, Frank Maresh, Vincent A. Thieman, George H. Abendroth, William M. Richtmann, Arthur F. Gettleman, Harry P. Dupuis, Robert B. Webb, LeRoy F. Laube, Arno M. Wiese, Hubert G. Holmes, Eugene A. Bergholz, George H. Field, Arnold C. Besserdich.

HIGH JUNIOR

Russell A. Nelson.

ETA KAPPA NU, honorary electrical engineering fraternity, announces the election of:

SENIORS

Donald H. Corey, Harold F. Hoebel, George E. Megow, LeRoy F. Laube, Harry C. Thayer, Vincent A. Thiemann, Robert R. Yehle.

JUNIORS

Lynn H. Matthias, Harry C. Wolfe.

PI TAU SIGMA, honorary mechanical engineering fraternity, announces the election of:

SENIORS

Arnold C. Besserdich, Howard E. Johnson, Merl W. Miller, Richard V. Rhode, Victor E. Shimanski, Daniel M. Sweet, Bernard A. Weideman.

JUNIORS

George C. Breitenbach, Luther E. Brooks, Ferdinand R. Lhotak, Ralph H. Sogard.

PROMINENT MILWAUKEANS ENTERTAINED BY ENGINEERING FACULTY

Thirty-one Milwaukeans, prominent in manufacturing and public utility circles, were the guests on Saturday, November 8, of the faculty of the College of Engineering. They attended the Wisconsin-Notre Dame game in the afternoon.

Most of the guests motored over from Milwaukee on Friday in time to attend a dinner set before them in the unconventional surroundings of the laboratory of the mining department of the college. The dinner was prepared by the faculty members themselves under the direction of Professors Mc Caffery and Shorey, who were aided by a corps of professorial assistants. Steak a la assay furnace, potatoes au crucible, and pie de retort testified to the versatility of both the faculty and laboratory equipment.

Among the speakers were Dean F. E. Turneaure, Prof. D. W. Mead, Prof. R. S. Mc Caffery, Mr. Carl Johnson, of Madison, and Mr. R. B. Brown, Mr. W. M. White, Mr. Fred Dorner, and Mr. Arthur Simon, of Milwaukee.

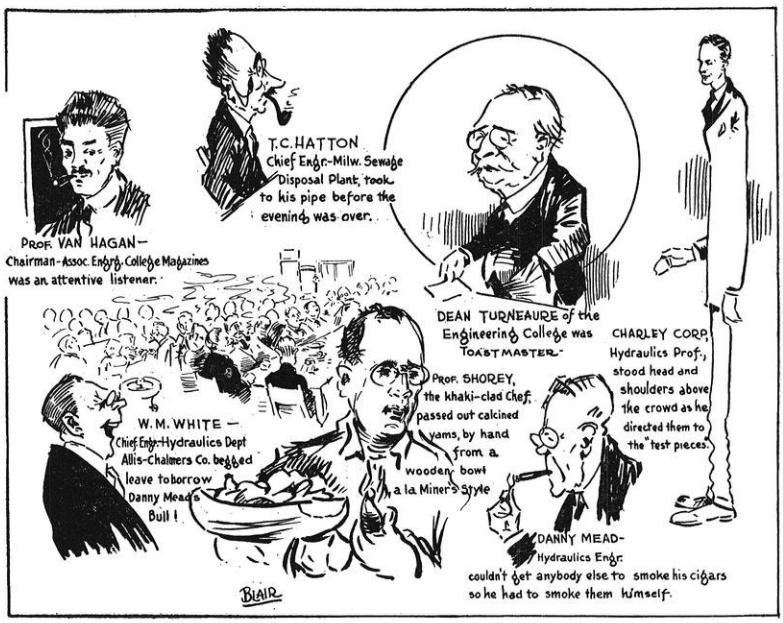
The laboratories and shops of the College of Engineering were thrown open to the inspection of the visitors on Saturday morning.

The guests were Arthur Simon, engineer, and L. L. Tatum, engineer, Cutler Hammer Co.; W. M. White, manager hydraulic department, and Fracer Jeffrey, W. Powell, and R. B. Williamson, electrical department, Allis-Chalmers Mfg. Co.; Harry Sloan, advisory engineer, Vilter Mfg. Co.; D. D. Webster, general manager,

THE FACULTY ENTERTAINS MILWAUKEE MANUFACTURERS

A dinner prepared by members of the faculty under the direction of Prof. E. R. Shorey, was set before the guests in the laboratory of the mining department.

Westinghouse Co.; R. B. Brown, president, Milwaukee Gas Light Co.; Robert Cramer, secretary, Engineering Society of Milwaukee; W. D. Hobbins, chief engineer, and Frank J. Mayer, superintendent, Wisconsin Telephone Co.; Ralph Cahill and Egbert Douglas, consulting engineers; E. R. Stoekle, central radio laboratories; Edward Burgess and W. E. Crawford, A. C. Smith Corp., W. A. Zinn, secretary-treasurer, Milwauke Western Malt Co., Walter C. Lindemann, superintendent, A. J. Lindemann-Hoverson Co.; A. R. Schmidt, president, A. R. Schmidt Electric Co.; Fred Doepke, president, Wrought Washer Co.; James Armitage, engineer, Kearney-Trecker Co.; L. H. Stark, engineer, National Knitting Co.; Carl Johnson, president, Wisconsin Manufacturers' Association; E. F. Johns, engineer, Board of School Directors; A. H. Luedeke, engineer, Gridley Dairy Co.; C. P. Bossert, engineer, Pfister & Vogel Co.; Emil Vilter, president, Vilter Mfg. Company.



OUR DIGNITARIES IN ACTION
Glimpses of the Faculty Reception

ARMY OBSERVER ON ZR-3 SPEAKS IN ENGINEERING AUDITORIUM

Major F. M. Kennedy, one of the army observers on the ZR-3 during its record flight across the Atlantic, spoke in the Auditorium of the Engineering college at 3:30 Friday afternoon, November 14.

Major Kennedy graduated from the College of Engineering in 1908 in the civil engineering course. Since that time he has taken up work in the air service.

The ZR-3 was built by Germany for the United States under the provisions of the Versailles treaty. The name of the craft was changed to the "Los Angeles" by order of the Secretary of the Navy.

IN RETROSPECT

It has been suggested that we award a trophy of some suitable form to the fraternity having the most "red tag" summons to police court for newly discovered traffic violations. The trophy shall be decided upon by a committee consisting of two car owners and one Ford owner who have not visited the judge. All fraternities are eligible, but no man giving his name as Smith or Jones that is not listed as such in the fusser's handbook shall be allowed to enter. Also any cars belonging to fraternity men that are tagged while parked south of Dayton Street shall not be allowed to count. Cars tagged along the drive likewise will not be counted as we must keep the count down to reasonable numbers. Fraternity cars parked in front of sorority houses after 12:30 count twice. We hope the boys will get behind this movement, as our motto is "A new City Hall by Spring."

MC CAFFERY SPEAKS

Prof. R. S. Mc Caffery, of the Department of Mining and Metallurgy, addressed the Iron and Steel Institute on the Constitution of Iron Blast Furnace Slags at the Institute's annual meeting in New York.

ATHLETICS

(Concluded from page 55)

was to be seen except Cardinal jerseyed runners. Bourke, by winning the race broke the course record by 28 seconds finishing in the good time of 25:25. Our men took second, third ,fourth, fifth, and sixth,—Kubly, Perry, and Piper running closely behind Bourke. The final score was 20-35 which plainly indicated that we were conference championship contenders.

After the Chicago meet Mead Burke took six men to Ann Arbor to show the rest of the conference teams that Wisconsin was "out for gore." Wisconsin's well balanced team ran away with the meet, the Badger runners finishing in the following order: Bergstresser, eighth; Kubly, ninth; Perry, twelfth; Petaja, sixteenth; and Link, thirty-second.

Most of the teams at Ann Arbor had a few outstanding stars, who finished well up in the race, but had no men to help in getting a low score. Phelps of Iowa won the race and thus helped Iowa take second place with 98 points, just 46 more than Wisconsin's low score of 52. Shimek of Marquette, who won the dual meet between the Badgers and the Hilltoppers, placed second in the meet, but his teammates accumulated enough points to bring their total up to 226. However, since in cross country the idea is to get the lowest score possible, Marquette was rather unsuccessful.

Four of Wisconsin's championship team ran their last race for the school at Ann Arbor. Kubly and Petaja will be the only men to come back next year

and Burke will have to build another championship squad around them. Piper, Bergstresser, Perry, and Link, who have donned the Cardinal jerseys for the last time, certainly deserve credit for helping bring a conference championship to Wisconsin. The cross country honors have not rested at Wisconsin for a long time and Burke will have his job cut out for him to repeat this victory next year.

THE EASTERN TRIP

(Continued from page 49)

Shredded Wheat" (with which Prof. Rood was connected some years back). Another interesting sight was that of a miniature Niagara maintained by the Niagara Falls Power Company. The miniature Niagara is an exact reproduction (reduction 1 to 100) of the real Niagara and is the basis for studying the stream flow.

We left Niagara at six o'clock Tuesday night and arrived in Buffalo about an hour later. There we had to wait until midnight for train connections to Pittsburgh. This gave Les Hanson and a few others a chance to absorb a burlesque show in the meantime. It suffices to say, that by this time our daily dozen had made most of us able to sleep standing up, if need be, and the rolling and pitching of the train bothered none.

A Miniature Niagara

The reproduction shown above is made exactly to scale. The miniature model was constructed by The Niagara Falls Power Company, for the purpose of showing the effect produced on the falls by the withdrawal of 56,000 cubic feet per second for power production purposes.

Wednesday morning found us in Pittsburgh, the city where the sun never seemed to shine. We forgave Pittsburgh its dirty look, however, when we learned to know the type of Wisconsin alumni residing there. Not satisfied with treating us to an elegant box dinner on Wednesday noon, the alumni entertained us at a smoker at the Fort Pitt Hotel that same evening. On Wednesday we inspected the Colfax and West Penn (or Springdale) steam turbine operated power plants. We also were able to thoroughly inspect the coal mine at the Springdale plant, which is a mine-mouth operated plant.

The Pullman remained parked at the station in Pittsburgh all day Thursday, and our inspection for that day was concentrated on the Westinghouse plant at East Pittsburgh. Here again we were feasted, this time in the employees dining hall; and everyone "fell to" with a vengeance. Shortly after noon thirty-four lusty voices sent *On Wisconsin* and *Varsity* out into the ether via station KDKA.

About midnight Thursday night, after another burlesque show to our credit, (or discredit, as you please) we left Pittsburgh for Cleveland. The "ALL OUT" signal on Friday morning wasn't hailed alltogether with delight, for the sky was overcast and the bed felt pretty fine. However, our toilet was finally made and, after a hearty breakfast, we took a street car to the door of the Willard Storage Battery Company. Besides seeing the how and why of storage battery manufacture, we were able to inspect radio station WTAM in its entirety, which we had not been able to do at station KDKA at Pittsburgh.

At noon we rode part way and then trudged the rest of the way through a down pour of rain to Nela Park. After we had enjoyed lunch in the employees' cafeteria, our dampened spirits were revived. We could not kick a great deal about the weather, however, since it was the first day that the sun hadn't shone since we set forth from Madison. Friday afternoon was spent at Nela Park, the University of Light. Nat Waffle didn't rate the park very high on account of the seeming scarcity of the gentler sex. Some of the boys chose to dine at the Big Ten Club that evening, and the Japanese cashier attempted to extract a healthy tip from each member of the party until Kwasigroch, with his 230 pounds of beef, told the Jap that a policy of extraction here would be unwise. Not to be outdone by the Jap's courtesy, the gang decided on a similar policy and several sugar bowls, knives, forks, and napkins were missing at the next regular meal.

Saturday morning we were in Gary, and we breakfasted at the Y. M. C. A. Our trip through the steel plant was rather abbreviated, since our train connections back to Chicago left us only about an hour and one-half in which to browse around. Everyone in the group had tickets to the Chicago-Wisconsin football game that was scheduled for Saturday afternoon; and that is where the Eastern trip unofficially ended. We saw our team hold Chicago to a 0-0 score in a thrilling game.

Some men stayed in the "windy city" over Saturday; others came back to Madison to catch up in lost sleep.

Above all, the Eastern trip made us more closely acquainted with one another. I dare say that the friendships formed and the good times enjoyed during our "Five Nights In A Pullman" will not be forgotten for many a moon.

A REVIEW OF THE WESTERN TRIP

(Continued from page 48)

of 175,000,000 gallons daily. The water, which is drawn through a nine-foot intake tunnel extending about a mile out into Lake Michigan, is pumped from the station at pressures of 70 lbs. and 120 lbs. by vertical engines of the triple expansion type.

Many automobile manufacturers use frames made by the A. O. Smith Corporation. The main features of this plant were the system of storing and shipping the completed frames and the contrast between the automatic-machine construction and the hand-labored method. The automatic method of construction, although it has not been put into operation, will rivet and shape automobile frames in a fraction of the time required at present.

The evenings we spent in Milwaukee were worthy of another week-end celebration. Some of the fellows slept during those intervals, but most of them experienced the night life of the town, or experimented with the capacity of Dodge coupes.

Seven-fifteen on Wednesday morning came rather early, but that did not deter us from leaving Milwaukee on our "special" for Kenosha where we put in our appearance at the Nash Motor Company and at the American Brass Company.

The Nash Company makes the complete Nash motor on a large commercial scale. In the testing room, where the bearings are "burned in," two or three hundred motors are running all the time. The keyword of the Nash Plant was SPEED; and the effect on us was quite noticeable in view of the fact that we passed through the place at "double quick" almost. Finally, we were treated to pie and sandwiches, a courtesy we fully appreciated.

The other Kenosha plant which we visited, the American Brass Company, makes a large percentage of the copper and copper alloy products on the American market. This Kenosha branch also manufactures large quantities of copper wire. The copper ingots are heated and rolled and then drawn out into the required sizes. In making the copper alloys, the various proportions of the metals are put into an electric induction furnace and melted together. The alloy is then cast into ingots or into tubes. When tubes are desired, the ingots are rolled to the proper form, after which they are drawn out into alloy tubing.

Our next destination was the American Steel Wire Company at Waukegan. This plant, which is a subsidiary of the U. S. Steel Corporation, owns its own iron and coal supply as well as its own railroad. The wire is made by rolling the hot metal into three-eighths inch wire, and then drawing it through hardened steel dies. The final products made from this wire vary all the way from bed springs to barbed wire. Automatic machines are used in making fence wire, one of their most important products. These machines make thousands of feet of this wire fencing every day.

We arrived in Chicago in time to save Miller from starvation. The first thing we did was to find places where we could stay for a couple of days. Hotel Sherman was the official rendezvous. The morning after we arrived we went to Buffington to give the Universal Portland Cement Company the "once-over." At the plant we were given a royal reception, and after being fitted out with khaki capes and caps, we were shown through the plant. These uniforms, we found, came in pretty handy, for the dust was thick enough to give one a permanent "set" if he was caught in the rain. The cement is made from furnace slag, limestone, and gypsum. These constituents are crushed, dried, proportioned, and pulverized. The final mixture is fed into rotating baking ovens which are fired with pulverized fuel. The baked product is a small, hard black clinker. After this clinker has been in the seasoning yard for at least ten days, it is taken to a pulverizing mill and reduced to a powder 75% of which will pass through a 200 mesh sieve. This powder is now bagged and shipped away to be sold as the cement. An idea as to the relative size of the plant can be gathered from the fact in the bag department alone 25,000,000 bags are stored ready to be filled.

After some of the dust had been blown out of us and beaten off of our clothing, we left for Gary, Indiana, to visit the Illinois Steel Company. The steel works which are situated on the shores of Lake Michigan cover an area of 2,600 acres. The ore is all received by boat, and enough ore is unloaded during the summer to last through the period that the lake is unnavigable. From the store piles, the ore, together with coal and limestone, is taken and dumped into the blast furnace. The iron is then cast into pigs which are refined by oxidation at high temperatures. After being cast into ingots, the refined steel is heated to redness and then rolled or pressed into the desired shapes. Railroad car wheels and rails are among the important steel products made here. This plant has a surprising number of safety devices which allow the men to keep at a respectable distance from the molten metal. In winter time this plant would be a fine place to work, but in summer — nix. Power for this huge foundry is produced by gigantic blast furnace engines which burn the gases from the blast furnaces. All told, there are about fifty-seven of these engines in the power room.

A visit to Chicago's State Central Telephone Exchange was enjoyed immensely. MacDonald wished he had worn a tux. However, "all's well that ends well." This is both an automatic and operated exchange. After the principle of the automatic telephone was explained to us, we were taken to see the apparatus at work. These telephones are very rapid and almost 100% efficient. The percentage of calls that are not completed is less than in the manually operated exchanges. Incomplete calls on this system are usually due to the carelessness of the person calling.

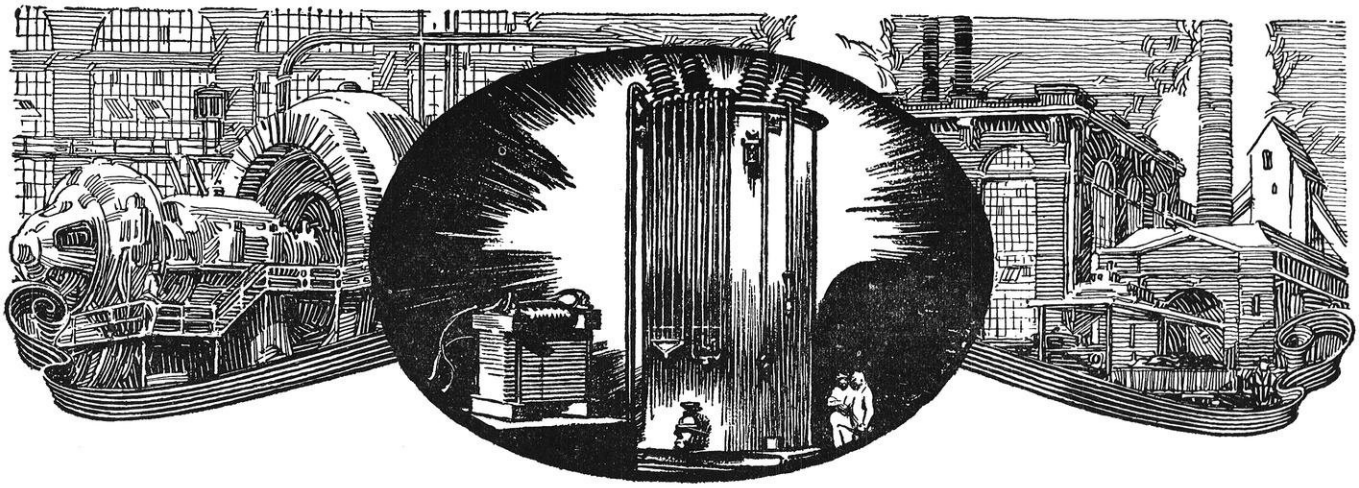
Next on the program was the Hawthorne plant of the Western Electric Company. Our guides here were

graduates of engineering colleges throughout the country. Here, too, we met many former Wisconsin men. This plant alone employs over 25,000 people, and 60% of these are women. We watched the process of making telephones and switchboards, and we marveled at the speed with which they were turned out. Automatic machines are the outstanding feature of Western Electric. A big dinner and songs for Western Electric concluded a perfect morning.

We hiked over to catch a glimpse of the Commonwealth Edison plant on Crawford Avenue. At the present time three turbine units are being installed — one Allis-Chalmers, one Westinghouse, and one Parsons reaction turbine.

Saturday morning as many of the Mechanicals as were able visited the Underwriters' Laboratories. It is here that all new devices and machines are taken and tested for safety. The variety of the products tested is unlimited. One person might be trying to burn up a fire-proof safe, while another is testing an automobile bumper to see how much it will withstand. The laboratories are operated entirely for the protection of the public.

Ah (this is meant for an ejaculation of relief) —, the drudgery was over, and all that remained for us to do was to pay that hotel bill and help the boys win that Chicago game. It was a tired bunch of engineers that cheered for "Old Wisconsin." Yes sir, we cheered so loud that the team heard us. We could tell by the way they out-fought Chicago.



A Toy—a Tool

THE first twenty days in December witnessed a big event in one man's life. They saw a toy grow into a tool—one of the most useful in all history.

On December 1st, 1885 there was brought to George Westinghouse, at Pittsburgh, an uncommercial "secondary generator"—a scientific toy. Westinghouse and associates lived with it day and night, and by December 20, 1885, in a flash of genius, had completed the essential conceptions of the modern transformer. Thus in twenty days they paved the way for alternating current, and the electrical era of the twentieth century.

Here was a brilliant engineering feat—a feat that through the years has been a particular inspiration to a specialized group of "design engineers" within the Westinghouse organization. These men are electrical and mechanical engineers who are attracted not merely by an engineering problem—but by the technical difficulties of "licking" that problem to narrow and exact practical limits.

These men work continuously with both sides of an equation. On one side are the needs of a customer. For the other side must be developed apparatus which exactly meets those needs. The apparatus may range from a complete system of electrification for a railroad to a new type of curling iron.

Engineering extends a welcoming hand to men qualified for designing. Many of the most constructive services of Westinghouse have been made possible by their leadership.

Westinghouse

ACHIEVEMENT & OPPORTUNITY

WESTINGHOUSE ELECTRIC