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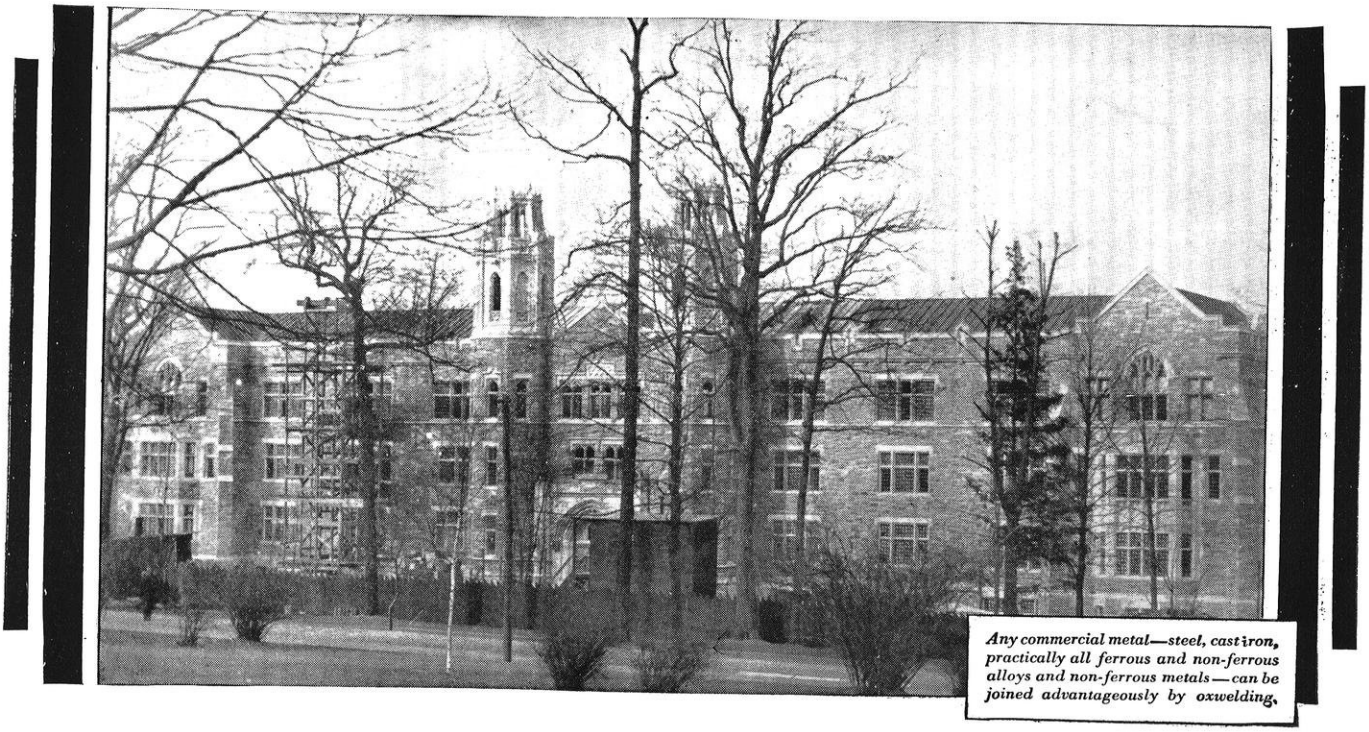
THE WISCONSIN ENGINEER

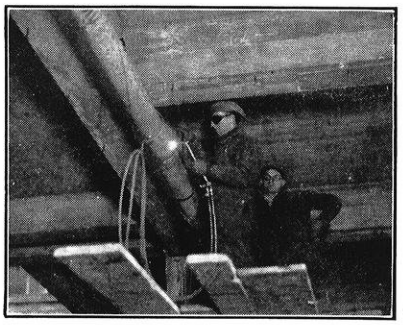
MEMBER E.C.M.A.

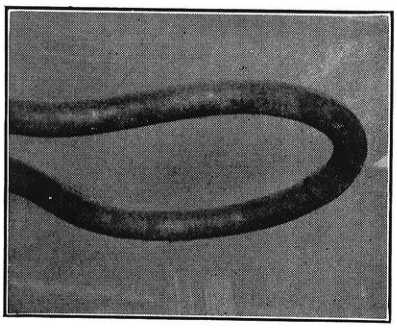
MARCH 1931

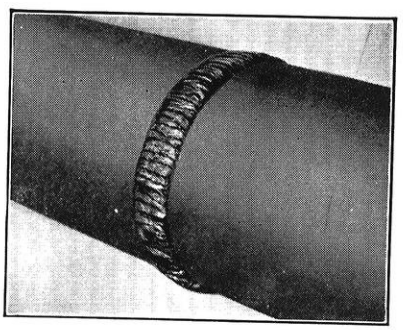


Any commercial metal—steel, cast iron, practically all ferrous and non-ferrous alloys and non-ferrous metals—can be joined advantageously by oxwelding.

At Lehigh University Packard Laboratory Piping is Oxwelded







OXWELDING was selected as the means of installing the piping system of the James Ward Packard Laboratory because of its many advantages over other methods of pipe joining. It lowered costs in every step of the installation. Design was simplified. Fittings were fabricated from standard pipe section. Weight was reduced. Insulation was facilitated and less time was required to complete the job. The piping system in this building is permanent. Every joint is as strong, as tight, as leak-proof and as lasting as the pipe wall itself.

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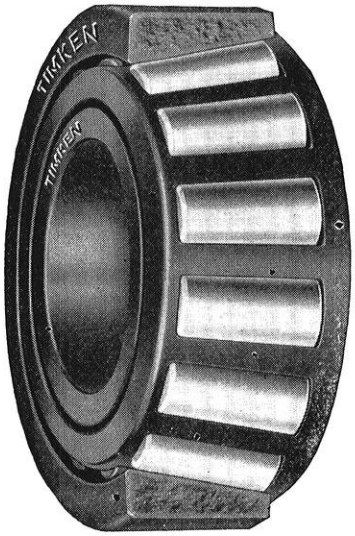

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The Wisconsin Engineer

VOLUME 35, NO. 6 MARCH, 1931

Sheboygan County Discovers

Some New Economies in Making Concrete Pavement*

By George Langley, Jr.
County Engineer, Sheboygan County

IT was my good fortune during the past summer to have field supervision of two paving projects constructed under the observation of, and subject to tests by the Division of Management, U. S. Bureau of Roads, the object of the observation and tests being the determination of the effect of the use in a 27-E mixer of various sized batches on the cost and quality of the concrete. While records quoted apply directly to only the 27-E paving mixer, I believe that, in a general way, the results would be proportionately the same with mixers of any size.

Since the beginning of the working season of 1927, the Sheboygan County Highway Commission, under the general supervision of the Wisconsin Highway Commission, has built eighty miles of portland cement concrete highway pavement.

Five miles were built in 1927 using the Wisconsin Highway Commission specifications 1:2:4 proportioning, with all measurements by volume. No strength tests were taken, but 1.6 bbls. of cement were used per cu. yd. of concrete.

Twelve miles were built in 1928 using the same specifications but with the sand measured by weight and corrected for moisture and bulking factor. The average compressive strength as indicated by cores broken at six months of age was 3960 lbs. per sq. in. The cement content was 1.39 bbls. per cu. yd. of concrete, and the average batch volume was 29.2 cu. ft.

Thirty miles were built in 1929 using a designed-mix specification. Fine and coarse aggregate were measured by weight, but without separating and recombining the coarse aggregate. Test beams were fabricated and gave an average modulus of rupture at 28 days of 665 lbs. per sq. in. Cores broken at an age of six months showed an average compressive strength of 4250 lbs. per sq. in. The cement content was 1.24 bbls. per cu. yd. of concrete.

On the work of that season, two 27-E Koehring mixers were used. Six bags of cement were used per batch. and the average batch volume was 33.4 cu. ft. This increase in the size of the batch increased the production rate to a very noticeable extent.

In planning work for the season of 1930 we expressed to the Construction Engineer of the Highway Commission, our desire to use a designed-mix, the coarse aggregate separated into three sizes and recombined into the batch; also, a desire to use a batch volume as large as the mixer would handle or as large at least as the average of the previous season, 33.4 cu. ft.

A Designed Mix is Used

We were granted permission to use a designed-mix and the separated coarse aggregate. Considerable argument developed, however, over the question of the size of the batch.

Mixer manufacturers had an agreement limiting the size of the batch in the 27-E mixer to 27 cu. ft. with an over run of 10%, or a maximum load capacity of 29.7 cu. ft. More or less authentic records were available from other localities which tended to show that over-loading the mixer was detrimental to the concrete. Engineers for the manufacturers argued that, even if the quality of the concrete produced with an overloaded mixer was satisfactory, the practice would not be economical because of the increased upkeep cost of the mixer.

In opposition to these arguments were the records of our work of 1929. Strength test records even with the batch size of 33.4 cu. ft. were satisfactory on a basis of comparison with results on work of a like type and the normal mix volume of about 28 cu. ft. We also contended that there would be a pronounced saving in the cost per sq. yd. with the use of the larger batches.

As a result of these arguments, we were finally granted permission to award contracts on two projects, one eleven miles long, and the other twelve miles long, with special provisions specifying the use of 27, 30, 33, and 35 cu. ft. batches on each project. We invited the co-operation of the

*This paper was presented at the convention of the Engineering Society of Wisconsin on February 19, 1931, and will appear in the bulletin of that society.

Division of Management, U. S. Bureau of Roads, and it was finally agreed that the projects should be operated as a test of the quality of the concrete produced from the various different sized batches and the economic value of each, the Division of Management to make the necessary tests and cost computations. Unit prices were requested on each batch size, and on the twelve mile project the contract was awarded with the following prices per sq. yd. of pavement exclusive of cement:

27 Cu. ft. batch — $1.07 per sq. yd.
30 Cu. ft. batch — 0.99 per sq. yd.
33 Cu. ft. batch — 0.97 per sq. yd.
35 Cu. ft. batch — 0.98 per sq. yd.

Prices on the eleven mile project were as follows:

27 Cu. ft. batch — $0.97 per sq. yd.
30 Cu. ft. batch — 0.95 per sq. yd.
33 Cu. ft. batch — 0.93 per sq. yd.
35 Cu. ft. batch — 0.93 per sq. yd.

Concrete is Tested

Each contractor was equipped with a 1927 model, 27-E Koehring Paver. Each batch size was used on each project in the construction of one mile of pavement. In taking tests, three collapsible steel beam moulds six inches by eight inches by forty-two inches in length were so placed on the subgrade as to obtain a sample of the middle and each end of the batch. Metal containers capable of holding sufficient concrete to permit the fabricating of one 6x12 inch cylinder, and a 25 lb. sample were placed at each corner of the batch and a container holding sufficient concrete for two 6x12 inch cylinders and a 25 lb. sample was placed in the center of the batch.

After placing these beam forms and containers on the subgrade, the batch was spread over them exactly as all batches were spread. The forms and containers, full of concrete, were then removed from the subgrade. The beams were finished off and laid aside to be transported to the curing yard at Sheboygan. The cylinders were fabricated with concrete from the containers. Beams and cylinders were carefully marked as to location in the batch and on the project. The samples were then analyzed to determine the proportions of coarse aggregate, fine aggregate, cement and water in each part of each batch sampled. Ten tests were made of each batch size.

The beams were cured in Sheboygan under as nearly as possible even temperature and moisture conditions. One break was made on each beam at seven days and two breaks at twenty-eight days. Thus, there were 30 seven-day breaks and 60 twenty-eight-day breaks on tests from each batch size. Cylinders were transported to Madison and broken in the University laboratory. Cores were cut from the pavement at each point where tests were taken, and these are now being broken in the University laboratory as they come to an age of six months.

After the projects were under way using the contractors' mixers, we sought and received the co-operation of the Koehring Company and the Chain Belt Company, so that after a complete set of tests had been made with the old mixers, a Koehring 27-E mixer of the latest type was placed on one of the projects and the latest and most modern of Rex 27-E mixers on the other project. No charge was made in either case for the use of these new mixers, and each of these companies went to considerable trouble and expense so that the tests might be as perfect and complete as possible.

Another complete set of tests was taken with each of the new mixers, that is, ten tests were taken and one mile of road was built with each batch size.

Time of Mixing is Studied

After these batch size tests were complete, one of these mixers was used for a study of the effect of time of mix on the concrete produced to test all four batch sizes in reference to time of mix, but ten tests were taken on a 30 cu. ft. batch with the meter set at 50 seconds, ten tests at 60 seconds, and ten tests at 80 seconds. The same number and type of tests were taken using a 33 cu. ft. batch. The other mixer was used on the balance of the project to which it had been assigned, in the study of a so-called consistency indicator.

General results of tests taken during the season of 1930 were very satisfactory. The twenty-eight day average modulus of rupture of beams was 851 lbs. per sq. in. The cores, reported to date, broken at an age of six months, show an average compressive strength of 5420 lbs. per sq. in. This is an increase of 50% in compressive strength 1928 to 1930, and 30% in flexural strength 1929 to 1930. The cement content per cu. yd. was reduced 10% 1928 to 1930. This pronounced increase in strength and decrease in cement content was, of course, due to closer control of the proportioning of the materials and the separation and recombining of the coarse aggregate which, with the resultant uniformity, made this control possible.

Records of the tests of batches of the various different cubical content used were as follows:

BATCH-SIZE TESTS

Batch Cu. Ft.	28 Day Cylinders No. of Breaks	28 Day Cylinders Pounds Per Sq. In.	28-Day Beams No. of Breaks	28-Day Beams Pounds Per Sq. In.
27	120	3513	120	868
30	120	3599	120	881
33	120	3641	120	886
35	120	3665	120	883

MIXING-TIME TESTS

Size of Batch Cu. Ft.	28-Day Cylinders Pounds per Sq. Inch 80-Sec.	60-Sec.	50-Sec.	28-Day Beams Pounds per Sq. Inch 80-Sec.	60-Sec.	50-Sec.
30	3849	3835	3857	818	845	841
33	3761	3837	3855	836	839	835

The report further shows that there was no difference, as the size of the batch increased, in the uniformity of distribution of the materials within the batch. The records of the cost studies show that there was a pronounced reduction in cost as the size of the batch increased up to the point where it became necessary to run the bucket out twice to discharge the batch. The records also show that this point with the old mixers was slightly over 33 cu. ft., the bucket capacity of the new mixers being large enough to handle the 35 cu. ft. batch in one load.

Summarizing

From the test records of Sheboygan County 1927 to 1930, it is evident that as greater control of the proportioning of the materials is attained, the cement content may be reduced to some extent without lessening the strength of the concrete.

From the records of the Division of Management, U. S.

Bureau of Roads of tests taken during the season of 1930, it is apparent:

1st: That the practice of separating and recombining the coarse aggregate is warranted.

2nd: That the volume of concrete per batch in a 27-E paver may be increased to 33 or 35 cu. ft. without harm to the concrete, and that this increase reduces the cost per sq. yd. of the pavement.

3rd: That the mixing time may be reduced to 50 seconds without harm to the concrete.

It is needless to say that these results are of enormous economic value.

Sheboygan County this year is to construct twenty miles of portland cement concrete highway. On a basis of the above findings, the saving on this season's work will be as follows, comparing material quantities and methods of 1928 with those of the present:

Cement saving @ 6½c per sq. yd. ----------$15,252.60

Saving due to increase in batch volume @ 5½c per sq. yd. ----------$12,906.30

A total of $28,158.90, or $1,408.00 per mile.

In conclusion, I would feel that I had neglected to do my duty were I not to call your attention to the fact that money invested in good practical research, in the laboratory or in the field, is money profitably invested.

FACULTY STUDIES TIME DEMANDS ON STUDENTS

IN line with its policy of making occasional investigations of the hours of work required of engineering students, the engineering faculty last spring sampled the various courses and collected information which was referred to a committee consisting of Professors J. B. Kommers, J. W. Watson, and G. C. Wilson. The report of the committee, dated on February 1, presents information of interest to both students and faculty.

The report indicated that the greatest time demands are made in the laboratory courses. Recitation courses average 2.67 hours per week per credit, including both class room time and time spent in preparation. The range is from 1.99 to 3.30. On the basis of a 19-credit schedule and a 52-hour week, the time demand should be 2.75 hours per credit.

Combined recitation and drawing courses averaged 2.72 hours per credit with a range from 2.26 to 3.38. Combined recitation and laboratory courses averaged 3.45 hours per credit with a range from 2.63 to 4.48. Laboratory courses averaged 3.86 hours per credit with a range from 2.10 to 5.07.

In the sophomore year, students in chemical engineering average 54.59 total hours per week, in electrical engineering, 53.55 hours, in mechanical engineering, 52.49, and in civil engineering, 48.17. The corresponding average grade points earned last semester were 0.95, 1.14, 1.15, and 1.29. The civil engineering sophomores take 17 credits as against 18 credits in the other courses.

In the junior year, students in chemical engineering average 58.26 total hours per week on 19 credits; students in electrical engineering average 54.11 hours on 19 credits; students in mechanical engineering average 62.45 hours on 20 credits; and students in civil engineering average 49.59 hours on 20 credits. The corresponding grade points earned last semester were 1.42, 1.26, 1.52, and 1.56.

The following is a summary of the time requirements of the various departments in the college of engineering:

Department	*Total Hours*	
	Recitation Courses	*Combined Recitation and Lab. or Lab. only*
Chemical Engineering	3.10	3.25
Electrical Engineering	2.75	3.59
Steam and Gas	2.46	4.64
Mechanics	2.40	4.22
Civil Engineering	2.51	3.04

The committee points out that, "If 19 credits is looked upon as an average course, and 52 total hours per week as an average total time, then a course would be entitled to about 2.75 hours per credit. It will be noted in the summary that all but one of the departments come within this limit on purely recitation courses, and that all departments are offenders in requiring more than this in purely laboratory, or in combination courses.

"All courses, with the exception of civil engineering, are now requiring more than 52 hours per week, which total this committee believes to be a reasonable upper limit. Any changes or adjustments should have in view an increase in the quality of the work done rather than an increase in quantity. The committee wishes to point out that, in general, this situation should be remedied by a reduction in the amount of work required in the offending courses, and not by an increase in the amount of work in courses which may not be getting their fair share of the student's time. It is recommended that the total number of working hours per week be brought down to 52 hours."

The departments and courses that have been found to be making unusually heavy demands upon the students' time have, according to Dean Turneaure, already taken steps to adjust their work so as to bring it into line with the recommendations of the committee.

THE MARCH COVER

A New View of the Campus

Editor's Review

THE illustration on the cover of this issue shows a recent aerial view of the campus from the men's dormitories on the left to Lathrop Hall on the right. The new Mechanical Engineering building is just north of the stadium, near the left edge of the picture. The old Randall Shops building has been incorporated into the new building, which surrounds the shops on three sides.

When the new Forest Products Laboratory is built, the old laboratory, standing next to the new mechanical building, will probably be occupied by the department of mining engineering. Ultimately, all of the departments of engineering will be housed on this site, and the present engineering buildings will be turned over to other colleges.

Equipment will begin to move to the new mechanical building this spring, and by next fall the new building will be in full use. The fact that the new building is located half a mile from the present engineering group promises to create some difficulties for the students who have to attend classes in both places.

A Review of Recent Developments in Timber Framing*

By GEORGE W. TRAYER, WIS.'12
Senior Engineer, Forest Products Laboratory

BECAUSE wood was the pioneer building material and has long been the one most familiar to builders and to the general public, the need for adequate research in the use of this material in construction has been largely ignored. The assumption is tacitly made that all worthwhile points in wood construction must have been discovered in the course of centuries and consistently embodied in carpentry practice. This is a mistaken and dangerous attitude, however, and continued indifference to the necessary research would tend to hasten a crisis in forestry and forest industry by rapidly diminishing the most important market for lumber, namely, building construction, to which over 60 per cent of the lumber produced in the United States goes.

Realizing the significance and the importance of this situation, the Forest Products Laboratory has started a research that aims at improved design and construction methods for wood. At present the funds and personnel available for the work are very limited but it is hoped that an expansion of the program will eventually be possible.

Some changes in timber-framing practice have come in the past 10 or 15 years, most of which have been brought about through a demand for economy of material and labor. Structural research, however, has not kept pace with this rule-of-thumb development and, consequently, economy in first cost has too often been obtained at the expense of strength and stability. Hence, structural research of fundamental character is needed in this field to make wood construction at least as much of a science as steel construction has become. Wood itself compares favorably with other construction materials, and much reliable information is available on its physical and mechanical properties. The same can not be said, however, of general design and construction practices in its use.

In Europe timber design has undergone radical changes within the past 10 years. In consequence, not only local lumber but also that imported from the United States is now effectively competing with other materials of construction produced locally. This paper will describe some of the more recent developments here and abroad.

Joints and Fastenings

Joints and fastenings form the greatest source of weakness in wood construction. Timber of small dimensions is usually joined by nails and that of larger dimensions by bolts or other metal fasteners. Much has been accomplished at the Forest Products Laboratory in the past few years on the resistance to withdrawal of nails and the resistance to lateral movement of nailed joints. Fairly complete data are now available on withdrawal resistance, and tests of lateral resistance, covering a wide range of nail sizes and species of wood, are now in progress. Within a short time dependable information will be available on this vital subject, now either ignored in engineering handbooks or dismissed with an apology for the lack of useful information.

Reference to several widely used handbooks on the design of a simple bolted tension joint shows a range of over 600 per cent in the working loads recommended by various authorities. Fortunately, this situation will soon be corrected. The Forest Products Laboratory has just completed an extensive series of tests on the bearing strength of wood under common steel bolts, from which dependable working loads have been derived. Hundreds of bolts of various lengths and diameters were tested in both hardwood and softwood species. The results of these tests and the working stresses derived from them are now being incorporated in a government bulletin which should be available within a year.

The work on bolted joints is being carried still farther, however, and a variety of metal fasteners now used extensively in Europe to increase the efficiency of bolted joints are being tested. Preliminary results indicate that with the best of these fasteners, which act somewhat like dowels or

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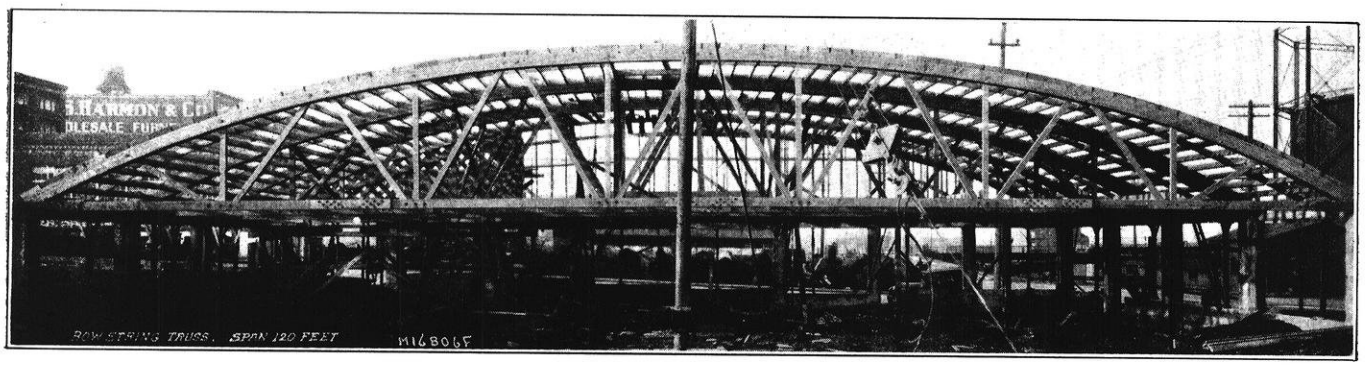


Courtesy U. S. Forest Products Lab.

The demand today is for large floor spaces unobstructed by columns. Timber trusses are meeting this demand in a satisfactory manner. This truss has a span of 120 feet.

keys, the strength of a bolted joint can be enormously increased; the possibilities of their usefulness, therefore, are great. Their field of application includes large roof trusses, transmission towers, radio towers, hangars, stadiums, and the like.

Considerable publicity has lately been given the recent development in welding steel joints, which promises to advance the use of steel greatly by opening up vast new fields of application. It is reasonable to think that better joints and fastenings may do as much for lumber as welding is expected to do for steel.

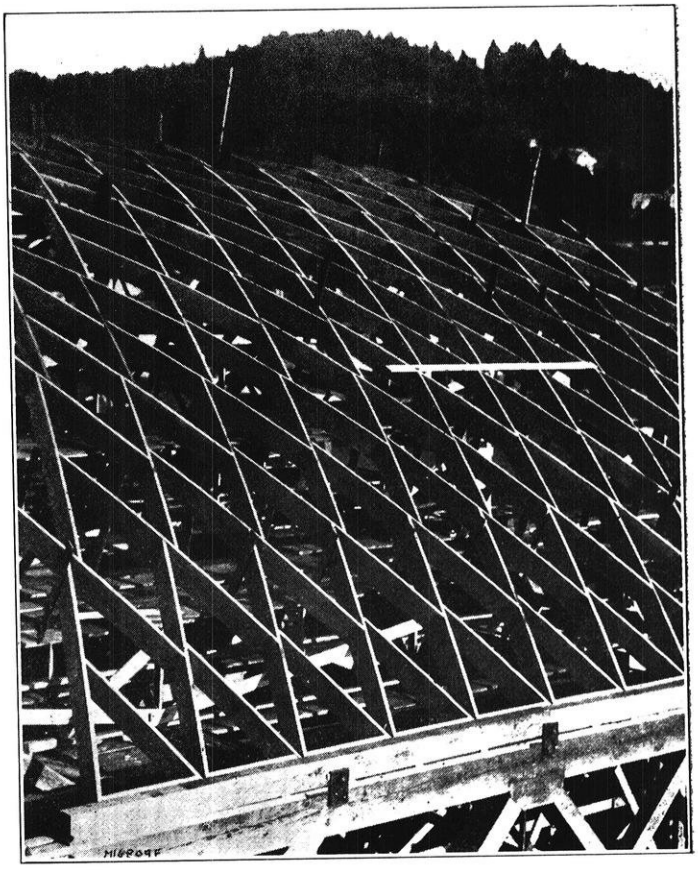
Laminated Wood Construction

In laminated construction several pieces of wood are so joined that the grain of all pieces runs in the same general direction. The various laminae may be glued, nailed, bolted, or joined by a combination of these methods. This type of construction is becoming increasingly general; its particular merit hinges both upon the possibility of utilizing thoroughly dry, short-length, small-dimension material and upon the effective placement of the best material.

Some progress has been made in the design of laminated columns joined with nails and bolts. With this type of fastening it has not yet been possible to develop an arrangement of laminae that would equal the strength of a solid stick of like dimensions, but tests have shown that, with good nailing, about 80 per cent of the strength of a solid piece of comparable quality can be obtained. This applies to short columns and to those just within the Euler class. Simply joining the various pieces face to face is very poor practice and tests showed that such a column was only one-third as strong as a solid piece of like overall dimensions. One simple and good arrangement consists of several pieces face to face but also having their edges joined by wood cover plates. Another good arrangement is four pieces of good quality boxed around a low-grade solid core.

Laminated beams and girders in which the plane of each joint between faces is vertical have long been used. Ordinarily the laminae of such members are either nailed or nailed and bolted. At the present time tests are being conducted at the Forest Products Laboratory on glued laminated beams that have the plane of each joint horizontal. This construction offers the possibility of putting high-grade material in the upper and lower laminae and poorer material near the neutral axis. The tests have not yet progressed far enough to permit the drawing of conclusions as to the effectiveness of this type of construction. Should it prove satisfactory, however, its field of application will be tremendously broad.

Within the past few years the use of bow-string wooden trusses with laminated upper chords has become increasingly common. The upper chord, which is arched, is built up of a series of long lengths of 2-inch lumber, superimposed one on top of another and either nailed and bolted or glued, nailed, and bolted together. These arches are assembled around a form and retain their curvature when removed from it. Two such laminated arches spaced to receive the web members constitute the upper chord of the truss. The web members are usually solid. The lower chords consist of two or more pieces conveniently spaced to receive the web members, and spliced with wood fish plates at intervals according to the span. Practically no dependable design data are available on this adaptation of laminated construction. Present practice is largely the result of cut-and-try methods. It is simply another instance in which research has lagged behind changes in practice.



Courtesy U. S. Forest Products Lab.

Lamella construction in the roof of the gymnasium of the University of Oregon at Eugene, showing the barrel-like surface of mutually-braced members.

Still another application of laminated construction is found in gothic barn roof construction. The barn roof truss has evolved from the heavy-timber type, strong but costly, to much lighter types of construction, one of which is the laminated arch. One-inch material is common, and usually four or five laminae are bent around a form and nailed together to form an arch. Very often these arches, which are spaced laterally at intervals of about 2 feet, are not sufficiently rigid to make the roof self-supporting, in which case it is common practice to use a segmented arch in place of every fourth ordinary laminated arch. The segmented arches differ from the usual laminated arch in that their face joints are vertical. The laminae consist of a series of segments cut from 1-inch stock and nailed face to face. Sometimes segmented arches, spaced 2 feet apart and only two or three laminae thick, are used throughout the roof. Both of these types of construction represent a great economy of material in that short-length, narrow, and relatively low-grade material may be utilized.

Opposed to light-arch construction, in which the laminae are nailed, is a relatively modern European development of large laminated arches, which are glued. Small stock re-

(Continued on page 184)

State Engineers Hold Annual Meeting

Walter A. Peirce, manager of the Racine water department, is the new president of the Engineering Society of Wisconsin. H. C. Webster, consulting engineer of Milwaukee, is vice-president.

* * * *

Ray S. Owen was elected to succeed himself as secretary-treasurer. R. W. Gamble, of Milwaukee, and A. L. Boley, of Sheboygan, are the new trustees.

* * * *

Registration at the convention was 141 as against 172 for a year ago. The depression is blamed for the drop.

* * * *

Secretary Owen reported the membership as being 363, a drop of 20 from a year ago.

* * * *

Members of the student section of A. S. C. E. handled the arrangements for the evening program on Surveyors' Day, and assisted generously in other ways.

* * * *

Members of Chi Epsilon, honorary civil engineering fraternity, handled the registration.

* * * *

Student reporters from the classes in Engineering English covered the three days of the meeting so that some one was on the job at all times.

* * * *

Prof. J. B. Kommers was in charge of arrangements for the smoker at the University Club on Thursday evening and provided entertainment, refreshments, and a chance for a quiet social hour.

* * * *

The luncheons at the University Club proved very popular. On Friday, 35 persons signified that they would be present; Prof. Owen guessed that five more would come and ordered 50 places to play safe. Sixty people showed up.

* * * *

Motion pictures of the dropping of the obelisk dam at Chute à Caron were shown at the smoker and aroused such interest that they were shown again at the meeting on Friday.

* * * *

Raymond Trow's demonstration of how and how not to clean a transit was well received by the surveyors.

* * * *

The 6½-lb. explorer's transit used by Byrd's party at the South Pole was exhibited by the Gurley Company and drew a crowd at all times.

* * * *

The auditing committee consisted as per tradition of Gallistel and Cottingham, who reported everything okeh.

* * * *

The resolutions committee consisted of L. J. Markwardt, Karl Zander, and L. P. Atwood.

Three past-presidents, Randall, Heebink, and Ullius, were appointed to the nominating committee and are chiefly responsible for the new officers.

* * * *

The program was presented as printed with two exceptions: H. C. Webster, the new vice-president, was in Florida and did not discuss the platting law, and Governor La Follette, scheduled to speak on the grade separation program, sent Lieutenant-governor Huber in his place.

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Mr. Huber found the going a little heavy when the questions began to fly in regard to the new highway bill. Henry Traxler, who was informed because of his contact with the League of Municipalities, came to his aid with the facts and figures.

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Surveyors' Day, which was introduced last year, proved again successful. It was kept as informal as possible with much discussion and few set speeches.

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The ten-day short course for plumbers was in session at the university during the convention and offered an attractive program to those interested in sanitary matters. Prof. F. M. Dawson was in charge of arrangements for the course.

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Letters were received via air mail from Prof. L. S. Smith and C. V. Kerch, both of whom are in California. The latter indicates that he is still in a wheel chair but is making rapid improvement, and "is still a pretty good old dog for the shape he's in."

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Henry Tubbs, of Elkhorn, grand old man among the city engineers of Wisconsin, was in attendance again after missing last year's meeting because of an operation. He was present Wednesday for Surveyor's Day and remained for the banquet on Friday.

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The Beloit engineers were present in force: Heebink, Batterman, Popelka, and Collins.

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Dwight S. Fowler led off the discussion on land surveying with an account of how broken blue pottery, placed in the hole with the marker for a section corner thirty years before, enabled him to recover the corner in 1930.

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John Williams and Karl Zander upheld the honor of Kenosha and helped to make the discussions lively and interesting.

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Prof. John Dodds, of Iowa State College, in telling of the operation of the Iowa registration law, stated that in five years 290 applicants have been examined, of which number 85 failed to pass.

Natural gas, Prof. Otto Kowalke told the meeting, must be "reformed" by passing it over a bed of coke before it can be mixed with manufactured gas.

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Hans Peterman, Karl Zander, John Williams, and George Randall created a lively discussion over the proper way to monument a new plat. Iron markers and plenty of them, preferably on inside corners, seemed to have the edge over concrete monuments, fewer in number, placed where grading operations destroy them.

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Prof. Owen promised to demonstrate next year a radio device by means of which iron stakes may be quickly discovered although buried in earth or snow.

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The Highway Commission was criticized for not making greater effort to preserve section corners and mark them on the pavement.

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Herbert Lord, engineer with the Metropolitan Sewer District of Madison, told of his troubles in trying to correlate the information on individual plats and produce a comprehensive plat of the district. Failure to apply simple and obvious checks to the work, he stated, leads to much inaccuracy.

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Adolph Kanneberg, railroad commissioner, also mentioned inaccuracy and incompleteness as common faults of surveyors' maps in his talk on the surveyor as a witness. He showed actual maps to prove his points.

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George Langley, Jr., who is described by his home town papers as the "Lincolnesque surveyor of Sheboygan County," had his audience sitting on the edge of their seats with his paper on the effect of over-charging mixers.

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Sheboygan County, according to Mr. Langley, saved $1408 per mile of pavement by doing two things: first, separating the gravel into three sizes and recombining it as desired; and, second, by charging 33 cu. ft. of materials into 27-ft. mixers. Tests showed no loss of strength in the concrete.

* * * *

Gov. La Follette's grade separation program, as outlined by Lt. Gov. Huber, contemplates making in 1930 the 91 separations originally planned for the next three years. Plans are said to be completed for the work; actual construction awaits the passing of legislation for a 2-cent increase in the gas tax, which is to provide the necessary funds.

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Each separation will provide work directly for 30 or 40 men. The governor estimates that two or three times that number of additional men will be given employment indirectly through this activity.

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The joint banquet with the Technical Club of Madison, held in the Park Hotel, Friday evening, brought out a big crowd. Many present were members of both societies. C. B. Hayden, chief engineer of the Wisconsin Railroad Commission, presided.

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Engineers are well represented on the roster of the Mozart Club, which gave a delightful program at the banquet. This feature is gradually mellowing into an established tradition.

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Motion pictures of the work of providing a modern water supply for Athens and of building a new railroad in Persia were shown at the banquet by Mr. G. E. Hines, chief engineer for Uhlen & Co.

* * * *

Temperatures in Mesopotamia reach 165 in the shade, according to Mr. Hines, and nothing but hot tea will stay in the human body long enough to reach the kidneys. Ah, the romance of it!

* * * *

Americans, before leaving New York for Persia, were shot for typhoid, typhus, small pox, bubonic plague, cholera, and a few other choice diseases.

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The registration of engineers received attention as it has at each meeting for many years. T. Chalkley Hatton told of the efforts of a joint committee representing the organized engineers of the state to prepare a bill for presentation to this legislature.

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The architects, who already have registration, again generously agreed to co-operate in securing a law that would cover both architects and engineers. This is a decided contrast to the situation in some states where architects and engineers have developed considerable antagonism.

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A bill was prepared and, after many conferences, was printed. Last minute objections by mechanicals and electricals upset calculations.

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The civil engineers are trying to arrange with the architects for a bill that will cover just those two groups.

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The surveyors have been left out of all attempts to secure legislation.

* * * *

President Glenn Frank spoke for the second time before the society. He warned that certain unusual features mark the present business depression and indicate that it may develop into a chronic condition instead of passing quickly as every one hopes.

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Dr. Frank opposes those who would lower wages and reduce standards of living. Such a policy he labels, "defeatist." Such a retrogression, he claims, cannot be justified in the face of our abundant resources.

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The proper remedy, Dr. Frank states, lies in providing work for every one through shorter hours, and in increasing

(Continued on page 186)

Editorials

IN CASE YOU DON'T KNOW The engineer-governor of Wyoming, Frank C. Emerson, died on February 18 from heart attack induced by pneumonia. He was serving his second term as governor.

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Athens will soon have a water supply of 35 gallons per capita per day, instead of 4 gallons as at present, thanks to an American construction firm, which has built a great marble dam, overlooking the plain of Marathon, and an aqueduct from the dam to the city. The construction firm supplied the necessary finances and will operate the plant temporarily.

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When Denver changed from the use of artificial gas to natural gas recently, it was necessary to change the burners on every gas appliance in the city as the two kinds of gas differ radically in their characteristics.

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The civil engineering course at the University of Wisconsin is sixth largest among the 125 American colleges according to figures released by the Department of the Interior.

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C. C. Williams, dean of engineering at Iowa University, was made chairman of the athletic board at the institution following the famous ouster. He represented the Big Ten at the National College Athletic Association at the December meeting. Write your own ticket.

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An engineer, Col. Robert Isham Randolph, president of the Chicago Association of Commerce, is leading the fight to restore law and order in that city. Incidentally, he is being sued by Mayor Thompson for one million dollars, on the charge of slander.

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Work has begun on the Mississippi River Bridge at Prairie du Chien.

EIGHTH IN WHO'S WHO The University of Wisconsin rates eighth in *Who's Who*, according to a recent issue of *School and Society*, which lists the leading schools in this order:

1.	Harvard	1374
2.	Yale	937
3.	Princeton	480
4.	Michigan	470
5.	Columbia	402
6.	Cornell	401
7.	Amherst	296
8.	Wisconsin	287

A total of 139 schools is listed, the last school in the list having 20 names in *Who's Who*.

UNITED WE STAND The engineers of the state have recently held their 23rd annual convention. Attendance was good and those present seemed to enjoy themselves. On the surface, there is cause for some self-satisfaction over conditions, but is it justified? The society has 363 members — almost as many as last year, in spite of hard times — but there are probably 3,000 engineers in the state. Twelve per cent membership leaves much to be desired. Lawyers, for example, are fewer in number in the state, but their organization has 1,500 members.

The Engineering Society of Wisconsin tends to be strongly civil in membership in spite of definite efforts to make it more comprehensive. The programs are planned to make a general appeal to all groups of engineers. In addition, there is an effort to supply something of interest to the special groups. The trustees now hope to develop the idea of Surveyors' Day so that they can provide programs for mechanicals, electricals, and other groups. Progress in this direction is, however, somewhat discouraging. Engineers other than civils do not seem to feel the same urge for a society that will integrate the diverse groups of engineers into a single profession.

Is there no common denominator in engineering? Will engineers continue to differentiate until our 157 varieties become 257? Is the engineer hopelessly self-centered?

"The technical student cannot be satisfied with an open mind and a liberal heart, but he is required to submit a positive answer supported by logical reasoning."

—J. Hugo Johnson.

FOR THIS RELIEF, MUCH THANKS The investigation of the engineering faculty into the hours of work required of engineering students, an abstract of which appears upon another page of this issue, promises to result in better balancing of the load that the student, like a patient burro, carries upon his back. In general, the engineering student cannot complain of being overloaded, but, like the burro, he appreciates having the load properly balanced and so adjusted that it doesn't make pack sores.

A study of the detailed information collected by the faculty indicates that some departments work out their courses so that they get their fair share of the student's working hours but no more. They have budgeted their time with considerable skill, — which is as it should be if the faculty members have the intelligence they are supposed to have. Other departments either have paid insufficient attention to the matter of time, or have been

poor guessers, with the result that their loads have galled the withers of the aforesaid patient (more or less) burro. The relief which is promised as a result of the investigation will be appreciated in proportion to its promptness.

"An engineering course offers many real advantages of a purely educational nature for the student seeking a liberal education — entirely aside from its usefulness as a direct preparation for his life's work."—J. Hugo Johnson.

WE MUST HAVE TIME TO DRAW THE PICTURE

One of the railroad classics is the story of the general manager who arrived at the scene of a washout all of a lather and stepped off of his private car to find himself face to face with the bridge foreman.

"How are things going?" demanded the manager all of a quiver. "Has the engineer given you the plans for the temporary bridge?"

"I don't know if the engineer has drawed the pitcher yet," said the foreman calmly as he spat the customary squirt of tobacco juice into the soft October breezes. "I don't know if the pitcher's drawed, but the bridge is built."

In the discussions which are raging over proposals to do extensive public construction as an emergency measure to relieve unemployment, editors and politicians are revealing a naive tendency to accept the philosophy illustrated by the story. They seem to regard the "engineer's pitchers" as unimportant preliminary to important construction. One editor, for example, suggests that the government work be confined to highways, which he explains, can be started without any preliminary planning!

The American Engineering Council has recently gone on record as opposing the plan to have the Federal Government issue large amounts of bonds for emergency engineering construction. The grounds for this opposition are:

(1) The organization and facilities of the several departments of the government, which under the law must direct this work, would not be able to expend with reasonable efficiency and within a period of two years, any large amount in addition to the appropriations already made.

(2) The sums already made available by the Federal, State and municipal governments, by the railroads, public utilities, and other corporations, are so large in the aggregate as to make the effect of an additional billion dollars which might be appropriated, relatively secondary and of minor importance.

This country learned to its amazement in 1917 that it could not depend for its army upon men who would "spring to arms over night." Armies have to be trained. Apparently the country must learn that it cannot spring to work on a big program of public construction. Such a program must be carefully planned.

All through the life of a pure minded but feeble bodied man, his path is lined with memories — gravestones which mark the spots where noble enterprises perished for lack of physical vigor to embody them in deeds.—Horace Mann.

REGISTRATION STILL A MIRAGE

Those who desire a registration law for engineers in Wisconsin, will probably have to pull up their belts, call upon their reserves of determination, and begin another round of the battle that has lasted for so many years already. Prospects of putting a bill through the present legislature are not good.

T. Chalkley Hatton told the recent convention of the Engineering Society of Wisconsin about the efforts of a joint committee, representing all organized engineers in the state, to prepare a bill. Good progress was made and a bill was prepared and copies distributed to engineers throughout the state. Just when everything seemed set to go, the electrical and mechanical groups, acting at the request of their national societies, asked for delay. This completely upset all plans. The architects have gone ahead with their plans for a modification of their existing bill. The civils have made some efforts to go ahead and secure registration for themselves in conjunction with the architects.

The electrical and mechanical groups, in asking for delay, were acting upon instructions from their national societies, which are making plans to secure registration upon a national scale. This would be highly desirable, but it is estimated that national registration cannot be secured earlier than four years from now. Many who have hoped for registration in Wisconsin at this time, will be disappointed at the turn of events.

"My message to the engineering profession is to develop a professional class consciousness, and to overcome the inferiority complex which has heretofore obscured the importance of the engineer as a factor in the progress of civilization."—John Hays Hammond.

LET'S HAVE IT

It is rumored that the mechanicals are thinking of holding an all-engineering housewarming dance in honor of the new Mechanical Engineering Building which will be opened some time in the late spring. Perhaps this might be taken as the much-asked-for substitute for the abolished St. Pat's parade. At any rate it brings a thrill to think of the possibilities such a party would doubtless offer. Imagine sitting one out over in the corner behind a brand new diesel, with the soft strains of orchestra music lilting around among the dynamometers and Nordbergs, and the gentle zephyrs of the new-born Spring being wafted gently against the face by the fan of the Liberty motor mounted on the test block! Go to it, you mechanicals, we're behind you.

Some of the more desirable results of four years spent in college may be a thoughful consideration for the rights of others, a tolerant respect for their neighbors' convictions, an ability for and an enjoyment in pleasant co-operation with one's fellows, a capacity for self-enjoyment when alone, the development of real convictions as to standards of life, and a habit of seeking a definite solution for all problems through a fearless, honest balancing of carefully ascertained facts.—J. Hugo Johnson.

Alumni Notes

Among Our

Successful Wisconsin Engineers

is

Joseph P. Schwada

As city engineer of Milwaukee, the largest city in Wisconsin, and as past president of the Engineering Society of Wisconsin, Joseph P. Schwada stands among the leaders of his profession in the state. He unites the temperment of the scientist with the executive ability to carry out the plans that he conceives and is giving Milwaukee what his associates in the profession recognize as very fine service.

Schwada was born in Milwaukee on May 1, 1886, of Bohemian parentage. His father was a tailor. He attended West Division High School. He was graduated from the course in civil engineering at the University of Wisconsin in 1911 and received the degree of Civil Engineer in 1926.

He Begins as Rodman

He began his engineering experience as chainman and rodman on the staff of the city engineer of Milwaukee in the summer of 1908, working under Mr. Charles Poetsch. The next summer was also spent working for the city as material clerk in the pipe yards. During the summer of 1910 he did general civil engineering work for T. M. E. R. & L. Co.

Following his graduation in 1911, he was appointed field engineer and inspector for the Wisconsin Railroad Commission and worked on surveys, plans, and estimates for grade separations. He left in January, 1912, to accept a position as structural designer in the department of bridges and buildings of the C. M. & St. P. Ry. at Chicago.

In the fall of 1912 he was appointed instructor in structural engineering at the University of Wisconsin, which position he held until late in 1916, when he returned to the employ of the Wisconsin Railroad Commission. His vacations during this teaching period were spent on various jobs. One summer was spent in charge of a field party on the appraisal of the Bay State Street Railway in Boston, one summer as inspector on municipal work in Madison, and one summer on the design of sewage disposal plants for a consulting engineer.

He was structural engineer for the Railroad Commission from 1916 to February, 1918. During this time he reviewed plans of bridges and dams, made special studies and reports, and designed miscellaneous structures for the state architect.

He Builds Concrete Ships

When the Emergency Fleet Corporation began to experiment with concrete ships during the war, Schwada was one of the numerous Wisconsin men who were called upon. He was granted leave of absence and was with the corporation until recalled in October, 1919. This was one of the most interesting phases of his career. He was assistant in charge of concrete-ship design at Washington and Philadelphia from February, 1918, to February, 1919, and inspector and assistant resident representative in charge of the concrete-ship yard at Jacksonville, Florida, from February, 1919, to October, 1919. During the summer of 1918 he carried on a three-month investigation of concrete ships in ocean service, measuring and studying the effect of strains on the hull during a cruise to South America and back through the Panama Canal to the East Coast.

Schwada returned to the Wisconsin Railroad Commission and remained until May, 1921, when he entered the employ of the City of Milwaukee as engineer in charge of the design and construction of the Riverside Pumping Station.

He Is Made City Engineer

The appointment as city engineer for his home town came on April 17, 1923. The position carries heavy responsibilities, for Milwaukee is a lake port, and an industrial city, and is intersected by two large rivers. It has almost doubled its population since Schwada was appointed. It makes heavy demands upon its engineer.

In 1928 the engineers of the state honored Mr. Schwada by electing him to the presidency of the Engineering Society of Wisconsin.

Schwada has contributed to engineering literature from time to time and is the author of formulas and methods of design for concrete arches that have been accepted and included in text books on the subject.

WISCONSIN MEN SPEAK AT CONCRETE MEETING

Among the speakers at the 27th annual convention of the American Concrete Institute, which was held in Milwaukee during the week of February 23, were Professor Morton O. Withey of the College of Engineering, who presented a paper on "Some Long Time Tests of Concrete," **Paul T. Norton, Jr., e'17,** professor of industrial engineering at Virginia Polytechnic Institute, who presented a paper on "Permeability of Gravel Concrete," and **S. C. Hollister, c'16,** professor of structural engineering at Purdue University, who presented a paper on the effect of extracting water from concrete after placing.

OLD TIMERS ACTIVE AT SCHENECTADY

B. Richard Tearle, Jr., e'27, is the new chairman of the Wisconsin Club of Schenectady, which is composed largely of the engineering alumni connected with the General Electric Co. During the past year, under **Roy De W. Jordan,** e'27, as chairman, the club met regularly on the first Monday of each month. Special events included a dinner and bridge at the Edison Country Club in March and a family picnic at Saratoga Lake in June. Professors Jimmie Watson and D. W. Nelson were entertained at a special luncheon in July. On the afternoon of the football game with Purdue, the Wisconsin alumni joined the Purdue alumni in leasing a wire to get play by play returns.

G. E. MEN WIN PROMOTIONS

Among recent promotions of Wisconsin graduates with the General Electric Company are the following.

H. D. Taylor, e'21, has been made head of the department of turbine engineering at the River Works, Lynn, Mass. **E. H. Horstkottie,** e'12, has been placed in charge of the general engineering laboratory at the Erie Works. **C. B. Bradish,** e'12, has been appointed engineer in charge of the industrial control engineering department of the Schnectady Works. He replaced **J. E. Brobst,** e'03, who became manager of the Bloomfield Works. **J. D. Wright,** e'09, has been appointed assistant engineer of the industrial engineering department. He has taken the position of **R. C. Muir,** e'05, made vacant when the latter was made assistant to the vice-president in charge of engineering. **E. S. Henningsen,** e'12, has recently been appointed engineer in charge of the alternating current engineering department. **J. G. Van Vleet,** e'30, and **A. A. Cuneo,** e'28, have recently reported for work at the General Electric Company, Schenectady. They are enrolled in the test course.

MID-YEAR GRADS LAND JOBS

Lawrence H. Glaessner, Millard M. Hill, and **Phil H. Thern,** who completed the course in civil engineering in February, are located as follows: Glaessner is in the office of the army engineers at Milwaukee; Hill and Thern are with the Wisconsin Highway Commission, the latter in the bridge department at Madison.

ALUMNI TAKE PROMINENT PART AT CONVENTION

The 23rd annual convention of the Engineering Society of Wisconsin brought back many alumni, who found a much better opportunity for renewing old acquaintanceships than they find at Homecoming. Many of them were on the program and others took an active part in the discussions.

HOTCHKISS INVENTS MAGNETOMETER

W. O. Hotchkiss, g'03, president of the Michigan School of Mines at Houghton, has invented a device known as a magnetometer for use in geo-physical exploration. The instrument received attention at the recent meeting of the Institute of Mining Engineers.

CALCULUS MADE EASY

Long years of watching men under him struggle with the intricacies of calculus in various phases of engineering design and research set **John M. Barr,** m'99, general manager of the Louis Allis Co., of Milwaukee, to wondering if there were not some mechanical means of simplifying their tasks.

Three and a half years ago he began working on an idea that promised to accomplish that purpose. A few weeks ago he exhibited three odd-shaped, flat pieces of celluloid, which, he says will eliminate the long, wearisome toil of reducing curves to equations which form the basis of analysis of the information contained in the curves.

He expects his instruments, known as an integraph, differentiator and Simpson's rule, to make it possible for the average draftsman, or even a high school boy, to perform mechanically, integrations and differentiations that ordinarily must be left to the comparatively few skilled workers in calculus.—**"The Wisconsin Alumni Magazine."**

CIVILS

Airis, Thomas, c'29, visited Madison on Jan. 6. He is doing field and office work for the U. S. Engineer Office at Detroit.

Arnold, James, c'29, formerly with the U. S. Engineers' Office at Milwaukee, is now in Washington working on airport design.

Bendt, J. P., c'12, who has been with the Koppers Construction Company at Pittsburgh, Penn., writes that he has sailed for Russia, where he will spend two years as an engineer for the Koppers Company. The work consists of building a By-Product Coke Plant on the eastern slope of the Ural Mountains. This plant will be the second largest of its kind in the world. The location will be about 59-40 east longitude and 53-30 north latitude. His address will be: Koppers Construction Co., c. o. Soynse-Koks, Magnitogorsk, U. S. S. R.

Bundok, Marianno, G., c'28, who was formerly with the U. S. Engineer Office at Milwaukee, has left for his home in the Philipine Islands where he intends to continue in engineering.

Kessler, Louis H., c'22, was presented with a son, Avery Bassett Kessler, on January 9. Mr. Kessler a member of the faculty of the College of Engineering, is on a year's leave of absence in order that he may install a sewer system at Williams Bay, Wis.

Levin, J. D., c'27, is spending this semester at the university doing graduate work in building construction. He has had several short articles in "Engineering—News Record", "Engineering and Contracting", and the "American Builder'.

Lindner, C. P., c'25, is with the Army Engineers at Norfolk, Virginia.

Mead, Harold Washburn, c'20, was married Saturday, January 31, to Margaret Frances Howard at Winona, Minnesota. They will make their home at Madison, after April 1. Mr. Mead is with Mead and Seastone, consulting engineers, at Madison.

Smith, Leonard S., c'90, CE'95, former professor of city planning at this college, was in active charge of "Better City Week,, at National City, Calif., from January 25 to 31. He gave eight addresses during the week under the auspices of the City Planning Commission.

Titus, William J., c'13, is chief engineer of the Indiana State Highway Commission. He gives his address as, State House Annex, Indianapolis, Indiana. To quote Mr. Titus: "In 1930, the Indiana Highway Commision completed its most successful year, paving a total of 446 miles. In addition, a bituminous surface was placed on 116 miles, an oiled

(Continued on page 182)

Campus Notes

'STEW BAD

When the choo-choo hits a surveying instrument, it's just too bad. Two civil freshmen, Gordon J. M. Gorlin and James P. Michalos, returned to the building from a surveying expedition on Feb. 21, carrying the mangled remains of a level, which they had set up on the I. C. track and left to the care of Providence while they ambled off in search of a bench mark. There are not many trains on the I. C., of course, but any good railroad engineer knows that just as soon as a surveying party begins work on a track, the despatcher begins shooting trains that way. By the way, did you ever gaze into Prof. Owen's blue eyes while you held out to him the remnants of a level? There's a lot of education in it.

ENGINEER MARKSMEN PUNCTURE TARGET

Arnold L. Colpitts, George P. Schipporeit, Charles W. Littleton, and Louis J. Bohm, engineering members of the R. O. T. C. rifle team were big factors in winning the match with Ripon College by a score of 2,535 to 2,440.

The match was shot at Camp Randall on a 50-ft. indoor range with .22 rifles.

Colpitts, a sophomore electrical from Madison, was high man with 260 points. Schipporeit, a junior civil from West Allis, tied with two other Wisconsin men for third with 257 points. Littleton, a junior mechanical from Madison, scored 251 points, and Bohm, a freshman electrical from Beloit, shot 252.

VAN HAGAN AND STRAND TO HEAD ENGINEER

At the annual banquet of the *Wisconsin Engineer,* held at the Park Hotel on February 17, announcement was made of the election of Robert L. Van Hagan as editor and John A. Strand as manager for the ensuing year. Gold keys were awarded to Le Roy Bell, retiring circulation manager, David Mack, local advertising manager, Van Hagan, and Strand for outstanding service on the staff. Franklin T. Matthias, faculty adviser, acted as toastmaster. Mr. Frank Blied and his son, Ray Blied, who have printed the *Engineer* for many years, were guests of honor.

MINING FACULTY PRESENT PAPERS

Five papers by Wisconsin men were presented at the meeting of the Institute of Mining Engineers held at the building of the United Engineering Societies in New York, Feb. 16-19. Professor McCaffery spoke on "Progress in Blast Furnace Slag Investigations." Other papers included: "Determination of Viscosity of Blast Furnace Slags," of which the joint authors were McCaffery, Oesterle, C. H. Lorig, Ira Goff, and O. C. Fritsche; "Effect of Magnesia in Blast Furnace Slags," of which the joint authors were McCaffery, Oesterle, and Fritsche; "Statistical Analysis of Blast Furnace Data," by McCaffery and Ronald Stephenson; and "Discharge of Air Through Circular Tuyeres," by McCaffery and Daniel E. Krause.

HONORARY ENGINEERING JOURNALISTIC FRATERNITY ELECTS

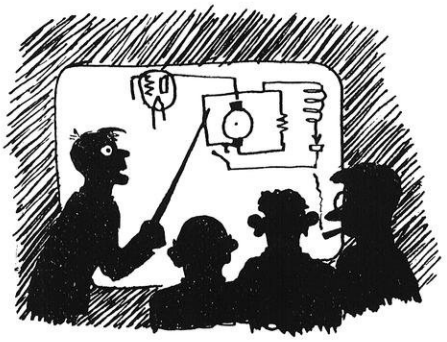
Alpha Tau Sigma, honorary engineering journalistic fraternity, initiated R. L. Van Hagan, J. A. Strand, and David Mack on February 17.

A FUTURE ENGINEER?

Joseph F. Oesterle, research professor of mining and metallography, is the proud father of a son born Jan. 12 at St. Mary's hospital. Mrs. Oesterle was formerly Miss Helen Schaeffer.

THE STUDENTS TELL THE FACULTY

The usual procedure of the faculty man lecturing to the student was reversed at the joint meeting of the Madison and the student sections of the American Institute of Electrical Engineers, held at the University Club on Wednesday, February 19. The students were in charge of the program, which consisted of three talks by senior electricals.



James D. Cobine, of Madison, presented a paper on "Automatic Oscillographs," in which he described two oscillographs, recently developed, which are valuable in analyzing disturbances on transmission systems. "Trends in Electrical Construction," were outlined by Robert J. Nickles, Jr., of Madison, who has had active contact with the subject. He described the new materials and methods used in the electrical work of the Chicago Merchandise Mart and the Wisconsin Field House. "Copper Oxide Rectifiers," which are widely used in radio and in industrial control apparatus, were described with reference to their design, operation, and application by John Lloyd Jones of Madison.

CHI EPSILON

Richard E. Wolff, of Milwaukee, becomes the new president of Chi Epsilon for the coming semester as a result of the recent election of officers. Lester W. Bartsch, of Milwaukee, is vice-president. The secretary is to be Donald Bengs, and Frank Erichsen will take over the books as treasurer. Aubrey J. Wagner, as associate editor, will supply material for the Chi Epsilon *Transit.*

ALUMNI NOTES

(Continued from page 179)

surface on 600 miles, and a calcium chloride treatment on 250 miles. In the complete system 2,900 miles of roadway are paved.

White, Omar Washburn, c'25, is a bridge designer for the Montana Highway Commission. His address is: 847-6th Avenue, Helena, Montana. Mr. White has a wife and three children who have moved out to Montana with him.

ELECTRICALS

Quillemin, Earnest A., e'22, is the author of a book, "Communication Networks", just published. According to the prospectus, the author has prepared a skillful treatment of the subject for the beginner. It is elementary in that it does not presuppose any particular knowledge of the field. Advanced mathematical methods, however, are introduced wherever it is advisable. Mr. Guillemin is a member of the faculty of the Massachusetts Institute of Technology.

Henningsen, Earl S., e'12, has been appointed engineer of the alternating current department of the General Electric Company at Schenectady.

Hansen, Clarence F., m'20, is a refinery engineer with the Pasotex Petroleum Co. at El Paso, Texas.

Mansfield, Carrol G., e'23, is an assistant underground engineer with the Bureau of Power and Light, Los Angeles. Address: 627 N. Plymouth Blvd.

Moir, R. C., e'05, was presented with a son, Morley, last September 21.

MECHANICAL

Sogard, Ralph H., m'25, has been appointed assistant superintendent of buildings and grounds at the University of Missouri, Columbia.

CHEMICAL

Ladon, A. A., ch'15, announces his new address as: Masonite Corporation, 1745 Builder's Exchange Building, Cleveland, Ohio.

MINERS

Goff, Ira N., met eng'28, is director of research for the Inland Steel Co., at Indiana Harbor.

Higgins, Arthur K., min'28, is assayer at the Perth Amboy plant of the American Smelting & Refining Co.

Jones, T. Delbert, min'22, Met. Eng. '29, is metallurgist for the American Smelting & Refining Company's plant at Perth Amboy, N. J.

Lorig, Clarence, min'24, M. S. '25, Ph. D. '28, is metallurgist at the Batelle Memorial Research Institute at Columbus, Ohio. The institute, founded by the Batelles as a memorial to a son killed in the war, is devoted to metallurgical research. The Batelles made the first tin plate in the United States.

Uhlig, William F., min'22, is with the Semet-Solvay Engineering Corporation, New York City. His residence is 31 Newfield St., East Orange, N. J.

CLOSE WORK

Homer Sowl assures his public that the operation of erecting the large vertical pumps in the Riverside pumping station is so delicate that the anchor posts are set within 0.001 *inch*. It may be so, but it calls for a micrometer.

DEVELOPMENTS IN TIMBER FRAMING

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duces the stresses induced in bending the laminae to form. This type of construction has not yet been introduced into the United States, but plans have been made to employ it in one of the buildings of timber construction at the Chicago Century of Progress Exposition. The fundamentals of the laminated arch are not well understood as yet and much research work needs to be done before efficient, safe designs can be worked out. Tests of half-size models will probably have to be made before the huge arches contemplated for the exposition building can be designed.

Lamella Roof Construction

Because of mass production, large manufacturing units, and the growing use of conveyors in manufacturing assembly, there is today a growing demand for large and unobstructed floor areas. At the same time social and recreational requirements have also brought about a demand for similar accommodations. The lamella roof is particularly suited to this requirement. It makes interesting and ingenious use of two simple engineering devices; namely, the arch and the triangle. The roof framing is made of relatively short timbers, varying in section from 2 by 8 inches to 3 by 16 inches and in length from 8 to 14 feet, which are bolted together to form a network. The lamella roof was invented in Germany about 1923 and has had considerable application in that country. It was first introduced into this country in 1925, and patents were taken out by an American syndicate, which now has branches throughout the country. The large number of buildings that have been erected with this type of roof are said to have proven uniformly satisfactory. Among the principal structures so far built is the Auditorium at Houston, Texas, in which the Democratic National Convention of 1928 was held.

Frame House Walls

Some work done in the residential-building field has given quantitative proof of the superior strength, permanence, and economy of certain types of wall construction. Tests were made at the Forest Products Laboratory on wall panels 9 feet high and 14 feet long. All the panels were framed of 2 by 4-inch material with vertical studs spaced 16 inches and an upper and a lower plate. To this frame was added in turn various kinds of bracing, sheathing, lath and plaster, or combinations of these. A window and a door were framed in some panels while others had no openings. Each panel was subjected to a thrust applied at one end of the upper plate while the lower plate was securely held. This distorting force is equivalent to the racking action that comes upon the east and the west walls, for example, when a wind is blowing against the north or the south wall of a house.

These tests showed that if the exterior walls are sheathed, they may be braced most effectively by putting the sheathing on diagonally and thoroughly nailing it to the studs. Such placement of the sheathing is two to four times as effective as horizontal placement, the exact increase depending upon the size and the arrangement of the openings.

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Further, long, continuous braces let into the faces of the studs and thoroughly nailed to them will increase the rigidity of a horizontally-sheathed wall to such an extent that it will compare favorably with a diagonally-sheathed wall. Braces cut on a bevel and nailed in between the studs are not so effective as continuous braces. If used at all corners, however, and made as long as the let-in braces, they will increase the rigidity of a horizontally-sheathed wall about 50 per cent. So-called "bridge" or "herringbone" bracing placed at mid-story height fails to increase the rigidity of a wall to an extent that would justify the expense of putting it in for this purpose.

Lath and plaster is more rigid than any type of sheathing or sheathing and bracing. Under normal conditions plaster may furnish all the rigidity required for most purposes. As the plaster begins to crack from shrinkage, settlement, or other causes, however, the rigidity of the sheathing comes more and more into play. Thus, in violent winds or earthquakes, it is the sheathing and the bracing that become all-important in preventing complete destruction. Logically, too, slightly more bracing than that needed to resist ordinary distorting forces will, in the long run, more than pay for itself through diminishing, if not entirely eliminating, maintenance costs that result from the structure getting out of alignment.

Research of this nature represents a worthwhile contribution to the art of timber framing. Possibly funds will ultimately be available with which to extend this work to include roof construction, floor construction, general framing around openings, and all other integral parts that enter into a strong, rigid, and lasting frame structure.

ENGINEERING SOCIETY CONVENTION

(Continued from page 175)

the purchasing power of the mass of the population through high wages.

* * * *

"The machine order was never more efficient than in 1929," stated Dr. Frank, "but the economic order found itself swamped by that efficiency."

* * * *

Prof. D. D. Lescohier, chairman of the state unemployment commission, told the convention that the present social organization faces a critical test in its handling of the unemployment problem. It must assure jobs to those willing to work or there will be a change in the social organization.

* * * *

The railroads, according to Mr. A. R. McDonald, member of the Wisconsin Railroad Commission, have lost much of their passenger business and are facing loss of freight traffic. They have been hit hard and spurred to action. They are trying to develop new services, new traffic, and new economies.

* * * *

The surveyor-witness is classed as an expert, according to Adolph Kanneberg, and is permitted to testify as to matters of opinion.

Light is the first of painters.
— EMERSON

BUILDINGS in Which You Take Pride

Drawing of the Coughlin Campanile at South Dakota State College, Brookings, S. D. Perkins and McWayne, architects

ON THE CAMPUS, where class buildings and memorial structures are so often distinguished by their noble form, floodlighting equipment serves to prolong the enjoyment of their beauty and to enhance pride in the institution. » » Such an application is made for the new 165-foot campanile at South Dakota State — magnificent gift of an alumnus. Electrically operated chimes sound the hours and are heard in concerts. At night, shafts of light from General Electric floodlighting projectors effect a picture of superb beauty done in the school colors and white. From the air, the tower is identified by the beam from a G-E airway beacon surmounting the floodlighted dome. » » Thus, G-E equipment plays its part in promoting progress and fine appreciation. Back of every G-E product is an organization in which college-trained men are largely responsible for the planning, production, and distribution.

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