The Wisconsin engineer. Volume 37, No. 3 December 1932

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

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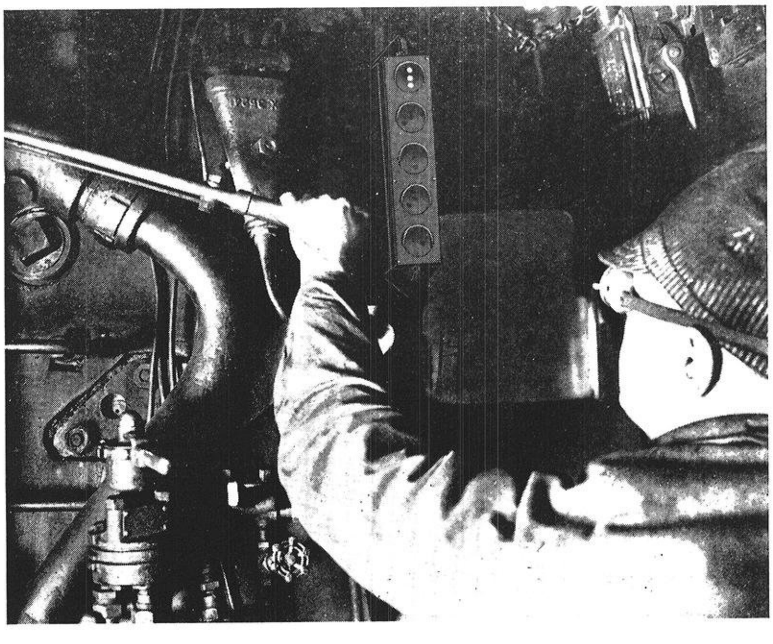
THE WISCONSIN ENGINEER



Railroad Number

« MEMBER »
E. C. M. A.

DECEMBER
1932

The WISCONSIN ENGINEER

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

Telephones University 177W - 277

Founded 1896

VOLUME 37 DECEMBER, 1932 NUMBER 3

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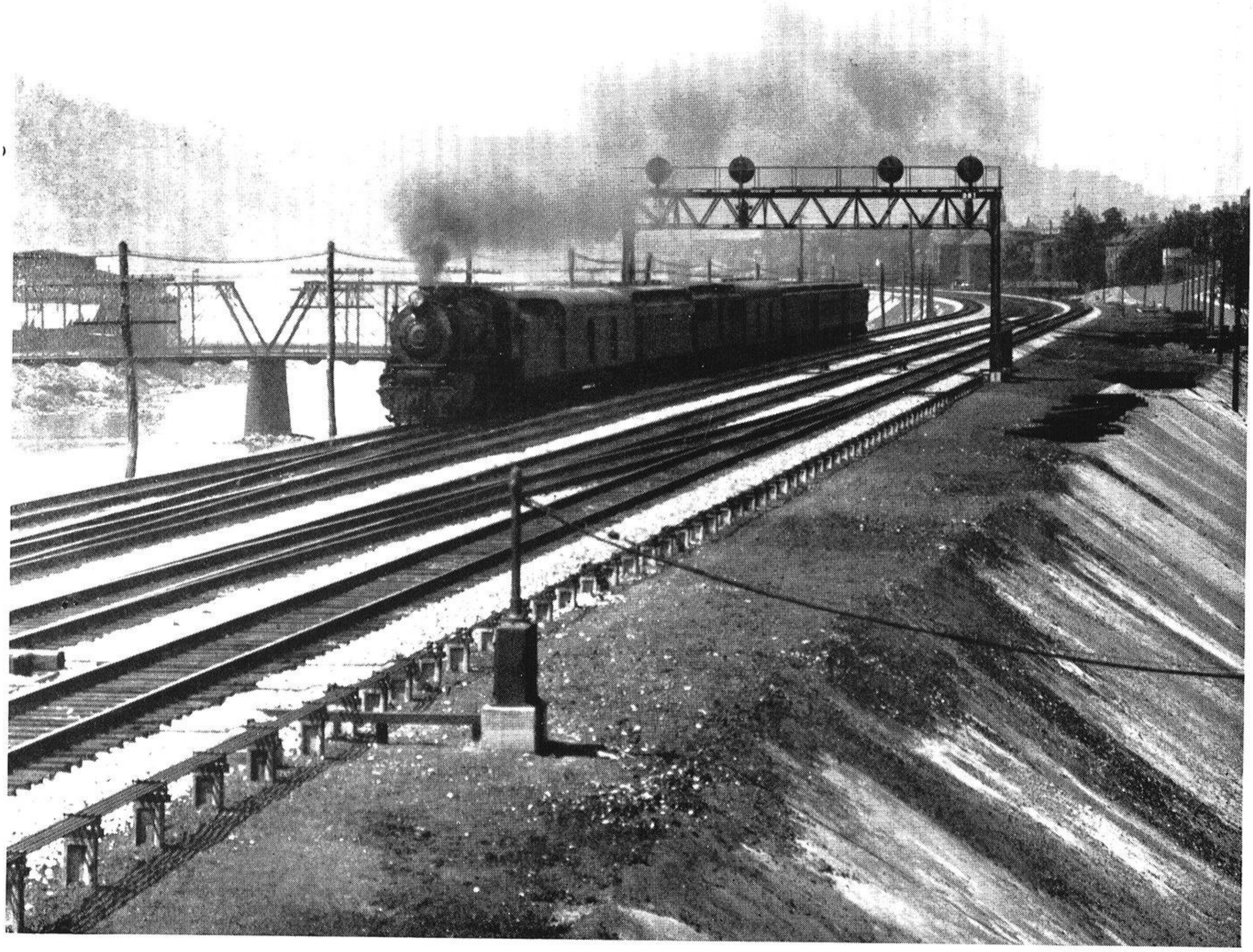


Cut Courtesy Signalman's Journal

POSITION-LIGHT SIGNALS ON THE PENNSYLVANIA RAILROAD

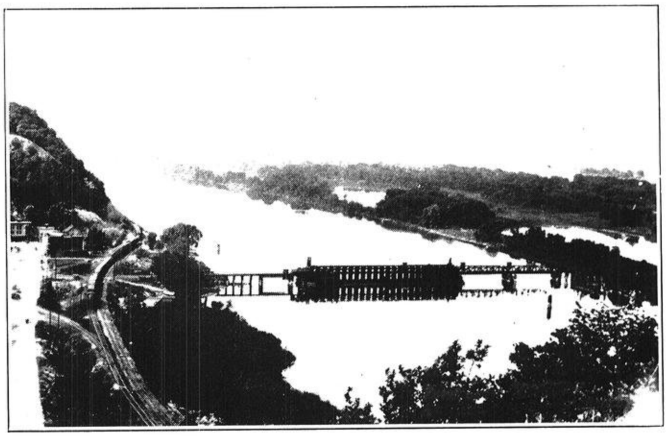
The WISCONSIN ENGINEER

VOLUME 37, NO. 3 DECEMBER, 1932

The Milwaukee Road Rebuilds

The Prairie du Chien Pontoon Bridge

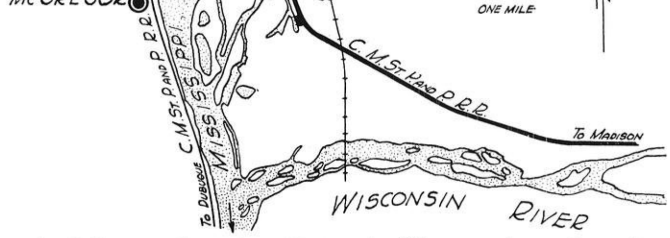
By JAMES P. KAYSEN, c'33



The pontoon over the main channel viewed from the Iowa Bluffs.

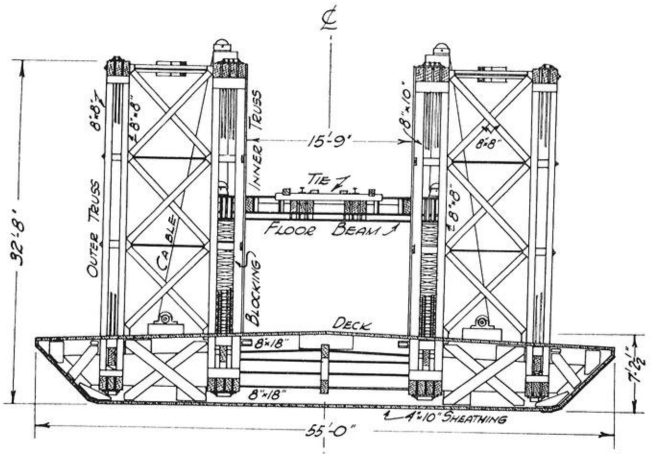
SHORTLY after the close of the navigation season of the Upper Mississippi River last winter, the Chicago, Milwaukee, Saint Paul and Pacific Railroad towed its West Channel pontoon draw-bridge at Prairie du Chien, Wisconsin, a short distance down stream and built a cofferdam around it so that repairs could be made. The pontoon was swung out of position and a temporary pile trestle was constructed across the 276-foot gap within the short space of 24 hours available between the passage of through trains. The change was made on a Sunday when local traffic was lightest and, hence, least affected by the closing of the line. Throughout the winter season carpenters were kept busy fitting new timbers and planking on the pontoon so that in the spring it was ready to be put back into service with all repairs made. It was necessary to remove the pile trestle and replace the pontoon in the same period of time allowed for the reverse process. The task was complicated by the necessity of completely removing the temporary piling in order to comply with the orders of the War Department. The piles were withdrawn by a locomotive crane after having been loosened in the river bed with steam jets.

The pontoon, or floating, draw-bridge is a comparative rarity in the field of bridge engineering. It consists essentially of a barge or scow equipped with a superstructure upon which the floor system of the bridge is carried. The entire structure is rotated horizontally about a pivot at one end whenever necessary to provide an open channel for navigation. In the Western Hemisphere this type of movable bridge has been used chiefly as a temporary means of crossing streams. The Milwaukee Road alone has employed pontoons as a more or less permanent form of bridge structure. This company has successfully built and operated pontoons since 1874, the Prairie du Chien crossing of the Mississippi having been opened in that year. As the result of nearly 60 years' experience with these peculiar structures, the railroad company has developed a practical device for spanning navigable water that has the cardinal advantage of low first cost as compared to the more common types of movable bridges. Due to certain inherant disadvantages, the use of the pontoon bridge has been confined to secondary main lines and branches of the railway system.



Each of the two channels at Prairie du Chien requires a draw span.

The Madison Division of the Milwaukee, extending from Milwaukee across the southern part of Wisconsin, crosses the Mississippi River between Prairie du Chien, Wisconsin, and Marquette, Iowa. The river at this point is divided by an island into two navigable channels, each of which must be spanned by movable bridges to provide for river traffic. The double-channel feature makes a bridge crossing at this point expensive and no doubt prompted the railroad promoters



This cross-section shows how the track is carried on a support that can be raised or lowered as the water level changes.

back in the 'Seventies to seek a cheaper means of spanning the river than the customary masonry and iron structures of the time. The problem was solved by John Lawler, the company freight agent at Prairie du Chien, who constructed a pile trestle across the river bottoms with openings at the navigable channel which he spanned with scows upon which the track was laid.

Since Lawler's time the bridge has been relocated a number of times and new pontoons have been built at intervals of about 15 years. The earliest pontoons were crude affairs representing the combined efforts of bridge and boat carpenters working in a field quite strange to designing engineers. The rather short life of the pontoons has been accredited to the unusual deflections set up in the hull on account of the great length (over 400 feet in the spans built prior to 1914) in proportion to width and depth. In 1914 the War Department permitted a material reduction in the channel openings because of the cessation of log rafting on the Mississippi. New pontoons were built at that time embodying many new ideas and improvements. These spans are in service at the present time, the renewal of timbers and planking on the West Channel pontoon last winter and on the East Channel pontoon in 1927 being the only major repairs necessary to date.

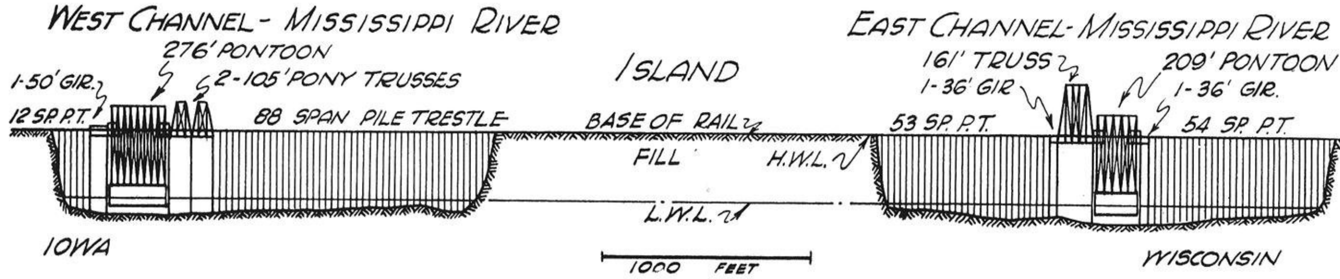
The present East and West Channel pontoon draw spans are similar in design, the latter being somewhat more interesting due to its greater length and improved operating machinery. It consists primarily of a timber barge, 276 feet long, 55 feet wide, and seven feet deep. Four longitudinal timber trusses with steel tension rods provide the necessary stiffening and support the floor system. Design is based on a modification of Cooper's E-50 loading. The trusses are arranged two on each side of the center line of the pontoon with 15½ feet of clearance between the inner pair, this space being occupied by the railway track.

Inasmuch as the Mississippi River has a maximum recorded difference in stage at Prairie du Chien of 22 feet between high and low water, it is obvious that a track carried on a floating foundation, such as the pontoon affords, cannot be supported at a constant height above the deck and still maintain a satisfactory grade on the railway. To eliminate this difficulty an ingenious system has been developed so that the track level on the pontoon can be moved up or down in a vertical plane through a range of 16 feet, which takes care of all but rare flood conditions of the river. The track is carried on wooden stringers which are supported by steel floor beams at each panel point of the inner pair of trusses. The ends of the floor beams rest on timber blocking which carries the load to the bottom chord of the trusses. By adding or removing blocking the track level is supported at any desired height within the 16-foot range provided. By means of sheaves and cables attached to the floor beams the entire system may be raised or lowered as a unit so that the proper amount of blocking may be inserted. The hoists are electrically driven through two long shafts running almost the full length of the pontoon. In the slightly older East Channel pontoon the bridge floor is raised with hydraulic jacks.

The pontoon sinks about 16 inches under the weight of the heaviest locomotives using it, so the track level on the draw span is kept an equal amount above the approaches. To provide a run-off for this difference in level and care for minor changes in river stage, approach girders are provided at each end of the pontoon. These girders are 50-foot, through steel spans, one end resting on blocking on the pontoon and the other end supported on abutments of the approaches. The shore ends are lifted clear by electric hoists when the bridge is to be opened.

The timber used in the construction of the pontoons is principally Douglas fir. All of it is creosoted except the hull planking; the preservative apparently has a tendancy to cause shrinkage in the planks and this makes it difficult to secure a water-tight hull. Both the West and East

(Continued on page 39)



The profile of the crossing shows two long bridges with a high embankment between them.

A Senior Electrical Engineer Discusses the

Development of Railway Signaling

In Its Relation to Safety

By Thomas M. C. Martin, e'33

Editor's Note — *The author of this article, prior to his enrollment at Wisconsin, was engaged for several years in railway signaling and train control work on two prominent eastern roads. He has endeavored to treat his subject in a strictly non-technical manner and has included no circuit diagrams or lenthly theoretical discussions although the signaling art is one which embodies much complicated detail.*

A DOMINATING characteristic of the modern world is speed. It enters as a governing factor into whatever man undertakes today. The business of transportation is most affected by the new and ever increasing demands for acceleration. Nevertheless, in railroading, speed is always secondary to safety. Safety First is not a mere advertising slogan, but it has become the ruling motive of the entire railroad organization. Much has been accomplished in recent years to promote the security of rail transportation. The more important of these accomplishments are the installation of all-steel car equipment, heavier rail sections, larger crossties, crushed rock ballast, improved drainage, and reductions in grade and curvature of the track. Some of the greatest contributions to safety, however, have come from the art of signal engineering. Without the latter, the other improvements would be trivial since they are important only after the greater dangers have been removed.

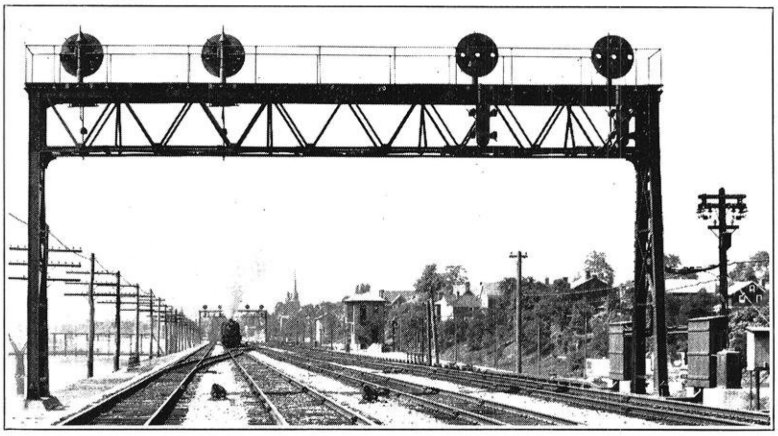


Photo Courtesy Union Switch and Signal Co.

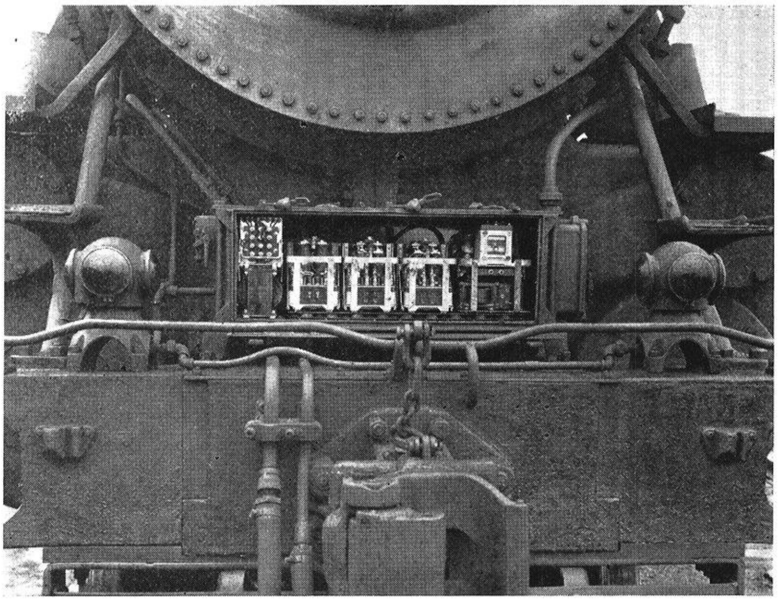
Close-up of signal bridge with position-light signals displaying stop indication. Note dwarf signals governing reverse traffic movements on two lefthand tracks.

For years engineers knew that the effectiveness of safety devices was conditioned by the human element as the following example shows. When George Westinghouse invented the airbrake he placed in the hands of the engineman a means of deceleration more powerful than his means of acceleration, that is, he made possible the safe handling of speed, but he could not guarantee that the engineman would use this medium of control at the proper time, and in the proper way. That was entirely up to the engineman. From the first it has been the task of signal engineers to remove as many sources of danger resulting from errors in human judgment and faculties as possible. The great signaling systems of today are constructed always with this object paramount. The possibility of mistake can never be entirely eliminated from the operation of a railroad for to do so would necessitate its operation without human aid. This fact, while recognized, does not prevent the adoption of as many automatic safety features as practical. Many of these features operate automatically to give information to train crews by means of signal indication.

Signaling has grown in complexity and diversity of application until it affects nearly every department of the railroad, and in most cases takes precedence in importance. If it were possible to pick out one development as being outstanding in the field of signal engineering the honor would probably fall to the automatic electric block system. In the past there have been two quite different methods of train dispatching. The first historically was the method which aimed to direct traffic through keeping trains separated from each other by time intervals. This worked to only a fair degree with traffic in the same direction. In the case of opposing movements on single track the protection was almost non-existent. It was inevitable that this method should be discarded, and the space interval system put into practice. With modifications the space principle has survived, and is in use today. In the space interval system a train is not allowed to enter a given section of track until a proceeding or opposing train has cleared that section. In the early days space intervals could be maintained merely by telegraphic reports from one station to another. This was known as the manual block system. With increasing traffic this necessitated an unlimited number of block stations, and to eliminate, as far as possible, accidents caused by carelessness and errors in human judgment recourse was had to the automatic electric block system. The automatic block system was first introduced in this country about 1876, although British engineers had worked on the problem for about forty years before that time.

The automatic electric block sytem is based on the simple fact that the rails are separated into sections electrically insulated from each other. The length of these sections is determined by various factors such as speed of operation, degrees of curvature and grade, but in the open country each section is about a mile in length. Across these sections a source of electromotive force is connected, one polarity to each rail. The holding coils of a sensitive relay are likewise shunted across the rails of each section. The track relay is held up as long as there is no train occupying that particular section, but with the entrance upon the section of a pair of wheels the relay is deenergized. This primary or track relay is the key to all the other functions of the system. Each of these relays is provided with a number of points or contacts through which various circuits may be broken. Some of these contacts, called front points, are closed when the relay is energized, while others, referred to as back points, are closed when the relay is deenergized. It is possible to perform any desired operation simply by breaking the circuit to that operation through the proper set of points. In the best modern practice these supplementary functions are not broken through the track relay proper, but are put through repeater relays which in turn receive their energy from the primary relay. Signals are of many types varying with the railroad using them, and the density of traffic in the territory. Whatever the type of the signals, they are placed at the entering ends of the block sections, and the controls to them are broken through the proper relays. These signals, by a system of interconnections, control the relays of several succeeding blocks and thus indicate not only the condition of the track in the block immediately ahead, but may show the engineman whether the second, third, or even more distant blocks are occupied.

There are in use today a number of different types of signals. During the first period of intensive installation the semaphore, or motor type was most commonly selected. In late years the rapid development of light signals with their greater simplicity, and economies of operation and maintenance have come into general use. Light signals may be classified into three general divisions. They are color, position, and color position. The color light signal depends, as its name indicates, on color for the various indications. In the position light type the indication is shown by the arrangement in rows of uncolored lenses spaced angularly to represent the corresponding indications of the old semaphore type signal, while in the color-position light signal the combination of both color and position are employed to display the indication.



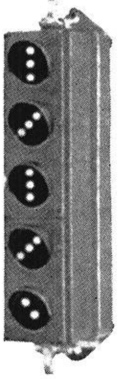
Courtesy Union Switch and Signal Co.

Equipment box mounted on locomotive pilot. Front cover opened to show location of amplifiers and decoding relays for cab signal system.

In congested territory four indication signals are usually employed, but in most other installations the three indication type is used. The three indications are clear, or high speed, approach, or medium speed, and stop. In the color-light signal green is clear, yellow approach, and red stop. In the position-light type clear is given by three lights vertical, approach by three lights at 45 degrees, and stop by three lights horizontal. In the color-position-light type clear is shown by two green lights vertical, approach by two yellow lights at 45 degrees, and stop by two red lights horizontal.

Each step in the development of the art of signaling has produced further economies in railroad operation. Because of the reduction in unnecessary delays, the ton-mile and passenger-mile costs of operation have been reduced. Railroads, to operate efficiently, must have a definite schedule of train operation carefully worked out. Enginemen are under the constant necessity of maintaining these schedules to the best of their ability, and one of their handicaps is the possibility of an obscured view of wayside signals. Smoke and fog may combine to make the view fleeting and uncertain. Misinterpretation can lead to dire results especially in congested multiple-track territory. To obviate the dangers resulting from such errors engineers have devised a signal which rides in the cab of the locomotive where it may always be seen by the engine crew. With the ordinary block signal system the engineman receives only intermittent information regarding track conditions at certain wayside locations. These conditions may change while he is traversing the length of a block, but he will be unaware of the change until he reaches the next wayside signal. Cab signals give constant information regarding road conditions ahead as they exist at each second of time.

The accompanying illustration shows a four indication position-light cab signal. Only one indication is displayed at a time, but note that the second and third lenses from the top form the one aspect, approach-restricting.



To illustrate the operation of cab signals, the coded continuous inductive, four indication type will be described. At each wayside location there is an instrument as the "coder" which consists of a rotating current interrupter having three discs, each with a different number of teeth in order that three separate codes of interrupted current may be fed to the rails. The current which is alternating and of 100 cycles frequency is thus broken up into varying numbers of interruptions per minute according to the condition of the track with respect to the traffic. On the locomotive there is mounted a receiver which consists of two coils wound upon an iron core and suspended one over each rail as near as clearance will permit. These coils act as the secondary coils of a transformer the primary coils of which are the rails. These receivers must be mounted ahead of the first pair of wheels on the locomotive since the coded current is fed from the leaving end of the block toward the train, and is therefore shunted by the first pair of wheels. The induced electromotive force in the receiver is amplified by means of vacuum tube amplifiers and then sent through decoding relays which embody tuned filter circuits each adjusted to respond to one particular frequency of code. When these decoding relays are energized the circuits which light the respective indications of the cab signal are completed. In order to understand the operation of these signals assume that a train is about to enter the first of four block sections the last of which is occupied by a train which has stopped for some reason. Upon entering the first section the receiver on the locomotive picks up a code of 180 interruptions per minute and the cab signals indicates clear. As the train passes into the second block the code changes to 120 per minute and the cab signal indicates approach-restricting. Similarly the code in the third block becomes 80 per minute and the indication is approach.

When the train enters the fourth block section it receives no current since the other train already occupying that section shunts out all current before it can reach the receiver on the second locomotive, and the caution-slow-speed indication is immediately displayed on the cab signal. Each time the signal indication is revised downward a shrill air whistle blows until the engineman pushes a small switch known as the acknowledger. This is designed to audibly call his attention to the fact that condition have changed requiring his action. When at any time the track conditions with respect to the second train improve, as for example, the stopped train starts and, gathering speed, increases the number of blocks separating the two trains the cab signal at once shows this fact and the engineman can increase his speed accordingly.

It might seem that in the cab signal the acme of safe train operation had been realized, and in truth it represents a momentous step, but engineers in their constant search for betterment are never satisfied. In connection with cab signals there has been developed a system of automatic protection to take away the control of the locomotive from the engineman if he fails, for any reason whatever, to reduce his speed to the proper degree cosistent with each indication of the signal. A certain speed is allowable for each indication, and when the indication changes to a more restrictive aspect an air whistle sounds for a period of about six seconds. Before this time elapses the engineman must push the acknowledging switch and in addition by means of his air-brake valve make a certain application of the brakes which has been predetermined as sufficient to bring his speed to or below the proper value. If he fails to execute either of these details the automatic control will take over the operation of the air-brake system and bring the train to a stop. The engineman can not regain control of his brake-valve until the train has stopped or until the track conditions have become less restrictive.

Automatic Train Control offers the greatest single contribution toward the removal of the human element in railroading since the advent of the Iron Horse. It protects against the failure of the engineman at critical times because of mental or physical incapacity. Signaling is a dynamic art, and the future is bound to bring forth ever increasing aids to safety, and make even truer the statement that a person is safer on a train of an American railroad than he is in his own home.

THE PRAIRIE DU CHIEN PONTOON BRIDGE

(Continued from page 36)

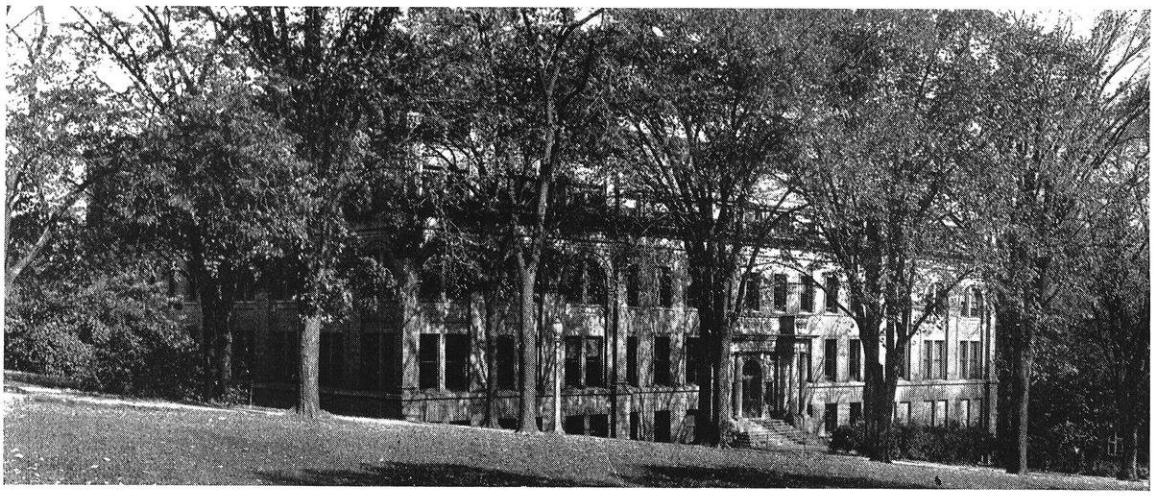
Channel draw spans are augmented by short steel trusses which permit the passage of smaller river craft.

The pontoon rotates about a pile pivot driven in the river bottom near the east end of the barge. To open the bridge, T-shaped latches are released and the pontoon is swung downstream through an angle of 90 degrees by means of a steel cable anchored in the bottom of the river and passing over the deck through a steam-driven winding mechanism. A boiler mounted on the deck provides steam for this purpose and also supplies a generator furnishing the electric power necessary for the hoisting system.

The long usage of the pontoons testifies to their success. The principal disadvantages are due to ice and low water. In the winter ice is cut away from the hull with steam lines but when the ice starts to move downstream after the spring thaws, the pontoon presents an obstacle to its movement that would probably be removed in short order so that it is necessary at times to keep the spans in open position for protracted periods ranging from 24 to 96 hours.

In times of extreme low water it has been necessary to dredge the channel under the pontoons to keep them from settling on the river bottom. Train movements, of course, are held up when it is necessary to keep the bridge open for more than a few hours. Traffic is rather light with

(Continued on page 47)



« CAMPUS NOTES »

PLASTER MODELS USED IN EXTENSIVE STRENGTH TESTS

Professor R. J. Roark and R. S. Hartenberg of the department of mechanics are using ingenious methods for testing the strengths of various shapes and sizes of metal parts used in present day machinery. Plaster models of shafts, axles, beams, and braces are made of plaster of paris and then broken under loads similar to those to which the parts are subjected when in actual use. Accurate conclusions are drawn by calculating the ratio of the strength of the plaster models used to the relative strengths of various metals used in similar parts.

"The problem is complicated by the fact that not all materials are equally affected by these irregularities of form. They may be said to differ in "tenderness," or susceptibility to stress concentration. It is known that parts made of ductile metals like the structural steel use in buildings and bridges are not appreciably weakened by the high stresses due to notches or holes, unless subjected to many repetitions of the load."

The materials that have been investigated so far include gray, white, and nickel cast iron, cast alloy steel, and three aluminum alloys in addition to the plaster of paris used for the models, according to Professor Roark. Many manufacturers throughout the state have furnished the materials used in these tests, these concerns having a vital interest in the outcome of the experiments.

HOUSE OF JANSKY WELL REPRESENTED IN UNIVERSITY

Rivalling the record of a Rio, Wisconsin household, the Jansky family at Madison has a similar claim to recognition in having enrolled six young people at the University of Wisconsin. Moreau, Nelson, Karl, and Helen Jansky (the last named now a student in the Wisconsin Library School), are graduates of the university, while Maurice Jansky is enrolled in the electrical engineering department at the present time. His sister Mary is a sophomore in the home economics department. These young people are the children of Professor and Mrs. C. M. Jansky.

CHI EPSILON

Robert J. Jenks, '33
Phillip S. Miller, '33
Ervin A. Schellin, '33
Robert L. Englehardt, '34
Winfred C. Lefevre, '34
Burr H. Randolph, '34
Robert A. Schiller, '34
Joseph W. Zack, '34

ENGINEERS OF THE FACULTY

After a bit of investigation, it was discovered that there are now ten licensed engineers among the members of the engineering faculty. They are: Dean Turneaure who has license number 1, Professor D. W. Mead, Prof. Dawson, Prof. Kessler, Prof. Kinney, Prof. Cunningham, Prof. Janda, Prof. Owen, Prof. Van Hagan, and Prof. Withey. The license gives them full rights and title of "Civil Engineer" in Wisconsin. The bill recently passed in the State Legislature requiring all civil engineers in Wisconsin to be licensed was primarily fathered by Dean Turneaure who was chairman of the committee working for its adoption.

The bill requires that all civil engineers be licensed in accordance with the idea that an engineer is fully as responsible for his work as a doctor, lawyer, or any other professional man. All civil engineering graduates of the University of Wisconsin are automatically granted a license, the diploma supposedly indicating that they know their stuff. Engineers who have practiced in the state for more than ten years also receive a license. Anyone else has to pass an examination. Approximately 700 civil engineers and about 480 architects have been registered and licensed thus far in Wisconsin.

A BOUQUET FROM THE PHYSICS DEPARTMENT

"The engineers," said Professor Ingersoll, "are the most practical group I have met. They know what they want and they are out to get it. Of course, they pull some awful boners, but that is only natural. About the best in recent years happened in my eight o'clock quiz section one Monday morning. I asked Lefevre to define 'Moment of Inertia', so he opened one eye and told me that the moment of inertia occurred when a ball thrown into the air reached the top point of its flight. The instant between the time it stopped rising and started falling was called the moment of inertia. No, he passed the course."

The Physics lab. course is using a new text this semester written by Professor Ingersoll. In addition to many of the experiments in the old text, Professor Ingersoll included several hitherto performed only in research laboratories. Among the latter is the experiment on viscosity, the only one of its kind in the country. Each experiment is preceded by a short discussion of the theory of the experiment.

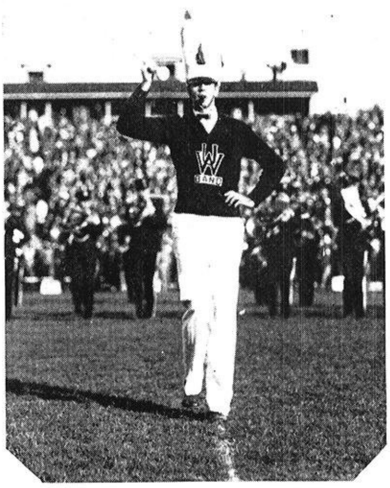
During the hot spells this last summer, Professor Ingersoll decided to attempt to cool his house. He obtained two old Ford radiators, set them one behind the other, ran cold water through them and blew air over them. The air thus cooled was conducted up a flue to his study. All the apparatus required was a fan and the radiators. The flue can be part of the hot air heating system used in winter. He was highly pleased with the results and stated that it worked "just as good as a movie theater".

ETA KAPPA NU INITIATES

A banquet on December 7th was the occasion which marked the initiation of seven students into Eta Kappa Nu, Honorary Electrical Engineering Fraternity. Clyde Schlueter, '33, acted as the toastmaster of the occasion. Professor G. L. Kirk, of the Political Science Department, gave a talk on "Inter-allied Debts." Walther Wyss, '33, delivered the charge to the initiates to which George C. Anderson, '33, responded.

ETA KAPPA NU

Stromberg, Gordon O., '33
Ueker, Alfred B., '33
Anderson, George C., '33
Hinman, John H., '34
Gates, Wallace G., '34
Stehr, Melvin W., '34
Howes, Robert I., '34



Paul Corp, m'33, Wields Baton

TAU BETA PI

Donald W. Anderson, m'33
Thomas Bardeen, e'33
Willard E. Grundman, min'33
Roy H. Holmquist, e'33
Elmer R. Kaiser, m'33
James P. Kaysen, c'33
Norman V. Kuehlman, m'33
Thomas J. Lambeck, m'33
Thomas M. C. Martin, e'33
Philip S. Miller, c'33
Adolph T. Peters, ch'33
Burr H. Randolph, Jr., c'34
Gordon O. Stromberg, e'33
Clarence O. Wagner, c'33
Roy H. Walters, ch'33
Philip H. Werner, e'33
Harry E. Wolcott, e'33
Delbert E. Zilmer, e'33

STUDENTS AND PUBLIC INSPECT NEW MINING AND METALLURGY BUILDING

A massive 'drill', mounted at the right of the entrance to the new Mining and Metallurgy Building stands forth like a cannon, announcing to passersby that the mining department is housed in the former Forest Products Laboratory.

On Tuesday, November 29, an 'open house' was fostered by the department to give everyone interested an opportunity to see the facilities which have recently been made available to this branch of engineering.

The building has been completely renovated and remodeled to make it adaptable for use as a college building. The first floor is taken up by laboratories where ores are studied and used in connection with machinery that is scaled to that actually used in industry. The second floor has a number of offices and classrooms as well as metallography and chemistry laboratories arranged on either sides of a long corridor which is a veritable gallery of engineering 'art' in itself. Numerous pictures of power shovels engaged in excavation and paintings of fiery blast furnaces are hung from the walls on either side.

The west wing of the building has been transformed into a large, well-lighted library which is stocked with books on mining and associated subjects.

With these new facilities the mining department will have almost unlimited opportunities for research and development.

THESE ELECTRICALS

It is worthy of note that James A. (2 minute late) Zimmerman, e'34, was five minutes late to a class on Wednesday, November 16. He reports that he was summoned to a short conference with one of his Profs the hour before, and when you gotta go, you gotta go.

PHI LAMBDA UPSILON INITIATES

Six chemical engineering students were initiated into Phi Lambda Upsilon, honorary chemistry fraternity, on Thursday, December 1. At the initiation banquet the initiates were formally welcomed by Professor Farrington Daniels of the Chemistry Department. The response of the initiates was given by Wayne K. Neill, ch'34. The address of the evening, "Otto Wollach, His Life and Work," was ably given by Dr. E. Kremers, Professor of Pharmaceutical Chemistry.

PHI LAMBDA UPSILON

John O. Iverson, '33
Abraham M. Max, '34
Robert G. Matters, '34
Wayne K. Neill, '34
Adolph T. Peters, '33
Torris Torrison, '33

« ALUMNI NOTES »

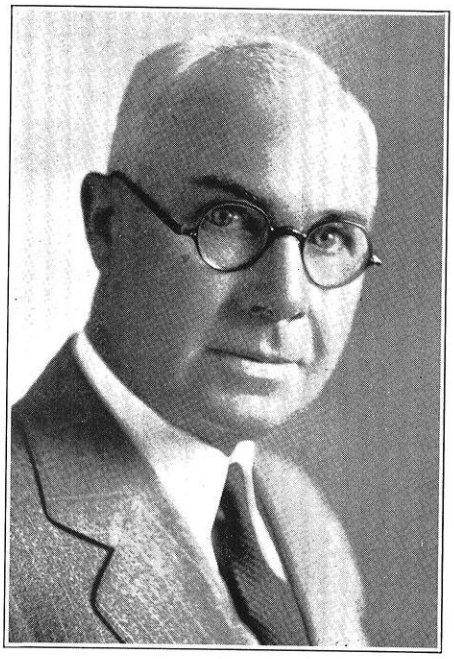
Among Our

Successful Wisconsin Engineers

is

John Lucian Savage

THE great Hoover Dam, now under construction on the Colorado River near Las Vegas, N. M., will stand as a monument to many men who will contribute their strength and skill to its creation, and not least among them will be a man, Wisconsin born and educated, who is chief designing engineer of the U. S. Bureau of Reclamation, John Lucian Savage, Wisconsin '03. For four years, ever since the Boulder Canyon Project was authorized in 1928, this dam has almost monopolized his time and energies, but not entirely, for even at the time of this writing, he is in Panama where a new dam is being built by the government in connection with the Canal.



JOHN LUCIAN SAVAGE

John Savage was born in Cooksville, Wisconsin, on December 25, 1879, son of Edwin Parker Savage and Mary Stebbins Savage. Both parents were Wisconsin born. His father was a successful farmer, and his mother was a writer whose work was admired by a large circle of friends. The boy was graduated from the Madison high school in 1898 and from the course in civil engineering at the University of Wisconsin in 1903.

At college, Savage was a successful student, being elected to Tau Beta Pi in his junior year. He also found time to work on the Badger Board and to take part in the proceedings of the Civil Engineering Society. Apparently he did not do much stepping, for the Badger of his senior year pegs him with the phrase: "Ladies are out of his sphere." It was not until June 1, 1918, that he was married at Denver, Colorado, to Jessie Burdick Sexsmith of Milton, Wisconsin. There are no children.

From the time of his graduation until the present, with the exception of the eight years from 1908 to 1916, he has been with the U. S. Bureau of Reclamation, designing dams and related engineering works. From 1908 to 1916 he was associated with the late A. J. Wiley, consulting engineer of Boise, Idaho, on the design and construction of irrigation and power projects. The list of important structures that have been designed and constructed under his supervision is so long that it would be monotonous to catalogue them here. Among them, however, are such familiar names as Arrowrock Dam, American Falls, Owyhee, and Cle Elum. Certainly no other engineer in this country has had so extensive an experience in dam design, and it is doubtful whether his experience can be duplicated by any other engineer in the world. Mr. Savage is ranked by competent authorities as the foremost engineer of the day in this field.

Writing, invention, and lecturing have served as avocations for John Savage's spare moments. He holds patents on various inventions for joint-grouping systems, hydraulic needle valves, and other hydraulic devices. He is co-author with J. M. Gaylord of a report on "High-Pressure Reservoir Outlets," published by the U. S. Bureau of Reclamation, and has written miscellaneous reports and articles for engineering journals and technical societies. With the assistance of R. S. Lieurance, an engineer of the Bureau of Reclamation, Mr. Savage conducted a lecture course for graduate students on the design of high masonry dams at the Massachusetts Institute of Technology.

Society work has received considerable attention from this busy engineer. He is a member of the American Society of Civil Engineers and is serving on the special committee on Irrigation Hydraulics and on the Arch Dam committee; he represents the U. S. Department of the Interior on the American Engineering Standards Committee; and he is a member of both the American Institute and the Colorado Society of Engineers.

Having no children of his own, John Savage has found pleasure and satisfaction in making it possible for a number of young men and women to meet the expenses of a college education.

The past quarter of a century has witnessed tremendous activity in the field of civil engineering; it is an era characterized by bridges, tunnels, buildings, and dams of unprecedented size. When the poems and the paintings and the songs of today have disappeared and been forgotten, these great engineering works, or their massive remnants, will remain to excite the wonder of future races and compel their admiration for the men who could design and build them. It is something to have had such a part as John Savage's in creating so great and enduring a work.

CHEMICALS

Bidwell, L. H., ch'32, was accepted and is now enrolled in the United States Government School for Aviation in Texas.

Hardell, Clarence W., ch'32, is employed as Chemical Engineer in a wood distillation plant in northern Wisconsin.

Miller, E. P., ch'32 and **Sobota, John T.**, ch'32, have found employment in the paper mills at Green Bay, Wisconsin.

Ritzenthaler, Phil., ch'32, is engaged in the refinishing of dental instruments in Milwaukee.

Sterba, Melvin J., ch'32, was awarded third prize of $25 in a national contest sponsored by the American Institute of Chemical Engineers. The contest was held at twenty-three institutes of learning and open to more than 1400 students. The prizes were awarded for general excellence in chemical engineering as determined by the solution of a practical problem.

Straka, Frank G., ch'32, is in the research laboratories of the Universal Oil Products Company at Riverside, Illinois.

Plewke, Walter H., ch'24, is now sales engineer with the Reilly Equipment Sales Company in Milwaukee.

Ouweneel, William E., ch'24, visited Madison in November. He is still employed at the Terre Haute, Indiana plant of the Commercial Solvents Company, a connection which he established at the time of graduation.

Thomas, Walter E., ch'24, is now the owner and operator of a drug store in Milwaukee.

Cirves, Frank, ch'21, is a chemist for the Filer Fibre Company, Filer City, Michigan. He read a paper, "Study and Evaluation of the Kraft Bleach Process," before the September, 1932 meeting of the American Association of the Pulp and Paper Institute.

CIVILS

McMicken, Robert H., c'32, was employed as life guard at Golden Lake Park during the past summer.

Wohlgemuth, John F., c'31, has been working in the office at Milwaukee for the Great Lakes Dredge and Dock Company since July.

Hornig, Fred F., c'30, was married last April to Florence Klumb of Milwaukee.

Paschen, Clayton, c'30, and his wife were in Madison early last month and attended the homecoming game, November 5.

Stevens, Clyde K., c'29, who has been designing a dam and gates for a Fox River job for the army engineers, has written suggesting an investigation of the adhesive strength of ice on various metals. The information, he says, would be of value in the design of vertical-lift Stoney gates.

Liddle, George F., c'27, has just finished a bridge job for the Highway Department of Michigan. He informs us that he is still single. His home is in Muskegon, Michigan.

Mickle, Charles T., c'26, will spend the winter in a cottage at Sandstone Camp at Ripon, Wisconsin. He is nominally the caretaker, but claims that his duties consist of being there to satisfy the Fire Insurance requirements.

Wisner, John C., c'26, is an engineer with the Bucyrus Erie Company, at South Milwaukee, Wisconsin.

Cottingham, Willard S., c'25, instructor in structural engineering at Wisconsin, has a new son, Willard Arthur, born Friday, October 27.

MECHANICALS

Colbert, Thomas P., m'25, is with the Bridge Department of the Wisconsin Highway Commission. During the past summer he was connected with the shop inspection of the steel work for the new Chippewa Falls bridge.

Sogard, Ralph, m'25, is still the engineering representative of the operating staff at the University of Missouri, Columbia, Missouri.

Buese, Frank, m'22, is extremely busy helping to produce several hundred tons of candy weekly at the Brock Company, Chicago. His address is 1328 N. Lockwood Avenue, Chicago.

McLenegan, D. W., m'21, has been transferred, and is now Assistant Engineer in the Air-Conditioning Department of the General Electric Company.

Wertheim, F. E., m'17, has had several interesting articles published in the July and August issues of the magazine, "Heating, Piping, and Air Conditioning." A feature of these articles is a description of the "Unsupported Area" principle developed from experiments with pressures of 550,000 pounds per square inch — a force equivalent to that which would be exerted at the base of a column of water 240 miles high.

Dorner, Fred H., m'05, was appointed, by the university alumni, a member of the board of visitors of the University of Wisconsin. Mr. Dorner is living at 1107 E. Knapp Street, Milwaukee.

ELECTRICALS

Racheff, Theodore W., e'32, is now employed by the Burgess Laboratories, in Madison. He is in charge of the zeolite water-softener department.

Betzer, Cecil, e'24, is doing cable research work for the Commonwealth Edison Company, at Chicago. His address is 349 Lawton Road, Riverside, Illinois, where a future Wisconsin engineer has recently arrived.

Olson, M. C., e'99, on June 1, retired from the A-C Engineering Department of the General Electric Company. Mr. Olson has been with this company for 33 years; his work being in the field of developing, designing, and estimating costs of hydraulic generators.

Schuchardt, Rudolph F., e'97, E. E.'11, Chief Electrical Engineer for the Commonwealth Edison Company at Chicago, died October 26 in a Boston sanitarium after an illness of several weeks. He was president of the A. I. E. E. in 1928-1929, and a former chairman of the Great Lakes District Power Survey. He was also a former chairman of the Public Affairs Committee of the American Engineering Council, and at the time of his death he was a member of the science advisory committee of the Century of Progress Exposition. Mr. Schuchardt's family is living at 3508 Prospect Avenue, Milwaukee.

Tyler, Edward, e'30, is now working for the Michigan Bell Telephone Company.

Teare, William, e'31, is a graduate of the 1932 class in Advanced Engineering offered by the General Electric Company.

Howes, Edward W., e'29, is working as an air conditioning engineer of the Long Island District for the General Electric Company. At present he is in charge of organizing a sales force for a new oil burner the company is putting out.

Montgomery, Wardwell, e'28, is a results engineer with the Madison Gas and Electric Company.

Jordan, Roy D., e'27, has been elected secretary-treasurer of the Test Alumni Association of the General Electric Company for the years of 1932-1933. He is in the Publicity Department of that company.

Brooks, Ralph R., e'26, is doing general electrical engineering work and research work for the Barber Colman Company. His new address is 530 N. Church Street, Rockford, Illinois.

« « EDITORIALS » »

AMONG OTHER RACKETS About this time every year certain stores on State Street are guilty of a type of racket. They prey upon us just before the holidays and again at the end of every semester, at a time when "iron men" are pretty scarce, when we need a few shekels for railroad fare to get home over the holidays, when we must get a wee gift for our latest flame or the girl back home, or perhaps for the doggiest social event of the year — Prom. They get us with that everlasting gag "We buy used books."

We promptly grab up an armful of three dollar books, some of which have been thoroughly thumbed, others have just been glanced at, which no longer are of immediate use to us, in the earnest belief that they will yield a sum at least approaching one-half their cost.

"Oh hum, afraid this one will not be used on the hill next semester, this one is marked up quite a bit. Fifty cents is about all I can possibly give you." What a condescension on the part of the book dealer by being gracious enough to offer us even fifty cents for a three dollar book.

This is a ridiculous price when we positively know that these books will be resold at two or three times this value. The defects that were unsurmountable mountains when we sold them will mysteriously be converted into mole hills when the books appear for resale. Those books that are no longer used on this campus are sent through exchange agencies to other colleges that are using them and sold there at fabulous prices.

Even the student co-operative stores are not free from this game. Stores whose chief aim should be to co-operate with the students in getting a respectable price for old books are as guilty, if not guiltier, than the privately owned stores of making excess profits on used books by selling the books at many times the cost to them.

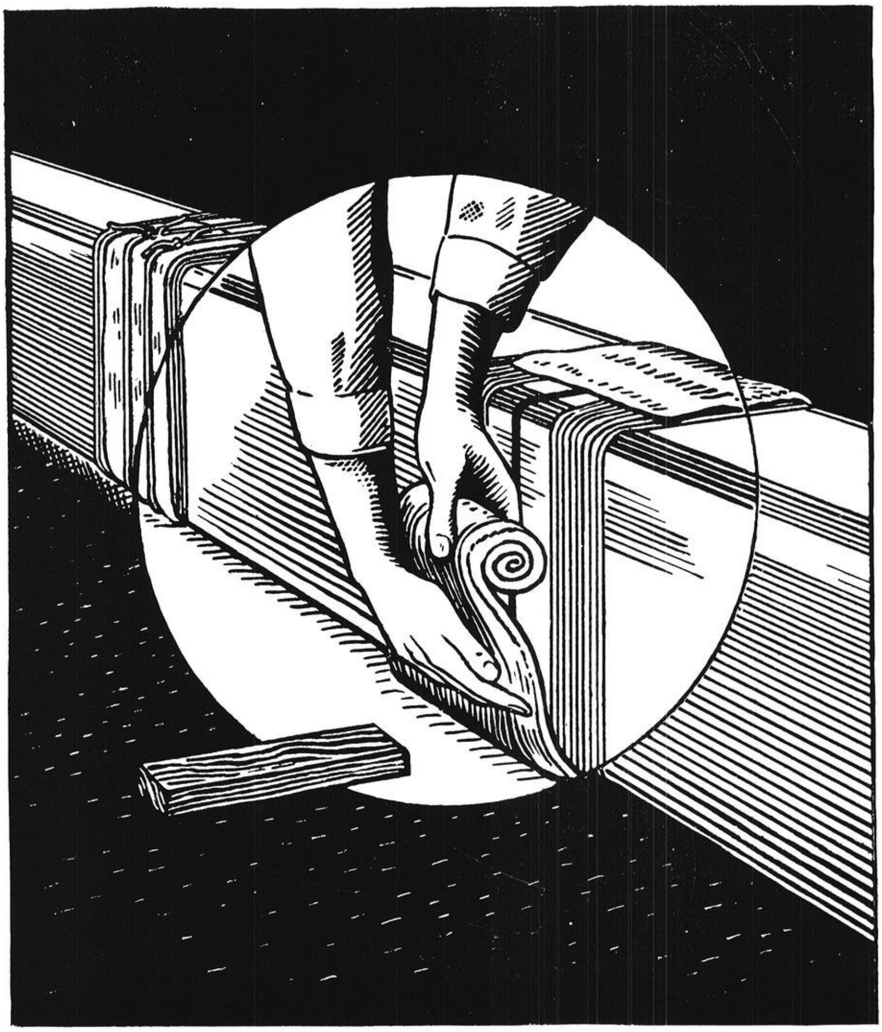
If this is not a racket what is? In our moment of weakness we fall prey to these sharpsters. Because we are individuals selling as individuals with no bargaining power we are continuously subjected to this racket. We have been and will continue to be GYPED. —C. M.

FINIS 1932 With the completion of the publication of this issue, we write finis for the year 1932. Soon another milestone in history will have passed and as we look back over the events of the past year we heave a heavy sigh of relief that the year has at last come to an end. About one year ago, the people of the world listened to the great prophets — our politicians — and believed them when they said that the year would see the return of good times. As the year grew older, the corner around which the mythical "prosperity" was lurking receded farther and farther into the mists of even the most vivid imagination, and still the politicans could think of no better solution than to say it might have been worse.

We have seen bonus marchers, jobless marchers, and more recently hunger marchers file past the doors of our governmental offices, and inside these very doors the legislators have been wrangling over whether or not a 2% or a 5% beer should be allowed, and how much tax should be levied on each glass. The irony of it is appalling!

What are we as citizens going to do about it? Are we going to sit back, during the next year, and take a passive interest in the nation's affairs or are we going to resolve to get into the game and fight hard for the realization of our rights as human beings in a civilized world, virtually over-flowing with "milk and honey" — the right to work, the right to enjoy the fruits of our work, and the right to live without fear of starvation or want.

The world is a looking-glass, and gives back to every man the reflection of his own face. Frown at it, and it in turn will look sourly upon you; laugh at it and with it, and it is a jolly, kind companion.—William Makepiece Thackeray.



« CAMPUS ORGANIZATIONS »

PARKER OFFERS DEPRESSION HINTS

"It is cheaper for the people of a community to do jobs that all have to have done through a specialist hired by the community and paid out of the tax fund, than to have the jobs done individually," said E. E. Parker, city engineer of Madison, in a talk before the A. S. C. E. at their monthly meeting in 214 Engineering Building, Wednesday, November 9.

"Most of the work which comes under the city engineer is of this type. There are hundreds of little things, like grease trap cleaning, which can be done cheaper by the city than by the people. A good depression stunt would be to increase the city payroll to cover these jobs rather than to cut the budget of these items."

Mr. Parker was introduced to the Society by Roy Weston, '33, who gave a brief resume of Parker's activities since he received his B. S. here in 1907.

The talk and following discussion were full of interest, chiefly because of Parker's practical slant on engineering problems of everyday occurance. He spoke at some length of various sewerage problems that he has encountered in and around Madison and of the ways in which they were met.

"A sewage disposal plant which was designed to supply the city's needs for twenty years, on the basis of the population growth of other cities of like population, reached its capacity in ten years because of the phenomenal growth of Madison during this period. In cases like this, all known material on a subject may be studied and analyzed, but uncontrollable factors will be the deciding ones in the final success or failure of a design."

THE NAVY FLIES FOR THE MECHANICALS

Those persons interested in aeronautics, the Navy and National Defense, found a real treat in store for them at the third meeting of A. S. M. E. in the Auditorium of the Engineering Building, November 3rd, when Lt. Case of the Naval Reserve, showed them a navy air picture, "The Navy Flies". He clarified doubtful points of the film by short barks interspersed between scenes. The film made its first public showing at this meeting. It is a Navy Department picture, exceedingly complete in detail.

Although the last meeting, that of November 15, was purely a business meeting, the general excitement among the mechanicals would seem to betray that a new birth has come to A. S. M. E. According to some of the members, the officers and faculty advisor have succeeded in revitalizing the student branch to the point where it is no longer the lackadaisical group of students trying to maintain a front, but a society embodying the whole of the mechanical engineering student body.

PI TAU SIGMA HOLDS FORMAL INITIATION

Following on the heels of its plaque night, informal initiation, the men whose names appeared in this magazine last month, were formally initiated into Pi Tau Sigma, honorary mechanical engineering fraternity, at a banquet held in the Memorial Union, November 16. Prof. G. L. Larson and Prof. P. H. Hyland were the principal speakers. Prof. B. G. Elliott acted as toastmaster.

Plaque night, night of the informal initiation ceremony, the initiates worked until early Saturday morning, making their own molds and castings for the plaques. George C. Schmid was in charge of the ceremony. Perhaps it was through his kindness that the all night vigil was lightened by a midnight lunch of sandwiches, doughnuts and coffee.

Attend Convention

A. B. Epple, official delegate, E. R. Kaiser, and Milton R. Paulsen rode with Prof. G. L. Larson to Urbana, Illinois, where they attended the National Convention of Pi Tau Sigma. The Illini must have treated them well for they have nothing but good to say of their trip. They report much accomplished in the way of forming new friendships and good will toward the Mechanical Engineering College at Wisconsin.

In the near future the Wisconsin chapter intends to put into practice some of the suggestions received at the convention.

CHI EPSILON INITIATION

Chi Epsilon, national honorary civil engineering fraternity, held its annual initiation banquet Wednesday evening, November 16, in the Memorial Union. Claude A. Lyneis, c'33, president of the Wisconsin chapter of Chi Epsilon, welcomed the initiates in a short congratulatory speech. Robert J. Jenks, '33, responded on behalf of the initiates.

Professor Lew H. Kessler, Department of Hydraulics, officiated as Toastmaster. He entertained, a la Winchell, with a few anecdotes concerning items the initiates had thought were forgotten and buried in the past. He stressed one particular story whose heroine is a redhead, but we won't relate it here inasmuch as we do not wish to embarrass our dear friend Mr. Lefevre.

The speaker of the evening, Professor C. D. Cool, Professor of Spanish, vividly portrayed the history of Spain from pre-Roman to pre-depression times. Professor Cool possesses a deep sense of humor and a store of jokes and sarcasm of the type most appreciated by the engineers. He told of the conquest of Spain by the Moors, its reconquest by the Spaniards, and its subsequent political troubles closing with a description of the abdication of King Alphonse and his flight to Paris where he became ill and "was confined to his bed, supposedly in his pajamas".

TAU BETA PI

Seventeen senior engineers and one junior engineer were initiated into Tau Beta Pi at its fall initiation held at the Lorraine Hotel on December 1.

At the dinner following the initiation, Professor Francis M. Dawson of the hydraulic engineering department of the university acted as toastmaster. James P. Kaysen, c'33, responded for the initiates to President Royal H. Wood's welcome. The speaker of the evening was Mr. L. J. Markwardt of the Forest Products Laboratory, who spoke on "Facts and Fancies About Wood."

ELECTRICALS DISCUSS UTILITIES

"Shall We Have Public Ownership of Public Utilities?" was the topic of discussion at the last meeting of A. I. E. E. held November 30, in the Old Madison Room of the Memorial Union. Professor Martin Glaeser of the economics department led the discussion with an excellent talk on the public utility situation today. Following that, a free-for-all discussion held rigidly the interest of all present for two hours.

The ability to present extemporaneously a clear and logical argument on a subject is absolutely essential to success in electrical engineering. Because most engineers do not have an opportunity in their class work to attain this ability, the officers of the A. I. E. E. feel that it is the duty of its student branch to provide such an opportunity. Consequently a series of meetings on controversial questions has been arranged. The meeting of November 30 constituted the first of these open forums.

THE PRAIRIE DU CHIEN PONTOON BRIDGE

(Continued from page 39)

two passenger trains, one mixed train, and two freight trains daily in each direction. Heavy traffic would no doubt require replacement of the pontoons with some form of structure that would eliminate the occasional delays now afforded. This would mean a large capital expenditure in contrast to the present low first cost and rather high maintenance charges.

It is interesting to note that James Doyle, operating foreman on the West Channel pontoon, has held that position since 1874 when the first bridge was constructed at this point. A new pontoon has recently been completed at Read's Landing, Minnesota, where the Milwaukee's branch from Wabasha, Minnesota, to Eau Claire, Wisconsin, crosses the Mississippi River. This, together with the Prairie du Chien pontoon, is believed to constitute the entire list of structures of this type in North America, if not the world. A fourth pontoon, at Chamberlain, South Dakota, where the Milwaukee's Rapid City Line crosses the Missouri River, was replaced with a steel swing span a few years ago.

ENGINEERING REVIEW

22,000 H. P. DIESEL ENGINE UNDER CONSTRUCTION

Burmeister and Wain of Copenhagen, Denmark, are completing a Diesel unit of 22,000 bhp, for central station work in Copenhagen.

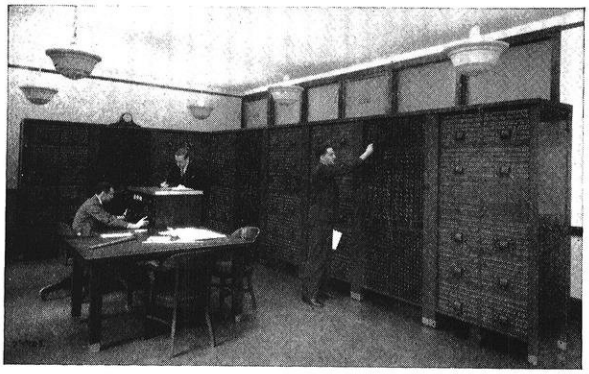
The engine is of the eight cylinder double acting two-stroke type. The cylinders have a diameter of 33 1/16 inches, with a stroke of 59 1/16 inches It will run at 115 r. p. m. and will be directly coupled to a 6000 volt alternator.

The continuous output of the unit is 22,000 bhp., or 15,000 kw. with a normal load of 12,500 kw. This engine will be the largest stationary oil engine in the world.

—*The Engineer (London)*

FIRST A-C CALCULATING BOARD IN REGULAR USE BY UTILITY

Studies of power flow, regulation, losses, power factor and system stability are made quickly and easily on this alternating-current calculating board recently installed in the engineering department of the Commonwealth Edison Company, Chicago. Built by the Westinghouse Electric & Manufacturing Company, it is said to be the first alternating-current calculating board to be placed in regular use by an operating utility. It operates on a frequency of 440 cycles. On it can be reproduced in terms of circuit constants the whole or any part of the Commonwealth Edison a. c. system.



— *Courtesy Westinghouse Electric Co.*
The A. C. Calculating Board in operation.

UNDER THE COLUMBIA RIVER

The highest-voltage submarine cable crossing in the world, rated at 115,000 votes, is to be installed beneath the Columbia River and the Oregon Slough so that power can be transmitted directly to Portland, Oregon, from the new Ariel hydroelectric generating plant on the Lewis River in Washington. The installation also will mark the first use of oil-filled cable for a submarine crossing.

The present route for sending power from Ariel to Portland is by overhead lines from Ariel to Vancouver, Washington, directly north of and on the other side of the Columbia River from Portland; than east several miles to Camas; across the river on overhead lines to Fairview; then west to Portland. Construction of the cable crossing will eliminate several miles of the distance, improve the transmission efficiency, and, with two lines available, afford a guarantee of continuous service.

While the cable will be rated at 115,000 volts for a grounded neutral system, it will be operated temporarily at 66,000 volts on an isolated neutral system until power demands require an increase in the operating voltage to full rating.

The cable crossing will be from Vancouver to Hayden Island, and from there to the Portland shore of the Oregon Slough. Because the initial cost and the subsequent maintenance of oil filled cable is excessive the line will be carried over Hayden Island by means of overhead wires supported on steel towers. Under the Columbia River there will be three 3700-foot lengths of the cable, buried beneath six feet of the river bottom, and beneath the slough there will be three 1515-foot lengths, likewise buried.

HUGE WATER CLARIFYING PLANT

At Hoover Dam, 85% of the water used by the 500 tons-per-hour aggregate plant is pumped back to this 800,000 gallon water treating reservoir and used over and over again. The Dorr equipment removes the silt and reduces the turbidity of the water to not more than 500 parts per million.

— *Courtesy Westinghouse Electric Co.*
Water treating reservoir at Hoover Dam.

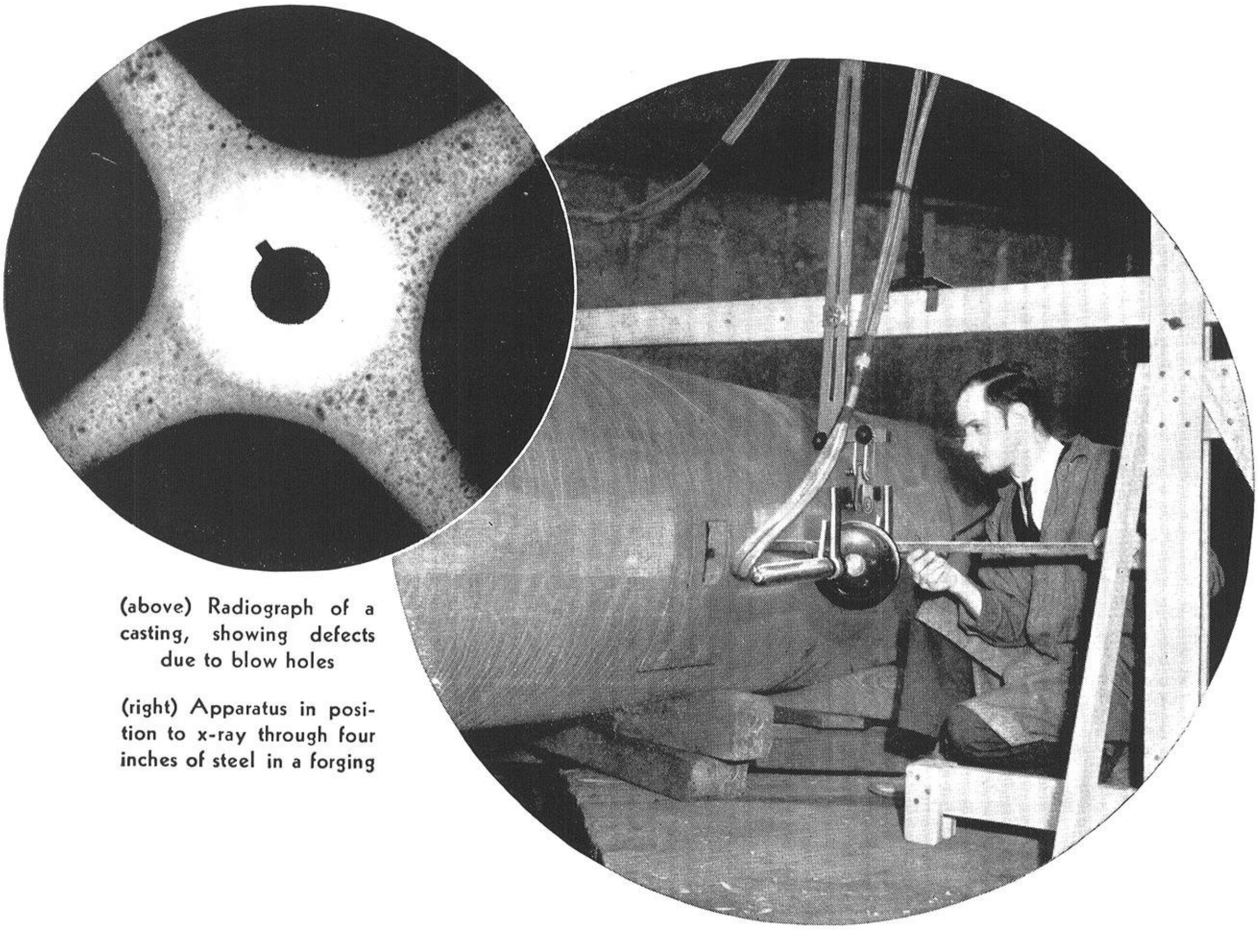
HOOVER DAM GRAVEL PLANT OPERATES AT NIGHT

At the Hoover Dam aggregate plant, 51 totally enclosed self ventilated squirrel cage motors ranging in size from 5 to 150 hp. and one wound rotor cone crusher motor, turn out 700 tons of raw gravel per hour. Subjected as they are to a continually wet, smothering cloud of grime, grit, and gravel, which would destroy both commutators and insulation in a short time, it is imperative that the motors be adequately enclosed.

Careful interlocking of various belts and screen trains prevents piling up of material at any point, in case an emergency stops one part of the equipment. Under normal conditions, the equipment can only be restarted after the final delivery belts are started.

The control of the flow of gravel for the entire plant is centralized at a push-button control tower, located in the top of the tower at the discharge belt over the scalping screen. From this point the operator can view the whole plant.

Seeing through steel



(above) Radiograph of a casting, showing defects due to blow holes

(right) Apparatus in position to x-ray through four inches of steel in a forging

When Prof. Röntgen announced his discovery of the x-ray, in 1895, he intimated that medical science would not be the only beneficiary. Since then, General Electric has been a pioneer in the development of the x-ray for industrial as well as medical use. • As a result, a new science — industrial radiography — enables us to peer at the internal structure of almost any material. Radiography reveals most microscopic defects in metals — blow holes, shrinks, pinhole porosity, cracks, dross inclusions, etc. — without destruction of the specimen. Even four inches of steel is no obstacle to the modern radiographer. • "Seeing through steel" has become a reality with the new and more powerful x-ray tubes developed by General Electric. These tubes, using as much as 400,000 volts, make possible the most powerful x-rays available to industry. Such developments are largely the accomplishments of college-trained engineers. They are leading the way to even greater progress in the electrical industry and are helping to maintain General Electric's leadership in this field.

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GENERAL ELECTRIC