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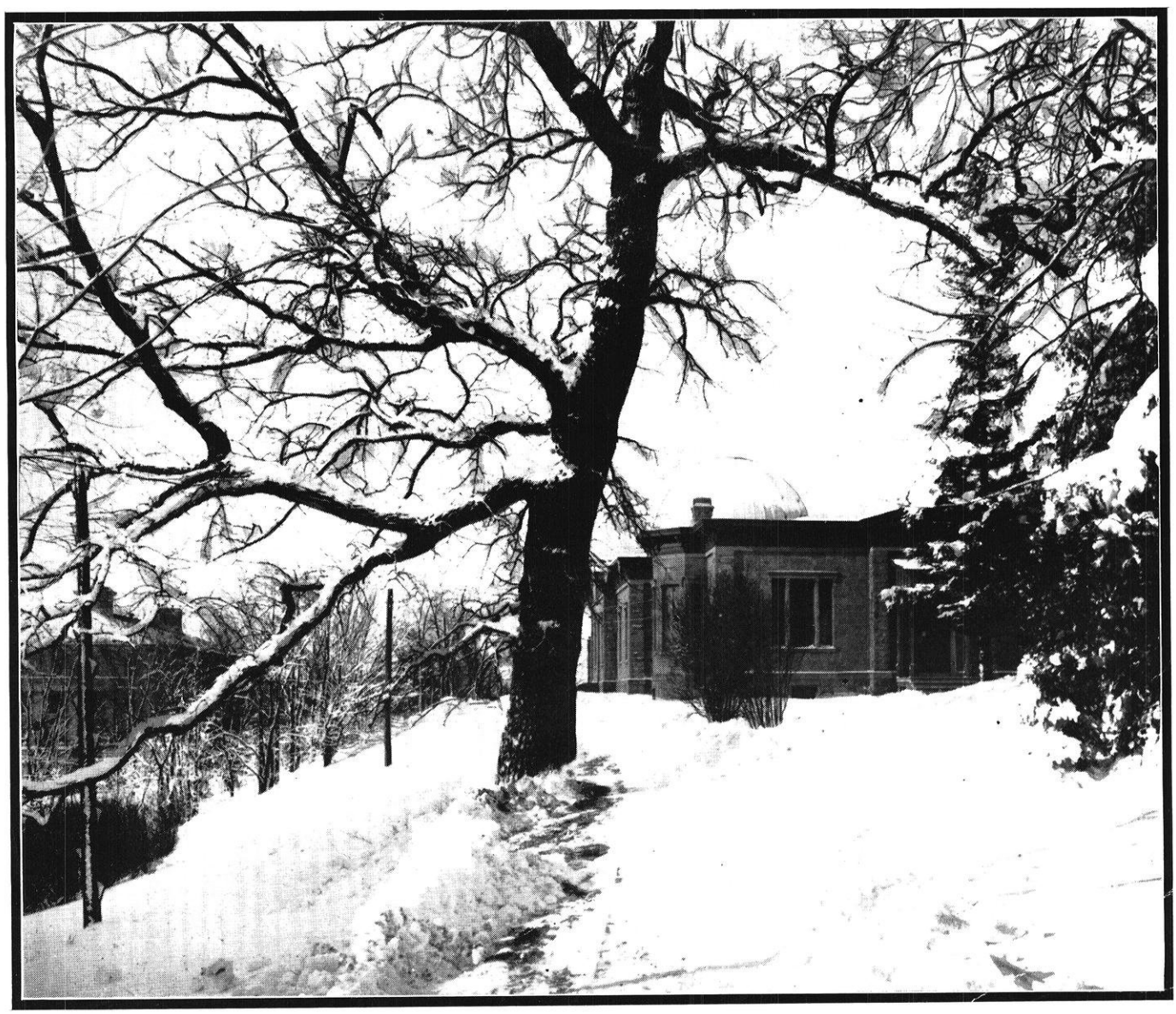

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VOL. XXIX No. 5 MADISON, WIS. FEBRUARY, 1925

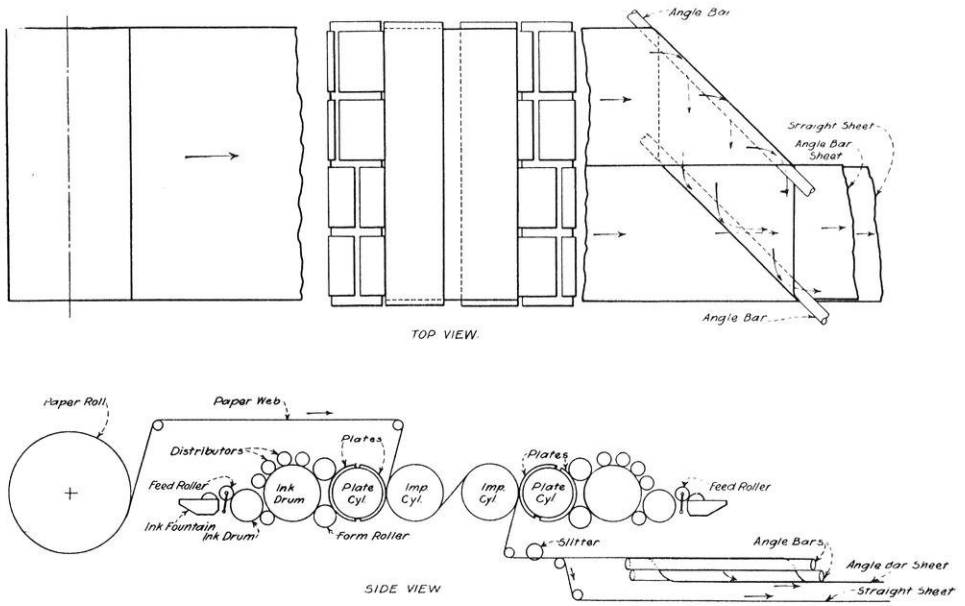
MECHANICAL EQUIPMENT OF A MODERN NEWSPAPER PLANT

By W. E. WINES
Assistant Professor of Mechanical Engineering,
University Extension Division

PART II

The most imposing piece of equipment in the entire newspaper plant is, undoubtedly, the web perfecting press. A modern high speed octuple press, taking paper from four rolls of paper simultaneously, will print, cut, fold, deliver, and count 16-page papers at the rate of 1200 per minute or 72,000 per hour. Such a press consists really of four separate presses united in one machine and having one pair of folders. Two diagrammatic views of a web press are shown in accompanying illustrations. One of these gives a side view of a single press, or unit, and the other gives a top view. The printing is done as the paper is passed between a pair of cylinders, — one of these cylinders carrying the curved stereotyped plates and the other, known as the impression cylinder, being covered with a suitable packing in order to press the paper firmly and into intimate contact with the printing surface of the plate. The diagram shows one unit of a press. One unit of printing mechanism is capable of operating on one web of paper. A unit contains two plate cylinders and two impression cylinders. The cylinders are so located that as the paper passes through the first pair it is printed on one side, and as it passes through the second pair it is printed on the reverse side. It is from the fact that the press prints both sides of the sheet or web that it is called a "perfecting" press. It is necessary that the paper roll be held back or retarded in its motion in order to cause the paper web to be at all times under tension, otherwise the web could not be controlled for the same reason that a power transmission belt must be under tension in order to keep it from wandering on the pulleys. In its passage through the press, the paper is carried over numerous hollow rollers, called "pipe" rollers, in order that it may be led where desired. Some of these rollers are driven in order to assist the onward movement of the paper; others are merely idlers.

Since the length of the stereotype plate is less than the semi-circumference of the plate cylinder, a pair of plates placed opposite each other on any cylinder do not meet. The spaces between opposite plates are occupied by margin bars fastened firmly to the cylinder. The space between plates forms the top and bottom margins of the printed page. Similarly, there is a space between any two plates which occupy adjacent positions on the same side of any cylinder. This space forms the margins at the sides of the pages.



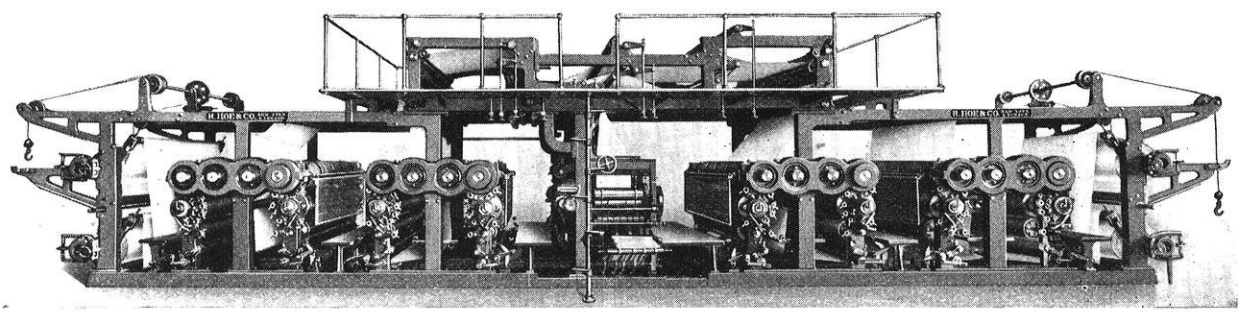
DIAGRAMMATIC VIEW OF THE WEB PRESS — *This illustration shows the plate* ***and impression cylinders,*** *inking devices, slitter, and angle bars for superimposing the two halves of the web after slitting. This press is "double-width" or four pages wide, each plate cylinder carrying eight plates.*

The diagrammatic view of the top of the press shows four plates side by side, counting lengthwise of the cylinder. Each plate cylinder, therefore, carries eight plates, and the two plate cylinders in any unit of the press carry sixteen plates. This means that one revolution of the press prints sixteen pages. If it is desired to print an eight-page paper, a double set of plates must be cast, under which condition one revolution of the press turns out two eight-page papers. In order to superimpose the two halves of the web, which is necessary in order to deliver an eight-page paper as a unit, the paper is slit down the center after it is printed and before it enters the folder, and the two halves of the web are brought together by passing one of them around a pair of "angle bars". These angle bars are of round steel and are set, as shown in the top view, at an angle of forty-five degrees to the direction of the paper travel, — the effect of the two bars being to give the paper two ninety degree turns and deliver the "angle bar sheet" directly above or directly beneath the other half of the web which has continued on its journey straight into the folder. It is thus seen that a single press unit (often referred to as a "deck") handling one roll of paper will print two eight-page papers per revolution, that a two-roll press will print two sixteen-page papers per revolution, that a three-roll press will print two twenty-four page papers per revolution, and so on.

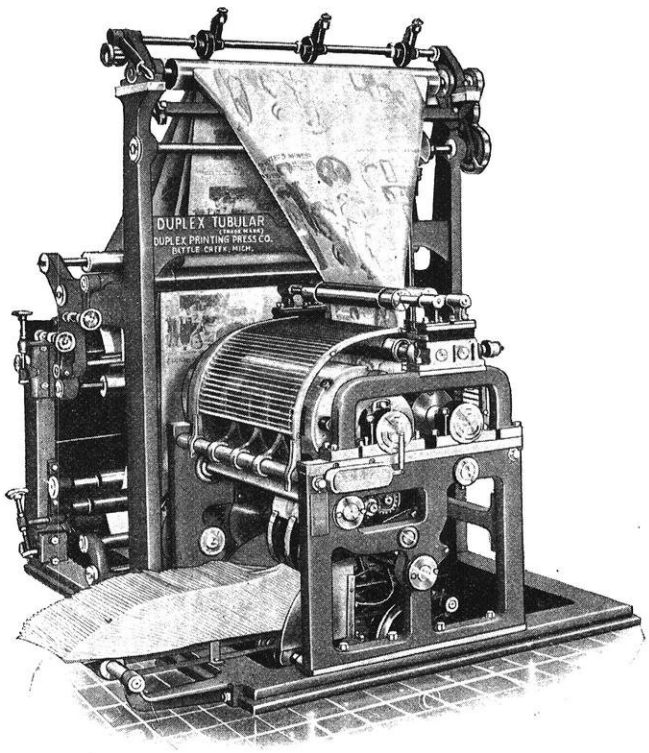
If it is desired to print a paper having a number of pages which is not a multiple of eight, this is readily accomplished by using "half" and "three-quarter" paper rolls. A full roll is four pages wide, a half roll is two pages wide, and a three-quarter roll is three pages wide. Consequently, a half-roll run through the press will produce a four-page paper. It is to be understood, of course, that in using a half-roll the plates are placed on only one-half of the cylinder, that is to say, one-half the length of the cylinder is plated. In using a three-quarter roll, three-fourths of the length of the cylinder is plated, and each revolution of the press prints a six-page paper. If it is desired to print a twelve-page paper, two units of the press must be in operation, and it will be necessary to use one full and one half-roll. If it is desired to print a fourteen-page paper, two units of the press will suffice, and it will be necessary to use one full roll and one three-quarter roll. If twenty pages are desired, it is necessary to operate three units of the press and to use two full rolls and one half-roll.

The press four pages wide is almost invariably equipped with two folders side by side and this arrangement makes it possible to "associate" two sections of the same or of a different number of pages and deliver them folded together. For example, a thirty-two-page paper may consist of two sixteen-page sections or it might consist of one twenty-page section and one twelve-page section. Very many combinations are possible depending upon the size of the press, that is the number of units of which it consists and upon the arrangement of the folders.

The modern folder is the survival of many types which have been tried and found inadequate. Reference to the view of the folder given herewith shows the various webs entering the folder over the driven roller at the top and passing down over the triangular member technically known as the "former". The former, without the use of any moving parts, gives the paper its first fold, which is the fold at the back parallel with the columns. After leaving the former, the folded webs pass between suitable guide rollers and enter between two heavy cylinders known as the folding cylinder and the cutting cylinder. The larger cylinder, or folding cylinder, has a circumference equal to the length of two papers, while the smaller cylinder has a circumference equal to the length of one paper. The term "paper" is here used to denote either a complete paper run in book form or one section of a paper run in two parts. The cutting knife is carried by the smaller cylinder which makes one revolution for each paper that comes from the former. When the white space between two papers is in the plane of the axes of the two cylinders, the knife, which has a serrated edge, passes through the paper into the cutting rubber and severs one complete paper from the web. The folding cylinder carries two sets of pins located diametrically opposite one another and it also carries two folding blades, — these folding blades being located on the



A Modern Web Perfecting Newspaper Press — *The picture shows a typical four-roll press in operation. It is of the modern, low down, unit-type design, — all cylinders, inking apparatus, etc., being accessible from the floor. Papers from 4 to 16 pages can be printed at the rate of 72,000 an hour.* —*Courtesy of R. Hoe and Company.*



WEB PRESS FOLDER — *The webs pass down the former, which makes the first fold, and enter between the cutting and folding cylinders. The folded papers are coming out on the delivery straps. Double width presses have two folders placed side by side.*

—Courtesy of Duplex Printing Press Co.

circumference of the cylinder midway between the two sets of pins. The papers as they leave the folding rollers are caught by curved arms called "fans" and deposited by these fans upon the delivery belts. Every fiftieth paper is "kicked out" a few inches by means of a "kicker" which is actuated by a cam. This allows the papers to be withdrawn in bundles of fifty.

For many years, the standard method of supplying paper to the press was to mount the paper roll on a shaft or spindle having a diameter of about one and a half or two inches. The spindle was supported in brackets, usually at the end of the press, and the tension was maintained by means of a brakeband bearing against a brake wheel fastened to the paper roll spindle. About twenty-five years ago Irving Stone, mechanical superintendent of the Chicago Daily News, devised a reel arrangement for supplying paper to the press and installed his device on a few presses in the Chicago Daily News plant. This consisted of two essential features or elements, namely: a revolving reel to carry the paper rolls, and a swinging belt which rested against the surface of the roll and by friction between the roll and belt created the necessary tension. The presses were mounted on steel beam construction supported by a minimum number of columns, leaving a nearly clear space underneath the machine for the installation of the reel device. This arrangement kept all roll paper off the press room floor and allowed presses to be placed closer together than had otherwise been possible. It also obviated all hoisting of the paper rolls to the brackets on the press and all handling of the heavy paper roll spindles. The proportions and relative locations of the parts are such that it is possible, whenever one roll is exhausted, to make a change to another roll without even stopping the press. An equipment of these reels, as installed in the plant of the New York Tribune, is shown in one of the accompanying illustrations. This illustration shows very clearly the reel for holding three rolls of paper, the tension belts, and the driving motor which causes the roll reel to revolve. The motor is operated from one of the push button stations shown in the picture. The tension belts are driven by gearing from the press shaft overhead, the gear ratio and the pulley diameter being so proportioned as to make the linear speed of the belt somewhat less than the linear speed of the paper thereby producing enough friction to maintain a tension in the paper as it is fed to the press.

Another valuable, in fact indispensable, adjunct to the large modern newspaper plant is the double-motor press drive. This also originated in the Chicago Daily News and is credited to Mr. Stone. The great obstacle to driving a large newspaper press with a single motor is the practical impossibility of obtaining the slow and uniform speed required to thread in the webs. The static friction of a press is very much greater than the running friction even when running at very slow speeds. Consequently, a motor controlled by armature resistance alone is in a condition of unstable equilibrium because the very great drop in friction, which occurs the instant the press starts, allows the motor to run very much faster than is desired. A great many schemes have been devised to get around this difficulty but most of these have been relegated to oblivion and the double-motor drive in various forms is now considered standard equipment for this service.

The double-motor drive consists of a small motor usually of five to ten horse power, a large motor of

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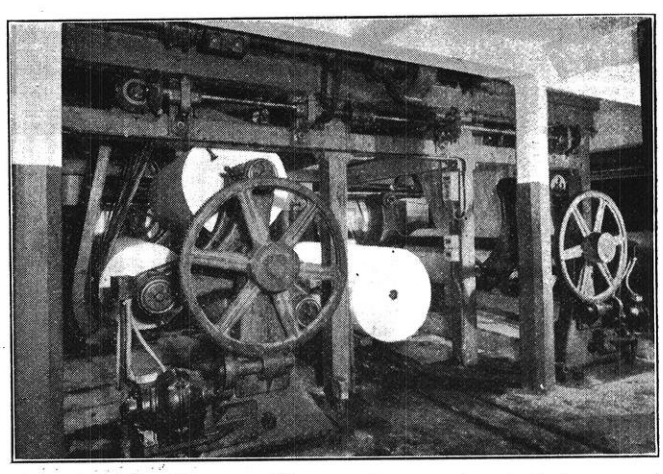
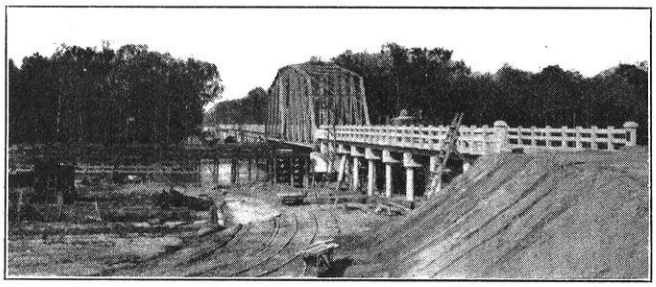


PAPER ROLL REEL — *The reels are located in a sub-basement beneath the press. Each reel holds three rolls of paper which are sufficient to print 30,000 to 35,000 papers.* *—Courtesy of Kohler Brothers.*

HIGHWAY BRIDGE CONSTRUCTION IN NORTH CAROLINA.

By PHILIP K. SCHUYLER, C '21
Assistant Engineer North Carolina State Highway Comission

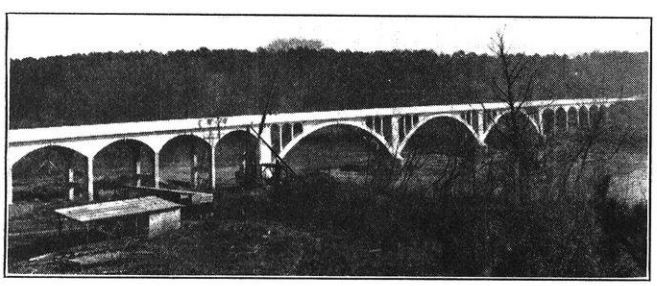
In 1921 North Carolina passed a $50,000,000 bond issue for highway work, and under the direction of Frank Page as chairman and Chas. M. Upham as state highway engineer, the present organization has been built up to handle the work. In 1923 a $15,000,000 additional bond issue was voted. The topography of the state varies from immense swamps in the east to a fertile rolling agricultural country cut up by large rivers in the piedmont or central portion, while in the western part of the state is the mountain region containing fifty peaks that reach an elevation of 6,000 feet



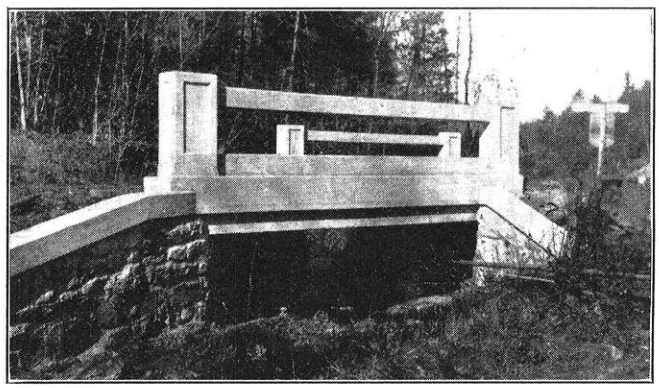
CONCRETE PILE TRESTLE WITH A TOTAL LENGTH OF OVER A MILE

or more, the highest being Mount Mitchell with an elevation of 6711 feet, the highest point east of the Rockies. When the present road building program was undertaken, serviceable roads and bridges were an unknown quantity in the east and west, whereas even in the central portion of the state there were but a few miles of hard surfaced roads.

It has been necessary to develop and use a number of different types of bridges for the varying conditions. In the east a number of swamps a mile or so wide had to be crossed, and for such locations concrete pile trestles were used. One of them, shown in Figure 1, was estimated to cost $332,180. For a structure over the Cape Fear River a steel span of 350 feet was built some 60 feet above the ordinary water level. On some of the secondary roads creosoted timber structures have been built. In the central portion of the state, concrete deck girder bridges are made use of wherever feasible, as



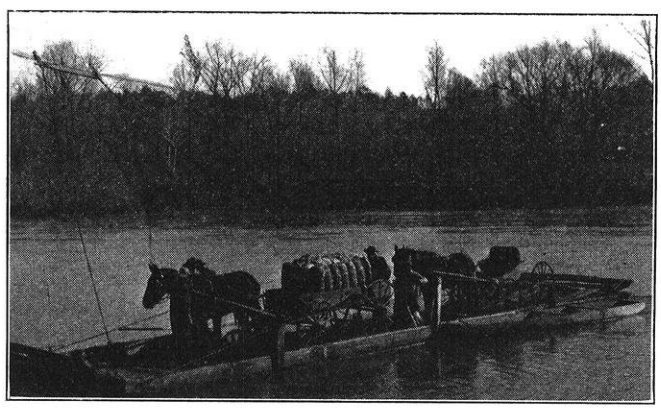
THIS ARCH BRIDGE REPLACED THE FERRY SHOWN ABOVE



A RUBBLE MASONRY CULVERT IN ONE OF THE WESTERN DISTRICTS

they are found to be the most economical type. Over some of the larger rivers open spandrel arches have been built; the one shown in Figure 2 was estimated to cost $199,615. In the west, bridges are numerous, altho smaller than in the other parts of the state, and here again deck girders are used; if good stone is available, rubble masonry type of construction (Figure 3) is made use of. Concrete structures are given preference, steel construction being used only where conditions are such that it is not practical to use concrete.

After the location survey has been made for a road, a structure survey field party is sent over the work to make surveys and recommendations for all culverts and



TYPICAL OF THE OLD SOUTH. *Ferrying Cotton across the Yadkin River.*

bridges. These recommendations and reports are sent in to the Raleigh office where they are gone over by the bridge engineer, who then turns them over to the designing engineer to prepare plans. The projects are then advertised and let to contract. The structures are built under the direct supervision of a resident engineer

(Concluded on page 94)

THE EVOLUTION OF SUPERPOWER SYSTEMS

By JOHN S. STRONG
Instructor in Electrical Engineering

Looking toward the future, we visualize an industrial and social structure characterized by the universal availability and utilization of electricity for all power purposes. The realization of such a state will depend upon the economic production of mechanical energy at favorably located sources and the transmission of this energy through the medium of electricity to the worker at the bench, in the field, or wherever he may be, in such abundance as his needs may demand. That is the "Superpower" ideal. The prefix "super" fascinates the popular imagination. Reason gives way to unbridled speculation.

When we are told, for instance, that our future power requirements can be supplied by the development of all our potential water powers, thereby rendering unnecessary fuel-consuming steam power plants; that unlimited quantities of electrical energy from these sources can be furnished every consumer at one-tenth present prices; and that hence by some occult means the working day can be reduced to two or three hours; it may be concluded that our would-be informant is either misinformed or uninformed. Governor Pinchot of Pennsylvania would have us substitute "Giant Power" for "Superpower." But even that term conveys to the lay mind little more of the objectives possible of attainment. It is the duty of the engineer and the economist to explain the meaning of superpower, to describe the mechanism by which its aims and objects can be realized, and finally to predict the effects of the new economic and social forces which will be brought to act upon human society.

(A) Some Significant Developments in the Electric Light and Power Industry.

It should be observed at the outset that what is called the electric light and power industry is practically synonomous with the central station industry. With the exception of the energy used by some manufacturing plants, mines, public institutions, hotels, and mercantile establishments from their own isolated plants, the great bulk of the electrical energy consumed today is supplied by central station service. The central station generating equipment and the transmission and distributing systems are owned and operated either by private enterprise in the form of corporations or as public undertakings by municipalities. For the reason that the business is an essential service to the general public, which very vitally affects nearly every person in the pursuance of his daily activities, it is classed as a public utility.

Origin of Central Station Industry.

The electric light and power industry as a public utility business is one of our youngest industries. It began its existence on September 4, 1882, when the Pearl Street Station, engineered by the guiding hand of Thomas A. Edison, commenced operations in New York City. This central station contained six direct current generators of 125 H. P. each (popularly known as "Jumbos"), driven by reciprocating steam engines. In the same year, about four weeks later, the first hydro-electric central station in the world at Appleton, Wisconsin, began to deliver power to lighting customers. This station had one generator rated at 250—16 candle-power lamps.

In these two stations we have the origin of what has become in only four decades a business capitalized at $6,500,000,000. The automobile industry in this country represents nearly $2,000,000,000; the iron and steel industry $3,500,000,000; the telephone industry $3,000,000,000; while the railroads aggregate $21,000,000,000.

The practicability of the central station method of furnishing electric light and power service to customers having been demonstrated, the idea soon spread with amazing rapidity. In the course of time every city and village boasted an "electric light plant." In many instances, especially on the Pacific Coast where coal was scarce and potential water power in the mountain-fed streams abundant, it was found feasible to locate hydro-electric stations at advantageous sites and transmit the electrical energy to the cities. The first single phase alternating current transmission line was built in 1889 in Oregon, and connected the plant at Oregon City with Portland, 13 miles distant. The first important three-phase hydro-electric development of considerable magnitude was at Niagara Falls where in 1895 there began the generation of electrical energy and the transmission of a portion of it to Buffalo.

Important Advances in Generating Methods.

One of the earlier and most significant advances was the ascendency of alternating current generation over direct current, until today more than 95 per cent of the energy output of central stations is generated in the alternating current form. Of this percentage, three-phase power comprises all but a very few per cent. Alternating current made possible the transformer, which in turn permitted the economical transmission of energy to a considerable distance from its source, as well as the more economical distribution at the load centers. The introduction in 1897 of the rotary converter into the central station industry, gave the final blow to direct current generation. With the beginning of the present century came the steam turbine to replace the reciprocating engine as a prime mover. The development of the turbine made possible the use of higher steam pressures and temperatures, which, with the low exhaust pressures produced by the con-

denser, very greatly improved the steam cycle efficiency. Furthermore the turbine permitted the concentration in single units of quantities of power that never could have been possible with the reciprocating engine.

Single plants of 200,000 kilowatts installed capacity are rapidly becoming not unusual. For a number of years the Fisk Street Station of the Commonwealth Edison Company of Chicago, having a capacity of 230,000 kilowatts, was the largest steam electric station in the world. Generating units ranging in capacity from 20,000 to 35,000 kilowatts are common sizes in the larger stations. Units of 40,000 and 50,000 kilowatts have been in operation for some time, and only a few weeks ago the installation of a 60,000—K. W. generating unit was completed and its operation begun. As an illustrative example of the modern tendencies in steam-electric central station practice, the 600,000—K. W. Crawford Avenue Station of the aforesaid company may be cited. The first three units of the original installation are of the compound type. The largest—the 60,000—K. W. unit just mentioned — takes steam at 550 pounds pressure and 725° F. temperature.

Steam-electric Station Efficiencies

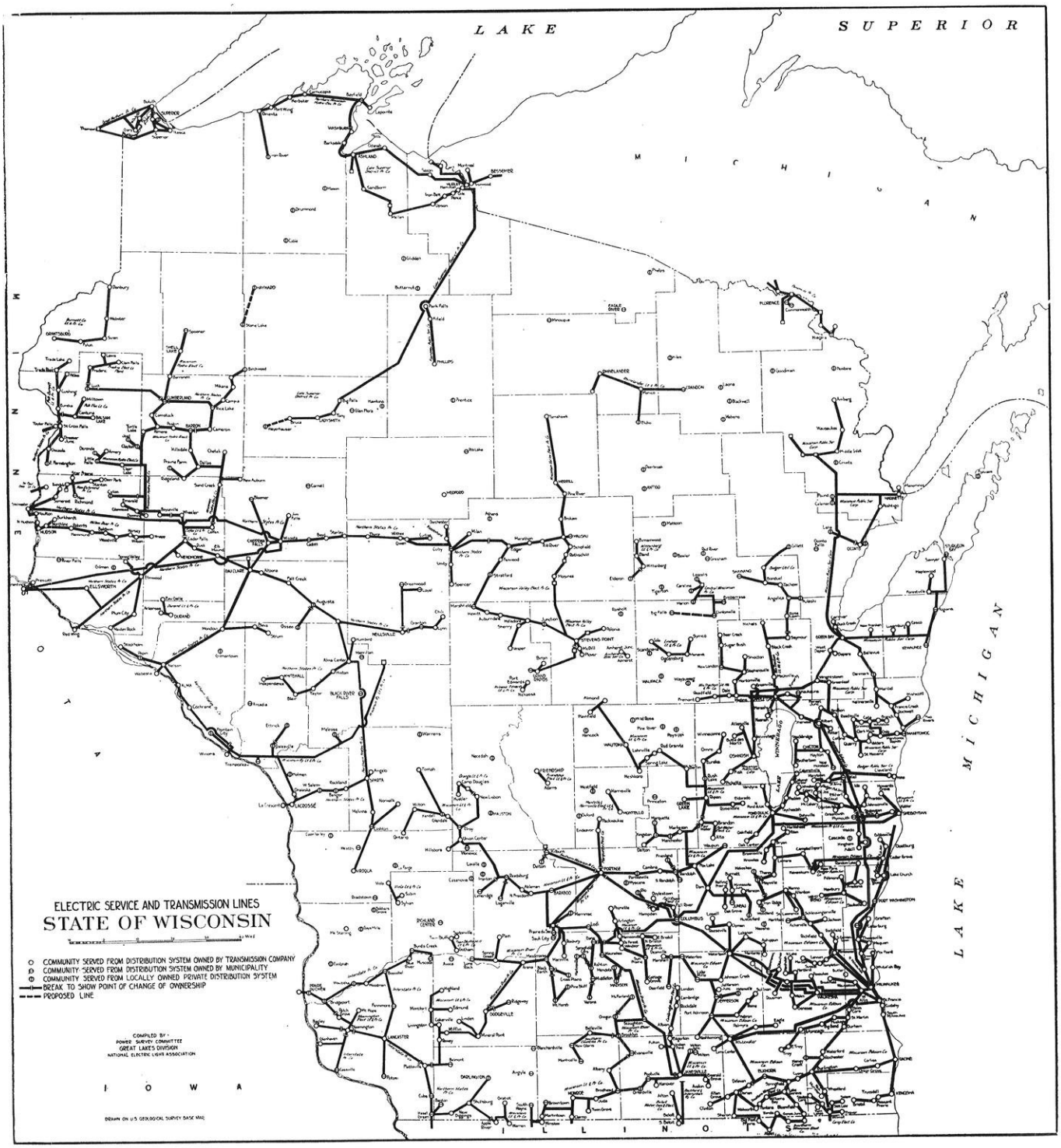
Some of the early steam-electric stations undoubtedly required twelve or more pounds of coal to produce a kilowatt-hour of electrical energy. Such a coal consumption would represent an overall efficiency from coal pile to bus bars of a little over 2 per cent. The gain in efficiency and the consequent saving of coal, have gone on steadily until the larger and better designed stations built since the World War show an average consumption of less than 2 pounds of coal per kilowatt-In the five years from 1919 to 1923, inclusive, the average coal consumption for all central stations in the United States decreased from 3.2 to 2.4 pounds per kilowatt-hour. There are several stations now in operation whose average monthly thermal efficiencies are 18 per cent or better. Pulverized fuel plants are giving better efficiencies. Lakeside Station of The Milwaukee Electric Railway and Light Company was the first station built for pulverized fuel operation throughout. A little more than a year ago the Cahokia Station of the Union Electric Light and Power Company of St. Louis went into operation. Its highest monthly thermal efficiency, as reported several months ago, was 20 per-cent. At that time this represented the best pulverized fuel plant efficiency ever obtained. But in recent months Lakeside Station's overall efficiency has reached 16,000 B. T. U. per kilowatt-hour, or a thermal efficiency of 21 per cent. The initial installation of the Crawford Avenue Station previously mentioned, burning raw coal and using the reheating-regenerating steam cycle, is expected by its designers to give, under the usual conditions of operation, a station efficiency of 23 per cent, or 15,000 B. T. U. per kilowatt-hour, which, with high grade coal, would represent about 1.1 pounds per kilowatt-hour.

The coal saving effected by improved economics in central station practice accrues not alone to the industry but to mankind in general. Since the world's resources of coal are limited and exhaustible, a pound of coal saved today means a pound more for future generations. Considering as an example the giant power station in the immediate future of 500,000 kilowatts operating at a yearly capacity factor of 75 per cent (which will not be exceptional for the load such a station will carry), an increase in station efficiency from present good practice of 18 per cent to 23 per cent will mean an annual conservation of 500,000 tons of fair grade coal — enough coal to fill the famous Yale Bowl five times. That such a fuel saving is no mere fantasy soon will be demonstrated by several stations now under construction, and in the not very distant future we may look for still greater savings since fuel economies are not yet approaching any limit.

There are now going on two lines of development in steam practice, though commercially still in the experimental stage, which give promise of a considerable increase in station efficiency. One is the increase in steam pressures and temperatures, and the other is the use of mercury vapor instead of steam. Steam pressures have shown a steady upward trend. Starting at 150 pounds with the advent of the turbine at the beginning of the century, there followed pressures of 175, 200, 250, and 275 pounds up to the opening of the World War. Afterward there came pressures of 300, 400, and 550 pounds and 725° F. temperature in the recently designed stations. With present materials the temperature of 725° F. represents about the limit for continuous operation, since at higher temperatures the elastic limit and ultimate strength of these materials fall off. In the Weymouth plant of the Edison Electric Illuminating Company of Boston an initial installation of a 1,200 pound boiler and turbine has been made. One or two other companies are reported to have ordered similar equipment. Developmental work on the mercury turbine has been carried on by engineers of the General Electric Company, and during 1923 a commercial installation of a 1,800—K. W. unit was made at Hartford, Connecticut, and is now in successful operation.

Hydro-electric Development

Supplementing the production of electrical energy in steam-electric stations, the hydro-electric plants of the United States, containing one-third of the central station generator capacity, produce about 35 per cent of the total kilowatt-hour output. The hydro-electric company reporting the largest output for 1923 was the Niagara Falls Power Company with an output exceeding 2.5 billion kilowatt-hours. This output was followed very closely by that of the Commonwealth Edison Company, which had the largest output of any steam-electric company. The output of either of these companies represents almost 5 per cent of the total central station output of the country, or twice the output for the entire state of Wisconsin. In 1923 the public utility plants



of eight states produced more than 91 per cent of their electrical energy by water power. In California it was 81 per cent. In order to gain some idea of the possibility of water power development in this country, it is interesting to note that the United States Geological Survey has estimated the total water power resources (developed and undeveloped) as 35,000,000 H. P. available 90 per cent of the time at an overall efficiency of 70 per cent (which is low for many present and future developments, one plant at Niagara Falls having an overall efficiency of 92 per cent), or 55,000,000 H. P. available 50 per cent of the time. Of this amount there is now developed over 9,000,000 H. P. in water wheel capacity. Public utility plants contain 81 per cent of that. Since the passage of the Federal Water Power Act in 1920 creating a definite federal policy concerning water powers on public lands and navigable streams, and the Federal Power Commission to administer the provisions of the act, projects totaling about 2,500,000 H. P. have been built, or are building, under licenses granted by the commission. Permits and licenses have been issued for 5,000,000 H. P. more.

As in the case of developments in steam-electric practice, hydro-electric practice has witnessed a steadily

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EDITORIALS

S. G. SARGIS

GET ACQUAINTED A good many men on our engineering faculty are nationally known men. They have contributed something permanent to the world. They have experienced and seen life in its fullness. To be able to associate with them and to get their views on the various problems which confront us is a rare treat. Yet how many of us go through our four year course without really getting to know these men. Students have been heard to brag about their not having visited their advisers except for the purpose of registration. Those students are to be considered unfortunate, for they have neglected an important phase of their education. Although the time of these men is considerably taken up, yet they never refuse to chat with you. A student too often looks upon his work as drudgery because he fails to grasp the inner significance of it. A little heart to heart talk with these men will act as a booster. Their intimate knowledge of the great things being done and their application to the conditions of life is at the student's disposal, and will help him to see the beauty in his work. The personalities of these men must necessarily be hidden to some extent in classroom discourse, but a personal chat reveals how broad-minded, how big-hearted, and how wonderful some of them are, and one leaves their presence with the determination to do better and with the feeling that after all he has chosen the best course in the world.

Ingratitude is monstrous; and for the multitude to be ungrateful, were to make a monster of the multitude.
—Shakespeare.

REFLECTION We have heard a great many reasons why the engineering course should be extended over a period of five years. We attempt to submit another. The work to be covered in the allotted four years has increased to such an extent that the *average* student merely crams the contents into his head without having time to question them or reflect upon nature of the meaning. He accepts them because the book says so and the instructor tells him so. An important function of all students should be reflection. He should have time to interpret all that comes to him. What does it mean? Of what use is it? In many courses he does not have time to ponder, weigh, analyze, compare, review or summarize the subject but is rushed superficially over it. In many cases he is left bewildered and uncertain as to his ideas. The ideas simply pass through him, failing to take root or to change his conception of the subject. In other words, they fail to change his meaning of things. In many instances he might just as well have not taken the course. To remedy this condition he should be given time to reflect and interpret the meaning of ideas he receives. In this way only can he receive the full benefit of instruction.

The darkest hour in the history of any young man comes when he sits down to study how to get money without honestly earning it. *—Horace Greeley.*

All our actions take their hue from the complexion of the heart, as landscapes their variety from light.
—Bacon.

THE ENGINEER'S RESPONSIBILITY In his recent presidential address to the Glasgow University Engineering Society, Mr. John Craig, the chairman of David Colville, Limited, dealt with the attitude of the engineer towards the general problems of to-day. If the standard of living were to be raised, engineers, he said, would need to harness more and more the resources of nature. The function of the engineer was to increase the productivity of man, enabling him to obtain a greater return for his labor and thereby decrease the cost of necessaries and comforts of life. He did feel that in the past the country had suffered because of a too strict demarcation in the engineering profession. So far, the engineer had been an engineer only and had not ventured to work out his plans in their relationship to the country as a whole. The danger which engineering faces is conventionality; a too strict adherence to the great principles laid down by a former generation; a lack of the spirit of adventure and of a greater play of personality in facing problems. It is very necessary that engineers should find time to study man. Inventive genius might produce very valuable machines; but their ultimate successful application to the problems of industry would always depend in an astonishing degree upon the human element. The art of management and the study of salesmanship are very necessary factors in the education of an engineer. He is not confident that the engineering products of this country have been placed upon the markets of the world as cleverly as they deserve.

Experience keeps a dear school; but fools will learn in no other, and scarce in that; for it is true, we may give advice, but we cannot give conduct. *—Franklin.*

EXTENSION NOTES

The firemen and engineers of the public buildings in Fond du Lac took a one-day course in Household Heating under Professor Ben G. Elliott of the University Extension Division early in January.

Four hundred and ten people in Appleton attended the two-day Household Heating Institute conducted by Professor W. E. Wines of the University Extension Division early in January.

A group of fifty foremen from the mills of Appleton are finishing a course in Advanced Foremenship. Mr. J. J. Davis, Efficiency Engineer of the Paine Lumber Company, has been the instructor.

On December 29th and 30th the Extension Division held a two-day school for the engineers and firemen of the Superior Public Schools. Morning and afternoon sessions were held on each of these two days at the offices of the Board of Education. Letters have recently been received from Mr. N. A. Valvy, Superintendent of Buildings, and also from Secretary Nichols of the School Board expressing satisfaction for the work done.

Mr. B. W. Meyer, Box 743, La Crosse, is in charge of the Extension activity for the University in the La Crosse District. For the past three years this territory has not been covered by the Extension Division. Mr. Meyer is enrolling many students for University credit and for Business courses. A number of people in La Crosse are enrolled for Engineering courses.

"Very favorable reports are coming to my attention regarding our Engineering courses," said Mr. Meyer. "After a few months I expect to have at least 100 students in the various branches of Engineering."

MILWAUKEE DISTRICT

Edward E. Olsen, a former student of the University Extension Division in Milwaukee and a graduate from the Mechanical Engineering course in 1924, is employed by the Newport Company.

Daniel W. Mead, professor of hydraulic and sanitary engineering, delivered the third of a series of ten lectures at the Extension Division in Milwaukee on Friday, December 19. The subject "Development of Water Power" was well treated and illustrated with numerous lantern slides.

A student writing from Cairo, Egypt, finds time to enroll for a course in mathematics, thus helping him to reach the goal of completing a College education.

NOTES FROM STUDENT LETTERS

A Wisconsin graduate working in the electrical engineering department of probably the greatest electrical concern in this country finds an opportunity to carry advanced mathematical work of which he finds himself in need.

A survey of part of the Norris Farm for Boys, Mukwanago, was made by students taking Topographical Engineering at the Extension Division during the Christmas vacation. This work was directed by H. W. Wesle, instructor in the department.

A Wisconsin man on a government vessel going around the world has completed a course in mathematics enroute. He will take his examination at the United States Consulate in Paris, France and will return for the 1925 fall session of the University.

The Tokio disaster seriously interrupted the work of a student by destroying all his possessions. He requested their duplication in a thrilling letter describing the disaster and his experiences.

A university student living in Manila on account of parent's official position is enabled to continue uninterrupted University study leading to a degree.

THE COMPLEX

A coast and geodetic survey engineer was making observations in Texas for compass declination. He was at his instruments, and taking copious notes, when a rangy Texan walked up, examined the outfit, and inquired:

"Whattyer doing, young felly?"

The engineer, new and enthusiastic in the coast and geodetic survey service, replied in detail:

"I am determining the latitude, longitude and declination of the compass and establishing a permanent survey monument for the benefit of local surveyors. The compass pointing goes through a small change in a period of years and I am determining the exact pointing at this date. I am observing on the sun, and by astronomy I am able to establish a true North and South line. Then I determine the magnetic pointing of the compass, and the angle between the two gives me what I'm looking for—the declination of the compass."

But the native wasn't convinced. He spat at the instruments, gave his big hat a vicious tug, and announced:

"Ye can't fool me, young felly; ye're looking fer oil."

—*Life.*

ALUMNI NOTES

R. T. HOMEWOOD

CHEMICALS

Kenneth R. Burke, ch'16, announces the arrival of Penn Elizabeth Burke. Mr. Burke is assistant general superintendent of the American Tar Products Company, Chicago.

CIVILS

Cuthbert P. Conrad, c '15, who has been connected with Mead & Seastone here, will leave Madison about March 1 for Rio de Janerio, Brazil, where he will be connected with the Brazilian Hydro Electric Company. This company, a Canadian concern, has for the past twenty-five years held concessions from the Brazilian government for the supply of light and power to Rio de Janerio and San Paulo. The demands for power have grown rapidly in San Paulo, a city of 700,000 which has equaled in rapidity the growth of Chicago. The company is pushing an energetic construction program to keep pace with the needs.

A. E. Cummings, c '21, is with the Raymond Concrete Pile Co., 1912 W. Monroe St., Chicago. His home is 452 Fullerton Pky., Chicago.

D. P. Dale, c '11, has changed his address from 1513 E. Hennepin Ave. to 1717 Rollins S. E., Minneapolis, Minn.

Phil. M. Ferguson, C. E. '24, gives his address as 87 Post Ave., Apt. 44, New York City, N. Y. He is with Dwight P. Robinson & Co.

A. W. Howson, c '16, is assistant engineer at the Chicago terminal of the Illinois Central R. R. His address is 6743 Dorchester Ave., Chicago.

H. F. Janda, c '16, associate professor of highway engineering at the University of North Carolina, has been appointed assistant director of the Advisory Board on Highway Research of the National Research Council at Washington. He has been granted a year's leave of absence from his university duties.

Frank Karger, c '20, is Senior engineer with T. M. E. R. & L. Co., Milwaukee, Wis. His home address is 1316 Cedar St.

MAJOR KENNEDY

Major Frank M. Kennedy, c '08, has changed his address from Chief of Air Service, Washington, D. C., to Lighter-than Air Section McCook Field, Dayton, Ohio.

Olaf Laurgaard, c '03, C. E. '14, city engineer of Portland, Oregon, visited the college shortly after the Christmas holidays.

Earl K. Loverud, c '23, is an engineering contractor at Stoughton.

F. C. McIntosh, c '13, announces the birth of a daughter, Sarah Jane, on Nov. 7, 1924. Mr. McIntosh is at present employed as District Manager for the Johnson Service Company of Pittsburg, Pa. He gives his address as 23 West Corydon St., Bradford, Pa.

William S. McLeod, c '24, gives his address as 75 West Second Street, St. Charles, Ill.

J. E. Mackie, c '23, who is in the office of the city engineer of Long Beach, California, has sent in two collections of papers, one being the records of Polygon and the other being papers about the St. Patrick's Day parade of 1923 of which he was chairman. These records have been filed with our librarian for the use of future chairmen. Mackie writes, "I find that the University of Wisconsin, and especially the College of Engineering, is rated very highly out here in the West and am indeed proud to have had the privilege of receiving my undergraduate training at an institution so greatly respected in the engineering profession."

Kenneth N. Mills, ex. c '23, is with the department of Public Works, St. Petersburg, Fla. He writes, "I am once more back in the sunny south after having spent a year in Pittsburg as assistant engineer N. of W. Dept. Pittsburgh Ry. Co. Here in St. Petersburg I am again connected with the Department of Public Works as Chief of Party. I wish to announce the birth of Mary Martha Mills on September 7, 1924."

ELECTRICALS

C. O. Bickelhaupt, e '11, EE '14, on January 1 became vice-president of both the Southern Bell Telephone and Telegraph company, and the Cumberland Telephone and Telegraph company of Atlanta, Ga.

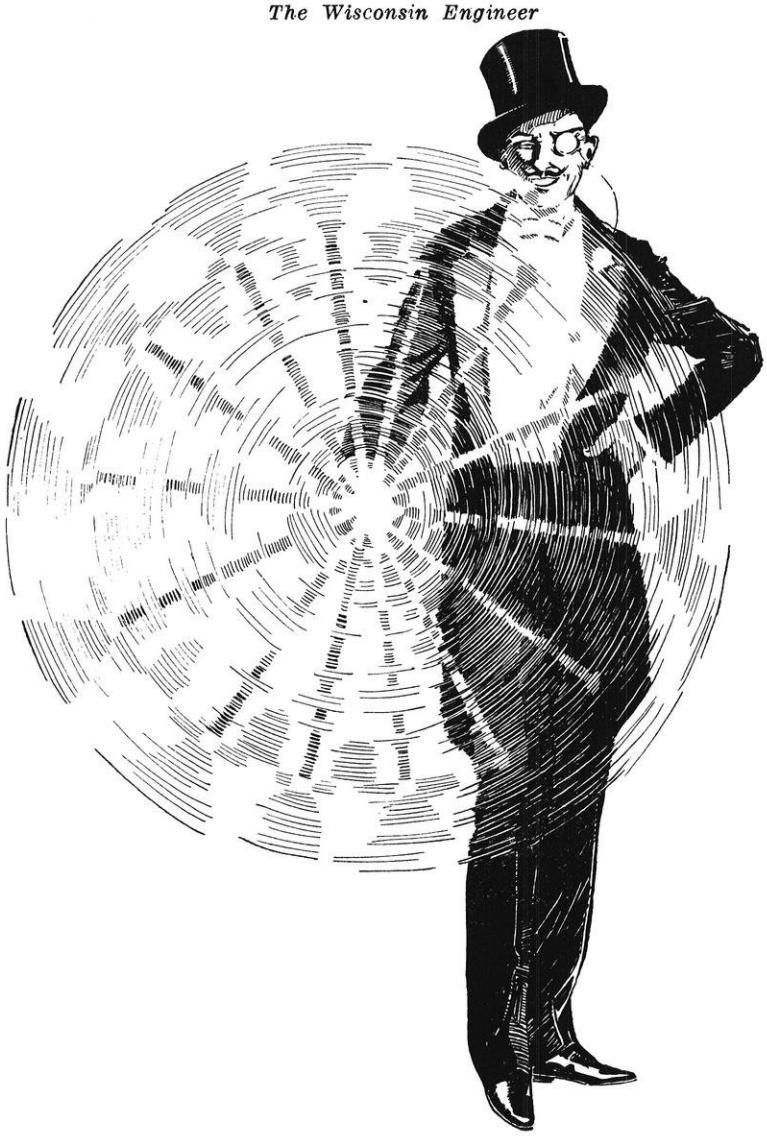
R. W. Brewer, e '21, is now with the Pennsylvania Power and Light Company as Power Engineer. His address is 860 Park Ave., Williamsport, Pa.

Donald Dewire, e '22, is with the Western Electric Company, La Grange, Ill. He was married on September 16 to Ethel Lemmer, '21.

E. A. Guillemin, e '22, was moved with "the spasmodic desire to write a long letter to the gang of embryo fellow sufferers back at the old Alma Mater" — something we wish more of the alumni would become moved by. He writes — "I find myself at the present writing not only in Germany but in Bavaria also — not only in Bavaria, but in that old historical metropolis Munich, whose fame for good beer even outshines that of Milwaukee and St. Louis in the pre-Volstead days..... Contrary to the opinions of most of my friends and undoubtedly also yours — if you have had the patience to read thus far — my principle subject in the land of the 'poet and thinker' is to try and absorb some of that intangible substance which these people call 'Wissenschaft'." Guillemin can be reached at the following address: Institut für Theoretische Psysik, an der Universität München, Germany.

R. J. Heins, e '22, is with the Menominee and Marinette Light and Traction Company. His address is 617 Stephenson Ave,. Menominee, Michigan.

A portrait of **Lieut. Paton MacGilvary**, e '16, has been on exhibit in the State Historical Library. The portrait was painted by MacGilvary's uncle, Norwood MacGilvary, who is professor of art in Carnegie Institute of Technology. It represents MacGilvary as just returning from an air raid on the Italian front; behind him is his Caproni, and



What Is Timken Dual Duty?

YOU know how it is; trying to make your finger keep up with a twirling cane. The cane may twirl all right, but it keeps trying to run out ahead of your finger—and off.

That is, the cane has at least two motions. It spins *around*, and also moves *along* your finger.

This same tendency toward motion in more than one direction exists in connection with nearly everything that revolves. The hubs of your automobile, for example, not only have the familiar spinning force applied, but there is also the sidewise push of turning corners or running on a crowned road. The transmission gears, too, not only turn 'round and 'round, but the mountings are pushed upon from the end by the same pressure felt in the clutch pedal.

In automobiles, and in most other machinery, the 'round and 'round whirling forces with which you are familiar, nearly always are combined with the endwise pushing forces known to engineers as *Thrust*.

The presence of Thrust is another factor contributing to the dominance of Timken Tapered Roller bearings. Timken bearings are able to care for *both* of the forces at work in almost every bearing mounting. Timken bearings are more capable in carrying the whirling motion (radial loads) and *in addition* Timken bearings carry all the thrust loads at the same time!

That's Timken Dual Duty, made possible only by the Timken Taper principle. When Timkens are engineered into automobiles, farm machinery and industrial appliances, it is accepted that the bearings are equal to the whole job of caring for *both* radial and thrust loads without compromise or complication.

THE TIMKEN ROLLER BEARING CO., Canton, Ohio

TIMKEN *Tapered Roller* BEARINGS

Kindly mention The Wisconsin Engineer when you write.

in the distance are seen the foothills of the Italian Alps. In the foreground is a group of aviators ready to get his account of the flight. The picture is done for the most part in dull blues and greens with here and there a bit of red to liven it.

Paton MacGilvary is one of the university's gold star heroes, and the son of Professor MacGilvary of the Philosphy department. In 1917 he went to Italy with the American Aviation Unit, and became adjutant of the combat division at Loggia. The Italian Government awarded him three medals and many citations for his coolness and daring.

Ira Reynolds, e '06, is with the Illinois Power and Light Corporation, 231 S. La Salle St., Chicago.

Nicholas J. Schmitz, e '16, was married on November 29 to Miss Ida Klosheim, La Crosse, Wis. They will live at 406 N. Henry Street, Madison.

R. F. Schuchardt, e '97, has been nominated for president of the American Institute of Electrical Engineers. He is now Chief electrical with Commonwealth Edison Co.

MECHANICALS

Fred W. Bentley, m '98, was recently appointed to the faculty of the engineering school, Marquette University, Milwaukee. He will be in charge of the drawing department. He has held a similar position in the University of North Dakota for the past four years.

Ellis R. Brandt, m '17, is mechanical engineer with Fairbanks Morse Co., Beloit, Wis. His home address is 1033 Prairie Ave., Beloit.

John N. Bruce, m '24, has been with the Racine Horseshoe Tire Co., Racine, since October 24, 1924. The concern employes about 300 people, and manufactures automobile tires and tubes. Bruce is in the engineering department. His address is 709 Villa Street, Racine, Wis.

Edmund Haugen, m '24, has been awarded a Carnegie Medal, and has had $500.00 set aside for disposition as he directs. Haugen, together with several other students, made a brave attempt to save the lives of Esther Wepking and Arthur Harwood on April 24, 1921. Haugen and the other students lashed their canoes together and set out from the point to aid Miss Wepking and Harwood whose canoe had been overturned by the high waves. The rescue party succeeded in getting the two out of the water, but the high wind prevented their returning to the point and they were driven to the opposite shore where the waves were so high as to swamp the entire raft of lashed canoes. All of the occupants were thrown into the water, but all reached shore safely except Miss Wepking. Vain attempts were made to save her, but the second plunge into the water proved too much for her, and she was drowned.

Dean Goodnight has been notified that each member of the rescue party has been awarded a medal and has had $500.00 set aside for such a purpose as he or she recommends.

E. E. Henry, m '22, gives his address as 808 D Street, N. W., Ardmore, Oklahoma.

Clifford Ives, m '19, was married on October 25 to Faye Albin, Chicago. They live at 4417 Hazel Ave., Chicago.

Roger Kahlenberg, m '23, gives his address as 2408 Jefferson Street, Two Rivers, Wisconsin.

H. A. Kleinhaumer, m '24, gives his address as 606 E. Main St., Platteville, Wisconsin.

Norman Koch, m '23, has connected with the power department of the Wisconsin Public Service Corporation.

J. B. Leonard, m '24, is with the American Blower Company, Detroit. He has transferred from the Sales to the engineering department. His address is 71 Medbury Ave., Detroit, Michigan.

Merrill D. Love, m '22, has changed his address to Box 731, Arcade Station, Los Angeles, Calif.

A. R. McArthur, m '00, is engineer with American Sheet and Tin Plate Co., Gary, Ind. His address is 674 Harrison, Gary.

"Spike" Madell, m '24, is cadet engineer with Wisconsin Public Service Corp. His home address is 1030 Algoma St., Oshkosh, Wis.

W. W. Mariotte, m '24, is employed by the Bucyrus people at their Cudahy plant. He gives his address as 321 Marquette Ave., South Milwaukee, Wis.

R. E. Maurer, m '14, is Sales engineer with offices at 1704 Fisher Bldg., Chicago. His address is 41 W. 14th Place, Chicago Heights.

Thomas C. Nichols, m '24, has located with the Railway Fuel Company, Parish, Ala., near Birmingham. He writes — "I was greatly surprised at the conditions of business here. There are wonderful opportunities for young fellows just out of college in both engineering and other lines of work. ..... This company has the most modern and best equipped coal mines in the south, and they have given me a wonderful opportunity for both engineering experience and advancement in future."

Due to the similarity in names, we published an obituary notice of Bruno V. Nordberg, m '07, in our January issue. It was Mr. Bruno V. Nordberg, Sr. who passed away on October 30, 1924.

Mr. Bruno V. E. Nordberg, Jr., and Mr. Rudolf Wintzer will continue in the conduct of the engineering department of the Nordberg Manufacturing Company.

W. R. Palechek, m '23, is sales engineer, 316 3rd Ave. N., Minneapolis, Minn.

Oscar Pfeffer, m '22, is erection engineer with Allis-Chalmers Mfg. Co., Milwaukee, Wis. He gives his address as 565—40th St., Milwaukee, Wis.

Harry A. Phillips, m '22, is Sales engineer, 1113 Cornelia Ave., Chicago. His home address is 1100 Grove St., Evanston, Ill.

R. E. Porter, m '17, gives his address as 137 Ridge Ave., Dayton, Ohio.

Walter Porth, m '23, has had some very interesting experiences in the past two years. On his trip around the world he had reached Hong Kong, China, before Christmas. He says that conditions in China are very bad; the political situation has upset commercial life, and has consequently put engineering at a standstill. He has greatly enjoyed his trip so far, and he plans to be thru Suez by February.

Milton A. Powers, m '22, has left the employ of the Underwriters' Laboratories, and is with the Sonocy Oil Burner Corp., New York City. The company is developing and marketing domestic oil heating systems, and Powers will be actively engaged in the development of their equipment.

R. H. Raube, m '23, who has just been transferred from Schenectady and Lynn Tests to the Industrial Department, Chicago, is taking up work in General Electrical Company's Chicago office.

Henry Saubert, m '06, is general manager of the Consumer's Light and Power Company, 910 C St., N. W., Ardmore, Oklahoma.

E. F. Week, m '12, has moved from 195 Haas Ave., San Leandro, Cal., to 4719 Ygnacio Ave., Oakland, Cal.

W. M. Whelan, m '24, gives his address as 552 Public Ave., Beloit, Wisconsin.

ENGINEERING REVIEW

J. P. SMITH

THE RECONSTRUCTION OF JAPAN

Permanent reconstruction in Japan will not begin for three years, according to the Far Eastern Division of the Department of Commerce, if the public declarations of the government can be taken as a criterion. There must be plans for the physical reformation of streets and the adjustment of land holdings. Japanese bankers and experienced industrial leaders appreciate the fallacy of the statements of early adjustments, and they go so far as to predict that it will be a decade or longer before this gigantic reconstruction program becomes a reality. The temporary buildings will not give way to permanent construction until necessity requires and in any case they are protected by lay for a period of five years. At the end of that period it will depend upon the prosperity of the individual as to whether he will or will not reconstruct his building. In the meantime, whether the city and national governments will carry out their announced program of reconstruction and expansion of public utilities prior to the expiration of the five year period, remains an open question. The present temporary structures have been built on approximately the old locations, and the carrying out of the ambitious street reconstruction program will involve the destruction or removal of a large number of them. It is obvious, therefore, that the protection of these buildings for a period of five years will automatically postpone the street improvement plan until the expiration of that period.

The long continued depression in the industries of the country has necessitated extensive borrowing by industrialists. At present industrial undertakings are floating short term debentures of 2, 3, and 4 years at an average interest rate of 8½ per cent. These funds are generally used for the settlement of past obligations and it seems unlikely that they will be able to cancel these obligations during the next few years. Therefore, many companies will again be in the market at the end of three or four years to take up the loans now being made. These companies will hardly be in a position to undertake extensive new reconstruction.

CURRENT STANDARDS IN HIGH CLASS PASSENGER TRAINS

All of the better railways are improving their train service wherever possible. Competition forces them to provide the best service that is practical. This high class service is best shown by the fast inter-city trains such as the Chicago, Minneapolis, and St. Paul train on the Chicago and Northwestern Railway. Some of the details of this train, as stated in the Railway Review, are:

Schedule — Daily between Chicago and the twin cities.

6:30 p. m., leave	Chicago	arrive 8:59 a. m.
9:00 p. m., leave	Milwaukee	arrive 6:20 a. m.
7:05 a. m., arrive	Saint Paul	leave 9:00 p. m.
7:40 a. m., arrive	Minneapolis	leave 8:20 p. m.

The route is the shortest line between St. Paul, Minneapolis, and Chicago.

Car Equipment — The equipment consists of the latest type of all-steel cars as follows: Baggage car; free reclining chair car; two 12-section drawing room sleeping cars; lounge car with two spacious club rooms and buffet service; dining car; two 10-section, 2-compartment, 1-drawing room, sleeping cars, which are attached to the train in Milwaukee; 10-section observation sleeping car.

Special Features — The equipment is of the latest construction, with Pullman equipment including such new features as permanent headboards, upper berth shelf, new safety ladder, and new type door ventilator. Screened, adjustable, ventilator in the outside window sashes is a feature that enables the occupant of the berth to control the temperature at night according to his liking. A service card in each sleeping car tells the name of the Pullman conductor and the porter in each car.

Passenger Locomotive — 4-6-2, superheater; cylinders, diameter 26 inches, stroke 28 inches, driving wheel diameter, 75 inches, maximum traditive power, 45,000 lbs., factor of adhesion, 3.9. Weight in working order: Leading, 58,000 lbs.; driving, 175,000 lbs.; trailing, 58,500 lbs.; engine, 292,000 lbs.; tender 194,800 lbs.

Heating — Vapor system. Provision is made in each compartment for individual control of the vapor heat and electric fans to suit the comfort of the occupants.

Lighting — Electric lighting system.

The Chicago & Northwestern sets here an example of travel comfort of 1924. All employees are specially trained to render attentive and efficient service.

Railway Review.

ATHLETICS

G. H. Abendroth

IN RETROSPECT

When Shakespeare said "Tomorrow and tomorrow and tomorrow" in Macbeth, he knew what he was talking about. For it seems that all we have to gloat over in the athletic line is yesterday and tomorrow. We had a football team in 1912 and we played a good game against Chicago, but that is where our glory ends on the gridiron.

Doc Meanwell has produced teams of championship calibre practically every year he has been here, but this year we are none too confident of being listed among the elite in conference basketball. Four black eyes in succession in basketball is nothing to crow over and will have to be content with talking about what Little will do next year.

When our basketball season started with a defeat by Minnesota we blamed it to the fact that Meanwell's teams always lose one or two games before they get started. After Minnesota gave us a lacing, Ohio came to Madison and trimmed us to the tune of 29 to 21. Cunningham and Miner demonstrated their ability and their right to place on the all-conference five by breaking through our defense again and again. When Michigan trimmed Ohio it seemed logical that Michigan should take us into camp. The Maize and Blue team did come out ahead, but they were only two points to the good when the final whistle blew.

After losing by only two points to a team which had beaten the favorites in the conference race, our prospects for a place on the upper rung took a brighter turn. Minnesota took whatever little chance we had away from us by coming to Madison and demonstrating that their first victory was not a fluke. In beating Wisconsin on the home floor Minnesota broke several records. Never before had a Wisconsin team coached by Meanwell suffered more than one defeat in a season on the home floor. The Gophers certainly have one or two things to be proud of in their basketball teams.

Although we have lost all of our prospects for a winning team, things do not look very much brighter for the remainder of the season. Meanwell certainly ran into a lot of hard luck. Spooner ineligible, Wackman graduating at the end of the first semester after being declared the mainstay of the team, and finally Martell with the prospects of not playing another game — it seems that the team is under an unlucky star. Meanwell can certainly have the distinction of being the prize hard luck man of the conference.

LITTLE

With George Little at the head of Wisconsin athletics, Wisconsin should be able to produce a top-notch football team next year. Little comes to Wisconsin with a real record behind him and a real job ahead of him. Wisconsin students and alumni want to see Badger teams out in front and Little will have a job cut out for him to put them there.

Little, as the football coach at Michigan, produced some good teams for Yost. If he can repeat his success at Wisconsin, we will see the Cardinal with its 1924 season of wins and losses reversed in 1925. Little seems to be the man for the job. Let us hope he lives up to expectations.

SWIMMING

With basketball and football classed as losing propositions at Wisconsin, Joe Steinauer should startle the conference by producing a winning tank squad. Thus far Joe's proteges have had two meets, one with Iowa and the other with the Milwaukee Athletic Club. The meet with Iowa was chalked up as an overwhelming victory for the Badger mermen, while the M. A. C. battle ended in a tie, 34 to 34.

The swimming team is provided with a few engineers, which is probably one of the reasons for its success. Walter Flueck, a senior civil, is helping Herschberger accumulate the points in the dashes. Flueck has been on the team for several years, and although not quite as fast as our speed demon Herschberger, he can always be counted on for seconds and thirds. Joe has quite a few engineer possibilities in the breast stroke, — Joe Bell, who took first place in the Iowa meet, Bardeen, and E. Abendroth. From these candidates for the squad he should be able to produce a consistent winner.

Wisconsin can this year boast of a plunger who can make the end of the tank without any trouble. Cook, a mechanical engineer, makes the 60 yards in 40 seconds regularly, and should make a few points for Wisconsin in a department in which we have always been weak.

The water basketball team has been more successful than Meanwell's team. Both the Iowa and the M. A. C. teams were easily disposed of, and if the team keeps playing the same kind of ball, Joe Feuchtwanger should keep his men on top of the heap. Schwarze, our football giant, is a candidate for the water basketball team, and should prove very efficient at keeping his opponent under water.

CAMPUS NOTES

J. LEVIN

ENGINEER-BARRISTER BALL

The lawyers and the engineers, traditional and diametrically opposite foes of the upper campus, are really going to bury the hatchet and give a combination plumber-shyster dance in the Lathrop Gymnasium on February 27.

The initiation of a new epoch in campus history will be heralded with much satisfaction by students and faculty members alike. No longer will the passerby be shocked and startled by the epithets that have floated back and forth across the campus so frequently. Snow ball battles are a thing of the obscure past. The windows of the shyster training quarters will remain intact forever and anon.

Wenzel Fabera, Hubert G. Holmes, and Norman Rick of the College of Engineering, together with Clark Hazelwood, George Ruediger, and Dwight Stevens of the Law School have evolved the ideas and plans for the dance. Thompson's ten piece orchestra has been secured to furnish the music which is to feature the affair. The price of the tickets has been placed at $1.25. The proceeds from the dance will be donated to the bar association and to the engineers' student loan fund.

The deans of the respective colleges will act as chaperones for the evening. Many special features have been planned and others are in the making. Don't forget the day, February 27, or your best girl, the one who sent you that teasing valentine.

ENGINEERING SOCIETIES HEAR PROFESSOR WILSON

On January 15, Professor Wilson, of the department of structures at the University of Illinois, addressed a joint meeting of all the engineering socities in the auditorium of the Engineering building.

Professor Wilson's lecture dealt primarily with the Delaware River Bridge project, but it also contained a general discussion of the different types of bridges and the needs to which they were adapted. In the course of his talk, Professor Wilson compared the Delaware River suspension bridge with large bridges of various other types throughout the world. The progressive steps in the construction of the Delaware River Bridge were well illustrated with slides.

Incidentally, the suspension bridge over the Delaware River is one of the largest spans of its kind in the world, and joins the centers of population of the Jersey side with those on the Pennsylvania side of the river.

He MIGHT PLAY WITH THE RATTLER

Ray Quinn (In Mechanics 2): "May I be excused from cement lab today, Prof. Withey? I don't believe I will be able to do anything."

Prof. Withey: "What'smatter?"

Ray Quinn: "I'm not feeling well. I'm trembling all over."

Prof. Withey: "'Zat so? Well, you go right over and lend a hand with that sieve analysis."

IT SOUNDED LIKE THAT TO THE STENOG

The Engineering Experiment Station recently received a request for "Bulletin No. 4, Vol. 8, High vs. Lowe and Tenny, by Bennett."

WHAT DO YOU MEAN—OUT?

"Here," said the instructor to the adviser, as he delivered the class cards, "here are some grades that I hope will help some poor students *Out*."

Joseph H. Kempster, general superintendent of the Buffington plant of the Universal Portland Cement company, gave an illustrated lecture in the auditorium of the Engineering building on January 15. Junior and senior civil engineers were excused from classes in professional subjects to attend this lecture.

DANNY'S STORY OF THE OX WHO LAID DOWN ON THE JOB

An unreasonable number of late arrivals at one of his eight o'clock classes, drew from Prof. D. W. Mead this story of the ox who laid down on the job:

A farmer had a team consisting of a mule and a lazy ox. One day the farmer started to drive to town. After going a mile the ox laid down. Patiently the farmer unharnessed the ox and returned him to his stall. Then he drove to town with the mule alone.

When the mule had returned to his stall after the long, hard trip, the ox looked over at him and asked, "What did the boss say about my lying down that way?"

"He didn't say anything," answered the mule.

"Not a word?"

"Not a word."

"H-m-m-m."

Some days later the farmer again started to town with his team, and again the ox laid down, this time after only one-half mile. And again the farmer, without a blow or a cross word, unharnessed the ox and re-

SHOP LIGHTING.

In an address delivered before the members of the Western Pennsylvania Division of the National Safety Council, Pittsburg, Pa., March, 1918, by C. W. Price, the importance of good lighting in industrial establishments was discussed, and the disadvantages of poor lighting were clearly shown by some figures mentioned by Mr. Price.

A large insurance company analyzed 91,000 accident reports, for the purpose of discovering the causes of these mishaps. It was found that 10% was directly traceable to inadequate lighting and in 13.8% the same cause was a contributory factor. The British Government in a report of the investigation of causes of accidents determined a close parallel to the findings of the insurance company above quoted. The British investigators found that by comparing the four winter months with the four summer months, there were 39.5% more men injured by stumbling and falling in winter than in summer.

Mr. John Calder, a pioneer in safety work, made an investigation of accident statistics covering 80,000 industrial plants. His analysis covered 700 accidental deaths, and of these 45% more occurred during the four winter months than during the four summer months.

Mr. C. L. Eschleman, in a paper published in the proceedings of the American Institute of Electrical Engineers several years ago, reported the result of an investigation of a large number of plants in which efficient lighting had been installed. He found that in such plants as steel mills, where the work is of a coarse nature, efficient lighting increased the total output 2%; in plants, such as textile mills and shoe factories, the output was increased 10%.

In an investigation of the causes of eye fatigue, made by the Industrial Commission of Wisconsin, it was found that in a large percentage of industries, such as shoe, clothing and textile factories, the lack of proper lighting (both natural and artificial) resulted in eye fatigue and loss of efficiency. At one knitting mill, where a girl was doing close work under improper lighting conditions, her efficiency dropped 50% every day during the hours from 2:30 to 5:30 P. M.

The above mentioned incidents indicate how important a factor lighting is in the operation of the industrial plant. It has been well said, "Light is a tool, which increases the efficiency of every tool in the plant." Glare or too much light is as harmful as not enough lighting, and in no case should the eyes of the workers be exposed to direct rays, either of sun or electric light.

Windows and reflectors should always be kept clean; that is, cleaning them at least once a week, for where dust and dirt are allowed to collect, efficiency of the light is decreased as much as 25%.

Good lighting, in addition to its other marked advantages, is a strong incentive towards keeping working places clean, for it clearly exposes any place where dirt or other material has been allowed to collect. White walls and clean windows glazed with Factrolite Glass will eliminate the sun glare and increase the illumination 25 to 50 feet from the window from 38% to 72% as compared with plain glass.

Lighting is of primary importance to every employer and fully warrants a careful investigation of the subject, for there is no substitute for good lighting, and if it is not supplied the efficiency of the entire working force must suffer a serious reduction.

If you are interested in the distribution of light through Factrolite, we will send you a copy of Laboratory Report—"Factrolited."

MISSISSIPPI WIRE GLASS CO.,

220 Fifth Avenue,

St. Louis. New York. Chicago.

turned him to his stall. Then he drove to town with the mule.

When the mule returned he was again questioned by the ox.

"What did the boss say today about me?"

"Nothing."

"Not a word?"

"Not a word."

"H-m-m-m."

"No, he didn't say anything," said the mule, "but I saw him leaning over the fence talking to the butcher."

Write your own moral.

YOU EGOTISTS!

When a man insists on boasting about his own importance, you might as a last resort remind him that scientific investigators have recently determined that the constituents of a man, outside of over 90% of water, include fat enough for seven bars of soap, iron enough for a medium sized nail, sugar enough to fill a shaker, lime enough to whitwash a small chicken coup, phosphorous enough for about 1500 match tips, magnesium enough for a single medium sized dose, potassium enough to fire a toy cannon once, sulphur enough to rid a dog of fleas. The whole collection is worth about 95c at present market prices.

Stephen Leacock, Prof. of mathematics at McGill University, proposes the following questionnaire to be used as an intelligence test for mechanical engineers.

1. How much pressure per square inch do you think a safe load to carry?

2. Suppose that a general buoyancy led you to expand what you considered prudent, and you felt you must deflate, what would you take in first.

3. Suppose that just as you were going to work, you got trouble in your flow of gas, causing backfiring in your tubes, would you attribute this to a defect in your feed?

4. Suppose you were going along at night at moderate speed and properly lighted up, and you saw a red light directly in front of you, would you stop or go right on?

5. If a spider wants to walk from the top corner of a room to the bottom corner farthest away, will he follow the angular diameter of the floor or will his path be an obese tabloid?

6. Alfiere must always be considered rather as the last of the cinquecentisti than the first of the moderns. How do you stand on that?

Xi chapter of Theta Tau, professional engineering fraternity, announces the initiation of Dean A. V. Miller as faculty member, Clarence G. Wollaeger '26, George F. Liddle '27, William H. Davidson '27, William B. Frackelton '27, Charles A. Lawton '27, Noel H. Miller '27, Grant O. Gale '27, Charles D. Highleyman '27, and Joseph W. Hanzel '26.

WHOOPS, MY DEAR!

"Concrete columns," states Ed Rundell in the final in the Dean's course in concrete, "are re-inforced with *whoops.*"

ITS ALL IN THE SPELLING

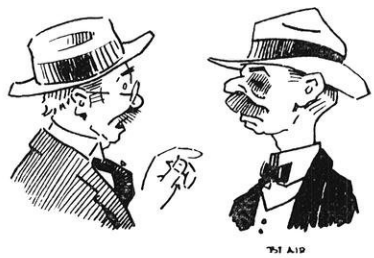
Round columns, according to some of the senior civils, should not be built with *plane* concrete.

COMPLETE AND COMPREHENSIVE DEFINITIONS

Oxygen — An eight sided figure.
Dispel — To spell incorrectly.
Blizzard — The inside of a chicken.
Buttress — A nanny goat.
Monomaniac — A man with only one wife.
Observatory — A place where flowers are kept.
Dogmatic — Pertaining to the culture of dogs.
Frontispiece — A headlight on a Ford.
Ruminating Animal — One that chews its cubs.

"Why, where did you get the black eye, Professor?"

"I attended the University Women's Annual Ball and was struck by the beauty of the place."



Prof.: "A fool can ask more questions than a wise man can answer."

Soph. (illuminated): "Ah, I see. No wonder I flunked that exam."

It has been noted by one of the more sparkling wits among the electricals, that the subject of screw fastenings in M. D. 5 is rather well taken up during the semester, since at the end of each period the entire class makes a bolt for the door.

Elsie: "Why are these lawyers like the moon?"
Jane: "Because they shine best at night and are down to their last quarter a good part of the time."

Math Instructor (explaining a difficult problem): "Now I think that's clear."
Voice from rear: "About as clear as mud."
Instructor: "Well, that covers the ground."

Hare: "What character do you have in the next act?"

Foot: "I'm not supposed to have any character. I am in the chorus."

Judge: "Having left your wife you are charged with being a deserter. Are these facts true?"

Victim: "No, Your honor, not a deserter, — just a refugee."

EVERY MAN TO HIS JOB

Note: An attempt by an engineering society to get its members to write an engineering short story or novel by offering substantial prizes has met with disappointing results.

The engineers, they have no fears,
They wear thick leather panties.
They spend their time in tropic clime
And live in wooden shanties.
Meanwhile just look, on screen, in book
Is told their tale romantic
By scribblers gay so dumb that they
Drive engineers near frantic.
But why in hell cannot they tell
These tales like any other?
The fact remains, they lack the brains
Or find it too much bother.

HERE ARE THE FACTS

One third of all the men in the Cadet Corps are Engineers.

Engineers constitute twelve per cent of the Varsity Track squad.

Joe Steinauer's amphibian list boasts sixteen Engineers.

Engineers are represented on the Wrestling squads to the extent of thirty five per cent.

There is an old saying that there is a time and a place for everything. Particularly does this seem true in the case of the formerly despised cross word puzzle. The interest taken in this revived pastime by educators can be judged from the fact that the University of Kentucky has placed its stamp of approval on this national mania by introducing such a course in its College of Engineering. Dr. Robert K. Rott, Professor of English at Princeton, thinks that a course in cross word puzzles would prove of inestimable benefit to both teachers and students. Imagine a cross word puzzle made up entirely of engineering, chemical, or biological terms. There would be a revival of learning.

HIGHWAY BRIDGE CONSTRUCTION IN NORTH CAROLINA

(Concluded from page 82)

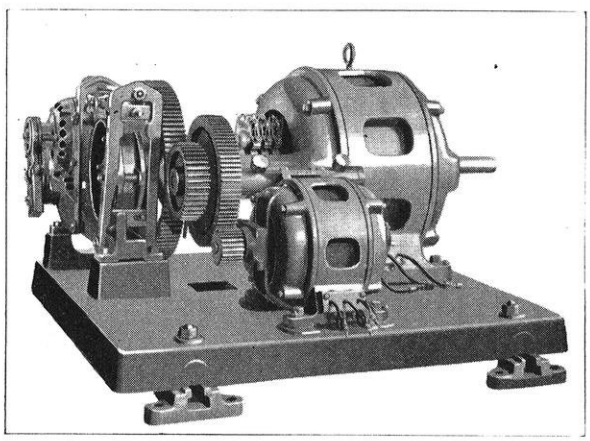
working under the district office, but during construction, frequent visits are made to the work by the bridge construction engineers of whom there are three working directly under the bridge engineer. These construction engineers direct and advise the resident engineer and tend to keep the quality of the work uniform thru out the state.

A total of over nine and one-half million dollars worth of structures has been completed or is under contract. Ninety-eight per cent of these are of reinforced concrete. The cost of making structure surveys and securing foundation data for these structures during 1923 was three-quarters of one per cent of the estimated cost of the structures, and the cost of preparing plans was five-eighths of one per cent of the estimated cost.

MECHANICAL EQUIPMENT OF A MODERN NEWSPAPER PLANT

(Continued from page 79)

perhaps fifty horsepower or more, and an automatic clutch which serves as a link between the small motor and the press when running at threading speed and which automatically severs this mechanical connection when it is desired to drive the press at printing speed by means of the large motor. The gearing between the small motor and the press is such that at full speed of the motor the press speed is about ten revolutions per minute. Since the small motor has the advantage of the very great leverage accompanying this speed reduction, it is able to start the press without jar or jerk and to maintain smooth operation at this low speed. It is also possible with this arrangement to move the press a very small fraction of a revolution at a time, equal to a movement as small as one-eight of an inch travel of the paper, when "inching", as it is called, is necessary to bring the cylinder into the proper position for plating. Other operations of the press often require that it be inched along.



DOUBLE MOTOR DRIVE — *The small motor starts the press, runs it at threading speed and positions the cylinders for plating. The large motor operates the press at printing speeds.*

—Courtesy of Cutler-Hammer Mfg. Co.

The push-button stations which operate the controller give the pressman complete control of the drive from as many convenient points as may be required. He can safeguard himself from injury by pushing the "safe" button at the nearest station, under which condition it is impossible to start the press from any station until the "run" button has been pressed, thus returning the "safe" button to a running position. This safeguard protects the men working on the press when they are performing such operations as plating, changing blankets, washing rollers, making adjustments, or doing any one of the dozen things which must be done while the press is not moving.

PUSH BUTTON STATION
Numerous push button stations are mounted at convenient locations around or on the press. This gives the operators control of the driving motors from any one of these points.
—Courtesy of Cutler-Hammer Mfg. Co.

The original installation of the Chicago News comprised the basic features of two motors, automatic clutch, and controller operated from various stations about the press. This controller was, however, operated pneumatically. An electrically operated controller for the purpose was subsequently developed by Kohler Brothers of Chicago and has entirely superseded the pneumatic type. Various refinements have been added from time to time, among them being relays which stop the press automatically in case the web breaks, and magnetically operated cylinder brakes mounted on the individual cylinders which make it possible to stop a press from high speed in four or five seconds without causing dangerous stresses in the gears.

Although this article has all ready run to a considerable length, I have been unable to even mention many important items. Very many large newspapers maintain their own photo-engraving departments. Some of them that issue color supplements also operate their own electrotyping plants. The subject of color printing must be dismissed with the statement that it necessarily involves different processes and different equipment from that required for black printing. The rotogravure process, which has come to the front within the last ten years, is in almost every particular a complete innovation in the printing art. Besides these larger items, every good sized plant and many of the small ones contain a collection of miscellaneous small equipment which is of interest to the engineer. In closing, I offer the suggestion that engineering students or even mature engineers will find that a visit to a newspaper plant will prove to be time spent at least pleasantly, and perhaps profitably.

THE EVOLUTION OF SUPERPOWER SYSTEMS

(Continued from page 85)

increasing concentration of power in single units. Previous to the initial installation at Niagara Falls in 1895 of 5,000 — H. P. units, the horsepower ratings of units probably had not greatly exceeded one thousand, or at the most but a very few thousand. Later there came single turbine runners, especially for high head developments, built for many thousand horse-power. The culmination of size and efficiency has come in the 70,000 H. P., single runner, vertical shaft units just recently put into operation by the Niagara Falls Power Company. One complete unit, rated at 65,000 kilovolt-amperers, 80 per cent power factor, and 25 cycles, is an Allis-Chalmers product. The other two units, consisting of I. P. Morris turbines and General Electric alternators, have similar ratings. The generators give a maximum efficiency of 98 per cent, and the turbines, an efficiency in excess of 93 per cent. Taking into account losses in penstock and draft tube, an overall efficiency from head water to tail water of nearly 92 per cent is obtained. Thus it is seen that hydraulic engineers and designers have already approached very closely to the limit of efficiency of conversion. On the other hand steam engineers and designers of heat conversion equipment are still far removed from the limit of thermodynamic efficiency.

Electrical Power Transmission

In the field of electrical power transmission the outstanding feature of the development has been the almost continuous increase of transmission voltages, with consequent proportionate increases in the amount of power and the distance transmitted. Steel towers with suspension insulators are now the rule with voltages of 66,000 and above. The longer and higher capacity lines are now operating at 110, 120, 132, 140, 165, and 220 kilovolts. In point of total right-of-way mileage, 110 kilovolts is the most prevalent of the higher voltages. There are approximately 3,000 miles of lines at that voltage, while for 132 kilovolts there are nearly 1,000 miles. The latter voltage is fast becoming the most usual here in the Middle West for the more recently built high voltage lines, and for those under construction and proposed. It is the highest transmission voltage in use today in Wisconsin. All the lines at that voltage belong to The Milwaukee Electric Railway and Light Company. These lines were described in the October issue of the Wisconsin Engineer. The most extensive 140-kilovolt system is the 526 miles of lines of the Consumers Power Company in Michigan. During 1923 the Southern California Edison Company and the Pacific Gas and Electric Company in California changed their longest transmission lines from 150,000-volt to 220,000-volt operation. The former now has two single-circuit lines, each 270 miles long, at that voltage, and the latter, one 202-mile line which will be extended eventually to 275 miles. Transmission at still higher voltages may come in the future, though it is probable that voltages above 220 kilovolts will not be economically justifiable for a number of years to come.

Expansion of Electrical Systems

The original function of a transmission line was to conduct electrical energy from a distant hydro-electric plant located at some particularly advantageous site to a nearby city where the power could be utilized for lighting and for the industries. In the course of time the transmission line may have been tapped at intervening points from which shorter lines extended to smaller

communities in the vicinity. In other cases where a company operated in a larger city and generated all its electrical energy in steam plants, transmission lines may have been extended out to suburban towns so as to give them the advantage of more reliable central station service. But whatever may have been the processes by which transmission networks began to grow, the fact remains that the past ten to fifteen years have witnessed a tremendous expansion and consolidation of electric light and power properties. The most natural expansion would be that of the distribution system of the large city electric light and power company reaching out beyond the city confines and supplying suburban towns, and then transmission lines being built to supply more remote cities and villages, until finally nearly every community in the territory covered by the system could be served from the central stations of the large company. A typical system of this kind is that of the Detroit Edison Company which serves not only the city of Detroit and suburbs but also towns for many miles north, south, and west in southeastern Michigan. The Milwaukee Electric Railway and Light Company has a similar system, especially if the properties of its affiliated companies are included.

Still another more common type of expansion and consolidation is that whereby a company gradually acquires the local properties in a group of small cities and villages spread over considerable area, and then by linking these communities together with a transmission network, it supplies them with energy from several small generating plants located at various points in the system. Such a system is that of the Wisconsin Power and Light Company, the Wisconsin Public Service Corporation, the Consumers Power Company, and dozens of others. The transmission lines of the Consumers Power Company, for example, cover a large portion of the southern half of the lower peninsula of Michigan and bring electric service to 163 communities. Scattered throughout the system are 35 hydro-electric and steam-electric stations feeding energy into the transmission network.

Methods of Expansion and Consolidation of Electrical Properties

A significant phenomenon attendant upon the expansion of electrical systems whereby hundreds of communities may be served from the transmission lines of a single company is the passing of the one-town "electric light plant." In order that a large company may be able to extend its transmission lines from town to town, it is necessary that the company acquire a large part or all of the electric light and power business of these towns. The more usual procedure is that the large company buys outright the generation and distribution properties of the one-town company, and the latter then ceasing to exist. The small one-town generating plants being generally of antiquated design and atrociously inefficient, are ordinarily scrapped. The better plants are often times retained as standby stations for emergency use. In either case the distribution network is connected through a substation to the transmission line. As an illustration of the present relative importance of the municipal electric plant in the electric light and power industry in the Middle West, passing note may be made of the fact that in Wisconsin about 3.5 per cent of the total installed generator capacity is in municipal plants. These plants in 1924 generated only 3.2 per cent of the kilowatt-hour output for the state.

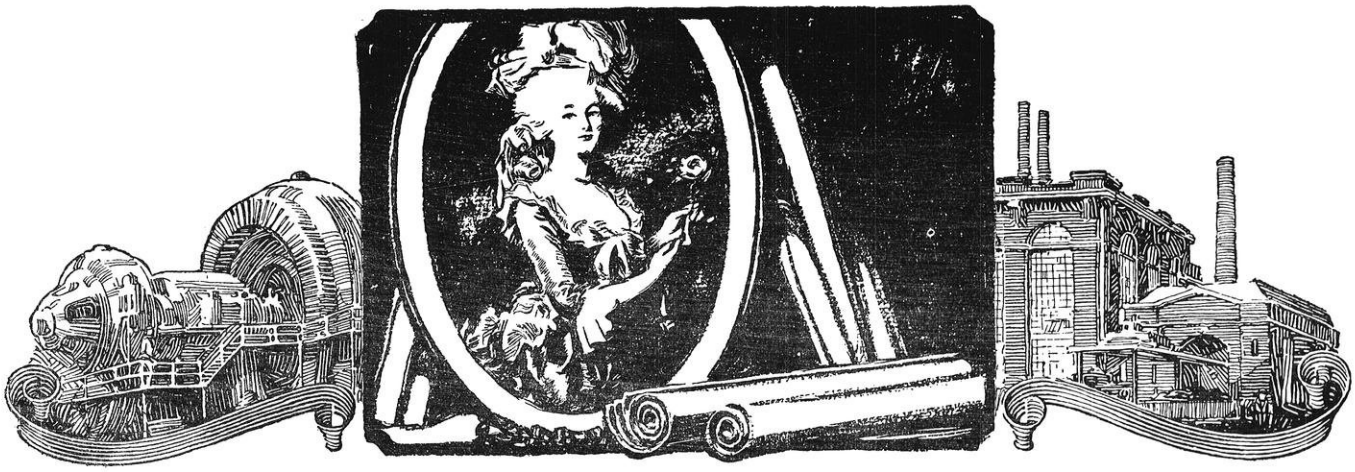
Another method, by means of which the smaller cities and villages are given the advantage of electric power service from transmission lines, is that whereby the local company, or the municipality, discontinues its own generating plant and buys its energy at wholesale from the transmission line company. This energy is then supplied to the local customers through the existing distribution system. Sometimes the local company draws upon the transmission line for only a part of its energy requirements, supplying the remainder from its own plant which is not generally operated at full capacity except in times of emergency. Such a procedure is followed by the Madison Gas and Electric Company. The major portion of its energy is taken from the transmission line of the Wisconsin River Power Company.

Still another procedure followed in the expansion and consolidation of properties, is for a company owning a large system to acquire control of a local company through purchase of all, or a majority, of its outstanding shares of common stock. This procedure is more particularly applicable to the absorption of a small system which already has transmission lines serving a number of communities.

Interconnections of Electrical Systems

The accompanying transmission line map of Wisconsin will give an idea of the extent of electrical systems in this state. It is generally representative of all the other states in the Middle West. As would be expected, there is a rather definite relation between the density of transmission networks and the density of population and industries. It will be noticed that as the transmission lines of one company are extended farther and farther, eventually they must reach out to and make contact with the transmission lines of neighboring systems. At these contact points an actual connection is made often times between the two systems, so that an interchange of energy becomes possible. Such "interconnections," as they have come to be called, are of considerable advantage to both systems, for they enable one company to draw upon the power resources of the other company in emergencies or at times of heavy peak load. The transmission line map shows that there are at present many interconnections in Wisconsin, and that short extensions of existing lines would make possible a large number of additional interconnections.

Editor's Note: A continuation of the article on "The Evolution of Superpower Systems" will appear in the next issue.



ART PRINTS AND BLUE PRINTS

Painters, authors, and musicians win fame and fortune by transmitting their conceptions to paper. Achievement can be completed merely with such expression of an idea. Not so with engineering. The design of a turbine or of a flat iron, once it is created, is not placed upon a pedestal in a millionaire's mansion, or in an art museum. It immediately goes into the shop—there to be executed. Its success is measured by the degree to which it fits manufacturing requirements. If it can't be manufactured economically it is a failure.

In an organization like Westinghouse there is a group of engineers whose chief interest and concern is the efficient, economical, large scale manufacture of electrical products. These men may be electrical engineers or mechanical engineers. They are primarily interested in shop practice and methods—in the same industrial problems as are the manufacturing customers whom Westinghouse serves.

The founder of Westinghouse was such an engineer. He possessed a marvelous faculty to inspire workmen and executives alike; there are many tales of men working nights and Sundays to help him complete a cherished plan.

Throughout all industry there is a call for men qualified as manufacturing engineers who can combine materials, machines, men, and methods with better and more efficient results.

Such men find pleasure and inspiration at Westinghouse—developing apparatus to help other manufacturing executives solve similar problems in every kind of industry.

This advertisement is fifth in a vocational series, outlining the fields for engineering achievement in the Westinghouse organization. Copies of the entire series will be sent to anyone requesting it.

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