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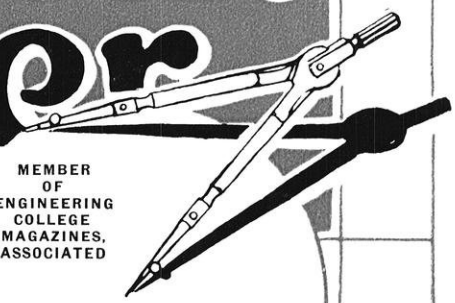

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CONTENTS

VOLUME 30 NOVEMBER, 1925 NO. 2

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THE COMMERCIAL RESULTS OF STANDARDIZATION

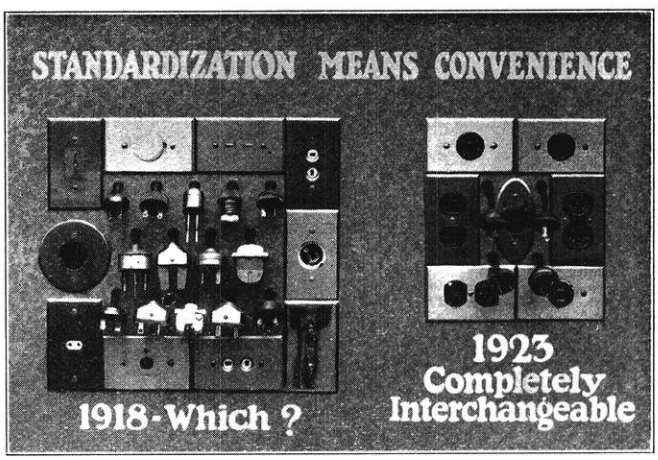
By M. D. Cooper, E '08, E. E. '10
Engineer, National Lamp Works of the General Electric Company

IT is the purpose of this article to show the benefits of standardization in certain parts of the electrical industry with which the writer is familiar.

From the view point of the manufacturer, standardization enables the concentration of research and design upon certain standard types to the end that better and cheaper goods are produced. In the field of distribution of goods, standardization produces great savings in decreasing the amount of stocks which it is necessary to carry to adequately supply the trade, thereby accelerating deliveries and increasing the stock turn over. In the utilization of goods by the ultimate consumer, standardization makes for ready availibility of supplies and eliminates vexations due to non-interchangability. Standardization thus produces economies all along the line, with a total cumulative effect that is very frequently underestimated.

A high degree of standardization has been accepted in this country for so long that in order to visualize the benefits of standardization, we must compare the present times, either with the conditions in this country as of several decades ago before standardization was started, or with the conditions in some foreign countries which have a lesser degree of standardization.

Let us assume for the moment that I have been residing in London. Let us assume further that I am dissatisfied with my living quarters and am about to move to a house which had been occupied by Brown. It has fallen to Brown and to me to gather up the electrical equipment in the home and transport it to the new place. The lamp bulbs which I have taken out of the sockets are equipped with a bayonet base (like the base on automobile lamps except somewhat larger.) I find my attempts are futile to place these in the lamp sockets in the new home as these sockets are equipped with Edison screw threads. Failing to make a lamp stay in the sockets in the living room, I try the dining room in which place Brown had left the switch in the on position. The long brass shell of my bayonet base acts in this fixture as might be suspected, and I am greeted with a spitting imitation of a cat-fight. On making a more careful attempt I finally make



The Results Obtained by the Standardization of Convenience Outlets

connection between the lamp and the socket and immediately the room bursts out into a blaze of light, resulting from one hundred percent too much voltage on the lamp. Whatever work I had to do must now be quickly done because I know that the life of the lamp at double voltage will be only a few minutes. While I have thus been cultivating a temper over the misfits of electric lighting, friend wife has been trying to use her electric iron. She has heard my remarks about the lamps not fitting in the sockets and has been inclined to congratulate herself to find that the appliance plugs are the right kind to fit in the receptacle in our new home. She speaks of a funny noise when she plugs the iron on and after some minutes remarks that the iron does not seem to heat up so well

as it formerly did. She finally concludes that the iron is not heating at all and asks me to see what is the matter with it. Addled by her persiflage about the ability of an electrical engineer to put a lamp in a socket, I very quietly replace the fuse which she blew when she connected her iron. My revenge is ample. After waiting the usual length of time for the iron to heat, friend wife burns a hole in her new dress, and then the iron starts a small Fourth of July celebration of its own, giving forth mutterings, smoke, and other signs of a volcanic nature.

In the meantime, Brown has had his troubles with his electrical equipment. Finding that his lamps would not go into the bayonet sockets, he has gone to an "ironmonger" and got some more lamps "just like these but with the bayonet base." His first evening in his new home is then illuminated by lamps which are barely red-hot, giving an amount and color of light which reminds him of a lecture of prehistoric man which he heard some evenings before. Brown's heating appliances grow warm but otherwise are useless. Mrs. Brown suggests using the flat iron for a bed warmer. The next day while preparing one of the meals the cook's attention is detracted by the iceman and the kitchen becomes filled with the vapors of the impending meal. Cook opens the window, but finds no breeze blowing. Consequently her kitchen remains full of smoke, whereupon she connects up the electric fan to blow the smoke out of the window. Her subsequent report is that, "The fan gave a grunt and started shooting at me." Of course cook could not be expected to be able to tell the difference between direct and alternating current by looking at the receptacle, but the fan, being accustomed to the tickling tremors of alternating current, deeply resented being subjected to a continuous pressure and gave vent to its temper by "shooting" at cook. Under the possibilities of such trying happenings upon moving, it is not to be wondered that people of London like to continue living in one place as long as possible.

A booklet issued by a British manufacturer shows a list of the various central stations which supply the city of London and its suburbs and shows the voltage, frequency, etc. This list shows 41 different supply companies or municipal plants. The largest one of these companies sells 66,000,000 kilowatt hours per year and the smallest 2,000,000. Service is rendered at about 20 different voltages, from 100 volts up to 500. About one half of the service is direct current. The remainder is supplied with alternating current at various frequencies, about one half the alternating current being 50 cycles and the remaining one half, or one fourth of the whole, being divided between 25, 40, 60, 83, 85, 90 and 100 cycles. A considerable portion of the alternating current service is single phase only. The majority of the polyphase service is 3-phase, although some portions of it is 2-phase.

As regards methods of distribution, the favorite seems to be a 3 wire system, either single phase or direct, with voltages of 230 and 460, or 210 and 420, 200 and 400, etc. There are a number of 2 wire systems, some operating at voltages in the neighborhood of 100 and others at voltages in the neighborhood of 200 volts. There is one large private company which operates a 415 volt 3-phase system, the lighting being supplied at 240 volts between one wire and the neutral. The outstanding oddity is one small direct current plant operating a 3 wire service at 150 and 300 volts.

On these 3 wire services it is customary, of course, to operate the lamps and small household devices on the half voltage and to take power for motors, and residence heating (which has come to be quite common in England) from the outside wires at the double voltage. In the list of voltages of supply (and taking now only the lower voltage, which would supply the lighting) we find 240 volts mentioned 33 times; 200 volts, 19 times and other voltages in order of their frequency of occurrence are as follows: 230, 220, 100, 205, 210, 105, and the following each occur once: 104, 110, 204, 250.

Let us contrast this electric supply in the world's largest city with that supplied in Chicago. Chicago, its suburbs, and a large surrounding territory are all supplied with 3-phase alternating current with 3 wire distribution giving 115-230 volts. Power customers are thus supplied with 3-phase 230 volt current for power and 115 volt single phase current for light. In case power demands are heavy the customer may buy his current at high tension and transform to 440 volts for power and 115 volts for lighting. There is in the down town business district a small remainder of the old Edison 3 wire direct current system operating at 115-230 volts, thus lighting in the entire metropolitan and suburban district is all 115 volts and any lamp or any household device can be moved from any part of the city to any other part. Except for the small direct current district, any motor can be moved from any part of the city to any other part and operate satisfactorily, with due regard to its voltage of supply.

This comparison between London and Chicago shows what standardization will do in simplifying electric service and in taking the trick out of electricity. The effect of standardization on the economy of electric service can best be summarized by a comparison of the respective rates charged for lighting current. In London the rates run from 3 pence (6 cents) up to 10 pence (20 cents), with an average of about 8 pence or 16 cents per kilowatt hour. The average rate paid in Chicago for lighting current is not over 5 cents.

The forty-one stations in London report sales of 788,000,000 kilowatt hours for all purposes. The population of London and suburbs is approximately 4,500,000, hence the per capita sales are 175 kilowatt hours. The corresponding figures for Chicago and suburbs are 1,387,000,000 kilowatt hours sold to 3,000,000 people or 462 kilowatt hours per capita.

The economy of standardization in electricity supply and the resultant increased use of electricity need no further demonstration.

(Continued on page 56)

SUMMER EXPERIENCES

As Set Forth By Sundry Seniors

When summer comes, we close our books;
We rest the weary nob,
And get us work with pen or "gun" or pick
Where labor hums. It spoils our looks,
But still we like the job,
For what we learn while working seems to stick.

A BIRCH ROD SURVEY

The student engineer is apt to associate certain kinds of engineering work with certain kinds of engineering instruments so closely that he becomes imbued with the idea that the work cannot be done without the instrument. One of the most noteworthy things that my summer's work taught me was that some kinds of surveying can be done without surveying instruments, and that it is often advantageous to supplement surveying instruments with simple devices.

I have in mind a long highway tangent that was relocated with no other equipment than a one-hundred-foot tape, a range pole, and two white birch rods. The birch rods were placed at the ends of the tangent and the line was retraced by lining in the range pole. The method was so accurate that many of the tags that were set at the 100-ft. stations were found to be superimposed upon the original tags that had long been covered with loose road material. The method is a boon to the inspector who is retracing an old survey and wishes a more positive check on the location of the center line than is possible if the measurements are taken from off-set stakes.

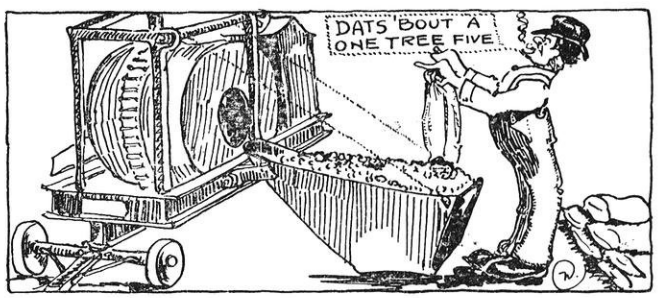
In another instance we had a compound curve with radii of 86 and 135 feet. The curves marking the limits of the right of way came in an orchard so thick that it practically prohibited the use of a transit. We first established the centers of the curves with the transit, setting up at the P. C. and the P. C. C. We were then able to set any number of points on the center line and on the right of way limits by measuring from the centers. —*L. E.*

DIVISION OF LABOR IN FORM CONSTRUCTION

The most effective method I have seen of building forms for concrete was the one used during the past summer in the construction of an eight-story building at Rockford, Illinois. The carpenter gang was divided into four groups, each of which was assigned a definite part of the work, and, because of this, the men became very proficient in their duties. The first group built the beam bottoms and wired them in place. The second group built the sides of the beams. The third group placed the floor joists and laid the floor. The fourth group made the column forms. It took this gang twelve days to erect the forms for the second floor. By the time the eighth floor was reached, the men were so proficient that they did the same amount of work in five days. —*J. C. W.*

CONCRETE AS IS

On the job where I worked during the past summer, the proportioning of the concrete was left almost entirely to an old man who had worked for years at the task of putting cement into the hopper. His method of proportioning was simple and crude: when he saw in the hopper what he considered a proper amount of aggregate, he added *some* cement and signaled for the hopper to be raised and dumped into the drum. The



The Old Man Added What He Considered the Proper Amount of Cement

rule that each batch be mixed for at least one minute was disregarded. The time for mixing was just sufficient to permit the necessary amount of water for the mix to flow from the tank into the drum. Some batches were taken out in twenty-five seconds. I often wondered how that concrete would stand up under tests. —*K. E. B.*

USES CALCIUM CHLORIDE TO HARDEN CONCRETE

The resurfacing of nine or ten blocks of brick and macadam pavement in Muskegon, Michigan, was held up this summer until the concrete curbs and gutters could be patched; so the city's engineers were confronted with the problem of getting the repairing done within the shortest possible time. They decided to experiment with the use of calcium chloride to hasten the hardening of the concrete.

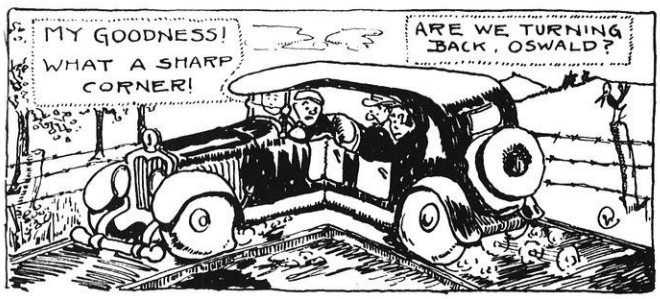
The chloride was obtained in 100-lb. sacks from the county road commission, who was using it as a dust preventative. A sack of chloride was stirred into 25 gallons of water, and the solution was used in the proportion of two quarts of solution to one bag of cement. Tests made on 1:1½:3 concrete at the end of seven days showed a strength of 3500 lb. per sq. in., or about 500 lb. more than would normally have been obtained at the end of 28 days.

We found that our standard 1:1½:3 mix gave good results, that the mix had to be drier than ordinary, and that the concrete had to be spaded or rolled after being placed. The concrete was covered with wet burlap sacks soon after the initial set, which took place much quicker than with ordinary concrete. The chloride cost the city $1.50 per 100 lb. —*G. F. L.*

THE DUMP WAGON LAYS OUT THE CURVE

Most engineers would say, offhand, that a transit is the instrument to use in laying out a highway curve; but I arise to remark that unless the highway engineer is endowed with good judgment, he may find himself outdone by the combination of an ordinary teamster and a dump-wagon, and I offer in evidence the following incident:

One of the first concrete roads in Dane county was built in 1914 a few miles south of Madison. The engineers, in staking out the pavement, followed the existing roads, and in one case, in turning a right angled



The Engineers, in Staking Out the Pavement, Turned a Right-angled Corner

corner, merely set a stake at the intersection of the two lines of stakes that marked the tangents on either side of the corner. The contractor, realizing that no vehicle could turn a square corner on a nine-foot pavement, decided to build the road on a line that could be followed, and told one of his teamsters to drive around the corner. Stakes were then driven on the lines followed by the wagon.

An inspector discovered the change in alignment and objected to it. The engineer then returned and staked out both edges of the pavement so that the outer edge came to a sharp corner while the inner edge was curved to a fifty-foot radius. And so it was built. It is now one of the most dangerous spots between Madison and Chicago. —*R. Q.*

DISCOURTESY IN THE MARTS

The lack of appreciation of the value of the other fellow's time, and the lack of even common courtesy that I encountered while selling garden produce during the past summer made quite an impression on me; and will result in making me a harder person to deal with in a business way than I have been in the past. Time was when I felt ashamed to go into a store and occupy a clerk's time without buying something. I felt that he might have been waiting upon a more profitable customer, and that it was my duty to pay for his time by a purchase.

Did the grocer have any qualms about taking up my time and then not buying? He did not. I would stand patiently while he puttered about minor duties that could easily wait, knowing that as I waited some competitor would be getting ahead of me to my next possible customer. When he was good and ready, he would permit me to display my wares, and make me arrange them so that he could examine them thoroughly. In the end, as likely as not, he would refuse to buy unless I would make him a heavy discount. As the proprietor of a little fruit store said, "Business is business."

—*P. W. B.*

A BIG DIESEL ENGINE FOR PANAMA

During the past summer I had an opportunity to visit the Nordberg plant in Milwaukee and witness the operation of one of the 400-h. p. Diesel engines designed for use at the Panama Canal. The total installation of 12,000 horse power will be the largest Diesel installation in the world, surpassing its nearest rival by 3000 h. p. The size of the engine has been increased, the most noticeable improvement being the addition of two cylinders, making it a six-cylinder, two-cycle engine. The installation will be used as a standby, supplanting a steam plant now in use. —*P. H. N.*

THE CODE OF AJAX

The shoveling gang with which I worked this summer, was made up of college students, like myself, and common laborers. The old hands set a slow pace, which the remainder of us followed without question. One morning a new hand joined the gang and amazed us all by his speed. He threw three shovels of sand to our one. This brought a lot of criticism and cajoling from the gang when it became evident that he was tireless and could out-work any two of us. To this he replied by explaining his philosophy of life.

He said that he loved to do hard work better than anything else. It was the only thing he could do, his livelihood depended upon it, and he might just as well

The Old Hands Set a Slow Pace

like it. By his actions he showed that he enjoyed a piece of work that required extra labor and strength. He was christened "Ajax" after he had lifted a huge rock that two other men had failed to lift.

Ajax was always willing and ready to tackle the hardest and most disagreeable job, and he did it with a smile. There wasn't another man on the job who didn't hate the work and grumble and swear when he had to do an unpleasant task. Ajax didn't swear; "Mercy!" or "Cheese and crackers!" was his limit. He was the most remarkable character that I met during the summer, and I admired him for his outlook on life and his love of hard work. —*W. H. C.*

NATURE ABHORES A VACUUM

By WILLIAM J. RHEINGANS, C '20

Practically every engineer has heard the expression "nature abhores a vacuum" but few know the origin and exact meaning of this term.

Previous to the 17th century philosophers did not know of the relation existing between atmospheric pressure and vacuum, in fact nothing was known about the changes and variations of atmospheric pressure from day to day and at different localities. It was thought that water was raised in pumps by an occult power in nature which resisted with force all attempts to make a void, but when a void was made nature used the same force to fill it by urging the next adjoining substance, if a fluid, into the vacant space. Hence the term, "nature abhores a vacuum", was originated.

It was not known that this force was limited until 1641. During that year a pump maker of Florence made an atmospheric, or sucking pump, the pipe of which extended 60 feet above water. Upon completion he found that he could not raise water over 32 feet. A careful examination showed that the pump was perfect, but he was still unsuccessful in attaining the desired 60 feet. The superintendent of the Grand Duke's water works, under whose direction it had been made, consulted Galileo, a native of Florence.

Galileo gave it some thought but could only say that nature's abhorence to a vacuum was limited and ceased to operate above 32 feet. He was at that time 80 years old, totally blind, and within a few months of his death, and probably was unable to give much attention to the problem.

A philosopher by the name of Torricelli was living with Gallileo as one of his family, and it was this same Torricelli who announced in 1643 that liquids were raised in tubes by atmospheric pressure. His first experiment was with a tube 60 feet long with the lower end immersed in water. The air was extracted at the upper end by a syringe. He found that the water could not be raised more than 32 feet, and attained no further success when the length of the tube was reduced to 40 feet. Torricelli reasoned that if the water was being held up by atmospheric pressure, then the height of liquids other than water would be inversely proportional to their specific gravities. He took a glass tube 4 feet long, sealed at one end, filled it with mercury, and holding his thumb over the open end immersed it in a dish of mercury. When he removed his thumb, the mercury dropped in the tube until it stood 28″ above the surface level of the mercury in the dish.

His contentions were proved.

The theory of atmospheric pressure met with much opposition for it prostrated the long cherished hypothesis of nature's abhorence to a vacuum. Unfortunately Torricelli died in 1647 but his experiments were followed by philosophers, most eminent among them being Pascal, a French mathematician. He reasoned that if it was really the weight or pressure of the atmosphere which sustains water in a pump, or mercury in a tube, then the intensity of this pressure would be less on top of a mountain than at the foot because there is less proportion of air over the summit than over its base. If the mercury in the tube was being forced up by air pressure, then the column ought to diminish as it was being carried up the side of a mountain, but if air pressure had nothing to do with it, the height of the column would remain constant.

This experiment was carried out on Sept. 19, 1648, on Puy de Dome near Clermont, the highest mountain in France, and the result was as Pascal had anticipated; the column of mercury dropped from 28″ at the base to 23″ at the summit. Additional experiments along the same line on different mountains, and different sides of the same mountain, confirmed the atmospheric pressure theory. Torricelli's mercury tube was first named a baroscope and then a barometer, because it measured atmospheric pressure.

In 1766 a circumstance arose which threatened a renewal of disputes about the vacuum. A tinman in Seville, Spain, built a common pump for a well 60 feet deep. Instead of having the sucker play within 32 feet of the water level, he used a rod so short that the sucker was at least 50 feet away. Disappointed because he was unable to pump water, he descended into the well to examine the pipe, while a person above was employed in working the pump. At last in a fit of despair at his want of success, he dashed a hammer violently against the pipe. In doing this, a small opening was made in the pipe about 10 feet above the water, and — what must have been his surprise — the water instantly ascended and was discharged at the spout.

When this fact was published some philosphers used it as a proof that the pressure of the atmosphere could sustain a perpendicular column of water much longer than 32 feet, and consequently the experiments of Torricelli and Pascal were inconclusive. M. Lecat, a surgeon at Rouen, in Normandy, repeated the experiment with a pump with a small hole bored in the suction pipe ten feet above water to which he fastened a cock. When the cock was open the water would discharge at a height of 55 feet instead of the 32 feet when it was shut.

Naturally when these experiments were investigated instead of overthrowing the doctrine of atmospheric pressure, they more fully confirmed it. Air entered the pipe and became mixed with water. This water, instead of being carried in an unbroken column, was raised in disjointed portions. Since the mixture was lighter than water alone, a much longer column of it could be supported and we had the start of the air lift pump.

POWER PLANT MODERNIZATION WITH 1200 POUND PRESSURE

By M. K. Drewry, M '22

Assistant Chief Engineer of Power Plants, The Milwaukee Electric Railway and Light Co.

UNPRECEDENTED progress in power generation during the past decade has left many power stations, a large percentage still not developed to their ultimate capacity, considerably behind in the rapid race for greater economy. But progress has pointed a way of modernizing these older, unfinished stations to a point where they may be as efficient as some of the recently erected 500# to 600# stations.

Enlarging these supposedly obsolete plants, instead of erecting new ones is the method by which the economy of lower pressure stations is made equal to that of most recent ones. By the addition of one or more 1200# boilers, one or more 1200# turbines expanding to station head pressures, and sufficient normal-pressure condensing turbines to balance the station, the obsolete plant may be modernized. The best 1200# thermal cycle is such that 1200# and, say, 300# pressure in a power station furnish a desirable pressure combination for operation of the combined equipment at peak efficiency.

How 5% additional turbine capacity of the 1200# pressure type where added to an existing station allows thereafter the generation of about 40% of the station output by 1200# pressure steam is shown in figure I. Recent load curves of the Lakeside Station, T. M. E. R. & L. Co., compared to the power block which would be generated by the proposed 1200# unit for that station were it now in service, show that baseload operations of a high pressure unit allow it to generate a high percentage of the station output and therefore materially affect station economy. A second 1200# unit planned for Lakeside will allow 75% of the station energy to be generated by 1200# steam at 15% greater efficiency than were the station enlarged in the usual method with 300# units.

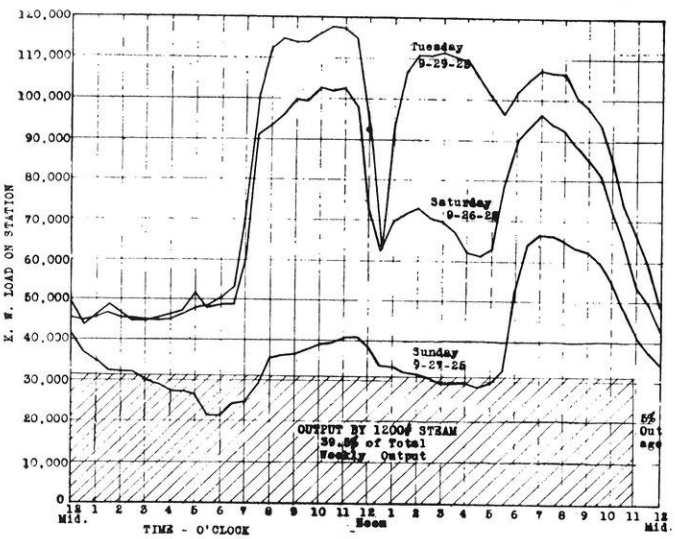


FIGURE I. LAKESIDE STATION LOADING. *Showing percentage of total output which would be furnished by 1200# steam were the proposed high pressure installation in operation. A 7,000 K. W. 1200# turbine exhausting to the present 300# steam headers would furnish enough 300# steam to generate 24,300 K. W. in a present turbine, or 31,300 K. W. total. Though the 7,000 K. W. unit addition would increase station electrical capacity only 5%, it would allow 40% of the weekly station output to be generated by the expansion of 1200# pressure steam.*

The relative output of the small high pressure turbine and of the large standard type condensing turbine into

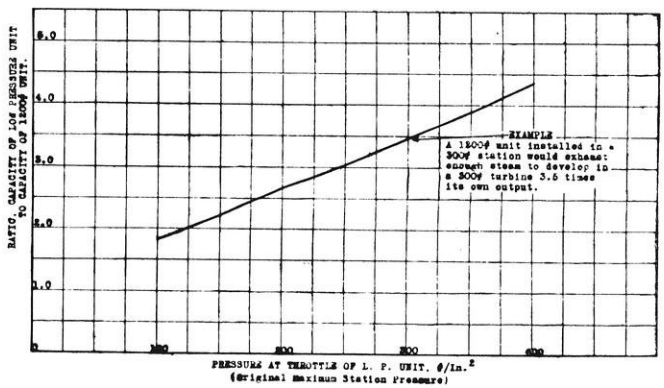


FIGURE III. COMPARATIVE SIZE OF HIGH AND LOW PRESSURE TURBINES. *Installation of a 1200# turbine does not necessitate the purchase of an additional low pressure unit of any particular size, for the exhaust steam of the 1200# unit is sent into station mains and may be used in any one or all low pressure turbines in operation.*

which the exhaust of the high pressure turbine passes, is shown by Figure II by referring to the vertical height of the two expansion lines. How expansion from 1200#, 700° F. to 300# maintains superheated steam throughout the high pressure turbine is shown by the nearness of the exhaust point to the saturation curve. Since turbine stage efficiency is about 10% higher in the superheated field than in the saturated field, the value of maintaining superheated steam throughout the 1200# turbine expansion is evident. How the heat supplied to high pressure boilers decreases as higher pressures are attained is shown by the downward trend of the saturation curve in the high pressure region.

Analysis of the gains of 1200# equipment above

300# equipment show them to be composed of a gain due to less heat added in the boiler unit (see items 4 and 5 below), and to the greater energy obtained in the turbine room, thus:

1. Turbine pressure, #G.	300	1200
2. Temperature, °F.	700	700
3. Total heat in steam at throttle, Btu/#	1368	1300

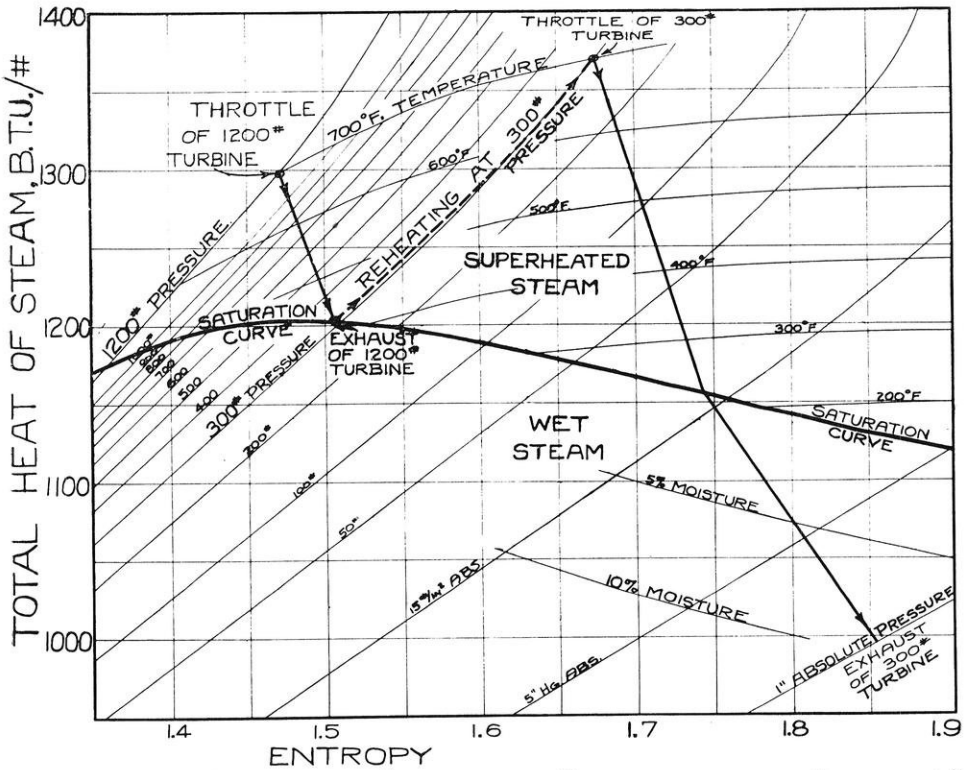


FIGURE II. THE CONDITION OF STEAM AT ALL POINTS IN THE 1200# AND 300# TURBINES. *Wet steam is just avoided in the 1200# unit if its throttle temperature is 700° F. Reheating carries the expansion again some distance in the superheat field and moisture is not present in the 300# turbine until the steam pressure is about atmospheric. A gain of the 1200# cycle is represented visually by the downward curving of the saturation line at the left side of the chart.*

4. Heat supplied by boiler, assuming 200° F. feed water and no reheating	1200	1132
5. Percentage comparison of item #4	100	94.3
6. Work done when expanding, Btu/# steam *	375	470
7. Percentage comparison of work done	100	125
8. Heat supplied to boiler, 200° feed water and reheating	1200	1299
9. Percentage comparison of heat added	100	108
10. Net gains of 1200# cycle		15%

* Reheating cycle for 1200# system.

The vertical height of the 1200# expansion line, compared to that of the 300# line, gives a conception of the extra energy (25%) developed by the high pressure turbine. To obtain this added k. w. output, the only extra heat, added above that supplied to the 300# turbine, is the heat drop in the 1200# unit, or approximately 100 B. t. u. /#. Thus 25% extra energy is obtained with an expenditure of only 8% extra heat, resulting in approximately 15% greater economy. Figure III shows how the sizes of the high and low pressure turbines compare when the intermediary pressure is of various values as exist in present day stations.

With one high pressure turbine installed at Lakeside, the heat consumption per k. w. h. is expected to decrease 6%, or from its present level of 15,700 B. t. u. per k. w. h. to 14,750 B. t. u. per k. w. h. to 14,000. This latter figure is comparable to that of the best 500-600# stations recently built and in operation under load factor conditions better than those at Lakeside.

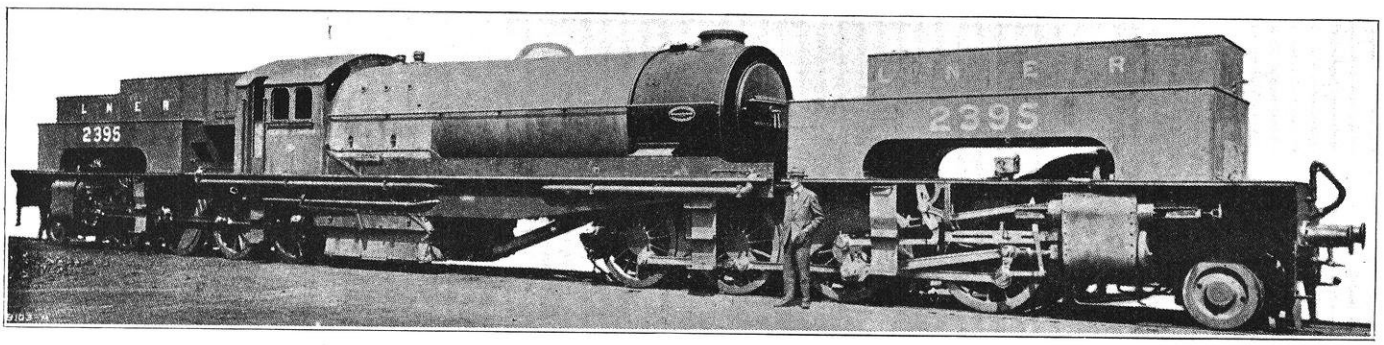
That modernization of low pressure, unfinished stations with 1200# pressure need not be done at a cost any greater than extending the stations with the older type of equipment is learned by analysis of station costs. Boiler plant equipment may cost twice as much for a 1200# installation and the boiler itself may be nearly five times as costly, but the 25% extra energy produced by the turbines so increases station output that the cost per installed k. w. is equal to or increases station output that the cost per installed k. w. is equal to or actually lower than the cost per k. w. of low pressure equipment. Following is a tabulation comparing actual boiler room costs of No. 2 boiler room, Lakeside, and manufacturers' and estimated costs of the proposed 1200# boiler room, showing factors by which the 1200# equipment is costlier than the 300# equipment.

Relative Boiler Plant Equipment Costs
300# and 1200# Installations

	Ratio of 1200# costs to 300# costs
Boilers	4.8
Superheaters, Reheaters	4.2
Economizers, air heaters, etc.	1.3
Boiler Feed pumps	2.0
High pressure steam mains	3.
High pressure feed piping	3.
Total boiler plant equipment	2.15

Though the total boiler plant equipment costs are 2.15 times those of the 300# plant equipment, they are insufficient to cause the new plant unit cost to exceed the 300# plant costs. When figured on the cost per

(Concluded on page 58)



A Modern English Locomotive, the Garratt, Fitted With "Gresley" Valve Gear. There is a Complete, Three-Cylinder, Eight-Coupled "Pacific" Engine at Each End of the Central Cab.

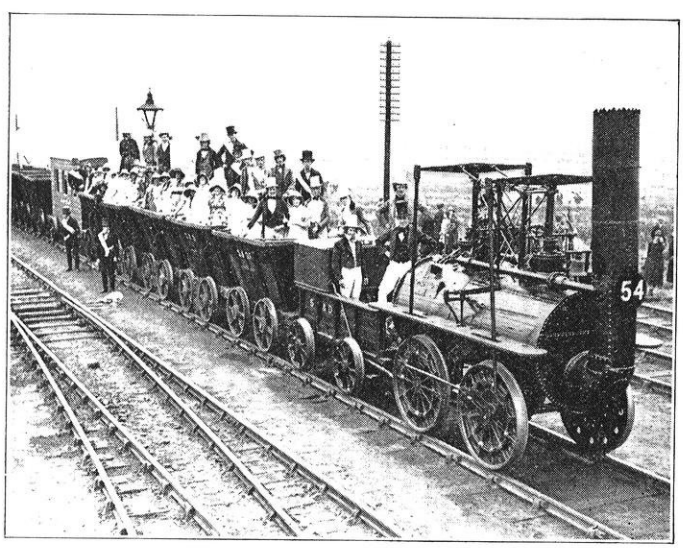
THE RAILROAD CENTENARY

Darlington, England. July, 1925.

By George E. Stephenson, M. Sc., Ph. D. *Armstrong College, University of Durham, Newcastle-on-Tyne*

THE readers of these columns may perhaps be interested in a short account of some of the events of the railroad centenary celebrations held in Darlington, England, on July 1, 2, and 3, 1925.

The London and North Eastern Railway of England (L. N. E. R.) is the direct descendant of the first railway in the world; I refer to the Stockton and Darlington Railway opened in 1825. On this account the celebrations were staged and the programme carried out by the L. N. E. R., in conjunction with the municipal authorities of the towns of Stockton and Darlington. The proceedings were graced by the presence of Their Royal Highnesses the Duke and Duchess of York; and the customary civic banquets, processions through these boroughs and the like, were characterized by the utmost enthusiasm on the part of the inhabitants of the district, the occasion being one of general holiday and feting.



The Original Stephenson Locomotive, "Locomotion No. 1".

In Darlington a very interesting exhibition was held in the carriage and wagon shops of the L. N. E. R. This exhibition contained many historical exhibits showing the development of railroad travel and organization during the century now completed. Many of the exhibits, such as posters, old railway tickets, historic furniture used at the formation of the S. & D. R. Co., were in the nature of railway curios. In addition there were exhibited signalling devices old and new, together with coaches and trains showing the development of comfort and luxury in travel as we know them today. It was especially interesting to observe the transition to our present day English "compartmented" coaches from the early stage coach type which was adapted for use on railroads and which for many years, indeed almost up to 1850, ran horse drawn on the same tracks in competition with the earliest trains drawn by steam locomotives.

The most spectacular event, and that which aroused the greatest enthusiasm among technical and non-technical visitors, was the procession of locomotives and trains which ran over the identical portion of the Stockton and Darlington Railway first constructed in 1825 by George Stephenson, the first practical railroad engineer.

The engines, which had been supplied by many railroad companies in Britain, illustrated the progress made in locomotive construction, while later in the procession tableaux were arranged showing passengers dressed in the costumes of the period travelling in early types of passenger coaches. The procession was completed by fully-equipped, luxurious Pullman trains, truly a contrast with what had just preceded them.

This procession was headed by the "Hetton colliery" locomotive and the "Derwent" engine — both moving under their own steam although they had been consigned to honourable retirement after many years of service before the opening of the present century. At two minute intervals there followed other engines, illustrating periods of construction and development from 1840 to the present day. Small "copper kettles", some completely enclosed in their cabs, "local" type passenger engines and freight class engines built between

1880 and 1900, and the "Atlantic" type of express locomotive, designed by the late Mr. Wilson Worsdell of the Gateshead-on-Tyne works of the L. N. E. R., and used between 1903 and 1922 to haul the Scotch expresses out of London. The successors of this type were represented by the "Flying Scotsman", a "Pacific" type of the engine fitted with "Gresley" valve gear. These engines are used by the L. N. E. R. and G. W. systems over their 200 mile non-stop runs, an average speed of 60 m. p. h. being attained on awkward curves and heavy gradients. In Yorkshire the "Scotsman" attains a speed of 75 m. p. h. over a long stretch of flat track.

The greatest contrast was seen in the exhibition of "Locomotion No. 1", Stephenson's original S. & D. R. engine of 1825, and the Garratt locomotive, the latest acquisition of the L. N. E. R. Some contrast between the earliest and latest of engines is given by the following figures:

1825 LOCOMOTION NO. 1

Height	Length	Weight	H. P.	Cost
13′3″	24′	8½ tons	25	£500 or $2,500

1925 GARRATT

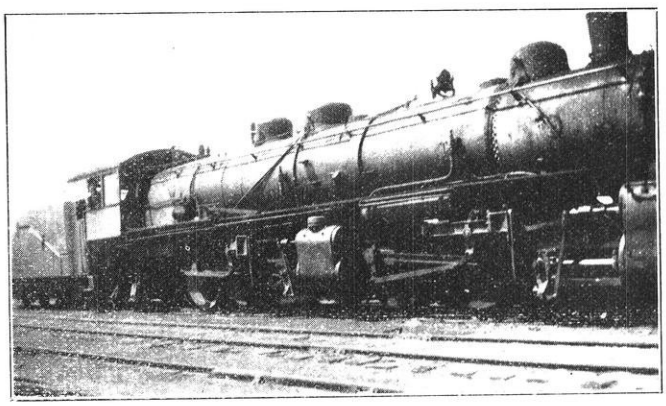
Height	Length	Weight	H. P.	Cost
12′10″	80′	178 tons	3824	£10,000 or $50,000

The Garratt is a six cylinder locomotive fitted with "Gresley" valve gear. At each end of a central cab and boiler is placed a complete, three-cylinder, eight-coupled "Pacific" engine. These locomotives will be used by the L. N. E. R. for passenger and freight service over the Pennine Range in central England to replace the two engines at present necessary to haul a train in that part of the country. "Locomotion No. 1" was driven for the occasion by a gasoline motor, since, on testing at the works at Darlington the boiler could not withstand the pressure of steam required. All other engines ran under their own steam, and were driven by men dressed in the costume of the period of their construction. The driver of No. 1 was dressed in a blue swallow-tailed coat, with white trousers, and wore a tall white hat; the whole pageant was very complete and effective.

Included in the procession were several types of electric locomotives hauled by steam engines, small gasoline driven motor busses adapted to run on rails, and coke burning steam engines with cars, designed to operate on "local" routes for passenger service where such traffic is not heavy.

The exhibits numbered about 60, and were run at intervals of about 2 minutes, so that the procession took two hours to pass a given point; they were driven at a speed of about 5 m. p. h.

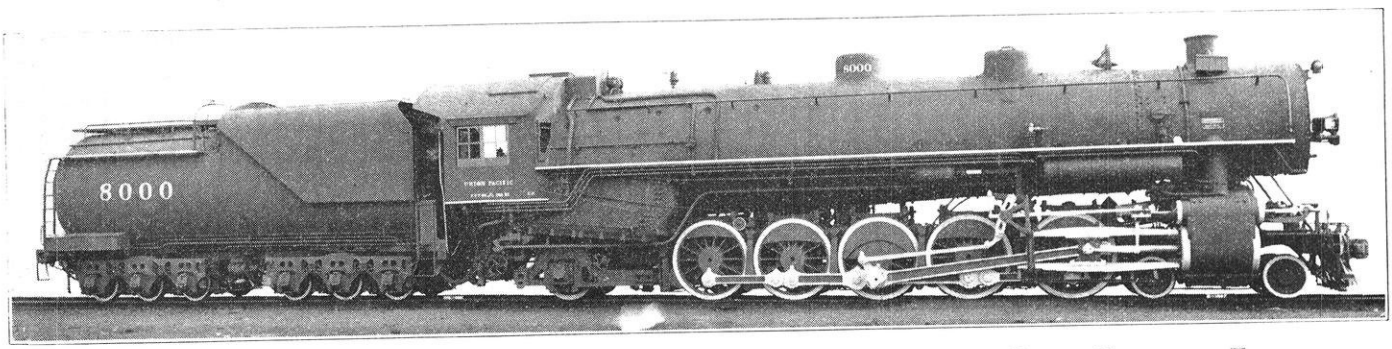
A description of the life and works of Stephenson is to be found in almost any book of locomotive engineering, and I need not enlarge on this subject. It gave me a thrill of pleasure to see his name inscribed above the door of the Wisconsin College of Engineering, since the name and works are held in high esteem in my native city of Newcastle-on-Tyne, where the major part



AN AMERICAN ARTICULATED-COMPOUND LOCOMOTIVE — *The two boilers, mounted one before the other, are not rigidly coupled, thus permitting the locomotive to take sharp curves.*

of Stephenson's life was spent. Like Christopher Wren, the architect, "If you wish to see his monument, look around" (an inscription in St. Paul's Cathedral, London). Two of his earliest engines are preserved in the stations at Newcastle and Darlington, respectively; his birthplace, a cottage at Wylam-on-Tyne, six miles west of Newcastle, and his home in later years at Killingworth, three miles northeast of the city, may still be seen; while outside of the station at Newcastle a simple but noble statue commemorates his work which included one of the first designs for a miner's safety lamp ever produced.

In conclusion I might relate one anecdote concerning George Stephenson, which can be fully appreciated by American readers. When asked what he thought would happen if a cow strayed on to the line, he answered, "It would be hard lines for the cow!"



A MODERN AMERICAN LOCOMOTIVE, THE UNION PACIFIC OVERLAND TYPE, THREE-CYLINDER ENGINE.

AND THAT'S ABOUT ALL ONE FELLOW CAN DO

John H. Quackengroober came to college for high purpose; he would be a leader of men. John H. was not clear as to details about such leadership, but he was sure that it would be spectacular and rather romantic. He pictured himself as the builder of a great industrial enterprise, as the leader of a political crusade, or as the master scientist of the age. The romantic pictures, however, faded as time went on. John H. graduated and got a job back in Podunk-on-the-Creek. Life became a tough and tedious struggle with nothing of the spectacular about it, and John H. smiled to himself at his early dreams of leadership which were never to be realized. Other and better men would have to do the leading; he was one of the mob.

But John H. has gained something in college; he knew the fundamentals underlying business, government, science, and religion and he knew how to think. When he discussed these things with his fellow citizens, his clear, sound thinking found expression in convincing language. Gradually his neighbors acquired the habit of asking John H. what he thought about the project to widen Main Street, or about the Klan, or about evolution; and what he thought carried more weight than any of them ever realized.

John H. Quackengroober never towered above the mob; he never held office, nor made a Fourth of July oration. No one recognized him as a leader of men, but what he thought on public problems was usually adopted as a basis for action by those who knew him. His influence kept that little knot of voting citizens lined up for the best interests of the country. And that's about all that most of us can expect to do.

I believe we will get further if we mix sentiment with business, if we have ideals as well as ideas, reason as well as rule, and use our hearts as well as our heads.
—W. G. Lee, President, Brotherhood of Railroad Trainmen.

BOOSTER KNOCKER

The *Engineer* would prefer the role of booster to that of knocker. The knocker is apt to be unpopular even among those who benefit most by the results of vigorous criticism, and no one craves unpopularity. The booster is everybody's friend. Both the knocker and the booster contribute to advancement. The booster can function best when leadership is wise and broad-visioned and honest. When leadership becomes petty, purblind, and dishonest the booster looses his effectiveness, and the knocker must swing into action with determination and a stout club. The knocker is a blessing until he becomes chronic.

The engineering profession is sound in its citizenship, but I think there is some tendency on the part of teachers and their students to yield to the loose claims of reformers. A true leader is only the gate-opener to larger fields. Without him the human family would be a failure, but the reformer is rarely a leader. At the present time we are listening to too much propaganda on property.

JUST HANDLE HIM RIGHT, THAT'S ALL

Pater Tempus, or Father Time if you please, hath much to do with the pure enjoyment (to say nothing of the sound learning) that an engineering student can get out of his courses. The old man is one of the inexorable quantities with which a student must deal, and the student can never fool him.

It is an undeniable fact that if one can prepare a recitation immediately after it has been assigned, or write a report soon after the test has been finished, he can do it in less time and more accurately than if he waits until the night before the report is due. Those among the slide rule pushers who have never had the rare joy of getting work done in advance have something coming, if they will ever try it out. It will take extra time and effort to get one's work ahead, but when it once *is* ahead, it can easily be kept that way, and the returns in mental relief, accurate work, and learning will justify that extra effort. Plug up your ears, shut your eyes to the movie ads, and get ahead! Try it! The change won't kill you.

"He, who has knowledge and does not practice it, is still ignorant." —*Saadi.*

SHOTGUN OR RIFLE

Our pioneer predecessors were accustomed to shoot squirrels high in the tree with a rifle. Not only that; they felt humbled and abashed if they hit him anywhere but in the head. Furthermore, if their shooting ability were really at stake, they could hit the squirrel in the eye, allowing anyone who might be skeptical of their ability to choose the eye.

Some people, now-a-days, hunt squirrels with a shotgun. Even a pretty poor shot can hit the mark with that weapon. But, with such a weapon, hitting the squirrel doesn't mean much.

Students fall into two categories when it comes to answering the questions put to them by their instructors in recitation, quiz, and exam. A few of them use the rifle method in answering; they know at what they are shooting and they waste no lead. Their answers are brief, to the point, and they indicate that the student

has understanding. Other students use the shotgun method; they aim in the general direction of the target and let fly with both barrels, trusting that at least one shot out of many will hit the mark. They are wordy, rambling, and vague, and their efforts reveal a state of ignorance even though they may be so fortunate as to include the correct answer in their mass of language.

Of course, some instructors invite wordiness and vagueness by asking vague questions, and others invite it, if we credit a popular belief, by giving higher ratings to wordy answers than they give to concise answers. This, however, does not justify a student in adopting the shotgun method as his standard.

"The making of a man is a life work."

ART OR COMMERCE? Regardless of what the *legal* aspects may be of the action of the Badger Board in making a contract with a single firm of photographers to make all senior pictures for the year-book, it was, undoubtedly, an unpopular action, — unpopular with all photographers except the one favored, and unpopular with the seniors who have to pay for the pictures.

So far as the photographers are concerned, it is a case of, "We should worry." The *Engineer* has found the photographers hard people to do business with in spite of the fact that they benefit largely from university trade. The favored photographer in this case has a reputation for being exceptionally hard-boiled in his advertising policy. But if we are indifferent so far as the interests of the photographers are concerned, we are not indifferent where the students are concerned. By the shades of Patrick Henry and the Boston Tea Party we are moved to arise and tell the Badger Board to jump in the lake. Like Cousin Egbert, we can be pushed only so far. And when it comes to the delicate matter of deciding which artist shall "do" us, as it is technically called, we object to being ordered, just as we would object to being told where to buy our spats.

It is our opinion that both the Badger and the photographer are "doing" the student. The Badger receives one dollar for each senior picture that the photographer takes, — *from the photographer*. This is in addition to the dollar and a half that the senior pays the Badger. For printing the pictures and summaries of twelve seniors on one page the Badger receives thirty dollars. Since 1914 the price of a page in the Badger has increased 400%. Ten years ago fifteen dollars was a high price for any page in the Badger, but this year organizations are required to pay forty dollars a page — "an increase of *only* four dollars over last year, which is required to meet the *increased* engraving costs". The Wisconsin Engineer finds that engraving costs are no higher than they were last year.

The "official" photographer must sell pictures to the seniors to make a profit on his agreement with the Badger, and he uses "strong arm methods" to make his sales. In addition, we find that his prices are from 20 to 50 per cent higher than those of photographers whose work is of at least equal quality.

The defense of the Badger Board, namely, that their action was taken in the cause of Art, that only so could the board insure that the backgrounds of all pictures would be the same shade, may be classed, in the inelegant phrase of the day, as "boloney". Give us the low down on this contract. Is Art the only reason why seniors should be delivered *en bloc* like lambs to the slaughter?

"The world is an infinitely complicated place, and every man and woman is, ultimately, alone."

—Jesse Lee Bennett.

AN EXPERIENCE THAT HURTS Professor Larson, during the summer, was asked to recommend some young engineer for a job in one of the big power plants. It happened that he knew of a recent graduate who wanted to get into that particular field. He recommended the young man rather strongly to the superintendent of the plant and then, knowing something of the habits of the superintendent, he tipped off the young man to the fact that he might be put through a course of sprouts involving some unpleasant work for the purpose of trying him out.

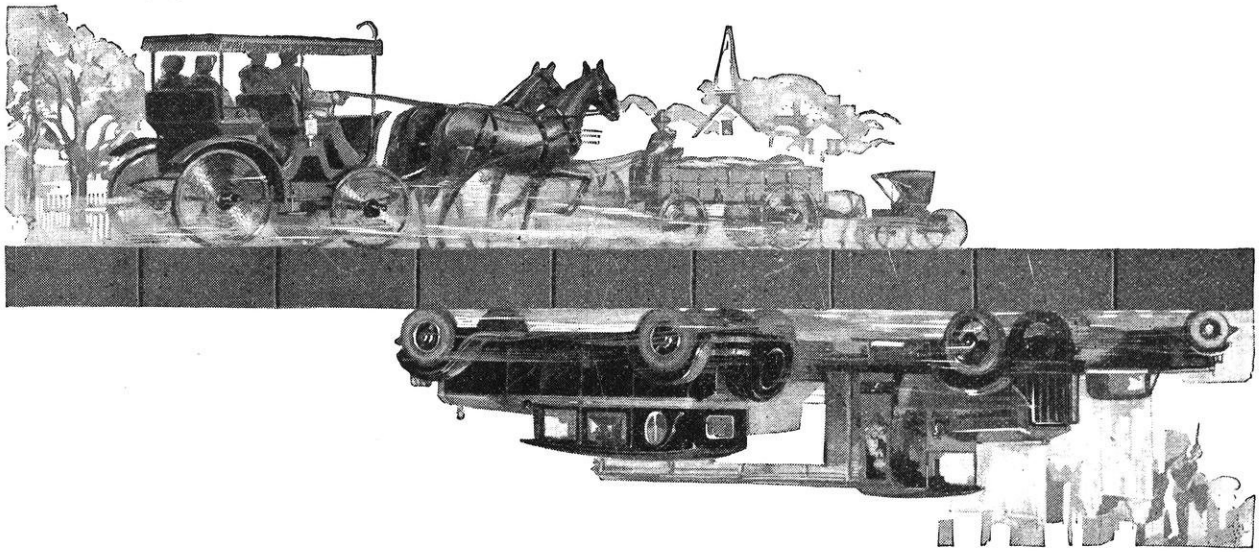
"No matter what you are asked to do, do it," said Professor Larson. "This is the field you say you want, and the opportunity is a good one. Stick to it."

Toward the end of the summer, Professor Larson made inquiry about his protege.

"Oh, he lasted only one night," was the answer. "He was put to work at a dirty job. It wasn't long before he was fed up, and announced that he held a college degree and didn't have to do that sort of work; so he quit."

We believe that a case like this is rare enough to be considered news and worthy of editorial comment. Most Wisconsin men are stickers and most of them know enough not to wave their diplomas during working hours. It is unfortunate that the actions of this one man are likely to have a number of regretable consequences: The superintendent of the plant is unfavorably impressed with college men and particularly with Wisconsin men; he is also made doubtful about the value of Professor Larson's recommendations. The workmen with whom this young engineer came in contact have had their opinion of college men lowered; the incident will make a good story for them to tell whenever the subject of college graduates comes up for discussion. All in all, it is the sort of thing we don't like. The fewer incidents of this kind, the better for all of us.

"What an individual makes of himself, determines the success or failure of his life." *—Chrisman.*



Sentimental Journeys
Then and Now—

WHEN the campus sheiks of the Class of 1896, Anyold College, donned their most heart-breaking raiment and sallied forth to play sentimental havoc with the inmates of Miss Van Teetum's Select Finishing School for girls, no gas-fed conveyance carried them on their way. Instead, they went in debt to the corner livery stable.

However, there's one thing to remember which links their day to yours. Many of the very same pavements—those of vitrified brick—over which they drove are the same pavements you are using today.

Keep that little fact in mind whenever you hear the praises sung of so-called "modern" pavements. Ask their backers to show you examples which have rendered even as much as fifteen years of service. (And then we will give you a long list of vitrified brick pavements which have resisted from twenty-five to forty-odd years of traffic.)

A Book for Roads Scholars

If "*The Construction of Vitrified Brick Pavements*" is not already a text-book in your courses, let us send you a personal copy. It is an accurate and authoritative handbook of 92 pages which you will want to preserve for reference after graduation.

VITRIFIED
Brick
PAVEMENTS

OUTLAST THE BONDS

NATIONAL PAVING BRICK MANUFACTURERS ASSOCIATION, ENGINEERS BLDG., CLEVELAND, OHIO

Kindly mention The Wisconsin Engineer when you write.

J. P. SMITH

ENGINEERS APPOINTED TO DESIGN A $5,000,000 DAM

A board of consulting engineers to supervise plans and specifications for the construction of the Coolidge Dam on the San Carlos Indian Reservation in Arizona, was named June 22 by the commission of Indian Affairs with the approval of the Secretary of the Interior.

The dam, which will be built across the Gila River near San Carlos, will cost approximately $5,000,000 and will store water for the irrigation of from 75,000 to 100,000 acres of Indian lands, public and private lands in the lower Gila River Valley. It will furnish a permanent supply of water to the Pima Indians living on the San Carlos Reservation.

—*Engineering News Record.*

ALASKAN ROAD CONSTRUCTION

The American frontier has not entirely disappeared. The roads which will open up the interior of Alaska are being built today under the direction of the Corps of Engineers, United States Army. The policy in regard to Alaskan Roads is to enlarge the territory reached by the roads and let the improvement for automobile traffic go until later. The automobiles in Alaska are not as important as the need for communication in the interior. In due time, possibly four years, the roads will be improved to meet automobile needs.

—*Engineering News Record.*

RAILWAY SANITARY ENGINEERS

Announcement by the Rock Island Line that there has been appointed as consulting sanitary engineer a man who has for some years past been sanitary engineer for the St. Louis Southwestern Ry. suggests the question, how many of our railway systems have sanitary engineers and of those who do not, how many might do so to advantage? The work on these two lines is called for largely by regional conditions, this work being malaria control. Other parts of the country than those reached by these two railway systems have need of malaria control work, and on all our railways there is constant need for the improvement of the environment of railway employees by eliminating unsanitary conditions on the railway lines and in the towns where their employees live, especially in small towns. Besides this, every railway engaged in interstate commerce has to give careful attention to the drinking water supplies on its trains in order to comply with the so called Treasury Standards administrated by the United States Public Health Service. Doubtless on many lines the last mentioned matter is well handled by the railway water supply departments, but not all the men in charge of these departments are well versed in matters of sanitary engineering. It is gratifying to see that some of the railways are appointing sanitary engineers to look after problems which can be best handled by members of that branch of the engineering profession.

—*Engineering News Record.*

RADIO IN HOTELS

The popular demand for radio in the United States has prompted the installation of receiving sets in some of the metropolitan hotels. Individual sets in each room are too expensive to run profitably but a solution has been reached in the Robert Morris Hotel in Philadelphia. A simple receiver costing about $25 is installed in each room. This set is connected with the main receiver in the lobby. The same program which is broadcasted in the lobby is sent to the rooms. The main telephone switchboard is also the control board for the receiver. The operator selects the best program which is being broadcasted at any particular time and plugs it into the rooms desiring service. The installation of radio in the rooms is a feature which has attracted many guests to the hotel, especially since this service is given without extra charge.

Summer brick work costs almost two and a half times as much as work done in the winter. This is the statement made by the business manager of one of the largest firms of architects in the country. It is due to the fact that the men who work in the winter do a bigger day's work because of the scarcity of jobs. This is undoubtedly true of all other phases of construction work and it will not be long before engineers realize this situation and do more winter work.

The developed water power of the world in 1920 was about 23,000,000 horsepower, according to an estimate made by the United States Department of the Interior in 1921. At the end of 1923, according to the best information available, it was about 29,000,000 horsepower, an increase of 26 percent in about three years. The increase in the production of electricity by water power in the United States for the same three years was about 20 percent.

Campus Notes

J. LEVIN

A. I. CH. E. INITIATES

The student branch of the American Institute of Chemical Engineers initiated twenty men at the recent initiation. This was the largest group of initiates that has been taken in for several years. At the same meeting Russel Harr and R. J. Zinn were elected to Polygon.

ETA KAPPA NU INITIATES

Eta Kappa Nu, honorary electrical engineering fraternity, held its fall initiation on November 12th. O. E. Anderson, G. G. Hebard, A. S. Holmquist, N. A. Golz, John Rabbe, and A. H. Reese, of the class of '26, and I. H. Gerks and B. R. Teare of the class of '27, were initiated. A banquet for the new men was given at the Hotel Loraine following their initiation.

A WISE ELECTRICAL

He drew a diagram of connections for the 110 volt to 2200 volt transformer; he connected it up very properly; he went to the switch board and plugged in 110 volts - **D. C.**; he threw in his switches. The primary meters gave a *good* deflection, but the secondary meters showed no reading. And *then* he told his instructor that the transformer was no good. Albert, of meter-room fame, said that even he could do better.

OUR MONTHLY PLAY

THE CRUEL CITY

A Play in One Act and Six Bits

SCENE: Chicago; the Northwestern Station — Butler Brothers across the street from the station.

Enter Mr. French, a stranger in the city. Hails taxi-cab.

Mr. French: "Butler Brothers, and hurry."

Driver: ? ? ?

Driver turns cab around and draws up in front of Butler Brothers.

Driver: "Six bits."

Mr. French: ! ! !

Stanley Roland, e '26, represented the Wisconsin chapter of Eta Kappa Nu, honorary electrical engineering fraternity, at the National Convention held at Purdue, November 5, 6, and 7. Roland is secretary of the local chapter.

Have you noticed the Wisconsin Engineer contributions box which has been placed below the Engineer bulletin case toward the left of the main stairway on the first floor of the Engineering Building? This box has been placed there with just this one idea in mind: The Engineer is *your* magazine, and, because it is your magazine, it wants you to share in its make-up. If you happen to hear a choice bit of humor that you think the rest of the fellows could appreciate, just jot it down and drop it into the "Contrib" box; if you notice something here or there that you believe would prove of interest to your fellow-engineers, drop a little item to that effect into the box; or if you've had some experiences working during the summer that you would like to pass on to the other fellow, don't hesitate to write a little story and drop it into the Engineer box.

E. A. Sipp, e '15, who is now Aero Engineer at McCook Field, presented an illustrated lecture on "Illuminating the Way for Night Air Mail", Monday morning, October 19, in the Engineering Auditorium. Juniors and seniors were excused from classes in professional subjects to attend this lecture.

Erwin R. Summers, e '26, attended the National Convention of Tau Beta Pi, honorary engineering fraternity, held at Purdue on October 15, 16, and 17, as the representative of the Wisconsin chapter. Forty-eight chapters of Tau Beta Pi sent delegates to this convention. Summers is secretary of the local chapter.

Kappa Eta Kappa, professional electrical engineering fraternity, announces the formal initiation of the following men:

H. F. Mackin '27, Madison; O. S. Young '27, Chili; and R. D. Jordan '27, Marinette.

John Piltz, c '26, and Judson P. Smith, c '26, must henceforth be addressed by the titles of "Judge" Piltz and "Judge" Smith, respectively. Both have been elected to the Student Court as representatives of the College of Engineering.

Two announcements which ought to interest some connoisseur of antiques may be found on the bulletin board toward the left of the main stairway in the Engineering Building. One of these notices is a letter of instructions from Dean Turneaure to John Babcock, janitor of the Engineering Building in the transition period between the nineteenth and twentieth centuries, dated December 15, 1902. The other is an announcement of a medal award to be given for the best thesis submitted to the Science Club not later than May 1, 1903. Collectors of antiques, how much are we bid?

IN little more than a quarter century, the manufacture of Timken Bearings has become by far the greatest bearing industry. A daily capacity of 125,000 bearings is required of Timken plants in the United States, Great Britain and France. The total of Timken Bearings built has reached 150,000,000! And Timken Bearings are being ever more nearly universally applied to machinery of all kinds, to rolling stock, and to motor vehicles.

Indeed, in many instances, the use of anti-friction bearings first became possible only because of the special characteristics of Timken Bearings.

The progress of industry toward a scientifically economic basis throughout will be in your hands. And Timken Bearings are playing an ever larger part in industrial economics. The reasons are interestingly outlined in the little stiff-bound book, "The Design of the Timken Bearing." You may have a copy upon request.

THE TIMKEN ROLLER BEARING CO.
C A N T O N , O H I O

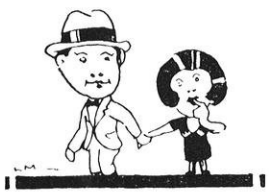
Alumni Notes

R. T. Homewood

CHEMICALS

Clarence Hare, ex-ch '24, was married on September 5 to Miss Alva Groth. Hare is with Du Pont Powder Works, and is living at 820 S. Pearl St., Joplin, Mo.

C. F. Hayden, ch '18, is with the Minneapolis Heat Regulator Company, Grand Central Terminal Bldg., New York City.



Guerdon H. Head, ch '21, was married on October 12 to Miss Margaret Elizabeth Torrance of Dubuque, Ia. Head is Industrial Gas Engineer with the Wisconsin Gas & Electric Co., Racine, Wis.

Presley D. Holmes, ch '19, became the proud father of a daughter, Pricilla Karen, on September 14. Holmes is living at 10315 S. Campbell Ave., Chicago, Ill.

C. H. Nicholson, ch '16, sends his address as 730 Jefferson Ave., Scranton, Pa.

The following chemicals were back for the Homecoming Game:

G. H. Head, ch '21, is an industrial engineer with the Wisconsin Gas & Electric Company at Racine, Wis.

A. S. Krenz, ch '23, is laboratory engineer with H. A. Peterson Company, Chicago. He is living at 4346 N. Hermitage, Chicago, Ill.

A. J. Huezel, ch '22, is chemical engineer with Albert Trostel & Sons Company, Milwaukee. His address is 654 Island Ave.

CIVILS

W. H. Bradley, c '78, has changed his address to 960 S. Oxford Ave., Los Angeles, California.

Louis C. Crew, ex-c '25, is with the Morehouse Natural Gas Company, Bastrop, La. He writes, "Although I am not an alumnus, I wish you would list my address so some of the old gang can know where to write me. I would be glad to hear from any of them."

Cecil R. Ekholm, c '25, is manager of the Superior Bottling Works. His address is 1212 East Second St., Superior, Wisconsin.

George Evans, c '94, has recently been made president of the Laclede Gas Light Company, one of the largest corporations in St. Louis.

C. W. Green, c '07, is with the Bell Telephone Laboratories of New York engaged in telephone systems development. In addition to his regular duties, he is instructor in Toll Systems in the out-of-hour educational courses which the company provides for its employees during the winter months. Mr. Green has been with the Laboratories, formerly the Engineering Department of the Western Electric Company, since 1919.

Glenn N. Grout, ex-c '25, is chief of party in the La Crosse Division of the Highway Commission. Address: Room 308 Y. M. C. A., La Crosse, Wis.

K. Dick Farwell, c '23, is chief of party for Chicago North Shore & Milwaukee Electric Line. He is chief of the party which includes **Glenn Bartleson,** c '25. Farwell says he still plays the drums occasionally, but has cut out orchestra work; he finds the midnight drumming and work do not go well together. He is living at 6117 Kimbark Ave., Chicago.

Raymond Grans, ex '18, is with Arthur Neilson Company, Engr. Adv. Specialists, Franklin & Madison St., Chicago, Illinois.

W. O. Hotchkiss, c '03, C. E. '08, has accepted the presidency of the Michigan State School of Mines at Houghton, Michigan. Professor Hotchkiss has been on the University instructional staff since 1904.

E. T. Howson, c '06, C. E. '14, is second vice-president of the American Railway Bridge and Building Association.

J. H. Kuelling, c '08, has opened offices at Milwaukee as consulting engineer in municipal engineering work of all types. In addition, Mr. Kuelling has been retained by the Wisconsin Vibrolithic Company as their consulting engineer.

E. E. Parker, c '07, City Engineer of Madison, has recently been elected president of the Madison Association of Commerce. Mr. Parker is serving his fourth year on the board of directors, and was vice-president at the time of his election.

Arthur C. Nielson, c '18, is president of the Arthur Nielson Company, Engr. Adv. Specialists, Franklin & Madison St., Chicago.

Frank Schroeder, c '07, is engineer and appraiser with the American Appraisal Company, Milwaukee. He is living at 535 Downer Ave.

Fred A. Simons, ex-c '25, is with the Wisconsin Highway Commission, working in the Testing Laboratory at the university.

James Smallshaw, c '25, sends his address as 811 S. 20th St., Birmingham, Alabama.

Edward Stearns, c '07, is consulting bridge engineer with offices at 2008 Lexington Bldg., Baltimore, Md.

The following civils were back for the Homecoming Game:

Louis C. Alk, c '25, engineer with the Sanitary District of Chicago. He is living at 4032 W. Van Buren St., Chicago.

H. V. Ballam, c '25, is with the Metropolitan Sewerage District of Milwaukee. The district takes in Milwaukee and surrounding municipalities. Ballam is on inspection on development. He is living at 245 Prospect Ave.

R. H. Cahill, c '13, is designing and constructing engineer with the water department of Milwaukee. His home address is 386 Beverley Rd., Milwaukee.

Herbert H. Brown, c '17, is working with the City engineer of Milwaukee. His residence address is 1205 Thirty-sixth St., Milwaukee.

Glenn S. Bartelson, c '25, writes, "I am working for the Chicago, North Shore & Milwaukee R. R. as levelman. Dick Farwell, '23, is chief of party. We are on location on the new Skokie Valley extension — a high speed electric railway, double tracked from Chicago to Waukegan. I commute to the construction camp from my room at 625 Clinton Place, Evanston, Ill. From camp we are taken out on the line in trucks.

"I am using all the knowledge I gained in Railways 22, and could find use for more. My experience so far has shown me it is harder to keep a six to ten thousand foot tangent straight than it is to check out on a 1000-ft., one-degree curve. We have to re-run part of the line daily, and that center line on a tangent sure is a real problem, even with reference stakes on both sides of the track.

"I like the work well, but I imagine I will shiver plenty this winter, for the constructional work won't be finished till sometime next summer and our field party is set for work in the open all winter."

Arthur W. Crump, c '15, is valuation engineer with The American Appraisal Company of Milwaukee. His residence is at 356 N. Park Front, Milwaukee.

F. L. Bumer, c '23, is with the American Bridge Company of Chicago. He is living at 2829 Cambridge Ave., Chicago.

Henry C. Fuldner, c '97, registers his business as 228 Third St., and his home address as 2727 Chestnut St., Milwaukee, Wis.

Ralph N. Greenman, c '23, is with A. T. & T. He recently received a commission of 2nd lieutenant in the engineers reserve, and has been assigned to Company B-346 Engineers, a Wisconsin Regiment.

Wm. S. MacLeod, c '24, is assistant office engineer with Consoer, Older & Quinlan. His home address is 140 S. Dearborn St., Chicago.

Walter G. Nathan, c '18, is service engineer with Ajax Motor Co., Racine. His home address is 602 Frederick Ave., Milwaukee, Wis.

Thomas M. Niles, c '23, is with Pearce, Greeley and Hanson, as assistant engineer. His address is 6 N. Michigan Ave., Room 1710, Chicago.

Louis Pope, c '11, can be reached at 914 State St., Racine, Wis.

Walter J. Parsons, c '00, of the Wray-Parsons Company of Waukegan, Ill., registers his address as 1815 Lunt Ave., Chicago, Ill.

A. H. Pitz, c '08, is a contractor at 923 Commercise St., Manitowoc, Wis. His residence is 512 State St., Manitowoc.

L. T. Sogard, c '24, is mason inspector with the Illinois Central Railroad. His home address is 1521 Wisconsin St., Racine, Wis.

H. F. Weckwerth, c '23, is an engineer with Northern Indiana Gas & Electric Co. His address is 127 Detroit St., Hammond, Ind.

K. R. Wicker, c '23, is assistant city engineer of Manitowoc. His home address is 1915 Wollmer St., Manitowoc, Wisconsin.

ELECTRICALS

E. L. Andrew, e '16, has recently been appointed Assistant Manager of the Merchandising Department of the Westinghouse Electric & Manufacturing Company. Mr. Andrew's duties as Assistant Manager are in addition to his other responsibilities as head of the advertising department for all merchandising products of the Company. His headquarters are at Mansfield, Ohio, where merchandising and heating products are manufactured.

Neal D. Herrick, e '23, has changed his address to 382 Charles St., Malden, Massachusetts.

Alex Morgan, e '09, M. E. '17, announces the arrival of Carol Ann on August 3. Mr. Morgan is living at 1549 Robinwood Ave., Cleveland, Ohio.

Frederich G. Mueller, e '16, was married on September 2 to Miss Ruby Worthington of Union Grove. Mueller is with the Commonwealth Edison Company, Chicago.

A. S. Rufsvold, e '23, is now located in the General Engineering Department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Hugo L. Rusch, e '23, is at 441 Lexington Ave., Room 802, New York City.

Clare L. Schneider, e '18, is the proud father of a son, Charles Monro. Schneider is living at 22 Lathrop St., Madison, Wis.

C. W. Thomas, e'25, sends his address as 1506 Florence Ave., Evanston, Ill.

The following electricals were back for the Homecoming Game:

Nathan Boruszah, e '24, is engineer with T. M. E. R. & L. Company. His home address is 604 Galena St., Milwaukee, Wisconsin.

A. O. Bullerjahn, e '13, is consulting engineer on plants and processes at 2620 Potwyne Place, Chicago, Ill.

Lloyd L. Call, e '18, is research engineer with The Victor X-Ray Corporation, Chicago. His address is Robey & Jackson Blvd., Chicago.

Simeon M. Coe, e '24, can be located at 1005 W. 3rd St., Sterling, Ill.

N. J. Conrad, e '05, is general manager of Schweitzen & Conrad, Inc., Chicago.

G. H. Finkle, e '24, is electrical engineer with the Wisconsin Power & Light Company at Berlin, Wis.

L. M. Fraiser, c '23, is with the Chicago Surface Lines. He is living at 150 N. Elmwood Ave., Chicago.

Wayne R. Fleishauer, e '25, is student engineer with Allen Bradley Company. His address is 129 13th St., Milwaukee.

H. R. Heintzen, e '18, is an industrial engineer with Cudahy Bros. Co., Cudahy, Wis. His address is 730 Murray Ave., Milwaukee, Wis.

Carl E. Hoelz, e '23, is engineer with T. M. E. R. & L. Company. His home address is 634 Walker St., Milwaukee.

A. N. Hoelz, e '23, is an engineer with T. M. E. R. & L. Company. He is living at 1013 Frederick Ave., Milwaukee.

E. Holub, e '25, is railway superintendent with Wisconsin Public Service Corporation. His home address is 423 N. 6th St., Manitowoc, Wis.

C. G. Jones, e '09, is sales engineer with General Electric, at Milwaukee. His home address is 942 Cramer St.

T. P. King, e '24, is with the Wisconsin Public Service Corp. He is living at the Y. M. C. A., Green Bay, Wis.

Howard G. Krohn, e '24, is with the Automatic Electric Company, Chicago. He is living at 208 N. Central Ave.

Raymond A. Krueger, e '23, is assistant engineer with Wisconsin Valley Electric Co. His home address is 902 Prospect Ave., Wausau, Wis.

J. Wilbur Magann, e '22, is a rate engineer with Byllesby E. & M. Corp., at 231 S. La Salle St., Chicago. He is living at 156 N. Oak Park Ave., Oak Park, Ill.

G. W. McCollum, e '21, is with Joslyn Mfg. & Supply Co., at Downes Grove, Ill.

E. B. Morse, e '18, with his wife, mother, and sister was up for homecoming. He is with Valley Iron Works Company, Appleton.

V. W. Nemetz, e '24, is with the Commonwealth Power Corp. His home address is 519 W. Michigan Ave., Jackson, Michigan.

Frederick W. Nolte, e '23, is purchasing agent with Wisconsin Valley Electric Co., Wausau, Wis.

K. J. Pech, e '24, is with the Wisconsin Public Service Corp., Green Bay, Wis. His home address is 727 N. 7th St., Manitowoc, Wis.

E. M. Plettner, e '24, is with T. M. E. R.& L. Company. His home address is 155 Farwell Ave., Milwaukee, Wis.

C. W. Sharratt, e '25, is transmission tester with Wisconsin Telephone Company, Appelton, Wis.

W. P. Schoenoff, e '24, is with Wisconsin Power Light & Heat Co. His address is 112 Forest Ave., Fond du Lac, Wisconsin.

Edward A. Sipp, e '15, is at McCook Field, Dayton, Ohio. His home address is 1043 Rupin Ave., Dayton. Mr. Sipp gave an illustrated talk on night flying while he was here. The advancements made in illumination to aid night flyers to land safely were well brought out by the talk and the accompanying slides and movies.

N. L. Waffle, e '25, is with C. S. I., Commonwealth Edison Co. He is living at 6425 Ingleside Ave., Chicago.

R. Wood, e '17, is engineer with Western Electric Co. He is living at 526 N. Central Ave., Chicago.

MECHANICALS

Harold Addington, m '24, has been transferred from the La Crosse office to the Cleveland branch of the Trane Company.

Earl Caldwell, m '24, and former staff member of the Engineer, is in Ward 55 of Walter Reed Hospital, Washington, D. C. Earl is suffering from a shrapnel wound in the face which has begun to give trouble again. He has been in the light-house service at Staten Island.

Horace K. Dean, m '21, was married on August 5 to Miss Evelyn Brodesser of Milwaukee. They are living at Allentown, Pa.

O. H. Marshall, m '19, has developed into a merchant at East Troy, Wis.

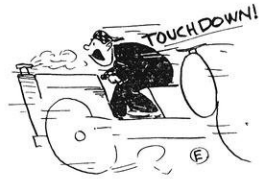
Roger S. Moore, m '11, has changed his address to 936 Washington Blvd., Oak Park, Ill.

W. D. O'Connor, m '22, has been with the Westinghouse Company since June, 1924, and is now in their Bureau of Patent Development. His address is 1028 South Ave., Wilkinsburg, Pa.

M. K. Drewry, m '22, announces the arrival of a son, Kenneth Allen, on August 20. Drewry is living at 367½ Beulah Ave., Milwaukee, Wis.

John B. Leonard, m '24, is now assistant to the Chief Engineer at the Detroit branch of the American Blower Company.

Bruce F. Reinhart, m '25, is with The White Motor Company at Cleveland. He writes to Professor Larson, "I entered as a technical apprentice for one year, but I justified my conceit to some extent at least by getting out of the training course in three months. While waiting for a permanent assignment, which by the way, I received today in the Service Department, I whiled away the time by being a rough tester on the largest size bus chassis, — 230 inch wheel-base. And believe me, I have been some rough tester. The blooming things will make nearly 50 m. p. h. in top gear with the governor on, and as usual, I rode the governor whenever the opportunity presented itself. I am afraid that I have caused many gray hairs to sprout on some of the peaceful motorists on the roads near Cleveland. There are two one-ton cast iron weights, a seat, and a gas tank, which comprise a tester's equipment. No, I did not have to lift 'em on alone. Fortunately, I had only the usual run of accidents; — mud, ditches, blowouts, and one bum wheel, though I have had my share of narrow escapes. But I start on a white collar job tomorrow as a service salesman for the Cleveland district, so I'll be fairly safe this winter." Reinhart can be reached at 8109 Hough Ave., Cleveland, Ohio.



Chester J. Schmidt, m '25, is connected with the Armstrong Cork and Insulation Company, working out of the Milwaukee office. His address is 2904 Grand Ave., Apt. 308, Milwaukee, Wis.

W. M. Shelan, m '25, is with the Public Service Company of Northern Illinois on the construction of their transmission and distribution power lines. His address is 1515 W. Monroe St., Chicago, Ill.

Earl P. Shnable, m '18, is sales engineer with Pauling Harnischfeger Company, Milwaukee, Wis.

G. B. Tjoflat, m '24, is now located in the Patent Department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh. He recently completed the Graduate Student course of the Company, and is deeply engrossed with the study of patent law with the Westinghouse legal staff. He is much interested in his work, which offers a wide field for engineering students having a liking for the legal side of things.

Alfred T. Muehlenbruch, m '25, is working at the Standard Oil refinery in Whiting, Ind. He writes to Professor Larson, "We left immediately after I received my sheepskin and the next morning we were on our way to Three Lakes where we had a little cottage, just the right thing for honeymooners. For a week we had a wonderful time cruising around the chain of lakes with our Evinrude and fishing and hiking thru the woods. The fish weren't biting very good, but we managed to get several nice pike and our only regret was that we couldn't stay longer. . . If the job had been specially made to order it could not have been better suited to my wants. What we are mainly trying to find out now is to how high an initial pressure we should go, and also how well we can balance the steam and electrical loads." Muehlenbruch is living at 6440 Woodlawn Ave., Chicago, Ill.

Robert B. White, m '18, editor of the Wisconsin Engineer back in '17, is sales manager with the Valvoline Oil Company at Chicago. His adress is 108 N. Clinton St.

John M. Wood, m '17, is at 2544 East Blvd., Cleveland, Ohio.

Benjamin F. Wupper, m '23, is now with Williams, Bradbury, McCaleb, & Hinkle, Patent & Trade Mark Law, at 1315 Monadnock Bldg., Chicago.

The following mechanicals were back for the Homecoming Game:

Ellis R. Brandt, m '17, is with Fairbanks Morse & Company. His address is 1045 Prairie Ave., Beloit, Wis.

C. H. Cambell, m '22, is production engineer with Acme Steel Company. His address is 102 Lincoln St., Riverside, Illinois.

C. J. Chambers, m '24, is working on heating and ventilating at 1417 Railway Exchange, Chicago. His home address is 311 N. Center Ave.

(Continued on page 54)

Athletics

B. R. Teare

FOOTBALL

With the loss to Michigan, Wisconsin's hopes suffered a slight fall, but none the less the team showed real spirit and honest-to-goodness fight. It was the home-coming game and the stadium was packed to the capacity of its regular and auxiliary seats. In that contest the Badgers were defeated by a superior team, without a doubt, but the score by no means indicates the slightness of the superiority. During the first few minutes of play Michigan opened up a heavy surprise attack, and before the Cardinal team or fans realized what had happened, the Wolverines had covered the length of the field to score two touchdowns. The first of these came on a pass after two plays, and the second, much to the surprise of all, was made by an eighty-seven yard run from the kickoff. But the Wisconsin team, dazed a bit as it seemed by this sudden course of events, never lost an ounce of fight and came back to face the foe determined to stop this onslaught. From that time on, the teams played a well matched game, first one eleven then the other seeming to have the advantage. Many men, including Captain Steve Polaski, were injured and had to be taken out. In the second quarter Michigan again scored a touchdown after a strong aerial attack. This type of attack was worked consistently and successfully by the opponents throughout the entire game, and Wisconsin, too, proved her ability to gain yardage in this manner. The game finished with no more scores for either team, a 21-0 victory for Michigan, but to the last minute of the last half, the Badger warriors gave their utmost, doing their best to avenge the early cyclonic attack of the opponents.

All bitterness of defeat was then put aside as the Cardinals, profiting by the lesson from Michigan, prepared to blot out the past in the game with Purdue. The Boilermakers, seldom serious contenders for the championship, nevertheless, came with a strong aggregation and the dope and reports that preceded them led the coach to give his men strenuous drill during the preceding weeks in preparation.

The game, which was the first conference victory for Wisconsin since the Indiana game of 1923, was a battle royal in a sea of mud. Both teams slipped and splashed, and slid back and forth in a nip and tuck affair, until Wisconsin in the first quarter made the final winning score of 7-0. Purdue never gave up hope, and with a slashing line and aerial attack often seriously theatened the home team, but each time their supremacy was endangered the Badgers tightened and showed their teeth. Taken all in all it was a very close game and not an easy win for Wisconsin, but the playing conditions were very adverse, — incessant rain and an abundance of mud made plays anything but easy.

Following the contest with Purdue came a week of intensive preparation for Minnesota, which although having played no conference games had a high rating according to reports, which, as was subsequently found, were not exaggerated. To add to complications, the weather man sent his worst, regular December weather. Most of the practice, however, was still outdoors, to prepare for the actual conditions of the game.

On the Thursday night before the game the team was given a huge sendoff in the red wagon with a

Wisconsin Revives the "Red Wagon" Days For The Team Send-off

seventy piece band and a yelling, singing, and cheering crowd of 2000 students. The torchlight procession made its way to the West Madison depot with a strong determined enthusiasm that presaged a stiff fight. Before the team left, the crowd called on Steve Polaski, Coach Little, and trainer Joe Steinauer. The captain and coach promised the students to give all they had, and Joe told them that the squad was in the pink of condition.

October thirty-first was Dad's Day at Minnesota and the contest was the first conference game to be played in the new stadium. The game started out briskly with Wisconsin seeming to have the advantage, but this lasted for only a few minutes, while the Badgers made first downs twice by a couple of brilliant plays. Then the honors fell to Minnesota as the Gophers crashed through the line again and again for substantial advances that gave them a touchdown in each of the second and third quarters. In the third, especially, they threatened the Badger goal, but the defense would strengthen sufficiently each time. In the last quarter when all seemed lost, the Cardinal eleven suddenly opened a brilliant aerial attack that soon netted a touchdown, and spurred on by the pleading of the Wisconsin fans for another one, the team intercepted a pass from Minnesota and started down the field again. There was a tense moment when Leo Harmon hit the line for the last yard and again

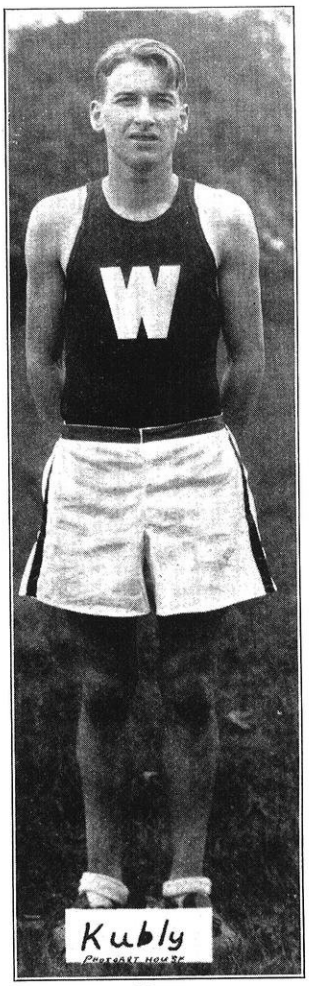
when his brother Doyle kicked for the extra point. Unfortunately this was blocked and the score remained 12-12, the third successive tie with Minnesota in as many years.

From Minnesota the Cardinals turned to prepare for Iowa, which has one of the strongest teams in the conference. The game, which came a week later, was played in a raging blizzard, and only by a narrow margin was Wisconsin victor, the score being 6-0. The wind was so strong that punts were difficult, and the playing conditions were exceedingly bad — the players had to wear gloves, and every few minutes the ball had to be wiped off. During the whole first half the game was Iowa's, but in the second, the come-back power of the Badgers was again demonstrated. Fumbles came very frequently, being made by both sides, and the breaks were about evenly divided. However, in the fourth quarter, Kreuz carried the ball across for a touchdown, adding another conference victory to Wisconsin's record. Only one conference game is left and that is with the old traditional rival, Chicago. If that game falls to the Cardinal, there is a chance of winning the championship.

However, as has been shown in the preceding games, each man on the team may be relied upon to give his last ounce, and no more can be expected. To George Little, the Badger mentor, highly admired, and the favorite of all, goes most of the credit for the new Wisconsin fighting team. He is building, not a team of the moment, but a lasting spirit and is just as truly as Fielding H. Yost, a "builder of men". With him to guide the Badgers, there need be no fear for lack of a real team.

CROSS COUNTRY

Wisconsin's harriers, headed by Captain Ray Kubly, the only veteran of conference competition on the squad, have a good start toward another conference championship. At Homecoming the team gave Michigan a decisive defeat with a score of 22-33, as Chapman, the sophomore flash, cut the course record to 15:29. Wisconsin took four of the first five places. The Chicago race, scheduled for Oct. 24, was postponed because ineligibility made it impossible for Chicago to send a team to Madison. Instead, a time trial was held to pick the men who were to go to Minneapolis on Oct. 31. Captain Kubly, Schutt, Elleson and Chapman were sure to go, and Coach Mead Burke also selected Butz, McGee, Gumbreck and Reeves to make the trip. Incidentally, in this time trial these men clipped about thirty-five seconds off the time they turned in for the Michigan race.



CAPTAIN KUBLY, OF THE VICTORIOUS CROSS-COUNTRY TEAM

On a strange course, against the veteran Minnesota team, the wearers of the Cardinal won their second conference meet. The race over a five mile course abounding in hills was a real test for the Badgers, and proves that Wisconsin will again be strong contenders for the 1925 cross country title.

Chapman was well in the lead as he neared the finish line, but he slowed down and crossed on even terms with Captain Kubly. Gumbreck ran a beautiful race finishing close behind Elleson, while Schutt, McKee, and Butz followed in order.

On November 7, the Badgers faced the strong Iowa team, held slightly in less favor than their opponents. The turf course there, too, was very hilly, and the defenders had proved their ability in the previous race with Illinois. However, in the face of a raging snowstorm, Coach Mead Burke's men defeated the Hawkeyes by a score of 25-30, Chapman leading the nearest opponent by a hundred yeards. Since Iowa was one of the strongest contenders for the conference championship, this victory adds much to the rating of Wisconsin.

ALUMNI NOTES

(Continued from page 48)

Daniel Donnelly, m '24, is with the National Heating and Ventilating Company, Wausau, Wis.

Courtney C. Douglas, m '03, is working on Steam Turbine Sales with General Electric Company at Chicago. His address is 223 S. East Ave., Oak Park, Ill.

Art. Edwards, m '25, is student engineer with the Trane Company, La Crosse. He is living at the La Crosse Y. M. C. A.

H. E. Fellows, m '16, is with Webster Electric Company at Racine. His address is 1436 Hayes Ave., Racine, Wis.

A. P. Gerhardt, m '21, is with Western Electric at Chicago. His address is 156 N. Oak Park Ave., Oak Park, Ill.

M. W. George, m '13, registers his business address as 6 N. Clark St., and his home address as 4846 Kimbark Ave., Chicago, Ill.

David Greiling, m '24, is with Bishop Babcock Company, Cleveland, Ohio.

Winford W. Greiling, m '22, is sales engineer with American Blower Company at Detroit. His address is 291 Chandler St., Detroit.

Waldo G. Ganson, m '20, is with Fairbanks Morse Company at Beloit. His address is 760 W. Grand Ave., Beloit.

H. T. Hartwell, m '24, is instructing at the university. He is living at 405 N. Frances St., Madison.

B. H. Hawkins, m '13, is assistant engineer with Underwood Oil Products Company. His address is 3205 Kenilworth, Berwyn, Ill.

A. R. McArthur, m '00, is chief engineer with American Sheet and Tin Plate Company, Gary Tin Mill, Gary, Ind. He is living at 674 Harrison St., Gary.

O. A. McArthur, m '23, is assistant to the superintendent, Gary Railways. His address is 647 Harrison St., Gary, Ind.

Roger S. Moore, m '11, is engineer with Chicago By-Product Coke Company. His address is 936 Washington Blvd., Oak Park, Ill.

E. E. Olson, m '24, is distribution engineer with The Newport Company. His address is 379 E. Oklahoma Ave., Milwaukee, Wis.

W. R. Palechak, m '23, is a designer with Water-Genter Company. He is living at 1224 La Salle Ave., Minneapolis, Minn.

J. L. Peterson, m '23, is with Fairbanks Morse Company. His address is 1025 8th St., Beloit, Wis.

R. S. Phillips, m '23, is instructing at the university. He is living at 405 N. Frances St., Madison.

H. M. Posz, m '21, is with the American Well Works, Milwaukee. He is living at the Y. M. C. A.

P. A. Royer, m '21, is with the Illinois Steel Company at Gary. He is living at 6241 Blackstone Ave., Chicago.

R. R. Schaub, m '22, is with Western Electric at Chicago. His address is Westmont, Ill.

John Slezak, m '23, is with Western Electric. His address is 156 N. Oak Park Ave., Oak Park, Ill.

R. A. Trotter, m '24, is instructing at the university. He is living at 660 State St., Madison.

I. L. Wade, m '23, is fuel engineer with Public Service Company of Northern Illinois. His address is 410 N. Nicholson St., Joliet, Ill.

MINING

Don V. Slaker, min '20, is secretary and treasurer of Slaker Health Food Company. His address is 84 Galent, Aurora, Ill. Slaker was here for the Homecoming Game.

STANDARDIZATION

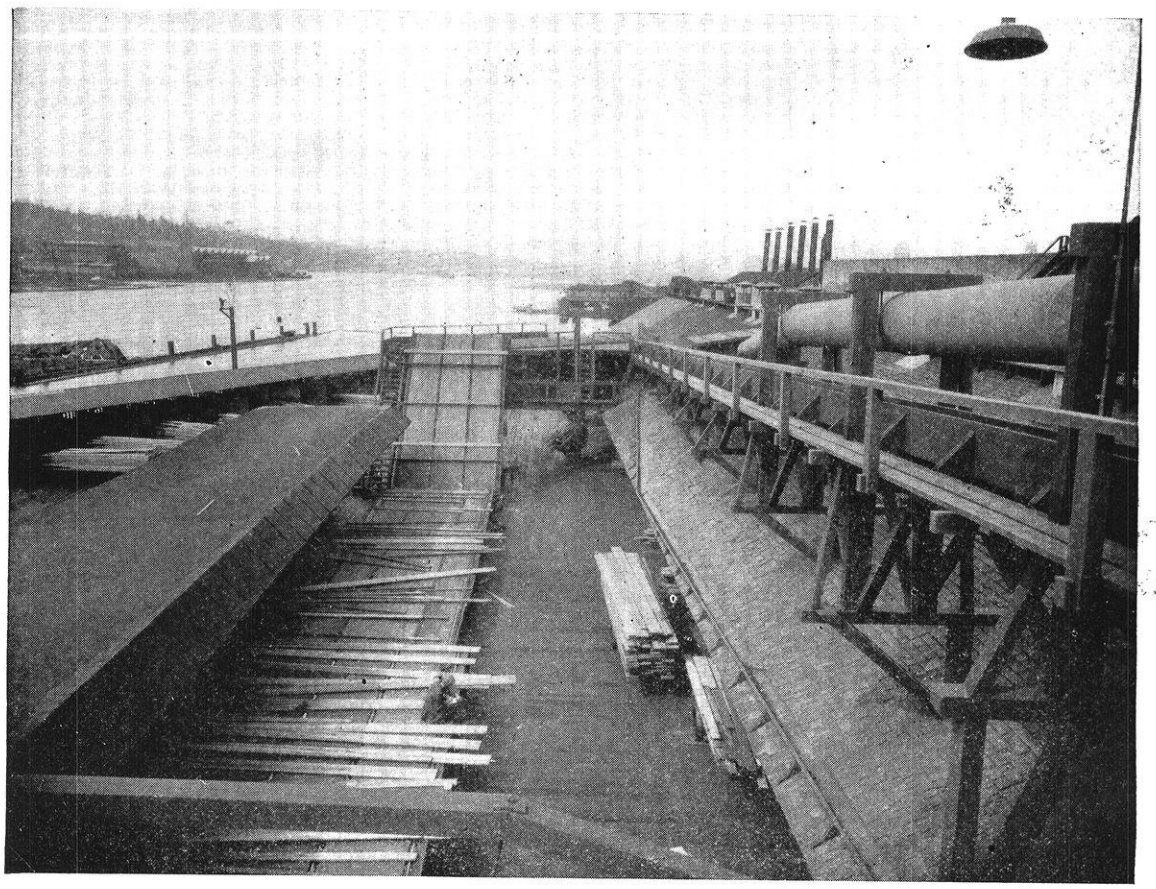
(Continued from page 28)

The incandescent lamp and its widespread use in this country is an outstanding example of the results of standardization.

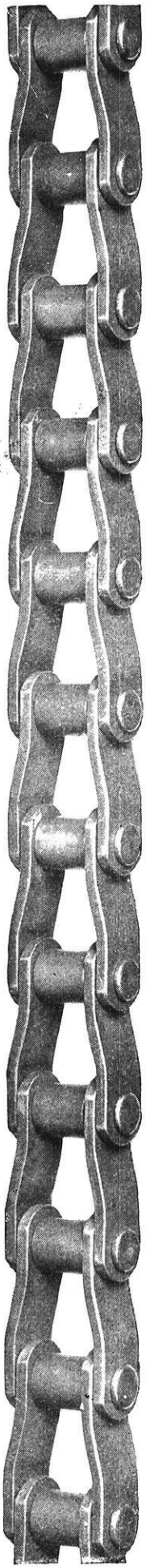
If we go back to the year 1900, we find that lamp sizes ran from 2 to 32 candle-power, the sizes being 2, 4, 8, 16, and 32 candle-power. Since 3 of these sizes were each made for 3 different efficiencies there were lamps of 11 different wattages. Although there was some demand for lamps of voltages between 200 and 260, the principle demand lay between 100 and 130 volts. In this range there was at least some demand for each individual voltage. With 11 wattages and 30 voltages there were, therefore, 330 wattage-voltage types. Thirteen different styles of bases were in use, hence the total number of wattage-voltage-base types was 4,290. Each lamp was made with 3 different shapes of filament and 3 different bulb finishes. (Clear, bowl frosted, and all frosted.) Taking account of the full description of the lamp — wattage, voltage, base, shape of filament, finish of bulb — there were 38,610 types of lamps, for any one of which a manufacturer was liable to receive an order any day.

At the present time the range of sizes of incandescent lamps is from 10 to 1,000 watts or 100 to 1 as compared with 16 to 1 in the days of the carbon lamp. Each size of lamp is now made with only one standard base. The number of individual voltages has been decreased from 30 to 3 — 110, 115, 120. There is only one standard type of filament mounting for each lamp. Not all of the lamps are finished with the 3 different bulb finishes. The result of this standardization is that there are about 150 types of lamps in common demand. This standardization of types has resulted in great economy in the manufacture of lamps since it is possible to set up the complicated lamp manufacturing machinery for a given type of lamp and let the machine run for weeks or months without change. A great economy has been produced in manufacture also by decreasing the amount of stock of parts it is necessary to carry.

A tremendous saving has been made in the investment in trade stocks. Even with the present degree of standardization of lamp demand, the total amount of stocks carried by all the electrical dealers of the country would amount to approximately three month's total demand. The carrying charges on this amount of stock are of the order of magnitude of 1 cent per lamp. If the number of lamp types was suddenly increased to 38,610, it would be necessary, in order to maintain the same rapid service to the trade, to increase the stocks approximately in proportion to the number of types. This would call for a theoretical stock increase in the ratio of 300 to 1. If this were put into effect the carrying charges per lamp would be $3 instead of 3 cents. This is manifestly an absurdity. This assumed increase in the number of types would not be accompanied by a corres-



General View of Rex Conveyors at Seattle Cedar Lumber Manufacturing Company; Overhead Conveyor at the Right



At the Forefront of an Expanding Industry

THE outstanding development of American Industry during the past decade has been the progress of mechanical handling of materials.

Necessitated first by the demands of quantity production and the rising cost of labor, it was given additional impetus by war conditions and the later curtailment of immigration.

Great as the progress of mechanical handling has already been, it is still in its infancy. The possibilities of its expansion seem to be unlimited, as there is scarcely an industry today that does not realize the advantages of dependable, always-on-the-job conveying machinery.

The Chain Belt Company was a pioneer in the mechanical handling field. Many of the outstanding improvements in material handling equipment have been designed, engineered and built by it.

Rex Chain, Rex Transmission Machinery, Rex Concrete Mixers and Pavers, Rex Water Screens

REX CONVEYORS

CHAIN BELT COMPANY

759 Park St., Milwaukee, Wis.

ESTABLISHED 1891

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ponding increase in trade stocks. The carrying charges would increase in whatever proportion the lamp stocks were increased, and the rapidity of service to the trade would decrease directly in proportion to the unfulfilled part of the 300 to 1 increase in trade stocks.

The practical results of standardization of lamp voltages and types is best illustrated by a comparison of the prices in England and in this country. The common small sizes of vacuum lamps sell here for 27c while in England the corresponding price is 2s. 2d. — approximately twice as much.

Thus we see that a standardization has contributed very materially to the economy and wide-spread use of electric lighting in this country.

POWER PLANT MODERNIZATION

(Concluded from page 33)

K. W. capacity developed, even the boiler plant equipment costs are less.

Therefore the saving of about 10% in the fuel bill of the station will be made without an increase in fixed charges. Since the coal bill is very approximately two-thirds of the total power production costs, the installation of 1200# equipment should net a reduction of about 7% of total production charges.

Relative Total Plant Costs

Proposed 1200# plant costs compared with cost of present Lakeside Station.

	Ratio of 1200# unit costs to 300# unit costs
Land	1.0
Tracks	1.0
Marine, tunnels, etc.	1.0
Excavation and structures	.77
Boiler plant equipment	.82
Coal handling and Pulv. Equipment	1.0
Prime Movers Equipment	1.02
Electrical Plant Equipment	1.0
Miscellaneous	1.0
Total plant costs	0.91

When it is appreciated that addition of only 10% added turbine capacity to a plant can effect a decrease of 7% in the total production costs of the entire output, the value of 1200# cycles in modernizing older power stations is realized.

Following the announcement that the Government had lost its case against the Chemical Foundation, the Attorney General announced that he would make an appeal to the United States Supreme Court.

Chemical engineers in Washington feel that this is an extreme measure and are at a loss to understand why the administration is making such a determined fight to regain the German chemical patents seized by the alien property custodian during the war. They feel that the action taken to secure these patents was for the good of this country.

BRINGING MORE DAYLIGHT INTO INDUSTRIAL BUILDINGS.

Dr. George M. Price, writing on "The Importance of Light in Factories," in "The Modern Factory," states: "Light is an essential working condition in all industrial establishments, and is also of paramount influence in the preservation of the health of the workers. There is no condition within industrial establishments to which so little attention is given as proper lighting and illumination. Especially is this the case in many of the factories in the United States. A prominent investigator, who had extensive opportunities to make observations of industrial establishments in Europe as well as in America, states: "I have seen so many mills and other works miserably lighted, that bad light is the most conspicuous and general defect of American factory premises."

"My own investigations for the New York State Factory Commission support this view. In these investigations it was found that 36.7% of the laundries inspected, 49.2% of the candy factories, 48.4% of the printing places, 50% of the chemical establishments, were inadequately lighted. There was hardly a trade investigated without finding a large number of inadequately lighted establishments."

Inadequate and defective lighting of industrial buildings is not confined to the establishments in New York State alone. The same conditions prevail in most sections of the country.

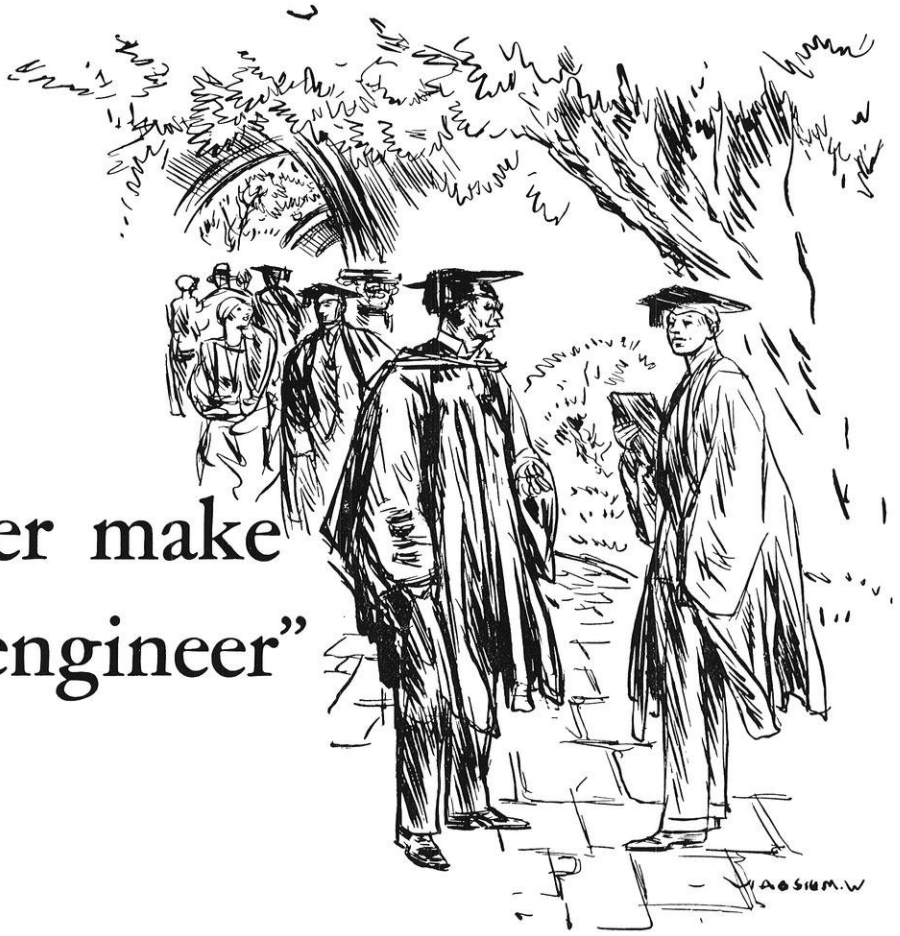
Such conditions as mentioned above are entirely opposed to the laws of health, sanitation and efficiency. Wherever poor lighting conditions prevail, there must be a corresponding loss of efficiency and output both in quality and in quantity. American industry is not using nearly enough daylight and sunlight in its buildings. Every endeavor should be made to use as much as possible of daylight for lighting purposes. To obtain this it is of course necessary that the rays of daylight and sunlight are permitted to enter the interior of the buildings as freely as possible, with the important modification that the direct rays of the sun must be properly diffused to prevent glare and eyestrain. A glass especially made for this purpose is known as Factrolite, and is recommended for the windows of industrial plants. Windows should be kept clean if the maximum amount of daylight is to pass through the glass, but the effort will be well repaid by the benefits secured.

In the presence of poor lighting, we cannot expect men to work with the same enthusiasm as when a well lighted working place has been provided. The physical surroundings have a deep effect upon the sentiments of the employes, and where bad working conditions are allowed to prevail, there is invariably a lessening of morale and satisfaction created thereby. Neglecting to utilize what nature has so bounteously provided, daylight, and which is so essential toward industrial efficiency, we have an instance of wastefulness, but now that the importance of good lighting is becoming recognized, undoubtedly more attention will be given by progressive industrial employers to furnishing the means which are essential for their workers to secure and maintain the efficiency, which counts for so much in the success of any industrial concern in this competitive age.

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.
No. 3.

Kindly mention The Wisconsin Engineer when you write.



"You'll never make an electrical engineer"

Carl Taylor

SO a blond young man named Taylor, just graduating in electrical engineering at the University of North Carolina, was advised by a conscientious professor. The professor's conviction was based on quiz papers and was amply justified. But the young man was not discouraged; he had other hopes, he said. Today—ten years later—he occupies a peculiarly important position with the Westinghouse Company.

Before Carl Taylor had completed his apprenticeship with Westinghouse he began to sell apparatus to utility-customers. He had previously sold clothing in college. He had selected an electrical engineering course because he believed the industry promising for men of selling interests.

His first actual order—the electrification of a scrap yard—was awarded to him at a higher price than that asked by any other bidder because he had "lived with" the job and given all the service this implies.

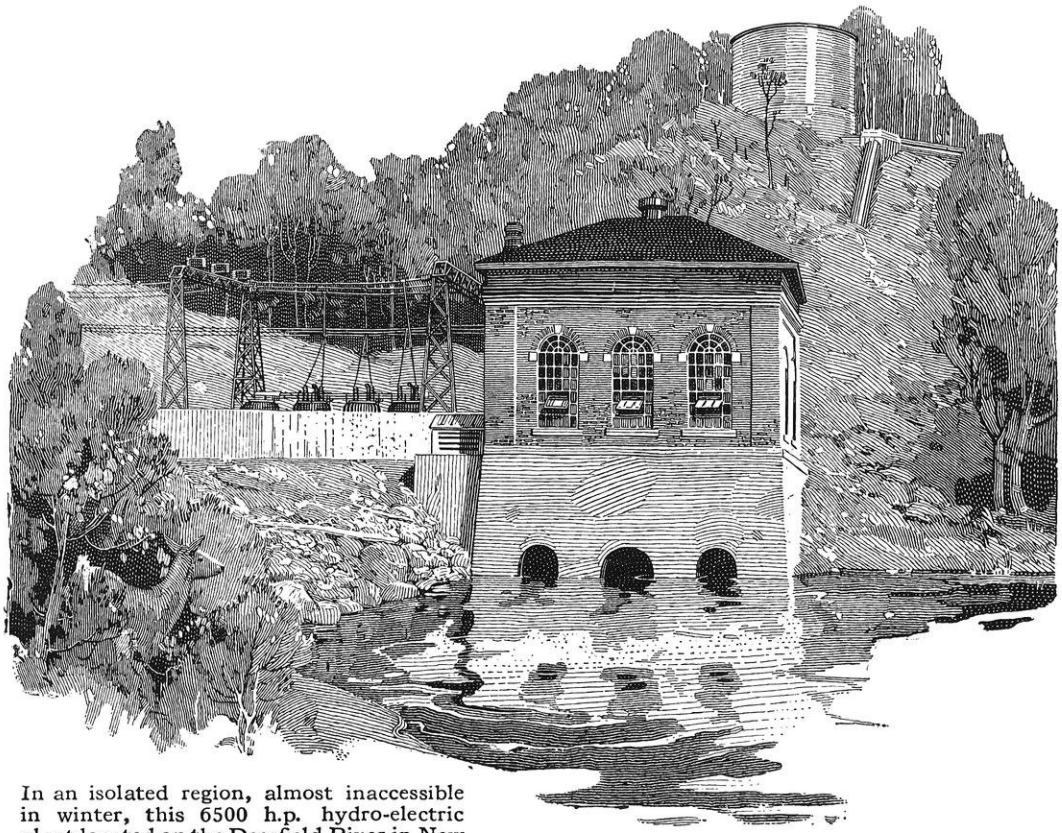
Some months later the Company was surprised at a request from him for an indefinite leave of absence. He wanted to take a job with a manufacturer of steel mill machinery, in order better to understand the problems of such users of electrical equipment. His leave lasted two years. He returned from the superintendency of a well-known plant—returned at a lower salary than the superintendency had paid him. But within three years he was manager of the industrial division of the Pittsburgh Sales Office—the largest division of the Westinghouse Company in the entire country. Today he has a sales organization of sixty-five men.

To get the customer's point of view—to go the limit to anticipate his wants and keep him satisfied—this is the Westinghouse sales policy. It is the policy of all enlightened industrial organizations. Men who can exemplify it in their personal careers need have no question about their futures.

The question is asked: Where do young men get when they enter a large industrial organization? Have they opportunity to exercise creative talents? Or are they forced into narrow grooves?

This series of advertisements throws light on these questions. Each advertisement takes up the record of a college man who came to Westinghouse within the last ten years, immediately after graduation.

Westinghouse



In an isolated region, almost inaccessible in winter, this 6500 h.p. hydro-electric plant located on the Deerfield River in New England, starts, protects, and stops itself.

A Self-Starting Power Plant

Dawn—the slumbering city awakens and calls for electric current. Many miles away the call is answered. A penstock opens automatically, releasing impounded waters; a water turbine goes to work, driving a generator; and electric current is soon flowing through wires over the many miles to the city. This plant starts and runs itself.

Power plants with automatic control are now installed on isolated mountain streams. Starting and stopping, generating to a set capacity, shutting down for hot bearings and windings, gauging available water supply, they run themselves with uncanny precision.

Thus another milestone has been reached in the generation of electric power. And with present-day achievements in power transmission, electricity generated anywhere may be applied everywhere.

The non-technical graduate need not know *where* electricity comes from—nor even *how* it works. But he should know *what* electricity can do for him no matter what vocation he selects.

The General Electric Company has developed generating and transmitting equipment step by step with the demand for electric power. Already electricity at 220,000 volts is transmitted over a distance of 270 miles. And G-E engineers, ever looking forward, are now experimenting with voltages exceeding a million.

A new series of G-E advertisements showing what electricity is doing in many fields will be sent on request. Ask for booklet GEK-1.

3-10DH

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, NEW YORK

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