The Wisconsin engineer. Vol. 22, No. 6 March 1918

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

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

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The Wisconsin Engineer

VOL. XXII MARCH, 1918 NO. 6

Printing — (net) 90.11

Cuts — (net) zincs ½ tone — 6.04

Central Station Heating

The Recovery of Brass From Foundry Waste

Successful Wisconsin Engineers

With The Colors

After the speech he was tendered a banquet.

WHITE ARTICLE FAVORS CENTRAL HEATING PLANT

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We are a bright people. One of our ... by

Jmmmd 3/21/18

WISCONSIN ENGINEER ISSUES THURSDAY

3/21/18

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The Wisconsin Engineer

VOL. XXII MARCH, 1918 NO. 6

CENTRAL STATION HEATING.

A DISCUSSION OF ITS ECONOMIC FEATURES WITH REFERENCE TO COMMUNITY SERVICE.

JOHN C. WHITE

State Power Plant Engineer, Wisconsin

Complete Utilization of Fuel Necessary to Community.

The conservation of our national resources has lately been the subject of much discussion and some laws have been enacted with a view primarily to preventing monopoly and control by private interests, but having little further to commend them as economic measures. Much has been accomplished in the development of high efficiency prime movers, manufacturing methods and machinery, transportation, hydro-electric power plants, and transmission lines. This development, however, has been instigated by a commercialism that has been fatal to the highest utilization of one of our most valuable and necessary resources,—coal.

Engineering attention, technical and commercial, has been occupied with the securing of a mechanical horse power or kilowatt hour at the switchboard for the least possible evaporative cost, regardless of the waste of the heat not accounted for at that point. The limit of attainment in that direction seems now to have been reached, and yet, with the highest type and largest capacity unit, but little more than 15 per cent. of the heat of the fuel can be converted into a salable product as power in the form of electric energy. Many installations do not deliver as a commercial product more than 6 per cent. of the energy of the fuel. A method that promises at once to increase greatly the *community value* of such stations in the use of coal is worthy of consideration. This can be accomplished by combining, with our steam power plants, a central station heating system.

Development of Central Station Service.

Many persons now in middle life can remember when the only central station services to be had were gas and water. To these have been added the telephone, electric current, and in some cases, heating by steam or water. When electric lighting had been developed commercially, it at once became popular; nearly every hamlet now has its central station and most of them, in the smaller cities and towns, are quite extravagant in the use of fuel. It was, in many cases, more of a fad than a necessity. People preferred electric light because it was spectacular and they did not have to take care of oil lamps or light the gas. Companies were easily formed, and a small capital would start a plant where the community could ill afford it. The rates were made and the standards of service were determined by the companies; there was no public regulation of either design or operation. These conditions resulted in a one-sided development of the industry, and the possibilities of a larger use of the heat of the fuel by a combination of services giving both current and heat were practically ignored. Where, in isolated cases, notice was taken of such use, it was based upon the idea of using the exhaust steam as a *by-product.*

Heat a Prime Requisite.

Heat is a fundamental requirement—a prime necessity for which there is no substitute; artificial light is convenient, but not absolutely necessary. Furthermore, light may be had from other sources in greater volume and at less cost than from electric current. Central station heating affords an opportunity for a great saving in the total fuel consumed by a community, while at the same time furnishing electric energy in greater quantity and at a less cost than otherwise. To make it a success, however, some important factors must be considered, and better methods and designs than those now in use must be worked out. In the late 70's, the first central station heating plant was put into service at Lockport, New York. Since that time many others have been installed with varying degrees of success. Much has been done in the development of methods, the perfection of devices, and the working out of rate schedules and other commercial problems; but there is still a great deal of room for improvement along certain lines. An unsuccessful attempt has been made to get information from operating companies on various features of their plants and on operation and maintenance costs. Had some of these companies responded, specific data might be given instead of the assumptions and generalities upon which the following is based.

Competitive Nature of Service.

The test of any such project, which is and should be competitive, is its ability to furnish a satisfactory service for the price that may be charged; but, unless all of the factors entering the problem are considered at their face value, the results will be misleading. One of the most important factors in the sale of steam for heating is the economy with which it will be used. The early method of charging for the service was based on the amount of radiation installed at such rate per square foot per season, as was agreed upon. It is easy to predict the fate of the gas or electric company that had to sell its product on that basis to-day; nevertheless, some of those heating companies survived. A later method was based on the cubic feet of space heated. This was practically the same thing in another form. The present method, and the only proper one, is to *meter the condensation* and charge the consumer for the heat supplied, as is done with any other commodity, leaving him to exercise, or not, the same economy in the use of the steam that he did in the use of the coal which he formerly bought.

Early Rates and Costs.

Referring again to the square foot of radiation basis for selling steam, it is interesting to note that, while many of the early companies charged a rate of only 20 cents per square foot per season of 7 to 8 months, the fuel cost of energizing such radiation for a period of only 6 months, (180, 24-hour days) with an overall efficiency of 50 per cent. in generation and transmission, (steam at atmospheric pressure and a room temperature of 70° F.), would be from 10 cents to 15 cents with coal at $1.00 per ton. Since but few companies get their coal at that price, it is easy to see why these heating companies failed. Many electric companies claim a cost of less than 1 cent per K. W. hour at the switch-board; the public, however, except a few large consumers, pays from 3 to 10 times that amount for what it uses. Steam heating can never carry such an excess as that, but there must be a margin for operation, distribution, overhead costs, and profit. An attempt will be made in the following analysis to determine what margin exists between the cost of central station service and private heating to cover those items.

It has been shown above that the average fuel cost of supplying radiation under the conditions named, will be about 10 cents to 15 cents per square foot for a season of 8 months, with coal at $1.00 per ton. The cost can be readily computed with coal at any other price. From a series of tests at the engineering experiment station of the University of Illinois, (Bulletin No. 31, Fuel Tests with House Heating Boilers, Snodgrass), the plant efficiencies for such equipment, using the fuels named, were as follows:

Fuel Used	Average Efficiency (per cent)
Illinois Coal	48.86
Pocahontas Coal	50.20
Anthracite Coal	54.00
Gas house coke	59.63
Solvay	61.73

The efficiencies given above for Illinois coal are no doubt somewhat higher than will be maintained in practice by the average householder for an entire season. Based on the relative average heating values of the fuels named and with the efficiencies above given, the prices per ton, at which the cost of heat to the consumer would be equalized, are as follows:

Fuel Used	B. t. u. Per Lb. as fired average.	Heat absorbed Total value Per cent Eff.	Cost per Million B. t. u.	Prices at which values equalize.
Illinois Coal	12,000	5,863	8.53c	$1.00
Pocahontas Coal	14,750	7,400	6.75c	1.26
Anthracite Coal	12,700	6,858	7.28c.	1.17
Coke	12,000	7,150	7.00c	1.22

From the above it appears that, with Illinois coal at $1.00 per ton, we could afford to pay $1.26 for Pocahontas, $1.17 for anthracite, and $1.22 for coke. The Illinois coal would, therefore, be in demand if it were not for other considerations than the cost of the heat. Some cities have smoke ordinances which make it nearly, if not quite, impossible for householders to burn the Illinois coal. It also requires more labor to keep up the fires, remove ashes and clinkers, and keep the heating surfaces free from soot. All things considered the Pocahontas Coal, anthracite coal, and coke are in demand at from 1–½ to 3 times the cost of Illinois coal.

These differences represent charges against dirt, smoke, and excess labor. In other words, they are a contribution to cleanliness and convenience. Taking the Illinois coal at $1.00 per ton, with a heat value of 12,000 B. t. u. and 49 per cent. average efficiency, the cost of energizing a square foot of radiation for 180, 24-hour days will be only slightly higher than in the case of the central station given above, where the overall efficiency of generation and distribution was taken at 50 per cent. The fuel costs for the heat are, therefore, about the same, whether furnished by the private plant or from a central station, with the same coal at the same price. There are these differences, however; the central station can operate at a higher sustained efficiency, it can produce electric current as a by-product with only a small loss of heat generated, and it eliminates all of the objectionable features of a private plant.

Value of Central Station Service.

The development of boiler room equipment and methods of operation in the modern power plant leave little to be accomplished at that point. Soft coal may be had under contract in Wisconsin at prices ranging from $2.50 to $3.50 per ton on the track. It can be burned at an overall efficiency of above 70 per cent. and the product is heat with steam as the medium of transmission. Served in this manner through a distribution system, it has a value equivalent to the total cost of all items included in the operation of a private plant, plus a considerable allowance for greater convenience and perfect cleanliness, and it should be so estimated in all computations on which costs and rates are based. Whether or not it is exhaust steam, in whole or in part, has no bearing on the case; any allowance in that direction should affect the price of current and not the cost nor value of the steam. *The steam should be considered the prime requisite, with any output of current incidentally derived as the by-product.* It will then stand or fall on its own merits which is the only substantial measurement of its value. The reasons on which this argument is based will appear later.

Price of Cleanliness.

Returning to the subject of generation and transmission costs and margins; with coal at $3.00 per ton and an overall efficiency in the plant of 70 per cent., the steam can be delivered at a fuel cost of approximately 30 cents per square foot of radiation served. This allows 20 per cent. for loss in transmission, a figure considerably higher than that found in practice, as evidenced by a report in a U. S. publication, (Bulletin No. 40, Bureau of Mines), where this loss is given variously at from 4 to 12 per cent. The same coal will cost the private user about $4.00 per ton delivered at his premises, and his fuel cost for the same amount of heat will therefore be not less than 40 cents. But he still has the smoke, dirt, and labor inseparable from the use of soft coal in such equipment as he uses. How much is the elimination of these objectionable items worth? Based upon the relative costs of the soft coal and those substitutes, anthracite and coke, which most nearly accomplish the desired end so far as smoke and dirt are concerned, it is worth from 100 to 150 per cent. more than the estimated cost of the heat as computed at 40 cents, making the real value $0.80 to $1.20 per square foot per season. These values may seem high, but when the economy that is practiced in the use of hard coal at $8.00 to $9.00 per ton is considered, they are probably not far from correct. Storm windows are in evidence at the first frost, ventilation is sacrificed, and no space is heated that is not absolutely needed.

Comparison of Costs of Service from Private Plant and Central Station.

The use of the higher grade fuels eliminates nearly all of the smoke, part of the dirt, and some of the labor; we still have to provide and maintain a furnace and furnace room, provide space for coal storage, buy coal, haul out ashes, and do the firing and cleaning. These items may be estimated to cost approximately 50 per cent. of the value of the soft coal burned. Assuming that the investment is already made in the private plant, we can make no charge against the same, except for repairs; these can be neglected as can also any charge for space occupied by equipment, coal, or ashes. Adding the 50 per cent. or 20 cents per square foot as determined above, to each of the costs for the various fuels, gives us rates of $0.60, $1.00, and $1.40 respectively for Illinois coal, anthracite, and coke.

The central station can deliver the heat for a fuel cost of 30 cents, thus leaving margins of $0.30, $0.70 and, $1.10 to cover labor, maintenance, overhead charges, and profits. In addition it has eliminated every objectionable feature of the service and made it a convenience instead of a nuisance. It is a fact worthy of note, that central station heating plants are most numerous where coal is abundant and cheap, as in Pennsylvania, Ohio, Indiana, and Illinois. This confirms the deductions to be made from above, viz., that the elimination of the smoke, dirt, and disagreeable labor are of more value in some cases than the fuel cost of the heat. In the localities cited, that is essentially what the consumer is paying for. The fuel is so convenient and cheap that the central station can offer no inducements in the way of economy, and must make its campaign for consumers on the basis of better service and the elimination of all objectionable features.

As stated before, a number of the old companies did survive the 20 cent rate period. The coal was cheap, and they had a considerable quantity of exhaust steam, which they discounted in making their rates, and the product of which,—electric current,—was sold at a good profit. It is still remarkable that they could exist with the fuel cost approximately 12 cents per square foot per season and a margin of only 8 cents left to cover all investment and operation ccsts.

Another Method of Computing Costs.

Viewing the problem from another angle, the cost of evaporating a given quantity of water in the large public service plant as against the small private plant may furnish a better basis for comparison. With Illinois coal at $1.00 per ton, the fuel cost of evaporating 1,000 pounds of water (generating 1,000 pounds of steam), should not exceed 7 cents, and in a well designed and carefully operated plant it may be as low as 6 cents. The other costs will increase this to about 10 cents, and with coal at $3.00 per ton, the total cost will be about 25 cents. The private consumer cannot evaporate the water any more cheaply, even with coal at the same price, and, since he will have to pay more for his coal, it will cost him more to evaporate it. Furthermore, when he only requires a little heat, his efficiencies drop very low and his losses are correspondingly great.

In the former estimate of the cost of supplying one square foot of radiation for 180 days, a rate of emission of 2.5 B. t. u. per square foot of surface, and per degree difference of temperature per hour was used. This rate shows that 1,500,000 B. t. u. will be required to energize one square foot of radiation for the period. In evaporating 1,000 pounds of water, there will be a heat transfer of approximately 1,000,000 B. t. u. at a cost of 25 cents, with coal at $3.00 per ton. From these figures it is evident that it will cost 38 cents to 40 cents to evaporate the water for each square foot of radiation supplied To this must be added all investment, operation, and other charges on the plant and distribution system. These can only be approximated in a general estimate, but they will probably equal the fuel cost, thus bringing the total up to 75 cents or 80 cents per square foot per season. It should be borne in mind that, in the computations made on the quantity of heat emitted, the radiation was assumed to be active for the entire period. This will not necessarily be the case in practice, and somewhat less heat will be required to energize a square foot than we have assumed in this discussion. It makes little difference, however, as the inaccuracy will be about the same whether the heating is done privately or from a public service main.

Rates for Steam.

An examination of the schedules of rates in 28 cities of from 25,000 to 400,000 inhabitants, covering many of the middle states and ranging in latitude from Michigan and New York to Georgia and Alabama, shows the highest minimum to be $1.50

per 1,000 pounds of steam at Peoria, Illinois, and the lowest for maximum consumption to be $0.3105 at St. Joseph, Missouri. The lowest minimum consumption rate is 54 cents at Penn Yan and Geneva, New York. The rate at these points for maximum consumption is 46.35 cents. The average minimum and maximum rates for the 28 cities, on quantities of 4,000 pounds or less and 300,000 pounds or more per month, are 76.40 cents and 45.33 cents respectively. While a study of the rates referred to shows an entire lack of uniformity in the methods of their deduction, the averages given confirm, in general, the costs which have been established herein for furnishing 1,000 pounds of steam. In about half of the schedules mentioned, there is a demand charge of $3.00 per month minimum, on all buildings having a capacity of 25,000 cubic feet of space or less, and of 12 cents per 1,000 cubic feet on all buildings having more than 25,000 cubic feet.

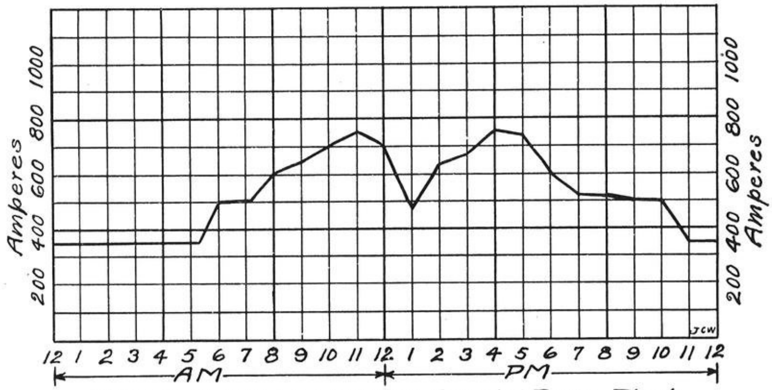
Economy in Use of Steam.

It is evident, from the foregoing, that economy in the use of steam from a central station is just as important as in the use of the coal burned privately. Will the consumer practice such economy? Under meter rates it may be assumed he will; under flat rates he will not. The quantity of heat necessary to supply a square foot of radiation for a season is probably less than the estimate given before in this paper. While the heating season is from one to two months longer than the period named, there are many days in the early fall and late spring when little or no heat is required. At such times the consumer can reduce his active radiation to any amount desired with less trouble than he can allow his fire to go out and rekindle. He can also have a little heat in the morning and shut it off for the rest of the day if desired. A proper demand charge will protect the central station at such times. The latter has a decided advantage, also, in that the boiler capacity in service can be adjusted to the load, and maximum efficiency can thus be maintained. As in the case of some electric schedules, the rates for steam frequently throw a burden on the small consumer by forcing him to help pay for the large consumer's service. In the case of steam, no consumer should be given service for less than a profitable rate.

There is some justification for the apparent discrimination in rates for electric service as between the large and the small consumers. The former may make their heaviest demands at times when the load is otherwise small and thus bring up the station load factor. In a central station steam plant, the load will vary little during the entire day; the changes go up and down with the weather conditions, with changes of wind and temperature. These are gradual and give ample time to control the operation of the plant so that the highest possible economy can be realized. Daily peaks are almost negligible.

Exhaust Steam.

So far exhaust steam has not been taken into consideration for the reason that there is no difference between it and live steam at the same pressure, and if any exhaust steam is available it costs just as much and it is worth just as much for sale as heat, as though a part of its potential energy had not been converted into useful work. The product resulting from such conversion, usually electric current, should be considered the by-product in a combined plant. Where the heating load is large enough to submerge entirely the power load, there will be no peaks in the boiler room due to variations in the power load. The power requirements may vary from zero to maximum and the firemen will not know it unless they are told or consult the records.



Typical Daily Load Curve Capitol Power Plant.
December 1911.
Figure 1.

When the engines are exhausting their maximum into the heating system, the reducing valves will automatically cut off the supply of live steam to the required amount; when the power load is a minimum, they will open up and supply the requirements with live steam.

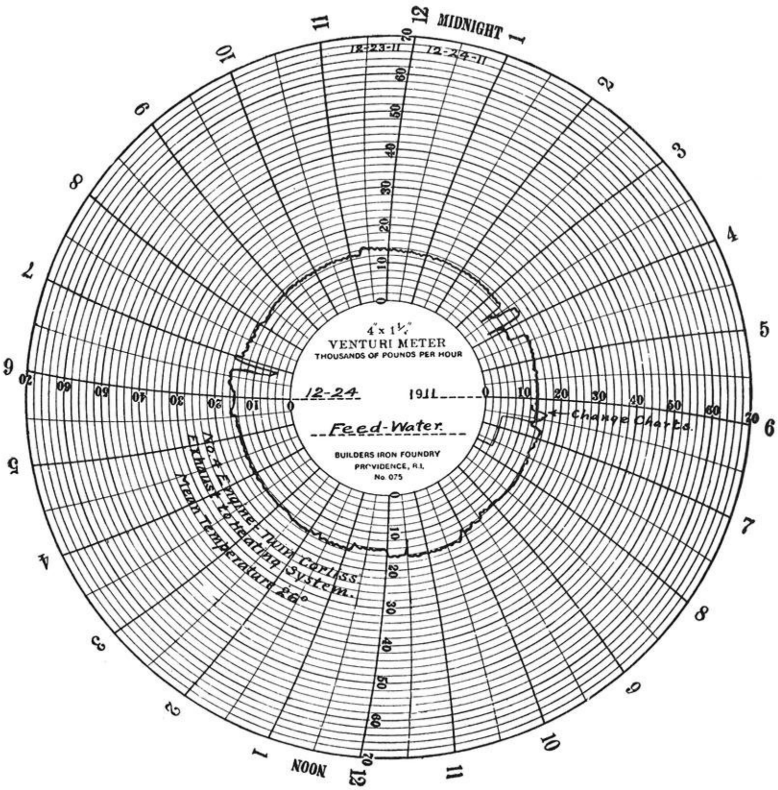


Figure 2.

The following curves, from the records of the State Capitol Power Plant at Madison, Wisconsin, will make this clear. Figure 1 is a typical daily power load curve: It shows a variation of over 100 per cent. in current output. Figure 2 is a daily feedwater chart. There is no evidence of the variation in the power load discernible in it. Figure 3 is a feed-water record of the day previous to Figure 2. It shows the effect on the feedwater rate of changing from simple non-condensing engines to compound condensing engines. The heat thus wasted to the sewer costs about $15.00 per day of 24 hours for each 100 kilowatt output. The engine is a compound condensing Corliss with an economy of about 14 pounds of steam per i. h. p. per hour. Figure 4 is a curve showing the relations of coal burned to temperatures. Ordinarily no heating is done from June 15 to September 15.

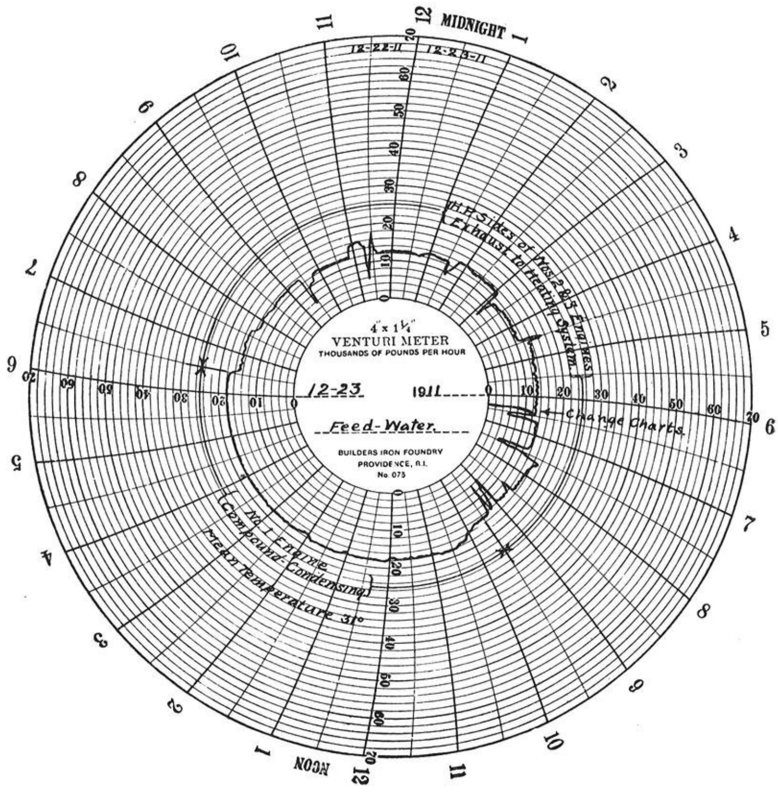


Figure 3.

The fuel used during that period is all chargeable to electric service, pumpage, and steam for other uses. Compound condensing engines are used when no heating is required. The graphical data referred to above are from our records for 1911.

Figures 5 and 6 are from the records for December 29 and 30, 1917, the charts being removed at 7:00 a. m. on those dates. It will be noted that the loads are much heavier, and the quantities therefore greater, for the reason that in 1911 only part of the new Capitol was in use while in 1917 the building was completed and full service was being given.

Figure 5 was obtained to show the effect of the hot blast heating and ventilating equipment on the heating loads. The fans were running from 6:00 a. m. to 12 M., when they were shut down. The feed water rate dropped about 5,000 pounds per hour at that time. The electrical load also dropped about 500 amperes due to fan motors being cut out and to the normal drop at noon time for other reasons. Later on it increased again until closing time at 5:00 p. m. There is little difference in the feed

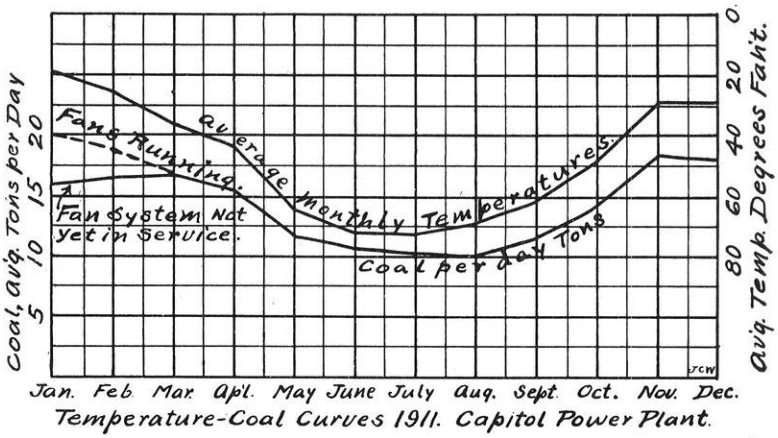


Figure 4.

water rate that can be accounted for by any change in the power load. The latter was submerged at all times and in addition to the exhaust steam available, live steam was required for the heating load during the entire 24 hours.

Figure 6 is the record for the following day and confirms the previous record, the only essential difference being that it was Saturday and most of the offices were closed in the afternoon, thus reducing the power requirements. The temperatures for the two days were practically the same. From 150 to 250 amperes of the electrical load from 7 a. m. to 9 p. m. are used for cooking, heating water, and so forth, in the Capitol restaurant. This could be done much more cheaply by other means, and, while the fuel expense of it is negligible in severe weather, it is a direct expense when the heating load is light. The use of electric current to produce heat should be discouraged, where steam and gas are available, except for very special requirements.

Correlation of Loads.

The relations of loads, as disclosed by these records, have an important bearing on the subject of central station heating.

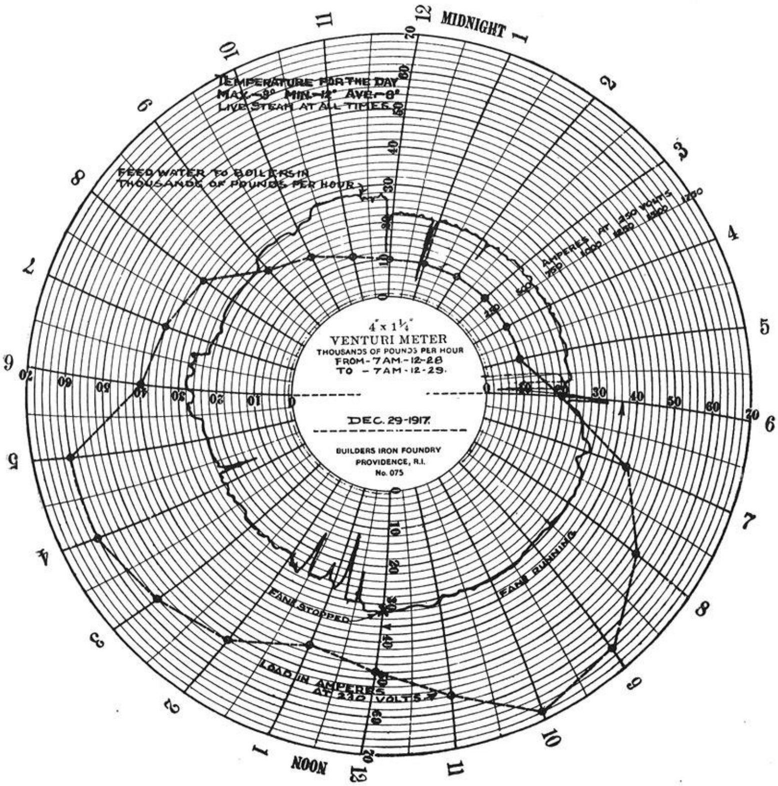


Figure 5.

They show that, when the heating load is made large enough to give constant conditions in the boiler room, the efficiency at that point is materially increased and that the power output is a matter of secondary importance so far as cost of operation is concerned. While it is still desirable, for commercial reasons, to keep the station load factor for power as high as possible, peaks and variations of any magnitude within the range of the boiler capacity can be handled with a minimum of trouble and expense.

The early efforts, and perhaps it is so yet, sought so to adjust the loads, in a combined power and heating plant, that the ex-

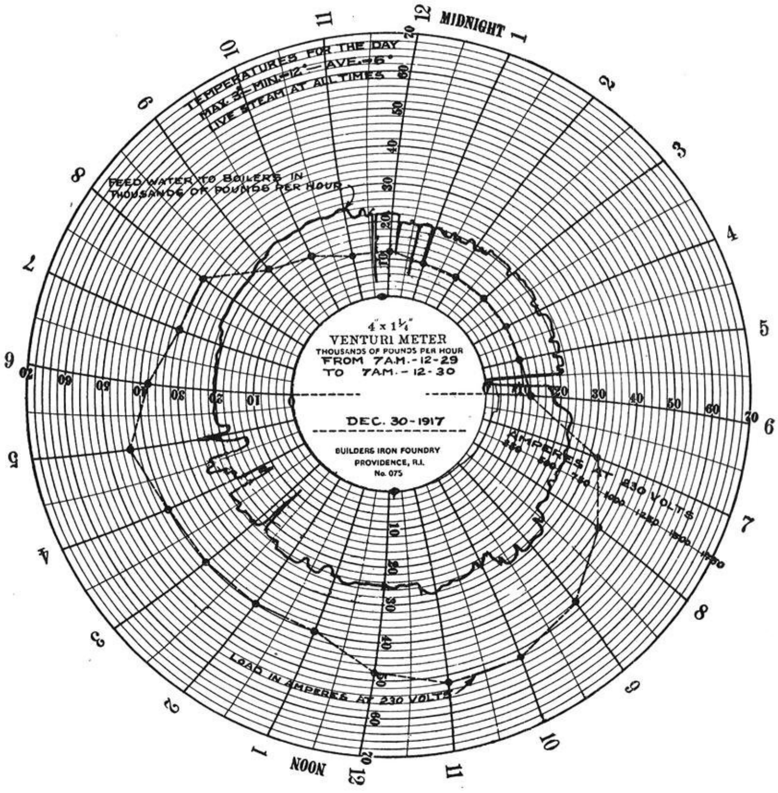


Figure 6.

haust steam, considered as a by-product, would do the greater part of the heating, such live steam as might be necessary being introduced in severe weather. In the average central station this is practically impossible on account of the wide variations in the power requirements during the day and the comparative uniformity of the heating load. As a result some exhaust steam is wasted during part of the day and considerable live steam is required at other times. This procedure leads to establishing too low rates for heating service. *It is wrong in principle for the* *reason that it discounts the value of exhaust steam.* Fortunately, in some of the successful plants, the heating load crept up until a favorable relation did exist and, had the rates been equitable, a much better showing could have been made. Where the service is good, it is not difficult to book all of the business along the mains or a very satisfactory portion of it. The central station that can supply both heat and current stands a much better chance of displacing the isolated plant than the one that can bid for the current only.

In cities of medium size, the same boiler capacity that will supply from three to four blocks with current will heat only about one. This fact should make it comparatively easy to take on a suitable heating load within easy distance of the plant if the latter is located favorably to the district served. By a suitable heating load is meant one in which the power ceases to be a factor so far as the boiler requirements are concerned. As regards steam that has passed from a higher to a lower pressure by doing useful work in an engine, the conditions are somewhat similar to that of a water power where the water is used for irrigation, navigation, or any other purpose after it has passed the wheels. The quantity is the same and if it still has sufficient head or depth it will irrigate as much land or float as large a boat. The steam, after it has passed the engines, will do practically as much heating as it would before. The current generated may vary from zero to maximum with only a trifling increase in the quantity of fuel required. For this reason *the steam should be considered the prime requisite and any current produced the by-product.* The latter will be cheapened somewhat by the process, and a correspondingly greater number of people will be benefited by the combination. Also a more complete use of the fuel will be effected.

Water Powers as Sources of Heat.

It has been suggested that the development of the water powers of Wisconsin would furnish a perpetual substitute for coal for producing current for industrial and domestic use and for heating. That the former is true to a certain extent is conceded, but the latter is not. It is not probable that any one familiar with the subject ever attached much value to the water powers for heating purposes other than in furnaces and in electrolytic processes. To the lay mind it may appear possible to do considerable heating from such a source. A brief consideration of the matter may be of interest.

On a severe day in the winter about 10,000 pounds of coal per hour, of an average value of 13,000 B. t. u., is burned at the University of Wisconsin heating plant. This represents about 130,000,000 heat units liberated. At 50 per cent. overall efficiency, it thus requires 65,000,000 heat units to warm the buildings. From a 20,000 h. p. hydro-electric plant, only about 51,000,000 heat units could be furnished, and if used at 100 per cent. efficiency its entire output would not be able to heat the one institution. As to the cost of the two methods, the heat of the five tons of coal costs about $20.00 generated and delivered to the buildings; the 20,000 h. p. hours from the water power plant, at ½ cent per h. p. hour, would cost $100.00, and it is very doubtful if it could be obtained for that figure. It is worth more for other use. The reason electric power can not do much heating is because it requires 778 ft. lb. of work to produce one unit of heat. It has been estimated that electric current from our water powers cannot be used for heating until the price of soft coal has risen to about $20.00 per ton, and even then there would not be enough heat available to make it worth considering.

Applied to industrial use and as a motive power for transportation, the current from our water power developments is worth many times what it would be in any heating project. There are, however, many industrial plants which require so much heat in their processes that the steam plant will still be necessary whatever the source of power. A survey of a number of paper mills, wood working plants, and other industries has shown that no saving could be effected by the purchase of outside current at the lowest rates possible to obtain. In one important factory, by a careful analysis of all costs, its engineers determined that outside current would have to be supplied them at 0.7 cents per kw-hr. in order to come out even on the deal. This was a careful and competent investigation, without bias in either direction, and its results are worthy of note.

Hot Water as Medium.

Steam is generally used as the medium for conveying the heat to the consumers, though hot water has its advocates and some advantages. Where hot water radiation has already been installed, it is a simple matter to put in a small heater and use the steam for heating the water instead of heating it directly by a coal fire. Nearly any kind of steam or hot water system that a consumer may have can be satisfactorily operated from the central station mains by using the necessary devices for pressure regulation and control. All installations should have thermostatic regulation if the best economy is to be maintained.

Good Engineering Necessary.

The design, materials of construction, and methods of operation of district steam heating plants will require careful consideration by competent engineers to insure the success of each installation. The pipe lines have generally been laid of iron or steel pipe, several times heavier and stronger than necessary for the pressure carried, but failing rapidly by corrosion. It is a false economy to use material not permanently resistant to the destructive agents encountered. The pipe is only one item of the underground expense, and means should be devised of making it durable. The best is the most economical where a long life with low maintenance cost is necessary to success.

The practice has been to lay the mains in the streets or alleys. This is desirable wherever possible. However, in mine and mill work, mains are frequently carried considerable distances overhead. Tunnels are convenient, but their cost is generally prohibitive except in the largest cities. Our city planning should include better provision for underground services than exists at present. The streets are practically the same in width and surface arrangement that they were fifty years ago when gas and water were the only utilities requiring space. There are some six or more utilities, besides the sewers, at the present time, and the number will increase.

Recommendations.

From the foregoing it would appear of advantage to:

(a) Select plant locations favorable to the district to be served,

(b) Adopt more permanent construction materials and improved designs,

(c) Submerge the power load entirely at all times during the heating season,

(d) Put all consumers on meter rates with an equitable demand charge,

(e) Run compound engines, or run exhaust turbines tandem to simple engines during the summer months.

THE RECOVERY OF BRASS FROM FOUNDRY WASTE

ALBERT C. REED

Graduate Student in Chemical Engineering

> Want of copper, necessary for ammunition, has compelled Germany to take the bells out of the church steeples, says Der Unter Emmentaler, a Swiss German language paper. "Now the rural communities of Baden have to part with their most treasured, sacred and historical relics. A touching aspect to see the people work on the job! All able-bodied men being in the war, old men, women and larger children have to do the work. Afterward the bell is decorated with grapevine leaves and bunting and blessed by the priest. The whole population escorts the truck to the station."

Waste occurs in all industries engaged in the production of and the working of metals. In foundries this waste occurs as coarse or fine metal in the floor sweepings, in the furnace ashes, in the slag, and in the molding sand. Besides this there is, in brass foundries especially, the loss caused by volatilization of the metal at the high temperature used. It is difficult to get definite figures as to the amount of this loss, mainly because the majority of foundries keep no accurate records. One of the members of a firm in Waterbury states: "In Waterbury the metal loss is greater, in money, than the profit from the mill." Graham, in *British Manufacturing Industries,* states that the loss in melting is from 4 per cent. to 6 per cent., and higher with the lighter alloys. He makes no mention of any attempt to recover the metal. Figures as to the loss vary from 0.5 per cent. to 8.0 per cent., while the recovery, where practiced, runs from 0.3 per cent. to 2.5 per cent. Gillet (Bureau of Mines Bull. 73) states that the net loss, after deducting any metal recovered, will average not less than 2.5 per cent. of the total melt, while the gross loss would average from 3 to 3.5 per cent. The loss due to volatilization would probably be around 1.5 to 1.75 per cent. He estimates the value of metals passing through brass and bronze furnaces in 1911 to be $120,000,000. A loss of 2.5 per cent on this represents a loss of $3,000,000. Good practice reduces this loss to 1.25 per cent., and if the average could be brought to this

(1) The figures in paranthesis correspond to the references given on the last page of this article.

figure, a saving of $1,500,000 would be secured in metal alone. In view of the increasing magnitude of the industry and the increasing cost of the raw materials, the importance of cutting down this waste becomes evident. A great deal of work is being done at present with a view both to developing a furnace which will so operate as to lessen the volatilization loss, and to developing a more efficient method of recovering the metal from slag, ashes, skimmings, and so forth, or, as it is usually called, waste. It is the purpose of this paper to give a brief description of the various methods used and proposed for the recovery of metal from waste.

The separation of metal from waste would appear to be a very simple matter. The metal is present chiefly as metallic particles, in the form of shot, or as very fine dust, and ranges in size from pieces two inches and more in diameter down to particles so small as to be almost a slime. It may be either free or imbedded in slag, ash, or sand. It would seem that crushing, followed by concentration on jigs and tables, would leave little to be desired. The recovery of coarse metal presents no particular difficulty, and is readily accomplished by hydraulic classification, either in a jig, or in one of the various forms of classifiers. When an attempt is made, however, to recover the fine material there are several factors which combine to prevent a satisfactory separation. Perhaps the chief of these is the fact that there is a relatively small amount of metal in a very large amount of gangue, or the material is very low grade. Further, in the grinding the metallic particles are flattened, and in such a state they tend to float off with the pulp rather than to settle out.

A great majority of plants have been content simply to pick out the large pieces by hand and to sell the rest to dealers in old metal at a low figure. As it became more and more evident that this procedure was taking from the plant a constantly increasing amount of metal, and as the various plants took occasion to inform themselves as to the actual metallic content of this waste, steps were taken to recover more of the metal on the spot. As a result crushing, followed by hydraulic classification, was added to the hand sorting. This gave a very fair recovery of coarse material and the fine waste was either discarded or sold to metal dealers. This method of treatment is used to a large extent today. One firm picks out the large pieces by hand, crushes the rest, and runs it through a simple sluice box. The material recovered is in a form suitable for use direct in the melting furnace. This product amounts to about 2 pounds per molder per day. The fine material is settled and then sold to a junk dealer for $5 a barrel.

Another plant (2) modifies this method by substituting a two-compartment Hartz jig for the sluice box. The concentrate from the second compartment, which is very low grade, is returned and put through the process a second time to separate further the foreign material. The tailings are settled, the water drawn off and used again, and the solids are wasted or used for filling low ground. This treatment gives a very satisfactory recovery of the coarse metal but leaves a large amount of metal in the tailings.

Various methods have been proposed to recover this fine material which involve generally the use of a table or a table followed by a vanner. The installations vary from one using one crusher, and a single jig followed by a table to one comparable with a modern metallurgical mill, employing several crushers and a series of jigs and tables. The German practice (F. W. Siepke, Metallurgie—9–121, 1912) furnishes a good example of this method of working. The waste is hand sorted and then crushed in a jaw crusher. The discharge from the crusher is ground in a ball mill which has a screen on the discharge to recover the coarse metal. This material is removed from time to time and melted into ingots for later use. The ball mill discharge is then subjected to hydraulic classification and the recovered metal is added to that obtained from the mill. The classifier overflow is run through screens to remove stones, wood, and so forth, and is then thickened. This thickened pulp is run over a table and the concentrates are briquetted, with lime as a binder. The briquettes are dried and smelted in a blast furnace. The middlings from the table are returned to the classifier for retreatment.

A. W. Lemme (3) describes a similar process used by the Chicago Bearing Metal Company. This plant melts (in 1915) 100,000 pounds of metal per day and refuse collects at the rate of 12,000 to 15,000 pounds per day. In this case an edge runner or Chilean mill replaces the ball mill. The following products are obtained: (1) Large pieces, hand sorted. (2) Material held on a 1 inch screen. (3) Washings, or jig concentrates. (4) Table concentrates, containing 20 per cent. metal. The first three products are used direct while the last is made into briquettes and smelted. The tailings from this treatment contain 1.1 per cent metal.

A. F. Taggart (4) mentions a very similar process, and then, on the basis of a sizing-assay test, proposes a more complex treatment to secure a higher recovery. He states that a typical ash contains 10 per cent. copper and 5.4 per cent. zinc, making the value of the waste $33 per ton (Cu @ 13c—Zn @ 6c per lb.). He proposes so to treat the waste that none of the material goes through a ball mill until all the free metal is removed. To accomplish this he screens the material coming from the coarse crusher. The oversize is treated in a jig, the free metal being removed and the tailings, mainly slag, going to a ball mill for further crushing. The fines from the first screen are run through a second screen, with smaller openings, and the oversize run onto a second jig, the metal being recovered and the slag going to the ball mill as before. The fines from this screen are put through a still finer screen with a jig for the oversize and so on until the free metal left is so fine that it is not recovered on a jig. The fines from the last screen are combined with the discharge from the ball mill and run over a table, or the two products may be kept separate and each put over a table. The number and fineness of the screens is dependent upon the richness and amount of the waste, and upon the recovery desired.

Separation by means of air was formerly used. The fine material was allowed to fall through a shaft having light air currents blown at right angles to the descending waste. The light material was removed by the air and the heavy metal was collected at the bottom. This method, however, has been largely replaced by wet concentration.

H. M. Burkey (U. S. Patent—1,061,447) proposes to mix the raw waste, after hand sorting, with fine coal and treat in a converter of the Huntington-Heberlein type. The zinc passes to the flues and is recovered as zinc oxide, while a cake of copper sinter is formed which is suitable for treatment in a reverbratory or blast furnace.

F. Johnson (5) advocates, under certain conditions, a dry concentration by screening which removes only the large pieces of metal, followed by direct smelting of the balance. The conditions are:

1. Existence of smelting plant close at hand.
2. Supply of cupriferous slag and cheap flux.
3. Knowledge of the process of smelting.
4. Cheap labor and fuel.

The advantages claimed are:

1. Uses the unburned coke in the ashes.
2. Gives a 98 per cent. recovery of copper.
3. Avoids the expense of crushing, washing, etc.
4. Obtains pure copper instead of an impure and uncertain product.
5. Copper present as oxide is recovered, while it is largely lost in wet concentration.

J. L. Jones (6) advocates selling all waste direct to a smelter after picking out the large pieces. The material will be bought on a strictly assay basis and practically all the copper will be recovered. In support of this proposal P. H. Langdon (7) says, "We have no hesitation in saying that any brass works or rolling mill which uses up its own residuals is losing money at it * * * Residuals in the future will be reduced to a minimum; brass ashes will be a thing of the past." He thinks that the development of gas and oil furnaces will eliminate ashes, and advocates selling waste direct to a smelter after removing the large pieces.

In the meeting of the Birmingham Section of the Institute of Metals (8) the following suggestions were made:

1. Waste of various kinds should be kept separate and the different classes treated by suitable methods.
2. While the working up of waste at the plant formerly paid, it does not now. There are houses which make a business of this sort of work and are equipped to do the work better and cheaper than the average individual plant.

3. It was suggested that several plants unite to build a mill to treat their waste on a co-operative plan.

It would seem as if work along these lines would do much to solve the waste problem. A custom works for the recovery of metal would be able to put in more complete equipment and would get a higher recovery than the individual plants on account of the larger tonnage treated. For similar reasons a combination of several plants would secure a higher recovery at a reduced cost, due to greater tonnage and more complete operation. It is only the very large plant that has enough waste to justify the installation of a recovery plant capable of securing the maximum separation. The smaller plants recover what they can without excessive expense and either waste the remainder or sell it for next to nothing.

Besides the metal present as such, there is always a greater or less amount of copper existing as copper oxide. Very little of this copper oxide is recovered in the concentration. Figures are uncertain as to the amount of this oxide, as there is no satisfactory method of determining the oxide in the presence of metallic copper. One plant mentions 6 per cent of oxide in the tailings from a jig. This figure is extremely high, and does not represent an average. The opinion has been frequently expressed that the amount of oxide present is larger than is commonly thought, and that it would pay, in some cases, to remove it by leaching.

In any process for the recovery of copper, or brass, the iron must be removed. This is usually accomplished by magnetic separation. The discharge from the coarse crusher or the raw waste, in case a ball mill or Chilean mill furnishes the only crushing, is run over a magnet and the iron removed. Usually the washings (jig or classifier concentrates) are given a second magnetic treatment in case they are to be remelted direct. For the removal of iron mechanically held in the brass, Vickers (9) proposes to wet the metal with salt water, when, after standing a few days, the iron will rust and can be washed out.

While there have been great advances in the recovery of waste, there is still room for much work. A plant capable of the maximum recovery is available only to the large foundries with their large tonnage to be treated and their large financial backing. The smaller plants are forced to be content with a very low recovery. It would seem as if work along the line of developing a cheaper and less complex recovery system would be advantageous. Failing in this, the establishment of custom plants or co-operative plants would be of great advantage to the industry.

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The fly upon the fly-wheel
  Was astonished when he found
That the fly-wheel that he stood upon
  Was going 'round and 'round.
So he spread his legs akimbo
  And he shouted in his glee,
"Why the thing that makes this wheel go round
  Is evidently me."

Volume 22 Founded 1890 Number 6

The Wisconsin Engineer

$1.00 a Year 15c a Copy

Subscriptions, payable before February 1, $1.00 a year in United States, Porto Rico, Hawaii, the Philippines, Cuba, or Mexico; $1.25 in Canada; and $1.50 in other countries. Entered at the postoffice at Madison, Wisconsin, as mail matter of the second class.

Published monthly from October to May, inclusive, by
THE WISCONSIN ENGINEERING JOURNAL ASSOCIATION,
306a Engineering Building, Madison, Wisconsin
Telephone University 276

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KEEP YOUR EYE ON THE BALL

Each issue of the daily papers brings the story of another addition to the critical situations in which the world finds itself involved at the present time. Under the terrific strain which these announcements cause, we engineering students are trying to do the thing that is best for ourselves and for our nation. Many of our number, unable to stand the pressure, have hastily joined the colors, leaving their education unfinished. Others, resisting this impulse, are staying in school, putting special emphasis upon those subjects that will make them of the most service when their help is called for, and trying to work to a greater degree of efficiency than ever before. A few, however, have not yet realized that their nation is facing one of the great crises in its history, and that they may find themselves called to aid in saving the situation and be unprepared. The path of the middle group is the one into which every technical student should conduct himself. In the face of the unusual conditions which prevail, let us be masters of ourselves; let us put forth every effort toward gaining the utmost from our educational opportunities so that when we go to our Country's aid we shall go prepared to give the best that conditions have enabled us to offer, and so that when we return, if such be our fortune, we shall be prepared to take up our life work, and, in a different sense, again give our best to our nation and to humanity. L. S. B.

"GARIBED"

Again we have him—the man who claims to have discovered a new source of energy, who expects to drive battle ships without fuel, enable airplanes to carry thousands of pounds of munitions, double the speed of steam-engines, supply electricity, produce nitrates, and what not. Just think of it—ships to be smokeless and their speed to be increased 50 to 100 per cent., airships to develop 10,000 H. P. if necessary, without fuel and other material to hamper flight. With this power we could encircle the globe without landing. It would enable us to fly across the Atlantic because we would be unhampered by the excess weight of fuel.

What is this marvelous and mysterious power? It is called "Garibed" after its inventor, or discoverer, Garibed T. K. Giragossian, an Armenian who came to the U. S. in 1891. He claims that he has discovered a new principle of energy. He has perfected a machine which he claims will run without fuel, "without expense, and without toil, except wear and tear of machinery."

Mr. Giragossian does not claim to have discovered anything along the lines of perpetual motion. He has not overcome gravity or anything of the kind. According to the discoverer, Garibed is a natural force which he intends to utilize by means which he has discovered. It is concentrated. His device is used in such a way that it is almost concentrated energy itself. He says, "I am not claiming that I will produce energy by magic, but I will tell you that I have discovered a natural force that we can utilize and have energy as we like, without toil or expense. I can demonstrate it before anybody and convince any man of common sense. I can lay down my drawings before scientists and can convince them in 15 or 20 minutes that I have accomplished this work."

The inventor, or discoverer, has worked 17 years perfecting his machine to utilize this force. Now he proposes that the government investigate the matter, at his expense, through fully competent and properly accredited scientists; and he wishes, if their report be favorable, to assign to the United States Government the rights of the use of his invention, to the end that we may employ it to bring about the end of the war. The inventor has succeeded in interesting Congress in his "scheme" to the extent that the House has ordered an investigation of the device by five scientists approved by the Secretary of the Interior.

Of course, there are many men who, remembering Keeley and his wonderful motor, will laugh at this recent proposal; but there were also those who laughed at Edison, Bell, Marconi, Fulton, and the Wright brothers. The inventor admits his claims are open to ridicule because of a "prevailing prejudice or conviction among a certain class that energy cannot be produced without expense." Supposed laws of nature are frequently proven erroneous. Perhaps Mr. Giragossian has actually hit upon some scheme for the commercial utilization of the cosmic forces. Or, perhaps, he is on a par, so far as proper development of working details is concerned, with another man from Boston—can it be that he himself is the one?—who was anonymously reported several years ago as being prepared to retard the earth in its rotation and impound the energy thus released. You must form your own conclusions of the existence and possibilities of "Garibed."

We are entitled to protect ourselves against a man when he tries to sell us something; but when a man offers to let us decide whether we want what he has, and if we do, to give it to us, all at his own expense—well, there can be no argument. We must not draw too hasty conclusions in regard to "Garibed."

W. E. E.

THE ENGINEER IN PUBLIC AFFAIRS

Since engineering is preeminently a profession of public service, engineers are constantly being urged to take an active part in public affairs. It is believed that their active participation will react beneficially both upon the well-being of the profession and upon the welfare of the community. Those students and faculty members that vote in the Fifth Ward will have an opportunity to back their convictions along this line with deeds at the Spring election. Harrison L. Garner, c '09, C. E. '15, has announced himself a candidate for the office of alderman. Mr. Garner, at present the Manager of the Co-op, was, for several years, an instructor in Hydraulic Engineering. His success as a teacher has created, among his college associates, a confidence in his ability and judgment. In addition to the thorough grounding in the theory of water supply and sanitation gained through his teaching work, he has had considerable practical experience along the same lines. This theoretical and practical engineering experience, combined with his well-known business ability, should make him a useful and influential member of the City Council. Vote for Garner.

OUR VISITING LECTURERS

Each year from six to ten engineers are brought to Madison for the purpose of addressing the students of this College. They are usually men of prominence in their profession, whose mere presence should be an inspiration to a student of engineering. They are busy men who willingly make the necessary sacrifice of time and effort in the hope that they may help in the training of the coming generation of engineers.

Certain classes are excused so that the students may attend these lectures. The lectures are held during morning hours, which is often inconvenient for the speaker, so that they will be most convenient for the student.

The records show that, of the men excused from classes, only from 40 to 80 per cent actually attend the lecture. The average is 65 per cent; a little more than half. What is the answer? Are the lectures not worth while, or, as some cynic has remarked, is the object of the student to get as little education as possible for his money?

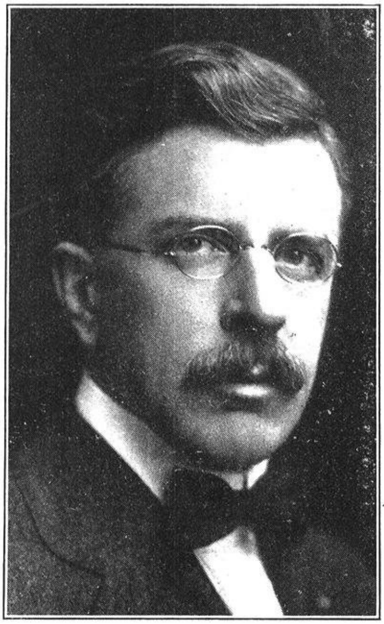
THE VALUE OF SKETCHES

A young engineer, a Wisconsin man by the way, was giving "cut-offs" for a pile bridge. He knew the elevation of the base of the rail, and he thought he knew just how far below the base of the rail the tops of the piles should be. He put in an industrious day and managed to keep the carpenters busy sawing off the tops of the piles. That night, as he reviewed the day's work,—for he was already beginning to acquire the habit of reviewing his work somewhat anxiously during his spare moments—he was suddenly assailed by doubt. Taking his pencil, he sketched the cross-section of the pile trestle,—ties, stringers, and cap—and he put down the dimensions of each. The total was not what he had thought it was, and the next day a sadder, but wiser, young engineer went over all those cutoffs again, in the presence of a most unsympathetic and sarcastic crew of "coarse bridge persons." Never, after, that did he take a chance of that kind. If a sketch could be used to check his calculations, or to refresh his memory, he took the trouble to make it.

In many cases, the student in college could guard himself against error by using sketches. It is a useful practice that is not sufficiently appreciated. It brings the physical eye to the aid of the mental eye, and some mental eyes need all the aid that can be given them. The man who possesses natural ability for sketching should use and improve his gift; the man who lacks the ability should cultivate it, for it is something that can be acquired.

SUCCESSFUL WISCONSIN ENGINEERS

John S. Allen, of the State Railroad Commission, was a member of the third class of electrical engineering students to be graduated from Wisconsin,—the class of '97. Mr. Allen was born at Lake Geneva, Wisconsin, on February 28, 1872, and received his early education in the public schools of that town. He entered the University in 1893 at which time Professor D.C. Jackson was at the head of the small, but rapidly expanding department of Electrical Engineering.



JOHN S. ALLEN

The first four years after his graduation, Mr. Allen spent principally in construction work.

In 1901 he was made manager of the Beloit Electric Co. which position he held until 1906, when the property was combined with that of the gas and water company to form the Beloit Water, Gas, and Electric Co.

In 1906, with others, he purchased the property of the Equitable Electric Light Co. at Lake Geneva which he managed until it was sold in 1915.

In June, 1917 he was appointed by Governor Philipp as a member of the Railroad Commission to fill the unexpired term of Walter Alexander another member of the class of '97.

WITH THE COLORS.

It is desired to leave a record, as complete and accurate as possible, of the response made to our Nation's call in this hour of need, by the students, the faculty, and the alumni of the College of Engineering. We most earnestly hope that you will give your assistance and coöperation toward this end. Bits of news, extracts of letters, photographs, and material of a similar nature will be welcome and should be given to some member of the Staff, or dropped into the mailbox of THE WISCONSIN ENGINEER, addressed to WITH THE COLORS. Letters and photographs will be returned undamaged.

By Loyal S. Baker

HONOR ROLL (Supplementary)

BRAGG, KENDALL B., c '15, Lieutenant in the Civil Engrs. Corps, U. S. N. R. F.

BACHHUBER, G. E., electrical senior, has been made a sergeant in the 120 F. A. Band. He is now in France.

CAMLIN, H. A., ex-'20, is Electrical Engr. in the shipyard at San Diego, Cal.

CONATY, BERNARD M., c '18, is in training for the non-flying branch of the aviation service. He is stationed at Atlanta, Ga.

CONNELLY, ROBERT M., c '16, Ground School, Aviation Service, Berkely, Cal.

FISHER, E. W., c '16, is now in France with the Coast Artillery Corps.

GOCKEL, A. P., ch '17, is a Second Lieutenant with the 344th Inf., Camp Grant, Ill.

GOLDAMMER, CHARLES J., e '17, has been promoted from a First Class Electrician to an Ensign in the Navy. He is now located at the Reserve Officers' Quarters A, Room 203, U. S. N. A., Annapolis, Md.

HAYDEN, CARL F., Ch. E. 4, who enlisted in December is now a Sergeant in the Ordnance Dept., and is stationed as Inspector of small arms ammunition at the Bridgeport, Conn., plant of the Union Metallic Cartridge Co.

HEDRICK, ARLY L., graduate student of '10–11 and '11–12, is Captain of the 110th Engrs. at Camp Doniphan, Okla. He will leave for the Company Commanders School in France at once.

HOPKINS, WILLIAM T., c '13, has been promoted to Lieutenant in the U. S. Naval Aviation Forces.

HELMLE, WILLIAM C., ch '17, is now a member of "D" Battery, 332 Field Artillery, Camp Grant, Illinois.

Paton McGilvary

LORD, HERBERT, C. E. 4, has been promoted to a First Lieutenantcy with the 160th Depot Brigade, Camp Custer, Mich.

McGILVARY, PATON, e '16, has received his promotion to a First Lieutenant in the Aviation Service. A recent letter from Pat tells of his selection along with two others to head a new camp to be established at the point from which he writes.

MEYERS, PAUL D., Ch. E. 4, has been transferred from the Coast Artillery Corps, in which he first won his commission, to the Aviation Service, where he retains his same rank. Paulie is now in France doing "spotting" over the German lines in one of the heavier types of planes. The cut shows the former hero of the Badger gridiron ready for a flight. His garb is the new uniform recently issued to the aviators. It is designed for the maximum of warmth and comfort with the least weight and bulk.

MILLER, EDMUND, ch '17, has been transferred from Camp Custer to Washington, D. C., where he is stationed in the chemical division of the Bureau of Mines.

PHELPS, RAY, e '16, who has been with Co. 2, E. O. T. C., Ft. Leavenworth, Kansas, is believed to have sailed for France on the eighteenth of January. He continues his rank of Second Lieutenant.

ROARK, R. J., former Inst. in Mechanics, is now a First Lieutenant in the Field Artillery in France. At present he is in training at one of the American Bases.

SWIFT, J. D., M. E. 3, has enlisted in the Signal Corps.

TRAYER, GEORGE W., c '12, is at Camp Lee.

WELCH, H. A., civil sophomore, has left school to enlist in the Signal Corps.

WHIPPLE, NEWTON D., ch '17, has finished his studies at the Ground School for Aviators at Rantoul, Ill., and is expecting to be sent to San Antonio, Texas for further training.

PAUL D. MEYERS

Another record has been made by a Wisconsin man in the service. Lester C. Rogers, c '15, a member of the First battery R. O. T. C. at Camp Grant, Illinois, recently made the remarkable score of 395 points out of a possible 410, in the tests which were given the men to determine their mental alertness. His record has been equaled by but one other man in the thousands examined since the system was inaugurated by the war department.

The following letter, dated January 31, has been received from A. E. Kelty, m '17.

I'm at the third Aviation Instruction Center in France and flying about everyday. It is a "chasse" or scout school and the little busses are wonderful. The comparison between them and the old "safety first" Curtiss (as one of our boys puts it) is like that between an Elgin and an Ingersoll. They are just a trifle nose-heavy, so that one can sit up there and drive them with the motor without touching the stick. If she starts to dive, just open the throttle a very little, and if she starts to nose up, just shut it off a bit. Of course if you get a wallop, or lose your lateral stability, you've got to straighten her up. The rudder is very dangerous in the air unless it is properly used and is apt to send one up the hill (the cemetery is on top of a hill). That is generally known as "getting over the last hump." You see we say that when we accomplish anything;—for instance getting out of the ground school or passing the R. M. A.'s,—"we've gotten over a hump." It might be applied to exams over there.

Tell those boys who get into this stuff that if they have an opportunity to get their training in the States, after graduating from ground school, to do so by all means. The boys who come here directly from ground school are just put on the waiting list because all the preliminary training schools are full. Glenn Richardson is here doing M. P. (Military Police) duty until he can get his flying. Most of them are doing guard duty and such. Had muster for the post today. I had no idea there were so many men here. It was the same old stuff; column of companies and eyes right to a General Somebody—not a full general of course, but probably a Brigadier. I've got my commission as first lieutenant now and have been enjoying the position for a month. Give my regards to all the fellows.

CAMPUS NOTES

A short time ago, Captain Culver, representing the United States Government, visited the University to make arrangements for the new government Experimental Station soon to be established here. The purpose of the station will be to carry on experimental tests of new types of wireless receiving apparatus. There will probably be three enlisted men in charge, with whom three student operators will coöperate. The station is expected to be in full operation by the middle of March.

Professor Van Hagan spoke to the Civil Engineering Society on February 28, upon the subject: "Why Should an American Wish to Live in Mexico?" Some newspaper paragrapher, he explained, advanced the question at the time the government was having so much trouble in inducing Americans to leave Mexico. Views were shown to illustrate living conditions in Mexico City and the various ways in which an American spent his leisure hours.

The enrollment of the College of Engineering for the second semester is 452 as compared with 510 for the first semester. The total enrollment for the University for the second semester is 3,500, a decrease of 13 per cent. compared with the first semester.

The Miners have organized a class in Chinese with Chen T. Chiang, mining sophomore, as instructor. The class meets on Saturday at 2 p. m. in room 210. Mr. Chiang is an optimist; he says his students will learn to talk Chinese in a year.

At a meeting of Eta Kappa Nu on the evening of February 20, Mr. A. R. Taylor, e '14, an old member of the chapter, gave an interesting talk about the type of work that should be chosen after graduation. Mr. Taylor believes that the young graduate should commence work with some company where he will have an opportunity to work at enough different branches of his profession to be able to make a wise choice of his life work.

According to information received from the Adjutant General's office in Washington by Major Kerwin, the Secretary of State approves the recommendation of the Chief of Engineers, that engineering students enlisted in the Reserve be authorized to wear on the left lapel of the coat in civilian clothes or on the left hand side of the collar of students in uniform, the regulation enlisted man's letter of the Corps of Engineers, but without a company letter. However, these men in the enlisted reserve corps are not entitled to wear the uniform of the United States army until called into active service.

Considerable interest is being shown in the two-credit wireless course given in the Physics building. At present there are seventy-five students enrolled in the course. Students will be given practice in the operation and adjustment of the various kinds of apparatus used in wireless telegraphy.

One of our foreign students states that when he entered the university he was obliged to take an examination in American history. He was asked five questions. Two of the five questions were as follows: (a) What is a carpet-bagger? (b) What is a wildcat? Small wonder that the wildcat is sometimes wild.

Miss Helen Smith, '19, daughter of Professor Leonard S. Smith, won the Junior Exhibition, with an oration entitled "Women and the War."

On February 20, Mr. Ernest Bateman of the Forest Products Laboratory gave a lecture before the Wisconsin section of the American Chemical Society on:—"Coal Tar and Water Gas Tar Creosote." The lecture was delivered in the Chemistry building before an audience of about forty. It covered a discussion of the analysis of various coal tar and water gas creosotes from several portions of the United States.

Another opportunity is now open to the engineering students who believe that, by finishing their technical training before they enter the active service, they can be of more ultimate value to the government than by volunteering now. At present the navy is enlisting engineering students in the Naval Reserve Force, Class 4, as second class seamen, and then is sending them back to school to finish their education. No promise of a commission is given the men; but when they are graduated and are called into the active service, they will be reexamined and rated according to their ability and the current requirements of the navy.

Professor E. R. Maurer has been granted leave of absence for the second semester. He will be engaged in making some investigations in aeroplane construction at the Forest Products Laboratory. His only work in the College of Engineering will be to give the course in Aeronautics, for which there has been a strong demand.

Professor M. C. Beebe has been granted leave of absence for the second semester to engage in war work with the Western Electric Company. He will be located at New York City.

Mr. W. Chisholm, instructor in Pattern Making, has been granted a leave of absence for the second semester. He will teach machine gunnery at Champagne, Illinois.

Mr. W. L. Dabney, instructor in Mechanical Practice, has been granted an extended leave of absence this semester, so that he may continue his work on submarines at New London, Connecticut.

Charles E. Dennis, a senior in civil engineering, has been granted permission to withdraw from school in order to take up investigative work at the Forest Products Laboratory.

There is a possibility that, in the future, there will be a more general excusing of classes in the College of Engineering in order to give students the opportunity of hearing speakers who are brought from outside. Methods are being considered that will furnish a record of the students who avail themselves of the privilege thus granted.

ALUMNI NOTES

By Walter S. Nathan

Wisconsin men seem destined to take an active part in the development of concrete ships. Last month we announced that "Jake" Glaettli, instructor in mechanics, had gone to Washington to work with the Emergency Fleet Corporation. Since then we have learned that Solomon C. Hollister, c '16, is with the same Corporation, and that E. E. Parker, c '07, City Engineer of Madison, has obtained a three months leave of absence and has also joined the Wisconsin colony in Washington.

Howard ("Cub") Buck, c '17, Assistant Professor of Athletics at Carleton College, was in Madison February 4. Carleton had a successful football season, and won the Championship of its Conference. Buck has recently received some "black hand" letters threatening his life. He believes they were written by a foreigner—a student in his Surveying classes in the last Summer School, who was a most eccentric and apparently irrational fellow.

H. L. Garner, c '09, C. E. '15, who is Manager of the University Cooperative Company, Madison, has announced his candidacy for the office of Alderman of the Fifth ward.

J. F. Gross, M. E. '16, is with the Davison Chemical Company of Baltimore, Maryland.

Captain Arly L. Hedrick of the 110th Engineers, former student in civil engineering, has been associated with his father in engineering work at Kansas City under the firm name of Hedrick and Hedrick. The firm has specialized in the design of steel and reinforced concrete structures. Captain Hedrick is married and has a five year old daughter, Barbara Jane.

C. W. Jehle, ch '17, is with the Linderman Steel and Machinery Company at Muskegon, Mich.

Herman Lachmund, m '09, is now at Bremerton, Wash. His address is 632 Washington Avenue.

E. L. Leasman, ch '07, Ch. E. '13, is Metallographist for the Falk Company of Milwaukee.

A. G. Oehler, e '11, may be reached at 561 Bradford Avenue, Westfield, N. J.

M. J. Steere, c '16, is with the Gerharz-Jaqueth Engineering Company of Great Falls, Montana. His address is 405 Fifth Avenue East, Kalispell, Montana..

C. L. Van Auken, c '10, has accepted a position as Associate Editor of the Railway Review, 537 So. Dearborn Street, Chicago. Mr. Van Auken's previous position was Assistant Engineer, New York Central Railroad, Chicago.

Glenn F. Vivian, c '13, Statistician for the C., M. & St. P. Railway Company, has just completed some extensive investigations into the cost of switching in the Chicago terminal district. The investigations were carried out in connection with some rate cases before the Interstate Commerce Commission. Vivian's address is now 4137 W. Adams Street, Chicago.

J. F. Wolff, g '08, E. M. '11, for the past ten years a mining engineer and geologist for the Oliver Iron Mining Company, the mining branch of the U. S. Steel Corporation, resigned his position on January 1st to engage in consulting mining engineering work with offices at Duluth and Crosby, Minnesota on the Cuyuna Range. Mr. Wolff is well known through his engineering and geologic work in the Lake Superior district, and particularly his contributions in the Engineering & Mining Journal and other mining press to the detailed knowledge of the structural geology of the Mesabi Range and it's ore-bodies. He has also done extensive experimental work on the concentration of the Mesabi Range washable ores. Mr. Wolff was a member of the 1908 Varsity baseball team.

G. E. Youngberg, c '14, is Deputy State Surveyor at Rapid City, South Dakota.

J. G. Zimmerman, ch '04, E. E. '15, lives at 1145 Kinnickinnic Avenue, Milwaukee.

But for Electricity, the Panama Canal would still be a dream

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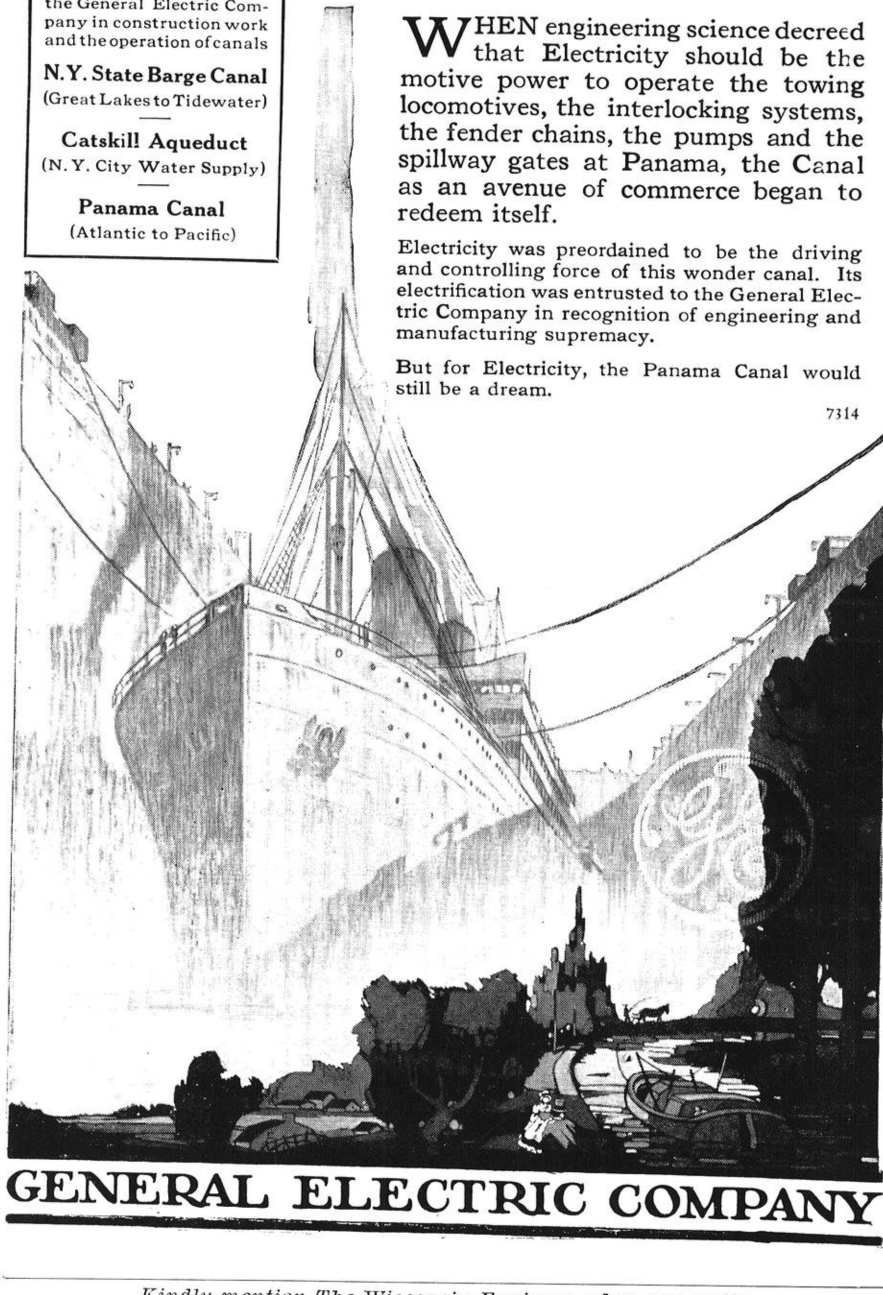

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