Gas and Electric News

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Palmer's Glen in Winter

Photo by Graves

In Memoriam:

Horace Ellsworth Andrews

President

Rochester Railway and Light Company

Died — December First — 1918

"The Good Men Do, Lives After Them"

GAS AND ELECTRIC NEWS

Vol. 6 DECEMBER, 1918 No. 6

Horace Ellsworth Andrews

TWO YEARS ago the Christmas issue of Gas and Electric News was honored by a Christmas message from President Horace E. Andrews. It is with sad hearts that we record in our Christmas number this year the death of the Company's President, which occurred with great suddenness on Sunday, December 1st, after an illness from pneumonia of only five days. In grateful recognition of his memory we are briefly reviewing his past achievements.

Horace Ellsworth Andrews was born in Cleveland, Ohio, in 1863 and was graduated from the Sheffield Scientific School, Yale University, in 1882. He then went to Germany where he studied in the Frieburg School of Mines. Returning to his home city he entered traction work and became President of the Consolidated Railways Company. He later organized and financed many other large enterprises and with his business associates acquired control of the railway and lighting companies of Central New York, including the Rochester Railway & Light Company and the New York State Railways. In 1908 the offices of the latter company were moved to New York City and Mr. Andrews went there to live.

As President of the Rochester Railway & Light Company he followed a consistent life policy of straightforward dealing which has set new standards of honor and integrity in the business world, and through able associates has shaped the Company's business ideals and policies to conform to the highest known standards.

His duties occasionally brought him to Rochester and his visits were always an event in the Company's offices where his kindness, no less than his record, had taught those who were privileged to come in contact with him, to admire him greatly. He constantly had the interests and advancement of the Company's employees at heart, and did everything within his power to encourage the personnel with his kindly advice and wise counsel.

With varied and wide business interests, Mr. Andrews also interested himself deeply in war work and labored unceasingly to aid the country in every conceivable way, especially associating himself with Red Cross and War Relief Committees. At the beginning of the war he became Chairman of the Finance Committee of the War Relief Clearing House for France. He was also Trustee of Teachers College, the Provident Loan Society and the Charity Organization Society of New York, all of which work he carried on in addition to the duties of the directorship of the New York Central, Michigan Central, Big Four, Pittsburg and Lake Erie, West Shore, Missouri, Kansas and Texas Railroads and the Havana Electric Railway Co.

He was President and Director of the Rochester Railway and Light Company, New York State Railways, Mohawk Valley Company and the Schenectady Railway Company. His club affiliations also were very extensive and his personal friends among the big men of the world were numbered by the hundred.

Mr. Andrews' career speaks for itself. He was a broadminded captain of industry and his lieutenants and subordinates in the ranks who were privileged to know him were without exception inspired by his personality. Mr. Andrews was a keen observer of human nature and made every effort to develop those whom he associated with himself in business. He, while a towering figure in business, was a cultured gentleman, interested in home, art, literature and music. As a man typifying the best achievements of the human race, he was truly a colossal figure, as his daily life was made up of a consistent practice of the noble things. In his death another name is added to the long list of rare men who have given their lives, consecrated to noble work for their country in these troubled days. Those in the Rochester Railway and Light Company who knew him will feel a sense of personal loss which time will not efface. It has been the privilege of many in this Company to consider Mr. Andrews the biggest man they had ever known and to emulate him even though at long range. His fidelity to the best in life, his strict attention to work and his personal kindness and gentleness of character have proved an inspiration. In his death we have lost one of the world's greatest men.

"He has won the Golden Star."

The Effect of War Industries on the Company's Electric System

ANDREW S. MACDOWELL

THE FAR reaching effects of the war have repeatedly been impressed upon us. Unusual things are now usual. Standards of personal and corporate thought have been moulded to conform to the standard of national necessity and sacrifices of all kinds have been cheerfully made that the great principles for which the United States and the Entente Allies stand may be perpetuated.

In addition to voluntary personal sacrifices many incidental sacrifices of material, energy, etc., have been concurrent with the development of the Government's war organization and, while these have often been somewhat disheartening, the tremendous task of speedily co-ordinating the vast resources of the Country for a single and unusual purpose made such sacrifices inevitable at first, to be eliminated as the war machine became more perfectly proportioned and reciprocal.

The central stations of the country as a very integral part of the war organization were called upon to furnish power for the great industries which sprang into existence almost overnight. It was necessary for them to carry great overloads on existing apparatus, increasing maintenance and jeopardizing continuity of service; also, where possible, to repair and place in service obsolete and inefficient machines until suitable apparatus could be secured from the manufacturers.

In addition to this sudden increase in load, the power companies were further embarrassed by the nature of a large part of the additional load, which has the characteristic of an unusually low power factor and this is also a war condition brought about by the fact that the new industries were necessarily engineered more or less hastily and often were compelled to take what motors they could get from the manufacturers, whether or not they were exactly suitable for the particular installation on which they were used.

Induction motors are almost universally used on alternating current systems for industrial power purposes, being preferable to other types of alternating current motors by reason of sturdier design and greater facility of operation. It is a well known engineering fact that an induction motor operates with a lagging current or power factor under the best conditions and that a motor should be chosen large enough to carry the average load of the machine or group of machines which it drives, as at this point its operation will be at the highest efficiency and power factor. If the motor carries less than its rated load a correspondingly low efficiency and power factor result. In selecting available motors for quick delivery it would obviously have been poor engineering for the war industries to install motors too small for the load with the risk of burning them out and slowing up production. Larger sizes were therefore used where the proper size could not be secured, and this condition is principally responsible for the general decrease in power factor all over the country.

The matter of a large and sudden decrease in power factor is a serious and real problem for a power company particularly at a time when the systems of most of the central station companies are loaded to the limit of their current carrying capacity. Decreasing the power factor has the effect of increasing the current flowing in the generators, tie and distribution lines for the same amount of power generated and delivered, which increases the generating and line losses and also the voltage drop between sending and receiving ends of lines. For example 1,000 kilowatt at 500 volts would have the following current values for different power factors:

1,000 K.W. at 100% Power Factor=2,000 amperes flowing in circuit.

1,000 K.W. at 80% Power Factor = 2,500 amperes flowing in circuit.

1,000 K.W. at 60% Power Factor=3,334 amperes flowing in circuit.

The current performing useful work, which is in phase with the voltage, is the same in all three cases (2,000 amperes) and the power factor shows the percentage of the current in the circuit which is working current. The total current which flows in a circuit with a power factor lower than 100 per cent is the resultant of a working current and an idle or reactive current which is not in phase with the voltage and therefore cannot be used to perform useful work as explained later.

A decreased power factor means among other things: (1) Increased losses in the system. (2) Impaired service to consumer. (3) Decreased capacity of the system for generating and transmitting energy.

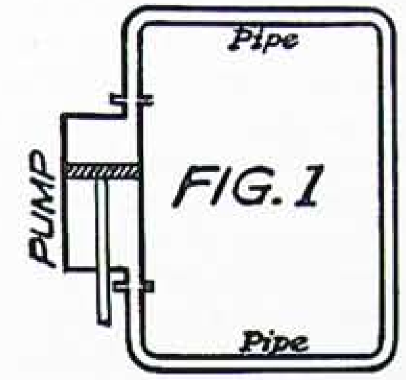
If the power factor is so low that the idle current loads the conductors of the system to the limit of their current carrying capacity, the power company cannot supply more power without installing additional generating and line equipment or raising the power factor thereby reducing the reactive current and releasing more capacity for the flow of useful current. The latter method is of course the correct way of handling the condition as far as possible.

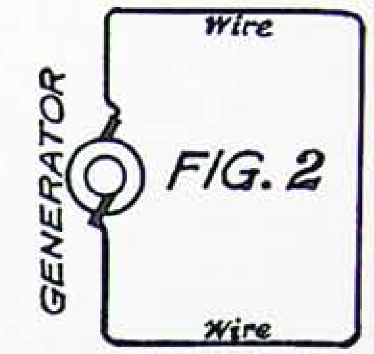
Before going into the matter of power factor correction, a brief description of the causes of low power factor may be of interest. Low power factor is a characteristic of alternating current only and its value depends upon the character of the load which it supplies.

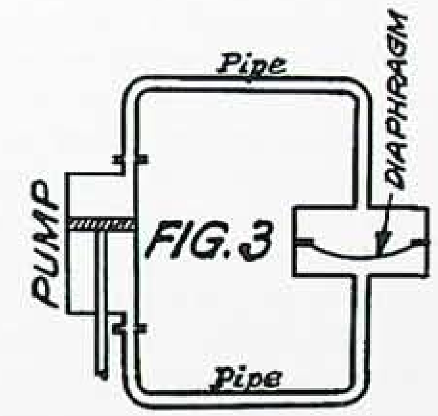
Some classes of load such as certain types of electric furnaces, incandescent lamps, etc., operate at a very high power factor. Other classes as induction motors, arc lamps, etc., operate at a much lower power factor. The power factor of a direct current circuit is 100%, as the total current is working current in phase with the voltage and only resistance is present to oppose the flow of current. In an alternating current circuit the problem becomes more complex as the frequent alternations of the current (in a 60 cycle circuit the current reverses its direction of flow 7,200 times a minute) introduce two new factors opposing the flow of current, known as inductance and condensance which cause currents to flow out of phase with the voltage and thereby lower the power factor.

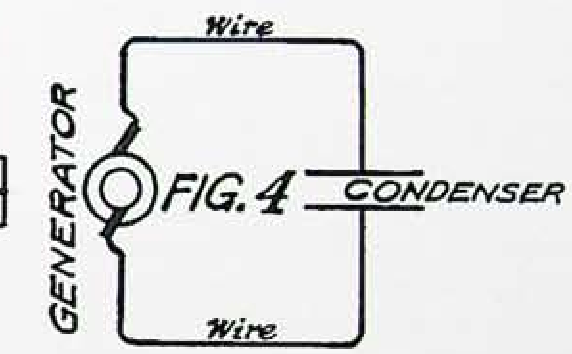
This may be explained by a water analogy. Figure No. 1 shows a loop of pipe with a plunger pump which causes a current of water to surge back and forth as the piston moves up and down. If the flow of water were continuously in one direction only the resistance of the pipe to the flow of water need be considered, as in a direct current electrical circuit. But, where the current of water reverses, part of the pump pressure is consumed in overcoming the inertia of the water in the pipe, first getting it started, then stopping it and starting it in the opposite direction. This corresponds to the current flowing in an alternating current circuit (Figure 2) where part of the voltage or pressure is used in overcoming the inertia or inductance of the circuit as the current reverses.

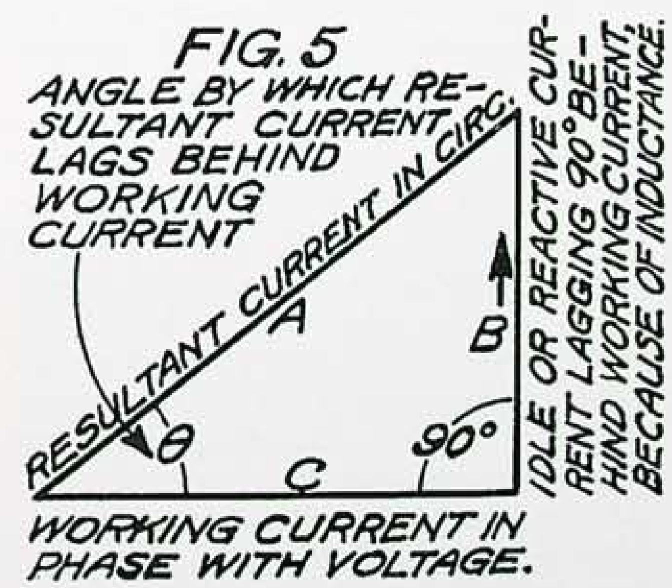
If an elastic diaphragm were stretched across the pipe (Figure 3), the alternating pump pressure must overcome the resistance of the pipe, the inertia of the water and also dis-

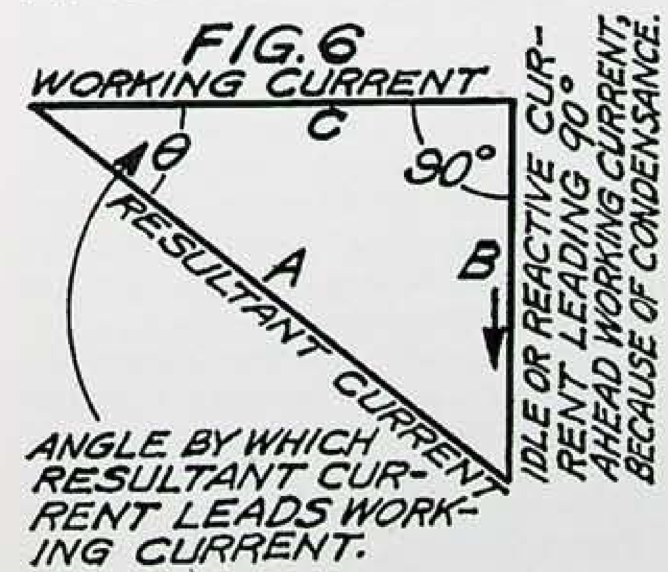


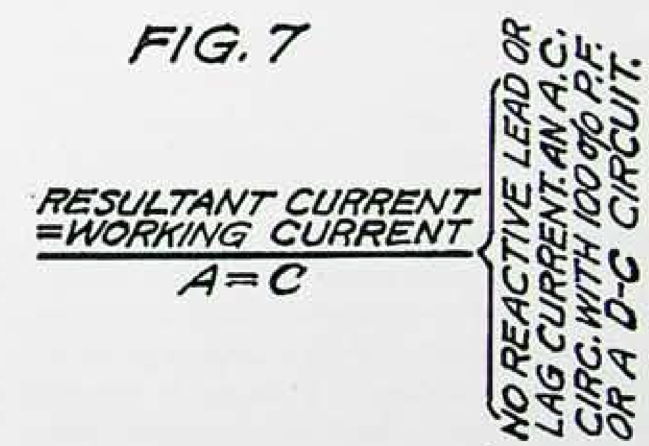


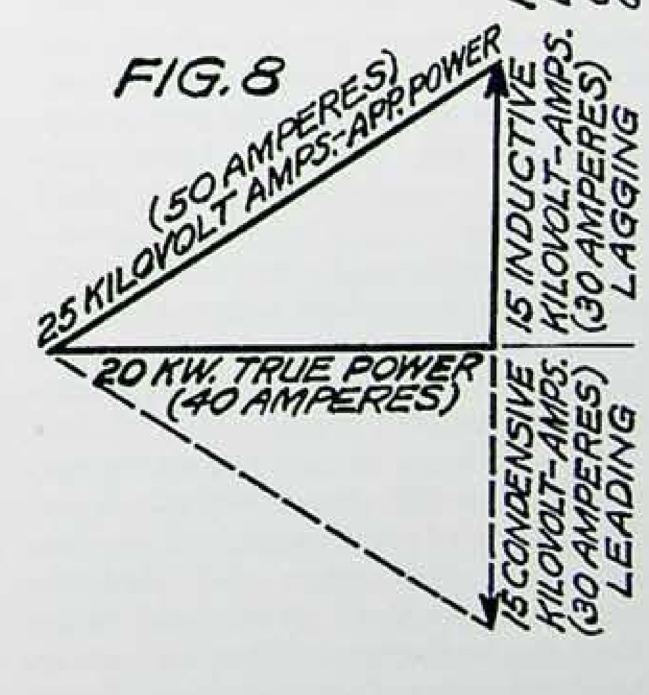












tort the diaphragm. Similarly in an electric circuit (Figure 4) part of the voltage is used in producing the electrical stress created in the insulating material between two plates which are charged first in one direction and then in the other. The combination of plates and insulation form a condenser. The elastic diaphragm permits an alternating current of water to surge back and forth but not a steady current of water to flow. The condenser permits an alternating electric current to surge back and forth in the wire but a steady electric current does not flow. In an alternating current circuit, therefore, the voltage must overcome not only the resistance of the conductor but also the inductance and condensance of the circuit in forcing a current of electricity back and forth in the circuit.

As indicated above it is inductance or condensance or both in an alternating current circuit which lowers the power factor. This is due to the fact that they cause idle or reactive currents to flow in the circuit out of phase with the voltage. The current in an alternating current circuit which performs useful work is known as the working current and is in phase with the voltage. That is, it reaches its maximum and minimum values at the same time as the voltage, and the product of the voltage and working current equals the real power supplied by the circuit. Inductance causes a current to flow 90° in phase behind the voltage and as this current is at right angles to the voltage it reaches its maximum value when the voltage value is 0. It therefore, performs no useful work and is called a reactive or idle current.

Condensance causes a reactive current to flow 90° ahead of the voltage. The effects of inductance and condensance are 180° apart and therefore oppose each other. If of equal values they neutralize each other and no reactive currents flow, the power factor is then 100% and all the current in the circuit is working current. If either inductance or condensance are present separately or both in an unequal degree, there is a reactive current produced which is either lagging or leading, dependent upon the predominance of inductance or condensance. The resultant current which flows in an alternating current circuit is, therefore, made up of two components. The working current which is in phase with the voltage and performs useful work in turning motors, etc., and the idle or reactive current which is out of phase with the working current and simply circulates in the circuit performing no useful work.

The component currents which flow in a circuit due to the presence of inductance or condensance may be shown diagramatically as follows: Figure 5 shows the condition with inductance in the circuit causing a reactive current (B) to flow 90° behind the working current (C). The resultant current (A) which an ammeter shows flowing in the circuit is the geometrical sum of (B) and (C) as these forces are at right angles to each other. $A=\sqrt{B^2+C^2}$. The resultant current (A) lags behind the working current (C) in a degree measured by the angle O. The greater the reactive current (B), the wider the angle becomes and the greater the lag. As the resultant current (A) lags behind the working current (C) it also lags behind the voltage which is in phase with the working current and this angle of lag has to be taken into consideration in computing the true power of the circuit. Figure 6 shows the opposite condition with condensance in the circuit causing a reactive current (B) to flow 90° ahead of the working current (C).

The reactive currents caused by inductance and condensance oppose each other, as shown by the arrows, and when these currents are of equal value the condition is represented by Figure 7 where the reactive currents neutralize each other and the angle of lag is decreased to 0. The working current (C) = the resultant current (A). All the current flowing is working current and the power factor = 100%. This is a theoretically perfect condition and seldom obtains commercially.

Power factor is the term used to indicate the amount by which the resultant current (A) is out of phase with the voltage and is the ratio of the working current to the resultant current. If in Figure 5 (C) = 40 amperes and (A) = 50 amperes the power factor in terms of current values =

$$\frac{\text{working current}}{\text{resultant current}} = \frac{40}{50} = .8 \text{ or } 80\%.$$

Eighty per cent of the current flowing in the circuit is used for real power purposes.

A diagram similar to Figure 5 may also be used to show the relative power components. Figure 8 represents a circuit with an assumed voltage of 500. As the power in a circuit in which the voltage and current are in phase = voltage x current, the power values are

Current Values	*Values*	*Power Values*
Working current	=40 x 500	=20,000 watts true power
Reactive current	=30 x 500	=15,000 volt amperes reactive power
Resultant current	=50 x 500	=25,000 volt amperes apparent power

Apparent and reactive power is measured in kilovolt-amperes, (K.V. A.) and true power in kilowatts (K.W.)

An ammeter reads the resultant current flowing in a circuit and the product of the voltmeter and ammeter readings = the power which is apparently being delivered (25 kilovolt-amperes). This is not true power, however, as the resultant current is not in phase with the voltage. The true power is measured by a wattmeter which reads volts x amperes x power factor (20 kilowatts). The power factor of the circuit (Figure 8) in terms of power values =

$$\frac{\text{True Power}}{\text{Apparent Power}} = \frac{20}{25} = 80\%.$$

Only 80% of the power apparently being supplied by the circuit performs useful work. Figure 8 also shows a line supplying 20 kilowatts of true power to a load of such a character (inductive) that 15 inductive K.V.A are circulating uselessly. To eliminate this it is necessary to introduce 15 condensive K.V.A. into the line. This reduces the value of the apparent K.V.A (25) to the true kilowatts (20) and the resultant current (50) to the useful current (40). The power factor is now 100% and the circuit is supplying the same power (20 kilowatts) but with a current of 40 instead of 50 amperes. It is evident that a low power factor by increasing the resultant current flowing in a circuit, increases the energy losses and voltage drop in the circuit as the energy loss = the square of the current x voltage and the voltage drop = current x voltage.

Power factor is generally lagging caused, as indicated above, by the use of underloaded induction motors on the system. The best method of raising the power factor is obviously to so rearrange the motors that all are operating at full load. If such a rearrangement will not raise the power factor to the required value it becomes necessary to introduce condensance in the line as in Figure 8. Condensance in an appreciable degree is seldom normally present in a power system and is generally due to the condenser action of long transmission lines. Condensance of larger values is added either by the use of static condensers which have the advantage of requiring little attention but are manufactured only in comparatively small sizes, or by the proper use of synchronous motors.

A synchronous motor differs in many respects from an induction motor. The latter has alternating current flowing in both stator and rotor, always operates at a lagging power factor and the power factor can only be brought up to a certain point by increasing the load which the motor carries. A synchronous motor has alternating current flowing in the armature and direct current in the field windings. By varying the field strength or the amount of direct current flowing in the field, a lagging or leading current may be made to flow in the armature which is connected to the electric system. A weak field produces a lagging and a strong field a leading current. Synchronous motors for power factor correction, known as synchronous condensers, are especially designed with heavy field windings to permit large field currents to flow without undue heating. They are operated in this manner to produce leading currents of large values to compensate for the lagging currents caused by induction motors.

Synchronous condensers to be most effective should be installed as near as possible to the points on the system where the lagging currents originate as the leading current which they produce then compensates for the lagging current, or as much of it as is practical, at its source and removes it from the transformers, distribution and tie lines as well as the generators. If installed at the power house the condenser relieves only the generator windings of the reactive current which is still carried by the lines and transformers.

Many central stations offer a bonus to power consumers for maintaining the power factor of their electric load above a certain per cent which encourages the use of proper sized induction motors and also the use of synchronous motors on constant loads where their operation is excellent. The advantage is mutual as the consumer secures better voltage conditions and the power company decreases its losses and can take on more load without additional equipment. For example, a distribution line may be loaded to the limit due to poor power factor at a certain factory. More power is needed at the factory to drive an air compressor. A synchronous motor of the proper size and design will operate the compressor without increasing the total current flowing in the line as the decrease in lagging current which it effects is greater than the relative working current which it adds to the line for performing the work of driving the compressor. Referring to Figure 8 assume the circuit will carry 50 amperes safely and with a reasonable voltage drop. By installing a synchronous motor and raising the power factor from 80% to 100%, the circuit will supply 5 kilowatts additional load with no increase in current over 50 amperes, as follows:

20 kilowatts at 500 volts and 80%

$$\text{Power Factor} = \frac{20{,}000}{.8 \times 500} = 50 \text{ amperes}$$

25 kilowatts at 500 volts and 100%

$$\text{Power Factor} = \frac{25{,}000}{1.0 \times 500} = 50 \text{ amperes}$$

The addition of another induction motor at 80% power factor to drive the compressor would have increased the line current to 62.5 amperes, making a larger line necessary.

25 kilowatts at 500 volts at 80%

$$\text{Power Factor} = \frac{25{,}000}{.8 \times 500} = 62.5 \text{ Amp.}$$

The effect of the city's war industries on the System of this Company has been marked but fortunately not serious enough to warrant a large expenditure for synchronous condensers. The power factor which last year was approximately 90% has fallen to less than 80% due to the very low power factor of the additional load. One new consumer, for example, is supplied with 1,350 kilowatts at 52% power factor, necessitating

$$\frac{1350}{.52} = 2596 \text{ K. V. A. of transformers}$$

to safely carry the reactive current. Ample provision, however, was originally made in this case for a still greater increase in load and 3,000 K. V. A. transformer capacity was installed. This will take care of 3000 x.52 = 1560 K.W. at the present power factor and 3000x.70 = 2100 K.W. by raising the power factor to 70%.

The Company's tie and distribution lines are sufficiently large to carry the increased current due to low power factor, as the increase in load has only been about 75% of the amount expected, due to the fact that the engineers for the war industries estimated somewhat high and also that sufficient labor and material have not been available to operate the plants at a maximum production. The lines which were designed for a certain load at 70% power factor will carry the same current when supplying 75% of the estimated load at 52.5% power factor.

There is also sufficient generating capacity at the power houses to carry the reactive current as the Company, by virtue of the fact that both steam and water generation are used, has a considerably larger total generating capacity than the load would warrant, were the generation all water or all steam. This is necessary as the greater part of the load must be carried by steam when the water is low, and when the water is high, water generation saves coal. The Company's last year's peak was 42,200 K.W. with a prospect of 50,000 K.W. this fall. The steam generating capacity aggregates 50,000 K. V.A. and the water 39,000 or a total of 89,000 K.V.A. The estimated load for this fall is 50,000 K.W. at 70% power factor or 71,000 K.V.A.

This surplus generating capacity permits a steam driven generator to be operated at low power factor in parallel with the water driven generators, thereby relieving the latter of lagging current and allowing more load to be carried by water. The prime mover driving the generator—steam, turbine or water wheel—delivers only enough power to the generator to carry the true power which is being generated. For example, a steam generator of 8,000 K.V.A. capacity may be operated at full K.V.A. 8,000, at 25% power factor in which case only enough steam is required to generate 8000 x .25 = 2000 kilowatts. If there is sufficient water available to carry a full load on the water driven generators, a low power factor on the generators means that this water cannot all be used as the generator windings are so loaded up with reactive current that a full load of true power would increase the current to a point where the windings would burn up. Thus the low power factor practically reduces the size of the generators and a 10,000 K.W. generator at 100% power factor becomes a 7,500 K.W. generator at 75% power factor. Floating a steam driven generator at low power factor in parallel with the water driven generator raises the latter's power factor and permits it to generate more real power from the available water. The steam generator under this condition requires very little steam to drive it on account of the lower power factor at which it operates.

It was necessary to operate a steam generator for power factor correction only for a short period during the spring of 1918 and the losses were small, amounting to approximately $20.00 a day for three weeks. It is more economical to have this small loss for a short period than to carry a large investment in synchronous condensers. These would be idle during that portion of the year when the load is in excess of the installed water generating capacity, even at 100% power factor. They would also be idle when the load is within the limits of installed water generating capacity but there is insufficient water to drive the generators at full load, making the use of steam necessary in either case to supply true power. The condition will also be improved this year as a 2,000 K.V.A. synchronous condenser, which was out of service last spring, will be available for the critical period next spring and this, together with the motor generator sets at the various stations, will be ample to correct for the power factor without the use of steam.

While this method of floating a steam generator at low power factor or operating motor generator sets at company stations as synchronous condensers is quite necessary as an emergency measure, it is more or less a makeshift as the steam generator operates at a small percentage of its capacity with a consequent loss of efficiency. The motor generators consume considerable power in overcoming their losses and the Power Factor correction does not extend to the distribution lines where the voltage drop is high and the losses pile up. The correction should be at the consumers factories to relieve the entire system of the burden.

With this end in view an analysis of the system is now under way. Readings are being taken to determine what factories are operating at low power factors and without doubt the consumers in these cases will cooperate with the Company in raising the power factor to the required percentage. One of the Company's largest consumers of power has for the last three months been operating a spare motor generator set as a synchronous condenser and is at present making tests on every induction motor in the factory to determine the load carried and if underloaded to replace by a smaller motor of the proper size. A general campaign along these lines will cause the power factor of the entire system to automatically rise, relieving all apparatus and lines of reactive current and having the effect practically of increasing the rating of the system enabling the Company to supply more power with existing equipment and with a reduced percentage of generating and distributing losses.

Considerable attention has necessarily been given to this problem of power factor which is nation-wide. Some companies were confronted with a condition where the great increase of load at poor power factor, coupled with the inability to secure delivery on additional equipment, caused a very serious embarrassment. Not only were they unable to supply more power, but could not maintain the proper voltage at important industrial plants, thereby slowing up the motors and causing the plant production to sag very materially at a time when the greatest output was vital.

Decrease in power factor in common with other trying conditions of war time origin, is now being met with intelligent and energetic corrective measures. Within a reasonable time considerably more power from existing apparatus will be available for the country's needs.

The Employees Benevolent Association of the Rochester Railway and Light Company offers employees Insurance at Less than Cost, by reason of Company Contributions.

Are You a Member?

Continuous Service

THOMAS H. YAWGER

WHEN WALKING at night along our brilliantly lighted streets, with their myriads of electric lights, or sitting at home reading the evening paper, few people realize the intricate and complicated methods and the tireless endeavors of the workers who keep these lights going. Consider for a moment the source from whence this illumination emanates, the devious paths and methods by which the cold and inert matter contained in the lamp undergoes this transformation, and our point of view is liable to undergo a radical change regarding the management and operation of this particular industry.

The first thing that impresses one is the fact that the electric current unlike any other commodity is sold or used the instant it is made, there being no commercial way of storing or putting it into stock for future demands. Consequently the continuity of supply depends upon the careful and minute attention to the design and proportion of the various parts of the steam, water and electrical apparatus in the power houses, together with constant vigilance on the part of the workers in these places.

For instance, take some particular day, everything is running smoothly and the proper number of generators and engines are working to carry the load, when a thunderstorm suddenly comes up. Everybody who has electric lights in their place of business or residence immediately turns them on. Instantly the load begins to increase and to avoid any drop in the candle power, measures have to be taken quickly to put into commission more generators, which also means more engines and boilers. More boilers mean more coal to be handled and that quickly, to keep up steam. After an hour or so of this strenuous work the clouds may pass and the lights be turned off, making the same process in a reverse order necessary.

Outside the power station the same vigilance is necessary on the part of the various classes of workmen, for during the storm the wind and lightning combined are almost sure to break down or burn out some part of the intricate network of wires radiating from the power plant. The result is that while these wires are broken down, someone is out of light and they call or send complaint to the office for attention. Long before their complaint reaches the office, the linemen or underground men have been notified by the station men that some particular circuit is out and they are on their way through the storm and wind to repair the damage. Should the storm come at night, we trust you can appreciate what it means to go out into the darkness trying to locate and properly connect the numerous wires that supply you with the current. There is a large element of danger in this work. A false move or mistake might be fatal, but as all hazardous occupations have a curious attraction for some natures, a man once started on this work seldom desires to change.

If the particular lights which you have in view are supplied by water power, a short visit to the plant at different times of the year is liable to change your opinion as to ease of running same. Starting at the inlet to the river, there are the headgates to regulate as the load comes on or off, or as the water in the river rises or lowers, due to rains or melting snow. Back of the headgates there is a fine grating or rack for the purpose of screening leaves, ice, etc., from the water to prevent such refuse from blocking the opening through the water wheels. It is at this point that the most arduous and disagreeable work in connection with a water plant takes place, and it is a difficult proposition to obtain enough men to carry it out successfully. When the river is full of broken ice, enormous quantities are drawn through the headgates to the rack and unless a large force of men are at hand to pull it out with long handled rakes, the racks will become clogged and the supply of water to the wheels stopped. The rack house is supplied with steam heat to thaw off the ice that freezes on the rake handles and to keep the men warm, but at best it is a job that a man will take only as a last resort, and at times the boss himself has to take a hand at raking to prevent the rack from clogging.

After the racks come the penstock, turbines and generators, all of which require practically the same alert attention to changes of load, etc., as a steam plant.

Mankind has made womderful strides in controlling the forces of nature, but until such time as he will be able to stop the lightning stroke, temper the wind, control the floods and make machinery that will not break down, the hardworked and harassed manager of a lighting company has to take things as they are with the hope that they who read this article and whose lights are out at some future time, may bear in mind the fact that he is striving by all known means to get them going again as soon as possible.

The Cheapness of Light

THAT THE average American family pays no more today than it did in the day of the tallow candle is the assertion of an editorial writer in Engineering and Contracting (Chicago). That it has about twenty times as much light for its money is an incidental fact that seems to the writer worth notice. Even if his estimate of $2 a month for electric light should appear a little low, there is enough margin to make his comparisons remarkable. Here is at least one necessity, he says, whose cost to the average family can be compared with what it was a century ago, tho we use it in twentyfold quantity. Whose labor brought about this result? And has he been paid what it is worth to the world? The writer hurls these questions at the thinkers who would credit the coalminer, the fireman, the engineer, and the wireman with it all. He writes:

"Of all the necessities of life there is probably but one that annually costs each household no more today than it did a century ago. That nessity is light. According to Dr. Walton Clark, president of the Franklin Institute, the average American family in 1815 used sperm-oil and tallow candles that cost $22 a year. This $22 purchased 25 candle-power-hours per night, or 9,000 candle-power-hours per annum, from 1815 to 1855. Then came kerosene, which at that time was two-thirds as expensive per candle-power as tallow candles. However, instead of reducing the annual outlay for light, the average family continued to expend about $22 a year, for which were secured some 13,500 candle-power-hours.

"During the decade of 1865 to 1875 the tallow candle was completely displaced by the improved kerosene-lamp and illuminating gas; and the average annual cost for lighting each house was about $24. Gas then sold at $2.50 per 1,000 cubic feet, and the family that used gas entirely spent about $34 a year.

"From 1875 to 1885 kerosene was reduced to 22 cents per gallon and gas to $2 per 1,000 cubic feet. The average family spent $30 a year and secured 76,000 candle-power-hours. During the next decade the price of kerosene dropt to 13 cents per gallon and gas went down to $1.50; but with this reduction of 40 per cent in prices came a reduction of only 17 per cent. in the annual expenditure for lighting,

the average yearly cost then being $25 per household.

"Between 1895 and 1905 kerosene had practically disappeared in city houses, for gas had not only fallen to $1 per 1,000 cubic feet in the larger cities, but electric current had fallen to 10 cents per kilowatt-hour. Using electricity at this price, and with carbon-filament lamps,' the average family secured 50,000 candle-power-hours yearly, for which was paid $25.

"During the next decade (1905-1915) an astonishing advance occurred in the science of economic illumination, both with gas and electricity. The Welsbach incandescent gas-burner, which had been invented in 1887, was enormously improved, and coincidently the mazda or 'tungsten-filament' incandescent electric lamp was developed.

"Today, with gas at $1, a thrifty family can secure 200,000 candle-power of gas light for $15 a year; and a similar family, using electricity at 10 cents, can secure 125,000 candle-power-hours of electric light for $18 a year.

"Supplementing the foregoing figures of Dr. Clark, the editor is able to say that his appraisals of electric plants and studies of electric rates in many cities have shown that the average family using electricity spends about $2 a month or $24 a year for light. The $24 ordinarily buys 240 kilowatt-hours; and, using mazda lamps, each kilowatt produces about 1,000 candle-power, so that the 240 kilowatt-hours generate 240,000 candle-power-hours. The average useful life of a mazda lamp is 1,000 hours of steady burning, or about a year at three hours a day, and adding the cost of the lamps (four yearly) to the cost of the electric current ($20 yearly) enables a family annually to buy 200,000 candle-power-hours for $24.

"We thus come to two astonishing facts: First, that during the last one hundred years the average American family has not departed widely from an expenditure of $24 a year for light. Secondly, that the family of today, altho spending almost the same sum annually for illumination as was spent by the family of a century ago, secures more than twenty times as much light! This astonishing result is due entirely to American inventors, engineers, and business men."

—*The Literary Digest.*

What is Your State of Mind?

If you *think* you are beaten, you are;
If you think you dare not, you don't;
If you'd *like* to win, but you think you *can't*
It's almost a cinch you *won't.*

If you *think* you'll lose, *you're* lost,
For out in the world we find
Success begins with a fellow's *will*—
It's *all* in the state of mind.

If you think you're outclassed, you are!
You've got to think *high* to rise;
You've got to be sure of *yourself* before
You can ever win a prize.

Life's battles don't *always* go
To the stronger or faster man;
But soon or late the man who *wins,*
Is the fellow who *thinks* he can. —*Ex.*

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The Proposal

A very shy fellow was dusky Sam,
As slow of speech as the typical clam,
He couldn't make love to his Angeline
Though his love grew like the great gourd vine.
So he brought the telephone to his aid,
To assist in wooing the chosen maid.
"Miss Angeline? Dat you?" called he.
"Yes—dis Angeline—dis me."
"Miss Angeline, does you love me, too?"
"Why, yes, of course, I loves my beau—
Say, what's the reason you wants to know?"
"Miss—hold de wire—will you marry me? True—"
"Yes, course I will—Say, who is you?"

—*Erie, Pa., Dispatch.*

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Regular Rate

Traveler—How much is my bill?
Clerk—What room?
Traveler—I slept on the billiard table.
Clerk—Fifty cents an hour.

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Vol. VI DECEMBER, 1918 No. 6

I have always thought of Christmas-time as a good time; a kind, forgiving, generous, pleasant time; a time when men and women and little children seem by one consent to open their hearts freely; and so I say, "God bless Christmas."

—*Charles Dickens.*

"Peace on Earth, Good Will to Men"

CHRISTMAS THOUGHT has always been "Peace on Earth, Good Will to Men." The fortune of war has made this thought literal at this season after four years of mortal conflict. We approach this Christmas, therefore, with feelings of profound gratitude toward all agencies which have contributed to the winning of the war, with a feeling of modest satisfaction that this Company and its individual members have not only done their bit but their utmost to bring about this happy consummation, and as we start on the new year it is with resolves for the expenditure of whatever effort may be necessary to bring about a happy reconstruction period. The coming year will be one of strain, in many respects. Re-adjustments in the employment of labor and in the use of capital are bound to come as we swing from the war to a peace-time basis. It will be our duty and our privilege to so conduct our own work that these changes in the Company will be beneficial rather than harmful. For some time to come the cost of material will be very high and more strict economy in its use will be the duty of all. Certain labor re-adjustments are also bound to come and we must meet these with business logic, recognizing the economic laws of supply and demand which are beyond our individual control.

Inasmuch as it is customary for most of us to make various new resolutions at New Year, suppose we follow the custom and resolve to make the most of our employment with this Company. To this end, investigate without further delay the various advantages other than our monetary compensation which may come to us. The long evenings are upon us and the Company will help us provide ourselves with suitable literature to entertain and instruct us. The E. B. A. is in flourishing condition. Resolve to become a member of it before another month rolls by. A very small amount of Company stock is still for sale. Don't let this opportunity go past. Accident prevention is still and always will be a vital policy with this Company. Resolve to do your bit in making your work safer and in preventing accidents to your fellow employees. The competition in business will probably be keener for some time to come. Resolve to meet it while learning more about your own work. Many men and women will be promoted during 1919 to positions of greater remuneration. Resolve to be one of these. It can be done only through the application of the time honored business principles which very few keep. Resolve to be one of the few exceptions.

Life seems to be a combination of ups and downs, of joy and sorrow. This is particularly the case with the organization of the Rochester Railway and Light Company this Christmas season for, while we rejoice in the virtual end of the war and in the measure of material prosperity which the Company has experienced during the past year, we are saddened by the death of our President, Horace E. Andrews on December 1st. We are printing as our leading article a biographical memoir of President Andrews. We are constrained to mention again our sense of personal loss in the death of the genial man who meant so much to this and other companies. Our Christmas is incomplete without his good wishes. We are, however, grateful that we had the opportunity of knowing him.

Imitation and Success

A good imitation is the most perfect originality.—*Voltaire.*

It is by imitation, far more than by precept, that we learn everything; and what we learn thus, we acquire not only more effectually, but more pleasantly.—*Burke.*

Do you know anyone doing the same work that you are doing who seems to enjoy it more, to put more heart into it, to derive more happiness and inspiration from it, than you do? Who altogether is more successful at it?

If there is such a person, do not be contented secretly to envy or admire him, but rather observe and study his methods. Watch him in action and try to see wherein the difference lies. What has he that you lack? Why is he better equipped to do this particular work than you are?

Is he in better health? Does he seem to be able to apply himself better, to shut out irrelevant things, other cares and responsibilities that have nothing to do with the work in hand? Does he seem to find some dream, some beauty, some vivid heart element in the work that you do not find there? Or does he simply seem by nature to be better equipped for it?

You may not be able to equal this man. You may not be able to acquire all the faculties which give him his advantage. But you may be able to acquire one, or some of them. Pick out, then, some quality of mind, or heart, or hand, that is his, and that you think you might be able to make your own, and imitate it.

Do not be ashamed or too proud to try. Some of the greatest things in the world have been accomplished simply through conscientious imitation.—*B. R. T. Monthly.*

New York State Lighting Code

FRANK C. TAYLOR

ON JULY 1ST 1918 the new Code of Lighting relating to the lighting of factories and mercantile establishments became effective. This Code supplements and explains Law No. 81-4 of the Industrial Code, prepared by the Department of Labor. This law states the "The Industrial Board may make rules and regulations to provide for adequate and sufficient natural and artificial lighting facilities in all factories."

Below is written the new Lighting Code:

RULE RELATING TO LIGHTING OF FACTORIES AND MERCANTILE ESTABLISHMENTS

General Requirements (a)—Working or traversed spaces in buildings or grounds shall be supplied during the time of use, with artificial light, in accordance with the following rules, when natural light is less than the intensity specified in Subdivision (c).

Measurements (b)—For the purpose of light measurements, a standardized photometer shall be used and such measurements shall be made at locations specified in the table.

Intensity (c)—The minimum intensity shall not fall below the figures given in the following tables:

	Foot-candles at floor level—minimum required
1. Roadways and yard thorofares	0.02
2. Storage spaces, stairs, stairways, halls, hallways, passageways, aisles, exits and elevator entrances	0.25
3. Water closet compartments, toilet rooms, washrooms, dressing rooms and elevator cars	0.50
	Foot-candles at the work—minimum required
4. Work not requiring discrimination of detail such as handling material of a coarse nature and performing operations not requiring close visual application	0.50
5. Rough manufacturing requiring discrimination of detail, such as rough machining, rough assembling, rough bench work, also work in basements of mercantile establishments requiring discrimination of detail	1.00
6. Rough manufacturing requiring closer discrimination of detail, as machining, assembly and bench work also work in basement of mercantile establishments requiring closer discrimination of detail, intermediate between 5 and 7	2.00
7. Fine manufacturing, such as fine lathe work, pattern and tool making, also office work, such as accounting and typewriting	3.00
8. Special cases of fine work such as watch-making engraving and drafting	5.00

Shading of Lamps (d)—Exposed bare lamps located less than 20 feet above the floor level, shall be provided with shades, reflectors, diffusing glassware or other accessories to eliminate or minimize glare.

This rule shall not apply to lamps used for a temporary decorative purpose where an unusual or harmful glare is not created.

Distribution of Light (e)—Lamps shall be so installed in regard to height, spacing reflectors or other accessories, as to secure a good distribution of light on the work, avoiding objectionable shadows and excessively sharp contrasts.

Emergency Lighting (f)—Where required, shall have a minimum intensity of 0.25 foot-candle.

In an appendix to the Code the various sections are explained and in addition a table is provided covering the minimum intensity for detailed industrial operation and processes. This table states the minimum foot-candles at the work for the different processes in bakeries, candy factories, machine shops, etc. The appendix states that "it is the intention of the Industrial Commission to make the intensity requirements of this table mandatory on July 1st, 1919, if, after public hearings and a year's experience, the same are found to be adequate and just."

Section 1275 of the Penal Law states—"Any person who violates or does not comply with any provision of the Labor Law, any provision of the Industrial Code, any rule or regulation of the Industrial Board of the Department of Labor or any lawful order of the Commissioner of Labor † † † is guilty of a misdemeanor and

upon conviction shall be punished, except as in this chapter otherwise provided, for a first offense by a fine of not less than twenty nor more than fifty dollars; for a second offense by a fine of not less than fifty nor more than two hundred and fifty dollars, or by imprisonment for not more than thirty days or by both, such fine and imprisonment; for a third offense by a fine of not less than two hundred and fifty dollars, or by imprisonment for not more than sixty days, or by both such fine and imprisonment."

The chief reason for the Industrial Commission making such a Code or Law is that they desire to reduce accidents and to improve the working conditions of all employees. One large Insurance Company reports that the number of accidents in December and Januray (the dark months) is 135% greater than in June and July (the daylight months).

From the employer's point of view, good lighting increases production, decreases spoilage and waste, decreases accidents and the attendant disorganization and loss of time, makes a more contented working force, and in general improves the working conditions which cannot but react to the employee's and employer's advantage.

Perhaps the most important rule is the one relating to the shading of lamps which states that "exposed, bare lamps located less than 20 feet above the floor level, shall be provided with shades, reflectors, diffusing glassware or other accessories to eliminate or minimize glare." It is well known that if the eyes are blinded by a bright light source in the line of vision that you cannot see the work properly, even though the actual intensity on the work is sufficient for normal conditions. Glare fatigues the eyes, is the source of headaches and decreases the sensitiveness of the eye.

The Type C lamps, sometimes called nitrogen lamps, when improperly installed are perhaps the greatest source of glare of any of the modern illuminants. The highly concentrated source of light gives much the effect of the arc light, and unless use is made of the bowl frost lamp, or unless the lamp is enclosed in an enclosing globe or other diffusing medium the glare is apt to be objectionable. Bare 100 watt, Type C lamps within the range of vision, when placed approximately 10 feet from the floor, in some instances give extremely bad results. There are few cases where even a lamp as small as a 100 watt lamp cannot better be replaced by a bowl frost lamp, or a lamp equipped with some diffusing medium.

Realizing this situation the General Electric Company has produced a diffusing cap of cream glass, of low absorption, which may be clamped on to any standard lamp of the sizes from 75 watt to 500 watt, inclusive. This device they call an opal lamp cap. The chief advantage of this cap is that one cap may be used for a long time with several different replacements of lamps. It is figured that the additional cost of bowl frost lamps will be greater than the cost of the cap. This cap has another advatage, and that is that it is impossible to see the filament of the lamp through it. The entire surface is evenly illuminated, which is not the case with a frosted surface on a bowl frost lamp.

In order to make possible the checking up of the foot candle intensity at the work the General Electric Company has produced a simple foot-candle meter. The entire apparatus is enclosed in a box approximately 10″ x 8″ x 2″, and is so simple in adjustment that no particular technical knowledge or experience is necessary. We have had one of these meters for some time and have found it to be of great practical assistance in determining the illumination at different points. This gives a good check on all figuring and makes it possible to determine the exact conditions.

Saving Fuel in the Home

HAROLD O. STEWART

MUCH has been said regarding fuel conservation. The point generally made is that we should burn our fuel more efficiently. The following discussion points out methods of saving fuel by reducing the amount of heat required to heat our homes.

One way of saving heat is to watch the thermometer occasionally and keep an even temperature. Exhaustive tests by competent scientists indicate that the house temperature should not exceed 68°. Air below this temperature has a very beneficial effect on the respiratory system causing a healthy muscular action of the air passages at each breath. As the temperature rises above 68° this beneficial effect decreases very rapidly, being practically zero above 72°, consequently, the air passages are inactive at the warmer room temperatures and are thereby weakened and rendered subject to disease.

It is not possible to tell how warm a room is without looking at the thermometer. The more moist the air is the warmer it seems. Very dry air feels much colder than moist air at the same temperature. The effect of circulation of the air in the room also has a considerable effect on the apparent temperature; the more rapid the circulation, the cooler the air seems to be.

As some people generate less heat than others, they should of necessity wear sufficient clothing to feel comfortable in a room at 68°. It is much more desirable to regulate one's comfort with clothing than by changing the temperature.

It should be noted that by carrying a temperature not exceeding 68°, the temperature difference between indoors and outdoors will be considerably lessened, thereby reducing the heat losses through the walls, roof and windows.

It is probable that in nearly every house the leakage of air around the doors and windows is equal to that of an open window $1\frac{1}{2}$ feet square. Most windows fit loosely in the casings and it is likely that the average gap between window and casing is $\frac{1}{16}$ of an inch. 192 linear feet of an opening $\frac{1}{16}''$ wide would equal one square foot. As cellar and attic windows fit more more loosely than others, it is probable that the gap is nearer $\frac{1}{8}$ of an inch. The openings around doors are generally more than $\frac{1}{16}$ of an inch. It can readily be seen that by adding up all of these narrow openings, a very large area results.

All attic and cellar windows and others which are not to be opened during the winter should be caulked. Weather strips should be put around doors and windows where leaks are considerable. Dampers in fire-places should be closed when they are not being used as the fireplace chimney will remove a very large quantity of heat from the house. Ventilators should also be regulated so as not to waste heat.

Inasmuch as heat rises, and most homes have an open stairway, it will be found that, when all registers are open or all heating coils turned on, the temperature of the second floor is considerably higher than the first floor. In fact, except for the bathrooms, many houses can be heated in mild weather entirely by the heat which goes up the stairway, the heat supplying devices on the second floor having been entirely turned off.

Rooms which are not being used should be shut off from the rest of the house. Both the registers and the dampers should be closed. Curtains can be used to prevent the heat from flowing to those parts of the house where it is not needed. It should be noted that an open window on a hot water radiator will take an enormous amount of heat out of the hotwater heating system, even if the radiator valves are "closed," there is at all times considerable flow of water to prevent freezing.

The greatest single factor in saving fuel in the home using a hot air furnace is the elimination of the cold air box, and the installation of one or more ducts which take the air from the first floor and return it to the furnace for reheating. By this method of recirculation it is only necessary to heat the air slightly, that is, from 65° instead of from the outdoor temperature which is below 30° in the winter.

The cross-sectional area of the recirculating pipes should equal the total cross-sectional area of the hot air pipes. This is necessary in order to get good circulation. In fact, the faster the recirculation, the greater the amount of heat which will be absorbed from the heating surface of the furnace and carried up into the house. Recirculating systems will save about 25% of the fuel.

For more vigorous recirculation, a small electric fan placed in the return system can be used. Much more heat will be absorbed by the recirculating air and much less will go up the chimney. Tests made in cold weather with a recirculating system where a fan was run sixteen hours per day showed a saving of 25% of the fuel.

There is some fancied objection to this system in that fresh air is not supplied through the furnace to the rooms. However, it should be noted that there is no fresh air supplied with steam or hot water heating system. The leakage of air through windows and door casings is more than ample to supply the amount required.

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Home Practices

WE PREACH safety in works and plants of every description, in the streets and buildings, but how often do we put our ideas into practice in our own homes?

Away from home, you are, to some extent perhaps, the subject of conditions as you may find them, but you can at least make your home reasonably safe for yourself, for those nearest and dearest to you and for your servants. The many unsafe methods and practices in the kitchens, laundries and cellars of the average American home are appalling, the toll taken, especially of the infant and child class, enormous and yet little, if anything, is done to mitigate these conditions.

Porches and areaways should be railed to prevent little children falling. Stairways should be kept clear of all obstructions. Do not store materials on the back stairway—some dark night someone will try to use it and a serious injury result from tripping over the stuff.

Don't keep gasoline, benzine or other volatile liquids around the house. If it is necessary to have them, keep them in bottles, securely corked, and in a cool place. And don't ever use them near a naked light.

If you smell gas, don't look for the leak with a lighted match. You will probably find it, but it is cheaper and better all around to get the plumber to look for it. Don't let the cook, when she wants to light a burner in the back of the stove, reach over a lighted front burner. Don't let her light the gas oven without first opening the door to permit the escape of any accumulated gas. Provide plenty of holders to prevent the cook burning her hands when shifting pots or kettles—they cost but a trifle, save many painful burns and relieve the cook's temper.

There are so many little things around the house that can be made safer and done in a better way—you can easily figure them out yourself. Is your home safe? Why not make it safe?—*Safety News.*

Letters From Company Men in Service

Vichy, France,
Oct. 21, 1918.

Dear Riss:

I suppose you wonder if I ever reached France. Yes, after twelve days on the ocean we dropped anchor in Liverpool harbor. The trip was rather tedious as there were so many troops aboard, composed mostly of Engineers, Infantry and two other Hospital units. Also it was not any too comfortable, it being necessary to wear a raincoat or overcoat at all times and the ever present life preserver. However we all felt comparatively safe with the heavy convoy that surrounded us on all sides; our ship being in the center. At night we slept in hammocks hung on hooks directly over the table where we ate our meals which consisted largely of porridge, beans and jam. One morning about two days out from England we were awakened and told to go on deck as the ship was entering the danger zone. It was about 3:30 A. M. and light, although there was a rather heavy gray mist in the air. We could just make out the dim outlines of Scotland on one side and Ireland on the other. We passed through safely without encountering "Fritz" and his "hell boat."

In the afternoon of the next day (June 16th) we left the ship and boarded the train for Southampton. Arriving there we went into a rest camp, which was a rest camp in name only as we slept on the wooden floor of a tent. I myself slept on the ground outside the tent where there was room enough to stretch out my legs. The next day we went aboard a steamer to cross the English channel which we did at night. Landing in Havre, France, we were again marched to a rest camp which was worse than the first. Here our tent was smaller and during the night when it rained the tent leaked so that the next morning we rolled out of a mass of wet blankets with colds and aches in every joint from the hard floor.

The next day we took the train for the last leg of our journey and believe me, it was a dirty, worn out, unshaven bunch that landed in Vichy on June 22nd.

Our first month in Vichy was full of hard work too. The work of construction and organization began in earnest. Our intended hospital had to be scrubbed from top to bottom. There was "*beaucoup*" plumbing and electrical work, incoming equipment had to be unpacked and installed, beds set up and placed, and last, but not least, the cellars had to be filled with coal. You can imagine yours truly in overalls and jumper on the handle of a coal shovel. I didn't get all of the coal dust out of my eyes until a week afterwards.

Finally, after every thing was in readiness, the patients began to arrive and once more we became acquainted with the stretcher handles and this time it was not to parade around before an admiring crowd on the Armory floor. From this time on it was "Watch Your Step."

I began my duties in a surgical ward and soon learned how much a man could be shot up without being killed. The machine gun bullet wound usually goes entirely through the part it strikes, especially the arms and legs. The shrapnel wound is a jagged wound and requires usually a minor operation to remove the piece. Then there are the gassed cases, where parts of the body are charred and burned. It is a very hard matter to carry a badly gassed case on a stretcher without causing him pain from the blisters. Later I was made wardmaster of a ward where there were only ear, nose, throat and jaw cases. Here I saw some wonderful work done smashed jaws and disfigured faces. I was soon due for another change, however, when B. H. No. 115 took over the hospital in which I was working. After two weeks duty in a contagious diseases ward, they detailed me for duty on the military police force and I was indeed glad of the last change as it is not easy to work on contagious cases.

Just a word about Vichy. Vichy is a small summer resort with fine first class hotels, two large pretty parks, tennis courts, a large fair ground and just across the river Allier in a little town called Bellerive, there is a large golf course. People come here from all over France to drink the Vichy water and take Vichy water baths which are considered good for various ailments. The town is nearly Americanized now and the people will find a vast difference when the Americans "parti." Our unit has a nice hotel for barracks in the center of the town. There is the Red Cross moving picture show, besides several French movies. There is just a little too much wine here, and one of my duties is to arrest those who partake too freely of the grape.

Well, Riss, this is getting to be a book so I'll cut it. Expect to be home about 1st of July. Would be very glad to hear from you. Remember me to Mr. Fisher and ask him how he would like a Safety Manager's job on the front line. Au revoir,

Yours truly,
FLOYD OWEN.

U. S. Naval Air Sta.,
Miami, Florida,
Dec. 11, 1918.

My dear Mr. Powell:

After nearly seven months of tiresome training in prospect of some fun dropping T N T on Huns and subs on the other side they have shipped me down to this hot corner of the U. S. to help teach future aces how to fly. I don't relish the job very much as it is very tiresome work compared with the excitement I might have had if the war had continued. As it was, I finished my training and qualified as a naval aviator just six hours after the hostilities ceased. I've been in Florida since the first of August, first in Miami for preliminary and stunt flying and then at Pensacola for advanced flying, bombing, gunnery and aerial navigation. The latter was particularly interesting as we were required to fly out of sight of land over the Gulf of Mexico, execute certain maneuvers and return to a certain buoy at a given time, keeping constantly in touch with the station by wireless. Flying is an experience that must be accomplished to be appreciated. With the possible exception of my first few flights I have enjoyed it immensely and have been fortunate enough to have escaped a fall up to date, although I had a few narrow escapes while I was learning acrobatic flying. The more you fly that more you like it. I don't know of anything more pleasant than to be soaring around over the coast here at Miami on the hot summer days we are having. You couldn't tell much low pressure steam here just now as it is like midsummer, and flower, oranges and palm trees give the place a very tropical appearance.

With best regards to the boys in the office and at Station 3, I am

Very truly yours,
C. W. SMITH, Ensign, U.S.U.R.F.C.

November 12, 1918.

Dear Old Ern:

Well, Old "F.A". as Russell used to call you. How goes it? From looking at the date U.S.A. must be a pretty happy place right now. You can't imagine the time here from a pretty bedlam of hell let loose one night to an absolute calm the next. Oh, it did seem good, and everyone had that worried look off their faces by noon. The worst is up in front of us, those following the barrage with a trip over the top so they are still working over new ground which it seems might have been spared.

I may not have been here long, but I assure you the war didn't end too soon to suit me. I have seen enough pitiful sights to wish a war could never happen again. Your grand letter came yesterday and I enjoyed it. I also got my registration card in the same mail, in fact twenty letters found me at one time. I would like to join you in that match in Roslyn. I'd buy you the drink if I could beat you the match. I'll think of you wandering through the woods and plowed fields cussing that fool ball. Your arithmetic on that Roslyn trip amuses me. Don't forget I had to pay for four double Tom Collins. I haven't a bank account in Rochester but in case you are troubled just salt down a bottle of gin and of vermuth and I'll brew you some of our choice cocktails when I get back.

Am glad West Station is ringing true and by gosh I always swore they would and they will. It will be a treat to come back and work with those boys I assure you. You did right on the mail question, I don't want any junk and your judgement is O.K. in any case.

I was sure Fred Remington travelled in our convoy and I asked permission to send a wireless but they did not do commercial work at such an important time. They shoot a man like J. A. Alling over the high spots and then send him back to raise money. I am getting along fine, am in a nice crowd of soldiers. I mess with the officers and they are a jolly bunch. This morning is a beauty, the sun up bright the first time in I don't know when, doing its best to remove the marks of a real heavy frost last night. Gee, it was clear and rippy cold. Our fringe of trees which top the surrounding hills have enough fall leaves on to make them pretty. The hut stands at the corner of a main crossroad going up front and it is some busy place. I have great pleasure in knowing that I am the only one doing business around here with any regularity. The usual routine is to sell out in two days and loaf a week. I have been going every day and the day I think I am going to finish I try to get a rig so we can go in for more. It has worked fine only I have to make a forty mile trip last time and I didn't get any sleep for two nights and plodded the last one in a deluge of rain. I was sure all in.

How is Ralph and your sister? Kindly remember me to them all. We are to be denied our dinner but as long as peace is on the way we could get along as we do. I want to inform you that rationing any army like this is *some* problem. A nigger said he had enlisted for the duration of the war and he had been due rations ever since! Really I'll have to approach an R C or O H C C dinner with a snaffle bit. Remember me to all the boys. A Merry Christmas & Happy New Year is the sincere wish of your devoted pal,

J. P. HAFTENKAMP.

Thought Too Highly of Both

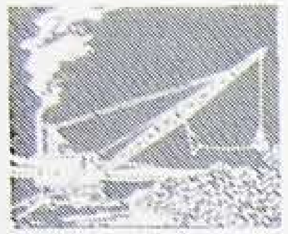
On a road in Belgium a German officer met a boy leading a jackass, and addressed him in heavy jovial fashion as follows:

"That's a fine jackass you have, my son. What do you call it? . . . Albert, I bet!"

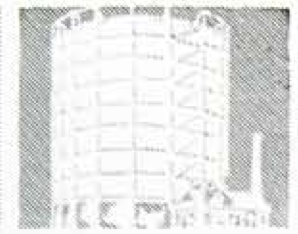
"Oh, no, officer." the boy replied quickly. "I think too highly of my King."

The German scowled and returned: "I hope you don't dare to call it William."

"Oh, no, officer, I think too highly of my jackass."—*Paris Liberte.*



Gas Manufacture



At the light oil plant, there are two "decanters" or separatory tanks on the circulating system, one for the benzolized wash oil going to the still, and the other for the debenzolized wash oil returning from the still. They are designed to separate the water from the oil. Periodically the water compartment has to be drawn off and each time that is done some oil is lost. Formerly this was wasted, but recently Mr. Harry Donovan constructed a separator from an oil barrel. The decanters are drained into the barrel, the oil separates and is returned to the system. About 35 gallons of oil are saved daily amounting to $4.00 per day or more.

❖

Mr. Hawley Taussig, the U. G. I. Engineer who designed West Station made a most persistent claim that if we used small dry breeze in the retort bottoms at West Station we would eliminate 90% of the trouble due to sticking charges. It seemed a bit unreasonable to suppose that 300 pounds of breeze with 10% or 30 pounds of water in each retort could be responsible for all our "sticks", and no very consistent effort was made to act on Mr. Taussig's suggestion. A rotary breeze dryer was purchased and installed, but to operate it properly meant either relocating it or installing additional conveyors, bins, etc., to make the installation satisfactory. The breeze accumulates in a bin in the crusher house under the finest coke screen, and is conveyed to storage bins in the retort house by the coal conveyors.

It was finally decided to install a steam heating coil in the crusher house bins, in an attempt to dry the breeze before carrying it to the retort house. This installation, consisting of a series of return pipe coils circulating live steam, reduced the initial moisture content by about 4%. Meantime, occasional experience had demonstrated that dry breeze *did* have a considerable influence on the "sticks." The partially dried breeze further confirmed this. So the idea was extended and a set of coils was put into each of the storage bins over the retort house, where a time contact of 48 hours is given the breeze with the heating surfaces, and the moisture is reduced to 5% or less. The steam cost amounts to about $3.00 per day, less than one man's wages, and no auxiliary equipment or additional capital outlay is required. "Sticks" are reduced almost to the vanishing point.

Mr. A. M. Beebee is responsible for the final plan and Mr. Taussig is vindicated.

❖

Occasionally a seemingly serious accident proves a blessing in disguise. When the Sturtevant blower, supplying air to Nos. 4 and 5 water gas machines at East Station overspeeded and wrecked itself last July, we faced a somewhat serious situation. We were left with one electric driven blower and one steam driven blower, neither of which was adequate to supply the air required for No. 4 machine. An old blower of still smaller capacity was installed in place of the wrecked machine, and the cycle of machine operation was reduced to meet the new conditions. Negotiations with the Sturtevant Company were then started toward securing a new blower, of larger capacity than the old one if possible, for it was well established that the capacities of the water gas machines could be materially increased if the air supply could be increased. For the uninitiated, it may be explained that a water gas machine is operated on an intermittent cycle of "blasting" the fire and steaming—that is, air is put through the fire bringing up its temperature. The air generates a "lean" gas which is burned in the carburetter and superheater to establish correct temperatures, then the air is shut off and steam is turned into the fire, decomposing according to the following formula:

$$C + H_2O = CO + H_2$$

The C represents carbon or coke. This reaction requires heat, which of course, comes from the fuel bed so that after the reaction proceeds for a time, the fuel temperature is reduced below the necessary point. Then the steam is cut off and the fire is again "blasted."

For each thousand feet of gas made about 1500 cu. ft. of air are required during the blowing period. To get the air through the machine therefore, the blower must be of the proper capacity and must work against sufficient pressure to counteract the resistance of the fire and the other portions of the machine.

At East Station the available steam supply has been greater than the proportionate air supply, hence, the machine capacities have been hampered, chiefly by the limited air resources.

It would be easy enough to buy a complete new blowing equipment, requiring new motors, foundations, etc., but that did not seem a feasible solution under present conditions. So the Sturtevant Company undertook to design a new runner for the old blower case, to deliver increased air without demanding a larger motor drive. This runner was ordered and likewise a new blower (runner and case). Very prompt delivery was made on the runner, and it was finally installed in the old housing.

How well the Sturtevant Company succeeded in its intentions is shown by the fact that we are now getting sufficient air to No. 4 machine to make its capacity 4,000,000 cu. ft. per day, an increase of 750,000 over its former rating, or 23%. When the other new equipment is received we should be able to get a similar increase on the other machine, giving us a total water gas capacity of 10,600,000 cu. ft. instead of 8,500,000.

Electric Generation

The installation of the new 10,000 K. W. 60 cycle, 11,000 V. steam turbine at Station 3 is nearing completion and it is now expected that it will be turned over for use by the Operating Department about December 23rd.

❖

Another street lighting transformer has been installed at Station 35, and circuit No. 11 which supplies a portion of the street lighting to the northwestern section of the City and which was formerly operated from Station 3, is now being more economically operated from Station 35.

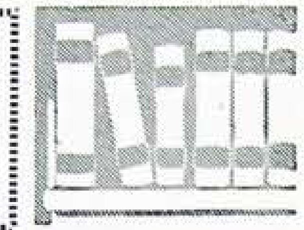
❖

The climax in electric generation for November was reached on Friday the 22nd, when the load reached a point a trifle over 52,000 K. W. at 5.30 P. M. This mark exceeds the peak for 1917, which occurred December 13th, by about 10,000 K.W.

❖

Partitions are being built around the elevator well and at the west end of the switchboard gallery at Station 3, the plan being to check the "flu" like drafts which in former winters circulated through the working galleries. These improvements will add greatly to the health and comfort of the operating force.

Auditing



New Business

Net Increase in Consumers in First Ten Months of 1918

	Dec. 31, 1917	Oct. 31, 1918	Increase
Gas	78,657	79,130	473
Electric	27,774	28,881	1,107
Steam	51	88	37
	106,482	108,099	1,617

Net Increase in Consumers in Twelve Months Ending October 31, 1918

	Oct. 31, 1917	Oct. 31, 1918	Increase
Gas	78,634	79,130	496
Electric	27,460	28,881	1,421
Steam	51	88	37
	106,145	108,099	1,954

Statement of Consumers by Departments as of October 31st

Oct. 31	Gas	Elec.	Steam	Total	Increase
1908	40,736	6,346	....	47,082	....
1909	44,680	7,189	....	51,869	4,787
1910	50,866	8,584	....	59,450	7,581
1911	56,179	10,442	17	66,638	7,188
1912	60,868	12,849	20	73,737	7,099
1913	66,133	15,772	23	81,928	8,191
1914	69,654	18,140	30	87,824	5,896
1915	70,968	21,714	39	92,721	4,897
1916	75,121	24,782	41	99,944	7,223
1917	78,634	27,460	51	106,145	6,201
1918	79,130	28,881	88	108,099	1,954
Inc. in. 10 Yrs.	38,394	22,535	88	61,017	61,017

Net Increase in Consumers by Months

	1916	1917	1918
Increase in January	341	194	54
Increase in February	253	(Dec.) 19	56
Increase in March	339	386	183
Increase in April	684	608	322
Increase in May	765	568	508
Increase in June	645	726	292
Increase in July	616	713	(Dec.) 53
Increase in August	777	669	(Dec.) 17
Increase in September	1,225	554	147
Increase in October	494	584	125
	6,139	4,983	1,617

Subscribers to 7% Preferred Stock

Number of Subscriptions November 1........1,372
Number of Subscriptions December 1.......1,406
Number of Shares November 1..................9,299
Number of Shares December 1..................9,478

Miscellaneous Data

	Oct. 31, 1918	Oct. 31, 1917	Increase
Miles of Gas Main	488	494	(Dec.) 6
Miles of Overhead Line	1,900	1,871	29
Mile of Underground Cable	1,133	1,072	61
Miles of Subway Duct	1,008	968	40
No. of Street Arc Lamps	1,636	1,583	53
No. of Street Incandescent Lamps	8,810	8,084	726
Total No. of St. Lamps	10,446	9,667	779
No. of Employees	1,192	1,321	(Dec.) 129
Amt. of Payroll (Mo.)	$135,498.66	$125,229.42	$10,269.24

E. B. A. for Month of November 1918

Receipts		
Bal. on hand Nov. 1st, 1918		$1,758.66
Dues—Members	$525.32	
Dues—Company	525.32	
Fees—Members	17.00	
Fees—Company	17.00	
Assessment No. 18—Mem	3.25	
Assessment No. 18—Com	3.25	
Int. on Bk. Bal. and Inv	42.50	
Group Life Insurance	12.12	1,145.76
Total		$2,904.42
Disbursements		
Sick Benefits	$896.26	
Accidents on Duty Benefits	21.45	
Medical Examiner's Expense	6.00	
Members' Military and Naval Expense	54.31	
Payments for Month of Nov		978.02
Bal. on hand Dec. 1st, 1918		$1,926.40
Membership		
Membership October 31, 1918		705
Affiliated Month of November	17	
Terminated Month of November	10	7
Membership November 30, 1918		712

Evening Schools

Employees of the Company who are interested in the free courses of study offered in the Public Evening Schools will find below a schedule of the subjects taught; the schools where classes are held; and the evenings. Also an Evening School Directory.

The Public Evening Schools Offer Free Courses

English for Foreign Born—W. J. H. S. Nos. 3, 5, 9, 13, 17, 18, 38.

Grammar School Subjects—W. J. H. S. Nos. 3, 5, 9, 13, 17, 18, 38.

War Cookery—W. J. H. S., M. P. V. S. No. 9.

Dressmaking and Sewing—W. J. H. S., M. P. V. S. Nos. 3, 5, 9, 13, 17, 18, 38.

Millinery—W. J. H. S., M. P. V. S. No. 13.

French and Italian—No. 3 School.

Typewriting, Stenography and Bookkeeping—W. J. H. S. Nos. 13, 38.

Machine Shop Practice (For Men and Women), Tool Making, Tool Designing, Auto-Mechanics and Gas Engine Repair, Radio-Mechanics, Electricity, Blue Print Reading, Blue Print Sketching, and Drafting for Machinists—W. J. H. S., R. S. S.

Industrial Science—R. S. S.

Commercial Arithmetic, Sheet Metal, Printing, Shop Mathematics, Cabinet Making, Mechanical Drafting—W. J. H. S.

SESSIONS: MONDAY, TUESDAY AND THURSDAY EVENINGS 7:30 TO 9:15 O'CLOCK. TERM BEGINS MONDAY, SEPTEMBER 30, 1918,

A new State law which went into effect Sept. 1st, 1918, compels minors between 16 and 21 years of age, who are unable to speak, read and write the English language, as is required for the completion of the fifth grade of the public schools, to attend some public school in day or evening session, or receive instruction in a shop, plant or factory, under the supervision of the school authorities.

EVENING SCHOOL DIRECTORY

Washington Junior High School, Clifford Ave. cor. Thomas St.

Madison Park Vocational School, King St. near West Ave.

Rochester Shop School, Cor. Joseph and Ave. D.

No. 3 School, Tremont St., No. 5 School, Jones St. cor. Dean St.

No. 3 School, Tremont St.
No. 5 School, Jones St. cor. Dean St.
No. 9 School, Joseph Ave.
No. 13 School, Hickory St.
No. 17 School, Orange St.
No. 19 School, North St. cor. Draper.
No. 38 School, Lake Ave.

Personals

At a meeting of the Board of Directors on Friday, December 20th, 1918, held it New York City, Vice President and General Manager James T. Hutchings was elected President of the Company to succeed President Horace E. Andrews who died December 1st, 1918.

Mr. Chauncey M. Briggs, a former member of the Engineering-Drafting Department, has been appointed Ensign in the Navy and is stationed at Washington, D. C.

The illustrated public lectures on electricity and gas will be given as formerly, free of charge to any organization in the city or vicinity. Arrangements can be made through Mr. F. W. Fisher, Employment and Safety Manager.

First Lieut. Samuel J. Cohen, of the Field Artillery, called on friends in the Industrial Sales Department. He has just received his discharge from the Army.

Mr. Ivar Lundgaard spent one day inspecting the Fulton Steel Works. He made the trip by automobile and was accompanied by Mr. Louis P. Willsea of the Willsea Works.

Mr. F. W. Fisher, Manager of the Employment, Safety & Claim Department, was elected to the Presidency of the Rochester Safety Council at a recent meeting of that body.

Mr. Edmund C. Schenk, Chief Engineer of Submarine Chaser No. 236, was home on a two weeks furlough and called on his many friends in the Operating Department at Station 3.

First Lieut. Edward A. Roeser, of the U. S. Signal Corps, expects to receive his discharge in a few days and will return to his position as Engineer in the Industrial Sales Department.

Mr. Harold O. Stewart has resumed

his position with the Industrial Sales Department, having completed his work with the Production Division of the Ordnance Department in which he has been engaged since last May.

Mr. J. F. Putnam has made a trip to Boston, New York, Long Island City, Albany and Schenectady, making investigations on methods used by various companies for taking and maintaining the physical inventory necessary for compiling tax reports.

Mr. Arthur C. Rissberger, formerly of the Employment and Claim Department, who left to take up the management of the Central Employment Bureau and later was identified with the Independence Inspection Bureau of Philadelphia, has returned to his old position with the Company.

A postcard was recently received by Mr. F. W. Fisher from Mr. Philip F. Stevens, formerly of the Engineering ing Department, in which Christmas greetings were sent to Mr. Stevens' many friends in the Company. Mr. Stevens is at present working for the Austin Construction Company of Cleveland.

Mr. Norman H. Davidson, of the Engineering Officers' Training School Camp Humphreys, Va., visited members of the Engineering Department on November 30th. Mr. Davidson will complete his training in about two months and will take up his work in the Engineering Department as soon as he receives his commission.

The Third Annual Safety Congress of the New York State Department of Labor was held in Syracuse December 2nd to 6th inclusive and was attended by several of the employees of this Company, namely: Messrs. A. M. Beebee, V. C. Hoddick, W. J. Consler, Seth Creighton, G. B. Swarthout, E. R. Crofts, W. H. White, P. J. O'Neill, and O. H. Gentry.

The windows on the lower floor of the Main Office are attracting a great deal of notice and causing much favorable comment. They are quite worthy of it and the trimmers are to be congratulated on the effect obtained by the artistic grouping of many useful electric and gas appliances. The entire main floor presents an attractive appearance with its Christmas decorations.

Word has been received of the birth of a seven pound son to Mr. and Mrs. Melvin D. Anderson of Ann Arbor, Michigan. Mr. Anderson was a former member of the Industrial Sales Department and is now acting as Instructor in Telephony to soldiers at the University of Michigan. Mr. Anderson expects to return to us when he is released from his present duties.

Mr. F. W. Fisher, Employment and Safety Manager, recently visited twenty-four of the principal eastern cities collecting rate information for Vice-President and General Manager James T. Hutchings. The trip east of Rochester was made by automobile with Mrs. Fisher and the trip west of Rochester by train. While in Baltimore "Senator" Tillman, formerly of this Company, was seen and he sent regards to his friends in the Company.

Among those who came to the Company since November first are: Miss Marie Mitzinger, clerk Collection Dept.; Miss Irene Legler, clerk Tabulating Dept.; Mrs. Jane E. Tucker, clerk Appliance Dept.; Miss Hazel Heisler, clerk Billing Dept.; Miss Norah C. Henehan, tracer Drafting Dept.; Miss Leona Frank, messenger Mailing Dept.; Miss Florence C. Wood, clerk Electric Distribution Dept.; Mr. Elmer H. Lerch, clerk Purchasing Dept.; Mr. James Boyle, messenger Mailing Dept.; Mr. Howard Walters, tracer Drafting Dept.; Mr. James Browne and Mr. Clarence George, clerks Credit Posting Dept.; Mr. Sidney R. Cady, clerk Order Dept.; Mr. Andrew Nelson, Laboratory Assistant, Messrs. Emmett R. Gildea, Carl Vogler, Charles Sullivan and Frank A. Krebs, Meter Readers.

Just American

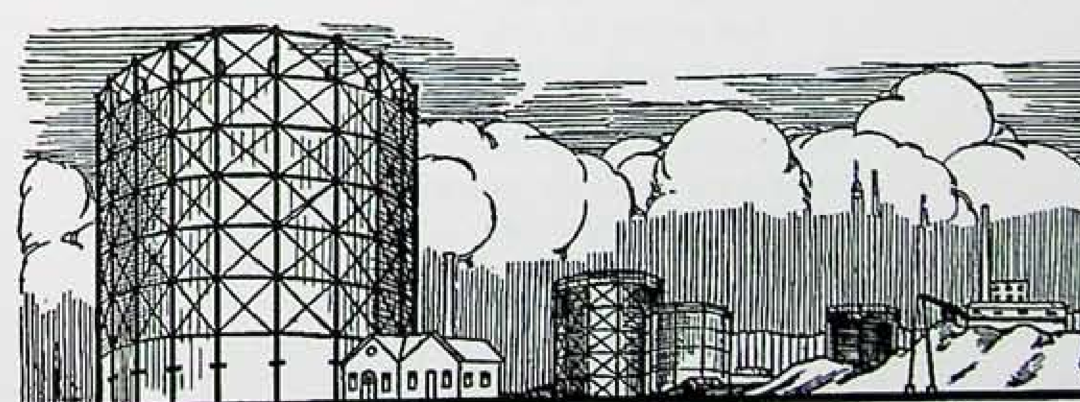
Just today we chanced to meet,
Down upon the crowded street;
And I wondered whence he came,
What was once his nation's name.

So I asked him, "Tell me true,
Are you Pole or Russian Jew,
English, Scotch, Italian, Russian,
Belgian, Spanish, Swiss, Moravian,
Dutch or Greek or Scandinavian?"

Then he raised his head on high,
As he gave me this reply:

"What I was is naught to me,
In this land of Liberty,
In my soul as man to man,
I am just American."

—*Bureau of Education.*



The Du Bois Press of Rochester

Christmas Bells

I heard the bells on Christmas Day
Their old, familiar carols play,
And wild and sweet
The words repeat
Of peace on earth, good-will to men!

And thought how, as the day had come,
The belfries of all Christendom
Had rolled along
The unbroken song
Of peace on earth, good-will to men!

Till, ringing, singing on its way,
The world revolved from night to day,
A voice, a chime,
A chant sublime
Of peace on earth, good-will to men!

Then from each black, accursed mouth
The cannon thundered in the South,
And with the sound
The carols drowned
Of peace on earth, good-will to men!

It was as if an earthquake rent
The hearthstones of a continent,
And made forlorn
The households born
Of peace on earth, good-will to men!

And in despair I bowed my head;
"There is no peace on earth," I said
"For hate is strong,
And mocks the song
Of peace on earth, good-will to men!"

Then pealed the bells more loud and deep
"God is not dead; nor doth he sleep!
The Wrong shall fail,
The Right prevail,
With peace on earth, good-will to men!"

— *Henry Wadsworth Longfellow.*