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He Preferred The Ride

BERNARD was every inch a Swiss, from his knowledge of cuckoo clocks to his skill as a yodeler. So on his first visit to New York, his cousins watched with some amusement his amazed delight as the Otis Elevator whisked them to the top of one of the highest buildings. They looked forward to witnessing his thrill as he stepped out on the balcony which overlooked the vast panorama of lower New York.

To their disappointment he seemed to lose interest as soon as they left the elevator.

"Look down", they said to him, "You've never seen anything like this in Switzerland!"

Bernard shrugged his shoulders.

"This is all very well, but my own mountains are much higher. If you don't mind, I'll spend my afternoon going up and down in those elevators. It is not the height of these buildings which I find impressive; it is the fact that we don't have to climb to the top of them!"

THE METROPOLITAN BUILDING, New York, is one of the earlier tall buildings, but its dignity and pleasing lines make it a favorite, and it is hard to realize that the top of the tower is some six hundred feet above the sidewalk. In the tower portion of the building there are six (6) Otis Gearless Traction Machines, running at 600 Feet per Minute. In the main part of the building, the old high pressure hydraulic elevators are being replaced by twenty-nine (29) Otis Gearless Traction Micro Drive Elevators of the latest type.

OTIS ELEVATOR COMPANY

Offices in all Principal Cities of the World

XXXV TERRE HAUTE, INDIANA, DECEMBER, 1925 No. 3

THE TECHNIC

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Summary of Contents

KNOWLEDGE OF LANGUAGE

—BY—

CLAUDE N. SETTLES

I am a power.
I am a force that helps to build the world,
And Progress owes its movements all to me
The telegraph and telephone, all books
And magazines, the wireless, radio,
And all the rest, are servants to my call:
Mere clods, quite dead and lifeless but for
me.

I am a tool.
If rightly used, I save more time and pains
Than most machines that man has yet devised.
Increased Efficiency at once takes up command
When I am brought to work effectively.
I aid the cook, the manager of wealth,
The tiller of the soil, and grocer's clerk.
I cleanse the atmosphere till all Mistakes
And harsh Misunderstandings, forced to
flee,
Retire to regions out beyond my ken.

I am a raiment.
It is I who clothe the plain blunt man
In mystic robes of finely woven thought.
I make presentable the warrior bold,
The engineer, the judge, the diplomat,
And all the rest who labor mentally.
I clothe their minds that they may feel no
shame
If pedant or if princely potentate
Should speak with them in council or in
court.

I am an entertainer.
More varied and accessible am I
Than any other thing that man may call
To bring enjoyment to his leisure hours.
More lasting are the pleasures that I bring
Than those of instruments of finest tone,
Than galleries of art, or engines gaunt
That speed you on and on without a pause.
Within the limit of a minute's time
I take you into any century,
I introduce a king or common thief
And reproduce the pleasures of success
Or triumphs all supreme; I show
The wasting horrors of disease and death
In musty prison dungeons, cold and damp.

All these I do.
Yet see how I am used; neglected, shunned,
Aye, and abused. Yet truly I contend
I am a force that helps to build the world,
And Progress owes its movement all to me,
For I am Language, carrier of thought,
And he who knows me, wields a mighty
power.

HOW HOT IS HEAT?

Instruments known as Pyrometers can tell us much about this seemingly indefinite question

By H. A. Schwartz, '01

Manager of Research, The National Malleable Steel Casting Company

WE measure temperature always by its effect on some physical substance.

The very earliest step in temperature measurement was the development of the thermometer 200 years ago, by means of which was measured the differential expansion between the liquid mercury and the solid glass. From that system of thermometry there arose the temperature scales now in use. It is, however, quite a problem to discuss how you can build on a temperature scale in degrees Centigrade from 100 degrees to say 1500 degrees, the melting point of pure iron, and know that your steps are even lengths.

At high temperatures you can look at an object and estimate the color of light that it emits and, depending on how good a guesser you are, form a somewhat good judgment regarding the temperature of the object. Expansion and the estimation of color are still practiced as actual means of measuring temperature, and we will come, as we go along, to the refinements that have been introduced into these methods in order to make them at all workable.

In the use of thermometers we have to stop at temperature at which the internal liquid boils or when the glass casing becomes soft. We can help the expansion method a little by measuring the expansion of a gas. This, however, is not a very convenient way for a steel treater to measure temperatures. When we remember the fundamental law that the product of the pressure and the volume of the gas is a constant multiplied by its temperature, all that we have to do is to measure two of these quantities and compute the third one. We can, for example, measure the temperature required to keep the gas a constant volume and use that as a measure of the ultimate temperature.

The expansion pyrometer was for a time a really commercially usable thing. It has a lot of undesirable features. It cannot be used in the furnace for a very long period and cannot be extended very far into the furnace. It measures the temperature over a rather large area because the platinum strips whose expansion compared with that of iron, measures the temperature is six or eight inches long.

Another method used in determining temperature was to put a small body, preferably platinum, into the furnace and then remove it quickly into water, measure the rise of temperature in the latter and calculate the temperature of the platinum when it went into the water. If this scheme is carried out carefully, good results may be obtained. In its time, this method was one of the useful methods of temperature measurement.

Nowadays, however, pyrometry means the use of a thermocouple for temperatures within its range. A thermocouple consists of a pair of wires of two dissimilar metals which are fused together into a little bead and that little bead is placed at the point where it is desired to measure the temperature. The ends of the wires extend out of the furnace and connect with an instrument for measuring the electromotive force. When the junction of two dissimilar metals is heated, an electrical potential is set up. There is a direct relation in any given pair of metals between the magnitude of this electromotive force and the temperature to which the juncture of the two wires is heated. Many different kinds of wires can be used depending upon the particular circumstances. Each kind has certain characteristics to recommend it and certain ones which are unfavorable. If it is desired to work with rather low temperatures, antimony and bismuth are rather advantageous for one of the wires. Their melting point is not high enough to be useful for steel treating. Alloys of nickel and chromium and the alloys containing aluminum and the combinations of some of those with iron may be used. There are a vast number of possibilities of relatively cheap metals which will make very nice thermocouples. The ones that have just been mentioned are called base metal couples and have the disadvantage that their melting points are relatively low. They are also likely to be affected by the chemical reactions; primarily oxidation. They have the great advantage that they set up rather large potentials, for a given temperature. While they are cheaper than other couples, the greatest advantage is their sensitivity.

The accompanying article by Mr. H. A. Schwartz, manager of research, National Malleable and Steel Castings Company, was secured through the courtesy of the American Society for Steel Treating. It is an abstract by Mr. Schwartz of an article he prepared for the Society, and is based on a stenographic report of a semi-popular lecture before the Cleveland chapter's night course given under the direction of Professor H. M. Boylston of Case School of Applied Science.

If, regardless of price and sensitivity, we have to consider permanence, both in the sense of the equipment not wearing out and in the sense of the calibration being constant, then the almost universal combination is that of platinum and platinum-rhodium. In scientific work the platinum and platinum-rhodium couple is usually the ultimate standard of comparison. Irrespective of the kind of wire used, we assume that the electromotive force corresponding to a given temperature is known, and the uestion of how we shall measure temperature becomes a question of how we shall measure this electromotive force. The simplest way is to connect a millivoltmeter or galvanometer to the couple.

These instruments depend for their action, not on the electromotive force, but on the current which flows through them although we can derive the current from the electromotive force by Ohms law. Evidently, if we have an instrument which measures electric current and we desire to use it to measure electromotive force, we must carry over into the calibration of the instrument some conception regarding the resistance of the circuit. This can be done in quite a number of different ways. Some systems when installed have the resistance of the whole circuit of the thermocouple and of the measuring device and of the leads permanently adjusted to a constant value. Another system is to make the resistance of the measuring instrument very high and then if the resistance of the thermocouple and of the leads is variable, the changes are only a small proportion of the total resistance and affect the results only to a small degree. Both of these methods prove workable. The high-resistance type, however, requires a sensitive galvanometer. Another error may enter whenever a galvanometer is used. It must be borne in mind that its coils change in resistance when the temperature changes. The current flowing for a given electromotive force may therefore vary with temperature. In the high-resistance type of instrument this difficulty can be overcome by making the windings out of some alloy wire whose resistance changes only minutely with the temperature, or the measuring instrument can be kept in a constant temperature room. With the low-resistance type much of the resistance is in the leads and cannot be kept constant. One of the difficulties with all millivoltmeter hydrometer systems is this change of resistance with the change of temperature.

There are sometimes occasions when we not only want to read the temperature but also want to record it mechanically. One of these indicating types of instruments is provided with some means by which the motion of the pointer can be recorded on a chart that is operated by a clock-work mechanism.

In the Harrison-Foote circuit, adjustments are possible for changes of resistance in the couple and in the leads joining the couple to the galvanometer. Its principle is that a resistance in series with the thermocouple can be adjusted until the galvanometer gives the same deflection when the current is passed through either of two sets of resistance coils in circuit with it. It is a fact that when the rheostat is so adjusted that there is no change of deflection whether the switch key controlling the path of the current is in or out, then the resistance of the external circuit is of a certain fixed value for which the indicator is calibrated.

There is another means of measuring electromotive force which measures it directly without the intervention of any relation between electromotive force and current. This is called the potentiometer method. It has the disadvantage that it requires a manual operation to determine the point on a slide series when the millivoltage of the couple balances a known EMF. Its advantages are that it does not make any difference what the resistance of any of the connections in the thermocouple circuit may be; all we need to know is the resistance of the potentiometer wire, and that stays nearly at constant temperature.

A potentiometer can be converted into a recorder if we devise automatic means for moving the pointer to and fro continuously, so that it always keeps the position of no current in the galvanometer and then move a strip of paper at contant rate under a pen fixed to the slider.

We must remember in any one of these schemes, that the thermocouple measures the temperature difference between its hot end and its cold end. Its cold end is the point where the two dissimilar metals join the copper wire which forms the leads or the windings of the instrument. We have to devise some means by which we can correct for variations of cold-end temperatures. One of the old and simple ones was to run the point where the copper wire is joined on to the couple wires underground four or five feet where the temperature of the earth remains constant.

With a water jacket, if the water supply is from a deep well, we may have a temperature which for most purpose is sufficiently constant. Another scheme is to put the cold end in a thermostat.

Another type of correction which does not involve the keeping of the cold-end temperature constant involves an electrical correction for the changes of temperature. Suppose we connect the wire from the galvanometer to another slider instead of attaching it permanently to the potentiometer circuit in a given spot. If we move this second slider by an amount corresponding to variations in room temperature, then the position of the first slider will not require changing unless the temperature within the furnace changes. This principle is used in potentiometers and potentiometer recorders.

An automatic means of doing this electrically is also available. In this arrangement we have shunted across the potentiometer wire two wires in series, one having a high thermal coefficient of resistance and one a negligible coefficient. One terminal of the thermocouple circuit is connected to the junction of the dissimilar wires. It is possible to make the ratio of the resistances and of the coefficients of the resistance of the two coils right, so that by this hook-up the correction for cold end temperature is automatically made. The electrical resistance becomes proportionally greater on one side of the point of contact with the external circuit than the other, due to differences in temperature by just the amount to shift the electrical position of the contact in proportion to changes in room temperature.

Change of resistance is a very good way of measuring temperature. We can make a coil of platinum or copper; the one requirement is that the metal shall be permanent at the temperature at which it is to be used. We can measure its change of resistance as the temperature changes, and hence, from the resistance we can determine the temperature of the coil. Such thermometers are not used very often because the resistance thermometer coil is a good deal greater in size than a thermocouple.

These methods which we have been discussing have implied that we can put part of our apparatus into the furnace and heat it to the temperature at which we are working. We might want to measure the temperature in an electric arc furnace wherein the temperature goes far beyond the ability of any metal to survive. In that case there are two or three schemes to use.

The radiation pyrometer again depends on a thermocouple. It looks like a shotgun barrel. We aim it at a point in the furnace that has the temperature we want to measure. The furnace opening must be large enough so that its image fills the whole diaphragm at the "muzzle" of the barrel. The heat rays come down the tube and strike a conical mirror and by multiple reflection come down and heat a

(Continued on page 18)

RECENT PROGRESS IN NITROGEN FIXATION

By A. T. Child

Associate Professor of Chemistry

VER since about the year 1830 Chile has furnished the world with most of its fixed nitrogen in the form of sodium nitrate. By fixed nitrogen we mean nitrogen in some available form such as ammonia or nitric acid, or sodium nitrate. A sure supply of fixed nitrogen is a fundamental necessity in peace times or war. In peace times we must have fixed nitrogen to produce fertilizers, nitric acid, and other necessary chemicals. In war a supply is absolutely necessary in order to supply armies with the constant stream of high explosives demanded in modern warfare. During the Great War, Germany was cut off from the Chilean nitrogen. Yet, because German chemists had developed a commercially successful process for converting the never failing supplies of nitrogen in the air into available "fixed nitrogen," Germany was able to carry on the war and maintain the fertility of the soil. Today Germany leads the world in this line and produces 90% of its own requirements. Dr. Fredrick Cottrell of the Fixed Nitrogen Laboratories at Washington, estimates that the current year will show a total world production of 44% from this source. Just prior to the war only 10% was produced by nitrogen fixation methods. Recent developments in our own research laboratories indicate that in a few years' time we shall be able to compete with Chilean nitrate and produce a large share of our fertilizer nitrogen by fixation, from plants within our own borders.

PRESENT COMMERCIAL STATUS

At the present time, practically all commercial plants producing fixed nitrogen, use one of three methods. (1) The Arc, (2) Cyanamid, (3) Ammonia Synthesis. Below is a statement of the power requirements of each and the percentage of world production from each process.

Process	Kw. hrs. per metric ton fixed nitrogen	Total percent fixed nitrogen produced
Arc	68,000	7.3
Cyanamid	15,000	28.2
Direct Ammonio Synthesis		
Electrolytic Hydrogen	20,000	2.0
Water gas Hydrogen	4,000	62.5

THE ARC PROCESS

The arc process is chemically the most simple of the three processes, but as will be seen from the above statement, consumes an enormous amount of electrical power. It is little used outside of Norway where electrical power is cheaply produced by water power. Two huge plants utilize about 380,000 horse power in making nitric acid by this method. By this method air is rapidly passed through a furnace at the center of which is an enlarged electric arc. In passing through this arc the nitrofactory fertilizer material and sold as "lime saltpetre," or "land saltpetre."

CYANAMID PROCESS

This process is used now in some thirty-three plants in nine different countries. A quarter of the world's production is obtained by this method. It was widely used in war times, because it was well understood and used only a quarter of the power used by the arc. However, the process seems rather on the wane, as the newer ammonia synthesis method is supplanting it in many localities.

In this process limestone is first converted into calcium carbide in an electric arc furnace and tapped into pots to cool. The finely pulverized carbide is next charged into relatively small electrically-heated fixation ovens. Here very pure nitrogen, obtained by fractionating liquid air, is passed into the carbide. The carbide rapidly absorbs the nitrogen, forming calcium cyanamid, the primary product of this process. A considerable amount of cyanamid is used in mixed fertilizers. During the war much of the cyanamid was converted to ammonia by autoclaving with steam at 300 pounds pressure. Ammonia can readily be oxidized by the Ostwald catalytic method to nitric acid and then combined with ammonia to form ammonium nitrate for high explosives.

In this country we have one small arc plant near Seattle which produces three tons per day of sodium nitrite. The American Cyanamid Company operates a carbide plant on the Canadian side near Niagara Falls. Crude cyanamid and crude sodium cyanide are produced here. Near New York this company also operates a plant which converts cyanamid into ammonia and absorbs much of the ammonia in phosphoric acid from Florida phosphate rock. The product is called Ammo-Phos and is mostly exported. It is a high grade fertilizer material.

In order to assure the steady supply of nitrates for explosives, Nitrate Plant No. 2, a cyanamid plant was built at Muscle Shoals. The plant cost the government $70,000,000 and was rated at an annual production of 40,000 tons of ammonia. Part was to be converted into nitric acid by the Ostwald method of oxidation and part into ammonium nitrate for the production of Amatol, the high explosive used in shell bursting charges. The plant never really produced during the period of the war but was given a very thorough work-out during 1919 with satisfactory results. The plant has been in stand-by condition ever since. The ultimate disposal of this plant awaits the report of the President's special commission.

DIRECT AMMONIA SYNTHESIS

This is the newest of the three processes. Germany alone of the warring nations understood how to operate it, thanks to the immense labors of Dr. Haber and associates which culminated in a plant at Oppau to produce 110,000 tons of ammonia per year, finished in 1913. This plant operated all through the war and another at Mercesberg of 220,000 tons capacity was 75% operating at the close of the war. This process requires very pure nitrogen and very pure hydrogen, and unites these gases in molucular proportion to ammonia in the presence of a carefully selected catalyst under conditions of high pressure and temperature. In the German process, 200 atmospheres' pressure and a temperature of 500 degrees Centigrade is used. The gas mixture is obtained in Germany by mixing water gas and producer gas. Carbon monoxide is next converted by means of steam under pressure and the inevitable catalyst into carbon dioxide and hydrogen. The carbon dioxide is scrubbed out in water under high pressure and the other harmful impurities absorbed in cuprous ammonium formate solutions. This in brief is the Haber-Bosch process as used during the war and, it is understood, still used in much the same form today in Germany.

In this country during the war, Nitrate Plant No. 1 was built at Sheffield near Muscle Shoals at a cost of about $13,000,000 with a capacity of about one-fifth that of Plant No. 2. This plant was built under the supervision of the General Chemical Company. The process installed was a modification of the Haber process, the catalyst and general procedure for which had been worked out by the General Chemical Company. Because of lack of confidence in the process, Plant No. 2 was projected and built. The fears for the success of Plant No. 1 apparently were only too well founded. The plant never operated in a satisfactory manner. After the war the General Chemical Company starting with the experience gained from this plant bult a plant at Syracuse, N. Y. which is now successfully operating and producing about 26 tons of anhydrous ammonia per day. The price of anhydrous ammonia for refrigeration has virtually been cut in two during the last year, largely because ammonia from fixation plants has entered the market. One result of this new factor in the ammonia market will be the production of more ammonium sulphate for the fertilizer trade at by-product coke plants.

At Niagara, a plant using the Italian modification of the Haber process is to be built. This method uses electrolytic hydrogen which requires very little purification to be satisfactory for synthesis. A pressure of 600 to 750 atmospheres is used.

The newspapers have had a good deal to say lately about the new Dupont plant near Charleston, West Virginia. This plant is to produce 25 tons per day of anhydrous ammonia, all of which will be consumed by Dupont. The process uses the Claude modification of the Haber process. It requires a very high pressure, about a thousand atmospheres. It is understood that at this high pressure the ammonia yield is better and that less sensitive catalysts can be used. The hydrogen for the process is to be produced by converting West Virginia soft coal into water gas. The nitrogen is produced by the following simple, but very effective procedure. By mixing the proper proportions of air and water gas together in a special burner, the oxygen is all burned out of the air and the gases remaining are in the right proportion to make ammonia when passed through the converter. The final purification is accomplished by passing the mixed gases thru a purification tube under the same pressure used in the ammonia converter. Here in the presence of a catalyst, the residual carbon monoxide is converted to methane, a gas which does not poison the catalyst in the actual ammonia converter. The product is anhydrous ammonia.

Results of Recent Research

Great progress has been made in modifications and improvements on the existing fixation processes during the last two or three years. In Italy, the Casale modification of ammonia synthesis has been successfully worked out. It is to be given a tryout at a small plant at Niagara Falls. As already stated it uses electrolytic hydrogen. Hence it is best applied where cheap electric power is available. It is felt that large power plants with off peak power available may use this process in small units to advantage.

In France, Claude seems now to have perfected his high pressure method of synthesis. This is to be used by Dupont at the West Virginia Plant. In a large plant it is almost necessary to produce the hydrogen from water gas because the cost of hydrogen is such a large item in the total cost of production.

In this country a large share of all we know about recent progress in fixation methods comes from the Fixed Nitrogen Research Laboratories at Washington, D. C. The Laboratory is in its sixth year and is now under the direction of Dr. Fredrick Cottrell. It has a staff of about 75 men and a budget of about $250,000. The Laboratories have done an immense amount of research in many widely divergent fields, that touch this great problem in some way. The recent results in ammonia synthesis are probably of greatest interest at the present time. A process using 300 atmospheres is used.

The hydrogen is obtained by electrolysis. The nitrogen is obtained from the air, the excess oxygen being burned out in much the same way as at the Dupont plant. The mixed nitrogen and hydrogen gases are passed through a pressure purification tube in the presence of a catalyst similar to the one used in the actual converter, but less sensitive. Here some ammonia is formed, sufficient to balance the cost of the purification step. The ammonia is condensed out as anhydrous ammonia and with it practically all gases which would poison the catalyst. The pure gases are next passed through the regular catalytic converter and the resultant ammonia condensed. Unconverted gases are returned to the process. The purification step results in a long life for the catalyst and high yield of ammonia. One of the most successful catalysts found is said to consist of the following mixture:—

Iron oxide 96%; Potassium Aluminate 4%.

Research has proved that the iron catalysts are best and that "promoters" greatly improve the yield. The potassium aluminate is the promoter in the mixture quoted above. Study has also clearly proved that two properly chosen promoter substances act far better in the catalyst mixture than any single substance.

Based on small semi-commercial production the Laboratories have now worked out a typical layout for a three-ton ammonia plant, using the above process. This modification is to be called the American Process of ammonia synthesis. It is expected that a good many small plants for producing ammonia for refrigeration etc. will be modeled after this layout.

Both the Arc and Cyanamid processes have been studied, but it is generally felt that these processes will produce only a small percentage of the total fixation nitrogen in the future. It is hoped that urea and some other fertilizer materials to be used in concentrated fertilizers, can be produced from cyanamid or direct from calcium carbide. Recent research seems to indicate that this can be accomplished economically on a commericial scale.

DRYING, DRIERS: THEIR OPERATION AND CONTROL

By M. W. Blair, '03

A road often traveled is seldom familiar. A tree, a house, a sharp turn suddenly comes to our notice and we wonder if it has been there all the years during which we have passed that way day after day. So it is in the manufacture of heavy clay products. We follow the same road for years; then our attention is called to some oversight, some lost motion in the process, or an obviously ridiculous method, and we wonder if it has been there all the time. Usually it has; but often it has crept upon us unaware because of our neglect, habits, or ignorance.

This tendency to pass things by without seeing them is one reason for repetition in our programs and discussions. Everybody does not wake up the first time the alarm is sounded or the loss pointed out. With the passing years there is constantly a new crop of foremen, superintendents, and engineers; and to them the past experience of many is a new adventure and the problems new.

The property of air to carry moisture and its power to absorb moisture from moist bodies, is the basis of drying of clay ware. The ability to obtain the maximum drying power at the least cost is the problem of the designing and operating engineer. The problem seems simple to the uninitiated, but in practice it is complicated, wasteful, and one of the least understood. Internal strains, (causing ware to check, crack, blister, twist and warp) and scum-producing gases give rise to some of the problems connected with drying.

It is not the purpose of this paper to cover all of these problems but to bring attention to a few causes of failures in the operation of driers and to suggest methods for increasing quantity and quality production and for lowering cost. Our big problem now is not to design a new drier, but to get the most out of the driers we have and to make them earn money.

DRIER FAULTS

Most of our driers are designed to be progressively operated; i. e., of the tunnel type, admitting green ware at one end and removing it dry from the other. Few driers of this type are working in a satisfactory manner. Capacities, in most cases, have been overestimated, and the plants are few that do not set some wet ware toward the end of the week.

One mistake of operation is the attempt to crowd into a period of six or seven hours what was intended to be accomplished in twenty-four hours. Ware which has been in the drier a period of thirty-six hours has not necessarily received a proper drying treatment. A car of brick made at 7 A. M. is often the fourth car from the door by 2 P. M. Under such conditions, it has received mighty rough treatment in the early stages and has then been over-dried for hours before being drawn. Those cars drawn later are often over-dried on the top deck, but still steaming on the bottom courses because the setting crew is permitted to finish its day around 2 P. M. The entire day's output is through the drier by that time. In many plants the day's run is also finished and the drier is put to sleep for the night, a long night too, for it stands idle sixteen hours out of the twenty-four.

The first four cars which are over the heat have finished drying in the course of four to six hours, but the heated air from fan or furnace continues to pour through the already dry ware. The humidity of the air then drops, its temperature rises, its velocity increases, and away go the heat units over the top to the stack and out.

ADVANTAGES OF CONTINUOUS OPERATION

All sorts of devices have been introduced to overcome this difficulty, bottom draft at wet end, either to stack or fan, curtains, deflectors, pressure and recirculation. Verily, laziness is the mother of invention but the wind, even in a tunnel drier "bloweth where it listeth and no man knoweth whence it comes or whither it goeth."

The common-sense cure is to draw and charge the drier over the entire twenty-four hour period. This can be done by working the setting crew in shifts and providing empty car storage. Continuous operation hastens the kiln turnover. The ware being uniformly dry, not red hot and bone dry in one spot and little better than mud in another, reduces the drier loss, lessens scumming, kiln marking, and production of bats. It also shortens water-smoking periods and increases the percentage of No. 1 ware and the kiln output.

This suggestion applies to any progressive type drier. It will apparently increase the cost of drier operation, but it will decrease the cost of ware per ton because of better quality and increased production. The machine crew will have a supply of empties. The setters will be able to take more time and consequently more care and can work more efficiently. The closing of a kiln will not be the cause of loss in output due to slow setting.

TSPERATURE CONTROL IMPORTANT

The regulation of heat by a look at the fire, by the feel of a door, by spitting on the fan housing, seems a silly proposition on a plant with an investment of almost $100,000.00 when proper regulation of drying and firing means the difference between a profit and the sheriff, but they are by no means uncommon. We have some remarkably good guessers in the industry, but the man who guesses at temperature also guesses at his bank account.

THE BOOSTER FURNACE

The booster furnace on waste heat driers is the offspring of slow kiln turnover and poor regulation. It may and should be eliminated. It is possible, in most materials and products, to turn a 28 x 32 ft. kiln twice a month. If that is done, there will be little necessity for the booster furnace, with its soot and sulphur, or the absurd expense of coke or blacksmith coal for its firing.

(Continued on page 8)

INDIANA PHYSICS CLUB MEETS

The Indiana Physics Club recently held its annual meeting at Indiana Central College in Indianapolis. The Club meetings are strictly informal gatherings of the college physics teachers of the state. These are held once each year for the express purpose of discussing mutual pedagogical problems and for the renewal of the close personal friendships that have made statewide co-operation possible. The Club has no formal organization and no fees, the host acting as the temporary chairman for each meeting. There is only one governing rule, that each member must pay his own share of expenses and that all entertainments, dinners, etc. must be strictly Dutch treat.

The members gathered at Indiana Central and after a pleasant social hour the papers of the day were read and discussed. The following were presented:

"Welcoming Back the Ether"....Prof. Abbot, Purdue.

"Measurement of Condenser Resistance"....Prof. Ramsey, Indiana.

"Calibration of a Wavemeter by Standing Waves" Prof. Ramsey, Indiana.

"An Interesting Experiment in Heat"....Prof. Howlett, Rose.

"Common Errors in Physics Textbooks"........Prof. Foley, Indiana.

"Why Should We Teach Physics in College"....Prof. Foley, Indiana.

Prof. Abbot's attack on the Theory of Relativity and the questions brought up in Dr. Foley's two papers served to start most of the conversational fireworks of the afternoon.

At six o'clock the Club adjourned to the college dining room for a very pleasant dinner. During the dinner President Good extended a very cordial welcome to the visiting teachers in behalf of the faculty and the student body of Indiana Central College. About thirty professors were present representing most of the colleges in the state. Professors Howlett and Rauth represented Rose.

Before the two numbers of the evening program Professor Hershman of Valparaiso University gave a short report of the present conditions in that institution. Professor Hufford of Indiana then gave a very interesting paper on "A Comparison of English and American Educational Systems." This was illustrated by slides taken by Dr. Hufford during his past year of residence in England. This was followed by a very interesting talk by Mr. John Ferguson. Vice-president of the Merchants Heat and Light Co., on "Superpower".

Saturday morning the Club was the guest of the Merchants Heat and Light Co. on an inspection trip thru the Lenore substation south of Indianapolis. This is the control station for a network of power lines covering the entire state and including the output of the local plant at Dresser. The manufacturing plant of the Fairbanks Morse Co. was also visited before adjournment at noon.

DRYING DRIERS

(Continued from page 7)

Kilns are sometimes allowed to stand twenty-four hours to rid them of sulphur fumes, an unnecessary loss of time if the ashes and clinker are removed from the kiln while still hot.

The final heat should be removed from the kiln by a cooler or goose neck to the crown. A kiln at 500° to 600° is of little benefit to the drier, but is often left on to cool the drawing crew and the booster fired to make up the difference.

WASTE HEAT DRIERS NOT ECONOMICAL

It might be considered reactionary to recommend the elimination of the waste heat drier for the sake of economy and better product. We are divided between two schools, one of which would make the entire plant a synchronized unit and another which would make a unit of every piece of equipment. The waste heat drier works neither way.

A direct-fired, radiated heat drier will work as a unit or will synchronize, and is much more easily controlled in temperature and circulation. It obviates a large percentage of objectionable fumes in contact with the ware, preserves equipment from destruction, and operates without power. Against these advantages are the items of fuel cost and labor of attendance, both of which seldom exceed fifteen cents per ton.

The more drier operations I observe and the more I contrast the results obtained by the two types, the more I am convinced that waste heat in drying is a misnomer and that it actually is waste, no heat and little drying.

DRIERS SHOULD OPERATE AT CAPACITY

Driers are usually short a few cars to fill the tracks and stubs. This is a source of difficulty in operation and regulation, as it is impossible to obtain 100% efficiency from less than 100% apparatus. These recommendations are not theoretical. They are in actual practice. For example, I have a record of drier operation where the trackage was increased 21% and the car equipment 34% resulting in an increase of 53.3% of dried product. That is, 90 cars per day were considered the limit and an average of that number had never been obtained, but with these additions and with care in regulation, together with the increased heat which was available, the output of the drier reached a daily average of 138 cars.

Many faults of design and construction exist, some of which can be corrected with little expense, others only by a new drier, but the ability to observe conditions and devise the remedy must be in the operator.

I have in mind a plant where sixteen tons per tunnel are dried and another where less than seven is the tunnel output product the material being similar. I have also in mind a plant where it is said to be impossible to put dry press ware successfully through a waste heat drier, but the clay from the same vein is shipped one hundred miles, made into dry press brick and dried in a waste heat drier. I mention these inconsistencies to emphasize what I have often stated: that the industry needs common sense as well as technical research.

WORLD'S LARGEST SINGLE CONDENSER COMPLETED

Another world's record in engineering achievement was attained with the completion July 24, of the largest single steam condenser ever built, at the South Philadelphia Works of the Westinghouse Electric and Manufacturing Company.

Weighing almost 1,000,000 lbs. and rising to a height of nearly 30 ft., this colossal piece of machinery when operating at maximum capacity upon its installation at the new Richmond Station of the Philadelphia Electric Company, will be able to circulate approximately 150,000,000 gallons of water per day. This is equivalent to half of Philadelphia's daily water consumption of 300,000,000 gallons.

The main condenser which has a cooling surface of 70,000 square feet in a frame of 85,000 square feet capacity, was ordered last winter for the Philadelphia Electric Company's new power plant at Port Richmond, which upon its completion will be the largest single steam power unit in the world. How great this plant will be may be gathered from the fact provision that has been made for the ultimate installation of twelve condensers of this giant type.

Inside the shell, which alone weighs considerably above half a million pounds, are a total of 12,734 one inch tubes, 21-1/4 ft. in length. This is equivalent to a total length of more than 270,000 ft., or in excess of fifty-one statute miles of condenser tubes. The function of these tubes is to convert the exhaust steam from the turbines into water. Their total weight is approximately 150,000 lbs.

Part of the condenser equipment consists of two circulating pumps each with a maximum capacity of 78,000 gallons per minute, or 4,660,000 gallons per hour. This in turn is equivalent to more than 112,000,000 gallons per day. If, however, both pumps are operated simultaneously, their joint capacity will be 100,000 gallons of water per minute, corresponding to 6,000,000 gallons per hour, or a total of 144,000,000 gallons every 24 hours.

By way of comparison, it is interesting to note that the combined waterworks and pumping stations of the City of Philadelphia during the twenty-four hour period, under normal conditions, pump a total of 300,000,000 gallons of water to supply the city's needs. To operate the circulating pumps, the condenser when erected will be equipped with two 500-h. p. Westinghouse motors, the weight of the condenser and auxiliary equipment totaling 985,000 lbs.

The work of dismantling the huge piece of machinery is now under way, preparatory to shipping it from the South Philadelphia Works to the Port Richmond plant of the Philadelphia Electric Company. Almost a dozen of the heaviest type steel flat cars will be required for the transportation of the equipment from one point, around the city borders, to the place of installation.

BOOK REVIEWS

Superheat Engineering Data—A Handbook on the Generation and Use of Superheated Steam. Sixth Edition Revised. (Superceding Data Book for Engineers.) The Superheater Company, New York and Chicago, 1925. Bound in Keratol, 4½ x 7 in., 208 pages, 85 illustrations and diagrams, 69 tables. Price $1.00.

This handbook contains condensed data for steam power plant engineers and operators. A feature of the book is the index consisting of 16 pages, assuring ready reference. Superheated steam, its advantages over saturated staem, and the proper design and performance of superheaters, are briefly discussed. It illustrates superheater arrangements in practically all stationary, marine and locomotive type boilers commonly made in America. Waste heat, portable and separately fired superheaters are also shown. Brief comparative data is given as to sizes, tube sizes, arrangement of tubes, etc., for the stationary water tube boilers illustrated. The steam tables cover pressures from below atmospheric to 600 lb., absolute, and include properties of superheated steam from 50 to 300 deg. F. superheat.

The section on piping includes information for figuring piping for handling water, saturated and superheated steam, and velocity and pressure drop of water and steam flowing through piping. In this section is included also the proposed American standards for high pressures. Superheat Engineering Data also contains engineering data on coal and oil fired boilers, which include tables of heat values for gaseous, liquid and solid fuels. Other miscellaneous data include complete conversion tables and data on bolts and screw threads, with the recent work of the American Engineering Standards Committee, and the National Screw Thread Commission. There are also many miscellaneous tables frequently used by steam engineers.

FOUNDATIONS OF THE UNIVERSE, M. Luckiesh, Van Nostrand Company, New York, 1925, 6 x 9 in., illustrated, price $3.00.

A popular, non-mathematical treatment of the physical sciences by the Director of the Lighting Research Laboratory of the National Lamp Works. It interestingly treats the breadth and scope of gravitation, atoms, electrons, energy and matter. From the standpoint of man's accomplishments in the realm of pure science it will held the reader's attention equally as well as Well's "Outline of History" does in the field of economics and sociology.

Througout the book there flows a unity of purpose in attempting to show the foundations of the universe as it now appears. Intellectual man's struggles to attain knowledge of the physical world about himself is discussed. The nature of light is also taken up, together with an understandable explanation of the evolution of the elements. A clear statement of the theory of relativity and of the nature of four dimensional space is included. An interesting chapter shows the progress of scientific knowledge from Thales and Archimedes to Millikan giving in chronological order what each notable contributed. Seventeen diagrams and illustrations are opportunely placed throughout the work.

'87

Mr. Frank P. Cox, manager of the West Lynn Works of General Electric Co., is vice-president in charge of production executives' division of the American Management Association. He presided at a conference of Employee Representation held at Kansas City on November 30th. and December 1st.

'07

Mr. Luis Bogran is at Washington, D. C. as the Minister of Honduras.

'08

Mr. A. S. Hathaway is assistant Professor of Civil Engineering at Pennsylvania State College. Address 803 West Beaver Ave., State College, Pa.

'09

Mr. R. F. Tyler is working with the C. M. & St. P. Railroad and has been transferred from Tacoma to Seattle. Address Room 315, Union Station.

'16

Mr. Sidney Leibing, who works for the General Electric Co. at Cincinnatti, is to be transferred to Indianapolis in December.

'17

Mr. C. A. Williams is Secretary and Treasurer of the Florida White-Way Illuminating Co., Inc. of Miami. His address is 621 Seybold Building.

'19

Mr. A. A. Geiger, with the York Products Corporation, has been transferred to Little Rock, Arkansas. Address 3415 West 10th. St.

'20

Mr. W. P. Wagner, ex 20, visited the school on Thanksgiving. He is now an architect with the firm of Edmund B. Gilchrist of Philadelphia.

'22

Mr. E. S. Whitlock is with the American Well Works of Aurora, Ill., and is being transferred to Jacksonville, Florida.

Mr. W. C. Turner, who visited the school in November, says that Mr. D. A. Young, '22, is being transferred to Pennsylvania.

Mr. R. W. Stevens of Ringwood, Ill. who was here as a Freshman in '18-'19 is planning to enter Illinois University.

'23

Mr. J. B. Connelly who is with the Kentucky Actuarial Bureau has been transferred from Louisville to Covington. Address c/o Kentucky Actuarial Bureau, Adams Building.

Mr. Floyd W. Benson has moved to 213 Elm Street. Marion, Ohio.

'25

Mr. J. W. Moorhead has come to Terre Haute to work for the Pennsylvania Railroad Co. He is living at the Farrington Apartments.

Mr. E. F. Rickelman has been transferred to Pittsfield, Mass. by the General Electric Co. Address 56 Glenwood.

Mr. H. R. Iker is with the Jones and Laughlin Steel Corporation of Pittsburgh. Address 131 Orchard Street. Woodlawn, Pa.

'26

Mr. L. J. Sisson ex '26 has gone to Detroit to work for Claude Cox, Rose '02. Address 4612 Woodward Avenue, c/o Commercial Engineering Laboratories.

'27

Mr. W. S. Ratcliffe of last year's Freshman class is planning to enter the U. S. Air Service. Address 206 Cagwin Avenue, Joliet, Ill.

'25

Mr. C. S. Withrow writes that he is working with a group of engineers who are reclaiming a large tract of jungle and waste lands for sugar plantations. Mr. Withrow wants some of the fellows to write to him. Address To Romana, Dominican Republic, West Indies, c/o Central Romana.

Mr. M. W. Blair '03 and Mr. H. A. Schwartz '01 have contributed articles to the November issue of the Journal of the American Ceramic Society. It is quite an honor to have article in this Journal as it is ascientific journal of national scope.

Mr. Lester W. Glenn was married to Miss Nellie McCoy on Saturday, November 7, at Palmetto, Florida.

FROM THE TECH CLUBS

The St. Louis Rose Tech. Club held its first 1925-1926 season meeting at the City Club at noon on Tuesday, November 10th, 1925. The following were present:

W. A. Layman, 1892; Wagner Elec. Corp.
G. E. Wells, 1896; Consulting Engineer.
H. E. Wiedeman, 1903; Consulting Chemist.
A. Bareuthers, 1910; R. W. Hunt & Co.
E. Bradford, 1911; International Business Mach. Corp.
J. A. Hepp, 1912; Union Elec. Lt. &Pr. Co.
G. W. Holding, 1917; Union Elec. Lt. & Pr. Co.

A letter of regrets on account of inability to be present at the meeting was received from Benj. McKeen, '85, Mr. McKeen being on his way to New York City. His special car was attached to the Penn. train which was involved in the rear end collision near Trenton, N. J. in which some twenty people lost their lives. Mr. McKeen was not injured, his car being the last one on the train which ran into the train stalled by the dense fog.

New officers were elected for the coming season:

President..H. E. Wiedeman, 1903.
Secretary..G. W. Holding, 1917.

ATHLETICS

ROSE OPENS BASKET SEASON WITH VICTORY

In the opening game of the basketball season the Fighting Engineers displayed an offensive power that refused to be halted, and more than doubled the score on Coach Kip Kessler's Oakland City quintet. The final score was Rose, 35; Oakland City, 17. The game was witnessed by a far larger crowd than any that has ever before witnessed a basketball game at the Rose gym.

The play in the first half was a splendid exhibition of close guarding, and at the end of the period Rose led by a 10 to 5 score. Capehart scored Oakland City's lone goal in the first half as the guarding of Goddard and Kehoe was so close that the few shots that the visitors obtained in that period were hurried. Berry, Rose center, slipped in two field goals from close under the basket early in the contest that put the Engineers in the lead, and at no time were they threatened. Berry's game in the first half was very good, and he teamed well with Capt. Wilson and Alexander. These three men kept up a whirlwind offensive in the time they played that kept the down-state bunch guessing, and this offensive was ably carried on by the subs who replaced them later in the game.

Perhaps the outstanding athlete in Friday night's game was Kehoe who took good care of the vacancy left last year by Schoonover at back guard. Although lacking experience in college basketball, he showed the speed and ability to cover the opposing forwards, and the close shots that they had were few and far between. All of the Rose basketeers played good ball and teamed together in a manner that was the cause for much comment on the part of those who witnessed the game.

We regret the fact that Rose has a long wait until the next home game, as the attendance at the opener revealed the fact that the student body as well as the home town folks realize that Rose Poly's teams are well worth supporting. Rose plays the next home game January 9 with Central Normal from Danville.

The line-up and summary is as follows:

Rose Poly, 35.		Oakland City 17.
Alezander	F.	Coleman
Wilson (C)	F.	Capehart
Berry	C.	Keller
Goddard	G.	Kell
Kehoe	G.	Decker

Substitutions—Rose: Rubins for Alexander, Kasameyer for Wilson, Thompson for Berry, Reinking for Goddard, Hillis for Reinking, Taggart for Kehoe. Oakland City: Thirty for Capehart Capehart for Price, Patberg for Keller, Couts for Kell, Kell for Couts. Field goals— Alexander, 6; Wilson, 4; Kasameyer, 2; Berry, 2; Thompson, Kehoe. Patberg, 2; Coleman, Capehart, Kell, Couts. Foul goals—Thompson, Kehoe, Goddard, Kell, 2; Decker, Capehart, Coleman. Referee—Vaughan Russell, Indiana State Normal. Time of halves—20 minutes.

KENTUCKY GRIDDERS OUTSWIM CLARKMEN

In the game played with U. of Louisville on Parkway field, or rather in Parkway Lake, at Louisville on November 7, Rose was defeated by a score of 30 to 0. Rain poured in torrents, and the field was ankle deep in mud. Incidentally this was the sixth game that U. of L. won this year, and at no time has an opponent succeeded in scoring.

Robertson kicked off to Leake at the start of the game and after an exchange of punts Leake intercepted a pass and ran 30 yards before being caught. However, the head linesman called a Rose man off-side and it was Louisville's ball in midfield. That was the only penalty of the game, although the Rosemen claim that there should have been many penalties called for slipping.

Sweeney kicked to Marks who ran 60 yards through the Engineers for a touchdown near the end of the first period. Louisville scored in the second period after Sweeney's punt was blocked and the Cardinals got the ball on the two yard line. The half ended Louisville 12, Rose 0.

The Engineers came back and fought hard in the third period and the play of Staggs and V. Martin stood out above that of their team mates. Late in the third period Mayhall went over for the Cardinal's third touchdown, after Marks had made a long return of Andrews' punt. In the final period Fischer and Marks made several gains around end and Blackberry scored on a line buck. Williams made a 35 yard run for Louisvilles' final touchdown. All tries for extra points were blocked and Louisville completed but one forward pass as did Rose. The Rose line played better football than the backfield, as the mud and water proved to be treacherous footing for the light Rose backs.

ROSE SCORES ON INDIANA U.

The Engineers threw a scare into Indiana's "thundering herd" in the game played at Bloomington on November 14, and the Indianamen were forced to uncork their bag of tricks to turn the tide.

The game started with about eight second string men playing for Indiana but Hez Clarks' players got off to a fighting start and the regulars were sent in soon after the start of the second quarter. The scrubs did not get back in the game until late in the third period when they were sent in to relieve the tired regulars.

Rose played the best brand of football they played this season and also broke into the scoring column against Indiana, something no Terre Haute team has done in years. Red Sweeney intercepted a pass from Tobin and ran 70 yards for a touchdown while Billy Leake "intercepted" the Indiana safety man and spilled him all over the field with a neat block. Red played a good game for Rose. His punts averaged

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SCIENTIFIC GLEANINGS

WIND PRESSURE ON MODEL OF BUILDING DETERMINED BY BUREAU OF STANDARDS

THE average wind pressure on a tall building when the wind is blowing at 76 miles per hour (100 miles per hour, as shown by a Weather Bureau, Robinson type anemometer) is about 22 pounds per square foot, according to results obtained by the Bureau of Standards, Department of Commerce. The value which is commonly used is 30 pounds per square foot. This would correspond to a true wind speed of about 88.5 miles per hour (118 miles per hour indicated speed). Gusts of this speed have only been observed in a few cities, such as New York. and St. Paul.

These results were obtained by measuring the force of the wind on a model of a tall building mounted in the large outdoor wind tunnel of the Bureau. This tunnel is 10 feet in diameter, and in these experiments winds up to 70 miles per hour were produced, values for higher speeds being obtained by exterpolation. By means of small openings in the face and top of the model which were connected to a pressure gauge, the pressures produced by the wind at various parts of the structure were measured. These measurements were made at 70 places on the face of the model and at 49 places on the top, with the wind coming from 13 directions, varying from directly against one face to directly against the opposite face. Of course, in this work the wind always comes from one direction, and the model is turned on its mounting. The pressures obtained were then multiplied by the appropriated areas to give the total force on the model under the different conditions. The forces tending to overturn and to twist the model were also computed.

This work was undertaken because of the many inquiries received by the Bureau concerning wind pressures on buildings. The same experimental methods were employed which have been found so useful in the investigation of air forces on airplanes.

It has always been recognized that in the design of engineering structures such as tall buildings, bridges, chimneys, transmission lines, radio masts, etc., it is

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A NEW DUST EXPLOSION MACHINE

THE engineers of the Bureau of Chemistry, United States Department of Agriculture, have recently developed new apparatus for exploding industrial dust by electric sparks. The bureau is being called upon continually for demonstrations of dust explosions before national organizations, conventions, and similar meetings, and also by grain handling companies and similar industries to test the various kinds of dust produced during grain handling and manufacturing operations.

In the original apparatus designed by the bureau, the ignition was produced by an open flame and served as the means of bringing the dust explosion hazard to the attention of workmen and operators in industrial plants. It was difficult, however, in the use of the open flame to control the explosions in an effective way.

The new apparatus is patterned after the arrangement in terminal grain elevators. It made its initial appearance at the recent National Exposition of Chemical Industries in New York City and was well received by the representatives of many industries. The apparatus is available for demonstration at similar types of expositions, conventions, or other meetings of this character, and arrangements for its use can be made with the Bureau of Chemistry. In addition to the demonstration feature, the new equipment affords a possibility of testing all types of industrial plant dusts to determine the possibility of ignition by electric sparks. This is a matter of very great importance to the managers of large grain handling plants and manufacturing establishments in the country, since many recent explosions have occurred in what may be termed modern and improved factories. The Department of Agriculture, through the Bureau of Chemistry, will be glad to continue to cooperate with the grain handling industries in conducting tests of this character.

CLEANING A STONE BUILDING WITH STEAM

THE use of steam from a boiler blown directly against the stone through a simqle nozzle has been found by the Bureau of Standards, Department of Commerce, to be a very effective way to remove dirt from the walls of a stone building.

To meet the changing demands of present day commercial conditions many old buildings are being altered or remodeled. In order to eliminate the undesirable contrast always present in such cases between the old dirty surfaces and the new stone put in the walls some kind of cleaning of the old portions is generally carried out. Because of the detrimental effects of acid cleaning or sand-blasting, scrubbing with soap powders and hand brushes is customarily employed. This method is effective but slow and laborious, and in an effort to devise a faster and more efficient means of cleaning limestone, experiments with the use of live steam were conducted under the

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FRATERNITIES

ALPHA CHI SIGMA

Since the Alpha Chi Sigma fraternity was founded on December 11, the Iota chapter enjoyed a theatre party at the Indiana in celebration of the event. There was a full attendance of both members and pledges, with several alumni, who are in chemical work here. The honor guests of the evening were Dr. and Mrs. John White, and Dr. Mees.

The annual Christmas party will be held December 22. This occasion is a most look-forward-to affair, and promises to even exceed expectations. It represents the finale of Iota's social program for the year. Many alumni members have signified their intentions of attending, so the party might well be called a sort of reunion of new and old members. Among the alumni who have already written in regard to their attendance is Bro. Errol Fox, who is connected with the department of chemistry in a Carolina college.

ALPHA TAU OMEGA

Tuesday evening December 1st Indiana Gamma Gamma held an informal stag dinner and theatre party. The entire active chapter and several alumni got together at dinner and a smoker at the chapter house and afterward went to the Indiana theatre where a section of seats was reserved for them.

Brother Ashley '25 was a visitor over the week-end of Nov. 21. "Midge" is now managing a line of service stations in southern Illinois. Brothers Hall, Shepherd, and Neeley of Indiana Delta Alpha were back to spend Thanksgiving vacation. Brother Crawford of Illinois Gamma Xi, formerly of this chapter, was also back to spend the holidays. Brother Jakle, who is working for the Exide Battery Co. of Chicago, dropped in on us while covering his territory, which consists of southern Indiana.

Gamma Gamma is laying great plans for its annual formal dance. This is a regular Christmas affair, and a large number of alumni are expected back to attend.

THETA XI

Kappa has always held a Christmas dance sometime before the holidays. This year it will hold sway on Dec. 22 at Edgewood Grove. Plans are underway which will surely make this dance long remembered for the spirit of festivity shown by those who attend. To further help St. Nicholas in keeping true Christmas spirit, several informal parties are planned for the holidays.

Many of the brothers have already begun making plans to attend the Theta Xi Convention—holding session in Chicago around the first of the year. As Chicago is at just the right distance for a good "bumming" trip, Kappa is sure to be well represented there.

Formal initiation was held for Pledges Clark, Goddard, Leake, and Walsh on Dec. 4.

THETA KAPPA NU

Theta Kappa Nu began the making of its national history when it held the 1925 national convention at the Lincoln hotel at Indianapolis on November 30, December 1, and 2. Max Sherwood was the represenative from Indiana Gamma, and Ray Davis acted as his alternate. Most of the other members were in the capital city some time during the convention. The chapter from Rose put on one of the degrees of the ritualistic work; Walter Davidson took charge of this work. Taking all in all, the convention was a decided success both from the social point of view, and from a business standpoint.

The days are now being numbered for the annual Christmas dance which will be held at the Edgewood Grove club house on the night of December 26, 1925. Many of the brothers return for this dance, and it is made a fine time for all to get together and having a glorious time.

Harry Patton, '26, has announced his intentions of returning to school in January.

Indiana Gamma announces the pledging of Maurice L. Witty of the class of '26, and Earl W. Cunningham of the class of '27.

Theta Kappa Nu extends its greetings to Rose and wishes everybody a Merry Xmas and a Happy New Year.

SIGMA NU

Smoke did roll out of the chapter house on the night before Thanksgiving, and its appearance did alarm the passerby who may have been tempted to turn in a fire alarm, but it was the hearts of many loyal Sigma Nus and not the house that was aflame. The post-poning of the alumni smoker because of conflicting mid-terms did not lower the attendance, and the evening did prove to be one of great events and one that will go down in the history of the chapter as the best alumni gathering ever had at Beta Upsilon. After bridging a few sighs with laughs enveloped in clouds of blue smoke, the cards were discarded for the world's best amusement—eating. All the old grads getting away with pounds of hot mastifs and cups of coffee, tended to arouse the spirit to a high pitch, and the alumni felt themselves drifting back to the days when they were in college. As a result the gang suddenly found themselves singing the old fraternity and college songs. When the smoke finally cleared and the enthusiasm declined to a more of a tranquil condition, the alumni held a meeting in which the chapter as a whole was discussed and plans laid for the Twenty-Second Grand Chapter at West Baden this Christmas vacation. The big session did not come to a close until dark noon, and those alumni who had not yet been overcome by the waves on matrimonial sea, remained longer for a good frat chat around an open fire.

Final plans are almost complete for Beta Upsilon's part as partial host of the Grand Chapter. The list of fifteen girls from Terre Haute who are to be the delegates' dates for the crowning dance of the convention has been completed. At the present outlook Beta Upsilon will have a 100 percent representation,

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BRINGING MORE DAYLIGHT INTO INDUSTRIAL BUILDINGS.

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

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

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

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

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

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

MISSISSIPPI WIRE GLASS CO.,
220 Fifth Avenue,
St. Louis. New York. Chicago.

HOW HOT IS HEAT?

(Continued from page 4)

thermocouple. They heat it a definite proportion of the temperature of the furnace.

Looking into the furnace and seeing the color is an old method which has been refined into the optical pyrometer. The hot body has its image focused on the filament of an incandescent lamp by a lens. Usually for high temperatures there is an intervening screen which cuts out some of the light. We look into an eyepiece at one end and adjust by a rheostat the current through the filament until the filament is neither darker nor lighter than the image of the object we are looking at. From the current flowing through the lamp and the calibration curve we know the temperature. The filament is not as hot as the original object because we have filtered out a definite amount of the colored light, but the temperatures are in a definite relation. The filament is tungsten and in a vacuum, so that it is somewhat permanent.

In another construction we compare by looking through an eyepiece, the light coming in one direction, from the furance, with light from a filament coming in another direction. Images of the filament and object are superimposed on each other. We insert a wedge of colored glass between the object and the image to the point where the brightness balances. The advantage is that in this apparatus the filament is not calibrated for a variety of temperatures. All we have to know is what current will burn it at a standard degree of brightness.

For either of these radiation types we have to make allowance for the fact that the heat or the light emitted by a body is not altogether a function of its temperature. If an object is entirely within an enclosure and the temperature of the enclosure and the object is the same, we call that black body condition. If we take that body out and set it down in the air, the amount of radiation for the same temperature decreases. In the case of light, this is called emissivity, and in the case of heat, it is called coefficient of radiation. These coefficients are different for different materials, and we have to consider what is the emissivity or the coefficient of radiation of the particular hot substance when we use either of these radiation types of pyrometers.

CLEANING STONE BUILDING

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cooperative research program of the Bureau of Standards and the Indiana Limestone Quarrymen's Association, Bedford, Indiana.

An interesting demonstration of this experimental work was the steam cleaning of a remodeled bank building in Baltimore, Md., where the scheme was given a practical trial under commercial conditions. The use of steam at 80 pounds per square inch pressure, the pressure ordinarily used in small portable boilers, blown directly against the stone through simple nozzles made of galvanized pipe fitted to the end of ½-inch steam hose lines was found to be very effective in removing the twenty-year accumulation of dirt on this Indiana limestone building. Although the structure was heavily carved and moulded the work was done rapidly with inexperienced labor, the engineer firing the boiler being the only skilled worker on the job. The cost of the job was somewhat higher than a bid received for acid cleaning which was due in part to its experimental character, this being the first complete building ever cleaned with steam. The final color of the stone was not so bright as that of the new stone work but was considered entirely satisfactory since it combined cleanliness with the appearance of age which is usually thought desirable in stone buildings. The successful use of steam in this practical test leads to the conclusion that for the removal of dirt from old limestone buildings, the steam cleaning process would, in most cases, be an economical and effective method to employ with the added advantage that it does not damage the stone.

WIND PRESSURE ON MODEL OF BUILDING

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necessary to make provision for the stresses produced by the pressure of high winds. However, the values of the forces produced by the wind used by engineers in structural design are based on experiments made a great many years ago by methods which are now known to be subject to large errors, and on models which do not resemble actual structures. Many engineers have felt that these old values are too large, and that many structures are made stronger than is necessary, and therefore cost more than they should.

The Bureau has determined the actual pressure corresponding to a given wind velocity. There still remains the problem of determining what wind velocity to use in designing a structure. Obviously, a higher velocity ought to be assumed in designing a building facing the lake front in Chicago than for a building in the downtown section of Washington.

ALL LIT UP FOR THE SMOKER

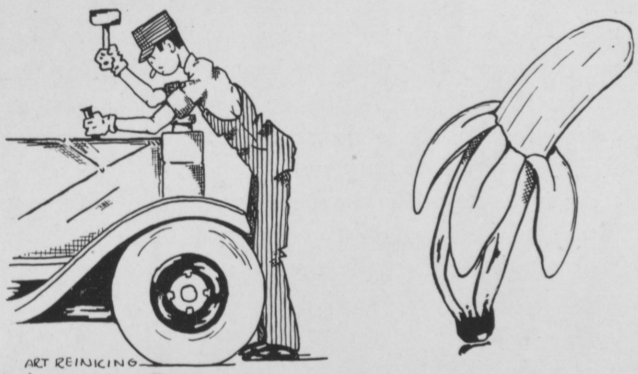
AT THE END OF THE ROPE

FRATERNITIES

(Continued from page 16)

and it is hoped that the roads will be in good condition in order to make the driving conditions best.

Among the alumni who paid vists to the chapter recently are Les Garrett, Bill Wagner, Ray Biller, Jack McDargh, Hubert Brinton, Franklin Bogardus, and Derb McDargh. Surely the most light-hearted of the above named alumni was Hubert Brinton who has just recently assumed the position as father of a son.



"BODY BUILDERS"

WHO'S WHO AT ROSE

Student Council

President.......... C. Max Sherwood
Financal Secretary.......... E. Wayne Watkins

Class Presidents

Senior.......... C. Max Sherwood
Junior.......... Arthur Reinking
Sophomore.......... Arthur Keiser
Freshman.......... Wayne Dodson

Y. M. C. A.

President.......... Clarence Ellis
Secretary.......... Donald Swanagan

Rifle Club

President.......... Prof. J. B. Peddle
Secretary.......... Ray R. Davis

Radio Club

President.......... Ralph E. Werner
Secretary-treasurer.......... Herman A. Moench

Rose Technic

General Manager.......... E. Wayne Watkins
Editor.......... Lowell E. Muehler
Business Manager.......... Edward Dunning

The Modulus

Editor-in-chief.......... Fred Nicosin
Business Manager.......... Milton Rubin
Managing Editor.......... Edwin Booth

Glee Club

President'.......... Richard C. Kadel
Vice Pesident.......... Morris Guggenheim
Sec'y-treasurer.......... Robert M. O'Rear

Junior Prom

General Chairman.......... Edwin S. Booth

Athletic Team Captains

Basketball.......... Harry L. Willson
Track.......... E. Dunning
Baseball.......... Harvey H. Mayrose

Athletic Team Managers

Basketball.......... Robert E. Wade
Track.......... P. J. Burt

Athletic Board

President.......... G. E. White

ROSE SCORES ON INDIANA U.

(Continued from page 12)

about 45 yards and he also did some nice tackling besides carrying the ball for numerous gains.

Leake played a steady game and twice kept Indiana from scoring. Once he brought Sibley back to earth on the 25 yard line when it seemed as though he was sure of a touchdown, and the other time he nailed Byers after a long run.

Rose had one other chance to score when Stamats of Indiana fumbled on the 15 yard line but Rose fell on the ball when there were no Indiana players near it.

The statistics show that Indiana made 21 first downs and Rose 12. The crimson made a total of 712 yards and Rose made 161. Indiana completed four passes and Rose none. Rose intercepted two passes.

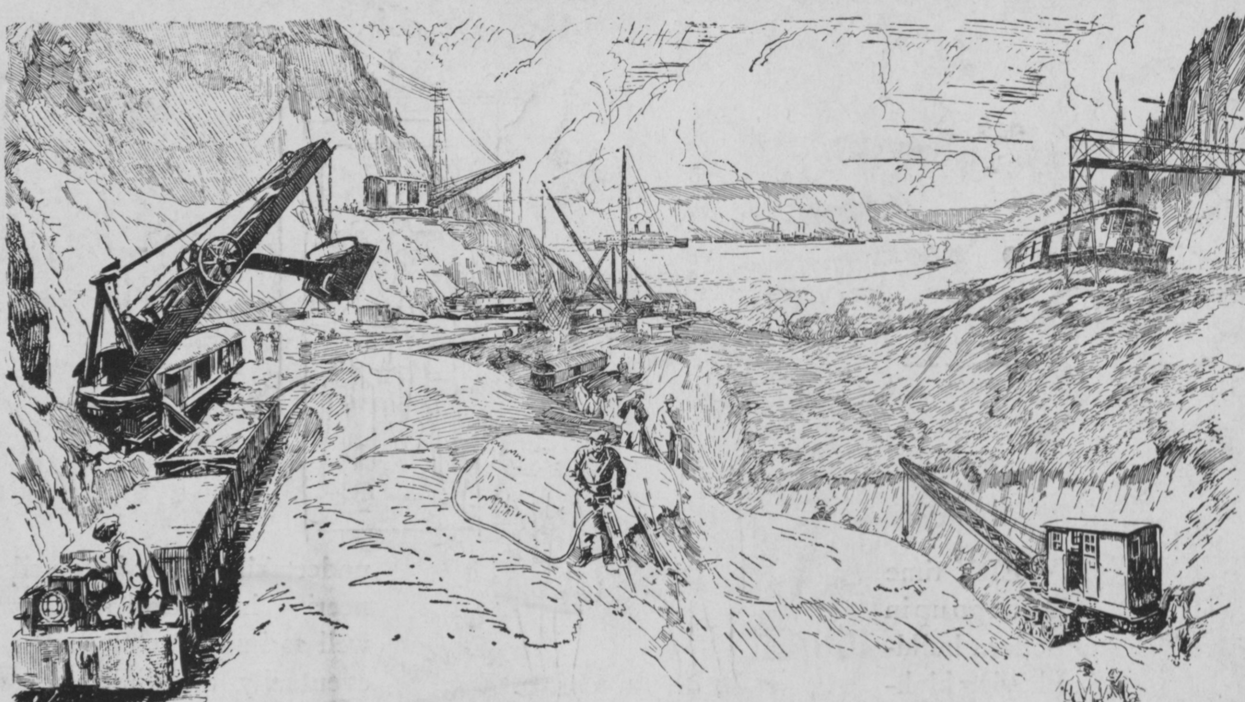
For ndiana, Stamatz, Sibley, McConnell, Byers, and Dick Ray made touchdowns, while Red Sweeney made the single touchdown for Rose.

THIS CONCERNS YOU

In the recent basketball game, we are glad to say that the crowd that attended was the largest that has ever attended a game held at he Rose gymnasium. We noticed too, that besides the student body, there were a large number of people present who attended because they apparently were curious to see just what kind of a team Rose has this year. But it was evident that they found out quickly enough, and that they were proud of the fact was shown by the manner in which they got behind the team and supported the players. The support offered the team was splendid and the men fought all the way through, while the team work was the best seen on the Rose floor for a long time. The reason? Support!

And what athlete will not do better than his best when the old gang and the folks as well are right out there with him, pulling for him and backing him to the limit in those eternities of suspense which come with all their breath-taking suddenness in the crucial moments that mean Victory or—defeat? You know the meaning fellows, of the tried and true spirit of all Fighting Engineers, that grit and dogged determination that spells Success at any price, and you know how much harder it is to fight the battle by yourself. If you could only change places with the man on the floor and feel the agony of every effort towards the end of the hard fought game when the breaks are against you and defeat stares you in the face. Then to hear a rousing cheer for the dear old Rose and White and realize that the fellows are right there with you helping you fight—why, its a revelation to you, and the old "cork" comes back in a jiffy and old man Defeat slumps back out of sight and you've won the game! That's what it means to the man on the Varsity, and it is up to every one of us to be there and fight with the team from the first whistle until the final gun.

Rose plays the next game on January 9 with Central Normal. We want every loyal engineer to have his name on the basketball honor roll the day after the game has been played. Don't you? In either case, it is entirely up to you, but we don't want slackers! And when "Nick" leads out in a series of cheers get behind him and yell your darndest, it's for the honor of the school fellows and that's what we are fighting for!



All the brawn of all the workers of the world would fail to supply the power needed for our construction and production requirements. Modern civilization is based on cheap power readily applied to tasks of all kinds.

Machinery *works:* Man *thinks*

According to college tests, man develops one-eighth horsepower for short periods and one-twentieth in steady work. As a craftsman—a worker who uses brains—he is well worth his daily wage. But as a common laborer, matching brawn against motorized power, he is an expensive luxury.

With a fifty-horsepower motor, for instance, one man can do the work of 400 common laborers. He is paid far more for his *brains* than his *brawn.*

The great need of this and future generations is for men who can plan and direct. There is ample motorized machinery for all requirements of production and construction. But motorized machinery, no matter how ingenious, can never plan for itself.

And that is precisely where the college man comes in. Highly trained brains are needed more and more to think, plan, and direct tasks for the never-ending application of brawn-saving electricity.

In most long-established industries the General Electric Company has brought about important changes making for better products with minimum human labor and expense. And in many new industries the G-E engineers have played a prominent part from the very beginning.

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

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