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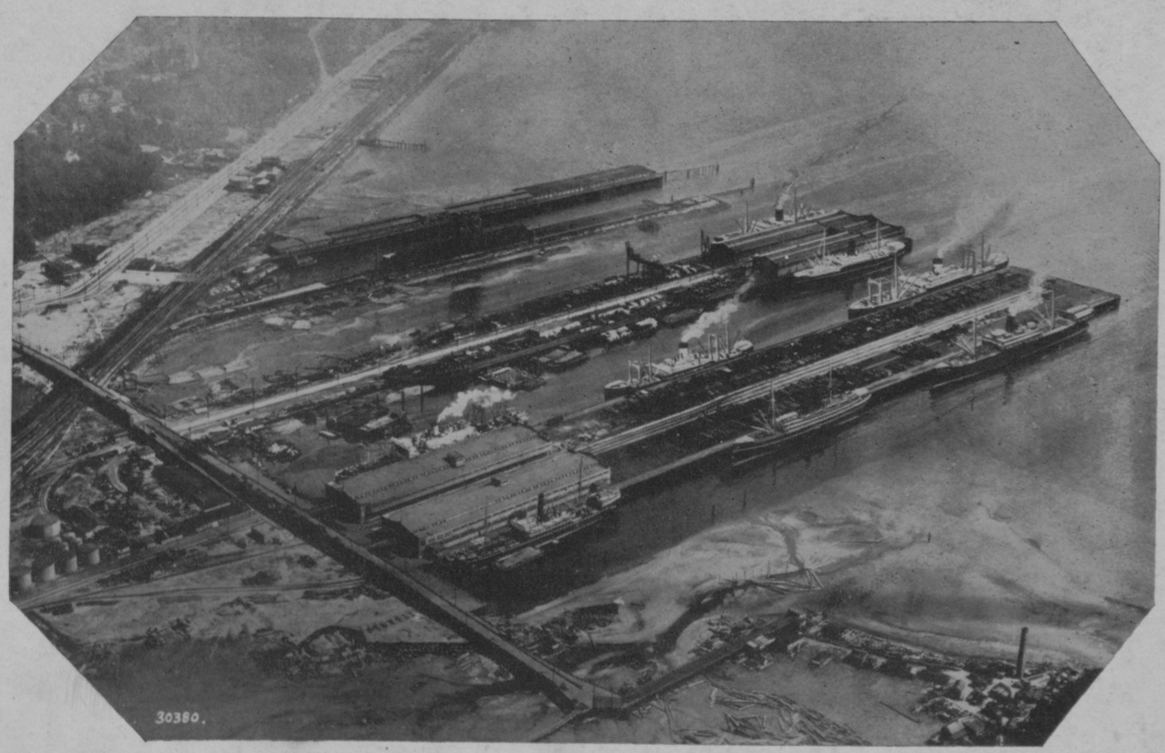

Aeroplane View of Seattle Smith Cove Terminals from Landside Showing
New Smith Cove Pier 41, in the Foreground

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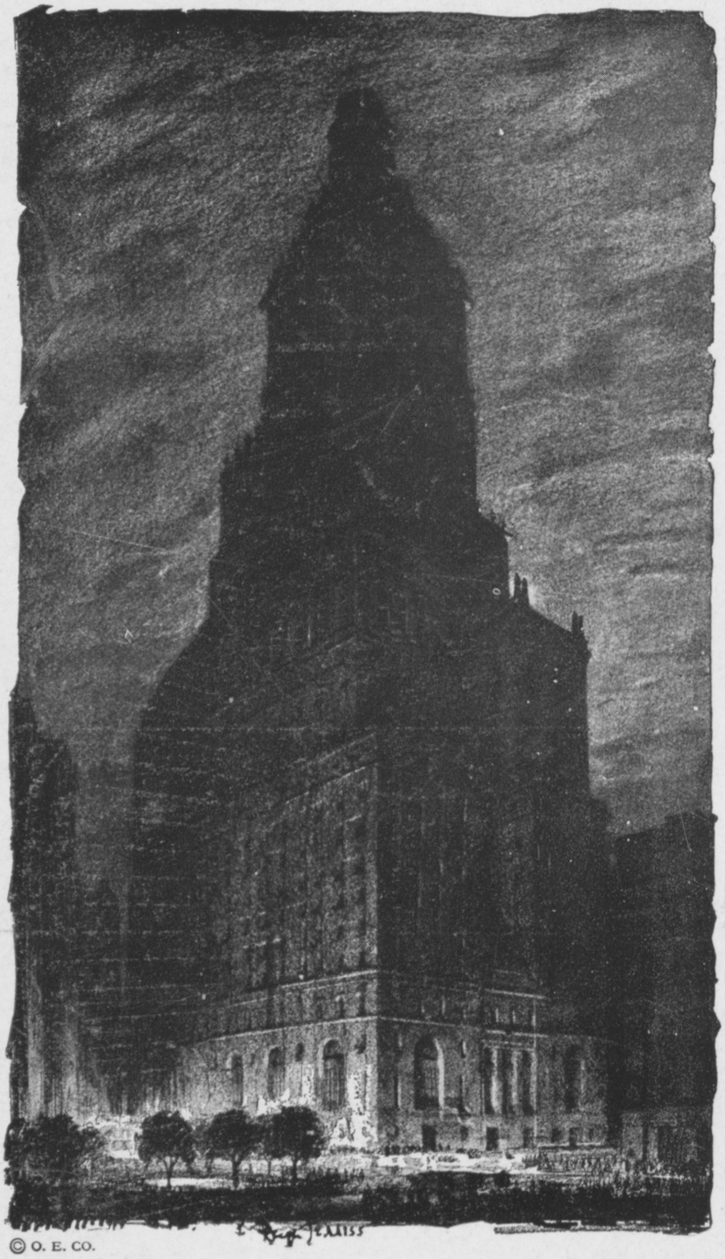

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The Complete Project for the Standard Oil Building New York City

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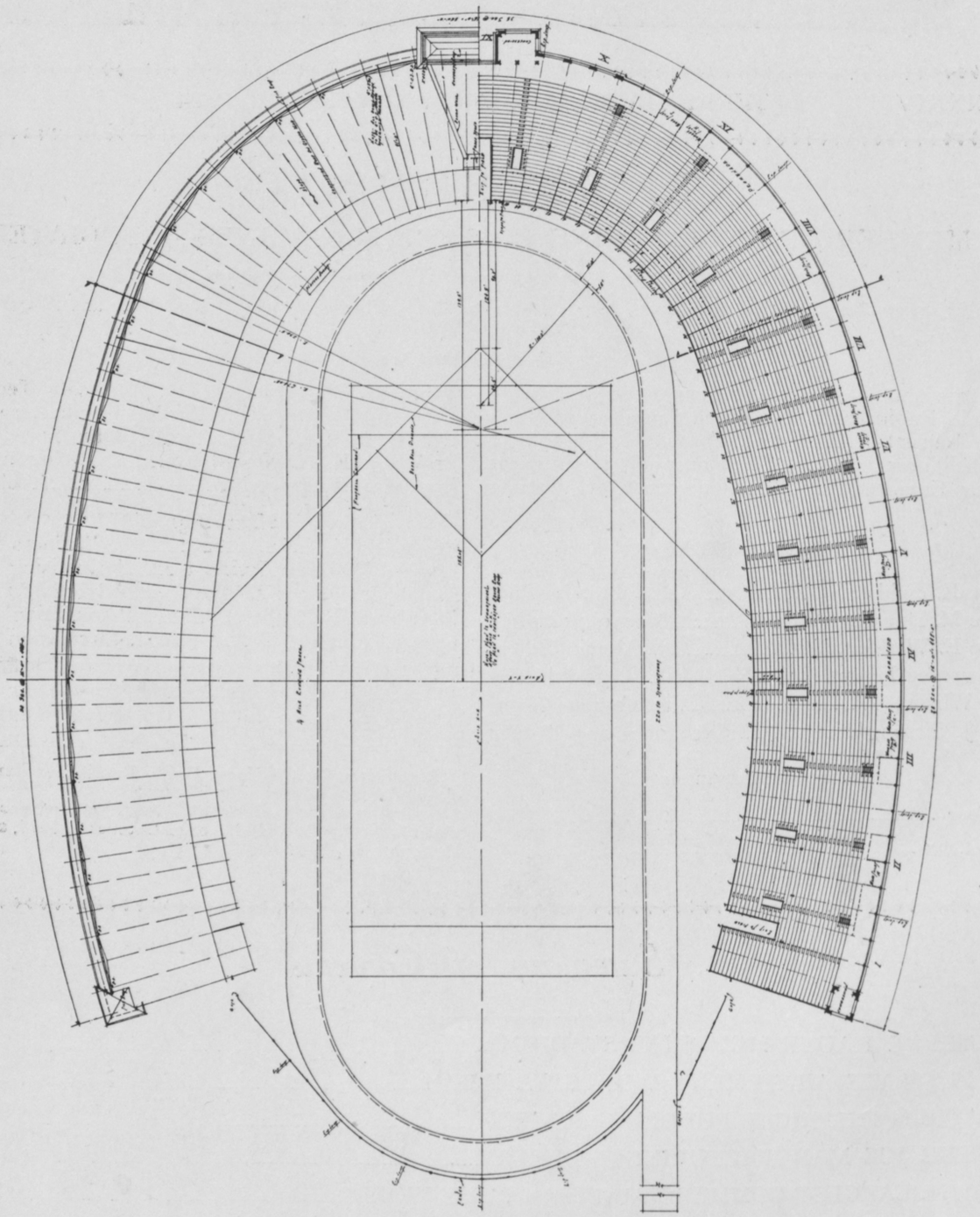
Summary of Contents



Architect's Plan of Terre Haute Memorial Stadium

Terre Haute's Memorial Stadium

*By Geo. J. Stoner, '15**

Terre Haute gets $400,000.00 Stadium—Only Stadium that houses both football and baseball—Thanksgiving Day to be formal opening day of new Stadium

Ever since the close of the World War it has been the sentiment of the majority of the citizens of Terre Haute that a fitting memorial should be erected in honor of the soldiers, sailors, and marines.

The Park Board of the city consisting of Mayor Ora D. Davis, Mr. Wood Posey, President; Mrs. Conrad Herber, Secretary; Mr. Carl W. Bauermeister and Mr. Wm. Cronin; conceived the idea for the erection of a Memorial Stadium.

The city of Terre Haute had long been handicapped by the lack of a suitable structure and playing field for the holding of athletic events. Enormous crowds every fall attend the annual city high school championship football game held on Thanksgiving Day. Large crowds attend the Three I League baseball games, especially on Sundays and holidays, when it was usually necessary to enter the grandstand about two hours before the start of the game if one were to secure a seat. Also open air boxing programs are held frequently and attract a large crowd.

Both the Rose Polytechnic Institute and the Indiana State Normal have been handicapped athletically through having poorly-located and inadequately-housed athletic fields.

The various organizations and citizens of Terre Haute throughout the course of every year hold different exhibitions, shows and fairs, such as the Pageant of Progress, automobile shows and agricultural shows. The place to hold these different shows had always been a problem, as there was no structure really adequate for them in any sense of the word.

So as before stated, the Park Board conceived the idea of erecting and laying out one structure and field which would be designed to adequately handle all athletic sports and outdoor spectacles and also house fairs and exhibitions of any nature, and at the same time which would be designed architecturally to be a fitting war memorial.

The Shourds-Stoner Company were selected by the Park Board as architects and engineers and were instructed to thoroughly study the problem and submit designs for a structure second to none in the country.

The architects and engineers secured data on both college and professional baseball stadiums throughout the entire country and visited notable examples of the more recent ones such as Ohio State University Stadium, at Columbus, Ohio; the University of Kansas Stadium, at Lawrence, Kansas; the Memorial Stadium of the City of Chicago; the Illinois University Memorial Stadium, at Urbana; the Yankee Stadium and Polo Grounds in New York; and the White Sox and Cubs Ball Parks in Chicago.

The design as prepared by the architects and accepted by the Park Board was for a reinforced concrete, horse-shoe-shaped, completely fireproof structure, to seat approximately 16,000 people. The total cost was to be about $400,000.

The Stadium is located near the center of the fifty-five-acre tract, known to all Rose men as the old fair grounds, the main entrance lying back about five hundred feet from the National road or Wabash Avenue, and the main axis of the horse shoe extending in a northeast and southwest direction.

The main entrance is an imposing triumphal arch, eighty feet in height, constructed of Indiana limestone. Bronze tablets bearing the names of every service man and woman from Terre Haute and Vigo County are to be placed in the main arch entrances where they will be seen by future generations, appropriate designation being made for those who made the supreme sacrifice in the great world struggle.

The skeleton of the structure itself is entirely of reinforced concrete, excepting the roof columns and trusses which are of structural steel and the main entrance arch which as above stated is of limestone. It consists of fifteen complete sections, there being expansion joints provided every 64 ft., traversing the complete section of the stand. From the front wall bounding the playing field to the outer wall the distance is 91 feet, there being thirty rows of seats 2 ft. 6 in. in width and a promenade 16 ft. wide at the top and rear of the seat tiers extending completely around the structure. The outer wall is nearly eleven hundred feet long. Numerous entrance and exit ramps serve to fill and empty the stand in a minimum time.

The structure is unique in that it is the only stadium so far designed to act as a permanent home for the two major sports of football and baseball. In other words it is a combination design of the usual college or university structure designed primarily for football and the professional baseball league park of the larger cities. In addition a full quarter mile running track with 220 yard straight-a-way is included in the playing field.

*Vice President and Secretary, Shourds-Stoner Company, Architects and Engineers, Terre Haute and Chicago.

The large space underneath the seat banks form an ideal place for the holding of the various exhibitions. This area contains several hundred booth spaces sixteen feet square, amply provided with day light and wired for night lighting.

A complete roof of reinforced gypsum supported by structural steel covers about eight thousand seats, one thousand of which are arranged as boxes. This provides for the baseball crowd where cover is desirable. The most desirable seats for football are not covered as it is generally more satisfactory for this sport to be entirely out in the open. These football seats form the so called "bleacher" seats for baseball. All seats are of wooden construction on top of concrete. All of them were designed for comfort and a great deal of care was taken in the design to study the line of vision from every seat to each and every part of the athletic field, and heights of seat risers have been arranged so that it is believed every seat will have a clear view of every part of the field for any athletic activity.

Upon entering, each person must traverse only a few feet to secure his seat, and this movement is upward, there being no aisles in front of the seated spectator except the small aisles which will take care of only the camparatively few box seat patrons.

The baseball field is similar to most of the major league diamonds, it being over five hundred feet from home plate to the center field fence. The foul lines enter the stands at the required distance set by the official baseball rules. However, there is only a small trianguler section on each side where the outfield is at all limited; the main part of the field being a great deal larger than that of the average ball field.

The football gridion is of the standard size and the seats extend entirely along both sides and one end of the gridiron. The open end of the horse shoe lies to the northeast.

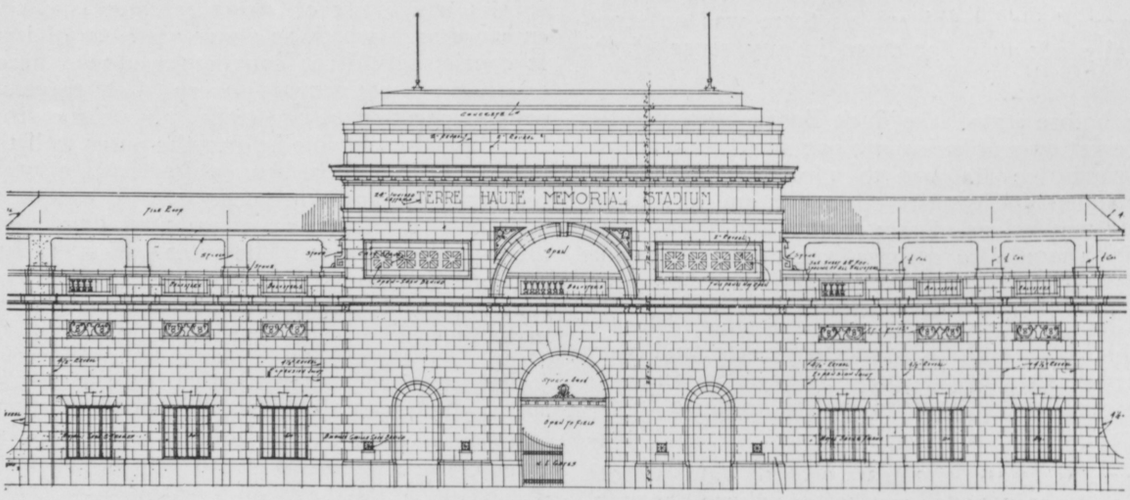
Particular attention has been paid to the design to secure adequate toilet and rest room facilities for both men and women. Also the highest class shower, locker, first aid and team rooms have been provided for each of the contesting teams. A large press box is provided on the roof immediately behind home plate. Large boxes prominently located are provided for notable guests of the city. Adequate arrangements have been made for concessions so that these have been taken care of in a manner in keeping with the rest of the structure.

A feature of the layout is that entrances to the field from the outside are of sufficient size to admit the largest vehicle or float and are provided so that parades or large spectacles such as circuses may be accommodated in the enclosure if desired.

The structure was designed for a live load of one hnudred pounds per square foot which is of course considerably larger than could ever be obtained in reality. However, this is in line with the best prevailing practice in the design of similar structures. A load test was made on two complete panels, the load consisting of two hundred pounds per square foot. The deflection noted in periods ranging up to one week was less than one-thousandth of the span.

An idea of the size of the Stadium may be obtained from the fact that about 40,000 bags of cement, 25 cars of lumber, 10,000 yards of sand and gravel, 500 tons of steel, and 40 cars of stone were among the materials required for its construction.

It is thought that the Stadium will be entirely self supporting from a financial stand point as well as a very desirable acquisition to the city from a recreational and civic point of view.



Entrance to Stadium

Is Smoke Abatement Worth While?

By Alfred Childs

Associate Professor of Chemistry, Rose Polytechnic Institute

The smoke nuisance has become a problem all over the country and Professor Childs tells us how to combat it. Dr. Mees and the Professor make sootfall surveys in Terre Haute. The smoke problem cost Terre Haute business men thousands annually.

MANY OF THE populous cities of the middle west and intermountain district suffer a heavy annual loss due to the various evil effects of smoke. These losses amount to millions of dollars annually. A careful survey made in Pittsburgh ten years ago disclosed the astounding fact that the aggregate annual loss from smoke amounted to **ten million dollars.** The annual loss to every family in Pittsburgh was estimated to be between eighty and one hundred dollars. These huge losses are charged to the following items resulting directly from the effects of smoke:—wasted fuel, damage to buildings, damage to merchants' stocks, extra artificial light because of smoke fogs, extra cost of cleaning in stores, homes, etc., extra cost in laundry bills and dry cleaning of clothing. Terre Haute houses 17,000 families. If we assume an annual loss to each family of $60.00, a conservative figure at present property values, the aggregate loss right here in Terre Haute is not less than $1,020,000.00. Such tremendous losses as these merit serious study. The enforcement of smoke abatement measures now marks the progressive city just as clean streets, city parks, and city playgrounds mark city progress.

Smoke abatement may be viewed broadly from two angles. First, the effect of smoke in industry and its control, and second the effect of smoke upon the community and its control. The first involves an engineering problem and will be considered at another time. The present article will attempt to make a brief study of the problem as it affects the community. The successful enforcement of abatement measures depends upon the full co-operation of the citizenship of the community. We shall obtain just as much smoke abatement as the people will stand for. Many people feel that those interested in the smoke abatement problem overestimate its serious effects and that abatement of the smoke would cause a great deal of annoyance and not be worth the trouble and expense. Let us then consider some of the positive evidence in the case before we pass adverse judgment.

Smoke and soot are the results of the incomplete combustion of bituminous coal. Other things aggravate the trouble. Some of these are: poor methods of firing, wrong mixture of air for combustion, too small firebox, wrong size of coal for the equipment in service, and finally a condition now quite common, overloaded boilers. It is not uncommon to find boilers loaded from 100 to 200% over their rated capacity. Local topography often makes the dissipation of smoke difficult and slow. In Pittsburgh and Salt Lake, cities located in valleys, the smoke clouds hang over the city nearly all day when the wind is unfavorable. If it is not located in a valley, low wind velocity will often hold the smoke fog over a city well on toward 10 o'clock of a winter morning.

When the smoke investigator wishes to study smoke conditions in a city, he usually starts by making a sootfall survey. The writer made such a survey last winter in connection with the work of the Smoke Abatement Committee of the Terre Haute Chamber of Commerce. Such a survey tells how much soot and dirt pollute the city air and form the basis for comparison with other cities. Our survey showed we had an average soot fall for the whole city amounting to 70 tons per square mile per month, averaging the months from November to May. A survey made in 1916 showed an **annual** average soot fall of 90 tons per square mile per month for the whole city. Cincinnati had a soot fall of 50 tons and St. Louis a like figure. In Pittsburgh smoke abatement has abated the dense smoke to the extent of 75% according to the last report of the Smoke Inspector. Cincinnati has had a Smoke Abatement League for many years which has worked with the city officials. The soot fall is now about 30 tons per square mile per month, a low figure for so large a city. It can readily be seen that Terre Haute must be classed a decidedly smoky city, especially as our down town section, where heating plants send out volumes of dense smoke, shows an average soot fall of 96 tons per square mile per month during the winter season. In Pittsburgh, the great iron and steel mills massed in the vicinity greatly aggravate the problem. Terre Haute has naturally a much easier problem than Pittsburgh.

Consider now some figures that show pretty clearly what smoke is costing us here in Terre Haute. The figures were collected by Dr. Mees and myself two years ago in connection with a partial survey of the conditions in this city. One large department store figures its annual loss in damage to stocks amounts to not less than $10,000.00. In the book department alone a loss of $1,600.00 was charged off. It was also stated that the store was restricted to the less delicate shades in fabrics because the light, delicate ones were impractical for Terre Haute.

Nearly all of the stores have to use a good deal of artificial light in the day time on winter mornings due to smoke fogs. In an average store using possibly 10-500 watt lamps the current bill for the extra lighting amounts to $33.75 for the winter months. Of course there are many stores in Terre Haute, and many larger than this moderately-sized store.

We thought it will be instructive to make a comparative study of the cost of household cleanliness in our homes. Accordinly two typical cases were studied. One an 8-room house in the down town section and the other an 8-room house near Collett Park. The items included in the study were just such as you find in any home, washing curtains and other draperies, dry cleaning clothing, washing paint and walls, the usual run. Summing it all up we found that it cost $150.00 more each year to keep clean in the downtown house than in the Collett Park house, covering the same run of items. From other sources we gained the information that it costs annually $125.00 more to keep clean in the Collett Park house than in a house of like size and condition in a smokeless eastern city.

At the Fairbanks Library 60,000 books must be vacuum cleaned four times a year. In an eastern city once sufficies. Books in frequent circulation can scarcely be kept in fit shape for circulation. Housekeepers will tell you that the tar in the smoke is hard to wash out of the curtains and the increased wear from frequent washings makes them shorter lived.

The case of a traveling auditor who visited four cities in his rounds is interesting and instructive. He figured his expense for dry cleaning of clothing as follows:—

Pittsburgh	$4.50
Chicago	3.50
Minneapolis	1.75-2.00
Philadelphia	1.75-2.00

No mention has been made so far of the big fire losses caused each year from soot-clogged flues. The fire chief tells us that 25% of all the city fires are caused by chimney fires. Verily soot costs us something.

One is naturally curious as to what part of the total smoke each source of smoke contributes. A few figures will help us a good deal. The city of Terre Haute burns 1,300,000 tons of soft coal every year. We have about 200 industrial plants, and 17,000 private home or families. The 17,000 families burn 204,000 tons of the grand total, or 15.7% of the whole. The rest is burned by the factories, heating plants, power plants, etc. The homes furnish about 10% of the total smoke, but the effect is very marked because the houses are very close together and the soot finds its way through loose window casings and other openings. Smoke from factories and power plants amount to 45% of the whole. Heating plants furnish 25% and locomotives furnish 15 to 20%. The smoke from the heating plants in the center of the city is very bad. You will remember the high soot fall in the down town part of the city. Remember that in the daylight hours a large percentage of the people are concentrated in this area and subjected during their whole working day to the wearing annoyance of dense smoke in the outside atmosphere. The locomotive smoke in switch yards also is a serious matter. You have only to pass through one of these areas on a winter morning to observe the conditions in these localities.

What can we do to abate the smoke? What practical measures can we adopt to bring about real abatement of the smoke evil? The industrial problem will be taken up at another time as we have already stated. It is not hard to show that they can save money by smoke abatement methods. The large office buildings, hotels, and stores down town can do much by adopting better firing methods and choosing the right size fo fuel. Most heating plants are not equipped to burn slack or coal containing much "fines" without smoke. Many of these plants could be made smokeless by the installation of auxilliary equipment costing not over $250.00. Central heating plants with modern equipment would solve the problem. The adoption of fuel oil or coke breeze would do away with smoke and prove economical in the net result if these fuels were generally used.

When we come to the problem of domestic smoke we have to do with considerable human phychology. In plain English, you have to persuade a large number of people that it is worth while before you can effect a measurable abatement of the domestic smoke. Co-operation is the heart of the matter. If any section of the residences would band together and agree to use a mixture of two parts egg-size domestic soft coal with one part furnace coke, they could practically do away with all dense smoke. The danger from chimney fires would be reduced to the minimum. The use of all coke as domestic fuel entirely does away with smoke and danger of chimney fires. Better firing methods will help much. Only egg or furnace size coal, free from "fines" are suited to domestic use. Big lumps should be broken to egg size. When coal is added to the fire push the red coals back—do not cover the whole firebox. Place the green coal in front. The hot fire at the back will burn up the smoke. Always leave the slide in the furnace door open. In starting a new fire, place egg sized coal on a thin bed of ashes with plenty of kindling and paper on top. The fire will cut its way into the coal without dense smoke. Many homes are adopting fuel oil and a few are installing the new gas fired furnaces. Both of these do away with smoke.

We have much hope that the new low temperature process will prove commercially successful in this country. It yields a high volatile quick fire coke that burns without smoke. It is already a success in England and one plant built in war time in Virginia produced it, although it was not successful after the war. Our high volatile coals would seem well adapted to this process. It is hoped that a few years more study will bring this process to a commercial success in this country.

Lastly, a well framed smoke ordinance backed by united public sentiment will effect great improvement in smoke conditions. It should control the legal smoke density within practical limits, and it should require that all new installations be of modern approved type.

In this article much of the material has been drawn from government bulletins written by experts, and many of the figures and methods are theirs. Smoke abatement is not an easily solved problem but is vastly worth while if a city desires to be known as a place in which it is desirable to have one's home and business.

The Mechanical Puddling of Wrought Iron

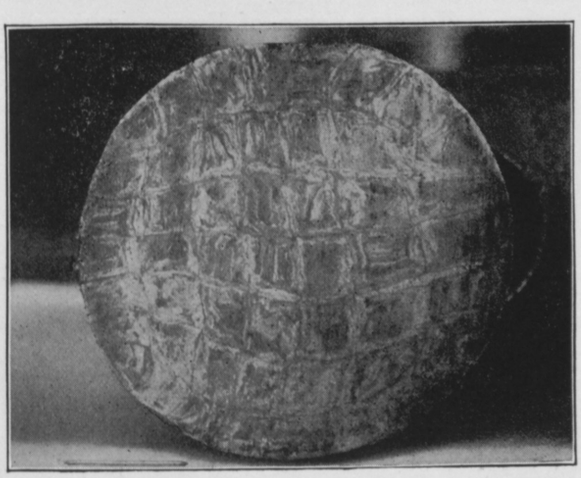
*Ray Fitterer '24**

SINCE the origin of the iron industry and up to the present time, men have been struggling with a problem which seemed unsolvable yet extremely simple. This problem has now been solved, completely enough, at least, to allow iron manufacturers a sigh of relief. The problem is the mechanical puddling of wrought iron.

Wrought iron may now be made commercially by a mechanical process much more cheaply than before because of the decreased time and fuel consumption and because of the entire absence of the man-breaking labor which has been up to the present "all in the day's work."

To understand the difficult phases of this problem, one should first follow the steps of the industry throughout its development. It is believed that wrought iron was first discovered by accidentally lighting a fire upon the ground, where the surface contained rich iron ore. The first real iron furnace was merely an excavation in the side of a hill, facing the prevailing wind and having an opening in the bottom for draft. The iron ore could have been mixed and heated with charcoal and a small pasty lump of iron produced. The American "bloomery" replaced this crude furnace. Its disadvantages were its large consumption of charcoal—about two and one half times the bloom produced—and the length of time necessary for puddling. The introduction of the blast furnace in the 14th century brought about a second process known as the "indirect" and it is this same process, without modifications, that is being used today.

Investigations have been going on in the centuries since. Some have extolled the direct process and some the indirect. The blast furnace served to produce a cast unmalleable pig iron which contained many impurities and which had to be refined to bring it to a useful state. This cast pig was taken to so-called "fineries" where the unwanted impurities were removed by an oxidizing flame passing over the tray of the reverberatory upon which the pig metal had been placed and melted.



Old Method of Piling, Showing Many Planes of Fracture

These "fineries" were replaced by the puddling furnace and process, discovered by Cort in 1784. Here iron oxides in the form of "fettling" or furnace lining, were added to the melted pig. The impurities, carbon, manganese, phosphorous, silicon and sulphur were removed from the iron as oxides. Moreover, the "fettling" lost its oxygen, thus adding iron to the melt and in a measure reducing the iron lost during the process as ferro-silicon.

The expense of such a procedure was enormous, since the iron requires constant stirring by hand. This is very exhaustive to human strength because of the intense heat and the large mass to be stirred. This work was called puddling. The puddler has his trade and is very jealous of it, so that as a result he ranks among the highest paid of all laborers today. This high wage, combined with the high prices of fuel, has served to make the price very high and has caused the contractor to turn to low carbon steels even though they are not as satisfactory in all cases.

New Method, Showing Few Planes of Fracture With a Solid Seal of Metal

Because of the trend toward steel the interest in wrought iron had considerably lessened until a year ago when it was learned that puddled iron could be produced economically and upon a large scale with a mechanical furnace which had been developed and improved. The appliances which made this mechanical furnace possible were the mechanical rabbles of Dormay and Witham and especially the rotary furnaces of Danks, Spencer, and Crampton.

The Danks furnace has been used for some time in the busheling of scrap iron. It was originally coal-fired but oil appliances have now been installed and are operating very satisfactorily. This oil-fired furnace may be rotated in either direction at will by

(Continued on Page 24)

* Research Chemist, Highland Iron and Steel Company, Terre Haute, Indiana.

The Ice Manufacturing Industry

By W. H. Motz, '16

Technical Editor Ice and Refrigeration. Chicago

The following pertains to the development and present scope of the ice manufacturing industry in the United States. Some interesting facts concerning the early history of the industry are given. This is followed by some statistical data showing the rate of growth of the industry, its present magnitude, and the expected expansion in the future.

A brief outline of the various systems of ice manufacture is given. The article is concluded with the description of one of the largest ice making plants in the world.

Especial attention is called to the great importance of the ice manufacturing industry, and the extensive use of the principles of mechanical and electrical engineering in the design, construction, and operation of such plants.

The description of the above mentioned plant will be published soon.

Historical Data on Ice Manufacture

The practice of cooling bodies below the temperature of the atmosphere has been followed for centuries. Early use was also made of natural ice, which formed on rivers, lakes and ponds. The ice, after being harvested in the winter, was stored in caves in the ground, so that perishable foods could be preserved during the summer months. Later, improved and modern equipment and methods of harvesting, storing, and distributing were adopted in this country with the result that this business assumed large proportions in the last half of the nineteenth century. However, it was not until modern times that the first attempts were made to produce refrigeration by mechanical means.

Within the time of the present generation, practically the entire industry of ice and refrigeration has grown from a crude or experimental stage to its present magnitude, serving as an outlet for the best efforts and endeavors of hundreds of thousands of people, contributing to the advancement of the industrial arts, sharing in the advance that medical science has made, conserving millions of dollars worth of food products annually, equalizing extreme prices for seasonable products, increasing the supply of perishable food stuffs by greatly extending the market for same, thus stimulating production, and furnishing our tables with fruit and other delicacies that the previous generation considered luxuries, or were unable to secure. It has been a leading factor in making possible the fullness of present day life.

The first machine to produce ice by purely mechanical means was the invention of Dr. William Cullen in 1755. Thus, mechanical refrigeration may be said to date from that year. Dr. Cullen reduced the atmospheric pressure with an air pump, the evaporation of the water being so increased as to produce intense refrigeration and ice. This was the pioneer ice machine, not only of the vacuum type, but of any kind.

Some years after the invention of the vacuum ice machine, the affinity that sulphuric acid has for water was utilized by Leslie, and in 1810, he succeeded in making ice.

In 1823, Humphrey Davy and Michael Faraday (chiefly the latter), of England, demonstrated that glass could be liquefied by mechanical compression, with continuous cooling apparatus to carry away the heat developed by work. Volatile freezing mixtures were also used in a vacuum.

To Jacob Perkins, an American engineer, is generally accorded the credit for inventing the first machine, which was the forerunner of the modern compression apparatus, capable of producing ice in commercial quantities. His patent was obtained in August, 1834, in England, ether being the refrigerant employed. The ice machine perfected by Perkins, comprised a compressor, evaporator, condenser, and expansion or regulating valve. The evaporator containing the ether, enclosed a system of pipes through which circulated brine, the temperature of which was lowered to 5° F.

Dr. John Gorrie, of Apalachicola, Fla., to whose memory a monument has been erected in Apalachicola, by the Southern Ice Exchange, and whose statue has been erected in the Hall of Fame, at Washington, D. C., by the State of Florida, obtained the first patent granted in America for the manufacture of ice by mechanical operation. The patent was issued in May, 1851, the letters patent to run from August 22, 1850. It is said that he acutally made a small quantity of ice with a model machine at a hotel in Apalachicola. Dr. Gorrie, however, undoubtedly, was the forerunner of the compressed air machine, later improved by Dr. Alexander Kirk, and others.

Although Edmund Carre, of France, improved the Vallance vacuum machine, so that in the early fifties it was making ices and cooling drinks in Parisian cafes, it was his brother, Ferdinand P. E. Carre, who in 1858-60, placed upon the market a machine which gave birth to the ammonia absorption system of today.

The Carre machine was the first one to obtain a foothold in the ice making industry in the United States. The first machine was shipped through the blockade in 1863, to Augusta, Ga., by Mr. Bujac, of New Orleans. It was supposed to have a capacity of 500 pounds per day. Due, mainly, to the parties who had it in charge, the machine was not a success, and in 1866, it was shipped to Gretna, La., where it was run for exhibition and experimental purposes.

In the fall of 1865, the firm of Mepes, Holden, Montgomery & Co., purchased the first of these machines and shipped it to San Antonio, Texas, and put it in operation under the supervision of D. L. Holden.

In the operation of this machine, another important discovery was made. Owing to the large amount of lime and magnesia in the water used, distillation was resorted to and, much to the surprise of everyone, the ice came out transparent, the first transparent ice ever made by an ice machine.

The success of the Carre machine in San Antonio was followed by the installing of others. In 1868, the Louisiana Ice Manufacturing Co. erected six 10-ton Carre absorption machines, which were constructed at Gretna, La., by Sylvester Bennett, from plans furnished by Mr. Carre.

In the years of 1873-75, the first successful ammonia compression machines were introduced by C. P. G. Linde of Germany and David Boyle of the United States. From 1875 to 1890, many new forms of apparatus were produced and certain improvements were made.

One of the greatest recent developments, in the year 1909, in the ice making industry in this country is that of the manufacture of ice from "raw" water, this term being used to distinguish it from distilled water ice. Much of the water used in the manufacture of raw water ice, also called "fresh water ice," is city water, used for drinking purposes. In many instances, owing to mineral matter, the water has to be treated, and usually all water is filtered before being made into ice.

Scope of Ice Industry

Measured by number of establishments, primary horsepower, invested capital, cost of material, and value of products, the ice manufacturing industry has shown an uninterrupted growth during the last fifty years.

From 1899 to 1919, the increase in the manufacture of ice was over 500 per cent. The increase in the number of tons manufactured between 1919 and 1921 was 12 per cent, which was noteworthy when it is considered that in the year of 1921, there was a general depression in many lines of manufacturing industry.

According to the statistics given in the Ice and Refrigeration Blue Book and Buyer's Guide, there was a total number of 2,218 ice making plants in the United States in 1904. These plants had a capacity of approximately 66,000 tons of ice per day, with an estimated yearly output of approximately 10,000,000 tons.

In the year 1923, there were approximately 5800 ice making plants, having a capacity of 246,000 tons of ice per day. The yearly output for 1923 was estimated to be about 37,000,000 tons of ice.

At the present rate of growth of the industry, it is estimated that in the year 1940, there will be approximately 8200 ice plants in the United States, having a capacity of 400,000 tons per day and manufacturing 60,000,000 tons of ice per year.

The number of pounds of ice manufactured per capita has shown a gradual increase also. In 1904, the ice manufactured per capita was 240 pounds, while in 1923, this was estimated to be 670 pounds per capita.

In the point of invested capital, the ice industry is placed in the ninth place, the investment in plants, buildings, and equipment being estimated to be three-quarters of a billion dollars.

Furthermore, it will be observed that the manufacturer of ice bears an important relation to the economic structure of modern life. It is used extensively for the preservation of food by the householder, and is really to be considered one of the necessities of life just as any food.

While the laymen is not ordinarily obvious of the extent and influence of the ice manufacturing industry, it is evident that it is one of the most essential industries of the country, contributing much to the fullness of present day life.

Ice Making Systems

Ice may be manufactured generally by means of two systems. In the first system, the water to be frozen is placed in suitable sheet-iron cans, which are then nearly submerged in cold brine. The brine is maintained at a low temperature by the evaporation of a refrigerant in a suitable container. This is known as the can system of ice making. In the second system, a coil or plate is immersed in the water to be frozen. The coils or plates are arranged for the evaporation of a suitable refrigerant, or for the circulation of cold brine. The removal of the heat from the water in this manner causes the formation of a layer of ice on each face of the coil or plate. This process is known as the plate system of ice making.

The brine is maintained at a temperature of 10° to 18° by means of the evaporation of a suitable refrigerant such as ammonia or carbon dioxide. The water in the cans, being exposed to the pressure of the atmosphere, will freeze at a temperature of 32°. The cold brine at a temperature such as 15° will therefore absorb heat from the water which is at a higher temperature. The brine will absorb the heat required to cool the water from the temperature of the supply to the freezing temperature, 32°; the latent heat of fusion of the water; the heat to cool the ice to the temperature of the brine; the heat from the ice cans; the heat transmitted by the insulation; the heat to cover the other losses. The transmission of heat from the air to the cold brine, of course, should be retarded as much as possible by using a suitable insulation on the brine tank. The brine is kept in constant circulation in the tank by means of a propeller agitator. The purpose of this is not only the equalization of the temperature of the brine in all parts of the tank, but also the increasing of the heat transmission which is due to the higher velocity.

As soon as the water in the cans is colled to 32°, ice will begin to form on the surfaces of the can. The rate of freezing is rapid at first, and becomes progressively slower as the thickness of the layer increases. If the can is left in the cold brine long enough, the water will entirely solidify, forming a homogenous cake of ice. The cans of ice may then be removed from the brine and then other cans filled with water may be inserted in their places, thus making the process of ice production continuous. The can system is used in the majority of the plants at present.

The Largest Commercial Pier in the World

By Geo. F. Nicholson, '06

The Port of Seattle boasts of the largest Commercial Pier in the World. Newest construction methods were used and timber was given preference over concrete.

THE PORT OF SEATTLE leads all other ports in the size and capacity of its terminal facilities, two of the ocean piers being the largest commercial piers in any port, either in America or abroad. These two piers, Smith's Cove Piers 40 and 41, each over half a mile in length and 310 feet and 366 feet wide, represent the last word in terminal efficiency.

Smith's Cove Pier 41, completed in 1920, covering an area of one million square feet, is the largest commercial pier in the world. Several years ago Chicago built a municipal pier on the lake front, 200 feet wide and approximately 3,000 feet long, but it has a smaller area than Pier 41; moreover, it cannot be called strictly a commercial pier, as it has been used for more conventions and as a pleasure pier than it has been used commercially. Los Angeles in her early harbor development, made a large fill projecting out into the harbor, but this very large area has only been partially developed, and it will be many years before this project is completed; and this so-called "pier" will contain a series of quay wharf developments, which together cannot be classed as a single pier. The Lehigh Valley Railroad has started a large, commercial pier development, the Claremont Terminal in New York Bay. When this is finally completed, it will be much larger than the Seattle Pier 41, but only a small start has been made, and it will be a number of years before it approaches completion. Smith's Cove Pier 41, Seattle, is a completed facility with two transit sheds and a large open area, all fully equipped and under operation.

The design and construction of this facility will probably be of interest to the readers of the "TECHNIC." It is what may be termed a solid filled type of pier, since with the exception of an apron wharf, 75 feet wide on either side, the pier has been filled to grade with the sand and gravel dredged hydraulicly from the slips on either side. The Port of Seattle is permitted by the United States Engineers, War Department, to make solid fill piers in this harbor; whereas, the San Francisco is unfortunate in this regard, not being permitted to construct solid filled piers on account of the flow of the tidal currents in San Francisco Bay.

In the construction of the above pier, three contracts were let: one for the dredging of the slips on either side of the pier and filling in the solid portion of the center of the pier; another for riprapping the slopes of the fill to protect them from the wash of tides and wave action; and a third contract for the building of the wharf substructure and superstructure. Although these contracts were let separately with the assumption that considerable money would be saved by the Port in eliminating the percentage of profit to one general contractor on subletting part of the work, it was the actual experience of the writer that far better results, both from the standpoint of time and cost, would have resulted from the letting of the work to one general contractor.

The dredging contract included the dredging of approximately 1,000,000 cubic yards of earth consisting chiefly of a mixture of sand and gravel. It was used in the filling of the pier, adjoining property of the terminal, and the waterfront street. This material was pumped hydraulicly a maximum distance of a mile and a quarter.

The contract for riprapping the slopes consisted of the furnishing and placing of approximately 125,000 cubic yards of rock, covering the slopes approximately 2½ feet deep.

The substructure and superstructure contract called for the driving of the bearing and fender piles, and the building of the wharf and deck structure along with the two-story transit sheds.

The first work done was that of dredging and at the same time filling the center of the pier. Following this, the bearing piles to support the wharf were driven. The rock work followed closely after the pile driving in order that the slopes would be protected as soon after the fill was made as possible. This material stands on a natural slope of approximately 2½ to 1, and with the aid of the rock riprap, we are able to maintain a slope of 1 to 1 below low tide and 1½ to 1 above low tide. Rock was brought in by scows and unloaded by means of skips and dumped between creosoted piling; the skips were lifted from the scow by a derrick, located on the caps on top of the piling. Care had to be taken in dumping the skips between the creosoted piling in order that no damage would be done to the piling.

The policy of the Port of Seattle has been to use wooden construction practically throughout the structure. The following two reasons are the chief factors in using timber construction in preference to reinforced concrete:

1. **The lower cost.**
2. **Obsolescence may require in a few years the rebuilding of the facilities to meet new methods of freight handling.**

Following this policy, creosoted piling has been used in the substructure of apron wharves supporting wharf deck. These piles are pressure treated and have a life of approximately twenty-five years.

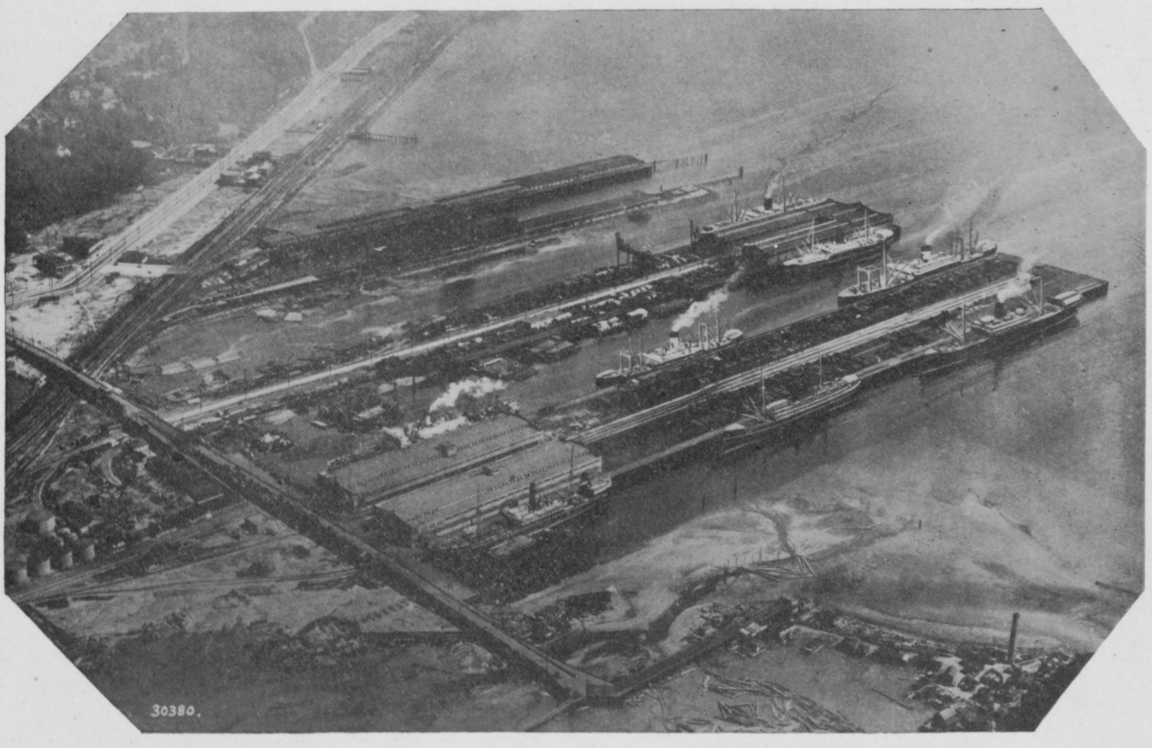
Heavy mill type construction was used in the building of the transit sheds. The double girders supporting the second floor at each bent are unique in the fact that they are much larger than timbers used in the middle west and the east. They are 18 x 32 in. and are spaced one inch apart to allow for the circulation of air. This was selected timber, and even in the Pacific Northwest, where timber is plentiful, we had some difficulty in obtaining the proper timbers for this structure.

The upper stories of the two transit sheds are used exclusively for passenger and mail business; one is used by the Admiral-Oriental Line, operating five palatial passenger vessels between Seattle and the Orient; the other is used by the Nippon Yusen Kaisha, a Japanese Steamship Company, the oldest operating on the North Pacific Coast. In 1923, Seattle ranked second as a foreign passenger port in the United States and all of the foreign passengers were handled at this pier. The lower floors of the sheds are given entirely over to the storage of import commodities,—spices from East Indies, rattan and matting from the Orient; tea from China and Japan; rattan and reed furniture from the Orient, beans in large quantities, vegetable and wood oils, peanuts, rice, toys and notions, burlap, rubber; and chief amongst the imports, silk, which practically all comes through Seattle by reason of the shorter route and therefore the saving of time. On account of the very high insurance on such valuable commodity as silk, it is important that it be transported in as short a time as possible.

The vessels which bring the raw materials from the Orient, carry back lumber, iron, steel, copper, machinery, cotton, canned salmon, condensed milk, fruit, wheat, flour, automobiles, cotton cloth, paper, leather, meat and meat products, and other manufactured articles.

The outer portion of the Smith's Cove Pier No. 40, or open wharf section is used entirely for export lumber that has to be assembled, awaiting the arrival of the ship. Approximately forty per cent of the lumber exports from the Pacific Northwest go to California; the balance goes to the Orient and the Eastern coast.

These piers are well equipped with heavy freight handling equipment, there being a 225-h. p. gantry crane, a structural steel shear-leg derrick of 125 tons capacity, locomotive cranes, gas and electric tractors, trailers, portable elevators, movable bridges and a miscellaneous assortment of other freight handling devices.



Aeroplane View of Seattle Smith Cove Terminals from Landside Showing New Smith Cove Pier 41, in the Foreground

University of Wisconsin Invaded

By Milton Feldstein, '25

"Badger" Engineers hosts to eighteen schools of engineering group

—Fine time enjoyed by four men from Rose—

Next Convention at Cornell

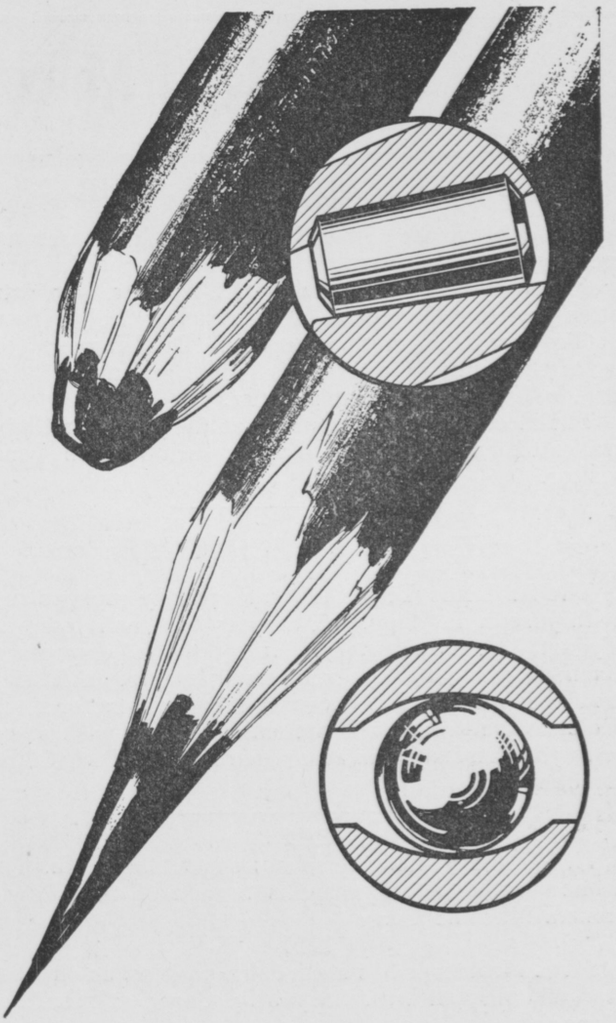
At nine o'clock Friday, October 24th, eighteen colleges of the engineering magazine group, invaded the University of Wisconsin for a two-day siege. It was the occasion of the fifth annual convention of the Engineering College Magazines Associated, of which the ROSE TECHNIC is a member. There are at present twenty-one members, forming as formidable an organization as any college publication group in the country, representing the cream of the engineering publications. The purpose of this organization is to standardize the size and editorial matter of the various organizations and to facilitate the sale of space to national advertisers.

These publications are divided into two groups—eastern schools and western schools. According to the classification of the spring of 1924, ROSE is classed as an eastern school. At the head of these two groups is a chairman. Professor Leslie F. Van Hagan, of the University of Wisconsin is the newly elected head. Each group has a vice-chairman, Merrihue of Pennsylvania, being the eastern chairman, and Professor Birk, of the University of Colorado, the chairman of western colleges. These three men form the executive committee.

The University of Wisconsin is situated at Madison, and can boast of one of the prettiest campuses in the "Big Ten." It is surrounded by four beautiful lakes which greatly enhance its beauty. The hospitality of the "Badger" engineers was beyond comparison, and the convention proceeded with scarcely a flaw. Programs were furnished each attendant, but they could scarcely be called that, as they were beautifully illustrated booklets of the campus, the town, and the university.

The main subjects of the convention were topics of editorial write-ups, magazine "make-up," and the soliciting of advertising. Two very interesting talks were given on the last two subjects named by experts at the University. The subjects may seem uninteresting to the reader, but the facts were presented so adroitly and with such a sincerity of purpose, interposed with so much humor, that they were enjoyed by everyone.

Saturday marked the close of the meeting, and the next convention was awarded to Cornell to be held at Ithaca, New York in the fall of 1925. It is an education in itself just to meet the various men from other schools and absorb some of the good fellowship which is always characteristic of a college gathering. There is an intangible something about an association like this which makes its impression on a fellow's mind, and is a source of many pleasant memories. The E. C. M. A. is a big thing and stands for big things. ROSE was one of the first to join this group, and it is up to the student body to so support the TECHNIC that it may some day become one of the big leaders in the association.



THE surest thing about a pencil with a fine, long point is that the fine, long point will soon wear off. Five minutes of rapid note-taking, and you're down to where the point is broad, and *there* the lead lasts much longer.

Here, in principle, you have a key to the superiority of a roller over a ball bearing.

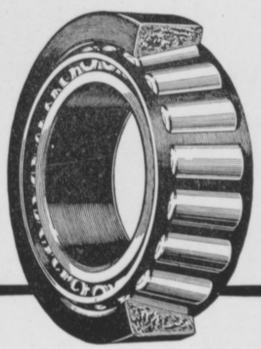
Two surfaces, separated by a ball, must rest upon points in the circumference of the ball. They rest upon points because there's nothing else in the circumference of a perfect ball but points.

Two surfaces that are separated by rollers, however, rest upon the broad length of the surface of the rollers.

Although made of steel instead of graphite, and thus infinitely more enduring, the difference in life between a roller bearing and a ball bearing is nevertheless typified by the sharp vs. dulled pencil point. The broader the surface over which the load is distributed, the less rapid the wear—and the longer the life of the bearing.

Timken Bearings, in addition to being roller bearings are also *tapered* roller bearings. Because of the taper, they withstand the loads which are called "end thrust," as well as those directly at right angles to the axis in which the bearing is mounted, called "radial load." Only tapered bearings have the capacity in one bearing to withstand both these loads.

The Timken Roller Bearing Company
CANTON, OHIO



TIMKEN
Tapered
ROLLER BEARINGS

ALUMNI NOTES

(All Alumni are invited to send in personals of themselves or fellow Alumni)

SCHENECTADY TECH CLUB

The Schenectady Rose Tech club held its second meeting since its organization on October 27th. We were very fortunate in having Dr. Wagner, who was attending the Centennial at Rensselaer Polytechnic at Troy, with us at this meeting. Dr. Wagner told us of the items of interest at school and also of his trip to Europe this past summer.

The meeting, which was held at the Mohawk Club, was attended by eighteen active members and one visitor.

ST. LOUIS TECH CLUB

The St. Louis Tech Club has recently reorganized with Joseph T. Hepp, '12, as president, and Jesse L. Tygart, '23, as secretary. The club had expressed itself as going to take a renewed interest in ROSE and the TECHNIC. Several members motored to Rolla to see the boys in action. Our well-wishes are with you, St. Louis, and may more of the Tech Clubs do likewise.

1911

H. W. Ker visited the school on October 13th. He is now with the Indianapolis branch of the Wapakoneta Machine Co.

1916

M. J. McKeever has accepted a position as chemist and metallurgist with Lucy Mfg. Corp., at Houston, Texas.

1919

H. A. Hearn has been transferred to Indianapolis by the Wagner Electric Corporation.

1920

Herbert Briggs, Jr., visited the Institute October 18th. He is with the Duquesne Light Company, at Cheswick, Pa.

W. C. Bryan, of the Kentucky Actuarial Bureau, has been transferred from Louisville to Owensboro.

J. S. King, who has been at home for some months, because of ill health, has returned to Youngstown to his former position with the Youngstown Sheet and Tube Company.

1921

Homer A. Clark has changed his address to 7610 Byron Ave., Detroit, Michigan.

R. L. Biller visited school October 22. He is now located in Indianapolis with the Century Manufacturing Company.

1923

H. Heck is night superintendent at the Vincennes Glass Company. His address is 212 Church Street.

F. Tetzel, who has been with the Marion Steam Shovel Company since his graduation, has been made assistant advertising manager.

J. L. Tygart visited school October 6. Tygart is now in St. Louis with the Chicago Pneumatic Tool Company.

1924

Harold Hood is a law student at the George Washington University, Washington, D. C. After December 1st, he is to take some work in the Patent Office in addition to the law course. Hood's address is 2114 G Street, N. W.

F. Bogardus is in the engineering department of the Connersville Blower Company, at Connersville, Indiana.

T. Stone is a test man with the General Electric Company at Schenectady. His address is 24 State Street, Schenectady, New York.

F. R. Martin visited the Institute on October 8th. He has a position with the I. C. R. R. at Jackson, Mississippi.

M. Loser is doing analytical work in the experimental department of the Sinclair Refining Company at East Chicago. His address is 4430 Magoun Avenue.

R. Reddie is with Westinghouse Company at East Pittsburgh. His address is 1230 Franklin Avenue, Wilkinsburg, Pennsylvania.

J. H. Hocker was a visitor on October 13th. He is with the American Bridge and Iron Company at Gary.

1925

C. Reid, ex-'25, is traveling for the Terra Cotta Service Bureau of Chicago. His address is 128 N. Wells Street, care of that company.

MARRIAGES

James Huber Brinton, '24, to Miss Leona Routzahn, August 30th.

F. Ray Martin to Miss Arline Weiss, October 11th.

ROSE TO RECEIVE FOREIGN STUDENTS

The immigration act of the Federal Government makes provision for the entrance of foreigners who wish to attend accredited colleges as students. Such persons are not included in the quota of immigrants for the country from which they come. Rose Polytechnic Institute has been placed on the list of institutions which may receive foreign students under these conditions.

TESTING THE EINSTEIN RELATIVITY THEORY

Two weeks will be needed by Professors Albert A. Michelson and Henry G. Gale of the University of Chicago, to test the Einstein theory of relativity by means of their elaborate apparatus which is nearing completion at Clearing, Ill.

On October 17 they will start observations. The apparatus consists of a rectangle of water pipe 1800 ft. long by 1200 ft. wide; an arc light which will flash two beams of light around the pipe in opposite directions; sets of mirrors to relay the light beams around the pipe; and an air pump to create a vacuum in the pipe.

According to the Einstein theory of relativity, one beam should travel around the circuit in slightly less time than the other.

—The New Student.

School Spirit

Perry Wilson, '27

How often we hear or use ourselves, the words, "Let's show some of the old Rose spirit." But upon hearing them how many of us realize just what significance they carry? Has the term "the old Rose spirit" become just a meaningless phrase to be used at random, merely as a tag to an often irrelevant speech? Is there any endeavor on the part of the majority of us to really comprehend the meaning of school spirit or, having the comprehension, try in any way to acquire it? School spirit is one of the finer feelings akin to patriotism; an emotion which bids the possessor to cheerfully place the good of the school above personal ambition; to sacrifice his own hoped-for rewards if it is for the best interests of his fellow students that he should do so.

An athlete, battered about through a wearisome season, carrying the double burden of upholding the honor of the school and his studies and whose only reward is the passing plaudits of a fickle mob when he is winning, with no cheers to encourage him when losing—such a student shows his school spirit. Out of a student body of 250 we have about 50 who are showing they have school spirit in this manner. Anyone who saw them make the game fight against odds in the Indiana or in the Purdue game where torn, bruised, exhausted, and beaten, they never gave up, but fought grimly on until the last whistle, can do nothing but grant that the members of the football team have the proper Rose spirit. But how about the rest of us—how many of us even try to show we appreciate the efforts of the men who are daily making sacrifices for the good of the school? Near the end of that game, one member of Rose's team was carried off the field completely worn out from the battering he had received; the Purdue, supporters arose and gave him an ovation in respect to his gameness which, I fear, would have never been duplicated had the game been played in Terre Haute.

While it is true that all of us can't shine upon the field, that is indeed a lame excuse for lack of school spirit. A school is alive only as its activities live and these function in direct proportion to the interest taken in them. There is or should be an activity for every man in school, and these are strong only through healthy competition and not by giving the offices to anyone who will take the pains to see the work is done in any fashion. If there is no activity in which you are interested, find enough of your fellow students who have tastes similar to your own and do something as a body that will give you an added interest in attending Rose and at the same time help raise the general morale. This spirit is achieved only through individuals having the interests of a group of their fellowmen at heart rather than their own. And if you must have a tangible return for your labor, you must admit that a very vital part of your education has to do with the knowledge only to be gained by contact with people, and there is no better way of effecting this than by going out for campus activities.

Finally, even though you have tried your hand at campus activities and have failed to find your niche, there is a nobler way remaining for you to show your school spirit. Every school has a reputation, and it falls entirely upon its undergraduates to determine what it shall be. When you enroll as a student you take into your keeping a part of the name of the school. It is a sacred trust and should be regarded as such. Whatever are your actions outside the school these will reflect for good or evil upon Rose. A deed that will be connected with your name only momentarily, attaches itself forever to that of the school. So let us endeavor to maintain the name handed to us or to add to its luster. Perhaps we do not possess "the old Rose spirit," we can create a new Rose spirit founded upon service to the school and respect to the ideals which moved its founder.

Scholarship as a product of a college is incomplete except as it be established on the foundation of character which is not only passively good, but which is of moral fibre definite enough to influence those with whom it is brought in contact. By as much as evil directed by intelligence is more dangerous than brainless badness, by so much is the college liable to the danger of doing the country an ill turn if it ignores its responsibility to safeguard and develop character as it undertakes to stimulate mentality.

—President Ernest Martin Hopkins,
Dartmouth College.

The New Fraternity—Yale

IS THIS THE TRUE ROSE SPIRIT?

While work was being done on the rifle range west of the school, several men from the student body were hired to aid in the construction. This was government work and when school ended in June, a check came for this certain man's work. As he was no where to be found, it was turned over to Mr. Pine until this fall. This September, the fellow concerned was presented with the check which he refused to accept, saying his efforts were donated for the good of ROSE and asked that the money be turned back into the school fund. That is the true school spirit and our hats are off to the fellow whoever he may be.

ROSE LEAVES

On Thursday, October 1, the military department with its characteristic forethought for the undergraduate's comfort issued to each member of the '27 class a new pair of the latest mode trousers—English cut, full length, quarter side pockets, etc., and made of the best khaki denim obtainable. In return the class was requested to aid Lieut. Bessel in the construction of a bridge to connect Heze Clerk's athletic field in the main campus. With a few dissenting votes, the members agreed and were rewarded with an additional gift of picks, shovels, and other implements dear to the heart of the engineer. Under the able supervision of the Seniors, a three-span trestle bridge, 48 feet long by 6 feet wide, was put over Lost Creek. Record time was made, the actual construction requiring only four hours—it is also noteworthy that the building was accomplished with no expense to the school, all materials used being salvages and the labor supplied by the sophomores. The bridge is similar to those made in the field under war conditions. The work repaid the builders in two ways—in addition to the experience gained they escaped the routine infantry drill for two periods. Much credit is due Lieut. Bessel for his excellent superintendence of the job.

Just prior to the first home football game, Rosie, the pallid pachyderm was examined and found to be in very poor physical condition. After treatment by three specialists from the sophomores, she recovered sufficiently to attend the Oakland City game. Although she made a brave appearance at the conflict with her decorations and new numerals, it was obvious she will never recover her former vitality; indeed the unsteadiness of her legs is a sure symptom that her mortal days ar few. Is tradition to die with Rosie or will St. Pat's see a new White Elephant? Sophs—the issue is clear—what will be your answer?

With the opening of the Fall semester, the Military department was confronted with many difficulties. Due to a forced absence of Lieut. Hill, Lieut. Bessel was required to handle all theoretical and practical classes; by hard work the latter was able to effect a skeleton organization and with the return of Lieut. Hill, the formation of the unit has been completed. A battalion, composed of the students taking the basic course as privates with the advanced course students as officers, will constitute the unit at Rose this year. This battalion will be former of three companies of two platoons each. Drill has been devoted to manual and simple squad movements, but the future military practice will be given over to the more intricate group movements with an occasional competitive drill among the companies. The cadet commissioned officers are: Major—C. Derby McDargh; Captains—Withrow, Iker, Reifenberg, and Merrill; Lieutenants—Bradford, Dunning, Griffith, Watkins, Yager, Gray, Grafe, Gosness.

A FABLE

High noon. Thursday noon to be historically correct, and the hunger maddened frosh stirred restlessly in the rear pews of the assembly chamber.

High in pitch above the sonorous drone from the snoozing seniors, the assembly orator continued to discourse upon the high cost of suspenders in Zanzibar—and the juniors snored on unsilently.

Presently a human figure, that had concealed itself in the shadows near the door, crept ape-like toward the exit, eluded the ever-present-sentinel-with-the-attendance-slips and crawled down the hall. At last our hero, the sagacious sophomore, stood free once more. Seemingly out of nowhere the assembly-hoppers gathered close and expectantly chorused "Has he finished his speech?"

And as our hero lit one of those "that satisfy," he harkened thus: "The poor fish finished his speech an hour ago and WON'T STOP."

Work has been started on the construction of two tennis courts on the main campus. At present the ground will only be prepared and leveled, then allowed to settle during the winter; next spring the actual laying out of the courts will be done. When the work is finished, Rose should have two tennis courts as good as any in the city. This will be welcome news to the large number of tennis enthusiasts in school who are now forced to find a vacant court in town when they desire a set or two.

Thirty members of the Rifle club have been holding competitive shoots every Thursday afternoon and Saturday morning on the Ft. Harrison range. To date the firing has been entirely on the outdoor range using the Springfield rifle over the regular courses but this winter the club will use the indoor range at the school and fire a .22 rifle. O. M. Dunning is leading in total score with 164 out of a possible 200. The club is anxious to secure new members and any student who desires to learn to shoot is urged to see Professor Peddle or Dunning.

New duties have been assumed by the Y. M. C. A. this year—they have relieved Miss Gilbert of carrying small supplies as pencils, triangles, etc., and in addition to helping out of town men to secure rooms, the "Y" is endeavoring to help all students who are seeking part time work. Under the auspices of the "Y" a banquet was given the Freshmen and the new men made welcome to the school. On Friday, October 24, the first of a series of suppers for the student body was held. Mr. Mendenhall, state secretary of the Y. M. C. A. was the principal speaker.

The Handbook published by this organization has been changed to a more lasting and convenient form; it is a regular pocket size note-book cover which is retailed to the students for fifty cents. Filler will be furnished for it free of charge every year and the covers sold only to new students after this year.

FRATERNITY NOTES

ALPHA TAU OMEGA

Gamma Gamma chapter of Alpha Tau Omega, entertained with a house party at the chapter house on South Fifth Street on Sunday evening, October 26th. All the active members and several alumni were present with their fair companions and enjoyed the dancing and stunts until a late hour.

Gamma Gamma is pleased to announce the initiation of Maurice A. Kintz of the class of '27.

Brother Hugh V. Alexander, class of '27, was awarded a place on the national roll of honor of Alpha Tau Omega for high scholarship.

Brother Engelhardt, of Louisville, visited the house on October 12th.

Brothers Sewell, of Paducah, Kentucky; Briggs, of Pittsburgh; Pittman, of Pittsburgh; and Woolfolk, of Louisville, visited the house on October 19th.

THETA XI

On the evening of the Louisville game, November 1st, Kappa held a smoker for alumni who motored up from Louisville to see the game.

About half of the brothers managed by some means, fair or foul, to make the trip to Purdue to see the game, where they were royally entertained by the Theta chapter.

Brother Kramer, of Louisville, visited the house last week. "Doc" failed to bring a prescription with him, however.

Brother Hartsock came around to see us for the first time since his marriage.

P. I. E. S.

The fraternity held its fourth annual dinner-dance at Turkey Run on October 25. At two o'clock the members and their lady friends drove to the State Park, and at six o'clock they enjoyed a chicken dinner in the dining room at the Inn. Roses were given as favors. Orville Dunning acted as toastmaster and called on Lieutenant Bessell and Prof. Wischmeyer, and Brothers Stock, A. L. Sherwood, Whitecotton, and Hillis for toasts. During the evening, Cliff Lowe's Orchestra furnished the music for dancing. Lieutenant and Mrs. Bessell, Prof. and Mrs. Wischmeyer and Prof. and Mrs. Stock were the honor guests. Six members of the Chicago Alumni Chapter, were present. They were Griffith and Donham, '23 and Sherwood, Freers, Maehling, and Loser, '24.

The pledging of Harry Paton, '26 and John Fairhurst, '27, is announced.

The Chicago Alumni Chapter held its first meeting at the Kunz-Remmler Hotel, Chicago, on the night of September 29. The Chapter now has eighteen members, most of whom were present at the dinner meeting. An active social program is planned.

SIGMA NU

Plans are rapidly going forward for the Hoosier Rally, the annual convention of the Sigma Nus in Indiana. This rally which is to be held early in December at the Lincoln Hotel in Indianapolis, promises to be better than ever this year.

Brother George Henry, class of '18, now employed with the General Electric Co., was a recent visitor.

On November 9th, the chapter attended services at the Centenary Methodist church in honor of Sigma Nu Memorial Day.

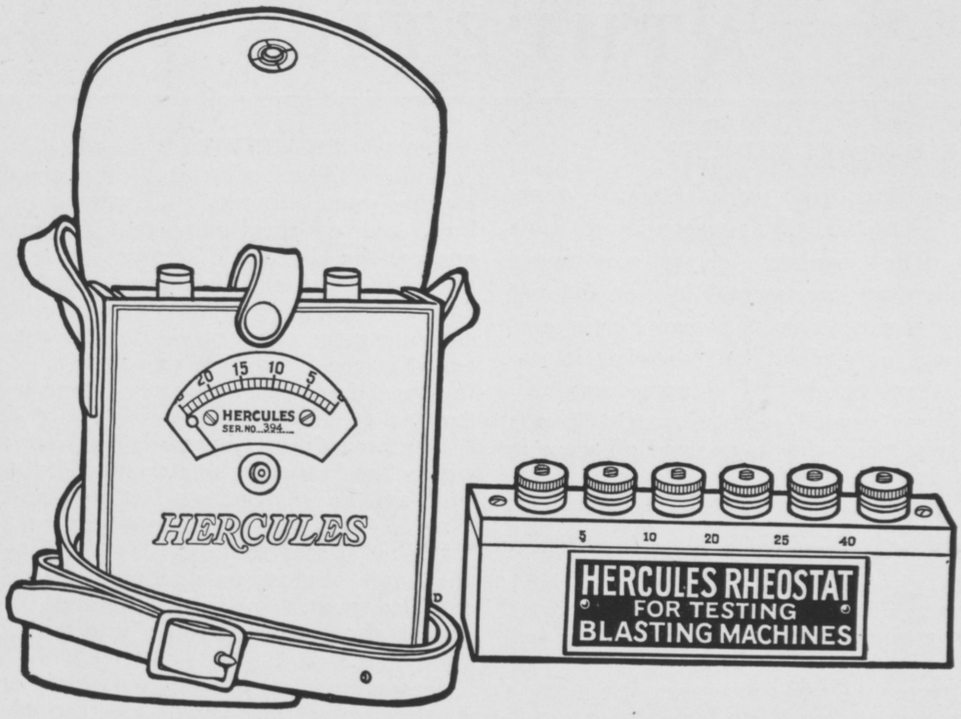
PEP SESSION AND PEP FEST HELD OCTOBER 2

October 4th was the first home football game, so at 11:00 o'clock Thursday morning, a big "pep session" was held. The meeting was in charge of football manager Derby McDargh. Talks were given by captain Moorhead, Coach Clark, Professor Settles, and lastly an account of his brief but spectacular football experience by "Doc" Johonnott. The problem of a yell leader was taken up and solved by the election of Nicoson '27, and Curl '28. The latter, however, was indisposed due to his weakness for the "weed." The newly elected cheer leader led a few yells, and the meeting was closed by the singing of "Dear Old Rose."

That night, the freshmen were hosts to the upper classmen at a pep fest held near the Union Station. After a few rounds of doughnuts and cider (less than ½%), a "shirttail" parade was formed and downtown Terre Haute visited. Everyone was informed of the football game on the morrow, and the multitude retired to rest their throats for the next day.

PROFESSOR FISHER ADDRESSES STUDENT BODY

At an assembly held Tuesday, October 7th, the student body was addressed by Professor Irving Fisher, head of the political economy department of Yale University, and noted international economist, upon the subject of "America and World Peace." Professor Fisher is among those who are devoting their time and energy to the worthy task of educating the people of America on the subject of the League of Nations. We are the only nation of importance who is not a member of the league, and he cites the following reasons why we, in respect to humanity and our soldier dead, should enter: a world court would abolish wars between nations; the United States needs a voice in world affairs; the United States incur in remaining outside; and it would abolish competition in armaments. The professor proved to be a most interesting speaker, holding the attention of everyone throughout his talk which was enthusiastically applauded at the finish.



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ATHLETICS

ROSE 33—OAKLAND CITY 0

The "Fighting Engineers" won their first game when they beat the Oakland City aggregation at home on October 3. The downstate eleven was much stronger this year than they were last year and put up a much better fight. This is shown by the fact that the score was only about half of what it was when we beat them before. The game was fast at all times and was a good game to watch. Coach Clark had his regulars rarin' to go, and all were in good condition for the tussle.

To start the game Captain Moorhead kicked off over the goal line for a touchback. Oakland City immediately punted out of danger. Rose made several first downs almost at will and then fumbled. Oakland City punted again and the Engineers started a march toward a touchdown, finally putting the ball over from the seventeen yard line on a triple pass play. In the second period Mayrose picked up a fumble and tore over the goal line for another touchdown.

Reinking, Piper and Miller in the backfield made most of the gains for Rose, Reinking making most of his on end runs and the other two going through the line for big gains. On defense the whole line was on the job every minute and allowed nothing to get by them. Mayrose made another sensational gain after he caught it.

Well, Oakland City, better luck next time, but not against us.

PURDUE 41—ROSE 3

October 11 seemed to be an unlucky day for the Rose Poly boys and they came home on the short end of a 41 to 3 score. The fact of the matter is they were outclassed and outweighed by the more powerful Purdue eleven, but they were never outfought. Though hardly able to stand on their feet they never once gave up or let down, and they gave everything they had even though they didn't bring home the bacon.

Miller played a wonderful game in the face of overwhelming odds. He was the only consistent ground gainer we had. Time and time again he tore through the Purdue line for gains but Purdue would always come back and get it all back and more too. Captain Moorhead's educated toe got us the only markers we got in the game. Standing 40 yards from the goal he sailed one squarely between the uprights for a field goal. Hall was the bulwark of defense and did much to keep the score as low as it was. He was in every play, smashing up plays on his side and the other side and everywhere. Bob is one of the most consistent men on the team and we'd hate to lose him.

Men of Rose, don't get discouraged, we've quite a few games left to win.

EVANSVILLE 12—ROSE 6

While still suffering from the reaction from the Purdue game we tackled Evansville College. The boys were off their game that day and as a consequence, the defeat. Then too there was too much overconfidence and there is nothing so disastrous to any kind of a team than overconfidence or under estimating the opponents. Both of these things happened in the Evansville game and there was a sorry bunch of football players who came home from that town.

The boys from Evansville had one man who was pretty much their whole team. His name is Studeville and he is about six feet four and a pass grabbing fool. He plays end and most of their gains are made on passes to him. He got lots of breaks in the game against us making one touchdown on a fumbled punt. In fact, it seemed that Evansville got all the breaks and our boys had a pretty tough time of it.

It was just an off day for the Clarkmen, so we mustn't take the defeat too seriously. It won't happen again with Evansville anyway.

FRANKLIN 23—ROSE 0

Franklin trotted out on the field with about the same good team they had last year and gave us another good drubbing. Red Rohrabaugh was the chief cause of our downfall and was Franklin's best offensive man. The Engineers fought with determination but were unable to stop the furious onslaught of the Franklin backs.

The Rose line played a wonderful game and was very highly complimented by the Franklin papers on its work. Captain Johnny Moorehead was on the sick list for this game, but his place was ably taken by Rickelman. Among the outstanding stars in the line were Hall and Schilt. Both of them were always on the job and allowed nothing to get by them. The whole backfield made a very good showing and it would be a hard job to pick out the best. It was fight, fight, fight from start to finish and when a team fights their best there is no disgrace in losing a game.

Franklin, we're coming after you tooth and nail next year, and there will be a different story, or we'll know the reason why.

SHOP LIGHTING.

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

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

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

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

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

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

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

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

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

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The Mechanical Puddling of Wrought Iron

(Continued from page 7)

electrical controls. The temperature and condition of the atmosphere may be controlled by the oil burner. Such a furnace as this is now being used by the Highland Iron and Steel Company, a subsidiary of the American Chain Company. Although there are a few minor points to be cleared up, it may be said that the operation has been very successful. Iron of the quality needed for engine bolts is being made with surprising uniformity.

At this plant, 20,000 to 40,000 pounds of pig iron are melted down in a reverberatory furnace and the metal carried by means of overhead cranes to each of four rotary furnaces. The charge to the rotaries is held near 500 pounds of iron to 200 pounds of roll scale (iron oxide). After charging, the door of the furnace is sealed with fire clay.

From this point on, the puddling process is mechanical, the reactions being the same as in the hand-puddling process. The furnace is rotated continuously while the temperature is adjusted to the point where a low simmering boil is started in the metal. When this boiling stops, the temperature is stepped up and held near 2000 degrees F. This causes a more violent high boil which lasts from five to ten minutes. A reducing atmosphere is also effected at this point to prevent oxidations of the pure iron at the exposed surface. When the impurities have thus boiled out at this high temperature, the pure iron begins to grain. This period is drawn out as long as possible to assure completion.

The iron balls up at the end of this graining process, and at the right time the ball or bloom is dropped from the furnace to a conveyor leading to the squeezer. The excess slag is squeezed out, and the bloom is rolled to a muck bar as usual.

The impurities are removed at various steps in the process. The low boil removes most of the silicon by producing ferro-silicate. The high boil is caused by the carbon uniting with the oxygen of the roll scale and forming carbon monoxide. If the reducing atmosphere is not complete, this will be changed to carbon dioxide and the surface of the iron oxidized. Some manganese and phosphorous are also removed at the high boil. Then during the graining period, the formation of the ferrite crystals will crowd out some manganese, phosphorous, and sulphur as oxides.

A chemical analysis of the iron resulting from this mechanical method proves that the metal is just as pure as that made by hand puddling. Moreover, the tests for tensile strength, percentage of elongation, nick bends, and the like show that the physical properties of the iron are extremely desirable.

BOOK REVIEWS

Colloid Chemistry—Jerome Alexander, M. SC., D. Van Nostrand Co., $2.00 Net.

Jerome Alexander, a consulting chemist and chemical engineer, has produced a book dealing with the comparatively new and fascinating branch of chemistry, that of colloids, which appeals to technicians and laymen alike. Scientists, manufacturers, students, and others who are constantly meeting the problem of colloids will find it a text-book of great practical value. The ordinary man who desires a change from his lighter reading will find it highly educational and entertaining, not merely a collection of dull and verbose technical terms. The language used is as simple as the subject matter permits and a glossary of unfamiliar words is placed at the end for the reader's convenience.

The first part of the volume serves as an introduction to the chemistry of colloids, describing and explaining the phenomena connected with them. The second part, which comprises about three quarters of the book, is devoted to practical applications, such as astronomy, geology, ceramics, dyeing, explosives, etc. These practical applications are arranged in outline form which, with the complete index, facilitates ready reference to any subject, general or specific.

A Chapter in American Education—Ray Palmer Baker, Ph. D., Chas. Scribner Sons, $1.25 Net.

This valuable outline of the progress of technical education in the United States by a professor of English at Renssalaer Polytechnic was originally intended as a memorial volume of the hundredth anniversary of the foundation of that institution. But the book is much more than that, and its scope of appeal includes all who have an interest in the development of the American educational system. Dr. Baker claims that there have been two outstanding events in the history of education in the United States—the founding of what is now Harvard University and the establishment of the school that has become Renssalaer Polytechnic. Established in 1924 by Amos Eaton and Stephen Van Renssalaer, the latter preceded all other scientific schools and colleges by more than a quarter of a century. The book deals with the transaction of Renssalaer from in institution intended for special study for graduates of classical courses to a school where it is possible for anyone to obtain both a practical and academic education. Dr. Baker points out that the school was a pioneer in the admission of women, in the developing of colleges of agriculture and special branches of engineering, and in providing special graduate instruction of professional grade. The evolution of the different departments of science and engineering are described in great detail, and as Renssalaer was followed in method by the other schools in the country the book really becomes a "chapter in American education." Emphasis of space is given to those who were responsible for the school's growth and success, and to the achievements of its most famous alumni.

Lime and Magnesia—N. S. V. Knibbs, D. Van Nostrand & Co., Price $7.50. Printed in Great Britain.

This volume is novel and unique in that it is the first venture in the publication of a book dealing solely with the technology of the Lime and Magnesia industry. Lime and Magnesia have been discussed in numerous treatises but no one until Mr. Knibbs has seen fit to devote an entire work to the subject. He has compiled all the available important information concerning these two chemicals into a copious print which contains over 300 double size pages of technical lore. Three divisions of the book systemize it into (1) the general chemistry of Lime and Magnesia (2) their manufacture from the natural minerals—and (3) their industrial and other uses. Each of these sections is complete in detail, charts, graphs, illustrations, tables, etc., being profusely distributed throughout to aid ready reference to any specific phase of the Lime industry. Wherever there is a need for ready information upon Lime and Magnesia, the book will be a valuable addition to the technical library as it is a veritable encyclopedia upon these subjects. The work may certainly be regarded as authoritative, the materials having been gathered from recognized sources such as The National Lime Manufacturers and accepted chemical publications. Special attention is called to the printing and general make-up of the volume—the paper, type, and set-up used are in the usual efficient English style.

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