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Rose Technic Staff
Rose-Hulman Institute of Technology

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THE ROSE TECHNIC

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THE TECHNIC

TERMS

One Year, $1.00 — Single Copy, 15 cents

Issued Monthly at the Rose Polytechnic Institute.

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THE rather untimely resignation of Mr. O. A. Ohmann as Editor-in-Chief of the Technic, in consequence of his withdrawal from the Institute, has necessitated a somewhat hasty reorganization of the staff in order to insure the publication of the remaining numbers of Volume XX. In assuming these new and trying responsibilities, the rehabilitated Technic staff trusts that all subscribers may be governed by a spirit of leniency in passing judgment upon the resulting product of our endeavors. We have been hurled into the breach rather unceremoniously and more or less under protest. However, we shall put forth our very best efforts in an attempt to uphold the enviable reputation which previous energetic and more competent men have succeeded in establishing for the Technic. Kindly criticisms and suggestions will at all times receive the most careful consideration and hence are earnestly solicited.

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DURING the progress of the regular monthly meeting of the Student Council, held on February 4th, a matter of considerable moment came to our knowledge, one which we feel ought to be taken cognizance of by the entire student body, a matter, which in our opinion, calls for thorough investigation and immediate action. In view of this fact, we do not hesitate to comment at some length upon the very apparent unbusiness-like and altogether careless manner in which the moneys drawn from the Student's Fund have been, and it appears, *are being* utilized and accounted for (in a negative sense) by our various school organizations. This condition represents a deplorable state of affairs. The educational influence of such a proceeding upon men, who will in the course of events become identified with the business world, is, to say the least, harmful. Furthermore, the actual loss in dollars and cents, which results from slovenly accounting and unnecessary, thoughtless expenditure of funds, is entirely too great to be borne by a Student's Fund which already, under the most favorable circumstances must be strained beyond the elastic limit to meet the legitimate demands made upon it.

It is usually a comparatively easy matter to decry existing evils, but quite another matter to suggest feasible methods for stamping them out. However, in the case at hand, the remedy does not appear to be so far removed as one might be prone to think.

We feel that the chief responsibility, involving the use to which the resources of the Student's Fund are to be put, rests upon the shoulders of the officers, president and treasurer, of the respective organizations, and in the case of the Athletic Association, upon both officers and team managers. We do not wish to suggest, even in the remotest sense, that funds are consciously being misused; on the contrary, we feel that everybody is trying to do his utmost to "make a little go a long way."

The entire trouble seems to lie in the fact that there is a *tremendous* lack of *System* all along the line. At the present time we are safe in asserting, that no one person knows the exact "status quo" of Student's Fund affairs. The present Student Council, which has custody of the funds, finds itself entirely unable to get clear and concise statements from the various organizations, and yet this body is ever expected to supply with magnanimous disregard for the future welfare of the student body—money, money and more money.

The one effective method of counteracting this evil undoubtedly lies in the adoption of systematic business methods. We would suggest the following scheme: Let the proper officers and team managers of each organization, student council included, be supplied with the proper books necessary for systematic accounting, and insist upon it, that certain definite methods, prescribed by the Council, be employed by each and every organization in keeping their respective accounts. At the close of the fiscal year, say on the first day of June, let each organization audit its books and turn same over to the General Auditing Committee of the Council for final approval. Should monthly statements, drawn up on regular forms, be required, the Council would at all times know the exact financial standing of each body and hence could frequently forestall impending disaster by applying the emergency brake. Such statements would also greatly facilitate the final balancing of all books.

After the closing of all accounts, we would suggest that a complete summarized statement of all receipts, appropriations, expenditures and whatever else may be of interest to the student body concerning each individual athletic activity and student organization, be printed in the June issue of the Technic.

This latter feature appeals very strongly to us. Inasmuch as each student pays toward the support of every student activity, is it not reasonable for him to expect that he be informed, in the columns of the official student organ, of the exact use to which his contribution has been put? Again, would not such a procedure put every officer and athletic team manager on his mettle, arouse in him the sense of pride, and spur him on to put forth his very best efforts, that his countersigned statement may be as favorable as possible?

It seems reasonable to assert that should plans similar to the ones outlined above be adopted, the existing disagreeable state of affairs would entirely cease. The position of officer or manager of this-or-that organization would be elevated beyond its present questionable level to a proper plane of dignity, where the burden of responsibility is at all times keenly felt.

Yours for Conservation—even unto the removal from their present *somewhat* exposed position, of one charging-machine and one press-stand!!

———ooo———

AT the beginning of the second term of the school-year the Freshmen are always required to state definitely the exact branch of engineering study which they intend to pursue for the remainder of the college course. In this connection it is ever interesting to note the general tendency of the mass of students in their choice of this or that specific line which they contemplate following.

As a rule, we may conclude that the majority of students are governed in their selection by certain prevailing conditions, as well as by personal preferences for a certain kind of engineering activity.

Conditions which influence prospective students to a large degree, are, first of all, the general trend of engineering activity in the world at large, and secondly, local conditions which may make it more advantageous to follow one line than another.

The thinking person asks himself: "In what department of engineering may I expect to find the most and the best opportunities for attaining ultimate success in my endeavors." He also will put the questions: "In what particular department is the school which I am attending, especially well prepared to give me the thorough training which I desire," and "For what particular kind of engineering work have I a pronounced liking, and—am I mentally and physically fitted to perform this work successfully."

A fact which is so very frequently lost sight of, is the pronounced correlation of all branches of engineering. A student graduating in the department of civil engineering may at any time in the course of his work be confronted with problems that would demand a knowledge of electrical practice or machine design, etc., for their solution, and vice versa. To equip students for just such emergencies would call for a broad education along the lines of general engineering. We feel justly proud of the fact that the various courses at Rose are so arranged that every student receives more or less instruction in the fundamentals of each department. The refinements of extreme specialization are then within reach of the progressive and studious graduate.

In the more specific lines of engineering it appears that the advances made in electrical and chemical engineering are most marked. These advances are in direct line with the march of progress of the present age, and are brought sharply to our notice by the large increase in the number of students who elect these courses in our technical schools. The present Freshman class of Rose may be grouped as follows: 20 electricals, 12 chemists, 12 mechanicals, 11 civils and 1 architect. Ten years ago, the entering class at Rose had: 8 electricals, 2 chemists, 19 mechanicals, 12 civils and 2 architects.

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THE series of Modulus Dances ended in a blaze of glory, at the New K. of P. Hall, on Monday, February 13th. Rarely, if ever, heretofore, have these hops met with such signal success. The three dances which comprised the series were attended by over 160 couples, and as a consequence, the 1913 Modulus Fund has been enriched to the extent of nearly $75.00.

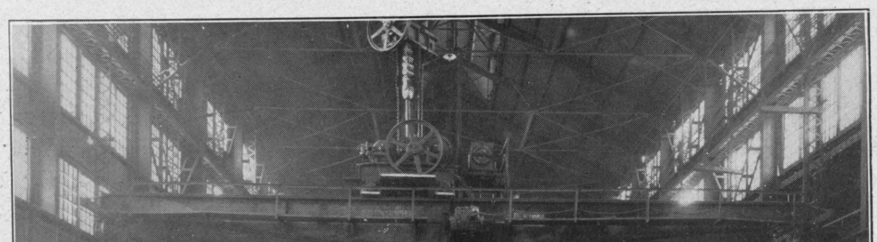
The scene at the K. of P. Hall, on the night of the final dance, was one long to be remembered by all those present. The kaleidoscopic color effects produced by the great variety of tints of dainty gowns, forever changing their relative positions to one another, was certainly pleasing to behold. The music furnished by the Stark-Offut orchestra was excellent, and the program of 21 dances was thoroughly enjoyed by everyone.

Retrospectively viewed, we can not refrain from saying that the Modulus dances of the season 1910-11, given under the auspices of the Class of '13, shall linger in our minds as being among the most pleasant memories of the days we spent as students at Poly.

APPLICATION OF ELECTRIC POWER IN THE IRON AND STEEL INDUSTRY

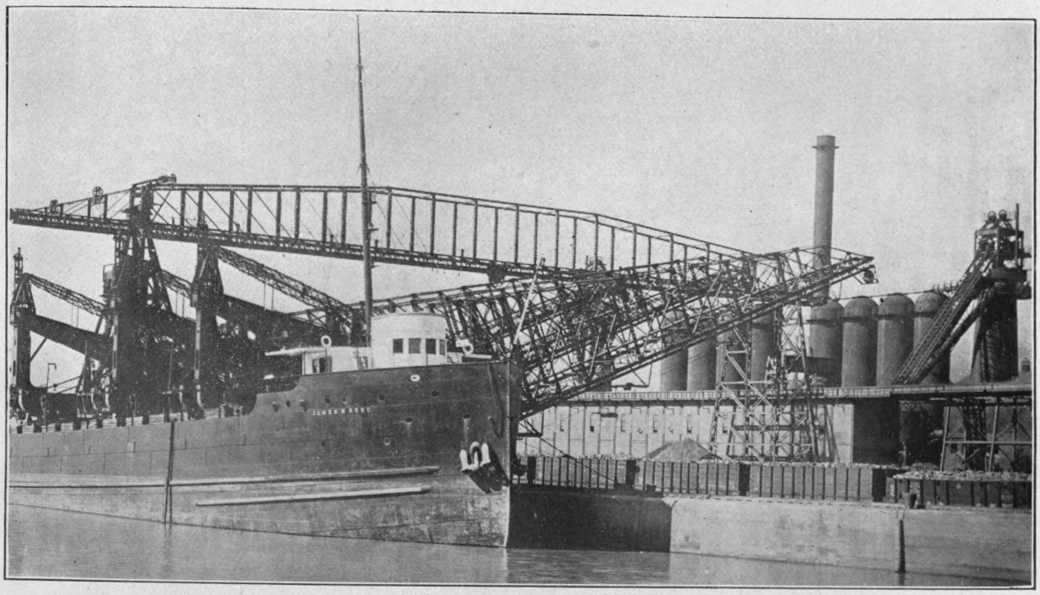
By Harry W. Eastwood, '06.

IN recent years, the manufacture of electric power for purposes of lighting and transportation has become an industry in itself. This development has been so vast and so rapid, that the immense importance of electrical energy as a subsidiary of other industries is often overlooked, and the fact that the kilowatt hours used for industrial power far exceed those used for purposes of illumination and transportation is not generally realized. Electricity, because of the numerous advantages which it possesses over any other means of transmitting power, has won its way into almost every industry, but in no other field is the advance in its application more marked or its use more extensive than in the manufacture of iron and steel. At the present time, we seem to be on the threshold of a still further development in the use of electric power in the steel industry, and for this reason it is interesting to review the accomplishments of the past and speculate on the developments of the future.



Two Hundred Ton Combined Soaking Pit and Stripper Crane, Equipped With E. C. & M. Controllers, at the Pittsburg Steel Co., Monessen, Pa. The Soaking Pit Covers Shown Are Operated by Motors.

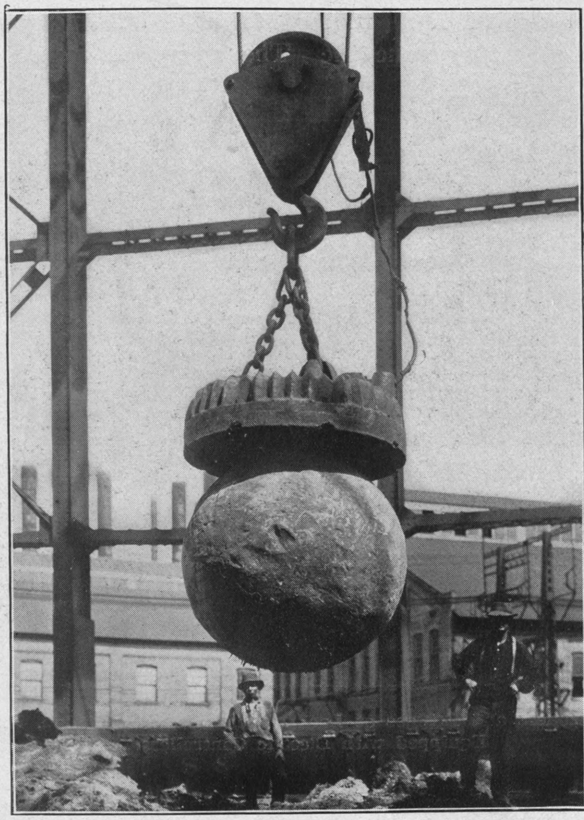
The early history of the use of electricity in the steel plants of the country is very uncertain in its details, but it seems fairly well established that the first installation was a small arc light machine installed at the plant of the Edgar Thompson Steel Company, about twenty-eight years ago. The use of electric lights in the mills kept pace from that time with their adoption for public lighting in cities. The next advance of interest was the installation of the first electric traveling crane at the Pencoyd Iron Works, in 1889. This was not a three motor crane, so familiar to us all because of its wide application today, but a single motor crane, the various movements of bridge, hoist and trolley being connected to the motor through clutches and the power transmitted from the motor to the various motions by means of ropes. Several cranes of this type were installed in different plants, and it was not until several years later that the first three motor cranes made their appearance. The year 1893 marks the first encroachment of the electric motor on the strong position occupied by the steam engine in mill work. In this year, the first motor driven roller table was put in operation at the Homestead Steel Works and two years later, the Ohio Steel Works in Youngstown, Ohio, started the first mill having all its roller tables (with the exception of blooming mill reversing tables) electrically driven. For the next five years the advance was very rapid. Electric motors replaced steam engines driving roller tables in the old plants and were used in all new construction. Electric cranes were installed in old plants and no one thought of building a new plant without them. The open-hearth charging machine came into general use and the electrically operated stripper and the soaking pit crane appeared.



Ore Unloaders and Bridges at Lackawanna Steel Co., Buffalo, N. Y. Equipped with Electric Controllers.

About this time, it began to be apparent that steel mill service was the most severe service to which electrical apparatus had been applied. The motors used in the early installations were very generally of the same design as those used for street railway work, and they were commonly controlled by railway type controllers, also. These machines, though quite satisfactory in the work for which they had been designed, were a source of great trouble and extended delays in the mills, and the manufacturers of electrical machinery finally came face to face with the problem of building apparatus especially to meet mill conditions.

There is a factor in the design of mill machinery which has, perhaps, escaped general attention, but which is nevertheless probably the most important single item to be considered this mill, where the failure of one motor would tie up the whole mill, and assuming that the company had plenty of orders ahead, and that its output was only limited by its own operation, the failure of one motor would be responsible for a loss of eighty-five dollars for every minute it held up the plant. It is this economic



A Lifting Magnet Handling a 12,000 Pound Ball at the Illinois Steel Co., Gary, Ind.

—namely, the economic value of continuity of operation. This can best be explained by a concrete example. The great rail mill at Gary is capable of rolling four thousand tons of open hearth steel rails every twenty-four hours, and assuming that these rails are selling at thirty dollars per ton, the value of a single day's product is one hundred twenty thousand dollars; or reducing to smaller units, eighty-five dollars per minute. Now, there are many places in factor which makes first cost a very secondary matter in the design of a steel plant, the primary item being always quality viewed from the standpoint of continuity of operation.

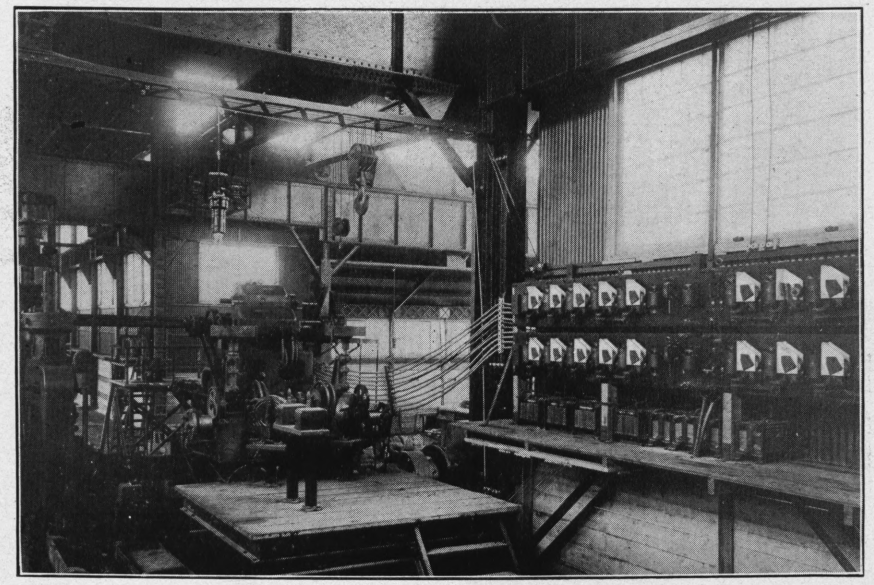
With this requirement well in mind, electrical engineers have designed motors and controllers especially to meet mill conditions, which are so rugged in their construction, so strong in all their parts, so large in size, and because of these features, so high in price, that they are not used in any other industry. The motors are built with heavy cast steel frames which enclose the field windings and armature completely. The windings are all insulated with asbestos and are moisture proof as well as fire proof. The shafts are exceptionally heavy and may be removed from their armatures without disturbing the windings. The air gap, commutator surface and brush area are liberally proportioned. The modern mill motor has proven so satisfactory that it has been adopted to the practical exclusion of the railway type in almost all recent construction, even on cranes.

At first, the controller problem was sufficiently simple that it could be attacked by the electrical engineers of the mills without the assistance of the manufacturers. The face plate type and the "grindstone" or commutator type were both originally built in the mill repair shops, but were soon taken over by different electrical manufacturing companies. Improvements in details of design and a great advance in the use of cast grid resistance in place of wire or ribbon have marked the development of these two types, but the point was finally reached where an entirely new system of control became necessary. The limitations of the manual controller operated not so much to the disadvantage of the controller itself, as to the disadvantage of the motor and driven machinery. When a careless or untrained operator reversed his controller rapidly, thus throwing the motor across the line when it was running full speed forward, the rush of current was limited only by the ohmic resistance of the lines and connections and the strain thrown upon the motor and machinery was terrific. This condition of operation, which frequently occurred, made it desirable to obtain a system of control which would eliminate the personal equation of the operator, and this result was obtained by the use of magnetic switches or contactors in various systems giving automatic acceleration. In all of these systems the rate at which resistance is cut out from the motor circuit is made entirely independent of the rapidity with which the operator moves his controller lever, the amount of current flowing alone governing the

Rail Handling Magnets at the Gary Works of the Illinois Steel Co.
Total Weight of Load, 23,000 Pounds.

closure of the contactors short circuiting the resistance. With this system of control it is possible to accelerate the motor in the shortest period of time which is safe. During acceleration the current flowing through the motor is the maximum safe current for it to take. It can not exceed the predetermined value for which the controller is set, no matter how roughly or rapidly the operator moves his lever, and the motor can be reversed from full speed forward to full speed reverse in a very short period of time, without danger of damage to the motor or driven machinery.

The inception of the magnetic controller with automatic acceleration opened up a still wider field of usefulness for the motor in mill work. Before this time, no one had dared to install motors on the feed tables of a reversing mill. The horizontal twin engine held its place on these tables long after it had been displaced from other parts of the mill, but in practically all the more recent installations electric motors with automatic magnetic control occupy this position, so long considered impregnable by the steel mill electrical engineer. In older plants many of the reserving table engines have been sent to the scrap heap by the installation of motors and in every case the introduction of the efficient, dependable electric motor has produced an immense saving in comparison with the expense incurred in operating with the leaky, inefficient, little reversing engines.

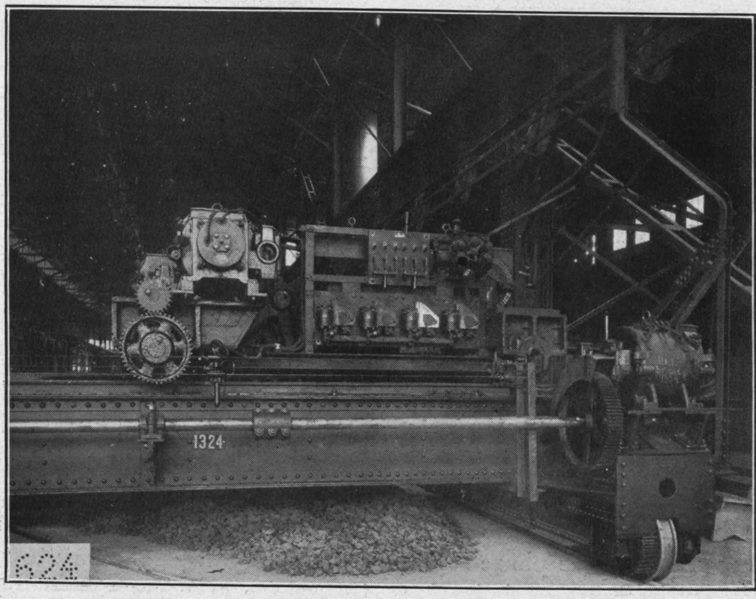


Two Fifty Horse Power Magnetic Switch Controllers, One Operating Screw-down and One Operating Closing-in and Side Rolls. Bethlehem Steel Co., South Bethlehem, Pa.

The introduction of magnetic control also made it possible to use electric motors in place of hydraulic cylinders in many places in the steel industry. Ore handling machinery, lifting tables, tilting tables, and manipulators are all motor driven in plants which have been built in recent years. In fact, by the year 1905, electric power had practically displaced both hydraulic power and steam for driving all the auxiliary machinery of the steel mill.

But up to this time, no attempt had been made to drive the roll trains themselves by means of motors. The immense amount of power required for breaking down steel, the instantaneous and extreme fluctuations in the load, and the generally severe character of the duty made the problem a very difficult one to undertake. At last, in the fall of 1905, the first motor driven roll trains in this country rolled their first steel at the Edgar Thompson Works of the Carnegie Steel Co. This installation consists of two three high mills rolling light rail sections. Each mill is driven by a fifteen hundred horse power two hundred twenty volt compound wound motor, the speed of which may be varied from one hundred to one hundred twenty-five revolutions per minute. A few details regarding these motors may be of interest. The shafts are twenty-eight inches in diameter at the fly-wheel and twenty-five inches in diameter in the bearings, which are sixty-two inches long. The motor is in a measure relieved from the tremendous fluctuations in load by means of a cast steel fly-wheel eighteen feet in diameter, weighing one hundred twenty-five thousand pounds. In actual operation the current taken by one of the motors rarely exceeds six thousand amperes, the decrease of speed with the increase of load, due to the inherent regulation of the compound field winding automatically causing the fly-wheel to assume the peak loads. This mill was a success from the start and rapidly lead to further installations of the same type.

In June, 1907, the Illinois Steel Co. put in operation the only reversing mill drive in this country. This is a thirty-inch Universal Plate Mill, direct connected to two two-thousand horse power, one hundred fifty maximum revolutions per minute, five hundred seventy-five volt shunt wound motors mounted on one shaft, two motors being used instead of one large motor in order to reduce the inertia of the rotating parts. A thirteen hundred horse power, twenty-two hundred volt, three phase induction motor is used to drive a three thousand kilowatt six hundred volt generator which furnishes power for the mill motors.



Open Hearth Charging Machines Equipped With Brakes and Dinkey Controllers, at Pittsburg Steel Co., Monessen, Pa.

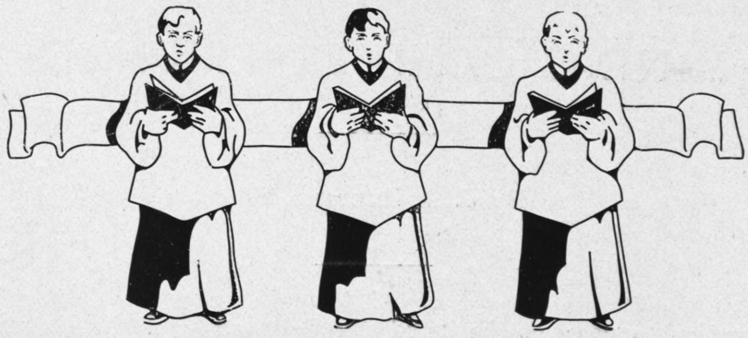
On the same shaft with the induction motor and the direct current generator, there is a fly-wheel fifteen feet two inches in diameter, which weighs one hundred tons. This fly-wheel as in the installation at Edgar Thompson, helps to equalize the load factor at the power house by absorbing to a considerable extent the extreme fluctuations in the power demand of the mill. The Illinois Steel Co. also installed in August, 1907, an electrically driven three high mill, twelve hundred and six hundred horse power alternating current motors with concatenated connections being used. No further reversing mill drives have been undertaken up to the present time, not because the operation of the mill at South Chicago has been unsatisfactory, but because very few reversing mills have been designed since 1907, the present tendency in mill design being toward three high mills.

The greatest impetus yet given to the use of electric power in the steel industry is the construction and successful operation of the mills completed, of the Indiana Steel Co.'s plant at Gary, Ind. In this great plant the steam engine and the hydraulic cylinder have been completely routed. Except for a small horse power in auxiliary apparatus, steam is not even used for the primary generation of the power required, practically the total requirements being furnished by gas engines using blast furnace gas. The mills are driven throughout by motors. The rail mill with its necessary blooming mill alone has three two thousand horse power and three six thousand horse power motors driving roll trains. These motors are all three phase sixty-six hundred volt alternating current induction motors, but auxiliary machinery such as cranes, roller tables, table lifts, and manipulators are driven by direct current motors operating at two hundred twenty volts, the alternating current power being transformed to direct current by one thousand kilowatt motor generator sets in conveniently located substations.

The installation at Gary may be said to mark a new era in the manufacture of iron and steel and the continually widening application of electrical power in this great industry is assured. This new era is the logical sequence of the appreciation of a single primary fact, namely that the metallurgical processes used in the steel industry make available an immense amount of power as a by-product. In the manufacture of pig iron in the blast furnaces there are generated combustible gases, hitherto largely wasted, which have a heat value in the neighborhood of one hundred thermal units per cubic foot. For each ton of iron manufactured there is sufficient gas generated, above local requirements for stoves, blowing engines, etc., to generate, when used in a gas engine, about one hundred fifty kilowatt hours. In addition to the combustible gases from the blast furnaces, there are also waste gases from open hearth furnaces, reheating furnaces, etc., ranging in temperature from one thousand to fifteen hundred degrees Fahrenheit, a great deal of the heat of which might well be conserved. In a recent article in one of the Technical Journals, Mr. R. Tschentscher, Electrical Engineer for the Illinois Steel Co., remarks: "A plant which the writer has in mind * * * may be arranged to produce more than seventy-five hundred kilowatts without requiring any coal for steam generation purposes."

Another source of waste heat hitherto untouched, is the coke oven. There is enough gas generated in the manufacture of a ton of coke to make one hundred fifty kilowatt hours of electrical energy. It is indeed time that our engineers were awakening to the possibilities of this phase of conservation. The Illinois Steel Co. has been purchasing electrical energy generated by water power, for its Joliet plant, for the last several years, but it is now installing a generating plant of its own which will make use of the waste gases from its coke plant.

The above facts enable one to realize that the iron and steel plant has an immense amount of power available at a cost which includes nothing but interest on the investment, maintenance, and attendance. The initial investment required in gas engines and electrical generators, gas washers and reservoirs, etc., is comparatively large, but it may be doubted whether electrical energy can be generated as cheaply even in water power plants except under the most favorable conditions. The available amount of this cheap power is so great that even in a plant like that at Gary, in which all the machinery is electrically driven, only a portion of the available power is required. It is therefore a matter of some interest to inquire what future development we may expect to make use of this surplus. The question has already been answered by the successful operation of the electric open hearth furnace for the refining of steel. Several of these furnaces have been in operation for some time at the Illinois Steel Co.'s plant at South Chicago, at the American Steel and Wire Co.'s plant at Worchester, Mass., and at the Carnegie Steel Co.'s plant at Homestead. To again quote Mr. Tschentscher: "When one realizes that a sixty thousand ton per month electric furnace plant will require roughly fifteen thousand to thirty thousand kilowatts, depending on the character of the work performed, an idea is obtained of what the future has in store in electric power application in the iron and steel industry."

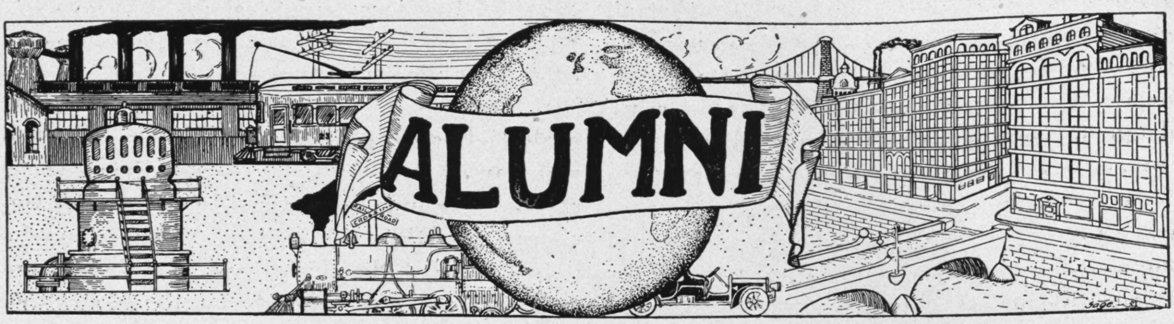


THE informal lecture on "First Aid to the Injured," which Doctor Mees held before the members of the Scientific Society, on Saturda, February 11th, should have been attended by a much larger number of students. Contingencies often arise where even a superficial knowledge along this line may enable one to prevent serious complications arising from apparently trivial injuries.

Doctor Mees confined his remarks to incised, punctured and lacerated wounds, and discussed methods of treatment and bandaging. Above all things emphasis was placed on cleanliness. Thorough washing and the use of antiseptics, such as hydrogen peroxide, borol, listerine, etc., was strongly recommended. The use of moist bandages, until all danger of suppuration had passed, was advised.

ON Friday, Feb. 17th, at the Heminway home, the ladies of the members of the faculty will give the third one of their delightful receptions to the different classes at Rose. On this occasion the ladies will have as their guests the members of the Junior class. Judging from the previous entertainments, the Juniors may anticipate a very pleasant evening.

The good effects resulting from these social events can not be overestimated. Students are brought in closer contact with one another and at the same time are given an opportunity to get acquainted with their instructors away from the influence of the classroom. To the ladies, through whose untiring efforts and kindly interest these functions have been made possible, we all owe a large debt of gratitude.



MINING CAMP EXPERIENCES

By J. A. Shepard, '10.

It is not my intention to pose as the "Old Grad" on the strength of my few month's absence from school, but merely to try to give an idea of the conditions prevailing in a typical Western Mining Camp, and some instances of trouble encountered on both the electrical and personal ends.

The camp I am describing is Morenci, Ariz. It is about a hundred miles above the Mexican line and near the Eastern border of the Territory. The whole region is mountainous and the town is up near the top of one of the smaller ranges. The population is about 5,000, of whom only about 700 are Americans. The labor is mostly Mexican, although there are quite a few Italians and Spaniards and a few Yaqui Indians. Almost all of the white men underground are either Cornishmen, known here as "Cousin Johns," or Nova Scotians, called "Fisheaters."

There are only two companies here, the Arizona Copper Company, which is a company working only in this district, and owned largely in Scotland, and the Detroit Copper Mining Company, which is the property of Phelps-Dodge & Co., owners of a large number of mining companies in this section, the El Paso & Southern Railroad and much other property. The two companies are known locally as the A. C. and the D. C. The latter has practically everything at Morenci while the former has other camps in the district and has its smelter, saw mill, offices and main store at Clifton, about six miles away.

Morenci is reached by a 3 ft. 6 in. gauge railroad, about 18 miles long, from Guthrie, Ariz., where it connects with an A. C. standard gauge line running south to the Southern Pacific. All tracks used in the hauling of ore, as well as the mine tracks, are 20 inch gauge. Porter steam locomotives are used outside, and mules in the mines, by the D. C., while the A. C. uses 250 volt direct current locomotives in both places.

The D. C. Company has a department store of four stories with a stock worth over $1,000,-

000, a very pretty little hotel and a splendid club building for the men, with gymnasium, bath, lockers, library, reading rooms and lodge rooms. Their smelter is in fairly good shape, though not very large. The concentrator has a capacity of 1,400 tons of ore every 24 hours and is thoroughly modern and is claimed to be the cleanest kept mill in the country. The company also owns the school house and church. All the saloons, gambling houses and dance halls have been run off company land and they comprise a little colony about a mile down the canon. The store will sell wine and beer, but these have to be taken off the premises. All of the Italians drink a lot of wine, Clout, Port and Angerca, called "Dago Red." It is very cheap and tastes like a mixture of red ink and vinegar. Two or three families go together and buy a 50 gallon barrel and four or six men come down to the store, place it on two poles or pipes, and carry it home.

There are no streets, simply trails up and down hill. All groceries are delivered on pack mules. In place of a milk wagon three or four mules tied in a string carry cans of milk suspended from straps thrown across their backs. All timber and supplies for the prospectors are carried in this way and high grade ore and fine wood are brought in on burros. A mule will carry about 400 lbs. and a burro is loaded to about 150 lbs. It is not policy to be caught on a narrow trail by a string of pack mules as they don't stop for anything.

Sanitary conditions are splendid as there are good sewers. Water is pumped three miles over the hills and each single man is charged $1.25 a month for water and a married man double. A large force of men and mules start out at about 6:00 A. M. each day and cover the entire camp collecting paper, tin cans and garbage.

A large part of these things are only possible since the company owns all of the land. The superintendent is in absolute authority and does his best to make this a model camp. There is no city government of any kind. The only officers are a few deputy sheriffs, and the company owns the jail.

A majority of the store business is done on credit. Each employee receives a book for each month and the paymaster keeps these posted with the man's time so that his credit is never exceeded.

Some of the Mexicans make great pack animals. They will put a 150 lb. pack on their backs, strap it around their forehead, and take it any place in camp for 50 cents. Most of the Mexicans are from Chihuahua and are rather small. They make fairly good laborers after you learn to handle them. A few of the Italians are from the north of Italy and these are good men, fairly good sized, light in color and quick to learn. There are quite a few of them who are bosses in the mill. The southern Italians are very poor laborers. They can't stand heavy work and display little or no intelligence. As a rule the Spaniards are pretty fair laborers. The Yaquis are all big powerful men, very quiet and almost surly, but fine workers. They hate the Mexicans and the latter are afraid of them.

The Mexicans now are all worked up over the revolution. Most of them sympathize with the insurgents.

In the electrical end here, there is almost every kind of electrical device to work with. The power house has four 250 KW and one 150KW, 240 volt generators, belted to Crossley gas engines, supplied by suction gas producers. The smelter, saw mill and town is supplied at this voltage, while all current for mines and mill is stepped up to 2400 volts for transmission. There are a number of Ligderwood electric hoists in the mines as well as lights, fans and pumps. Several prospects located from 2 to 3 miles out are also supplied. There is a telephone system, common battery for town, and magneto for long distance work, twenty-five miles of telegraph line, which also carries telegraphones, to maintain, and frequent repairs to be made on three intercommunciating systems, electric irons, fans and heaters, an X-Ray machine at the hospital and a French electric water level meter and line. There are probably some more things which I haven't found yet. Most of the company lighting has been changed, to adopt Tungsten burners, in the last few months.

To maintain the present installation and do all new work, there is a force of four electricians and a chief. Any of us may be called out at any time and for any class of work, although as a rule the work is divided to give one man the shop, power house and smelter, two men the lighting, phones and lines, and one the mines and concentrator.

If we have to go over about a mile or if we are in a big hurry, we always use horses and all the hole digging and heavy carrying is done by Mexicans.

We run across some odd cases of trouble at times. One of the boys was called out at 3 A. M. the other day to go to the gas plant and found that the whole trouble consisted of a blown out fuse on one of the motors. There are two types of men who operate the motors. One class will sit down and wait for an electrician if the least thing goes wrong and the other kind will try to fix anything, and when we get there we find everything half ruined. We found one fellow who was running his motor with all the starting resistance in and the coils covered with wet waste to keep them cool.

One afternoon, about Christmas, I had to catch the train to Guthrie to find where some resourceful highwayman had cut one wire before holding up a country grocery store. Another time we got a message to hurry up to one of the mines as the men refused to work unless things were fixed. On getting there I found a bare wire against a rail. The position of the rails was such that they were all pretty well insulated, but whenever a man would step on a rail or touch a car he would get knocked down. A pipe man coming along, stepped on a rail and put a stilson wrench on a water pipe. He was the most surprised looking Mexican I ever saw.

There are quite a lot of college men out here. Most of them are in the mining department, and from what I hear from them, they are not in love with the life. They start in on samples, at $2.75 a day, and as living out here is pretty high, that doesn't go far. They have a regular run in the mines and climb all the ladderways picking off samples. One boy said that in his run he climbed 1,200 feet of ladder each day. When they run out of work they take groove samples along some tunnel. To do this they spread a nine foot length of canvas on the floor and then dig a groove about 4x4 inches along the wall with a maul and single jack. When you get into some of the granite and quartizite it goes pretty hard. These men don't stay over three or four months on the average.

The principal trouble encountered in the mines is from dust and oil in the motors. The mining department is supposed to take care of the motors which means in most cases that they get no care. All hoist motors are cared for by the operators, and as a rule there is very little dust near them, but with the fans it gets pretty bad. To save running wire most of the fans are single phase Wagner's and the Mexican who starts them never stops to see that the check operates, but will go off and let the commutator give off a stream of fire that will light the whole tunnel. When we install a motor we always leave a bottle of dynamo oil at each motor and the men are supposed to get it filled when necessary at the nearest hoist, where a can is kept. There must be some peculiar fascination about this oil for them, as I have never yet found any in the mines. They may use it for hair oil or a sore throat but all they will put on a motor is black car oil, linseed oil or air compressor oil, generally the two former. They pour it in till the cellar runs over and the winding gets saturated, then the dust gets in and cakes. The dust is a light grey, soapy stuff from the porphyry and when you come out from the mine you look like a miller. All the miners in this section use candles instead of lamps. The miner candlestick is an iron rod about 10 inches long with a handle at one end, a sharp point on the other to stick in the timber, and a hook opposite the candle in the middle to hang it by. The candlestick is used as a dagger in most of the fights and also makes a splendid instrument to jab into a lead covered cable to cause us trouble.

As a rule all of the miners hold the electricians in awe, and will stand around in crowds watching us work as they can't see why we can work with the wires hot and not get knocked down. They are all afraid of a blow torch and when they pass one in an entry will squeeze against the wall to give it a wide berth. A Mexican will very rarely come on the job drunk like an American. If he feels bad or wants some more booze he stays away from work till he runs out of credit and gets hungry. They have quite a few fights among themselves and a few killings, but very little trouble with the whites.

The store does a great business in fire arms. Almost every Mexican owns a rifle and a revolver, but they are seldom carried. In the old days the only rifle carried was a Winchester, 44 caliber, and lots of them are seen yet, but now they all buy 30-30s. The American officers and cowboys will have nothing but a Colt's 45 for the revolver but the Mexican buys a cheaper 38 as a rule. Most of the Italians carry knives, but one American officer will go into a saloon and with a chair pacify four or five Dagos with stilettos.

In the foregoing I have said nothing of the attraction of the country which alone will make any place in this section endurable. If unrestrained I could talk of it like a real estate agent booming a new suburb. The climate, the mountain air, the view for miles and the sunshine almost all the year round would win an electrician in a short time, and to a native son each day makes surer the conviction that it is the only country.

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ALUMNI NOTES

Dudley D. Wright, '05, has left the sales office of the Westinghouse Electric and Manufacturing Co. at Columbus, Ohio, and will enter the sales department of the Wagner Electric Manufacturing Co., of St. Louis, Mo. He will assume his new duties in their San Francisco office on February 1st.

Born to C. B. Cook, '05, a daughter, Frances Catherine, on December 26th, 1910.

R. F. Tyler, '09, who has been in the Signal Dept. of the Rock Island Lines, has accepted a much better position with the Signal Dept. of the C. M. & St. P. R. R., with headquarters at the Milwaukee Shops, Milwaukee, Wis.

Howard C. Taylor, '07, has changed positions from the Holmes Machine Manufacturing Co., of Sparta, Mich., to the King Sewing Machine Co., of Buffalo, N. Y., where he will assist in the manufacture of cream separators.

It may be of interest to some of the later Alumni to know that William C. Royse, ex-'12 and '13, is now specializing in chemistry at the Indiana State Normal. (This is not a joke, but a fact.)

The following was misplaced and hence did not appear in the December issue:

Curtis A. Mees, '00, was married to Miss Beulah Estelle Howell, of Charlotte, N. C., on November 14, 1910, at Charlotte.

Rose Leaves

ONE of the most interesting and enjoyable features of the Rose Poly student's Christmas holidays is the opportunity to attend a meeting of the Rose Alumni Club in his home town. Of course, there are many undergraduates who live in towns where no such organization is in existence; but it certainly is a pleasure and privilege to attend one of these meetings, when one is fortunate enough to get the opportunity. The annual holiday meeting of the Rose Tech Club of Louisville, Ky., can be cited as an excellent example of the pleasure and benefit to be derived by the average Poly student from attending a meeting held by old Rose men.

The Louisville Rose Tech Club holds a meeting every year, during the Christmas holidays. A week or two before the Louisville boys at Rose return from their holiday vacation, each one of them receives through the mail a cordial invitation to attend this meeting—and indeed unfortunate is the student, who, from being a "social butterfly" or other reasons, is prevented from being "among those present." For he misses a double treat—a social one, as well as an educational one.

Upon reaching the club rooms, the undergraduate finds perhaps only two or three members on hand; but before he has had time to inspect the club room to his complete satisfaction, the rooms have been filled by gradual arrivals of Rose men—from gray-heads down to Freshman. Of course, all the old heads want to know all about affairs in Terre Haute; whether or not Wicky still retains his former energy and activity; how the "green carpet" is standing the wear and tear of time; whether or not 'Arry's language still sparkles with Biblical quotations; whether or not the elusive Sophomore still "beats it" from the calculus room while Hath isn't looking—and so on, questions on all the old familiar topics so well known to all who have ever been connected with Rose. This sort of general conversation is continued until the time arrives to start the business meeting. The most agreeable incident of the business program is a talk given by one of the club members. This is generally on an engineering subject, although the subject is entirely optional with the speaker. One year it was a discussion of the progress in constructing the Panama Canal; another year the speaker told some of his personal experiences in observing the aviation meet at Rheims, in France—and so on. One can rest assured that he will hear a good, straightforward talk by a technical man who "knows whereof he speaks."

The talk concluded, another entertainment of an altogether different type is presented to the student guests of the club—namely, a chance to demonstrate what Poly "hash-house" training has done for the undergrad's appetite; in other words, refreshments are served. These may not be elaborate, but the writer can say from experience that they are certainly well worthy of serious consideration, and that they disappear in a manner remarkable to behold.

From this point on, there is nothing on the program but social conversation—plus cigars—and when these are disposed of, and each "Son of Chauncey Rose" has left for home, he certainly feels the pleased sensation of having spent an entertaining and instructive evening.

On the whole, these meetings are undoubtedly successes. The alumni eagerly devour all news from the old school, while the students have an opportunity to mingle for a few hours with men who have "gone through the mill"—a condition which is of benefit to both, and which binds them closer together in their loyalty to old Rose.

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SENIOR CELEBRATION

AFTER weeks of fretting and worrying on the part of the Seniors, who entertained grave fears that the Faculty Discipline Committee would attempt to so completely alter

make it entirely inadequate to express a Senior's joy, the wild and woolly gun-play was the character of the annual celebration as to nevertheless successfully pulled off, and apparently to everyone's satisfaction.

Aside from the customary small shooting-bee a rather unique feature had been planned, one which would again emphasize the fact that the class of 1911 can depart from the beaten path and devise schemes, whether good, bad or indifferent, that smack of originality and daring. Had those eleven bombs and that mortar arrived, all the good citizens of Vigo and surrounding counties would have agreed that the '11s of Rose Polytechnic Institute could at least temporarily make themselves heard.

The festivities began promptly at 3:30 o'clock in the afternoon, on Friday, January 20th. The call to arms was sounded by Edward J. Ducey, erstwhile bugler in Coxey's army. Stationed on the cinder path midway between the main building and the shops, Ducey compelled a long-suffering Conn Wonder Instrument to produce a series of weird sounds that penetrated the crystalline (?) atmosphere with the shrill intensity of a fish-vender's horn. When the last spasmodic tone of the bugle call had sought refuge in a crack of the gymnasium wall, the simultaneous firing of 32, 38 and 45 caliber revolvers began.

The husky little band down at the shops did things up in brown style. A large number of incandescent lamps succumbed to the unerring aim of some of the sharpshooters. High Mogul Willmarth and his good man, Friday, Daddy Wires, sought refuge in their respective cubby-holes and prayed for calm and peace.

In the testing laboratories of the main building a similar farce-comedy was enacted. Our peace-loving professor, late from Columbia University, Noo York, one Harold Thomas, not being accustomed to western gun-play, had visions of a Christian massacre when every denizen of the underground department jerked a Smith & Wesson from his hip-pocket and blazed away. 'Twas truly a rude shock, and we hereby penitently apologize, "Tommie."

After this preliminary skirmishing, all forces congregated in the main hallway and spent 15 minutes disposing of 3,000 rounds of blank cartridges. Another short fusillade in the open air concluded the afternoon's entertainment.

At nine o'clock in the evening about twenty-five of the more hardy upper-classmen, whom such a slight circumstance as rainy, slushy weather could not deter, gathered before the president's residence in Collett Park, and used the final consignment of ammunition in giving Doc a rousing serenade.

The hospitable Doctor invited all hands in and—well, ask any of those present whether they enjoyed the red lemonade, the cookies, apples and Doc's special brand of Havana puffs!

Thus ended another one of those little affairs belonging to a class which is not included in the regular college curriculum, but which, we feel certain, is an essential feature and an educational factor in the life of a student.

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FRESHMEN BANQUET

On Thursday evening, January 12th, the annual banquet of the underclassmen took place at the Filbeck Hotel. At nine-thirty o'clock of that evening about thirty freshmen seated themselves at the splendidly appointed banquet table.

Under the leadership of Harvey Failing, a few preliminary yells were given after which everybody's attention was directed to the real business in hand. Good things in plenty were served and thoroughly relished by the boys who are becoming accustomed to the ceaseless monotony of standard boarding-house "grub."

The last course having been disposed of, toasts were given by various members of the class which were interspersed with yells for the orators, the class and the school.

Toastmaster Gillum, in a breezy little talk, called upon different members of the class and Prof. Clyde White, who was honor-guest, for impromptu speeches. These were enthusiastically received by the assembled banqueters. Young Doc White's humorous anecdotes were especially appreciated.

Throughout the evening the best of spirit prevailed and every feature of the evening's entertainment was thoroughly enjoyed by all present. The lion's share of the credit belongs to the energetic banquet committee composed of Messrs. Nehf, Schoonover and Scott.

With nine rousing rahs' for the class and a like number for the courteous hotel management, the Freshman banquet of the glorious Class of '14 came to a close. The toasts follow:

"Shop-work as a Pastime, or Daddy Wires as Patron Saint"............Harvey Failing

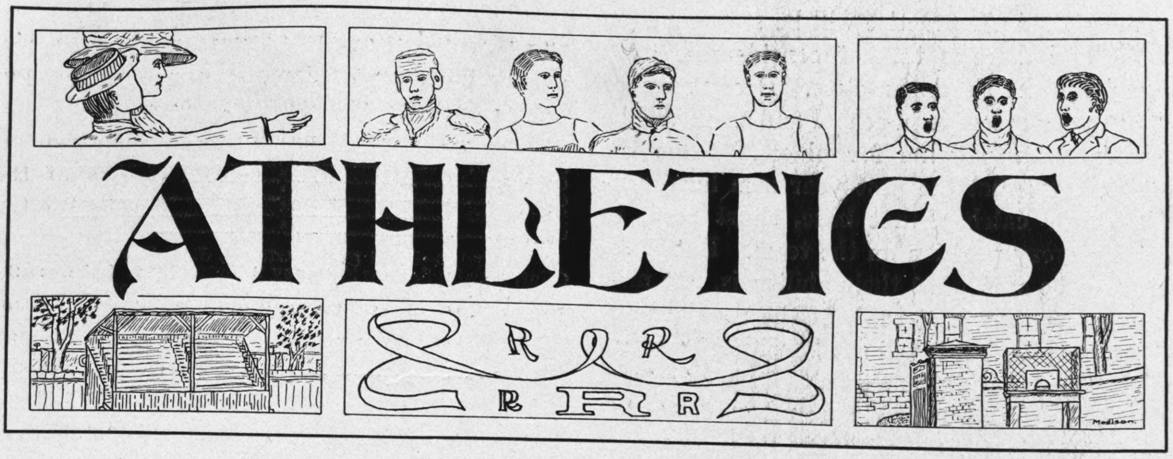
"The Common Sense Factor of an Engineering Education"....Harold Jones

"Athletics of the Class of 1914"............................Herbert Deming

"The Joys of Study"..................Arthur Nehf

"Basket Ball as Compared to Football"..............Marion Stoms

"On Seventh and Main Society"....John Scott



WITH two of the regulars lost to the team, Coach Hadley will have troubles of his own for the rest of the season. Poggensee has been compelled to quit the game and Capt. Hoffner had a rib broken in a practice game with the scrubs, and the doctor has ordered him to keep out of basket ball for the rest of the season. Hoffner has been playing a good game this year and not only that, but his presence in the game has given confidence to some of the newer men. At the start of the season it was doubtful whether Hoffner would be able to play basket ball, as an old injury to his knee from foot ball was troubling him. But that injury yielded to treatment and things looked bright for a good season. Now it is a question of developing nearly an entirely new team to finish the schedule. And to think that the Notre Dame, Wabash, Indiana and DePauw games still remain to be played. Ill fortune, indeed.

The team went to DePauw on Jan. 17th, and won a close game. Hoffner was out of the game with a bad ankle and that may account for the fact that we had such a close shave. It seems that the players were somewhat over-confident and didn't go at their best gait, especially in the first half. The first half ended eleven to nine in Rose's favor and the team hadn't really opened up. But it appears that DePauw was equally tardy in showing their aggressive spirit and it made things quite interesting in the second period. A lucky field goal in the last few seconds of play decided the game, Deming being the hero. Wouldn't it be nice now if Poly could only give DePauw the short end of a large score when they come here! It would make up for the game we didn't get to play at Greencastle last year. With the team in the condition it is, however, large scores are nearly out of the question except possibly in the case of Normal. There isn't any doubt of the result in that case, it is only a question of how great the final score will be.

The five must have been up against a real team down at Bloomington. It is not every team that can score forty-five points on Rose when the latter can only gather six. But considering the fact that it was a strange floor and that the game was played during examination week, it was not such a disappointing showing. Maybe it will be better when Indiana comes up here. Last year Indiana won at Bloomington, thirty-six to twenty, and when they came here were beaten twenty-four to twenty-three. Our chances are very slim for winning from them at home this year, but very likely the score will be much better.

BASE BALL practice will be starting soon and there is talk of considerable good material in the Freshman class. Every member of last year's team is in school and there will be some interesting fights for places. From the talk it seems that the first year men have candidates for catcher, first base, short stop, in fact for every position on the team. But it remains to be seen what their ability is. It may be that they will beat some of the regulars out of their places, but it will not be without a warm fight. Here is one time that a captain of a team is not to be envied. He will surely have his hands full. Captain Shook, with his three years of experience on the team, besides the other base ball he has played, ought to be a good judge of a player, and if a man gets on the team it will be because he deserves to be there.

———ooo———

ROSE 22—DE PAUW 21.

Here was a close game, won and lost several times in the last few minutes of play, Deming's field goal in the last twenty seconds giving Poly the final lead. Hoffner watched the game from the sidelines, a bad ankle keeping him from the activities. His absence was especially felt in the first half when Kelley could only land one of seven trials at foul goals. It was not any fault of Kelley's, as it was not his regular job. He played a fast game otherwise, getting two field goals in the half he played. Deming played forward in the second half, one of his two field goals being the one that decided the contest. Offut got three foul goals and a field goal in the second half, all of which were necessary for the rally that won the game. Gray was an individual star with four field goals. He outplayed his man, Dewey, although the latter outjumped him. Crowe and Poggensee put up good guarding games.

Leazenby, a Methodist sub, replaced Hardin at forward, in the second half, and immediately threw two field goals, putting his team in the lead and incidentally giving the rooters a chance to root. Dale, the much talked of midget forward, made only two field goals, both in the second half. Poggensee kept him well guarded.

The line-up:

Rose (22)	Position.	DePauw (21)
J. Kelley, Deming	F.	Dale
Offut	F.	Hardin, Leazenby
Gray	C.	Dewey
Poggensee	G.	Grant
Crowe	G.	Walker, Hardin

Summary—Field goals: Gray 4, J. Kelley 2, Deming 2, Offut, Hardin 3, Dale 2, Dewey 2, Leazenby 2. Foul goals: Offut 3, Kelley, Hardin 2, Dale. Time of halves—20 minutes. Referee—Reiman, of Purdue.

———ooo———

INDIANA UNIVERSITY 45—ROSE 6.

We were simply outclassed and helpless in this game. It was a rough and tumble affair, the larger Indiana men having things their own way. Barnhart and Graves were sensational in their basket throwing, the former getting nine and the latter six field goals. The first ten minutes the play was slow, but after that the short, quick passes of the Indiana men began to work and Rose was swept off her feet. The style of play was new to the men of Rose and they were unable to stop the fast work.

Poly's chances at the goal were few and only two field goals were made, Hoffner getting both of them. Poggensee was disqualified in the second half on the four foul rule and when Indiana agreed to let him continue the game, Referee Westover refused. The first half ended 27 to 3.

The line-up:

Indiana (45)	Position.	Rose (6)
Hipskind (Capt.)	F.	Hoffner (Capt.)
Barnhart	F.	Offut
Graves	C.	Gray
Berndt	G.	Deming, Poggensee
Davis, Stanton	G.	Crowe

Summary—Field goals: Barnhart 9, Graves 6, Hipskind 4, Berndt 2, Hoffner 2. Foul goals: Barnhart 3, Hoffner 2. Time of halves 20 minutes. Referee—Westover, of Purdue.

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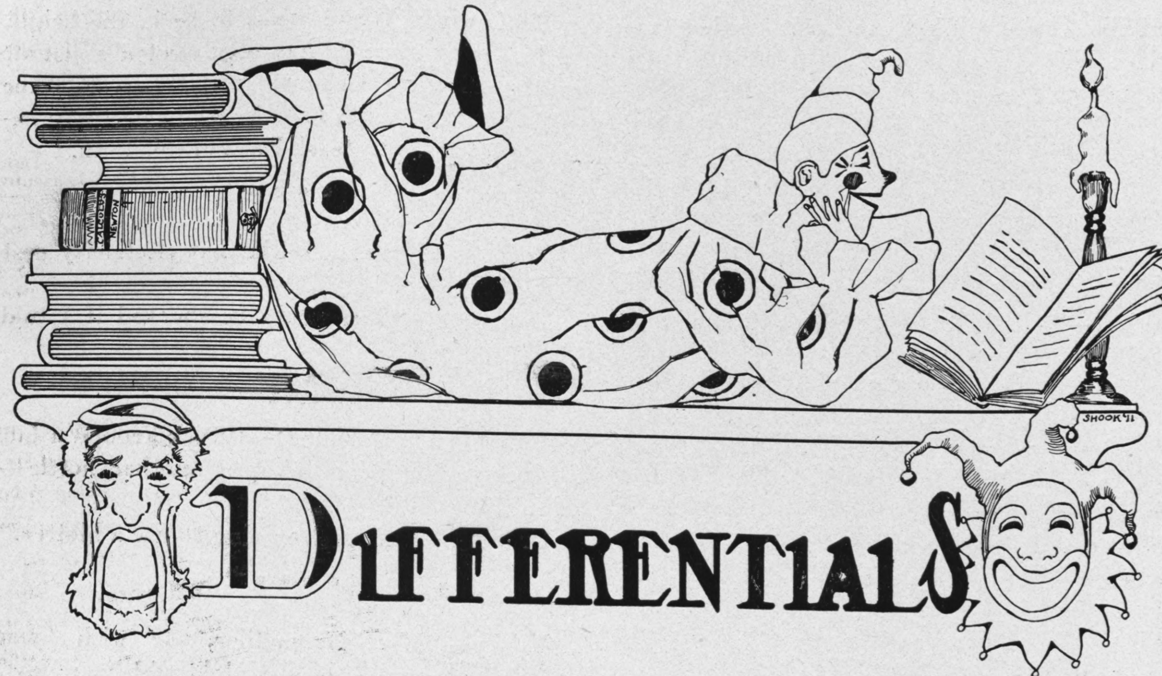
INDIVIDUAL RECORDS.

	Field Goals.	Foul Goals.	Total Points.
Gray	21	....	42
Hoffner	9	18	36
J. Kelley	11	1	23
Offut	4	4	12
Poggensee	2	....	4
Crowe	....	....	....
Deming	2	....	4
Totals	49	23	121

Rose 121—Opponents 132.



Hoberg—"I thought you were going to the Northern."

Byrd—"No; you can't shake me. I'm like a postage stamp, I stick around."

Hoberg—"Yes, and you are liable to get licked some day, too!"

* * * *

Ker—"Bud, what is a white lie."

Ferrell—"The milk we get at the boarding-house, sonny."

* * * *

Suggested Revision of Hotel Rules for the So and So House:

1.—Guests need not pay their bills, as this hotel is supported by its foundation.

2.—If you are troubled with the night-mare, tie it to the bed-post.

3.—Ladies are requested not to expectorate on the ceiling.

4.—If there is no clock in your room, listen to the bed—tick.

5.—If the room is too hot, open the windows and watch the fire-escape.

Teacher (to dull pupil)—"When Geo. Washington was your age he was a surveyor."

Dull Pupil—"Yes, and when he was your age he was President."

* * * *

Shook—"How did you come out on the exams, Ronald?"

Voelker—"I can't muster up the smile you can."

* * * *

Prof. Thomas—"We will need a gun on this trip to give rapid signals, but I guess you Seniors never carry guns."—Oh, shucks!!

* * * *

Uncle Winsett's Philosophy:

"If you can't laugh at the jokes of the age, laugh at the age of the jokes."

"A word to the wise is a waste of time and a word t' a woman is an impossibility."

* * * *

Prof. Thomas (In Strength of Materials)—"Portland cement is stronger than natural cement because it costs more."

McKee—"Offut, what causes that red spot on your nose?"

Offut—"Glasses."

McKee—"Glasses of what?"

* * * *

Edith (yawning at 11:30 p. m.)—"I don't know much about baseball."

Wilbur—"Let me explain it to you."

Edith—"All right, please illustrate the Home Run."

* * * *

Prof. Howe (In Specifications and Contracts) —Now, gentlemen, suppose one of you would be a trustee on the Board of Indiana State Normal——!! Suffering Corn Flakes!!

* * * *

Hepp—"Did you see 'The Girl I Love,' the other night?"

Bird—"Oh, I didn't know you were in love with her, too!"

* * * *

Reilley (In Machine Design)—"Confound it, I'd like to know where all my thumb-tacks go to."

Gilbert—"It's pretty hard to tell, since they are always pointed one way and headed the other!"

* * * *

Soph—"What do you study in valve motions, anyway?"

Junior (who has just seen "Madame Sherry")—"Oh, we merely study 'every little movement' of valves, and try to find 'what their meaning is.' "

* * * *

Of course, Adams can't close a window! What does he know about machinery!

* * * *

We wonder why Jo-Jo doesn't patent his wonderful blackboard.

Prof. Clyde White seems to be in the height of his glory since he has been elected assistant in the Physical Laboratory. However, some say, that "he should have learned something before attempting to teach Physics this term."

* * * *

Baines—"How much did that electricity cost you, Lawrence?"

Lawrence—"You would be shocked if I told you."

* * * *

Brennan (in Calculus)—"Stick around a bit, Brewer, we're going to open another bottle—of ink!"

Cronin—"Naw! we're going to use a blotter."

* * * *

Wicky—"Mr. Kronmiller, I wish you wouldn't stay up so late at night with your girl, it is affecting your nerves."

* * * *

THE COST OF RUBBERS.

A rubber at whist costs as much as the stakes, while a rubber at a pretty girl sometimes costs a broken face and a police court sentence.

* * * *

The steerage passenger who was operated on and sewed with the E string of a violin, arrived in New York "fit as a fiddle." Wow!

* * * *

Ethel—"Baker gave me this box of candies."

Marie—"Pretty soft, eh!"

Ethel—"Sure; both marshmallows!"

* * * *

Voelker—"Every time she looks into my face she smiles. Ah!"

Newhart—"Well, it may not be exactly polite, but it shows that she has a sense of humor."

Chas. Werst—"———, and then the water is drained off in a rather wet condition." Yep!!

* * * *

She Has a Kick a Comin', But Her Skirts' a Trifle Tight.

(Try this skirt on your piano.)

My Bonnie can't move; she is helpless.
She's so thin she looks ready to float.
She can't run, she can't sit, my poor Bonnie,
For the hobble skirt's got Bonnie's goat.
My Bonnie can't see the sweet sunshine,
She can't even see where to walk.
Her skypiece comes down to her elbows—
But just bet your sweet life she can talk!

* * * *

An observant Technic reporter made a note of how different Polys ordered whiskey in a barroom. Here are some of the different ways the stuff was nominated:

Fitz—"Gimme a skee."

Nick—"A little out of the barrel, please."

Sibley—"I'll take a little Scotch, Tim."

Evans—"Let me have a shot in the arm."

Rypinski—"Red-eye."

Shook—"Gurgle-gurgle!" (On rare occasions.)

Loehninger—"You know mine."

Bailey—"Me for a snifter."

* * * *

"My address, sir," said valedictorian Newhart, "will be very brief. I want a job."

"My remarks will be equally to the point," declared the man of business. "I'll give you one. I need an assistant janitor."

* * * *

The average man proposes once,
The average woman takes him.
If he won't propose (Lord only knows
Just how 'tis done) she makes him.

Beauchamp (To Mees, upon entering the Claypool Restaurant on I. C. A. L. Convention Day)—"Shall we pose as millionaires, or as foreign dukes."

Mees—"As the latter, my boy. As millionaires we might be expected to display some evidences of wealth. But as dukes, nobody can possibly take it amiss if we skip."

* * * *

Sky of blue,
Gladsome sun;
Wedding bells,
Two are one.

Years elapse,
Both feel blue;
Reno—freedom;
One makes two.

* * * *

Tilley—"We live in exacting times."

Buckner—"Say on."

Tilley—"One must deliver the goods and yet not be caught with them."

* * * *

"I hooked her gown from waist to neck,
And hooked it wrong.
One resolution went to wreck,
My words—were strong."

* * * *

Extract from a junior essay entitled "On Men": "Men are what women marry. They drink and smoke and swear, but don't go to church. Perhaps, if they wore bonnets they would. They are more logical than women, also more zoological. Both men and women sprung from monkeys, but the women sprung further than the men."

LIGNITE FUEL FOR LOCOMOTIVES

RENEWED interest in the use of lignite as a fuel for locomotives has been shown by the changes in practice of the lines in the Northwest. The Chicago, Milwaukee & Puget Sound, the Great Northern and the Northern Pacific are arranging to ship oil 1,300 miles from Bakersfield, Cal., to Tacoma, Wash., and Seattle; the last two mentioned roads have storage tanks for the oil in process of construction at Tacoma, and the oil is to be used on locomotives crossing the Cascades and the Rocky mountains. The Chicago, Milwaukee & Puget Sound is burning oil on locomotives running between Tacoma and Deer Lodge, Mont., but has 75 locomotives equipped with the Brooks spark arrester, so that the semi-lignite coal from its mines at Roundup, Mont., may be used. The Oregon Railroad & Navigation Company used oil to some extent, but lately has demonstrated by tests on a Mikado type locomotive especially designed for the use of lignite, that Washington lignite may be burned safely and economically. As a consequence it will order more freight locomotives of the same type especially designed for burning lignite. The North Western and the Mallet locomotives of the Burlington are using lignite in Wyoming and Colorado. These Mallets, illustrated in the *Railway Age Gazette* of May 13, 1910, have large fireboxes 78 in. x 120 in., a grate area of 65.2 sq. ft., and 5,090 sq. ft. of heating surface. The Oregon Railroad & Navigation Company's Mikado locomotive, which is illustrated in this issue, has a still larger firebox, 7 ft. x 10 ft., providing 70 sq. ft. of grate area and has 495 tubes 20 ft. 6 in. long, giving a tube heating surface of 5,292 sq. ft. Both the Burlington Mallets and the O. R. & N. Mikado have fire-brick arches and very large smokeboxes—100 in. long—so that it is possible to use a large netting area. The numerous experiments with lignite as a locomotive fuel have usually been made with some modification in the draft appliances of the engines keeping the fireboxes and smokeboxes of the ordinary proportions; as a rule, they have not been successful.

Nearly 40 years ago John E. Wootten demonstrated that in order to burn fine, friable fuel on locomotives it was necessary to have a large grate of about 80 sq. ft. area and a mild draft. The theory of the large grate is that the pounds of coal burned per square foot of grate may be small, but the total fuel burned per hour will be large with a corresponding abundant steam production. With a low rate of combustion per square foot of grate and a thin fire the vacuum required is low and the mild blast does not draw large quantities of the light fuel through the tubes. These are the conditions required for burning lignite, and the successful operation of the locomotives referred to above is principally due to their wide fireboxes and large grate areas. However, the brick arch and the long smokebox are also important features. The brick arch is especially useful for burning fine, light fuel like lignite. It increases the length of the flameway, and holds the finely divided fuel that is lifted from the grate in suspension for a longer time, allowing much of it to be burned by the flame, assisted by the radiation from the red hot brick. The brick arch also assists in distributing the draft over the entire grate, thus contributing to more uniform combustion and increasing the efficiency of the furnace. It is evident, therefore, that with the brick arch a large proportion of the sparks which might ordinarily be drawn through the tubes are burned in the firebox and do not reach the tubes. Those which do pass through must be caught, and with a light fuel like lignite a large area of fine netting is required; this is most easily and efficiently arranged in a long smokebox. The mesh of this netting should be about 7 wires per inch, and the diameter of the wire about .045 in.

The friction of the long tubes has some influence in retarding the discharge of sparks. The boiler of the Mikado locomotive has tubes only 2 in. in outside diameter, but 20 ft. 6 in. long. The Burlington Mallet has tubes 16 ft. 6 in. long; an intermediate boiler section 69 in. long without tubes, where a large portion of the sparks must be deposited; and a feed water heater with 406 2½-in. tubes 9 ft. long, which the remaining sparks must traverse before reaching the smokebox. It is obvious that sparks, especially those of a woody nature like lignite, will not have much life in them after traversing the 25½ ft. of tubes with an obstructing compartment between the two sets.

The problem of burning lignite appears to have been solved satisfactorily by the use of locomotives with large fireboxes and long smokeboxes, but it is desirable also to burn lignite on the older locomotives with smaller fireboxes, and it is possible that a brick arch and a long smokebox with some special spark arrester used with such engines may be successful. The Van Horn-Endsley spark arrester, a device for such purposes was recently tested at the locomotive testing laboratory at Purdue University, the results being published in the *Railway Age Gazette* of December 23, 1910. It was applied to a small locomotive of the Chicago & North Western, in which the smokebox was lengthened to 96 in., the rear 5 ft. beng fitted with a spiral diaphragm commencing immediately in front of the tube sheet. This directs the gas current around the outer portion of the smokebox, and by the centrifugal action the sparks and cinders are thrown to the somebox wall, and follow the shell until they drop in the hopper at the bottom. This is such a complete spark arrester that no netting is required, and when tested at night with Wyoming lignite, running under a heavy load, very few sparks were observed to pass out of the stack.

It is fortunate for the railways operating in the far northwestern territory that large fields of cheap fuel in the form of lignite are found in localities far removed from a good coal supply, and that it is possible to so proportion the boilers of locomotives that they will burn it safely and economically. It is also quite probable that the smaller locomotives may be so modified in their smokebox and draft appliances in such a way that they will use this cheap fuel successfully.—*Railway Age Gazette*, Jan. 27, 1911.

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FAILURE OF A VERY LARGE CONCRETE OIL RESERVOIR

DURING the latter part of November, 1910, two concrete oil reservoirs, each with a capacity of 1,000,000 bbl., were completed at San Luis Obispo, Cal., for the Producers Transportation Company. Oil to fill these reservoirs will be received from various California fields, where, on account of lack of proper reservoirs, much oil is now temporarily held in earth sumps. There is a large trade in oil on the Pacific Coast with steamship lines, and oil will be drawn from these reservoirs and pumped through pipe lines to Port Hartford or any other points to which the company may subsequently extend its lines. With these tanks in service the company expects to be able to supply whatever demand is expected by vessels calling at Port Hartford.

The two tanks cover an area of 13 acres. Each is 601 feet in inside diameter, and consists of a reinforced concrete wall, without buttresses, standing free and not supported by any filling. The walls rise about 20 feet above the concrete floor of the tank, are 6 inches thick at the top, 3 feet thick at the bottom, and are reinforced with plain round rods. The concrete floor is 2½ in. thick and is reinforced with wire mesh. The dimensions and disposition of the reinforcing rods, the proportions of the concrete mixture, the kind and size of aggregate and other data of this nature cannot be given since both the owners and the contractors were unwilling to supply any information to the representative of the Engineering Record who visited the site.

Outside each reservoir and concentric with it is an earth embankment 20 feet high, 8 feet wide on top and somewhat over 20 feet wide at the bottom. This embankment is termed a "firewall" and its purpose is to save the reservoir from fire which may creep over the surrounding plain.

Within each reservoir is a 12x12 ft. sump, 8 feet deep, in which the end of the outlet pipe is placed.

The construction of each reservoir required the excavation of about 80,000 cu. yd. of material. The excavation and concrete work required 300 two-horse tearms and about 300 men in addition to the teamsters. Four concrete mixers were used.

The two reservoirs were not built simultaneously though No. 1 was completed a short time before No. 2. Oil was turned into No. 1 from an 8-inch pipe line from the famous Lake View gusher and flowed at a rate of 900 bbl. per hour. This flow continued without interruption until the reservoir was nearly filled. As the oil neared the top leaks began to appear. They were caulked with abestos and cement plaster and it was believed that the wall would successfully withstand the pressure. But suddenly, accompanied by a roaring sound, a section of the wall, 125 feet long, spread outward, at the same time breaking in two horizontally, the lower portion revolving about the outer toe of the wall.

The earth embankment, or firewall, now came into play and held the oil in check until arrangements were made to remove and store it elsewhere.

Gangs of men and teams were at once put to work to reinforce the firewall, and though it was feared that there might be a heavy loss of oil, due to possible breaking of the embankment, no rupture occurred and the only loss will be a small amount due to seepage.

Reservoir No. 2 had just been completed at the time the break occurred, and, being on lower ground the oil from No. 1 was drained into it.

The break occurred at a portion of the wall which was completed first.—*Engineering Record.*

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PRINCIPLES OF SEWAGE DISPOSALS

THE *Engineering Record,* Vol. 63, No. 1, contains a paper by Mr. Geo. C. Whipple, read before the Institute of Chemical Engineers on December 9, 1910, on the Principles of Sewage Disposal. Mr. Whipple sets forth in an elementary and interesting manner the general principles of sewage purification, correcting a number of distorted ideas held by the public in general.

At the present time a strenuous campaign is being waged against the pollution of streams, purification of sewage being urged with increasing insistence.

The basic principles underlying all methods of sewage disposal are to get rid of sewage:

First—Without danger to the public health.

Second—With the least possible nuisance to the smallest number of people.

Third—With the least damage to property.

Fourth—At the smallest possible cost.

Public health is seriously menaced by failure in removing human excreta: Privies and cesspools in a closely built-up area being no longer tolerated as their existence gives opportunity for the spread of disease by insects and animals and the pollution of local wells. Statistics show that their abolishment and substitution of sewers has a marked effect in reducing the death rate. The water carriage system of removing fecal matter and other wastes is the readiest, cheapest and altogether safest method now in use. It is likely to be the prevailing practice for many years to come.

Sewage when discharged into rivers is a source of danger according to the extent to which the water is being used. Large cities discharging sewage into a small stream, the water being used at a lower point as a source of water supply, is certain to cause trouble. If the stream is large the danger decreases as the dilution becomes greater although it never disappears entirely. The danger of infection also decreases as the time interval between the entrance of the sewage and the use of the water lengthens, a longer time offering greater opportunities for the natural death of pathogenic organisms in an environment unfavorable to them, and for the action of certain natural processes of self purification.

While it is possible to purify sewage so as to make it entirely innocuous, it is so difficult, so expensive, requires such constant and painstaking care that it is seldom attempted and still more seldom accomplished.

The danger of sewage lies in the bacteria it contains. The methods of sewage disposal that have come into vogue during the last ten or twenty years do not effectively remove bacteria from sewage. Contact beds and sprinkling filters may at times remove as high as 99 per cent. of bacteria but in practical operation their effluents are found to contain bacteria in very large numbers. When it is remembered that sewage often contains 1,000,000 bacteria per cubic centimeter even 1 per cent of this figure, 10,000 per cubic centimeter, far exceeds any allowable standard for drinking water.

Long experience in this country and still longer experience in England and Germany have demonstrated that polluted waters can be and are being constantly purified by means of filtration to such an extent that they are reliably wholesome. In Germany the typhoid fever death rates in the large cities have been reduced to figures far below those of American cities, it being not at all uncommon for the typhoid death rate to remain less than 10 per 100,000 for ten and even twenty years in succession, the rate not infrequently dropping as low as 3 and 4 per 100,000. It is worth remembering also that the streams of Germany are far from being unpolluted with sewage and that no general attempt is made to provide sewage purification works of high bacterial efficiency.

Water filters, however, sometimes fail due to use of improper methods or carelessness in handling. The purification therefore, even though it is incomplete, is of advantage as it offers a second line of defense, an increased factor of safety.—*Engineering Record.*

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THE P. & L. E. CANTILEVER BRIDGE OVER THE OHIO RIVER AT BEAVER, PA.

THE *Engineering Record*, Vol. 63, No. 4, contains a very complete description of the new bridge carrying the Pittsburg & Lake Erie Railroad over the Ohio River at Beaver, Penna. The new bridge which is of the cantilever type, is 1787 feet long, center to center of end pins, has on approach span of 370 feet, two anchor spans 320 feet long and one channel span of 769 feet, made up of two 242 ft. cantilever arms and one 285 ft. suspended span, all measured center to center of pins. It is a double track bridge and replaces a single track structure built about 20 years ago. The channel span clearance was insufficient and objectionable to rivermen and its capacity became inadequate for the present very heavy and rapidly increasing traffic, and as piers were not adapted to a double track superstructure it was decided to abandon the old bridge entirely, and it has therefore been replaced by the new double-track bridge about 300 feet upstream from the old bridge.

The bridge carries two pairs of gauntleted tracks which are proportioned for extremely heavy locomotive and train loads that are equalled on few, if any, other long spans. The floor is proportioned for E-60 locomotives. The trusses are proportioned for the actual concentrations of dead load and for a live load of E-54 locomotives, for an impact of 100 per cent. on the hangers and of $L + \left[\frac{L}{L+D}\right]$ for other members, where L is the live load and D is the dead load.

It is interesting to note that the superstructure, containing about 16,000 tons of steel, cost $1,300,000 erected, or only a little over $80.00 per ton, but the bridge was fabricated entirely in the shop, the field work was intentionally reduced to a minimum and usually careful attention was given to detailing which would give comparatively easy shop work.—*Engineering Record.*

A METHOD OF BUILDING BEAM FORMS.

FORMS of concrete beams are frequently made in three parts, so that the sides may be taken off when the floor panels are removed, the bottoms remaining in place resting on the original support until the concrete has sufficiently hardened. In order to decrease the number of parts to each beam form, Messrs. Tucker & Vinton, New York, built the forms with the sides permanently attached to the bottom, but with the box for each span cut in two on a diagonal plane near the center. When the floor panels are ready for removal, one-half of the beam form is removed, and the original supports at once restored, a block of wood taking the place of the bottom of the form. The other half of the form is then removed and its original supports also restored. In this way each half of the beam is unsupported for a short time during the removal of the forms. This scheme has been used for a number of years, and is stated by the above mentioned firm to result in a considerable saving in forms and in labor.

—*Engineering Record.*

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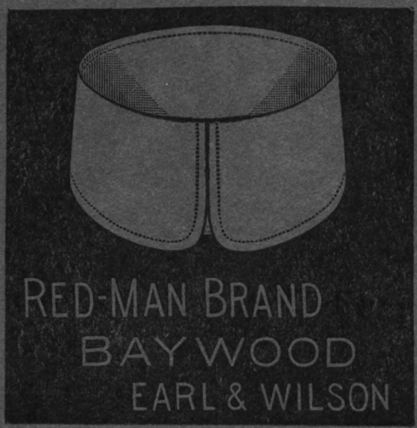

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