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Vol. XXI MARCH :: 1912 No. 6

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VOL. XXI TERRE HAUTE, IND., MARCH, 1912 NO. 6

THE TECHNIC

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TERMS

One Year, $1.00 Single Copy, 15 cents

Issued Monthly at the Rose Polytechnic Institute.

Entered at the Post-Office, Terre Haute, Indiana, as second class mail matter.

A few months ago, there appeared on the pages of the *Technic* an article on "Foundations," written by Mr. Charles Hermany some time during his fifty years' service as Chief Engineer of the Louisville Water Company. We present as a leading article for this issue a paper by Mr. Theodore A. Leisen, who is occupying the same position at the present time, and we have every reason to believe that his paper will prove fully as interesting to *Technic* readers as that of his predecessor.

———ooo———

IT may seem prevaricatory to state the Rose Tech is probably the only institution of learning in Indiana that has no flagpole on which the national colors may be displayed on suitable days, but such appears to be true. In spite of the prevailing custom of designating school buildings by a display of the Stars and Stripes, and in spite of almost continuous search by the different classes seeking for suitable "memorials," this fact seems to have been entirely overlooked. It is needless to say that this defect should be remedied as soon as possible. Could not the Alumni Association, in its June meeting, take some action? If not they, then let 1914 take heed. —J. A. H.

———ooo———

A joint meeting was recently held by the *Technic* staff and the faculty committee on publications, at which remedies for prevailing evils were suggested, and also plans for various much-needed improvements—especially concerning methods of awakening the interest of our Alumni—were brought forth. The meeting was without doubt of great interest and assistance to the *Technic* staff, and it is to be hoped that more such meetings may be held in the future.

———ooo———

AN article of interest to Seniors appears in the issue of *Science* for March 1, 1912. It states that several teaching positions in the Imperial Pei-Yang University, Tientsin, China, are likely to be open as soon as stable conditions are restored in China. The University is the provincial University for Chih-li (the province which contains Peking). Columbia University and the University of California have

recognized the completion of the course in this university as equivalent to attaining the B. S. degree. In 1910 the foreign staff consisted of two professors of law, three professors of civil engineering, one professor of mechanical engineering, a professor of history and economics, a professor of chemistry, a professor of metallurgy, a professor of mining and geology, in addition to a numerous staff of Chinese professors and other officers. The principal conditions of the contract which the University enters into with its professors provide for a three-year term of service. The salary is paid in silver at the rate of 300 Hongping taels per lunar month (the Hongping tael varies in value according to the rate of exchange, usually 60 cents to 65 cents); there are twelve and one-third lunar months in the year. All instruction is given in English, free medical attendance as well as suitable living quarters are provided. Applicants should address President S. H. Wang, Imperial Pei-Yang University, Tientsin, or Mr. Thos. T. Read, 420 Market Street, San Francisco. —J. A. H.

REPORT OF FINANCIAL SECRETARY TO MAR. 6, 1912.

Amt. in bank on Feb. 10		$159.12
Credit to Athletic Assn. (overdrawn)		145.08
Credit to Symphony Club (overdrawn)		25.00
Credit to General Fund	$276.59	
Credit to Rose Technic	23.97	
Credit to Y. M. C. A	11.84	
Credit to Scientific Society	9.40	
Credit to Camera Club	7.40	
	$329.20	$329.20

Expended by Athletic Assn. since Feb. 10	$377.29
Expended by General Fund since Feb. 10	100.00
Expended by Symphony Club since Feb. 10	47.30
Expended by Rose Technic since Feb. 10	11.67
	$536.26

Received by Athletic Assn. since Feb. 10	$ 880.05
Received by General Fund since Feb. 10	250.25
Received by Symphony Club since Feb. 10	103.95
Received by Rose Technic since Feb. 10	143.20
Received by Y. M. C. A. since Feb. 10	77.00
Received by Scientific Society since Feb. 10	7.70
Received by Camera Club since Feb. 10	15.40
	$1477.55

Amount in bank on Feb. 10, $1477.55	$1636.67	
Total expenditures since Feb. 10	536.26	
Amount in bank on March 6	$1100.41	

Credi to Athletic Associaion	$ 357.68	
Credit to General Fund	426.84	
Credit to Symphony Club	31.65	
Credit to Rose Technic	155.50	
Credit to Y. M. C. A	88.84	
Credit to Scientific Society	17.10	
Amount to Camera Club	22.80	
Amount in bank		$1100.41
	$1100.41	$1100.41

J. M. BEAUCHAMP,
Financial Secretary.

THE LOUISVILLE WATER WORKS

THEIR CONSTRUCTION, DEVELOPMENT AND OPERATIONS.

By Theodore A. Leisen, Chief Engineer and Superintendent.

HISTORICAL.

THE Louisville Water Company was incorporated under an Act of the State Legislature in 1854, with a capital of $1,000,000 shares, divided into 10,000 shares of a par value of $100 each. From its incipiency it became a quasi municipal corporation through the purchase by the city of Louisville in 1856 of 5,500 shares of the capital stock, and in 1859 of 2,200 additional shares. In later years the city gradually acquired the remainder of the stock, thereby securing complete ownership of the Company. Until March 21, 1906, the city exercised its control through the Board of Directors appointed by the Sinking Fund Commissioners, but from and after that date, in conformity with an Act of the Legislature, the full management and control of the Louisville Water Company was vested in the Board of Water Works.

CONSTRUCTION.

In 1856 the actual construction of the Water Works was commenced, and in October, 1860, water was first delivered by the present Cornish Pumping Engines at River Pumping Station No. 1 into the reservoir occupying the site on the hill, about 3,500 feet south of the Pumping Station, and from there distributed to the city through the twenty-six miles of mains constituting the initial distribution system.

The cost of the original works including Real Estate and pipe system was $829,455.81.

The original plant of the Water Company, including the Pumping Station and equipment, the old reservoir, and the pipe system, was designed by Mr. Theodore R. Scowden, assisted by Mr. Charles Hermany. Mr. Scowden resigned on January 1, 1861, and was succeeded by Mr. Hermany, who retained the position of Chief Engineer of the Water Company from that date until his death in January, 1908, and to these two eminent engineers at the beginning, and to Mr. Hermany alone during all the ensuing years of his successful career, is due the credit for the magnificent work which has characterized the plant of the Louisville Water Company.

Probably no community ever started out with a better initial equipment for its water works than Louisville, a fact which can be readily appreciated when it is realized that the pumping machinery then installed—fifty years ago—was maintained in active daily operation until 1909. This original pumping plant, which was built by Roach & Long, of Louisville, consisted of two Cornish engines, having a combined capacity of twelve million gallons in twenty-four hous, and for over thirty years these pumps continued almost uninterruptedly to furnish a water supply ample for the constantly increasing demands of the city.

In 1893, thirty-three years after the original installation, River Pumping Station No. 2 was completed and the Leavitt sixteen million gallon vertical compound pumping engine placed in service and this, in conjunction with the Cornish engines, pumped all the water necessary for the city's consumption until early in 1909, when the twenty-four million gallon vertical triple-expansion pumping engine was placed in commission.

Crescent Hill Reservoir was contracted for in 1876, and completed in December, 1879, from which date to the time Crescent Hill Pumping Station started in operation the city water supply was fed from the reservoir, and the pressure throughout the city was limited by the head due to the water level therein.

During 1896 and 1897 a series of experiments were conducted with a view to filtering the city's water supply, the result of which was the design of the present filtration plant. This investigation was one of the pioneer movements along the line of water purification for a municipal supply on an extended scale, and the results of these experiments, and the data secured thereby, have been far-reaching in the promulgation of a broader and more scientific knowledge of the subject of filtration.

In 1898 the first step in actual construction of the filter was taken, through the letting of the contract for the Clear Water Basin and Filter House. The work under this contract was not completed until 1902, and the construction of the coagulant house and filter tanks was finished shortly thereafter.

The Clear Water Basin is a covered concrete reservoir 392 feet wide by 460 feet long and 22 feet deep. The roof consists of a series of groined arches supported by massive concrete columns each 40 inches in diameter and 22 feet high to the springing line of the arch and spaced 22 feet apart from center to center. This basin covers an area of 180,000 square feet, and has a capacity of twenty-five million gallons. The Filter House is located over the easterly end of the Clear Water Basin, and is of ample size to accommodate the construction of another set of filter beds of the same capacity as the present filter.

In 1903 a contract for two twenty-four million gallon triple-expansion pumping engines and boiler equipment for Crescent Hill was awarded to the Holly Manufacturing Company, and during the same year the construction of the Crescent Hill Pumping Station and Boiler House was started. Work on these structures and on other portions of the filtration plant progressed slowly for several years. The two pumping engines were finished and placed in service in July, 1907, and the filter plant as originally designed was pronounced complete and ready for operation in February, 1908.

Owing to the fact that certain features of the strainer and washing system in the original design (which had worked successfully in the experimental stages) proved to be inadequate to the requirements of actual operation, extensive alterations had to be undertaken in the redesigning and remodeling of the filter beds, in consequence of which successful operation of the filter plant was not finally realized until July, 1909, since which date the citizens of Louisville have enjoyed the luxury of a supply of perfectly clear, wholesome water.

In September, 1907, contracts were entered into with the Holly Manufacturing Company for a third twenty-four million gallon pumping engine for Crescent Hill Station, and with the Allis-Chalmers Company for the twenty-four million gallon pumping engine for the River Pumping Station previously referred to. Both of these engines were completed ready for operation in December, 1908.

The Coagulating Basin, which was not included in the original plans for the filtration plant, was contracted for in June, 1909, and completed in 1910, and while the filter might have been operated without this basin, much better results in the way of coagulation can be obtained through its use.

IMPROVEMENTS.

The most important improvements now under contract are the construction of the Intake and Screen Tower at the River Station, and the installation of the thirty million gallon Steam Turbine-driven Centrifugal Pump to replace the Cornish engines at River Station No. 1.

The Intake and Screen Tower, with its connections, will increase the capacity of the conduits leading to both pumping stations, and will provide improved facilities for screening the water before it reaches the pumps.

The new Contrifugal Pump, with a capacity of thirty million gallons in twenty-four hours, is intended for a reserve, providing a total pumpage capacity of seventy million gallons daily at the River Stations. A new boiler plant, with automatic stoker, induced draft and superheater, is included in this contract.

OPERATION.

The water supply for Louisville is taken from the Ohio River through a steel-lined conduit to Station No. 1, and two submerged iron pipes, each thirty-six inches in diameter, to Station No. 2, the outer ends of which are protected by a timber crib built about one hundred feet from the southerly shore line. Through these the water is conducted to the pump wells of the pumping stations, whence it is forced by the large pumping engines up to Crescent Hill Reservoir through four cast-iron pump mains, two thirty inches and two thirty-six inches in diameter and about two miles long. The level of the water in the reservoir when full is 175 feet above low water in the river, but the frictional resistance to the flow of the water through the long mains raises the pressure against the pumps to a dynamic head equivalent to about 190 feet.

From Crescent Hill Reservoir, where the muddy water has an average of three days' sedimentation, it flows into the new Coagulating Basin, directly across the road, where the coagulant in the form of aluminum sulphate solution is introduced, through which medium the greater portion of sediment and other impurities remaining in the water are precipitated, and the partially clarified water is then conducted to the sand filter beds, where all remaining foreign matter is filtered out and the pure effluent run off into the clear water reservoir, ready for distribution through the mains.

FILTRATION.

The process of filtration is a comparatively simple one, and in general principle the system employed for filtering the Ohio River water at Louisville differs but slightly from the methods which have been in use in other localities for a number of years.

As now constructed the filter plant consists, first, of a Coagulating Basin, having two compartments, one 80x340 feet with a capacity of four million gallons, and the other 160x340 feet containing eight million gallons, each about twenty feet in depth, with baffle walls to divert the direction of the flow of water; second, a solution tank in duplicate, each section holding 140,000 gallons, where the aluminum sulphate solution is mixed and stored, and from which it is conveyed to the Coagulating Basin; and third, the Filter proper, consisting of six filter beds, each 30x72 feet, giving a total area of 12,960 square feet, or three-tenths of an acre, and a filtering capacity of thirty-six million gallons per day.

The aluminum sulphate or alum is dissolved in the solution tank, usually in the form of a two per cent. solution, and is conveyed thence through four-inch pipes to the regulating chamber of the Coagulating Basin, where it is mixed with the turbid water as it flows in from Crescent Hill Reservoir, the quantity of alum varying, with the degree of turbidity, from one-half grain to upward of two grains per gallon of water treated. After receiving the sulphate solution the water flows through the winding passage formed by the baffle walls in the Coagulating Basin, allowing the coagulant to perform its part of the work of clarifying and purifying the water. The action of the coagulant tends

to collect the minute particles of clay held in suspension in the water into masses or "floc," at the same time enmeshing the bacteria, and these flocculent masses are rapidly precipitated, thereby effecting in a few hours a greater percentage of clarification than could be gained by several days' plain subsidence.

At the end of its passage through the Coagulating Basin the water is drawn off from near the surface, flowing by gravity through a forty-eight inch main to the filter, and distributed equally over the different filter beds, where the final process of filtration takes place.

This final action of the filter, when stripped of all technical verbiage, is simply a straining process. The filter is a large steel takng containing a bed of sand and gravel thirty-four inches in depth, with a strainer system at the bottom, through which the water passes into the effluent collectors, after percolating through the sand in the process of filtration, and through which the water for washing the filter also is forced. The stratified gravel is placed around the strainers, the layers of finer particles at the top, and held in place by means of a woven wire screen, and above this is the bed of sand.

As the water which flows from the Coagulating Basin is distributed over the top of this bed, it passes down through the sand, which acts as a strainer, and practically all of the remaining matter held in suspension in the water is collected on the uppermost surface of the sand layer, the coagulation of the solids aiding this process by forming a gelatinous film on the sand surface. On an average only a fraction of one per cent. of the bacteria contained in the river water find their way through the filters, and these are mostly saprophytic organisms, the less resistant pathogenic or sewage organisms, which alone are disease-producing, being almost entirely removed.

The level of the water on the filters is automatically maintained at a depth of about eighteen inches above the sand level, and its rate of flow through the sand bed is regulated by means of a submerged orifice, which at all times controls the quantity of discharge, maintaining it at a uniform rate of approximately 4,500 gallons per minute for each bed, the success of filtration being largely due to this uniform control. After a certain period, verying with the turbidity of the water or the prevalence of

micro-organisms, the sand bed becomes so clogged as to impede the passage of the required amount of water, and it has to be thrown out of service and washed. This accomplished by reversing the current and forcing clear water upward from the bottom through the sand at a rate and under a pressure sufficient to keep all of the sand in suspension for three or four minutes, when the mud which has been collected on the surface during the "run" is carried up by the flow of wash-water, overflowing into the wash-water troughs, and discharging into the sewer. After this washing the bed is again ready to perform its functions for another "run."

The results obtained through the operation of the filter have been satisfactory in every particular. The turbidity of the Ohio River water, which is sometimes as high as 5,000 parts per million, has been uniformly reduced to zero, or absolute clarification, and the bacteria has been reduced 99 per cent. The total hardness of the water has not increased, and there is not the slightest perceptible evidence of any alum remaining in the filtered water.

A better comprehension of the work done by the reservoirs and filter is conveyed by the statement that over six thousand (6,000) tons of mud is removed annually, from the water supplied to the city, equivalent to about twenty wagon loads daily. In this process of removal Crescent Hill Reservoir takes out about 42 per cent., the Coagulating Basin 46 per cent., and the filter proper the remaining 12 per cent. When the improvements now being made to Crescent Hill Reservoir are completed, the results obtained by sedimentation alone, will probably exceed 50 per cent.

PUMPAGE.

Prior to the construction of the Filter Plant and Pumping Station, the water pressure in the city, as previous noted, was that due to the height of water in Crescent Hill Reservoir; but through the process of filtration and the transfer of the final source of supply to the Clear Water Reservoir, there was an average loss of head of over forty feet. In order to overcome this loss in elevation, and to furnish the additional pressure adequate to the growing demands of the city, re-pumpage had to be resorted to, and to meet this condition the pumping station at Crescent Hill was designed.

The water from the Clear Water Reservoir is pumped up into the riser of the stand-pipe at Crescent Hill to a height of about one hundred feet above the level of Frankfort Avenue, resulting in a pressure of forty pounds per square inch at the engines and from seventy to seventy-five pounds in the commercial center of the city. This is approximately twenty pounds greater than that obtained under the ocnditions existing prior to the construction of Crescent Hill Pumping Station.

The elevated steel tank or stand-pipe has a capacity of 1,200,000 gallons, and to the top of the tank is 220 feet above the street level. It was designed and built with a view to pumping the city's water supply up to that elevation, and as the ultimate object, increasing the water pressure to one hundred pounds per square inch at the engines, or sixty pounds per square inch greater than the present normal pressure. Experience, however, demonstrated that many of the water mains could not safely withstand this proposed increase, and as there appears to be no legitimate reason for maintaing such a pressure, the tank has never been utilized in actual operation. The use of the riser to the standpipe is confined to its value as a safety-valve, or balance to the pumps, under sudden variations of pressure, resulting from rapid fluctations in the quantity of discharge or consumption.

DISTRIBUTION.

The water supply is distributed throughout the city and its environs by means of 368 miles of cast-iron mains, varying in size from three inches to forty-eight inches in diameter. There are 74 miles of main supply arteries twelve inches in diameter and over, and 294 miles of

distribution pipe from three inches to ten inches in diameter. From these mains the water is conducted to dwelling houses and industrial plants through over 37,000 service connections, averaging thirty feet each, or over 200 miles in total length. Hence an aggregate length of 570 miles of water pipe of all sizes is required for the distribution of the water supply to consumers—an amount sufficient to lay a line from Louisville to the Atlantic Seaboard.

CONSUMPTION.

The present rate of consumption averages over twenty-three million gallons per day, equivalent to one hundred gallons per day for each inhabitant of the city, taking as a basis for population the recent figures submitted by the Government Census Bureau, and while city water is not furnished to all of the inhabitants of Louisville, owing to the prevailing use of cisterns and wells in many sections, there is a relatively large population outside of the city that is being supplied, and this suburban consumption should tend to offset, in part, the number of city residents not so supplied.

DEVELOPMENT.

The steady growth and development of the business of the Water Company is shown by the following tabulated statement, giving the records for each decade:

1861	25.95	512	640.627 gals.
1870	57.95	3,436	2,817,299 gals.
1880	111.29	7,506	6,567,141 gals.
1890	154.94	13,512	11,874,688 gals.
1900	230.52	21,751	16,037,039 gals.
1910	348.27	35,159	22,130,917 gals.
1911	367.67	36,992	23,868,420 gals.

VALUE OF THE PLANT.

The following resume of the most important features of the Water Works shows the present value of each, and the total value of the plant:

Real Estate and Buildings	$ 402,621.62
River Pumping Station No. 1, with Engines	270,720.13
River Pumping Station No. 2, with Engines	844,564.15
Crescent Hill Reservoir	673,673.90
Crescent Hill Pumping Station—Building	214,982.44

Crescent Hill Pumping Station—	
Engines and Boilers	509,218.16
Crescent Hill Stand-pipe	74,738.35
Filter, Clear Water Reservoir, and Labaratory	1,081,171.18
Coagulating Basin	130,067.68
Pipe System	3,903,835.38
Minor Buildings at Crescent Hill	7,908.03
Stock and Equipment	47,377.37
Total Value of Plant	$8,160,878.39

PUMPING AND STORAGE FACILITIES.

The present equipment of River Station No. 2 has a pumping capacity of forty million gallons per day, and when the proposed improvements at River Station No. 1 are completed and the new Centrifugal Pump installed, there will be a further reserve of thirty million gallons, or a total available pumpage capacity of seventy million gallons per diem, equivalent to three times the average consumption of the city.

At the Crescent Hill Pumping Station there are three pumps, each capable of delivering twenty-four million gallons of water in twenty-four hours, or a combined daily capacity of seventy-two million gallons.

The Filter Plant has a total filtering capacity of thirty-six million gallons per day, but should not be relied on to furnish more than thirty million gallons, leaving one bed always in reserve.

The water storage facilities consist of Crescent Hill Reservoir, with an area of 752,000 square feet (seventeen acres) and having a capacity of one hundred million gallons, and the Clear Water Reservoir, with a capacity of twenty-five million gallons. The Coagulating Basin contains approximately twelve million gallons of water, but should not be considered in the light of a storage supply. The combined contents of Crescent Hill Reservoir and the Clear Water Basin, amounting to one hundred and twenty-five million gallons, could be depended upon to supply the city for four days at the normal rate of consumption in the event of some unforeseen emergency which might interrupt the supply from the River Station.

EFFICIENCY---I'TS RELATION TO THE ENGINEER

By a '96 Alumnus.

THE subject of efficiency or industrial engineering has received a great deal of attention in recent years in both private and public business and has been given much prominence by articles in both popular and technical magazines.

It is the opinion of a large number of engineers and business men as well and with good reasons that the subject is being carried to extremes and might be called a fad. Nevertheless there are some features which are quite logical and if properly handled will be of some assistance in causing improvements.

It is not intended in this article to enter into the subject in its many details of scientific management, accounting, etc., but to discuss such phases as relate to the engineer in his work.

For many years passed it has been the constant aim of the engineer not only to be able to design and construct safely and thoroughly but economically as well. It has been, and is, his business to lessen wastes of material, of friction, of effect and those due to crude organization and administration.

His successive efforts in the designing of a boiler or steam engine, turbine, motor, generato, bridge, building and many other similar products, have resulted in obtaing an advanced degree of efficiency and but little improvement can be promised for the immediate future with our present knowledge and working materials.

The average business man and engineer of today is being constantly urged by keen competition and the ever-present aim of advancement to seek other ways and means to create methods by which the cost of achievement can be decreased. A plant may be fitted with the most efficient types of equipment but it is put up to the superintendent or engineer to operate and maintain and it is his duty to properly handle the machinery, material, methods, management and men; all of which enter into the ultimate aim and is usually expressed in dollars and cents. The same is true of the building, bridge or other structure designed by the architect or engineer and its construction as carried out by the contractor who is depending more and more upon the skill and ingenuity of the trained en-

gineer.

If improvements are made whereby the unit costs of any work are decreased, we are practicing what is now called efficiency. Formerly, a man who saw such opportunities and consumated them was looked upon as being farsighted and shrewd.

In the business life of today, we are always looking for some improvement over the other fellow and in taking over or carrying out any work it is advisable to make a study of it in two ways:

First: An examination should be made of the facts and conditions as they exist; they should be analyzed, dissected, weighed and placed in a graphical form if possible which will always make them more evident to the eye and mind.

Second: This examination should place a person in a position to effect possible improvements by devising new methods and processes for carrying on the work more economically; new ideas may be developed and operations rearranged to make the processes more simple; and above all, it may be possible to create a human interest in the work.

In order to partially illustrate the workings of the preceding suggestions the following experience is related.

In the construction of a large building faced with cut stone, a plant was erected near the job to turn out the cut stone from the rough blocks. The plant was housed by a frame structure served with a 15 ton traveling crane and contained the very best types of stone cutting machinery consisting of gang saws, planners, diamond saw, lathe for turning and fluting columns and also the necessary fittings such as machine drill, emery wheels, forge, etc., etc. Two shifts of men were employed and work from 12 to 12, Sundays excepted.

After several weeks operation, it was found that the output was less than one-half of what was desired and expected and the unit cost excessive. Continuous prodding of the foreman in charge by letters and telegrams did not bring any better results and in order to locate the trouble, two boys were employed to work in 12 hour shifts and instructed to make a simple statement at five minute periods of all operations, both as to men and machinery. A continuous record was kept for one week. They were separated for each workman and his machine. One reading was sufficient to disclose where the fault lay. The machines were idle about one-half of the time while their operators were sharpening tools, waiting for the crane to load or unload the machine, selecting stone, oiling up, etc., etc.

Orders were given to instal a three-ton crane, also to add one additional man for sharpening tools, several laborers for handling the stone, oiling, etc. In less than one week's time the number of cubic feet of stone turned out was more than doubled and the unit cost for labor was almost sliced in half.

The foreman in charge of this plant had shown his ability in a smaller plant operated by this company but was unable to observe that the men were not working to the best advantage in the larger plant.

One of the most desirable qualifications that is a large asset in business life is the power of observation. Too many of us go through our daily activities with no effort to improve the methods handed down to us and fail to cultivate the power of observation in both our own work and that of others which may be going on around us. It is frequently possible to prevent mistakes if we have been diligent in observing how the other fellow did it and where his methods could have been improved.

On a piece of construction work in charge of an Army officer, deviations from the specifications were always met with the question "why." Fortunately this gentleman had had a broad experience and was always open to conviction. In answer to an inquiry as to his gruff "why," he explained that in his training at West Point it was continually hammered into him to seek the root of every operation and to reasonably un-

derstand the manipulation of every transaction that might come under his direction.

This word should be cultivated by every engineer and used not only in the manner as by the Army Officer, but in another way as well, and that is to question every operation with the object of effecting some improvement.

Granting that an engineer is thoroughly acquainted with every detail of the work in charge a continued questioning of "why cannot these machines or these mechanics or these laborers be handled in some manner to cut the unit cost?" will eventually result in improvement and effi ciency is the art of improving on the operations of the other fellow.

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NEW YORK ROSE TECH CLUB.

THE Rose Tech Club of New York held its annual dinner Saturday evening, Feb. 17th, at the Engineer's Club in New York City with Dr. Mees as the guest of honor and twenty-seven of the alumni present.

It was desired to make this more of a mid-winter reunion of the Alumni in general than a purely local dinner, so invitations were sent to all the Alumni of Rose Polytechnic. While most of the men were not in a position to accept, a large number sent letters expressing their greteings and good wishes to those more fortunately situated; a number of these letters were read after the dinner to give the sentiments of the absent Alumni and were received with pleasure by all present.

After a very good dinner and with plenty of cigars at hand, informal talks on interesting subjects were given by several of the Alumni. Mr. Sames acted as chairman and introduced the various speakers, beginning with Dr. Mees, who gave us a very good outline of the present state of affairs at the Institute. He also discussed the future of the school in respect to its policy and aims and to changes proposed in its physical condition. These points were discussed by several of the alumni from the viewpoint of the man who is prepared by a technical education to make his way in the world.

Very few of the men present did not recognize the little ivory folding scale which "Doc" still uses to emphasize his remarks, and one '09 man was so glad to see Dr. Mees again that he greeted him twice within five minutes!

After having enjoyed a very pleasant evening, the meeting broke up about midnight. Everyone expressed the wish that he might be able to be present next year and hoped that more of the out-of-town Alumni could be with us at that time.

The great success of the dinner must be attributed to the untiring efforts of Mr. Putnam and Mr. Bowers, then President and Acting Secretary, respectively.

Before the adjournment, Mr. Boehm, '91, was elected President and the writer, Secretary, for the current year.

Those in attendance were:

Dr. Mees
Putnam, '86
Sames, '86
Gilbert, '89
Holding, '89
Collett, '90
Thurston, '90
Boehm, '91
Albert, W. H., '93
Hubbel, '98
Montgomery, '98
Cox, N. H. '03 Schwable, '99
French, '04 Davis, '99
Peddle, '05 Keyes, '99
Watson, 05 Michel, '03
Kahlert, '06
Ryan, '06
Willien, '06
Hatch, '06
Andrick, '07
Hammond, '09
Lee, '09
Bowers, '10
Kornfeld, '11

Frederick N. Hatch, Secretary.

THE St. Louis Alumni met at the St. Louis Club January 17th, with Dr. Mees and Mr. W. C. Ball as guests of honor. An interesting discussion of the school's past, present and future was held by all present.

Those present were: Dr. C. L. Mees, Mr. W. C. Ball, W. A. Layman, '92; M. C. Andrews, '94; J. J. Kessler, Jr., '97; G. E. Wells, '96; T. D. Witherspoon, 1900; R. M. Stubbs, '08; P. A. Phillipi, '09.

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THE officers of the Rose Tech Clubs are as follows:

Chicago Tech Club:
Walter B. Wiley, '89, President.
Harry H. Orr, '07, Secretary.

Cleveland Tech Club:
Jay H. Hall, '97, President.
Harry S. Richardson, 1900, Secretary.

Indianapolis Tech Club:
Herbert Foltz, '86, President.
Arthur M. Hood, '93, Secretary.

Louisville Tech Club:
Addison W. Lee, '06, President.
Walter B. Kuersteiner, '10, Secretary.

New York Tech Club:
W. H. Boehm, '91, President.
Fred N. Hatch, '06, Secretary.

Pittsburgh Tech Club:
Harrison W. Craver, '95, President.
Arthur F. Gordon, '97, Secretary.

St. Louis Tech Club:
John J. Kessler, Jr., '97, President.
H. Edmund Wiedemann, '03, Secretary.

Terre Haute Tech Club:
Omar C. Mewhinney, '91, President.
Max J. Hammel, '01, Secretary.

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ALUMNI NOTES.

Barton R. Shoover, '90, has been appointed steel plant Superintendent for the Brier Hill Steel Company at Youngstown, Ohio.

W. A. Layman, '92, has been appointed president of the Wagner Electric Company of St. Louis.

A. A. Bareuther, '10, has been appointed Inspector with the Isthmus Canal Commission at East Pittsburgh, Pa.

Carson A. French, '04, assistant Engineer of the Corrugated Bar Co., has been transferred from Buffalo to New York City.

Byron L. Kelso, '08, has returned to the Stone and Webster Engineering Corporation and is now at Keokuk, Iowa. He was with the American Bridge Co., at Pittsburgh.

C. F. Werst, '11, with the Stone & Webster Engineering Corporation, has been transferred to Keokuk, Iowa.

H. R. Voelker, '11, who has been with the Baldwin Locomotive Works at Philadelphia, is now a special apprentice at the shops of the Pennsylvania Railway at Columbus, Ohio.

H. O. Wimsett, '11, is with the Bullock Electric Company at Cincinnati, Ohio.

T. T. Barret, Jr., '11, is with the Edison Electric Co., of Los Angeles, Cal.

W. B. Shook, '11, is with Herbert Foltz, Architect, Indianapolis.

The following wedding announcements are made:

Miss Rosa Bailey Knapp to Mr. Robert York, 1900. Memphis, Tenn., Jan. 3, 1912.

Miss Ruby Kellog to Mr. Geo. H. Crain, '04, San Francisco, Cal., Jan. 22, 1912.

Miss Sarah Frances Sammis to Mr. Leo Dorn, '04, Nov. 17, 1911, New York City.

Miss Laura Warner Turner to Mr. Warren Kelley, '07, Dec. 6, 1911. Bluewater, N. M.

THE PROBLEM OF THE MISSISSIPPI

By Albert F. Brennan, '13.

IMPROVEMENTS along the Mississippi River have two general purposes in view —the deepening of the channel and the protection of the towns and farms along the banks in times of flood. The average person does not realize what a big proposition the government is up against in trying to do these two things. In order to understand what the people down there have to contend with, it is necessary that one should know something of what is generally termed the "cussedness" of the river.

Above the mouth of the Missouri, the bed of the river is composed principally of rock, and there is no trouble there as far as the channel is concerned. Then, too, that portion of the stream is well dyked, and is hardly large enough to cause any considerable damage on account of floods. Below the mouth of the Missouri, however, the bed and banks of the river are composed of fine mud, or silt, and when this point is reached, the troubles of the government engineers begin. The banks cave and wash away very easily, especially at bends, and there are plenty of bends. Whole islands have been washed away. There used to be an island, Forest Home, thirty-five mies from St. Louis, four acres in size. Last October it disappeared in forty-eight hours. It had been there ever since any one could remember. The river simply washed it away. The reverse operation occurs oftener, that is, an island is built up by the river. These islands are called "tow-heads." After several years, they grow up in trees and are called islands. There are hundreds of them in the river. At times they are washed away again, as quickly as they formed.

Vicksburg was formerly situated on the river thus: Grant tried to dig a canal through here in the Civil War, but he failed. Later, I do not know just when, the river cut through, a mile nearer the city than Grant's canal. Hence, Vicksburg is now two miles off of the main channel of the river. This leaves a small portion of Louisiana completely surrounded by the Mississippi.

At a point about thirty miles above Memphis, the river changed its bed, and cut off several hundred acres from the state of Tennessee, forming Dean's Island. Tennessee claims this land, but as it is on the Arkansas side of the channel, Arkansas has been fighting in the courts for it for several years. I do not know whether the contest has been settled yet or not.

The channel is constantly changing all along the river. At "Pull Tight," 14 miles south of St. Louis, it will change from one side of the river to the other about once a month. A pilot must be on the river constantly, or he will lose out, on account of these changes.

So much for the channel. The damages from the floods are too well known to need mention here.

About the first thing that was ever done to overcome these difficulties and dangers was the construction of levees. Contrary to the general opinion, these levees do not run right along the banks of the river, but are at times several miles away from it. They were originally started many years ago by private parties. Any man who had a farm near the river would build a sort of dirt bank or levee around it as a protection against floods. Gradually there increased in number and were connected to each other. Finally, the various state and national governments took up the work. The result is that today the levee is practically continuous on both sides of the river from Cairo to New Orleans. In some places it reaches twenty feet in height.

In ordinary times, these levees are quite sufficient against floods, but if the river gets close to the high water mark, they break in many places, especially in the country, where they are constructed of dirt alone. Another disadvantage of the levees is that, in some way or other, they tend to heighten the level of the bed of the river. Therefore, they must be made higher from yar to year. As a result, at New Orleans, the level of the river is above that of the surrounding country. Should the levee ever break at this or any similar point, the result can easily be forseen.

The caving of the banks along the Mississippi causes as much trouble as any other one thing. The soil is alluvial, and washes easily. The water slowly undermines the bank, and in the end, it slips into the river, and helps to fill up the channel, thus hindering navigation. In order to overcome this, the banks were formerly revetted in many places. This was done in the following manner:

So-called mats were constructed, about 300x 1,000 feet. These were made on a frame of willow poles, woven together, and fastened by cables. This frame was loaded with rock by means of wheel barrows, until it would barely float. Then barges were drawn alongside of it and stone was thrown on by hand until the mat sunk. It was sunk right along the shore, at the point where the bank was caving. The bank was then graded with hydraulic pumps to a slope of one in four, and a pavement of rock was laid upon it. The total cost of this was about $30 per lineal foot. Of this about 45 per cent. represents labor and 55 per cent. material.

From the solid manner of their construction, it might seem that these mats would last forever, but such is not the case. When the river goes down after a prolonged flood, at times it leaves them a mile away from the channel up on dry land. On account of the expense and unsatisfactory results, this revetment work was discontinued in 1903. As yet, no engineer has been able to devise a means of permanently holding these banks, and many pilots say that until this is done, the channel will not be benefitted.

One plan that has been proposed to ameliorate the conditions along the river is the construction of storage reservoirs at suitable points along the various tributaries of the Mississippi. The possibilities of such a system as applied to the Ohio River have been carefully investigated by M. O. Leighton, of the U. S. Geological Survey. He has studied carefully the topography of the country, and determined the best places for such reservoirs. The water which naturally drains to the rivers would be drained to them and held there until times of low water. In some places, these could be constructed large enough to hold the water drained from a given area for an entire year. At other points, only 25, 50 or 75 per cent. could be held. The plan as outlined by Mr. Leighton,

contemplates the construction of about one hundred reservoirs in the Ohio Valley. The capacity of each would vary greatly. The results of such a system, as nearly as can be estimated, would be about as follows:

The high water stage all along the river would be reducesd from three to ten feet. At Cairo the reduction would be four or five feet. This would be sufficient in almost every case, to bring the level below the so-called danger line. (At Cairo this is 50 feet.)

In low water, a nine foot stage would be assured at practically all points between Pittsburg and Cairo. The water gets as low as three feet at times, under existing conditions.

The range between the high and low water levels would be much smaller than at present, and disastrous floods would be avoided.

This system has been found successful along the Volga and Utsa Rivers in Russia. Floods are practically unknown there now, whereas formerly they were frequent. The surrounding country is prosperous. Practically all transportation is by river.

The cost of these reservoirs for the Ohio and its tributaries, as nearly as can be estimated, would be $125,000,000. At first glance, this amount seems appalling ,but considered in the light of other circumstances it becomes less so. It is said by Mr. Leighton, in his report, that, whether this system is adopted or not, the government will probably spend this amount on the Ohio in the next twenty years. As it would take at least this long to complete such a system, why not put the money in such permanent improvements as reservoirs? Such a system, it must be remembered, would benefit many tributaries as well as the Ohio itself.

In the year 1907, there were two floods in January and March. The total estimated damage was $100,000,000. If a system of reservoirs would overcome these floods, would their cost be wasted? I think not. The proprietor of one large manufacturing plant on the Ohio has said:

"We can prosper without water transportation, but we cannot withstand flood losses. If floods persist, we must move."

Such a system would make available, also, an enormous amount of water power. The government could sell the rights to this and put back into the Treasury every cent of the cost.

Were the scheme applied to the western tributaries of the Mississippi, as well as the Ohio the surplus storage water could be used for irrigation, also.

Such are the claims of the advocates of the reservoir system. As this system has never been given a trial in this country, it is hard to say whether these claims could be substantiated or not.

Beginning at a point about fifty miles below Natchez, the river makes a long curve to the east, finally ending in the gulf. Many engineers claim that if a canal was constructed from this point straight to the gulf, it would increase the capacity for outflow, and prevent overflow. Where this canal met the river, a dam could be constructed in such a way that the water would flow over it into the canal in times of high water only. In low water, the river would take its natural course.

It is peculiar to note that the advocates of the outlet system say that the only logical way to improve a river is to begin at the mouth, while those in favor of the reservoir systems maintain that the opposite is true.

We now come to the consideration of what the final solution of the problem will be. The concensus of opinion seems to be that this solution will be a combination of the reservoir and outlet systems. The total cost of both systems for the whole Mississippi Valley would run into the billions of dollars, but the property they would save from destruction by flood would easily pay a good return on the investment. Considered as a means of navigation, the river is not worth the money, but something must be done to give permanent relief from floods, and this seems to be the only way out of the difficulty.

April 6—Eastern Ill. Normal at Terre Haute.
April 13—Indiana University at Terre Haute.
April 17—Indiana University at Bloomington.
April 20—Wabash at Terre Haute.
April 27—Culver at Culver.
April 29—Notre Dame at Notre Dame.
May 3—DePauw at Terre Haute.
May 4—Eastern Ill. Normal at Charleston.
May 6—DePauw at Greencastle.
May 11—Hanover at Terre Haute.
May 17—Wabash at Crawfordsville.
June 1—Earlham at Terre Haute.

The above is the baseball schedule as arranged by Manager Krieger so far. There are more games under consideration but the dates and places of playing are as yet undecided. It may be that a team of Chinese players from the College of Hawaii will play Rose at Terre Haute on April 25. They are going to make a tour of the United States this spring and as Terre Haute is on their way east they want to play here on a stopover from St. Louis. The game would be a good drawing card and it might be that it would stimulate a little interest in Rose Tech base ball. It is certainly a fact that the said interest is lacking in the people of Terre Haute. By the time this *Technic* is issued the ball practice will have been started. From the kind of weather we are having at the present time it looks as if the men will have to work in the gymnasium until late. The first game comes early, April 6, but Capt. Lawler should have his team in pretty fair shape by that time. Now as to the material. Outside of the battery the candidates are of only medium ability, that is, as far as is known. There is always the chance of some stars showing up in the freshman class, but it is always best to wait and find out as there are rumors of stars each year that never show up. At any rate we have Lawler and Nehf to start with and with that pair working as they did last year it is hardly necessary to worry about the rest of the team. For first base there is Deming and Byers, each of whom played at that position last year. For the infield, the only candidates so far seem to be Floyd, Ahrens and Fishback, all of whom have had some experience. There are no old men for the outfield and it will be made up of freshmen most likely. Hegarty, Sheldon, Stoltz and Wright are the only ones heard of so far, all being freshmen. There is no reason why we shouldn't have a good team this year.

AMES G. MOORE, 1914, has been elected track captain this year by the members of last year's track team. Moore, who is better known as "Dutch" was not in school the first term this year, but the election was not held until after the second term was started and his election was nearly unanimous. Moore is the best in the dashes although he weighs above 175 pounds. Last year he was the fastest of any of the men who came out for the track team. There is a good deal of interest in track right now and if the men keep up the spirit Rose should regain some of its lost laurels of the cinder track. If the squad can have a coach we should be well represented this year and at least score some points in the I. C. A. L. meet. Manager Kelley is trying to arrange more than the usual number of meets for this spring.

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ROSE POLYTECHNIC—Secondary College Basket Ball Champions.

It has been a long while since any secondary college has had such a just claim on the secondary championship as Rose has this year. The only team that could possibly question the title is Wabash and since Tech defeated them on their own floor in the last game between the two teams they haven't much claim. In the first place it nearly takes a Western Championship team to defeat Wabash at Crawfordsville, as everyone knows, and if a team does defeat them there, it is practically decided that the said team is the better of the two. That settles Wabash. Rose defeated DePauw, Earlham, Indiana, Franklin and Hanover and since both DePauw and Earlham have defeated Butler all the rest of the secondary colleges are accounted for. So it is no rash assertion that Rose Tech is represented by the secondary champions. The team has played great basketball this year and every man has worked hard for the reputation gained. With good material to start with and a good coach the play has improved wonderfully over that of last year when we had practically the same line-up. One thing that has been pleasing to note is the absence of any individualism and internal strife that has been noticeable in the last few years. It is a reputation gained and one to be proud of.

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ROSE 20—WABASH 18.

Nothing but victories to tell about this month. Since the last Technic there have been five games, all of which can be placed in the won column. The first of these is with Wabash. The said triumph occurred at Crawfordsville as has been stated before. It was the second time that Rose had ever defeated Wabash and the first time on their own floor. The first half was close and ended with the score 8 to 8. Shortly after the second half started, Lambert was barred on account of four personal fouls. Captain Crowe covered Lambert so close in the first half that the famous Wabash star did not get a goal. It was the guarding of Poggenssee and Crowe that was doing the work for Rose, but early in the second half Eglin was left clear and Wabash obtained a lead of 12 to 8. It was then that the fighting spirit of Rose showed and from then on the team played great basket ball. Ellis failed to keep Gray covered and the center got four field goals. Wente also came into the scoring with some of his famous shots. It was a disappointed crowd of Wabash students that went home from the game that night. The score:

Rose (20)	Position	Wabash (18)
Wente	F	Lambert, Bishop
Deming, Hegarty	F	Eglin
Gray	C	Ellis
Crowe	G	Hill
Poggenssee	G	Burrows, Cloyd

Field Goals: Gray 4, Wente 3, Poggensee, Deming, Eglin 4, Ellis 2, Hill. Four Goals—Deming, Hegarty, Lambert 2, Eglin 2. Referee—Reimann of Purdue. Time of halves—20 minutes.

ROSE 30—McKENDREE COL. 18.

McKendree came to Terre Haute with quite a reputation but Rose more than held her own and when the final whistle blew we had doubled the score. McKendee started in with a rush and played some great basket ball in the first half and this period only ended Rose 12; McKendree 10. But the old fighting spirit came out in the seocnd half and the men from Lebanon, Illinois, were outclassed. McKendree displayed some pretty playing in the first half and it looked as if Rose might meet defeat but as has been demonstrated in all of the games this year the Engineers are best in the second period. The score:

Rose (36)	Position	McKendree (18)
Wente	F	Willi
Deming, Hegarty	F	Isaacs
Gray	C	Stokes
Crowe, Deming	G	Beedle
Poggenssee	G	Ebler

Field Goals: Gray 6, Hegarty 5, Wente 4, Deming 2, Poggenssee, Isaacs 4, Stokes 4, Beedle. Referee—Westover, Purdue. Time of halves—20 minutes.

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ROSE 27—FRANKLIN 12.

The defeat received at Franklin was wiped out in this game as it was plain that Rose was far out of the class of its opponents. It was an exciting game at that, one of the kind that keeps the rooters on their feet all of the time. The scoring began right away and in the first half Rose once had Franklin 11 to 0 but Franklin pulled together and the first half ended 11 to 7. The score:

Rose (27)	Position	Franklin (12)
Wente	F	Hill
Deming, Hegarty	F	McQuinn
Gray	C	Sheek, Meyers
Crowe, Deming, Harrison, Sheldon	G	Burton
Poggenssee	G	Wagner

Field Goals: Wente 5, Gray 4, Deming, Poggenssee, Hill, McQuinn 2. Foul Goals: Wente 3, Deming 2, McQuinn 6. Referee—Westover, Purdue. Time of halves—20 minutes.

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ROSE 24—DePAUW 12.

The result of this game was never in doubt. It gives a great deal of satisfaction to win a game from DePauw in any branch of sport but when a team wins a decisive victory, like this one was, a feeling of more than satisfaction is the result, in fact we would like to "crow" a little. The guards put up an especially strong defense against the Methodists. It made the second victory for the week, Franklin being the first victim. The score:

Rose (34)	Position	DePauw (12)
Wente	F	Pierson
Deming, Hegarty	F	Hollopeter, Groat
Gray	C	Austin, Fleming
Crowe, Deming	G	Walker
Poggenssee	G	Hawthorne

Field Goals: Hegarty 3, Deming 2, Wente 2, Gray 2, Crowe 2, Pierson, Hollopeter, Walker. Foul Goals: Pierson 6, Hegarty, Deming. Referee—Reimann, Purdue. Time of halves—20 minutes.

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ROSE 55—HANOVER 2.

Nary a field goal did the Hanover players get and they were lucky to score the two points on fouls that they did. The defense put up by Rose was great and in the second half the Hanover forwards could not get the ball anywhere near their end of the floor, while the Rose forwards and center were bombarding their goal. To give an idea of the second half, the first half ended 13 to 2, meaning that the Engineers scored 42 points in the second period while Hanover did not get any markers. The goal throwing of Wente was sensational, most of his shots being taken from the center of the floor. Gray led in the scoring with nine field goals and Wente and Hegarty followed with

seven each. It was a fitting close for the basket ball season in Terer Haute. Only one more game remains, that with Indiana at Bloomington. The score:

Rose (55)	Position.	Hanover (2)
Wente	F	Kehoe
Deming, Hegarty	F	Trotter
Gray	C	Dawson
Crowe, Deming	G	Mann
Poggenssee	G	Iddings, Ramsey

Field Goals: Gray 9, Wente 7, Hegarty 7, Poggenssee 2. Foul goals: Deming 3, Hegarty 2, Trotter 2. Referee—McCullough. Time of Halves—20 minutes.

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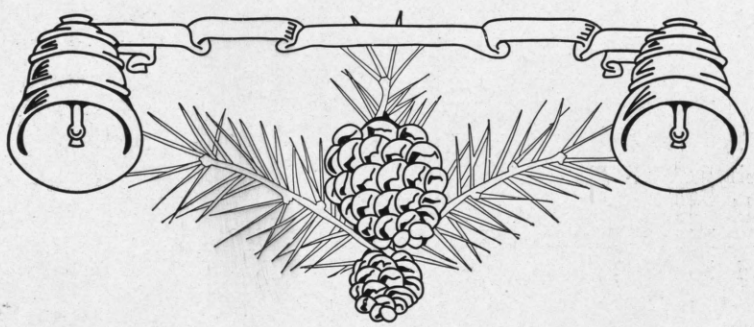
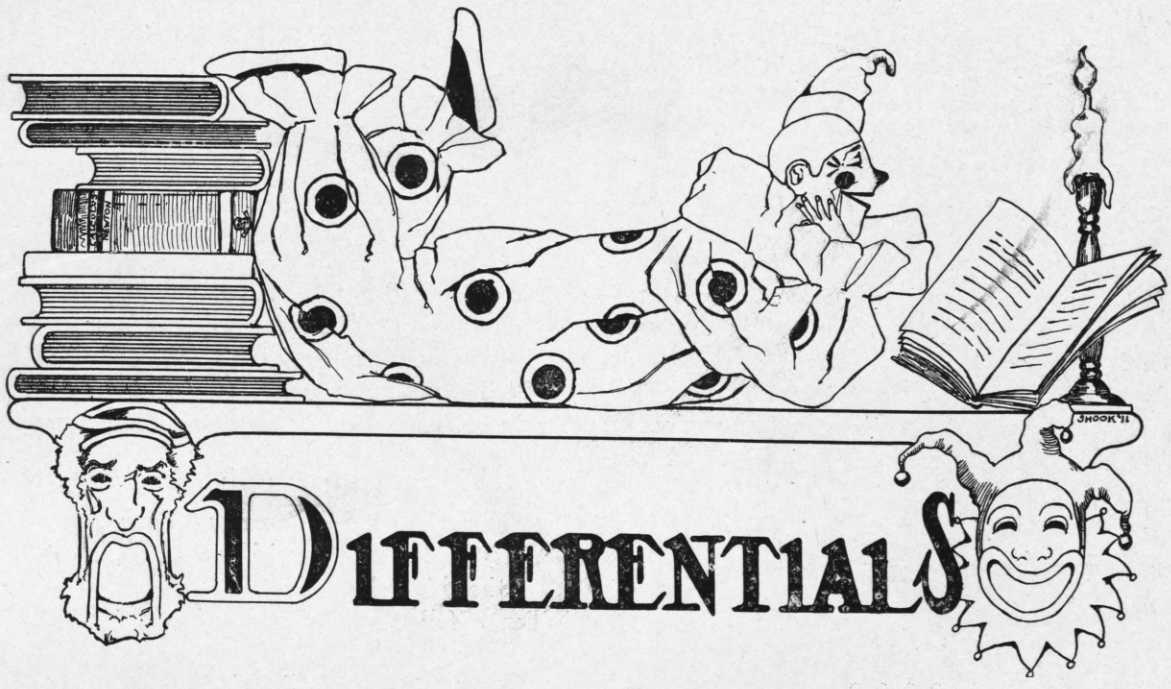
Rose dan away off from its opponents this month in the number of points scored. Last month it was 179 against 182, but now it stands Rose 337; Opponents 244. Hegarty still leads with Wente and Gray running a close race for second place. The players and the points they scored are shown in the following table:

Player.	Field Goals.	Foul Goals.	Tt. Points
Hegarty	38	38	114
Wente	40	6	86
Gray	42	....	84
Deming	12	7	31
Poggenssee	8	....	16
Crowe	2	....	4
Black	1	....	2
Sheldon	0	....	0
Harrison	0	....	0
Totals	143	51	337

Rose 337; Opponents 244.





Prof. Johonnot—Haven't seen you since you got up.

Prof. McCormick—Haven't been in bed, except at night, and I expect that is more than you can say.

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Bailey was looking through the Spectroscope after having had a hard night's study (?) when someone remarked:

"Let him take it home with him; he'll have more time!"

* * * *

Doc White (in Chem. Tech.)—The earth was supposed to be populated with large animals of horrible shape, such as some of you have seen—in Geographies.

* * * *

Wicky (to Sophomore German class)—Somebody close the transom, and I'll tell you a story.

Hath—Well, I never smoked until I came to Terre Haute.

Brewer—This is a smoky place.

Brennan—And how did you happen to start, Professor?

Adams—Not until they passed the cigars in the School Board meeting.

* * * *

Klingman (in Electricity)—How is that urge (erg) made up?

* * * *

If President Taft can laugh for an hour, how long can Minnehaha?

If Anna Held four aces, and John Drew a royal flush, how could Nat Goodwin?

If a man wanted money from the beef trust, how could he suet?

If the chamber maid a guest mad, would the house keeper?

Newhart (translating "Il n'est pas necessaire que vous perdiez votre temps")—It is not necessary that you lose your temper.

* * * *

Harris (translating a Greek word in the German lesson—This is derived from the Greek "Chop suey."

* * * *

Burns (to Hansen, who was smoking a corncob)—Why don't you try Sunshine Lump in that?

* * * *

Doc White—Mr. Harris, is water a mineral?

Dutch—I'm not sure, but I've heard of mineral water.

* * * *

"Do you want a narrow man's comb?" asked the clerk.

"No," replied Joe Wilson, "I want a comb for a stout man with rubber teeth."

* * * *

Knicker—How long does the cook promise to stay?

Mrs. Knicker—She says she will finish breaking this set of china.

* * * *

"One or the other of us is going to be turned down tonight," muttered John to Mabel, as he gazed at the gas light.

* * * *

"How cold your nose is!"

These words came from the daughter of the house, who was sitting in the parlor with her beau.

"Is Towser in the parlor again?" demanded her mother from the next room.

There was a long pause.

"No mother; Towser isn't in the parlor." And then silence resumed its reign.

* * * *

The Brother—She's got lovable eyes, kissable lips, a huggable shape and holdable hands.

His Sister—Yes, and she's got removable hair, adjustable hips, colorable brows and a transferable complexion.

THE GOOD LOSER.

"It's easy enough to be cheerful
When life moves along with a song,
  But the man worth while
  Is the guy with the smile
When everything's going dead wrong."

This old world is full of good winners
Who can grin with their hands full of trumps,
  But we honor the name
  Of the guy who is game
And can smile when he's getting his bumps.

There are plenty of girls who are willing
To share the good fortunes, no doubt,
  But the lass who's a brick
  Is the skirt who will stick
When a fellow gets down and out.

L'Envoi

Then cheer, if you will, for the victor;
Be he ball player, banker or bruiser.
  But when you have done
  Give a cheer every one
For the guy who can be a good loser.

* * * *

Sullivan—Cuppy, you need some fly-paper.

Hansen—Why?

Sullivan—So you can read up on aviation.

* * * *

FROM "LAWRENCEVILLE BUGLE."

January Fletcher went over to Hominy Knob yesterday on a business trip. During his absence his wife took advantage of his leaving and applied for a divorce.

Miss Pansy Wopp had her picture taken yesterday. She wanted a full length picture, but her shoes hurt her feet so bad she was unable to stand still long enough to have more than her head and shoulders taken.

During the recent cold weather, January Fletcher had been putting his dog out of the house at night, there being only enough heat to keep himself and family warm.

An ordinance was passed last week prohibiting applause in the court room because of it being liable to awake the Judge.

While operating her new machine, Mrs. Lebe Spront unthoughtedly placed her finger under the needle. The folks hope to be able to release her, as they have written to the factory for instructions.

* * * *

The following ad. appeared in the Knob-Noster (Mo.) Gem:

Undertaking, and time,
Anywhere, day or night.
My terms are very
Reasonable.
If you want first-class
groceries, at reduced
prices, here is the place
to get them:
Sauer Kraut, 3 cans 25c
Raisins, 3 pounds 25c
Also carry a complete
line of Linseed Oil, House
and Barn Paint, Gasoline,
Wall Paper, Furniture
and Carpets.
Yours for business,
U. G. SHIDLER.

* * * *

Oh, Paul Revere pursued his course
Beneath a lucky star,
'Twas lucky that he had a horse
And not a motor car.

—*Kansas City Journal.*

When Sheridan made his great ride
He might have mourned his luck
If he an aeroplane had tried
And found it prone to buck.

—*Chicago Record-Herald.*

When Washington crossed the Deleware,
And then the British smote.
His fate would have been different
Had he tried a motor-boat.

—*Abingdon Kodak.*

SOME FAMOUS SNOWS.

Phoebe——— ———bound
That———joke ———boy
———storm ———plow
White as——— ———drift

* * * *

Upon the stage Miss Tippy Toes
Looks fascinating quite,
But on the street, Oh! goodness knows
She surely is a fright.

—*Youngstown Telegram.*

* * * *

Sheffel—Professor, do you think I will ever be able to do anything with my voice?

Perspiring Teacher—Well, it might come in handy in case of fire or shipwreck

———ooo———

NEWS FROM OTHER COLLEGES.

Chinese students at Illinois University are preparing to celebrate the forming of a republic in China.

The msuic department of Indiana University will present the opera "Babette" some time during the Spring.

The students of Virginia University are opposed to the introduction of co-education in the university.

The Purdue Harlequin club will present "The Elastic Limit" this Spring.

New buildings for the department of mining, engineering and ceramics will be erected at Illinois University.

Iowa Freshmen have to pass two-thirds of their work before they can be initiated into a fraternity.

The Oberlin Glee Club will make a spring trip to the Alleghenies. The larger part of the concerts will be given in Pennsylvania.

Viscount S. Chinda, the new Japanese Ambassador to the United States, graduated from DePauw in the class of 1881.

The football squad of Tulane University was managed by a co-ed. She had complete charge of all the trips made by the team.

Six hundred students at the University of Minnesota failed in their mid-year examination. This has broken all existing records.

According to custom, the Senior Class of Notre Dame presented an American flag to the University on Washington's birthday.

A laboratory has been fitted out at DePauw resembling as nearly as possible a metropolitan newspaper office for the accommodation of a practical course in newspaper writing.

Several historical rooms were obliterated by the remodeling of the men's rooms at Miami. Among these were rooms formerly occupied by Benjamin Hanison, Oliver P. Morton, Whitelaw Reid and the room in which the Phi Delta Theta fraternity was founded in 1848.

The authorities of Yale's academic department intend to make a careful examination of expenses incurred during the undergraduate period at the University, so as to prepare an official table for the catalogue. The old table which appeared in the annual catalogue for years has been recognized as deceptive and has been withdrawn.

In order to draw attention to the deplorable condition of the "gym" at Wabash College, the students resorted to some scathing editorials in the school paper. According to one editorial, the gym was first found by early tribes of Wabash Indians. These found it in bad need of repair and left it in disgust. The agitation was fruitful, insofar that improvements and repairs are now being made.

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LOCALS.

It has not been definitely decided as to what city will be visited on the Senior trip.

Senior Students are busy selecting and deciding on thesis topics. Thesis work proper, begins April 8th.

Dr. C. L. Mees was in Cincinnati during the last week of February attending to copy reading for the new catalogue.

On February 29th, Professor R. L. McCormick addressed the Terre Haute Science Club. His paper was "A Description of a New Stadia attachment for Transits." Professor McCormick is the inventor of the attachment.

On March 23rd Professor Peddle will lecture on "Color Photography" at a joint meeting of the Camera Club and Scientific Society. Everyone is invited. The lecture will be given in the Assembly Room.

A NEW PILE FORMULA.

THE bearing value and resistance of piles, with the dynamic theory involved in their determination, are discussed at length by M. M. J. Benabenq in the "Annales des Ponts et Chaussees." M. Benabenq discusses various well-known theories of the subject and presents some original investigations and working formulas. In summing up his conclusions he notes the decidedly lower values obtained for the pile resistance by the use of dynamic formulas as compared with similar values obtained from static formulas and states that such a difference is to be expected. The range of application of dynamic formulas is limited to the periods of penetration of the pile up to a solid bearing and hence, the author states, can never be more than an approximation. He presents a simplified working formula of this class and recommends it as sufficiently accurate for general use. The expression is in the form:

$$R' = (MH'/2e) + M + P$$

wherein

M = weight of the hammer,
P = weight of the pile,
H′ = Fall of the hammer,
e = the penetration of the pile for any given blow,
R′ = the resistance of the pile at any time during the driving.

The author further states that the formulas derived from a study of the static conditions of this class of work are based on an exact theory and are applicable to screw piles as well as to the ordinary type. The composition of the ground where the work is to be done should first be determined from borings, and with this information the design of the pile foundation may be carried out with the aid of the static formulas. In conclusion the author recommends the use of static rather than dynamic formulas as being decidedly more accurate.—*Engineering Record, March 2, 1912.*

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SIBLEY (MO.) BRIDGE ON THE SANTA FE.

A bill has just been passed through both houses of Congress and approved by the President permitting the lowering of the clearance line 2 ft. under the three main channel spans of the new bridge which the Atchison, Topeka & Santa Fe is now constructing across the Missouri river at Sibley, Mo. This revised clearance line gives 48 ft. clear head room above the record high water of 1844 and a greater clearance than this above the standard high water line adopted by the United States Army Engineering department.

Beginning at the west end, the present bridge consists of one 80-ft. deck girder span, one 200-ft. deck truss span, three through truss spans, 396 ft. center to center of end pins, one 247-ft. deck truss span, two 172-ft. 6 in. truss spans and about 2,000 lineal feet of steel viaduct composed of 30-ft. towers and 60-ft. intermediate spans. In the reconstruction work the west abutment and pier No. 1 will be re-

modeled and the 80-ft. deck girder will be renewed. The 200-ft. deck truss span will be replaced with two 100-ft. deck girder spans resting on a new center pier, and three 396 foot three truss spans will be replaced with spans of the same length. From 8 to 20 ft. of the masonry will be removed from the tops of the piers of these spans and replaced with concrete. The three deck truss spans and the 2,000 ft. of steel viaduct will be renewed, the piers under the spans being remodeled, as necessary, to fit the new steel work. All piers in the main channel of the river rest on bed rock, while the piers under the east approach viaduct will be based on reinforced concrete piles, the tops of which will stand about 12 ft. above the extreme low water line.

The new structure is designed for Cooper's E-60 loading. The entire bridge will have a ballast deck with a foot-walk and hand-railing on one side. All telegraph, telephone and signal wires will be carried across the bridge on steel brackets placed on the down steam side.

While the bridge is being rebuilt as a single track, gauntlet tracks will be laid, the rails in each pair being placed 7 in. apart on centers. The 0.8 per cent. grade now existing on the east approach viaduct and for about two miles further east will be reduced to 0.5 per cent. by raising the shore end of the viaduct and the fill beyond.

In designing the viaduct it was necessary to adopt span lengths such that the new piers would in all cases miss the odd ones, the masonry in these old piers being badly shattered and worn cut, due both to faulty design in the bottom of the metal columns and to the lack of pile supports. One interesting feature in connection with the new viaduct is the placing of genuine expansion bearings on one bent in each tower, this bearing being made of four 12-in. segmental rockers. The work of replacing the 396-ft. spans is now well under way. Somewhat over half of the steel work for these spans is already on the ground at the bridge site and it is planned to begin the erection of the west span early in February.

The steel work is being furnished by the American Bridge Company, while the Missouri Valley Bridge & Iron Co., of Leavenworth, Kan., has the contract for remodeling the four large piers, building the false work, taking down the old spans and erecting the three new ones. It is planned to contract the sub-structure work for the approach viaducts, while the steel work will be erected by company forces.

The cost of this rebuilding is estimated at about $1,300,000. It is expected that the bridge will be finished by the end of the present year, although high water or other unfavorable conditions may delay this somewhat. This work is being done under the supervision of A. F. Robinson, bridge engineer of the system, and C. F. W. Felt, chief engineer.—*Railway Age Gazette*, February 23, 1912.

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TESTS ON FLAT SLAB FLOORS.

UNDER official tests, floors in the ten-story and basement reinforced-concrete Sharples' Building at Washington and Jefferson streets, Chicago, showed a maximum deflection of 0.22-in., equivalent to the diagonal span divided by 1363. The permissible deflection under the Chicago building ordinance for beam and girder construction is equivalent to the span divided by 800. As the diagonal span of these floors is 25 feet, the allowable deflection is 0.38 in. The foundation of this building, which is 74x90 ft. in ground floor plan, consists of concrete caissons carried to hard pan 75 ft. below the street grade. The floors and columns were designed for the dead load plus a live load of 225 lbs. per square foot. The column spacing is 18x17 ft. 5 in. and the story heights are 11 ft. 9 in. from floor to floor, with the exception of the first story, which is 14 ft. 9 in., and the second story, which is 1 ft. 9 in. The floors are flat slabs of reinforced concrete 8 in. thick, and the columns are uniformly 2 ft. in diameter from the basement to the tenth story, with capi-

tals flaring at the top to a diameter of 4 ft., above which is a plate 4 ft. 6 in. square.

Above the seventh floor, the usual type of reinforced concrete hooped column was used, while below the seventh floor the columns are of structural steel encased in concrete for fireproofing. The loads on these lower columns are carried by the structural steel, designed under the rules of the Chicago building ordinance. By the use of structural steel it has been possible to keep the size of the columns much smaller in the lower stories than would have been the case had hooped columns been used, thus saving a considerable amount of floor space in the lower stories, where the rental value is the highest, and also improving the lighting of these stories.

In designing the reinforced-concrete floors, the Condron & Sinks type of construction was used. The reinforcing bars are placed in rectangular belts in two directions only; that is, parallel with the lines joining the centers of the columns longitudinally and laterally. As no diagonal reinforcement is used in these floors, there are only two layers of bars over the column heads, and the engineers claim the stresses in the floors due to dead and live loads are determinate. In the assumption for the design, one-fifth of the area of the floor, that is, the area over the column cap and a small area outside it, is considered a platform supporting the square slab in each panel. Loals from the panels are carried to the steel running between column platforms. To prevent cracking on lines between columns, reinforcing bars are placed in the top of the slab at right angles to this line. No cracks have developed, it is said, in any of the floors or around any of the columns of this building.

Each belt of reinforcement consists of ¾-in. round bars and has a width of approximately 7 ft. These bars are so bent that they are in the upper part of the slab over the column head for a distance in each direction of about 5½ ft. from the center of the column and are in the lower part of the slab more than two-thirds of the span between the columns. These belts of reinforcing bars are considered to form wide beams or girders within the slab, enclosing a panel about 11 ft. square, which panel is in turn reinforced by ½-in. round bars so bent that they are in the lower part of the slab between the main reinforcing bars, and in the upper part of the slab across the main reinforcing bars.

These floors have been tested with a load of 550 lbs. per square foot, covering two entire panels. This load is equal to twice the assumed live load, plus the dead load. After the test load had been on the floors for two days, the maximum deflection, at the center point of each of the two panels was 0.20 and 0.22 in. respectively. Deflections were measured by the use of gauges reading to 0.02 in. and an engineer's Y level. The test load was not immediately removed, but was allowed to remain until the cement which was used for it was required in building two of the upper floors, so that a considerable part of the load remained on the panels nearly three weeks. One week after the load was entirely removed no appreciable deflection was observed.

Mr. T. L. Condron was consulting engineer for the architect, Mr. W. D. Mann. Messrs. Bulley & Andrews were the general contractors for the concrete and masonry work.—*Engineering Record*, February 24, 1912.

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ELECTRIC WELDING.

THE Railway Age Gazette for February 23, contains a very interesting article on Electric Welding, the general description of which follows. In addition to this, the article contains a detailed description of the Sienund-Wenzel process of electrical welding and the apparatus used including curves showing the effect of current used with different sized electrodes on the ultimate tensile strength of the weld:

In a paper presented before the New York Railroad Club, Friday, February 16, O. S. Beyer, Jr., of the mechanical department of the

Erie Railroad, spoke of the uses of electric welding in railway work. The resistance type of electric welding has its greatest application in the industrial field, but may be used to good advantage in certain cases of railway work. It consists of clamping the two pieces firmly together and passing an electric current through the joint, the resistance of the joint creating sufficient heat to do the welding. This system is used in railway work for welding rails together by means of two fish plates located one on each side of the web at the joint, and in welding certain parts of steel passenger cars. It could also be successfully used in spot welding the Russia iron engine jackets on locomotives.

The arc type of welding uses the electric arc for the heating. There are three methods used in this system; one of them consists of jumping an arc between two carbon electrodes and pulling the arc to the portion to be welded by a magnetic flux which acts similar to an ordinary blow pipe. The repairs material is placed in the weld as chips and fillings, or is applied with a metal pencil, the heat of the arc melting and fusing it to the object to be welded. The second method is drawing an arc between the material to be repaired and a carbon electrode, fusing the materials as in the first case. This latter method, however, tends to make the weld hard and brittle, on account of the carbon that is carried into it from the carbon electrode. This method has been used in steel mills and foundries to some extent, but has not been found very practical in railway work. The third method in arc welding is that of making the repair material the electrode. In this way particles of the electrode are fused and carried to the part to be welded and by hammering intermittently a good solid weld is procured.

This new method was first introduced by Slavinoff, whose system required large current, reaching in some cases as high as 4,000 amperes. A modification of this system was perfected by Siemund in Germany and is known as the Siemund-Wenzel electric welding process. The current never exceeds 150 amperes and usually ranges between 120 and 130. This tends to make the melted particles very small, detaching themselves in a rapid stream and following the arc and adhering to the spot on the work over which the arc comes. This method of electric welding has found very successful application in the repair of locomotive fireboxes, mud rings, machinery parts, wheel centers, tires, iron and steel castings, and many similar parts. Broken flue sheet bridges and complete sets of flues have been welded with success.

A claim that the saving on boiler work for this process or any other process of autogenous welding is the difference between the cost to renew the sheets and the cost to do the welding is not just. At best the welding has prolonged the life of the sheets a year or two, possibly. The repaired parts are not equal to brand new parts.

Complete sets of flues have been welded to the back flue sheets of several engines and the engines have been returned to service. Close observation of these engines indicates that the work in the engine house to keep the flues tight is considerably reduced. Three months' service of a few engines is too short to look for ultimate results. The indications, however, are that by the use of electric welding in flue applications, a step in advance in boiler construction and maintenance has been made. Add to this what will be gained by electrically welding all firebox and mud-ring seams, while the boiler is being built, and the proper maintenance of locomotive boilers may be considerably simplified from its present perplexing state.

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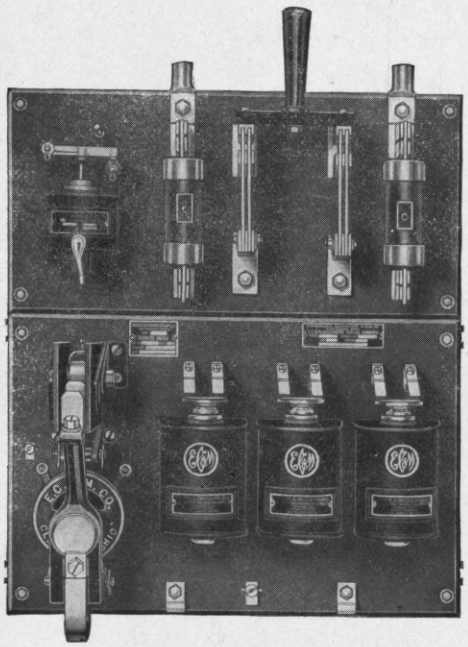

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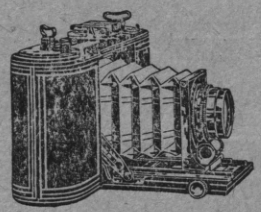

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