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THE ROSE TECHNIC

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THE TECHNIC

TERMS

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We take great pleasure in introducing our new Faculty member, Mr. Clarence C. Knipmeyer. Mr. Knipmeyer is a graduate of the electrical engineering department of the University of Michigan, of the Class of 1907, and since then he has been engaged in teaching and doing post-graduate work at the Massachusetts Institute of Technology.

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The Freshman Class will please take notice of the election of Mr. Krieger to the position of Freshman Local Editor. Any news items or happenings of interest should be handed to him.

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Just about exam time each year it becomes necessary for the Faculty to impress in some manner on the student body the importance of honesty in the examination room. Whether the exams are run on the honor system or not really makes no difference as to what the student's attitude should be on the matter. When a man is old enough to be in a school like Rose, he is surely old enough to appreciate what cribbing means. He is cheating himself, and as such will suffer for it, and he is also cheating his schoolmates who are attempting to do their work honestly. Perhaps the establishment of the honor system might tend to decrease cribbing, but I rather think that a man that will crib with a professor in the room will crib at any time. About the only solution will be for the Faculty to make a lasting example of the next man caught with the goods on, sufficient that it will stamp the habit out for the next few years at least.

* * *

As the second term begins, and being the last for the majority of the Senior Class, we wish to present some facts which our Alumni have discovered after leaving Rose. The Alumni article this month is written by Mr. D. D. Wright, '05, who has been connected with the Westinghouse Company since his graduation, and knows whereof he speaks. Mr. Wright presents the facts from his personal experience, with the hope that in so doing a benefit may be derived by those interested in taking up the apprentice-course work after leaving school. We should all feel grateful to get this information so easily and take advantage of it.

* * *

The leading article this month, "New Lock and Dam, No. 5, Monongahela River," by Mr. C. E. Ashcraft, was secured for the purpose of enlightening THE TECHNIC readers, who may not know as to what is meant by a lock and dam in a navigable river. Many in the civil engineering department, as well as in the other departments, have but a vague idea of the purposes and uses of such a structure.

Mr. Ashcraft is a graduate of the University of Cincinnati, and has been employed by the United States Government for a number of years in different sections of the country. He gives us a very comprehensive view of this kind of work from his own personal knowledge and experience.

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FROM THE JANUARY "COMMON SENSE."

There is a more basic honesty than that of moral honesty. It is scientific honesty.

Moral honesty is simply the recognition of custom, and custom is not always right.

A man may have the desire to be honest, yet by following custom his act may have the effect of intentional dishonesty; for he is unscientific and suffers by the simple law of consequence.

The civil, mechanical and electrical engineers are the people of real honesty. Their training and practice deals with the law of consequence, and their habit of thought and action in their work has brought them to play its harmonies with their man-to-man transactions.

The engineers are now running the business end of the railroads, and it is only a question of time when they will be in the management of great businesses, our cities, the state and the general government.

We would be a great deal better off with an engineer in the president's chair than a lawyer.

The lawyer reasons by precedent; the engineer by cause and effect.

The engineer gets down to the soil of a proposition—the base earth that sustains the superstructure. He applies this to every proposition put before him—business or political. He can't help it, it has become his second nature.

The very best formal training for a young man is that of an engineer, no matter what pursuit he may follow. It establishes the true value of efficiency, the habit of orderly thinking.

The best philosophical and artistic writing to-day is being done by engineers, or men trained as engineers.

With an engineer's education you know the relation of knowledge with its use.

NEW LOCK AND DAM, No. 5, MONONGAHELA RIVER

By C. E. Ashcraft.

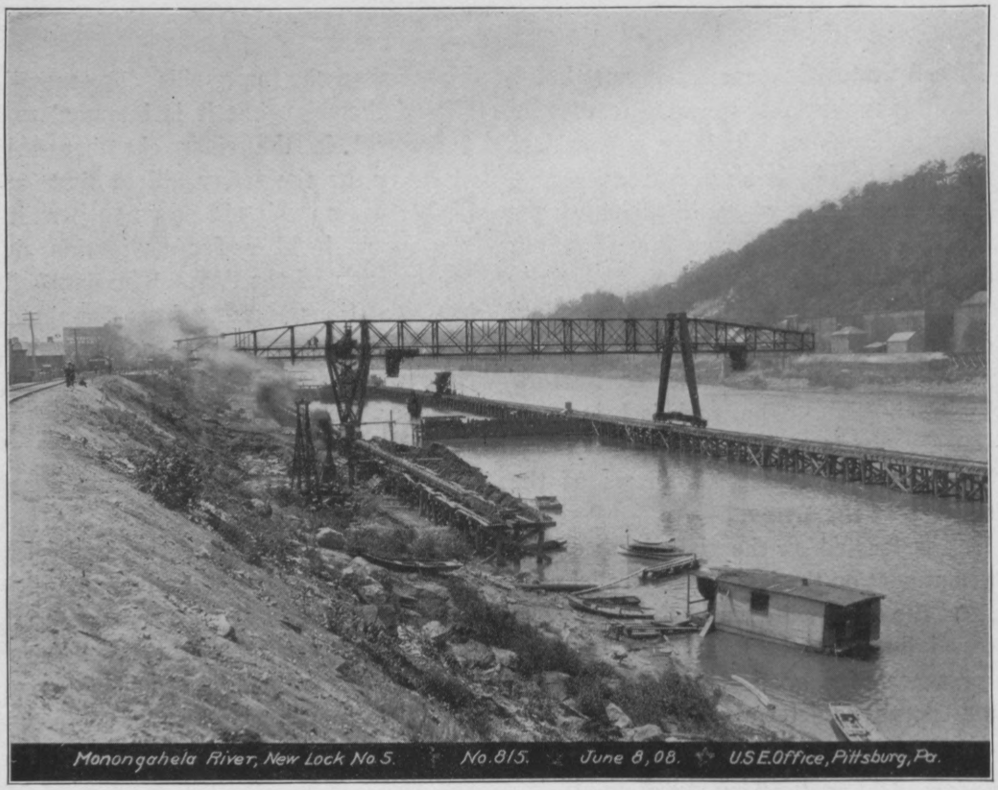
The United States Government is now building on the Monongahela River at Brownsville, Pa., fifty-five miles from Pittsburg, a new lock and dam to replace old Lock and Dam, No. 5, located about two miles above the site of the present work. The lock proper is being built under contract, but the dam and abutment are being built by the Government on "force account" because of the great and uncertain risks attending such work, which invariably render contractors' bids prohibitively high. The work is being carried on by the Engineer Department at Large under the direct supervision of officers of the Engineer Corps of the Army.

The lock is located on the right bank of the river, the abutment on the left bank, parallel with the lock, and the dam will connect the two. The main factor influencing the location of the lock was the presence of a good rock foundation at a reasonable depth, as determined by preliminary borings, although the width of the river at this point does not afford as long a spillway for the dam as was desired. For this reason both the lock and the abutment were crowded as far into their respective banks as possible.

The lock is a double one, each chamber being 56 x 360 feet in the clear. The gates are double swing gates of the mitering type, their angle of inclination to the lock walls being 70 degrees. They swing back into recesses in the lock walls so as not to encroach upon the effective clear width of the lock chamber. The river chamber is provided with middle gates for economizing water when making small lockages at seasons of low stage. The upper gate sills are 12 feet higher than the lower sills, corresponding to the lift of the dam, but it is intended to build the upper sill in the river chamber only to the elevation of the lower sill at first, and mount high gates on this sill so as to permit of using the river chamber for navigation during the construction of the dam. The dam will be built in two sections, starting from the abutment, thus permitting boats to use the right half of the river while the left half is coffered off. When, however, the right half is coffered off, navigation will proceed through the river chamber, the land chamber in the meantime being coffered off and the work of completing it being under way. When the dam is closed the land chamber will be used for locking, the river chamber will be coffered off, the high gates removed to the middle sill, the upper sill brought to its proper height and permanent gates of less height installed.

The lock proper consists of three walls known respectively as the land, middle and river walls. The land wall, however, is prolonged with a smaller section both up and down stream for about 350 feet, and these prolongations are known as guide walls. Likewise, the river wall is prolonged for about 125 feet, and this is known as a guard wall. The function of the guide and guard walls is to assist boats in entering and leaving the lock by providing fore and tail bays in which the water is comparatively quiet. These walls also contain snubbing posts by means of which boats may be warped into and out of the lock if their own power is insufficient to control them. Lock No. 5 has the lower 150 feet of the lower guide wall struck to a curve of

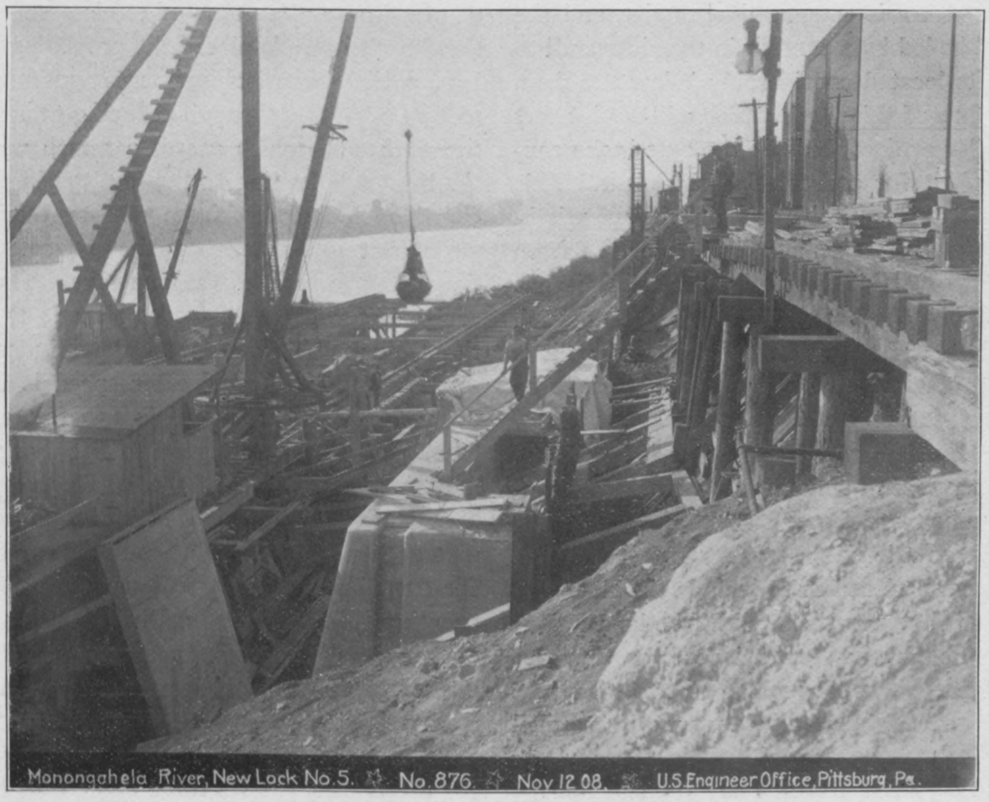
700 feet radius in order to further assist leaving boats to reach the channel. In addition to these main walls there is, under each set of gates, a wall called the miter wall, which is brought up only to the bottom of the gates, and on which rests the wood sill against which the gates abut, and another sill called the guard sill, which is raised a little higher than the gate sill to prevent the keels of boats from injuring the gate sill.



Site of the lock, showing the pile trestles supporting the tracks and one of the cranes, also the concrete mixer on the outer trestle beyond the crane.

All the walls of this lock are to rest on solid rock, except the upper guide and guard walls, which rest on three rows of wooden piles, three feet apart, and driven to rock. All the walls are of concrete composed of sand, gravel and Portland cement in a 1-3-6 mix, which is equivalent to 11 cubic feet of sand, 24 cubic feet of gravel and one barrel of cement weighing 380 pounds. The concrete is mixed rather wet and little tamping is done. The walls are built up in separate monoliths, which are limited by the specifications to not less than four feet in height nor more than forty feet in length, and concrete keys are built onto each block as it is finished. By building the walls up in blocks, joints are provided for taking up the contraction and expansion to which the walls are subjected at different seasons of the year. A heavy mortar finish is left on all faces exposed to view or with which boats may come in contact.

The valves for filling the lock are of the cylindrical type, eight feet in diameter, of cast iron, and sunk in recesses in the walls, from which they can be readily removed in case of need. The recesses can also be bulkheaded off and pumped out without pumping out the lock chamber. The aggregate valve area for each chamber is 200 cubic feet, which will empty the chamber in approximately six minutes. Half of this area is in the side walls of the chamber, conduits in the walls leading the water from the intake valves situated just above the upper gates. The other half of the area is in the bottom of the gates, these valves being of the "butterfly" type. On account of the upper gate valves not being available during the whole time of filling (they being out of water three feet at normal lower pool level), the exact time of filling will be greater than six minutes. The emptying valves of the land chamber discharge through the land and middle walls into the tail bay below the lower gates, while those of the river chamber discharge directly into the river through the river wall.



Completed section at the lower end of the abutment, showing the derrick used in excavating for the concrete.

The gates will be of structural steel, built of 24-inch I beams, with a one-half-inch plate on the upper side, and will swing on a cast-iron pintle. The water seal at the heel and at the miter joint will be effected by oak strips bolted to the gate. The gates will be opened and closed by rack spars operated by compressed air. All the machinery for operating the gates will be sunk in recesses in the top of the walls and protected by iron cover plates. The machinery is also arranged so that it can be operated by hand in case of temporary failure of the power plant.

The power plant will be located on the river wall in a concrete building, and will consist of two water turbines with vertical shafts connected by bevel gears to two air compressors, which will maintain a constant pressure of 100 pounds per square inch in the receiving tanks. Pipe lines will run in conduits from the power house under the lock to the other walls and thence to the valve and gate machinery. The intake for the turbine conduit is located above the dam where the water is comparatively quiet, and the water will be led by a conduit in the river wall to turbine pits located considerably below the dam.

A feature of this work which will set it apart from similar projects built in the past is the contractor's plant for constructing the plant. This type of plant is entirely new on river work in this country, and marks a radical departure from past practice in this field. Inasmuch as it has proved itself to be both efficient and economical, and is capable of still further improvement, it is likely that it will be adopted on lock work to be done in the future.

The main feature of this plant is a pair of huge gantry cranes running on a trackway supported on pile trestles parallel with the lock walls. There are two rails to the track, 150 feet apart on centers, and so placed as to include the river and middle walls between them, while the land wall is outside. The cranes, or "bridges," as they are commonly called, are supported on two towers of different design connected by a truss with parallel top and bottom chords and double diagonals in each panel. Each tower rests on six flanged wheels whose journal boxes are bolted to the lower chord of the tower. Cantilever arms 67½ feet long project at each end, making the total length of the bridges 285 feet, or 19 panels of 15 feet each. An extension of 27 feet can be bolted on to the shore end in order to reach the ends of the core walls which extend back into the bank from each end of the land wall. The bottom chords of the bridges are 32 feet above the rails, and are arranged to support a track for trolley cabs by means of which lateral motion is secured over the lock site. Each bridge carries one or two trolleys, depending on the nature of the work to be done, and these can be switched off from one bridge to the other by means of the 27-foot extension, which is kept mounted on a wooden trestle at the same elevation as the bridges. The cranes are built entirely of structural steel, all main members being bolted together for ease in assembling and dismantling. They contain 450 tons of structural steel, 28 tons of cast iron and 12 tons of steel castings. Over the shore towers is placed the propelling mechanism, which consists of two 50-horse-power motors operating through reducing gears a 5-foot drum, around which passes a 1-inch wire cable, the two ends leading to two pulleys in the lower chord of the tower, from whence they lead to permanent anchorages at the extreme up-and-down-stream ends of the runways. The motors are operated through a controller in the cab of the trolley, which connects them in series for starting and in parallel after speed is up. The maximum speed of travel is 150 feet a minute. The bridges were designed to lift five and one-half tons at the ends of the cantilever arms, and each trolley is equipped with a 50-horse-power motor for lifting and a 30-horse-power motor for traveling. One crane is usually used for excavating, back filling, handling bracing timbers, etc., while the other is engaged in setting forms and concreting. The former crane carries one trolley and the latter two.

The river runway, besides carrying the rail for the cranes, carries three other rails on which run the concrete mixer plant and the car that transports the cement from the storage bins on shore to the mixer. This car carries fifteen barrels of cement, and is propelled by a 5-horse-power motor at a speed of eight miles per hour, the power transmission being by a modification of the third-rail method.

When concreting is in progress the mixer plant is hooked on the river runway under the cantilever arm, and one trolley transfers the sand and gravel from the flats to the hopper of the mixer, using a clam-shell bucket, while the other trolley transfers the concrete from the mixer to the wall in a specially-designed two-and-three-quarter-yard bucket. A yard is mixed at a time, but the bucket usually waits for a two-yard batch.

The mixer is a No. 5 Smith, electrically driven by a 30-horse-power motor, which also dumps the mixer and operates the feed gates in the bottom of the sand and gravel measuring bins located immediately below the hoppers and immediately above the mixer. The cement car, which carries the cement in bulk, discharges through a chute in its side into a compartment, from whence the cement is lifted by a continuous chain-bucket hoist, operated by a 5-horse-power motor, to the level of the measuring bins. These binds are of the right capacity to give the proper proportions in the concrete. The sand and gravel bins are filled and emptied by mechanical means, but the cement bin is emptied by hand into the mixer. The mixer dumps into a hopper, where the concrete may be held until the bucket arrives.

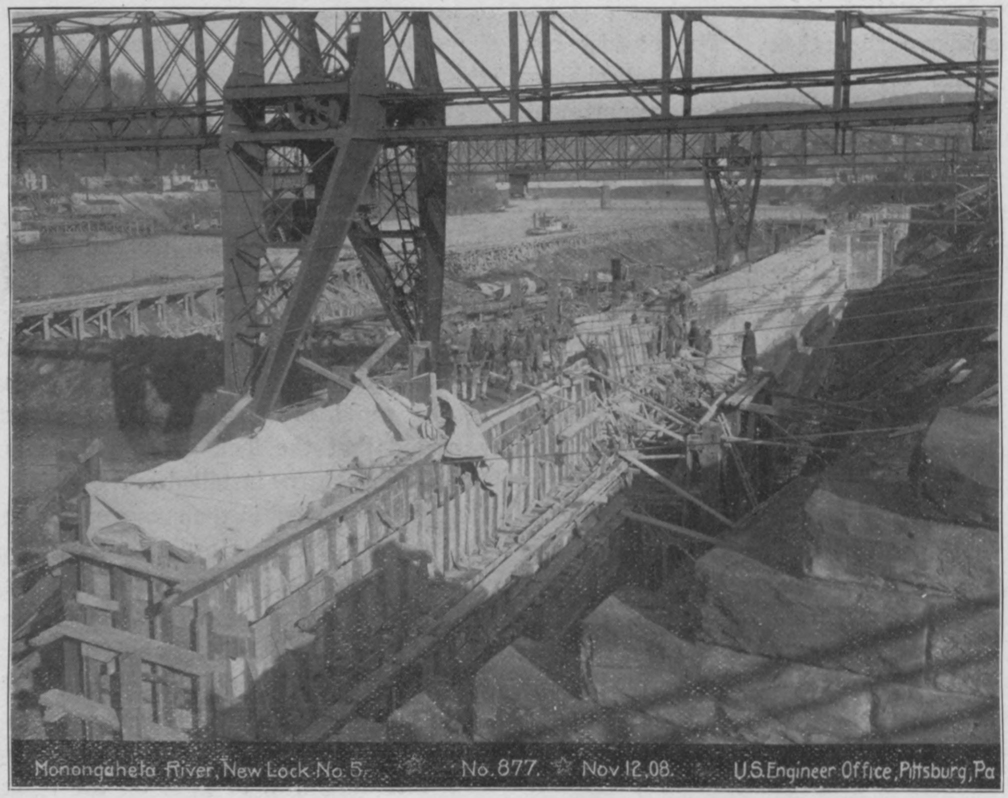
The power equipment for the plant consists of a 200-horse-power motor, operating on a two-phase alternating current of 2,200 volts, received from a local power company. This motor is direct connected to a 150-kilo-watt, direct-current generator, speed 580 revolutions per minute, which generates current at a voltage of 550. The current is led out to the cranes by feed wires running in a protected casing next to the rail on the shoreward runway. The cranes receive the current through a shoe attached to the lower chord of the shore tower which slides in contact with the feed wire.

The earth from the excavation was used to construct the coffer-dam, which is simply an earth embankment with a core wall of tongue-and-grooved wooden "sheeting." It completely encloses the land, middle, river and upper guard walls, and is 700 feet long and 200 feet wide. It has proved to be quite tight, although in places the excavation goes down twenty-five feet below the surface of the river. A No. 4 Emerson steam pump is usually sufficient to keep a section of excavation for a wall free from water, but three 10-foot vertical centrifugal pumps, electrically driven, are required to keep the whole coffer unwatered.

The efficiency of this plant is attested by the enormous amount of work that has been accomplished since actual construction operations began about June 1, 1908. The land and guide walls have been completed and the backfilling placed behind them. The middle, river and guard walls have been brought up a little above the bottom of the coffer. In fact, more than half the concrete work has been done in seven months. The miter and core walls will be built by spring, and it is estimated that all the concrete work will be done by September, 1909. Three shifts of eight hours each have been worked continuously, but they have not averaged over thirty men to the shift. It is true that weather and river conditions have been unusually favorable, but even so, the cranes remain the greatest factor in the rapid prosecution of the work. It is expected that the lock gates will be hung this fall, the machinery installed in the spring of 1910, the dam completed in the summer, and the whole project be in working order by the fall of 1910.

Work on the dam has not yet commenced, but the abutment on the left bank is about completed at this writing. The function of the abutment is to prevent the eating away of the bank below the dam by the scouring action of the water coming over the dam, but in this case it also acts as a retaining wall to hold up the bank, which rises at a 1-to-1 slope about twelve feet above the top of the wall. Immediately at the top of the slope is a main-line railroad track and twenty feet back an immense nine-story brick warehouse loaded with several thousand barrels of whisky. The presence of these structures rendered the job a difficult one, as the strongest kind of bracing had to be used and the utmost care given to the placing and removing of the same in order to prevent slips. The excavation was made between two rows of steel-sheet piles twenty-two feet apart, and went to rock, some fifty-five feet below the top of the bank. The back row of piles was only thirteen feet from the center line of the original railroad track, which was moved back temporarily about ten feet. The abutment is 266 feet long, extending thirty feet above the dam and 206 feet below it, the dam being thirty feet wide. It has a base width of twenty-one feet six inches, and is battered five on one on the front face and stepped in at the back to a top width of four feet, forty-eight feet above the base. To prevent scour behind the wall core, walls run back into the bank for seventy-five feet at each end of the abutment and rise eleven feet higher than the main wall.

The plant for constructing this work, which the Government is doing on "force account," is worthy of a word. Its main feature is a traveling derrick running on rails supported by pile trestles parallel to the abutment. The carriage of the derrick is framed of 12-x-12-inch timbers in the form of a square, and is carried on eight wheels, having a span of forty-five feet between centers of rails. An ordinary stiff-leg derrick with an 80-foot boom is mounted on the up-stream corner nearest the wall, the hoisting and slewing engines on the down-stream corner nearest the wall, while a 60-horse-power horizontal, tubular boiler occupies most of the river side. The traveler is pulled forward by ropes and blocks from time to time as the work progresses. When concreting is in progress, a concrete mixer boat is moored to the river row of piles, a derrick boat next to the mixer boat and the sand and gravel flats next to the derrick boat. The latter transfers the sand and gravel from the flats to



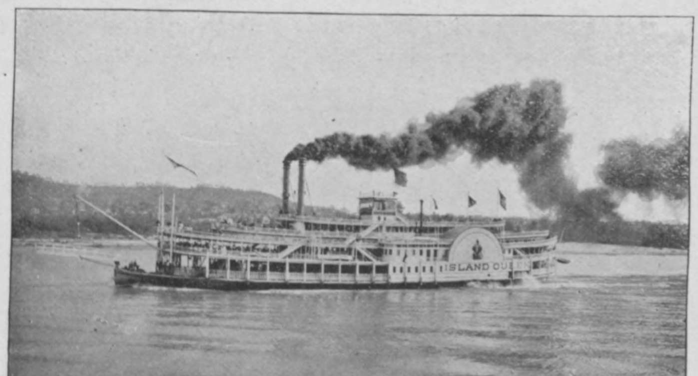
The land wall of the lock partially completed and the forms to shape the concrete, also a close view of the cranes.

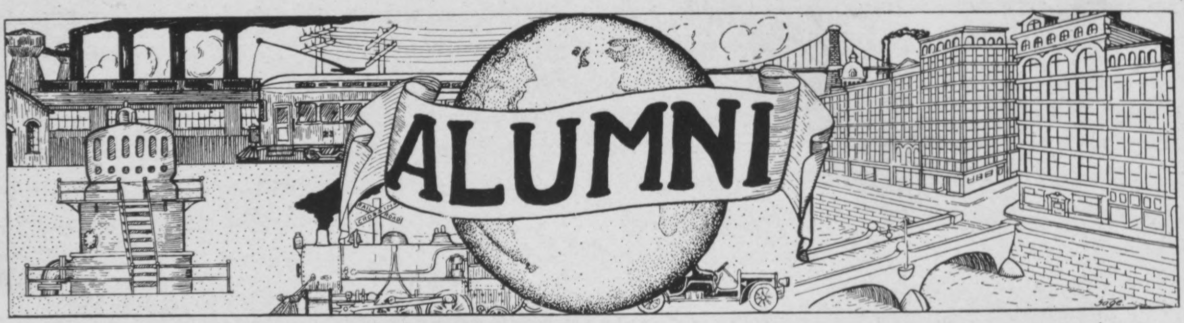
the mixer and the traveling derrick transfers the concrete from the mixer to the wall.

The dam will consist of concrete resting on wooden piles driven to rock, with triple lap-sheet piling along its up-stream side and an apron crib of timber, filled with stone to protect from scour, on its down-stream side. It will support a movable top by means of which an additional lift of three feet can be obtained above the ordinary lift of twelve feet provided by the main structure. The dam will have a spillway for its entire length of 550 feet.

The type of movable top proposed is interesting from the fact that it has never been used before in this country on river work, although it has a prototype in India on the Betwa dam, where, it is said, it has been a success. It is automatic in its operation of lowering, but will have to be raised by a maneuvering boat in the upper pool carrying a derrick. Essentially it consists of a series of thin shutters, twelve feet long and four feet high, making a continuous wall across the dam. Each shutter is held against the pressure of the water by two tension bars anchored by pivoted joints to eye-bolts in the top of the concrete and attached, also by pivoted joints, to the shutter at approximately one-third the height of the shutter from the bottom. The weight of the shutter is carried by wheels in journal boxes attached to the bottom edge of the shutter. When the water rises far enough above the top edge of the shutter the center of pressure will be above the point of attachment of the tension bars, producing an overturning moment on the shutter and causing it to tip and fold up under the tension bars, the bottom edge of the shutter running backward, meanwhile, on its wheels, and both shutter and tension bars falling flat into a recess in the top of the concrete, where they will be protected from ice, drift or craft going over the dam.

This automatic feature is a very alluring one, since it involves no power installation with its attendant conduits, valves and machinery, and also simplifies the construction of the dam by allowing it to be built with a solid section. It does not seem probable, however, that any automatic arrangement can afford as nice a control over the regulation of the pools as one operated by power.





THE WESTINGHOUSE APPRENTICESHIP COURSE

By D. D. Wright, 05.

A majority of the readers of The Technic are probably more or less acquainted with what is usually termed an apprenticeship course. Many have probably served some such course in one of the large industrial manufacturing companies, others have possibly been told something of these courses, possibly to the end that a bad or incorrect impression has been obtained as to their possibilities and good features. To such of our readers this article might not appeal, but it is the desire of the writer to give a fair idea to undergraduate students as to what an apprenticeship course in the works of a large electrical manufacturing company is, and what good can be expected from taking it.

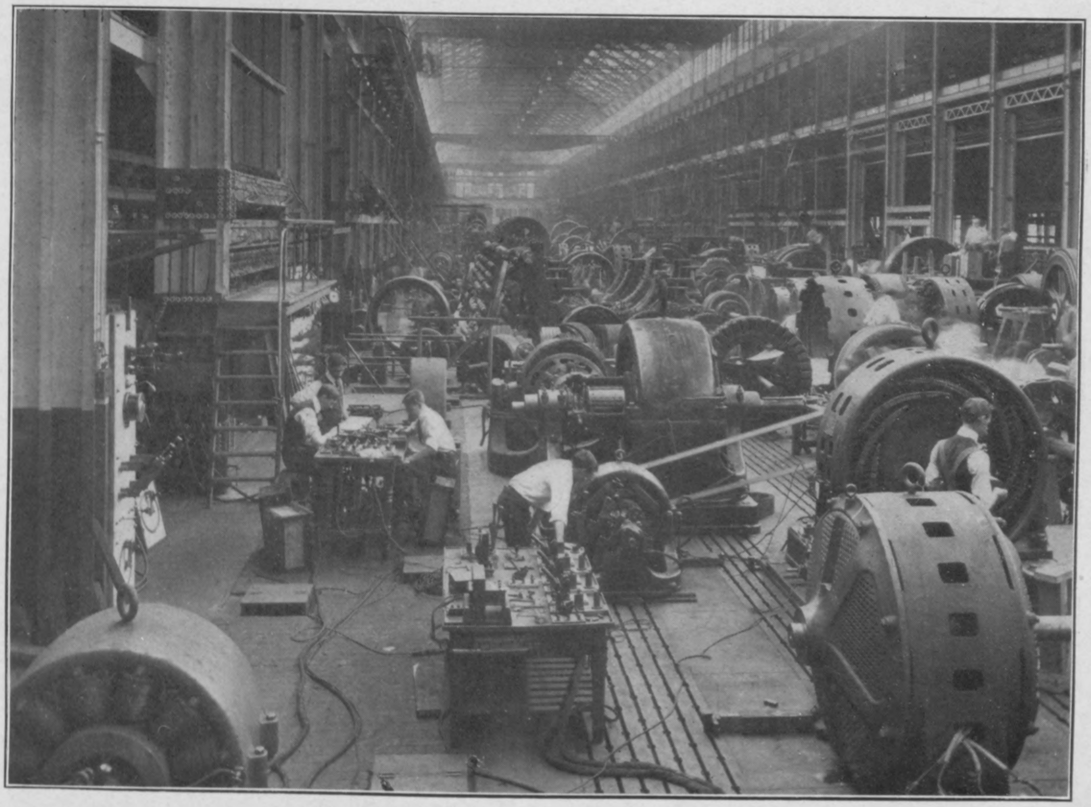
An apprenticeship course is a course offering a field for work and study, organized by a party or company for the purpose of training suitable men to fill positions in his or its employ. These men are taken into the shops and offices of the company, and are given an opportunity to observe and learn the methods used in manufacturing processes, the manner in which workmen are handled and the general policies of the company. This gives the student an excellent opportunity to study men and conditions, and not the least of all is the knowledge to be gained by coming into actual contact with the workman and obtaining his views on various subjects related to shop methods. The good to be gained by this experience can scarcely be overestimated when it is considered that ofttimes many men who, in after years, are in charge of a great number of men feel the lack of having had such training, and are handicaped in outlining policies due to the fact that they do not know how their employer will view certain questions.

Apprenticeship courses are not formed in order to give employment to graduates of technical schools or colleges, or for any charitable purpose, but with the sole purpose of bringing into the employ of the company young men who can afterward be depended upon to have a thorough grasp of the conditions surrounding the work.

The apprenticeship course as organized and developed by The Westinghouse Electric and Manufacturing Company has reached a highlyperfected state. There are three courses, embodying trades, engineering and special engineering courses.

The trades apprentice is usually one who desires to learn some trade such as machinist, molder, pattern maker, armature winder, etc. Many of these young men have had the equivalent of a common-school or high-school education, or possibly no school training whatever. Such students are given for the most part about the same kind of work as are the members of the other courses, but the time served in each department of the works is longer, and the compensation less. Many graduates of this course hold very desirable positions with the company.

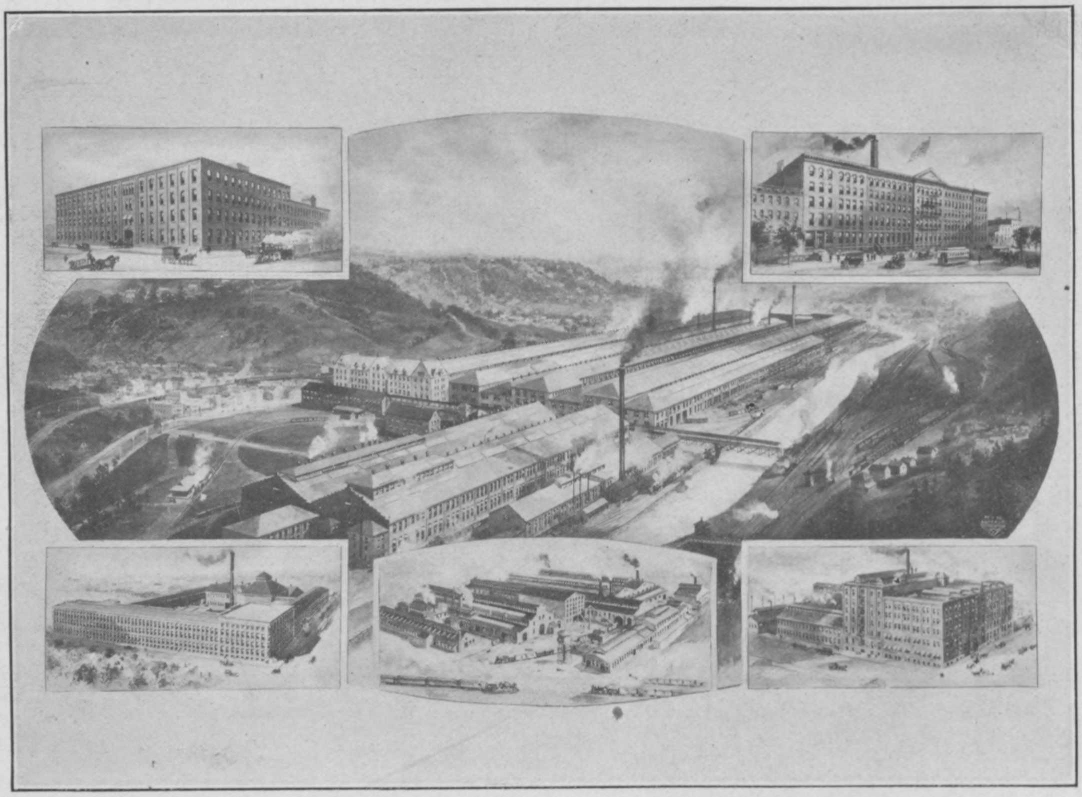
The members of the engineering course are recruited principally from among the graduates of the various schools, colleges and universities of our own and many foreign countries. They may, or may not, have had special training along electrical lines, but have at least had a general engineering, or the equivalent of a good college education. The engineering apprentice is given a greater variety of work than the trades apprentice, and is not assigned to perform actual machine work. However, he performs the operation of assembling parts into completed machines, and thereby learns the types of construction used, and by connecting the theory learned from textbooks with the experience gained in the shops, obtains a thorough understanding of the different types of machines and how to handle them. A considerable portion of the engineering apprentice's time is given up to testing and office work.



Dynamo Testing Department, Westinghouse Electric and Manufacturing Co.

In the former, he receives instruction in testing detail and supply apparatus, transformers, motors and generators, while in the office work he may be assigned to assist one of the regular engineers in the preparation of specifications and in the working out of details of new types of apparatus.

The special engineering apprentices are usually those who come from abroad, being graduates of foreign universities or being recommended to the apprenticeship course by some foreign representative of the company, and who do not care to remain in this country any longer than is absolutely necessary. These men are treated in exactly the same manner as are the members of the engineering course, but ofttimes they desire to spend part of their time in the works of some of the other Westinghouse Companies, in order get a more general knowledge of the engineering profession. Most of these men have had college or university training, and, while many are unable to speak the English language upon arrival, they soon acquire a good working knowledge of our language and pick up American manners and habits with astonishing alacrity.

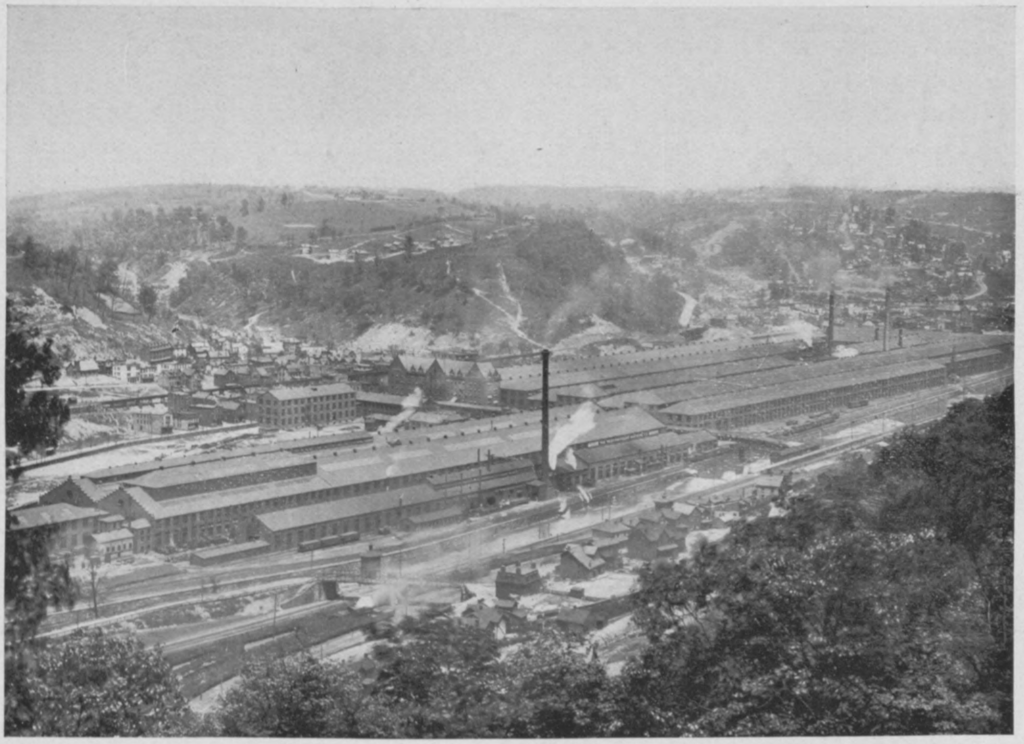


East Pittsburg and Branch Factories, Westinghouse Electric and Manufacturing Co.

The time of service of the trades apprentice is four years, or a total of 10,960 actual working hours. The compensation is nine cents per hour the first year, twelve cents the second, fifteen cents the third, and eighteen cents per hour the fourth year. At the expiration of this time the apprentice receives a gratuity of $100 from the company.

The engineering and special engineering apprentices are supposed to serve for two years, or for 5,480 actual working hours, the rate of pay for each being twenty cents per hour for the first year and twenty-two cents per hour during the second year. No gratuity is given for the completion of either of these courses. The above-mentioned rates of pay are based upon fifty-four working hours per week.

In this connection it should be noted that, while the apprentice is required to execute a formal contract with the company, after having served a trial period of three months, in which he agrees to remain in its service for a stated time at a stated rate of compensation, this contract is not considered as binding in any sense, as regards the time to be served as an apprentice, but it serves the purpose of discouraging some men who are not really in earnest from entering the employ of the company. From personal experience, the writer is of the opinion that many who might otherwise consider such a proposition, are loath to carry out such plans due to this clause, but any one who has any intention of pursuing such a course need not hesitate because of the time-element clause in the contract of the W. E. & M. Co. As a matter of fact, the greater number of men who remain in the employ of



WORKS OF WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., EAST PITTSBURG, PA.

All apprentices are expected to observe the same hours of work as are the regular shop and office employes, and when called upon to work in excess of the usual shop hours are paid at the rate of one and one-half pay for such excess time. Apprentices may also at times be called upon to perform night-turn duty, and, since the hours for night work are somewhat longer than those for day work, the apprentice is often enabled to complete his course sooner by night and overtime work.

the company never finish the course, as they are offered permanent positions in the manufacturing, engineering, correspondence or sales departments before the expiration of the time specified by the contract. It is also true that a great many students leave the employ of the company by the end of the first year, but for those who remain and who give diligent attention to the work assigned them, and show a desire to get the most from the work, good opportunities are offered.

The engineering apprenticeship course offered by the Westinghouse Company has several noteworthy advantages. First of all, special attention is given to this class of employes, and a separate department has been organized to recruit desirable members and to look after their welfare. Mr. C. E. Downton, the present superintendent of this department, is a graduate of Purdue University, and has been connected with this work for a number of years. He gives his entire time to this work, and is well qualified to look after the interests of apprentices.

The works of the company are located at East Pittsburg, in the very heart of "The Workshop of the World." It has been said of Pittsburg that "it is the hub on which the wheel of American industries has been wrought, and each spoke in this wheel represents a magnificent activity whose distinctive greatness may be approached, but is not surpassed anywhere." It will, therefore, be seen that excellent opportunities are offered for the student to familiarize himself with manufacturing methods and industrial conditions on a large scale. Almost every branch of manufacturing is carried on in the Pittsburg district, the iron and steel industries which have been so dependent upon electrical progress for their own development being, of course, the most important.

The company maintains a strict non-union policy as regards skilled workmen, so that the apprentice may work side by side and even compete with the regular employes in many of the departments, whereas, in some shops where similar courses are conducted, this is impossible, due to objections raised by union employes, and the student is compelled to give most of his time to test and office work.

The Electric Club, which is composed entirely of employes of the various Westinghouse Companies, offers good opportunities for intellectual improvement and social recreation, and the value of such an organization can scarcely be overestimated. The club quarters are located in Wilkinsburg, a suburb of Pittsburg, and it is here that most of the apprentices live. In the club quarters are found reading, writing, billiard and lecture rooms; also an assembly hall, where smokers, dances and receptions are held from time to time. The Electric Club plays an important role in every apprentice's life, and has a wholesome and uplifting influence.

The number of apprentices enrolled in the engineering and special courses during normal conditions will average from 300 to 500. This number was, of course, considerably reduced during the financial depression of 1907-1908, but it is expected that, commencing with this year's graduates, a considerable number will be enrolled.

During the past five years about 100 foreign students, all told, have been enrolled with the apprenticeship courses, these students coming from twenty-two colleges or universities, representing practically every civilized country. For the most part, these men come from British, German, Italian, Japanese and South American schools. Most of these men seem to take an active interest in the work and make rapid progress.

There have been but comparatively few R. P. I. men who have become connected with the W. E. & M. Co. within recent years. From the last six classes there have been only five men who have come to this company, and at the present time about eight graduates are in its employ. There are about twenty of the alumni located in the Pittsburg district, and while at present there is no Rose Tech Club, it is hoped that one will be formed in the near future.

Any undergraduate student who has in mind the taking of an apprenticeship course similar to that outlined above would do well to spend one summer vacation period in the factory in order to familiarize himself with the actual conditions. Such arrangements can usually be made, with the understanding that the time so spent will apply on the regular contract time, to be completed after graduation.

For the benefit of those who may be interested, there has been placed in the hands of the alumni editor copies of prospectus and contract forms, also some photographs which may be of interest to those contemplating such a course.

ALUMNI NOTES.

Mr. and Mrs. Gustav W. Grossenbach announce the engagement of their daughter Lydia to Howard A. Mullett, son of Mr. and Mrs. R. B. Mullett, of Kansas City. Mr. Mullett is of the class of 1904, and when last heard from was with the Electric Railway and Lighting Company, Milwaukee, Wis.

"Cy" Corson, '08, was recently heard from as being with the Olds Gas Power Company, of Lansing, Mich.

Mrs. Lois Bishop Stone, wife of George M. Stone, formerly of the class of 1902, died in New Orleans, December 14, and was buried there. She is survived by her husband and a two-year-old daughter.

A note from F. N. Hatch, '06, informs us that he is now with the Maintenance of Way Department of the Michigan Division of the Vandalia Railroad at Logansport, Ind.

Mr. L. Leslie Helmer, '01, and wife were recently in Terre Haute on a visit. Mr. Helmer is General Manager of the N. & G. Taylor Company, of Philadelphia, at Cumberland, Md.

Robbins, '08, stopped over in Terre Haute recently on his way to Chicago.

T. G. Pierson, '97, member of the recent Legislature of Indiana, was one of the very few Democrats to vote "dry" (for prohibition) against his party.

Let us have a few more such men.

J. E. Bernhardt, '08, recently with Libby & Nelson, contractors, of Minneapolis, has been home in Terre Haute since shortly before the Christmas holidays, waiting for the severe weather to break in that section.

H. E. Wiedemann, '03, has been elected President of the Saint Louis Chemical Society for the coming year.

Owing to the forgetfulness of our alumni, the following was until recently only known in Schenectady, N. Y.: Mr. William J. Davis, '92, of the railway department of the General Electric Company, was promoted about the middle of last summer to district office engineer at San Francisco, Cal., in charge of the engineering work on the Pacific Coast.

C. B. Trowbridge, '05, has just accepted a position with the Fort Pitt Bridge Company, of Pennsylvania.

During the short vacation between the terms, Mr. Fred A. Burgess, ex-'09, was seen in Louisville, looking better and happier than in the days gone by when in T. H. He is working in the Auditing Department of the L. & N. R. R., Louisville office.

Mr. Edward F. Phillips, 1900, is now Assistant Cashier of the First National Bank, Artesia, New Mexico.

FOOD ADULTERATION

By Milton Goodman, '07.

Perhaps nothing in recent years has caused such wide-spread attention and created such universal interest as the subject of "Food Adulteration." From the very wealthiest class to the extreme lowly there is gradually being imbued the idea that pure food is not a great luxury only to be enjoyed by the rich, but that it is a "something" which may be enjoyed by all.

At first the tradespeople all scoffed at the idea that they would be compelled to bring their food articles up to a certain degree of purity, but at the present time this false idea is dispelled, and those same people are now confronted with the stern reality that it must be either pure food or no food at all. This condition of affairs was not obtained by any weak or feeble effort by a disorganized body of men; on the other hand, the present state of affairs exists only because of a long and determined fight made by some of the greatest chemists of the country, ably aided by different legislative bodies, who, by the enactment of a large number of favorable food laws, have caused the unwilling or unscrupulous dealer to replace his *poor* food with pure food.

A large number of States are now protecting their citizens from the unscrupulous manufacturers who are trying to produce cheaper articles of food in imitation of pure food. Most all of these States have laws in accordance with which the sale of impure or adulterated foods is made a criminal offense.

On June 3, 1903, Congress approved an act relative to the standards of purity for certain articles of food, including meat and meat products, milk and its products, sugars and related substances, spices and cocoa and cocoa products, which were later established November 20, 1903, and adopted as the official standards for the United States by the Secretary of Agriculture.

What is adulterated food? This question was very ably answered by the Society of Public Analysis of England in 1874, as follows:

"An article of food or drink shall be deemed to be adulterated (1) if it contain any ingredient which may render such article injurious to the health of the consumer; (2) if it contain any substance that sensibly increases its weight, bulk or strength or gives it a fictitious value, unless the amount of such substance present be due to circumstances necessarily appertaining to its collection or manufacture, or be necessary for its preservation, or unless the presence thereof be acknowledged at the time of sale; (3) if any important constituent has been wholly or in part abstracted or omitted unless acknowledgment of such abstraction or omission be made at the time of sale; (4) if it be an imitation of, or be sold under the name of, another article."

The sum and substance of this definition is retained up to the present day, although, of course, there has been many restrictions added; in the main, however, it is essentially our idea of adulterated food.

MILK AND ITS PRODUCTS.

After the above brief preliminary description, it might be well to consider in detail a few of the more important food products, principal among which is the very common but all-important one: milk.

Milk is the secretion of the mammary glands of female mammals for the nourishment of their young, containing all the requisites for a complete food, i. e., sugar, fat, proteids and mineral ingredients combined in appropriate proportion.

Owing to its very wide application and universal use milk has been adulterated more generally, and has been the cause of more sickness, fraud, trouble and expense than all other food products combined. Clean, healthy milk has been, until recently, an almost impossible article to obtain. In order that milk should have the above-mentioned qualities it is absolutely essential that all the requirements of the various health authorities should be met by the dairymen supplying the milk. These requirements are quite rigid and pertain to the condition of the cows as regards health and cleanliness; they further specify that all receptacles must be sterilized, and, finally, the milk must be kept at a sufficiently cold temperature until sold to the consumer. It is a rather interesting fact to note that a short time ago one of the highest health officials in the State of Kentucky made the statement that of all the cows supplying milk to Louisville, approximately thirty per cent. were tubercular.

For the extermination of this appalling condition it is now being required that all cows be subjected to the tuberculin test, which consists merely of injecting tuberculin into the cow and noting temperature. In about nine hours the temperature is again taken, and a rise of not less than two degrees (Fahr.) is evidence that the cow is tubercular. This reaction does not take place in a healthy cow.

That milk is subject to more or less watering is a well-established fact, and one which has been brought forcibly to the attention of almost every one. In routine milk testing the watering of milk is detected with a fair degree of accuracy by the use of the thermo-lactometer, which is merely a fine hydrometer with a thermometer attachment; by means of this instrument the specific gravity and temperature are immediately obtained. For extreme accuracy the Westphal balance or pycnometer should be used. A good milk will usually have a specific gravity between 1.027 and 1.033 at sixty degrees F. Next in importance to the milk user is the subject of skimming milk. That a very large number of dealers sold and sell skimmed milk as whole milk is unnecessary to state. However, it is a very easy matter to detect a skimmed milk in a short space of time, by the use of a Babcock centrifuge. The milk is measured into graduated bottles, 17.6 c. c. being taken, an equal amount of commercial sulphuric acid (S. G. 1.82 to 1.84) is added; contents are then thoroughly mixed and the bottles placed into the centrifuge and whirled for a few minutes, length of time depending upon the rate of speed developed by the machine; hot water is then added to the necks of the bottles, which are whirled again; finally enough hot water is added to bring the fat into the neck of the bottle, when, after a little whirling, the per cent. of butter fat is read directly.

In some instances we find a man who is especially capable of defrauding the public; that is to say, we sometimes find a milk that is both watered and skimmed and still gives the lactometer reading of a good, untampered milk; this is, of course, due to the fact that "watering" lowers the S. G. while skimming raises the S. G. This double method of imposing upon the public is detected with certainty by obtaining the total solids of the milk and the butter fat content.

It is bad enough to get a skimmed or watered matter, but it is probably worse to get a milk containing preservatives. It is not a great while since a very large per cent. of all milk sold contained some kind of preservative; but it is true that in most instances the person using the "embalming" fluid was ignorant of the detrimental effect it had upon the human system.

By far the most common preservative used is formaldehyde in dilute solutions, containing from 2 to 6 per cent. of the gas, and usually being sold under various trade names, as "Freezine," "Iceing," "Preservaline," etc. It is commonly used in the strength of one part of the gas in 20,000 parts of milk. Formaldehyde is by far the most efficient of all milk preservatives, besides being the cheapest.

Boric acid and other preservatives are used to a very small degree.

Formaldehyde in very minute quantities (one part in 250,000 parts of milk) may readily be detected. The test more commonly used than all others combined is "Helmer's Sulphuric Acid Test." However, this is not quite so delicate as some others.

Helmer's test: To a small amount of the milk add about half the volume commercial concentrated sulphuric acid, which should always contain a very small amount of ferric chloride. If formaldehyde is present, there will be a violet coloration at the point of contact of the milk and acid. This test is usually made in conjunction with the butter-fat determination, considerable time and labor thus being saved.

Following is stamp used in our daily milk examinations:

Date..................Spec. of milk No......
Time collected.............A. M. P. M......
Temperature when collected...............°F.
From ....
Taken by...................................
Fat................................per cent.
Lactometer ....
Acidity ....
Dirt ....
Bacteria ....
Remarks ....

There are various kinds of milk upon the market, such as "Certified" milk, which is milk obtained from certified dairies under the supervision of a milk commission; all cows are tuberculin tested and the milk continually examined both chemically and bacteriologically; the bacterial count must be kept under 10,000 colonies per c. c., while ordinary milks under our supervision have shown a count as high as 5,000,000 colonies per c. c. This milk can almost always be recommended.

"Pasteurized" milk heated to about 140 to 160 degrees F. By this process the greater number of organisms are killed, including the enzymes which produce lactic fermentation. This last organism is an aid to digestion; this is, therefore, a great detriment to the "Pasteurized" milk. Heating the milk at 150 degrees for one-half hour is usually sufficient. If the temperature is raised above 155 degrees the taste is affected.

"U. S. Standard" milk is milk containing not less than 12 per cent. of solids, and not less than 8.5 per cent. of solids not fat, nor less than 3.25 per cent. of milk fat.

Cream must contain at least 18 per cent. milk fat.

BUTTER.

The most common fraud along this line is the sale of oleomargarine as pure country butter. As a rule, the oleomargarine sold on the market is composed of oleo oil prepared from the fat of beef cattle, usually churned up with neutral lard, milk and a small quantity of pure butter. This is then salted and usually colored to resemble butter.

Oleomargarine is a comparatively cheap article, costing never more than fifteen cents per pound for the uncolored product, with a Government tax of ten cents per pound for adding coloring matter. This tax is, in many instances, not paid, and the product sold at a very small cost to the unsuspecting public as pure butter. In appearance this colored product resembles butter very closely. It is a fact, nevertheless, that a pure oleomargarine is as healthy a product as butter.

There are a large number of tests used to distinguish between butter and oleomargarine, the main ones of which are given below. A very easy method of distinction between butter and oleomargarine is the "spoon or foam test," which is accomplished by simply placing a small amount of the specimen in a spoon and heating gently. If the specimen is butter, a rather copious foaming with little sputtering will be produced, while if it is oleomargarine scarcely any foaming but considerable sputtering will take place. This test, of course, is rather crude, but in most cases a fair idea may be derived as to the identity. The odor of the melted fat is also indicative of the substance.

The "Waterhouse" test gives very efficient results, and can be made in a very few minutes by heating a small amount of the milk and adding to this a small amount of the fat to be tested; butter fat has the power to emulsionize with the milk, but the oleomargarine forms in a clump.

By the use of the "Butyro Refractometer" the index of refraction of the melted, filtered fat is obtained, and owing to the considerable difference in the indices of refraction of the butter and oleomargarine, it is an almost positive method of detection. A failure or mistake by this method has never yet come to the attention of our laboratory.

As a conclusive proof the Reichert Meissl number is determined. This number refers to the number of cubic centimeters of tenth normal acid required to neutralize the volatile fatty acid in the fat. Butter has a number from 26.6 to 31.8, while oleomargarine has a number from .3 to about 3. This is an absolute and conclusive test, and is always used in court cases.

There are numerous other tests, but the above-mentioned are very commonly used, and very little difficulty and time is experienced in making the same.

A renovated or process butter will act similar to oleomargarine when the spoon test is applied; otherwise it acts in most instances very much like a pure butter.

MEAT.

Meat is another form of food upon which adulteration is freely practiced. Preservatives are very often found in meats and sausage; the more ignorant dealers frequently think that old meat can be restored to life by the application of a large amount of preservatives, and as a consequence sulphites, boric acid and other preservatives are often found.

Link sausage is often filled to a great extent with starch, partially because of its cheapness and partially because it has the power of retaining water at high heat and prevents the sausage from shrinking. This is one of the countless ingenious methods practiced.

Canned goods are often made more or less wholesome by the addition of metallic salts, used to make the goods appear to better advantage.

While water pertains to every one in the universe, nevertheless, it does not come in the adulterated food list, and will therefore not be taken up in this article.

One might go on and enumerate countless forms of adulterated food, but the ones already mentioned are probably the commonest, and will tend to give a faint idea of the enormity of this work.

It is quite true that it is possible, according to law, to mix an inferior substance with a pure one, but if this is done, it must be plainly labeled; and this last statement is almost the sum total of the pure-food law, i. e., the public must know what they are getting, whether good, bad or indifferent.

The concensus of opinion among all big health authorities favors the idea of education among the milk dealers, storekeepers, etc., and this sentiment is very fittingly expressed by the late Earl of Derby, eminent as a sanitary instructor, and as a sanitary legislator, who said: "Sanitary instruction is even more important than sanitary legislation."

GENERAL ASSEMBLY.

On January 22d, the last day of the term, a general assembly was called in commemoration of Dr. Gray. The assembly hall was full, almost the entire body of students, Faculty and shop force attending. President Mees outlined the life history and valuable research work of Dr. Gray, touching upon many attainments and honors of which most of those present had not previously heard. So modest was Dr. Gray that even those who had known him well during the twenty-one years of his work at Rose had learned only indirectly of his most valuable work in earlier years. A number of editorials in various scientific journals, all expressing regret at the loss of one of the world's scientists, were mentioned to show that his work was appreciated in scientific circles both here and abroad.

W. C. Ball spoke briefly but eloquently of the influence Dr. Gray left with the Institute, expressing a belief that it would continue to encourage those yet to study the subjects he taught so ably. Mr. Ball even suggested that it might well be the ambition of some Rose student or graduate to prepare to take up and complete the two scientific books which Dr. Gray left unfinished.

Following this address Prof. Hathaway told in a few simple words of Prof. Gray's last visit to the Polytechnic, made after it had become apparent that he could not resume his work and probably could live but a short time. The description was such a perfect tribute, and was so filled with feeling, that it appealed to every one present to a marked degree. As Prof. Hathaway sat down a silence prevailed over the entire assembly so intense that many spoke of it afterward.

No other subject was mentioned at the assembly; it seemed an occasion for reverence and respect only, and after Prof. Hathaway's words the men passed out quietly.

DR. THOMAS GRAY.

The members of the Rose Tech Club of St. Louis, all students of Dr. Thomas Gray, learn with great sorrow of his death, and desire to offer to Mrs. Gray and members of the family this expression of condolence and sympathy.

Dr. Gray stands in the memory of all of us as a teacher of the highest ability. He has been a Master Builder in laying the engineering foundation for the graduates of Rose. So deep was his experience, so great his patience, so masterful his technique, that his students have left him with the wish that the raw material they could furnish him had been of better sort, but with the impression, always, that it could not have been under the direction of more skillful hands. Wider experience has only served to strengthen this conviction.

But our greater privilege has been to profit from the example of his character. For his knowledge and achievements we honor him; but for his Nobility and Strength, we honor and love him.

Our fondest recollections of Old Rose are intertwined with the memory of our Teacher and Friend, and will so continue throughout the years.

Rose Tech Club of St. Louis.

Signed by the members of the Club:

McKeen, '85.	Rochester, '01.
Hendricks, '89.	Goetz, '87.
Layman, '92.	Benbridge, '06.
Wells, '96.	Wiedemann, '03.
Kessler, '97.	Crockwell, '95.

THE NATIONAL FLOWER.

CAST OF CHARACTERS.

Uncle Sam	Richard L. Smith, '09
Bailiff	William H. Webster, '10
Lawyers	Charles E. Washburn, '10 Adolph A. Bareuther, '10
Old Maid	Alan W. Thurston, '12
Young Maid	Erich A. Mees, '11
Sunflower	Walter E. Voss, '11
Onion	Harvey B. Messick, '12
Old Oak Tree	Carl A. Planck, '10
Young Rastus	Floyd M. Weaver, '11
Four-leaf Clover	Morton F. Hayman, '10
Little Honey Boy	Raymond P. Meyers, '12
Captain of Police	Roy F. Tyler, '09
Tiger Lily	Herbert J. Harries, '11
Meadow Lily	Donald M. Hubbard, '12
Day Lily	Joseph A. Hepp, '12
Spring Beauty	George A. Lund, '12
Peach Blossom	Henry W. Ker, '11

LITTLE DAISIES.

Alvin C. Rasmussen, '12. J. Harvey Beck, '12.
August H. Albrecht, '12. Harold O. Root, '12.
Floyd E. Bundy, '12. William R. Bell, '12.
James A. Spindle, '12.

JURORS.

Edmund T. Buckley, '09. Herbert C. Offutt, '11.
R. Thurbur Reinhardt, '11. Edwin L. Puckett, '11.
Harry H. Hummel, '09. Vere S. Calvin, '10.
E. Rector Lawrence, '10.

AND

J. VALENTINE DAVIDSON, '10,

In his Great Quadruple Role of
Leading Weed, Leading Juror, Leading Policeman,

AND

"LITTLE DEWDROP."

Was it a success? Well, we should remark! After weeks of faithful practice, the Rose Glee Club, under the careful guidance of Mrs. Adams, tripped daintily before the footlights and presented the people of Terre Haute with an operetta so witty and so musical as to gain the enthusiastic commendation and applause of all who were so fortunate as to see it. Fun, foolishness and frivolity were generously indulged in, and no attempt was made to dampen the spirits of the audiences by anything serious or solemn. The musical numbers, arranged by Mrs. Adams, made a pronounced hit, and numerous were the catchy airs that will be whistled by Poly students for many days to come.

And the plot—for, oh, yes, there was a plot—centered about the choosing of a national flower, by a severe and sedate set of solemn jurymen. Each pretty flower proceeded to present its particular charms to this tribunal, in the hope of becoming the floral emblem of the land of the Stars and Stripes. Dainty little daisies, bedecked with many fluffs, frills and feathers, sang their own praises to the jury in deep bass voices, which caused some surprise at first; the majestic oak and lengthy sunflower each argued his case with eloquent words and melodious voices; the lilies, the peach blossom, four-leaf clover and spring beauty each had its turn, followed by the charming little "cro-cus," and even the onion. The jury, overwhelmed by such a display of floral beauty, and besides, being too busily engaged in flirting with the young (?) and old maids, are unable to decide; whereupon Uncle Sam settles the fracas by naming the Rose, and brings forth to substantiate his choice, not a graceful, blushing creature representing the rose, but three husky athletes—Captains Backman, Hadley and Pritchard, of baseball, basket ball and football, respectively—each garbed in the athletic colors of good old Rose.

So much general praise is due the club that it is hard to pick individuals, but, at that, several were so good as to deserve special mention. The genial and cheery Joe Davidson kept the house in continual uproar with his antics as "Little Dewdrop," who weighed in the neighborhood of two hundred pounds. "Blondie" Meyers, of the Freshman Class, scored a tremendous hit, both with his characterization of "Honey Boy" and with his splendid tenor voice. William Webster, as the bailiff, was exceedingly comical at all times, and because of his superb singing was obliged to repeat each of his songs three or four times. Uncle Sam, the two maids and the lawyers must also receive their due amount of credit, while too much can not be said of the hard-working jurors and policeman.

The work of the orchestra in the first performance earned the applause of every one, and their interpretation of "college yells" was especially well received. On the whole, the boys did very well, and made every Poly fellow feel proud of the fact that he was a follower and supporter of the Old Rose and White. C. J. K.

MUSEUM OF SAFETY AND SANITATION.

Announcement has just been made of the acceptance of the treasurership of the Museum of Safety and Sanitation by Frank A. Vanderlip. An executive office for the administrative and promotive work of the Museum has been opened at the United Engineering Societies' Building, 29 West Thirty-ninth Street.

A committee on plan and scope includes Prof. F. R. Hutton, chairman; Dr. Thomas Darlington, Commissioner of the Health Department of the City of New York; P. T. Dodge, President of the Engineers' Club; William J. Moran, attorney-at-law, and Henry D. Whitfield, architect.

Plans are being pushed forward along practical lines to prevent the enormous loss of life and limb to American life and labor, through the Museum of Safety and Sanitation, where safety devices for dangerous machines and preventable methods of combatting dread diseases may be demonstrated. Charles Kirchhoff, editor of *The Iron Age*, is the chairman of the Committee of Direction; T. C. Martin, editor of *The Electrical World*, vice chairman, and Dr. William H. Tolman, director.

ALUMNI NOTES.

Miss Estelle G. Stamm
announces the marriage of her sister
Mary Agatha
to
Mr. Claiborne Pirtle
on Monday, the eighth of February
nineteen hundred and nine
Cincinnati, Ohio

Born to
Mr. and Mrs. Charles E. Mendenhall
January 29, 1909
a son
Richard Corwin Mendenhall.

Mr. Mendenhall is of the Class of '94, and at present Professor of Physics, University of Wisconsin.

...ATHLETICS...

BASKETBALL.

DePauw, 25; Rose, 49.

DePauw proved some easy for us on January 13th, so we had no trouble in beating them 49 to 25. The first half ended 23 to 4 in our favor, but in the second session we laid down, and the "Methodists" made more points. Then the subs which they put in proved more effective for them than the regular men, and had these men started the game, the score might have looked different. It was the roughest game yet, three men being disqualified. Hoffner was put out early in the fight for shoving Ell as he made a shot for the basket, and a short time after Grady was out for the same offense. Scott went out on the five-foul rule, and Ell was disqualified for the same thing near the end, but he was allowed to stay, as there were no more subs to put in his place. Webster and Wente led in the number of points for us, the former getting nine and the latter six, all from the field. Curry dropped four in all, being from long, difficult, spectacular shots. Richards, a DePauw sub, led his teammates with three.

LINE-UP.

DePauw.	*Position.*	*Rose.*
Crick	F	Webster
Ell, Wolfe	F	Wente
Hoffner, Offut	C	Scott, Holderman
Curry	G	Grady, Richards
Hadley, Standau	G	Hardin, Ell

Summary.—Field goals: Webster 9, Wente 6, Curry 4, Richards 3, Hadley 2, Crick 2, Holderman 2, Offut, Scott, Wolfe. Foul goals: Crick 5, Hadley 3, Hoffner 2, Ell 2. Referee, Dr. Guedel, of Indianapolis. Timers, Hathaway and Wallace. Scorers, Brennan and Holopeter. Time of halves, twenty minutes.

Wabash, 32; Rose, 11.

On January 16th Wabash came down and slipped one over on us to the tune of 32 to 11. Lambert, the fast little forward for the "Crimsonites," was the star of the game, with seven field and two foul goals to his credit. He is the fastest player seen here so far this season, and could make goals seemingly at all times. He had a zigzag method of dribbling and shooting that we could not solve, and therefore could not guard against. Wabash certainly has just as strong a team as she had last winter, even though many of the old familiar faces are missing. The game was fast and interesting all the way through, although we were not winning. Somehow or other the night seemed to be an off one for us, and we can not help but think that if the boys had been in better luck the score would have looked much different. Lafollette, who refereed the game, got in bad with the rooters on account of many things that looked like discrimination, and the boys would certainly not like to see him officiate another game here.

In a preliminary to, the Rose seconds defeated the Wiley High School five in one of the best games of the winter by the score of 22 to 20. The game was nip and tuck all the way through and the final winner could not be predicted until the last whistle was blown. Nicholson was the star for us, while Hegarty was the shining light for Wiley. This man is good on the floor, and would make a valuable asset for our own team.

LINE-UP.

Wabash.	*Position.*	*Rose.*
Lambert, Gipe	F	Webster
Walters	F	Wente
Bowman	C	Hoffner
Yount	G	Curry, Hadley
Stump	G	Standau

Summary.—Field goals: Lambert 7, Yount 3, Webster 2, Walters 2, Wente, Hadley, Bowman. Foul goals: Walters 4, Hoffner 3, Lambert 2. Referee, Lafollette, of Purdue. Timers, Hathaway and Modesitt. Scorers, Brennan and Hargrave. Time of halves, twenty minutes.

Indiana, 27; Rose, 12.

We reproduce here Indiana's story of the game there on January 23. We think that, had our boys been used to the floor, the game would have resulted differently. Curry could not make the trip on account of exams, and therefore the team was weakened somewhat.

The Indiana University basket ball team finally got on the winning side by defeating the Rose aggregation in a well-played game by a score of 27 to 12. In the first half the teams played nip and tuck, the score at the end of this period being 9 to 5 in favor of Indiana.

There was a marked absence of team work in the first half, although both teams showed brilliant spurts at times. There were two or three individual stars whose work kept the interest in the game from lagging. Hadley, the big Rose Poly guard, did some brilliant playing, while Captain Berndt and Hipskind did the best work for Indiana.

At the beginning of the second half Coach Harris sent Rogers to center in place of Trimble and Barnhart took Chattin's place in the line-up at forward. Both these men starred, and with the altered line-up the team got into some whirlwind plays which took the Engineers off their feet and allowed the Crimsons to run up several scores. The game was cinched in the first few minutes of the second half.

The game started out slow, and it was eight minutes before Chattin made a field goal and started the scoring. Rose made a foul goal, and after Hipskind made another field goal, Hadley, of the Rose team, came up from guard and with a beautiful shot sent the ball into the net.

There was little team work in evidence, and long shots were used. Rose came back with a burst of team work in the second half, and Hoffner scored a goal. It was here that Indiana took a brace, and, with the men playing furiously, scored many points. Line-up and summary:

LINE-UP.

Indiana.	*Position.*	*Rose.*
Hipskind	F	Wente
Chattin, Barnhart	F	Webster
Rogers, Trimble	C	Hoffner
Thompson	G	Hadley
Berndt	G	Standau

Summary.—Field goals: Chattin 2, Hipskind 3, Berndt 1, Barnhart 4, Rogers 2, Hoffner 2, Wente 2, Webster 2, Hadley 2. Foul goals: Thompson 1, Barnhart 2, Hoffner 2. Time of halves, twenty minutes. Referee, Lafollette, of Purdue.

Franklin, 24; Rose, 27.

Hadley was sick on January 30th, and not able to be out of bed, and Curry was away on a visit, so we did not present our best front to Franklin, and the visitors came near slipping one over on us. As it was, we won by foul goals, Hoffner getting busy at this and throwing eleven. Another thing that counted against us was, that, owing to the exams, none of the men had had a chance to practice for over a week, so every one was stale. Webster led in the matter of field goals with five, but to Hoffner, with his eye for the basket from the foul line, is the man to whom credit for the victory is due. Brown was the best man for Franklin, with four field and two foul goals. Dr. Guedel was again on hand with the whistle, and as usual gave the best of satisfaction. He is the best referee that has ever been seen here, and the rooters are only sorry that he can not be secured to run all of the games. He is square as a die, and fouls are few and far between that he does not see and call.

LINE-UP.

Franklin.	*Position.*	*Rose.*
Brown	F	Webster
Gaston	F	Wente, Markley
Beam	C	Hoffner
Chadwick	G	Standau
Ritchie	G	Offutt

Summary.—Field goals: Webster 5, Brown 4, Hoffner 2, Gaston 2, Wente, Beam, Chadwick, Ritchie. Foul goals: Hoffner 11, Chadwick 4, Brown 2. Referee, Dr. Guedel. Timers, Hathaway and Goheen. Scorers, Brennan and Selleck. Time of halves, twenty minutes.

Normal, 22; Rose, 50.

Once more we handed the short end of a 50 to 22 score to Normal on February 6th. Webster and Hadley were both out of the game, the former on account of overwork for the "National Flower," and the latter had not recovered from his illness. Wente was the star of the game. He broke the season's record by pocketing an even dozen baskets from the field. The team work was great, or this record of his would never have been possible. Curry, who was acting captain, showed that he had lost none of his skill during his period of absence, and he scored five from the field. Every man on the team put up a good game, and it was simply this great working together that allowed us to run up such a score. Nicholson played his first game of the season on the 'varsity, but he was not so effective, owing to lack of training. When he is in trim "Nick" is one of the best basket finders on the team, and the rooters are anxious to see him get in condition for the games that follow. All of Normal's points came from long, seemingly impossible heaves, which luckily passed through the rim.

At the start of the game Shook was leading one of our yells, when the entire bunch of seats which our rooters were occupying fell down. This created havoc with the rooting for the evening, but no one was injured in the fall.

In a preliminary the Wiley High School quintet walked away with the Normal second team by the score of 25 to 7 in a short game.

LINE-UP.

Normal.	*Position.*	*Rose.*
Schorling	F	Nicholson, Webster
Cohee	F	Wente
Everett	C	Hoffner, Offutt
Schoeppel, Bloomfield	G	Standau
Laughlin	G	Curry

Summary.—Field goals: Wente 12, Curry 5, Hoffner 3, Schorling 3, Everett 3, Schoeppel 3, Nicholson, Webster, Offutt. Foul goals: Hoffner 4, Everett 4. Referee, Dr. Guedel. Timer, Hathaway. Scorers, Brennan and McCullough. Time of halves, twenty minutes.

The following is an extract of a story that has been written in connection with several other college athletic writers for the *Indianapolis Star* on the subject, "Is the College Athlete a Roughneck?" Most of men will agree with the things that have been said, and that really they have not been made strong enough.

Is the college athlete a roughneck?

Well, not so as you could notice it at Rose Poly. Mayhap time was, and is, at other institutions of learning where he rightfully deserves this title, but at Rose this has never been the case, and the reason is, that even were he so inclined, he could not afford to be. Of all colleges in the State, athletes at Rose Poly are shown the less favors. Their work in school is watched much closer than the rest of the boys who do not go in for athletics, and along with their efforts for the school on the cinder path, gridiron, diamond and gym floor they have to make the highest of grades for the privilege of doing so. Then, again, as is the case with no other school in the State, most of the men have recitations clear up to 5 o'clock nearly every evening, so he must be an all-around man indeed who can afford to go in for athletics.

Then, again, at Rose the men that play on the teams are many of them the best all-around "good fellows" in school. I do not mean by this term what many people think, that is, the man that is the biggest rounder, or the one that can "put away the most booze," or get along with the least amount of sleep while spending his nights "out with the bunch." But I do mean that they are the most popular men in school, and would be even if they did nothing to bring them into the limelight in athletics. A large proportion of the stars in athletics at Rose are fraternity men, but I think that in every instance of this the man was taken into the frat before he showed himself to be anything out of the ordinary in sports.

Now, as to the scholarship of many of the athletes. Carl Wischmeyer, who received the medal upon graduation in '06, was an "R" man in basket ball and track, and was a member of the Athletic Association. Minor, the medal man in '07, played four years on the baseball team, was once manager of the basket ball team, and four times won his monogram on the diamond. Paul Turk, who was the greatest all-around track athlete that this State has ever known, was one of the best men in his class in his studies.

"Spot" Hadley, captain and star of the basket ball five, star of the nine and eleven, best tackle in the State last fall, and idol of all the boys in school, is considered one of the "sharks" of his class when it comes to studies. He is also a strong Y. M. C. A. man, and the school secretary told me that, never once during the football season, even when the team took a train out on Friday evening, did Hadley fail to come to the meeting.

Lester Backman, captain of the football and baseball teams, all-State fullback, best college pitcher in the State, and one of the most popular fellows in school, comes mighty close to leading his class in the matter of getting high grades. He is a member of the Sigma Nu fraternity and one of the best-liked fellows in school. Glenn Curry, President of the Rose Y. M. C. A., is a member of the basket ball and track squads. "Dick" Smith, who has won his "R" at both track and basket ball, was at one time the head of the Y. M. C. A., and is still an active worker in this line, and he has several times been an honor man in his class. He is at present President of the Senior Class, and as such is President of the Student Council, which directs all student activities.

This list could be continued in a minor degree so as to take in every member of every team in the school, but I think that this shows that there is no place for the "roughneck" and "flunker" on any of the teams at Rose Poly. He simply could not make good were he of this class, and even should he come to school, the fellows that are clean and straightforward would not stand for his presence in any of the organizations.

Again I say, No, the terms athlete and "roughneck" are never associated at Rose.

Armstrong, '09.

Alaska-Yukon-Pacific Exposition.

Athletes at the University of Washington at Seattle are training steadily for the big track meets which are to be held this summer on the campus. The mild weather permits outdoor training all through the winter, and without doubt the athletes will make a very creditable showing in competition with the men from Eastern schools who are invited to enter the numerous contests to be held in the new stadium this summer. The stadium, which is being built especially for track events, will be one of the best on the coast. It is being erected by the officials of the Alaska-

Yukon-Pacific Exposition, and after the fair will revert to the University, since it is on the campus of the University.

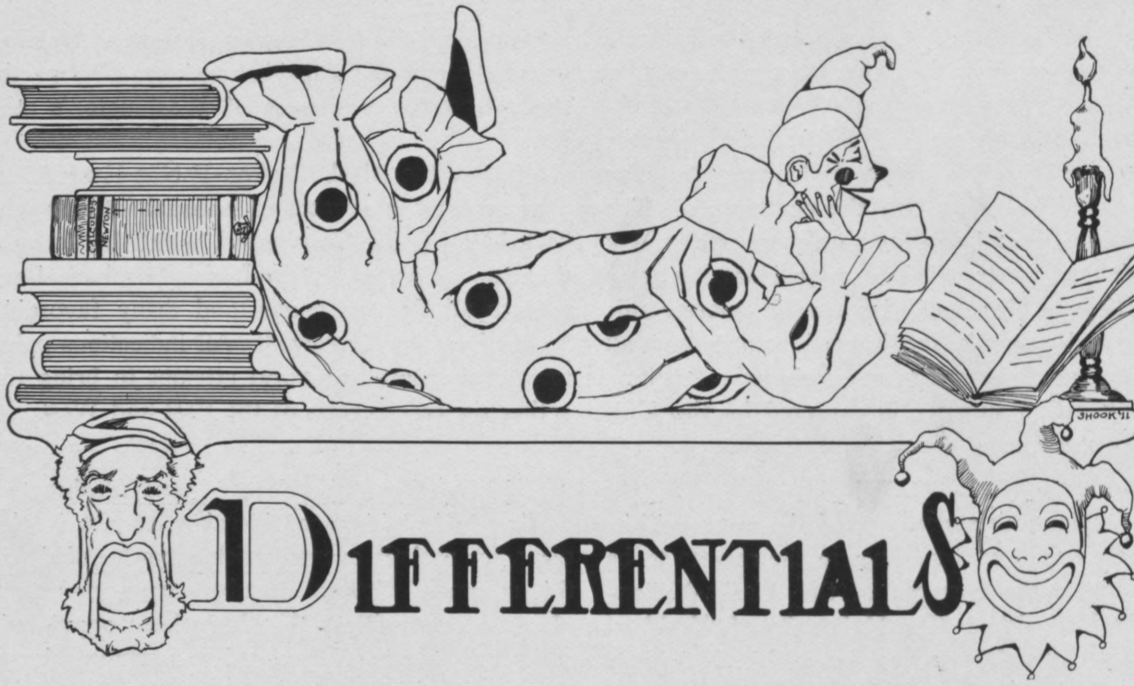
The meets this summer will be held under the auspices of the Exposition, and many attractive prizes will be offered to the contestants. The Exposition will be opened on June 1st, and a schedule of meets will be arranged starting from that time. There will be a wide quarter-mile track and grounds for baseball, tennis and all field events for track meets within the stadium, and an active summer is expected by the University students.

Washington's supremacy on the water will be severely tested next summer in the regatta to be held under the auspices of the Alaska-Yukon-Pacific Exposition. The University of Washington has thus far proven herself invincible in eight-oared shell races. Since this sport has been given a prominent position in 'varsity athletics, she has never met defeat. On the contrary, her crews have shown themselves victors in speed, endurance and form. The time made in her contests compares very favorably with that of the Eastern regattas, with time allowed for running water and tide.

The course where the races are held is one unsurpassed for racing by any in the world. With a twelve-mile straight-away on Lake Washington, where it is almost never too rough for rowing, one can easily imagine what a splendid asset it is for crew racing, taken in addition to an ideal climate. The shells are used winter and summer, and the resulting long course of training under the eye of a capable coach explains partly the extraordinary success of Washington's athletes.

During the Alaska-Yukon-Pacific Exposition, next summer, a regatta of unusual interest will be held on Lake Washington, which borders on the Exposition grounds. Invitations have been sent to all Eastern crews, and many favorable replies have been received. All indications point toward the first successful attempt to bring together the crack crews of the East and West.

The Faculty of the University of Washington at Seattle is taking considerable interest in the plans for athletic events which are scheduled for this summer. Several members have important places on committees that have been appointed, and are now actively engaged in securing a large turnout for this summer's games. So far as the work has progressed, success seems assured, and the greatest task, that of securing a suitable stadium, is almost accomplished. With the help of the Alaska-Yukon-Pacific Exposition officials, the committee is hopeful of building a magnificent athletic field. During the months from June to October, when the Exposition will be held, the field will be used for various athletic events and games, and then the grounds will be turned over to the University in time for the football season. If the crowds that attended the games this season continue to increase as they have in the past, a large stadium will be of untold value to the University.



DIFFERENTIALS

When you buy picture postal of "Sue," be sure to ask for the twenty per cent. off.

It's not the honor won in college, but the man behind, who gets the job.

In college or out, become known—but become favorably known.

"Doc" wants to know if "Bill" Royse has found the Benzine ring.

Jim Johnson's upper part of the entrance to the cavernous opening in his face is becoming very noticeable, owing to a dense growth of underbrush exposed to the sunlight. It is the reddish variety.

When your report card comes around at the end of the term, and you do not receive what you thought should have been, forget it. "Doc" will see to it that you don't lose out. Grades, as grades go, are hardly worth the space they occupy.

Ask Ralston what he did to "Dick" in Pittsburg during the Christmas holidays.

Why, oh, why, should it be?

Mrs. O'Brien—To think I once rode in me own kerridge.

Mrs. Brennan—Yes, wid yer mother a-pushin' it!

Who is the "Wooden Indian" of the Civil Gang? Ask Mosby.

Why does Ducey smoke?

Professor—Grosvenor, you've heard it said that beef is a good brain food. If I were you, I'd eat a cow.

Found—A Gibson's calculus by a Senior with slightly-worn edges.

Old Gentleman (reading basket ball news)—I see the Normals played with Poly last night.

Senior—Oh, no; Poly played with the Normals.

Reilly, '12 (reading theatrical bulletin, "Olga Nethersole in Repertoire")—That show must be a corker. That's about the fifth actress starring in it this season.

AN EPITAPH.

"Here lies my wife, Samanthy Proctor;
She ketched a cold and wouldn't doctor;
She could not stay, she had to go—
Praise God, from whom all blessings flow."

Judging from the amount of "shooting" done by the Normals on the night of the 6th, they evidently thought they were having target practice.

Rehm, '12—Tell me when you want me to go.

Frances—It's two hours too late for that now. —Ex.

Hummell—I'm going to send that girl the ugliest comic valentine I can find.

Sproull—Send her your photograph.

Sultan—Villain! what hast thou now been doing?

Guard—I merely notified the ladies of the harem, my liege, that you had ordered them to be beheaded. They were awfully scared.

Sultan—To the boiling oils with him, slaves! I am tired of these harem-scarem fellows.—Louisville Spectator.

This year, on January 22d, the day when Seniors celebrate with powder and smoke, they worked a new trick on the shop people. It happened this way: as Willmarth passed the shop draughting room, where two graduates-to-be were supposed to be at work, he heard part of what seemed to be a heated argument: "I tell you it's not so." "You're a liar." "And you're another." Willmarth hurried to the doorway, but he was too late; number one had drawn a revolver and number two was disappearing behind a packing case. "Bang!" spoke the gun of number one. "Bang! Bang!" came from the protecting shelter of the packing case. Marthy paled and ducked, but was brushed aside as number one sprang for the shelter of a lathe. "Bang! Bang! Bang!" continued the duel, and Marthy retired hurriedly for reinforcements.

Said reinforcements, arriving breathlessly, found two Seniors laughing gleefully and loading up again to help in the fusillade over in the main building.

A FABLE.

There was once a wise old Skate who Existed in a two-by-four Room above a Tonsorial Conservatory. He was Dead Next to all the Dope concerning the Solar system, but couldn't tell you the Difference between a beef-Steak and a side of Bacon. He could put you Wise to exact Distance between Mars and Venus, but every Newsboy on the Block would beat him out of the Change of a Two-bit piece. He could stuff your Noodle full of Salve about the kind of cheese the moon was made of, but would get Lost if he tried to go down town by his Lonesome. He Studied and Starved his whole Life away, and when he turned up his Toes, he was in a Home for the Aged and Infirm.

Across the street there Lived a Guy who manipulated a Booze joint. He didn't know the Difference between Arithmetic and Telegraphy, or between Geography and Railroading. He couldn't Tell a Text-book from a Polecat, if he met them Both on the Street, and was doing Blame Good to know his Name. All he could do was to shove out Booze to the Coons, and Sell cigars that smelled like Beargrass Creek, and all Day and Night he loafed behind the Bar, and took in so many jitneys, and Dimes, and plunks, and Vs, that he had to Hire a swell young Sport to Count them for him. He owned four or five Houses, and so much Tin that Folks said he must have Been a Plumber, and when he kicked the Bucket, his Kids had a great Scrap over the Estate.

Moral—It takes *Brains* to make a Success of Life.

[Editor's Note.—The Reviews Editor wishes to acknowledge the very material assistance of R. Montfort Reilly, '12, in the selection and copying of the reviews in this issue.—C. W. S.].

Electric Power Costs in Small Stations.

The small central station to-day offers one of the best fields in electrical practice for the close study of power economics. The opportunity to reduce expenses is excellent under careful management, for the reasons that a small improvement in load factor may bring about a larger proportional economy of operation, and because changes in the equipment are relatively less expensive than in stations of high capacity and correspondingly large total investment. The fact that excellent power cost figures have been obtained by plants of rather limited capacity shows that the small station can afford to study production expenses in the most exhaustive manner. The large plant may have an initial advantage in being able to buy more efficient equipment of larger rating, but the small station may go far in the direction of low cost of generation if the management can capture the necessary high-load factor. It is operation at underloads that plays havoc with the efficiency.

In this connection some suggestive figures of operating costs for the fiscal year 1908 have just come to hand for eight central stations of very moderate capacity in Massachusetts. The companies considered operate in Abington, Attleboro, Beverly, Clinton, Gardner, Leominster, Plymouth and Revere, serving communities of 10,000 to 20,000 inhabitants. The Abington company had a generating cost of 1.65 cents per kilowatt hour delivered at switchboard. Its station equipment is of the direct-connection type, consisting of revolving field alternators driven by compound reciprocating engines having a normal capacity of 725 horse power. During the year the company burned 2,219 tons of bituminous coal, costing $4.59 per ton. The fuel cost per kilowatt was 1.05 cents and the labor cost 0.47 cents; the total current generated and delivered at the switchboard was 967,544 kilowatt hours, and the maximum load was 453 kilowatts. The plant was operated by six men, under normal conditions, giving an annual output of about 161,000 kilowatt hours per station employe. An all-day service was given.—*Engineering Record.*

The Eighty-cent Gas Decision of the Supreme Court.

Probably few decisions of the United States Supreme Court have been of such importance to the engineer as that announced on January 4, on the legality of the law under which the Consolidated Gas Company of New York was ordered to sell gas at eighty cents per thousand cubic feet. The Circuit Court held that the law was unconstitutional so far as this company is concerned, because such a rate was practically a confiscation of its property. The Supreme Court reverses this decision, but does so in such a way that the case may be tried again upon facts based upon experience in the management of the property with the eighty-cent rate. The law as a whole was not passed upon in the last decision, but certain features of it were declared unconstitutional. One of these is the requirement that the company must maintain a certain pressure in its mains at all times. Such a requirement was so manifestly ridiculous from an engineering standpoint that it was predicted in this journal the courts would not uphold it. Attention is particularly called to this feature of the decision because it shows how our highest court views an attempt to require a given result while stipulating how that result shall be obtained. It is right to require certain results or to require certain methods of doing work, provided they are practicable, but it is not just to require both results and methods for many kinds of work.—*Engineering Record.*

Rapid Plate Punching.

At the structural shops of the receivers of Milliken Bros., Inc., on Staten Island, New York City, recently, 143 tons of plates were punched in eight hours, forty-seven minutes, on one machine tool. The plates were thirteen-inch flange plates for girders five-eighths and eleven-sixteenths inches thick and averaging about thirty-two feet in length. The average number of fifteen-sixteenth-inch holes was about ninety-six to each plate, staggered except at the ends.

There were three sizes of plates and varieties of spacing; 52 of one kind, 168 of the second, and 96 of the third. The total length of plate handled was 10,036 feet; weight, 285,850 pounds, and total number of holes, 30,384. This work was done on a multiple punch, four plates being passed through at a time.

A few days previous to this one man punched 12,740 9-16 inch holes, one at a time, in ten hours. This was on light transmission-line tower angles, on a light single-stroke quick-acting punch. These performances are believed to be records in the line of rapid punching in the bridge shop.—*Engineering Record.*

Use of Nickel Steel in Bridge Building.

In an interesting paper read before the American Society of Civil Engineers, J. A. Waddell contributed some valuable material to the prominent subject of using nickel steel in bridge building. Summarizing from the results of his experiments, covering a period of five years, he pointed out that nickel steel is in every way fitted for bridge construction, in that it is strong, tough, workable and reliable; moreover, its adoption would effect a decided economy. This economy would increase in the future as the cost of nickel decreases, and as the shops become more accustomed to the treatment and handling of the new alloy. That nickel will soon be less expensive is almost a foregone conclusion, in view of the enormous deposits of nickel that have been found in existence in Canada. It is stated on good authority that there has been found in one deposit in that country ore containing fully 200,000 tons of the metal, and the outlook for an enormous supply is bright.—*American Machinist.*

Graphite in Boilers.

One of the jobs I had in my earlier experiences was that of boiler washer in a plant containing six 250 horse-power water-tube boilers. These boilers were washed out every six weeks. When I close up a clean boiler, I put two pounds of flake graphite in each drum.

When a boiler was opened after this treatment and the turbine cleaner run through the tubes, the scales came off very readily. By examining the side of scale which was next the tube, graphite could be seen clinging to it. The same condition was found existing in the drums.

Since I received my license and had charge of boilers I have used the same idea, and find it works fine, especially in return-tubular boilers, where the tubes are hard to clean.—*F. W., in Power and the Engineer.*

The High-Pressure Fire-Protection System of New York City.

The high-pressure fire-protection system of New York City was subjected to a test recently in which approximately 23,000 gallons were discharged per minute through fourteen 2-inch and twelve 1¾-inch nozzles. Connections were made to the hydrants with 3-inch hose lines, which led directly to the 1¾-inch and to eight of the 2-inch nozzles, but siamesed to the remaining 2-inch nozzles. Four lines were attached to each hydrant, and in order to get all the lines desired it was necessary to go to hydrants at a maximum distance of 600 feet from the point of discharge, necessitating 14,000 feet of hose for the test. The hydrants were opened with the mains under city pressure, and the pumps gradually cut in until three pumps at each station were in operation, allowing a reserve of 40 per cent. of the total pumping capacity. The six pumps maintained a pressure of 270 pounds per square inch and discharged at a rate of about 33,000,000 gallons in twenty-four hours. After this test four of the new hose wagons for service in connection with the high-pressure system were rigged and the test repeated. Each hose wagon is fitted with a standpipe supplied by two lines of hose. A water tower with one deck pipe and one high nozzle, each supplied by two lines of hose, was also used. The remaining twenty hose lines were siamesed into ten 2-inch nozzles. No difficulty was experienced in either test, the pumps being cut in as planned and maintaining the final pressure with ease.—*Engineering Record.*

Salt Water for Killing Weeds.

Salt water for killing weeds has been extensively used during the past season on the Oregon Short Line Railroad, and very satisfactory results have been reported. Water for the purpose is taken directly from Great Salt Lake, which is approximately 22 per cent. salt, and is merely pumped into tank cars and hauled over the line. In June, 1908, the cost of sprinkling 304 miles of track of the Utah division of the system is reported to have been $2.66 per mile, about 2,660 gallons being used in the first sprinkling and 1,860 gallons in the second.—*Engineering Record.*

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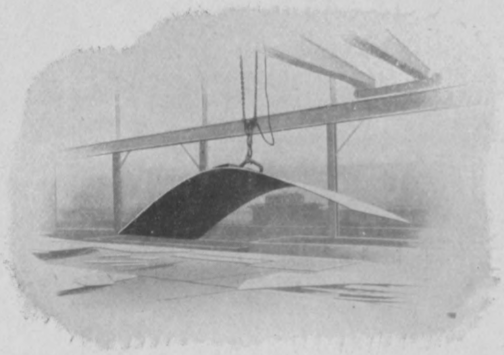

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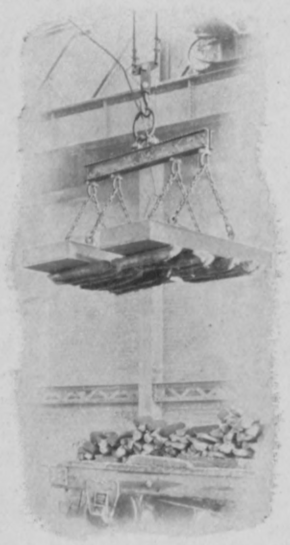

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