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THE ROSE TECHNIC

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THE TECHNIC.

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IN commencing the new school year, THE TECHNIC extends cordial greetings to the class of 1911. We hope that they will enjoy the work and the pleasures of Old Rose to the utmost, and venture the prediction that the longer they stay, the truer will be the satisfaction and the greater the pleasure resulting from their work in the Institute.

IT is with pleasure that THE TECHNIC welcomes to the activities of Rose Messrs. Elmer H. Willmarth and Luther Knight, who come to take up the positions of shop superintendent and instructor in chemistry, respectively. Mr. Willmarth is a graduate of Worcester Polytechnic Institute, and has been engaged in teaching and in practical work in the mechanical line for a number of years. Mr. Knight is a graduate of the Northwestern College of Napier, Ill., and has studied at both Johns Hopkins University and the University of Nebraska.

Mr. W. R. Plew, Rose '07, who takes up this year the position of instructor in the civil engineering department, needs no introduction to most of the undergraduates. We hope that his experience as a member of the faculty will be as pleasant and profitable as were those in the capacity of student.

IT has been often said that the time required to prepare lessons at Rose takes up so much of what is left from the recitations that there is little remaining for anything else, and sometimes it is said that there is even insufficient time to prepare the lessons. To those having trouble of this kind we would suggest a careful counting up of the odd quarter hours, and if possible a grouping of several of such, or the carrying of a text or note book to be read in leisure moments. Going to the extreme, a ledger account with Father Time, kept for a couple of weeks, would almost surely show how matters might be improved. Twenty-four hours a day received, *a* hours spent in sleep, *b* hours for meals and *c* hours for recitations and going to and from school deducted therefrom, will leave a balance which will generally be surprisingly large.

It is to be remembered that, as expressed by a well-known educator, "you can't put a three thousand dollar education into a fifty cent boy," and that if, when a boy finally graduates, his recollections of his college life consist mainly of how he tied up the sophomores and rolled face plates down the shop floor when a freshman, and how he shot up the main hall when a senior, with similar experiences between these periods, we think that the person who paid the expenses of that boy would have reason to regret his investment. Remember the folks at home, to give them value received for their money.

CLOCKS.

By E. S. JOHONNOTT, Ph. D.

AN article recently appeared in *Science* which gave the inspiration to write this paper. The article referred to is a reprint of an address delivered at a meeting of the American Association for the Advancement of Science, by Professor W. S. Eichelberger, of the U. S. Naval Observatory, and entitled, "Clocks—Ancient and Modern."

Accurate time-pieces are now so numerous and inexpensive that their efficiency is seldom appreciated. Like an organ of the body we are scarcely aware of their delicate mechanisms until some derangement occurs. It is not difficult to obtain for a dollar a clock of the Seth Thomas type, or a watch of the Ingersoll type, in which the error is within a minute per week. This means an accuracy of the order of one in ten thousand. It is only with a skilled observer using costly apparatus under favorable circumstances that such a high precision can be reached in measuring most of the other simple physical qualities. With the most accurate clocks used for astronomical purposes, an accuracy of the order of one in three million has been attained. It is interesting to observe, in this connection, that the greatest accuracy attained in the comparison of units of length is about one in two million.

Progress in the art of clock making has accompanied quite closely that of other mechanical devices. However, it seems rather strange, with the excellent facilities of modern times for distributing merchandise, that some partially civilized countries still use such crude devices for measuring time. For instance, Nepal, a state in Hindustan, measures time in terms of the interval required for a floating copper vessel, with a perforation in the bottom, to fill. In another country a cocoanut shell is used instead.

The clypsydra, or water-clock, was invented in China more than twenty-five centuries ago. In its original form it was an improvement on the floating copper vessel in that the water was made to flow out of the orifice at the bottom. It was found necessary to maintain a constant head in order to keep a uniform flow in the instrument. Various improvements were made, but at the end of eighteen centuries, the instrument consisted simply, in addition to the reservoir, of a vertical cylinder to receive the falling water in which was placed a float carrying an indicator. This indicator was made to travel over a scale and thus indicate the time of day. In some instances the indicator and scale were made so large that it could be read at a considerable distance.

The use of the sun-dial was practically quite nearly parallel with that of the clypsydra. No description of the sun-dial is given in history until that invented by Berosus, a Chaldean priest of the time of Alexander the Great. The following is the description given by Prof. Eichelberger:

"This consisted of a hollow hemisphere placed with its rim perfectly horizontal, and having a bead fixed at its center. So long as the sun remained above the horizon the shadow of the bead would fall on the inside of the hemisphere, and the path of the shadow during the day would be approximately a circular arc. This arc, divided into twelve equal parts, determined twelve equal intervals of time for that day. Now supposing this were done at the time of the solstices and equinoxes, and on as many intermediate days as might be considered sufficient, and then curve lines drawn through the corresponding points of division of the different arcs, the shadow of the bead falling on one of these curve lines would mark a division of time for that day, and thus we should have a sun-dial which would divide each period of daylight into twelve equal parts. These equal parts were called *temporary hours;* and since the duration of daylight varies from day to day, the temporary hours of one day would differ in length from those of another.

Dials of this form were still used by the Arabians a thousand years ago, and about 1750 four such were found in Italy."

Among the first clocks operated by a falling weight was one constructed by Henry de Vick and placed in the tower of the palace of Charles V of France. It consisted of a train of gears actuated by a falling weight as in the ordinary weight clock. The escapement wheel was not unlike a miniature band saw, Figure 1. The regulating device for marking time was a small horizontal beam with a transverse axle, b, placed in a vertical position and carrying the pallets, d and c. These pallets engaged the escapement wheel as shown in the figure. The pallet in the foreground of the figure is just about to leave a tooth of the escapement wheel rocking the axle and beam in a counter-clockwise rotation. The other pallet is about to receive an impulse from the tooth in the background causing a clockwise rotation. The period of oscillation of the beam is made adjustable by two equal small masses clamped at equal distances on opposite sides of the axle.

FIG. 1.—View of de Vick's Escapement Wheel from above.

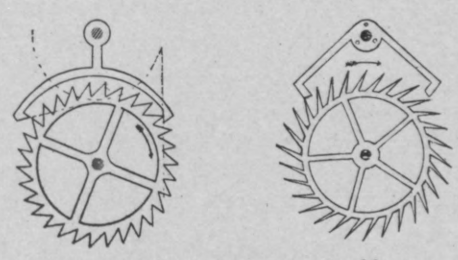
Soon after this the fusee was invented. This is simply a device to keep the actuating force of a coiled spring constant during its release. The first portable clock of which record has been found, was one constructed by Jacob Zech, of Prague, the inventor of the fusee. This differed from the one just described in the substitution of the coiled spring with a fusee for the falling weight.

Galileo, in 1583, while watching the great lamp in the cathedral of Pisa, observed that the oscillations were executed in equal periods of time, no matter how great were the swings. This discovery was soon followed by the introduction of the pendulum as the regulator of clock movements. It was Huyghens, however, who first proved that the motion of a pendulum is not strictly isochronal, and that it is for only small amplitudes that it can be assumed to be such. Huyghens was the first to work out the mathematical theory of the pendulum. He demonstrated that, with cycloidal stops for the pendulum to swing against, its period could be made independent of the amplitude. The idea has since been found to belong to that great class which, while very pretty in theory, is difficult to carry out in practice.

Since the time of Huyghens there have been only two features of the pendulum clock that have received important attention. The first and most important of these has been the development of the different types of escapements. The second has been the compensation of the pendulum bar for changes in length due to changes in temperature.

One of the disadvantages of the "verge" escapement, that invented by de Vick and already described, is that it required large amplitudes in the swing of the pendulum. Consequently, a slight alteration in this amplitude introduced a variation in its period of vibration. With the latter types of escapements, like the "anchor" and "dead-beat" of Fig. 2 and the "gravity" of Fig. 3, the amplitude may be held down to such a small magnitude that the departure from ischronism is insignificant.

Since the pendulum clock is our most accurate time-keeper, and its development has been so intimately connected with the perfection of the different types of escapements, a full description of the different forms now in use has been taken bodily from Prof. Eichelberger's paper.



Anchor or Recoil Escapement. Dead-beat Escapement.

FIG. 2.

"In Fig. 2 are shown both the anchor or recoil escapement and the dead-beat escapement. In the first, shown on the left, the pendulum

moving to the left has just escaped a tooth at the left-hand pallet and allowed a tooth to fall on the right-hand one. The pendulum, however, still continues its swing to the left, and in consequence the pallet pushes the wheel back, thus causing the recoil that gives the name to the escapement. It is only after the pendulum comes to rest and begins its excursion the other way that it gets any assistance from the wheel, and the difference between the forward motion of the wheel and its recoil forms the impulse. In the right-hand figure, the pendulum moving to the right has just escaped a tooth from the right-hand pallet while another has fallen upon the left-hand one. As the pendulum continues its motion towards the right, the left-hand pallet slides over the point of the tooth, but there is no recoil, as the 'dead' face as it is called, is the arc of a circle whose center is the point about which the anchor turns. As the pendulum returns towards the left, the tooth traverses the 'dead' face in the opposite direction, and immediately upon leaving this face it passes to the 'impulse' face, and while passing along this face, gives the impulse to the pendulum.

The great advantage of the dead-beat escapement over the anchor or recoil type is that, although a slight increase of force on the escapement wheel increases the arc of the pendulum, it does not sensibly increase the time, while the time does sensibly increase with the recoil escapement.

At about this time also, Mudge introduced the gravity escapement. With all the previous escapements the impulse was given to the pendulum by the driving weight acting through the train so that any irregularities in the train would cause a variation in the impulse. With the gravity escapement a weight is raised by the train and the falling of this weight gives the impulse to the pendulum. We thus have a uniform impulse at each oscillation due to the falling of a weight through a fixed distance. Simple and elegant as is this theory, the application of it gave a great deal of trouble and all gravity escapements were regarded with suspicion, as having a tendency to trip, until Mr. Denison designed the double three-leg one for the great clock at the Houses of Parliament about fifty years ago. Incidentally, it might be mentioned that this Westminster clock has turned out to be the finest timekeeper of any public clock in the world. The original specifications required that the clock should be guaranteed to perform within a margin of a minute a week, which caused the leading clock-makers of England to decline to bid for the work. However, under Mr. Denison's supervision the clock was built by Mr. Dent, and from reports of the Astronomer Royal, who receives at Greenwich two signals a day from this clock, sent automatically, its error is rarely over a second a week.

The Denison gravity escapement is shown in Fig. 3. This escapement consists of two gravity-impulse pallets pivoted as nearly as possible in a line with the bending point of the pendulum spring and touching the pendulum near the bottom of the figure. The locking wheel is made up of two thin plates having three long teeth or 'legs' each. These two plates are squared on the arbor a little distance apart, one on each side of the pallets. Between them are three pins which lift the pallets. In the figure, one of the front legs is resting on a block screwed to the front of the right-hand pallet. There is a similar block screwed to the back of the left-hand pallet for the legs of the back-plate, which is shaded in the figure, to lock upon. Projecting inward from each of the pallets is an arm. The tip of the one on the right-hand pallet is just in contact with one of the pins which has lifted the pallet to the position shown. The pendulum is traveling in the direction indicated by the arrow, and the left-hand pallet has just given impulse. The pendulum rod in its swing will push the right-hand pallet far enough for the leg of the front locking plate, which is now resting on the block, to escape. Directly it escapes, the left-hand pallet is lifted free of the pendulum rod by

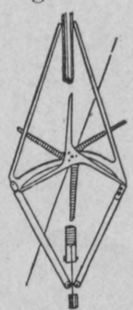


FIG. 3. Denison Gravity Escapement.

the lowest of the three pins. After the locking wheel has passed through 60°, a leg of the back locking plate is caught by the locking block on the left-hand pallet. As the three-leaved pinion always lifts the pallets the same distance, the pallets in returning give a constant impulse to the pendulum.

About fifteen or twenty years ago the Rieflers clockmakers of Munich, introduced into their clocks an escapement in which the impulse is communicated to the pendulum through the suspension spring. The pendulum is supported by a rocking frame to which is attached the anchor carrying the pallets which are acted upon by the escapement wheel. Just after the pendulum has passed through its vertical position, the escapement wheel, when released, gives to the supporting frame of the pendulum suspension spring a slight tilt in the opposite direction from that in which the pendulum is moving, thus increasing the tension of the spring due to the swing of the pendulum to one side.''

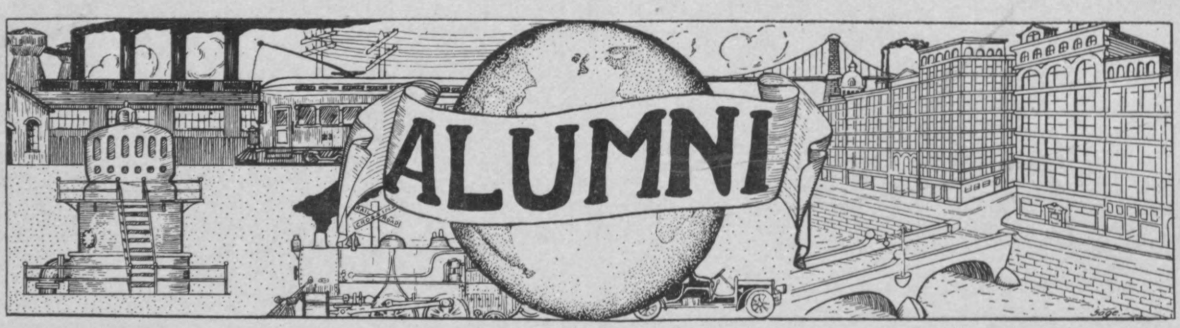
The different methods of compensation for temperature changes have been described so often that no attempt to take up the subject will be made here. The reader is referred to Draper's text, or most any other treatise on heat.

Below is given a table, taken from Prof. Eichelberger's paper, showing the accuracy of some of the best clocks in use in the leading naval observatories. These clocks nearly all have either the gravity or Riefler escapement. Precautions are taken with them all to keep the barometric pressure constant by enclosing them in air-tight cases. Means are also provided to keep the temperature variations small.

MEAN DEVIATION OF DAILY CLOCK RATE.

Clock	Date	Mean Deviation
Bradley, ...	1759	0.102
Greenwich Observatory, . . .	1850	0.149
Greenwich Observatory, . . .	1900	0.051
Berlin Observatory, ...	1877	0.02-0.03
Leiden Observatory, ...	1900	0.028
U. S. Naval Observatory, . . .	1904	1.015

The last column in the table shows the mean error in a day's run in seconds. This calculation is made from observations running over a period of several months.



THE ANCIENT POISON LORE.

By H. E. WIEDEMAN, '03.

WHEN we read the almost daily accounts in the newspapers of people who have met death by the aid of poisonous substances, either intentionally, accidentally, or through the instrumentality of other persons, we shudder at the idea ; and to the casual observer the thought probably comes—"Why are such substances in existence?" Of course these poisonous drugs were not intended primarily to be used in taking human life, and when used properly they are practically all a great aid in the alleviation of human suffering and the curing of disease.

The present knowledge of poisons is due to the persistent labors of a great many men of science, especially chemists, during the past one hundred and fifty years.

It is with the view of laying before the readers of THE TECHNIC some of the interesting facts regarding the history of poisons that the writer has contributed this article.

It is rather significant that the root "tox" of the modern word toxicology can be traced back to a very ancient word meaning "bow" or "arrow," or, in its broadest sense, some instrument for slaying ; hence it is no far-fetched supposition that the first poison knowledge was that of the septic poisons, i. e., those which are formed by putrefaction, or the venom of animals. Perhaps the savage found that weapons soiled with the blood of his former victims made the wounds inflicted by them fatal. From this observation the next step would naturally be that of experiment—the arrow or spear would be steeped in all manner of offensive mixtures, and smeared with the juices of those plants which are deemed noxious. And as the effects were no doubt mysterious they would probably be ascribed to supernatural powers and covered with a veil of superstition. We all remember the description, in our school histories, of the practice the American Indians had of fastening a poisonous snake to a post and teasing it with the points of their arrows so that the infuriated reptile in striking at the arrow would cover it with venom, thus making it doubly dangerous.

The history of the poison lore, like all history, begins in the region of the myths ; there was a superstition prevailing in Greece, that in the far north existed a land ruled by sourcerers—all children of the sun. Hecate, the daughter of one of the rulers, was the discoverer of poisonous herbs and was learned in remedies, both good and evil. Her knowledge passed to Medea, who narcotised the dragon, the guardian of the golden fleece, and incited Jason to great undertakings.

The oldest Egyptian King, Menes, was famous for his knowledge of plants, and was no doubt familiar with hyoscyamus, aconite, conium, veratrum, and others. The wonderful skill shown by the early Egyptians in embalming the dead, and in technical works, is sufficient to render it fairly certain that their chemical knowledge was considerable ; and their frequent operations upon the dead must have laid the foundations of a

pathological and anatomical culture, of which only traces remain.

The Egyptians knew prussic acid as it is extracted from plants in the dilute state, among the chief of which was certainly the peach; on a papyrus preserved at the Louvre, M. Duteil found the following: "Pronounce not the name of I. A. O. under the penalty of the peach," in which dark threat, no doubt, lurks the meaning that those who revealed the religious mysteries of the priests were put to death by the waters of the peach.

From the Egyptians the knowledge of the deadly drink appears to have passed to the Romans. At the trial of Antipater, Versus produced a potion brought from Egypt which had been intended to destroy Herod; this was tried on a criminal, producing instant death. In the reign of Tiberius, a Roman knight, accused of high treason, swallowed a poison and fell dead at the feet of the senators; in each case the rapidity of action appears to point to prussic acid.

The use of poisons by the Greeks as a means of capital punishment, without doubt favored suicide by the same means; the easy, painless death of the state prisoner would be preferred to death by the sword, to one tired of life. The ancients looked upon suicide indeed, in certain instances, as something noble, and it was occasionally formally sanctioned. Valerius Maximus states that he saw a woman of quality in one of the island governments, who, having lived happily for ninety years, obtained official permission to take a poisonous draught, lest, by living longer, she should happen to have a change in her good fortune. Curiously enough this sanctioning of self-destruction seems to have been copied in other parts of Europe. Mead relates that the people of Marseilles of old had a poison kept by the public authorities, in which cicuta was one of the ingredients. A dose was allowed to any one who could show why he should desire death. Whatever use or abuse might have been made of a few violent poisons, Greek and Roman knowledge of poisons, their effects and methods of detection, was primitive, stationary and incomplete.

Shortly before the birth of Christ a number of learned men interested in toxicology wrote books dealing with that subject. Dioscorides (40-90 A. D.) divided poisons, according to their origin, into three classes, viz:—

First—Under the head Animal Poisons were classed cantharides and allied beetles, poisonous reptiles, a particular variety of honey, and the blood of the ox, the latter probably in a putrid state.

Second—Poisons from Plants. He enumerates opium, black and white hyoscyamus (especially recognizing the activity of the seeds) conium and elaterin. He also makes special mention of aconite, the name of which is derived from Akon, a small city in Heraclea. The Greeks were well aware of the deadly nature of aconite, and gave it a mythical origin, from the foam of the dog Cerberus. The poisonous properties of certain fungi were also known. The venomous mushrooms, or "toadstools" were called "the evil fermentation of the earth," and the same antidotes were prescribed which we would give at the present time—vinegar and the alkaline carbonates.

Third—Mineral Poisons. Arsenic was known and used largely as a caustic; copper was known as sulphate and oxide; mercury only as cinnabar; lead oxides were known, and milk or olive oil prescribed as an antidote for their poisonous properties.

If we turn our attention to early Asiatic history, a glance at the sacred writings of the East will prove how soon the art of poisoning, especially in India, was used for the purpose of suicide, revenge or robbery. The ancient practice of the Hindoo widow—self-immolation on the burning pyre of her husband—is attributed to the necessity which the Brahmin authorities were under of putting a stop to the crime of domestic poisoning. Every little conjugal quarrel was liable to be settled by this form of secret assassination, but such a law, as might be expected, checked such a practice.

The poisons known to the Asiatics were arsenic, aconite, opium, and various solanaceous plants.

There had been for ages a myth that a poison existed which would slay a long time after its introduction into the system. Probably this is true, for no doubt the Asiatic poisoners were well acquainted with the infectious qualities of certain fevers and malignant diseases. Now such diseases answer to the description of a poison which has no immediate effects. Plant smallpox germs in a man's system, and for a number of days he walks about well and hearty ; then he is taken ill and usually dies, especially if he has not the proper attention. Clothe a person with garments impregnated with typhus, and the same thing occurs—for many days there will be no sign of fever. The gypsies were said to have known of a fungi which they administered in warm water through the mouth. The fungi rapidly attach themselves to the mucous membrane of the throat, all the symptoms of a phthisis follow, and death takes place in from two to three weeks.

There is also a modern poison which dooms the unfortunate victim to a terrible malady, simulating, to a considerable extent, natural disease—that is, phosphorus. This poison was unknown until in the eleventh century, when Alchid Becher, blindly experimenting on the distillation of urine and carbon, obtained his "escarboncle," and passed away without knowing the importance of his discovery, which had to be rediscovered at a later period.

The part that poison has played in history is considerable. The pharmaceutical knowledge of the ancients is more graphically and terribly shown in the death of men like Socrates, Demosthenes, Hannibal, and of Cleopatra, than in the pages of all the older writers on the subject of poisons.

In the early part of the Christian era professional poisoners arose, and for a long time exercised their trade with impunity. It was at this time that the infamous Locusta flourished. She is said to have supplied, with suitable directions, the poison with which Agrippa got rid of Claudius ; and the same woman was the principal agent in the preparation of the poison that was administered to Britannicus by order of his brother Nero. The details of this interesting case are given in Blyth's book on poisons (an interesting book, by the way, for one who is interested in this subject.) "It was the custom for the Romans to drink hot water as a luxury ; and as no two men's tastes are alike, great skill was shown by the slaves in bringing the water at the exact temperature most desired by their masters. A banquet is in order at the imperial house ; a slave brings hot water to Britannicus ; it is too hot and is refused. The slave adds cold water, and it is this cold water that is supposed to have been poisoned ; at any rate Britannicus had no sooner taken it than he lost consciousness. This produces consternation among the family and guests, with the exception of Nero, who looks coldly on, saying that such fits often happened to him in infancy without serious results ; and after a few moments silence the banquet continues as before." To produce such sudden death the poison must have been prussic acid or one of its salts.

In those days no autopsy was possible ; although some three hundred years before Christ the Alexandrian school had dissected both living and dead bodies, the work of those men had not been pursued, and the great Roman and Greek writers knew only the rudiments of human anatomy. Regarding pathological changes and their true interpretation their knowledge may be said to have been absolutely nil. It was not until the fifteenth century that the Popes, silencing ancient scruples, authorized dissections ; and it was not until a century later that Versalius, the first worthy of being considered a great anatomist, arose.

In default of pathological knowledge the ancients attached a great deal of importance to mere external marks and discolorations. They noted with special attention all spots and lividity, and they supposed that poisons singled out the heart for some quite peculiar action and altered its substance in such a manner that it resisted the action of the funeral pyre, and remained unconsumed. It may, then, fairly be presumed that many people must have died from poison without suspicion. And on the other hand, many no doubt

died from disease and the death was wrongly ascribed to poisoning. If, added to sudden death, the body entered into rapid putrefaction, such signs were considered absolutely conclusive of poisoning; this belief prevailed to the middle of the seventeenth century and lingers still to a great extent among some people.

The effects of decomposition are likely to arise in all bodies after death and accompany both natural and unnatural deaths; indeed, if we consider the preservative effects of certain metallic poisons and the fact that most diseases cause changes in the tissues which hasten putrefaction, while as a rule, those who take poison are suddenly killed, with their tissues fairly healthy; it may be assumed that generally the bodies of those dying from the effects of poison are less apt to decompose rapidly than those dying from disease.

Arsenic seemed to be the favorite powder of the professional poisoner, and it was known to the crowned heads as early as the fourteenth century. Documents have been preserved from those days which contain commissions given by rulers to poisoners to remove certain enemies of the king; and in these papers sublimed arsenic was usually mentioned. This subtile method of removing "undesirable citizens" was not practiced to any extent, however, by the Anglo-Saxon race. The anger to which these people were wrought on detecting poisoners is seen in the fact that in 1542 a young woman was boiled alive in England for poisoning several families.

From the fifteenth to the seventeenth centuries two great criminal schools of poisoners arose in Venice and Italy. The Venetian poisoners are of an earlier date than the Italian, and we find here the strange spectacle of the government formally recognizing secret assassination by poison, and proposals to remove this or that person were taken up as a regular order of business. In 1513 a Franciscan monk offered a selection of poisons and declared himself ready to remove any objectionable person. He concluded his lengthy proposition thus:—"The farther the journey and the more eminent the man, the more it is necessary to reward the toil and hardships undertaken, and the heavier must be the payment." The council appears to have arranged to take away the lives of many public men in this quiet manner, but their efforts were only in a few cases successful. It is not definitely known what poisons were used by these people.

About this time the Italians became notorious for their knowledge of poisons. Porta wrote a very comprehensive treatise called "Natural Magic," and under the section of cooking he gave a mass of knowledge as to the mixing and preparation of poisons. He gave a method of drugging wine with belladonna root, for the purpose of causing the tippler to loathe drink; he also gave a list of solanaceous plants, and makes mention of nux vomica, aconite, varatrum, and mezereon.

The iniquitous Toffana made solutions of arsenic of different strengths and sold them in vials under the name of "aquetta di Napoli." She is supposed to have poisoned more than six hundred persons, among whom were two popes —Pius III and Clement XIV. She had a number of disciples to whom she taught the gentle art of poisoning, and one in particular formed an association of young married women. These later were detected on their own confessions, and Toffana herself was brought to justice in 1709 but escaped punishment by availing herself of the immunity afforded by convents, and continued to sell her concoctions for twenty years more.

Contemporaneously with Toffana, another Italian, Keli, devoted himself to similar crimes. He sought this as a more profitable pursuit after having wasted his money in searching for the philosopher's stone. He instructed St. Croix, who in turn imparted the secrets to Madame de Brinvillers. This woman was as cold blooded as Toffana, and is said to have determined the strength of her mixtures by experimenting on the patients at the Hotel Dieu. Besides poison-

ing a large number of people she poisoned her father, brothers, and sisters. She was finally brought to justice and beheaded.

The numerous attempts on the lives of rulers by professional poisoners cast for a long time a cloud over regal domestic life. Bullets and knives were not feared, but in their place the dish of meat, the glass of wine or even water, were regarded as possible carriers of death. Often they had slaves who tasted every thing before it came to the royal lips; if the slave was not affected the food was considered safe, no doubt a very good rule.

At the present time it would be impossible for such creatures to carry on their crimes without detection, owing to the scientific knowledge which is applied, during life, to the discrimination of symptoms, distinguishing between those resulting from disease and those due to poisons; and after death to the pathology which has learned the normal and abnormal appearance of tissues and organs, and finally to an ever-advancing chemistry which is able to detect and separate the poisonous substance, although buried for months deep in the ground.

The first step in the history of the detection of poisons was as has been intimated, i. e., by antecedent and surrounding circumstances. aided by experiments upon animals. If the death was sudden, and if decomposition was rapid after death, poison was indicated. Sometimes a portion of the food last eaten by the unfortunate was fed to an animal and if the animal died this would render the matter without doubt. The last test would not answer of itself, however, at the present time, for it is known that food may become contaminated with bacilli and produce death, although no poison, as such, has been been added.

Later, doctors were permitted to dissect and thus become familiar with pathological appearances. This was a great step gained; apoplexices, heart disease, internal hemorrhages, etc., could no longer be ascribed to poison. It was not until the end of the eighteenth century, however, that chemistry was far enough advanced to detect the mineral poisons; since that time toxicology has made a wonderful advance.

Of the great chemists of those days Scheele stands at the head in relation to toxicology. It was he who discovered, or possibly rediscovered, prussic acid. He also made the important discovery that arsenic united with nascent hydrogen formed a foetid gas, and also that this gas could be decomposed by the aid of heat. From these experiments a delicate test for arsenic was afterward elaborated by other chemists and perfected by Marsh; thus for the first time rendering one of the most tasteless and easily administered poisons in the world at once the easiest of detection.

Joseph Orfila, who is considered the father of modern toxicology, discovered that poisons are absorbed and accumulated in certain tissues, which greatly extended the means of seeking poisons. Before his time a chemist, not finding anything in the stomach, would not have troubled himself to examine the liver, the kidneys, the brain, or the blood.

The discovery of the alkaloids at the begininning of the last century gave the poisoners new weapons, but the same processes, somewhat modified, that served to separate the alkaloid from the plants in which they were found, also served to separate them from the human body.

At the present time chemists are often called upon to analyze suspicious mixtures for poisons, or to analyze the contents of different organs in a deceased human being who has died under circumstances pointing to poisoning. If his results indicate the presence of poisonous substances, and he is called upon to make a statement to that effect in court, the party accused of administering the fatal potion is usually convicted and punished, sometimes entirely upon the chemist's statement. To such an extent has the science of chemistry advanced since the not so very remote days of the alchemists, when it was looked upon somewhat as an amusement and a form of intellectual entertainment.

ALUMNI NOTES.

Cards have been received announcing the marriage of J. M. Snead, formerly of the class of 1907, and Miss Johanne Catherine Hettelsater, of Chicago. Mr. Snead is in the employment of the Rogers Ballast Car Co. of Chicago.

W. S. Hanley, '05, is located in the office of the Engineer of Maintenance of Way of the Chicago and Eastern Railway, his address being 352 N. 65th St., Chicago.

Luis Bogran, '07, is in the employ of the Mexican Central R. R., Necaxa, Pueblo, Mex.

Chas. A. Cadden, '06, visited Rose at the opening of school, renewing old acquaintances. He was at that time expecting to leave shortly for California, to be employed by Stone & Webster in the construction of an electric railway between San Francisco and Sacramento.

Harry H. Orr, '07, is in the employ of the signal department of the C. & E. I. Railway at Chicago.

Owen L. Wood, '05, is at present employed as topographic draftsman in the mineral division of the office of U. S. Surveyor General, Reno, Nevada.

Among the alumni who were in Terre Haute about the time of the opening of the Institute were George H. Pfeif, '05, Leon J. Willien, Jr., '06, and Earle P. Lee, '06.

Uhel U. Carr, '96, formerly with the Eagle Iron Works, Terre Haute, is now in the employ of the Monongahela River Consolidated Coal & Coke Co., of Pittsburg, Pa.

Claude E. Robertson, '05, who has been in the employ of the General Electric Co. since his graduation, has accepted a position with the Toledo Railway & Light Co. His address is 1932 N. 14th st., Toledo, Ohio.

R. W. Benbridge, '06, is now located in Kansas City, Mo., being still in the employ of the Laidlaw-Dunn-Gordon Steam Pump Co., of Cincinnati, Ohio.

F. N. Hatch, '06, is at present in the employ of the St. L. & S. F. R. R. Co. (Frisco Sytem) in the maintenance of way department. His address is P. O. Box 71, Monett, Mo.

Mr. Carl Wischmeyer. '06, formerly with the Carnegie Steel Co., of Youngstown, Ohio, is now in the Electrical Department of the Bethlehem Steel Co., South Bethlehem, Pa.

CIVIL CAMP.

By G. M. CURRY, '09.

THIS year for the first time Civil Camp was held in Terre Haute. There were no adventures encountered in hunting board and lodging, no preliminary surveys to see "what the place looks like anyway," no long walks along a railroad track to the starting place; most of the novelty was missing and not much was left except hard work.

Professor Howe's recent rule making Camp compulsory for Juniors was responsible for a full attendance from that class, there being besides, four Sophomores present, making a total of twelve students. Camp started on Monday June 10, under the supervision of Prof. McCormick and his assistant, Mr. W. R. Plew.

The object of the survey made was to obtain sufficient data for an estimate of the cost and probable location of a belt line for the use of the various railroads running through Terre Haute. The line was to go through the city at the extreme west side, the tracks through town probably to be elevated.

The starting point of the survey was taken at Oak and Water streets. From this point a straight line was run along Water street to Elm street; here a line turned east and ran along Elm to Third; south on Third to Oak and west on Oak to the starting point. This constituted a closed traverse on which the survey through town was to be based and was required to check out within the usual limits of city work. With this traverse as a basis, lines were run on First and Second streets and all cross-streets between Elm and Oak. Latitudes and departures were figured on each line separately and then referred to the main traverse. The pluses of all property and street lines were taken on all lines run. All city monuments which could be found were tied in with these lines.

Profiles of all lines run were then taken, frequent bench marks being established. The usual method of taking topography was here impractical because of the houses and other buildings which obstructed the view. To overcome this difficulty cross sections were taken on all lines at ntervals of fifty feet, the elevations of all critical points such as street, property and curb lines being included. With this data at hand one may interpolate the contours. On the west side of the Water street line where buildings were not so numerous the usual method was used, no topography being taken below high-water mark.

All brick buildings, shops and warehouses, also all switches, railroads and street car lines were located with respect to the different lines. Where the line crossed a railroad a profile was taken for 1,000 feet on either side of the crossing. All other data necessary for the making of a complete and accurate map was obtained. The work up to this point occupied the whole of the first week.

On Monday of the second week the line was continued up the tow-path to Fort Harrison a distance of about 5¼ miles from the starting point. Here ended the section of the survey of the belt line with which the present Junior Class

is concerned. The line, however, as continued by some of the present Seniors who were deficient in camp work, runs farther north where it crosses the river and connects with the Big Four near St. Mary's. To check the line as far as Fort Harrison a traverse was run back along Seventh street to a point about half way between Terre Haute and Fort Harrison where a tie-in was made. From this point another line was run to connect with the basic traverse in Terre Haute, Thus the entire survey consists of three independent closed traverses.

Levels were then run on the line and the bench marks set, the levels being checked at Fort Harrison by an independent line run from a school bench mark at Collet Park. Topography was then taken along the line to high-water mark on the river side and from three to six hundred feet on the east. Contours were sketched in in the field to the same scale as the large map and then transferred to it. The running out of section and land lines completed the data for a paper location of the line over the distance covered by the survey.

Throughout the course of the survey a hundred-feet-to-the-inch map was kept up to date, a man being kept in the office each day for the purpose. Every one was occupied at nights from 7 to 9 o'clock in reducing and copying notes. All the notes were copied in ink and some duplicated.

Although the line run this year was not so long as that run by former classes there was more work to do on account of the fact that part of the line ran through the city, thus necessitating much greater accuracy and detail. Fair weather obtained and as no serious delays were encountered the work was finished in good shape within the usual two weeks.

THE Y. M. C. A. RECEPTION.

On Friday evening, September 27, the Y. M. C. A. held their annual reception for the Freshmen and other incoming students. They were all made acquainted with the upper-classmen and faculty, as well as some of the fair Poly co-eds.

During the evening the orchestra played several selections, which were greatly appreciated by everyone. The Glee Club sang some of their old stand-bys and also a new one. Solos by Smith, '09; Washburn, '10, and Fischer, '08, were enjoyed by the crowd.

The gym was well decorated with American flags, rose and white bunting and various class pennants. A large number of palms, ferns and rugs were arranged to help lighten the usual appearance of the gymnasium.

Refreshments were served during the evening. A large number were present, making the reception for the class of 1911 one long to be remembered.

OFFICERS OF STUDENT ORGANIZATIONS.

SENIOR CLASS—O. L. Stock, Pres., L. C. Kerrick, V.-Pres., J. H. Johnston, Treas., A. S. Hathaway, Jr., Sec'y.

JUNIOR CLASS—J. A. Shepard, Pres., J. N. Johnson, V.-Pres., G. M. Curry, Sec'y-Treas.

SOPHOMORE CLASS—D. B. Rush, Pres., L. F. Stratton, V.-Pres., M. F. Hayman, Sec'y., C. G. Planck, Treas.

FRESHMAN CLASS—H. A. Trueblood, Pres., D. W. Jones, V.-Pres., E A. Mees, Sec'y Treas.

ATHLETIC ASS'N—H. E. Schmidt, Pres., F. P. Mooney, Treas., G. F. Standau, Sec'y.

SCIENTIFIC SOCIETY—G. E. Heniken, Pres. H. D. Orth, Senior Councilman, G. M. Curry, Junior Councilman, C. W. Sproull, Sec'y-Treas.

Y. M. C. A.—R. L. Smith, Pres., J. F. Robbins, V.-Pres., W. L. Clore, Sec'y, G. M. Curry, Treas., J. B. Northcott, Gen'l-Sec'y.

CAMERA CLUB—G. E. Heniken, Pres., B. M. Lindsley, V.-Pres., W. H. Garrigus, Sec'y-Treas.

SYMPHONY CLUB—W. C. Knopf, Pres., O. L. Stock, V.-Pres., B. M. Lindsley, Sec'y-Treas.

STUDENT COUNCIL—O. L. Stock, Pres., H. E. Schmidt, V.-Pres., C. B. Andrews, Clerk, J. A. Shepard, Treas, D. B. Rush, Sec'y.

THE CLASS OF 1911.

W. E. Baker, ... Bushton, Ill.
D. Melville Ballard, ... Plainfield, Ind.
T. T. Barrett, Jr., ... Henderson, Ky.
Charles E. Bell, ... Paducah, Ky.
George E. Bell, ... Crawfordsville, Ind.
Everett E. Black, ... Terre Haute.
Arthur F. Boblett, ... Chillicothe, O.
Vern Buckner, ... Terre Haute
Earl G. Bullock, ... Clinton, Ind.
Will P. Caldwell, ... Danville, Ky.
Thurman Christopher, ... Terre Haute.
Oscar L. Coffey, ... Hartsville, Ind.
Raymond E. Corbin. . . . . Linton, Ind.
Edward M. Cosand, ... Terre Haute.
Harry B. Drake, ... Terre Haute.
E. J. Ducey, ... London, O.
Don G. Evans, ... Terre Haute.
Chester Evinger, ... Vermilion, Ill.
Edward Ferrell, ... Cookville, Tenn.
John P. Fitzpatrick, ... Terre Hante.
John G. Floyd, ... Terre Haute.
Fred Funkhouser, ... Terre Haute.
Ernest E. Garst, ... Dayton, O.
Kenton B. Garst, ... Dayton, O.
Chesleigh Gray, ... Shelburn, Ind.
Harry Haufman, ... Terre Haute
Otto B. Hepner, ... Terre Haute.
Clyde E. Hoffner, ... Terre Haute.
Walter Hodge, ... Paris, Ill
Leonard S. House, ... Ft. Wayne, Ind.
Ora Hughbanks, ... Plainfield, Ind.
Clifford Hughes, ... Terre Haute.
Atberb F. Jewett, ... Indianola, Iowa.
David J. Johnson, ... Chicago, Ill.
David W. Jones, ... Terre Haute.
Henry W. Ker, ... Indianapolis, Ind.
J. W. Ketterer, ... Butler, Pa.
Emerson King, ... Sullivan, Ind.
Carlton Lawrence. . . . . Terre Haute.
Scott Mace, ... Terre Haute.
Loren T. McKee, ... Hymera, Ind.
Erich Mees, ... Columbus, O.
Philip A. Newhart, ... Terre Haute.
Herbert C. Offut, ... Terre Haute.
Oscar A. Ohmann, ... Louisville, Ky.
Roacca Owen, ... Vincennes, Ind.
H. P. Perrin, ... Terre Haute.
E. L. Puckett, ... Owensboro, Ky.
Thurber Reinhardt, ... Owensboro, Ky.
Harold J. Rood, ... Terre Haute.
Wilbur B. Shook. . . . . Terre Haute.
M. P. Springer, ... Tulsa, Ind. Ter.
Paul E. Strouse, ... Rockville, Ind.
Robert L. Stump, ... Valdosta, Ga.
Charles M. Templeton, ... Linton, Ind
Robert J. Templeton, ... Covington, O.
James M. Tilley, ... Terre Haute.
Howard A. Trueblood, ... Terre Haute.
Ronald Voelker, ... Terre Haute.
Walter Voss, ... Davenport. Iowa.
William Wallace, ... Terre Haute.
C. Rayburn Wallick, ... Pleasant Hill, O.
Merritt E. Ward, ... Lumber City, Ga.
Floyd N. Weaver, ... Dayton, O.
Milford Welsh, ... Owensboro, Ky.
Harold O. Winsett, ... Newport, Ind.
Clinton, O. Worsham. . . . . Terre Haute.
Ross Wyeth, ... Terre Haute.

NEW SOPHOMORES.

A. A. Beville . . . . Louisville, Ky.
W. M. Edwards, ... Indianapolis
W. B. Kuersteiner, ... Louisville, Ky.
F. W. Kroemer, Jr.. . . . . Dayton, O.
Edgar G. Peters, ... Frankfort, Ind.
H. C. Thomas, ... Dallas, Texas.

NEW JUNIORS.

Fred A. Burgess, ... Louisville, Ky.
Everett Hughes, ... Terre Haute.
T. Ludwell Lee, ... Terre Haute.

THE Faculty committees on athletics have been announced as follows:

Finance . . . . Prof. Williams
Football . . . . Prof. Hathaway
Basketball . . . . Prof. Peddle
Baseball. Dr. White
Track. . . . . Dr Johonnott
Tennis . . . . Prof. Hathaway
Gymnasium . . . .Dr. Johonnott

Professors Hathaway, Williams and White are the Faculty representatives on the Athletic Association Board.

The-Mandolin Club met on Thursday September 26, for the election of officers for the coming

year. Although small, the club will be composed of the best material it has had for some years. Any freshman or any other student who has attained any proficiency with the mandolin or guitar is urged to come out for this organization, as it will be well worth while. The officers elected were as follows:

R. M. Stubbs, '08, Pres.
B. M. Lindsley, '08, Vice-Pres.
R. H. Green, '09, Sec.-Treas.
Representatives to the Symphony Club.
A. P. Boblett, '11
D R. Bogran, '08.

The prizes in the first Camera Club contest were recently awarded as follows:

J. L. Herman—First prize.
L. P. Webert—Second prize.
R. S. Wilson—Third prize.
A. J. Schweers—Honorable mention.

The prizes awarded were, 1st, Steel Tripod, value $4.00; 2nd, Maple Tripod, value $2.00; 3rd, Photo Album, value $1.00, the prizes being exchangeable for other photo goods of equal value if desired.

The following men have been appointed to the management of the different athletic teams:

H. B. Cannon, '08—Manager of basketball team.
W. H. Rockwood, '09—Asst. manager of basketball team.
C. H. Sievers, '08—Manager of track team.
F. P. Mooney, '09—Assistant manager of baseball team.
W. L. Uhl, '08—Tennis manager.
B. O'Brien, '09—Assistant tennis manager.

F. P. Mooney, '09, has been elected captain of the baseball team for the season of 1908. Douthett, '08, had been elected captain but could not play on account of having played professional ball during the summer.

At a recent meeting of the Glee Club the following officers were elected for the coming year:

B. M. Lindsley, Vice-President.
Chas. N. Lammers—Secretary-Treasurer.
R. L. Smith, J. F. Robbins—Representatives to Symphony Club.

Pritchard, '09, has been appointed temporary captain of the football team.

THE PIPE RUSH.

The presence of the class of 1911 on the Institute premises, ready to dispute the supremacy of the class of '10 in any way and in all things, led to the usual rushes which have come to be looked upon as a part of the opening-of-school program.

The challenge rush took place on the campus on Thursday evening Sept. 19th. The sophomores chose the open ground at the south end of the football field as their place of defense, and hung the challenge on a wire stretched about fifteen feet above ground between a tree and a telegraph pole. The freshmen entered by the north gate at about 9:30 p.m., and the battle was soon on. Outnumbering the sophomores slightly, the freshmen soon had matters in their favor, but the '10s had counted on this and had kept a reserve secreted under the bicycle shed. These men appeared at the psychological moment and soon had all the sophomores cut loose, and the tables were turned on the freshmen, who were tied up and carried to the east side of the gym, although a couple of them got possession of the challenge and made away with it. The '11s later enjoyed a moonlight ride into the country as the guests of the sophomores.

The fortunes of the pipe rush of Saturday afternoon were all in favor of the sophomores from the start. The baseball game which preceded the rush was called at 2:40 p.m. and lasted about 45 minutes, the score being 6 to 0 in favor of the sophomores in the middle of the fifth inning, when one of the freshmen showed his Missouri merschaum, and the game suddenly ended. The feature of the ball game was the pitching of Backman, '10, who struck out eleven freshmen out of a possible thirteen, and allowed no safe hits. The teams were as follows:

Backman	p	Bell
Abbott	c	Evans
Hadley	1b	Fitzpatrick
Watts	2b	Shook
Stratton	ss	Hoffner
Skean	3b	Weyth
Nicholson	lf	Black
Webster	cf	Winsett
Kramer	rf	Buckner

After the preliminary tussle and an intermission the pipe rush proper was started by Douthett tossing the large pipe into the field between the two classes. Webster, '10, was the first to reach it, tossing it back among his classmates, who covered it with hands at once and maintained their hold for eight minutes allowed. The final count was 19 to 6 in favor of the sophomores, who formed into a triumphant procession toward the gym in celebration of their victory.

ROSE, 0; WABASH, 27.

Rose opened the football season on Saturday, Sept. 27th, when they met Cayou's warriers at Crawfordsville.

Rose won the toss and received the kick, but was forced to punt, Wabash returning the punt about 20 yards. For about ten minutes the ball was carried back and forth between our 20 and 50 yard line until Wabash finally made a 20 yard run for a touchdown. Wabash failed at goal. In about five more minutes Wabash made another touchdown in the same manner and kicked This ended the scoring in the first half. Score, 11 to 0.

In the second half, Rose kicked off to Wabash. Wabash then advanced the ball by end runs, line bucks and forward passes to the 10-yard line, from which they made a run for a touchdown. Two more touchdowns and a goal were made after this in about the same manner, making the score 27 to 0.

THE LINE-UP.

ROSE.		WABASH.
Cannon,	R. H. B.,	Garver
Pritchard,	L. H. B.,	Glasscock
Lammers (Capt.)	F. B.,	Soel
Strouse, Bernhardt, Uhl,	Q. B.,	Hargrave
Offutt,	C.,	Brown
Jewett,	R. G.,	Watson
Hadley,	R. T.,	(Capt.) Gipe
Standau,	R. E.,	Burns
Loeb,	L. G.,	Brown
Schmidt,	L. T.,	Hess
Backman, Johnston,	L. E.,	Putnam

Time of halves—25:25.

Referee—Fleager, of Northwestern University.

Umpire—Jamison, of Purdue.

Head linesman—Jones, of Wabash.

E. I. S. N., 0; ROSE, 0.

On October 5th the team of the Eastern Illinois State Normal met Rose on the Poly campus and the ball was kept see-sawing between the two pairs of goal posts with no effect on the score in favor of either side.

The game was called at 3:15, the teachers kicking off from the south goal. The ball changed hands with almost monotonous regularity, neither side being able to make continuous gains by hitting the line, and punts being resorted to. After ten minutes of play the ball was advanced to within ten yards of the pedagogues' goal, from which point it was gradually taken by punts and occasional gains around the end to Rose's 11-yard line, where Rose lost the ball on downs and was penalized five yards for off-side play. Rose held the teachers for downs within two yards of the goal and a long punt by Pritchard sent the ball almost to the middle of the field, where it was re-captured by Rose. Another kick carried the ball almost to the Normal goal, but it was brought back by a return punt. At this period Baker dislocated his arm and Cannon was substituted. A couple of neat forward passes took the ball to within ten yards of the Normal goal, when time was called.

In the early part of the second half, Johnston sprained his arm and was replaced by Davidson. After about five minutes of play the ball was put by forward passes and end runs within seven yards of Normal's goal, whence it was carried by punts to the middle of the field and passed from one side to the other and from one end of the field to the other by kicks, neither side making much headway in bucking, though several plays of the Normal which looked very much like hurdling the line gained some ground for them without attracting the attention of the field officials. In tackling Vaughn, Bernhardt received a bad fall, and his place was taken by Uhl, who did some very pretty work in the short time that he played. Several end runs and a forward pass carried the ball to Normal's 10-yard line with only a minute left; a drop kick was tried but failed, and the game was over.

LINE-UP.

Rose		E. I. S. N.
Offutt	L. E.	Frazier
Backman	L. T.	Zimmerman
Loeb, Smith	L. G.	Chapman
Schmidt	C.	Smith
Jewett, Davidson	R. G.	Kibler
Hadley	R. T.	Hume
Standau	R. E.	McDaniels
Pritchard	L. H. B.	Huber
Johnston, Hadley	F. B	H. Belting
Bernhardt, Uhl	Q. B.	Vaughn
Baker, Cannon	R. H.	P. Belting

THE SCHEDULE.

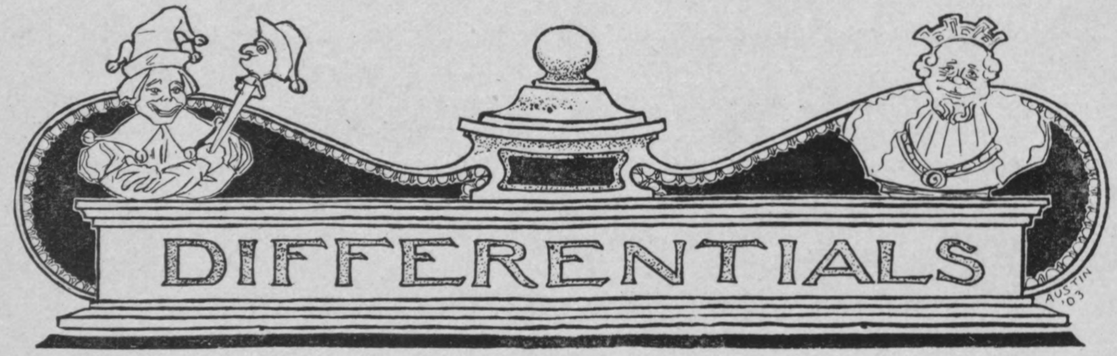
October 19th—Rose vs Butler, at Terre Haute.

October 26th—Rose vs. Vanderbilt, at Nashville.

November 2nd—Rose vs. Earlham, at Richmond.

November 9th—Rose vs. I. S. Normal, at Terre Haute

November 23rd—Rose vs. DePauw, at Terre Haute.



Sue Curry, '09.—(At election of class officers where there were but two nominations made) "Mr. President, I move the high man be elected."

———

Curious freshman.—"What is a bucketshop?"

Wise Senior.—"A bucketshop is a place where you carry in a bucket full of dollars and are lucky if you get out with the bail of the pail."

———

Prof.—"I shall now endeavor to teach nothing but the naked truth."

Student.—"That must be a bear story."

———

Especially for freshmen.—Even your best friend will keep your lead pencil and smile when he thinks of you using it.

———

Have you noticed the baseball whiskers (nine on a side) that the freshmen are wearing?

———

Prof. Hathaway.—"Boys, now I want you to pay attention to this demonstration."

Calculus students (?)—"What's the use?"

———

Prof. Dickinson (in foundry).—"I should be very much pleased if the gentleman who just precipitated a small quantity of sand on my head would be kind enough to not repeat the operation."

'arry must have been helping to make Milwaukee famous.

———

Dr. Mees had his mustache shaved off. Sam had his mustache shaved off. When will Green, '09, have his mustache (?) shaved off? Will it survive the junior banquet?

The United States Government intends recommencing the coinage of three-cent pieces, in anticipation of the heavy demand for them, which they expect to arise in Terre Haute within the next few weeks.

———

Northcott (talking over telephone).—"This is Northcott of the Normal."

———

Fred A. Burgess, with the '09 class in the freshman year, is again with us, having spent the winter of 1906-7 at Kentucky State University.

———

Tyler, '09.—"Guess I had better go up town this evening. I have an account to settle."

Smith, '09.—"That is no account."

———

Mosby, '09, (with French book in hand).—"Say, Dick, have you got your nose guard here? I would like to pronounce some French."

———

Stump, '11, talking about football.—"How many innings do they play?"

———

Jo, excitedly to class.—"Now just imagine a unit positive charge of electricity moving away from this point on a freight car."

———

FRATERNITY DIRECTORY.

Theta Xi, 425 N. Center St.

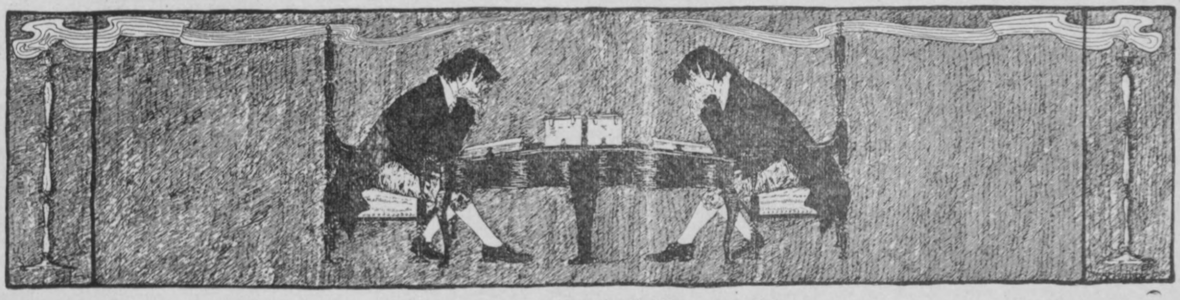
Sigma Nu, 520 N. Center St.

Alpha Tau Omega, 911 N. Eighth St.

V. Q. V., 825 N. Eighth St.

P. I. E. S., (rooms) S. E. Cor. Elm and Seventh Sts.

M. E. P., 501 North Seventh St.



REVIEWS

Technical Literature, which is now in its second year, has appeared in an altered form, the size of its page having been reduced from 9x12½ inches to 7x10 inches, and the number of pages having been increased until it resembles a literary magazine in appearance. Mr. Chas. M. Sames, '86, is Associate Editor of this journal.

In the *American Machinist* for July 18 is an article descriptive of the action of the Morse chain in driving cone sprockets, which combination is offered as a substitute for cone pulleys and belts and for gear boxes for main drives, possessing the convenience and ease of speed control of an ordinary cone pulley and the positive drive which accompanies the use of the chains. Illustrations are presented, made from photographs of boring mills and milling machines on which this drive is used.

To those who wish to make themselves familiar with the design of the Quebec Bridge, a series of nine articles which appeared in the *Engineering Record* from June 30 to August 24, inclusive under the head of "The Quebec Bridge Superstructure Details" will be interesting. The articles contain descriptions of the following portions of the structure: Main Pier Pedestal, Upper Part of Center Posts, Upper Part of Vertical Post 4, Vertical Post P_1, Diagonal Members, Anchor Arm Bottom Chords, Floor System and Transverse Bracing, and are fully illustrated by drawings and photographs.

A description of the hydro-electric plant of the McCall Ferry Power Co., now under construction at McCall Ferry, on the Susquehanna River, is to be found in *The Engineering Record* of Sept. 21. McCall Ferry is situated 25 miles from the head of Chespeake Bay, within 60 miles of Philadelphia, Harrisburg and Chester, Pa., Wilmington and Dover, Del., and Baltimore, Md., and with many smaller cities within a 20-mile radius. The plant has been designed for a normal capacity of 100,000 h. p., half in the initial installation, and the remainder developed by additional units as needed. The article describes in detail the solutions of the problems involved, and is fully illustrated by diagrams and photographs.

A New Swedish Combination Gaging System.

The *American Machinist* for September 19 contains a description of a new set of machinist's gages, illustrated with photographs, which is strange almost beyond belief. The set of gages consists of eighty-one pieces varying from 0.1001 inch to 4 inches in thickness, the smaller pieces rising by 0.0001 inch. The finish is so perfect that when two gages are "wrung" together so as to expel the air from between their surfaces, they will stick. Testing with a spring balance, a pull of over 31 pounds per square inch was required to separate two pieces so wrung together, and it is stated that they are not magnetic. The makers claim that by combinations of the gages over 80,000 different sizes can be made.

An attractive 48-page pamphlet has been received from the Lidgerwood Manufacturing Co., 96 Liberty St., New York, describing in considerable detail the operation of coaling ships (prin-

cipally war vessels) at sea from colliers, by means of the Lidgerwood-Miller Marine Cableway. The cable is stretched between the masts of the two vessels operating, one of which is supposed towed by the other, and is kept at a constant tension sufficient to keep the load of coal out of the water while being transferred, either by means of a "sea-anchor" or a special tension engine on one of the decks. The cables and rigging are designed to carry loads of coal in bags up to 3,000 lbs. weight. It is said that coal may be put on board a vessel, in a moderate sea, with 400 ft. between ships at the rate of 22 tons per hour. A copy of the pamphlet will be sent free to anyone addressing the publishers.

The Pittsburg Filtration Works.

The design and construction of the water purification plant now being built at Pittsburg under the direction of Mr. Morris Knowles, was the subject of a series of articles printed in the *Engineering Record* during December of last year. The plant is located on the Allegheny River, from which the raw water is drawn, and considerable pains will be taken in the final finishing to give it an attractive appearance. The general idea that has been followed in developing the landscape plant has been to isolate the site from the surroundings by hedges and to plant hardy shrubs and trees of slow growth, which will require pruning only at considerable intervals. All attempts at elaborate decorations, such as flower gardens, set plants and fountains, have been avoided and the money will be spent on more permanent work. A growth of heavy timber on the hill back of the site will be retained. The entrances to the filter galleries from the drive over the Allegheny water main will be relieved by shrubbery. The entrances to the plant will be closed by iron gates carried by large stone piers. All overhead wires have been avoided by a system of underground ducts in which wires for all purposes will be carried.

The water is taken through an intake from the river into a low-lift Ross pumping station. The pumps deliver it to the central sedimentation basin, which has a capacity of 20,000,000 gal. and is flanked on either side by two much larger sedimentation basins, the three having a total capacity of about 150,000,000 gal. The water will pass from them to the filters, which are covered and lie on either side of Allegheny Drive, along which runs the Allegheny city water main. The filtered water flows into a covered reservoir built along the bank of the river, from which it passes through parallel twin steel conduits to the Brilliant pumping station of the Pittsburg waterworks The plant will have a net capacity of approximately 100,000,000 gal. of water per day under normal operating conditions, with a maximum rate of 3,000,000 gal. per acre per day.

The filter beds are forty six in number, each with a net filtering area of 1 acre. Beds are arranged in eight rows transverse to the Allegheny Drive, with a covered pipe gallery 31 ft. wide in the clear between each alternate row of filters, or four galleries in all. These galleries are approximately 1,000 ft. long with the exception of the one at the end, and are divided in half transversely by the roadway over the 60-in. rising main of the Allegheny water works. The filters are entered from the galleries and all sand washing will be done in them, special appliances having been built to handle the sand economically between the filters and the washing apparatus. No storage for dirty sand is provided, for the system of operations will involve the continuous removal, washing and restoration of the sand. Provision has been made for warming these galleries so that all work connected with the maintenance of the plant can be done without interruption from the cold.