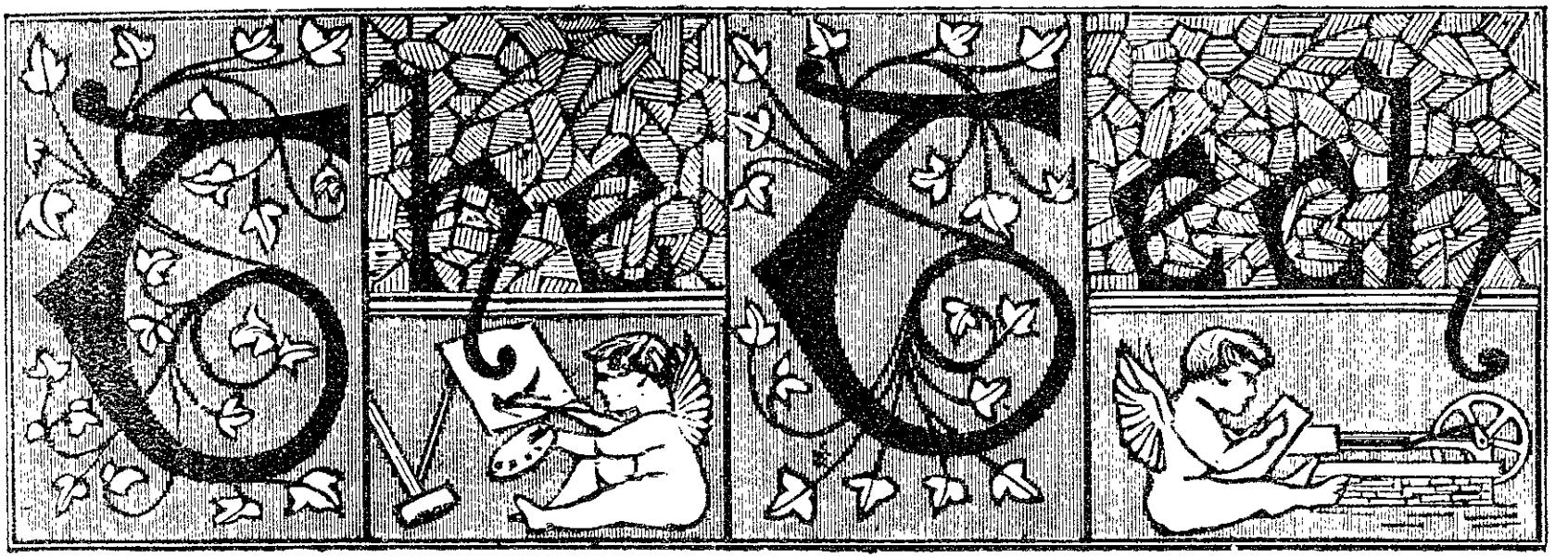
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

1861

MENS ET MANUS



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The Tech.

VOL. III. BOSTON, MARCH 26, 1884. No. 12.

ALFRED MUDGE & SON, PRINTERS, 24 FRANKLIN STREET, BOSTON.

THE practice which has prevailed among the professors at the Institute for several years past of substituting "papyrograph rules" for text-books has, we hope, reached its height and is now on the wane. Ever since the papyrograph process for multiplying writings and drawings came into use, the custom of giving to the students such notes has been on the increase, and some of our professors have carried it to a surprising extent. In many cases the "notes" have been quoted almost entire from text-books, which, if used instead, might have saved the student much strain of eyesight, caused by trying to decipher illegible writing, the vexation of correcting obvious errors made in copying,— though many might go unnoticed, — that of keeping the pages in order, and, finally, the necessity of transporting a great bulk of such notes containing comparatively little matter daily to and from the Institute.

When we take this category of evils into consideration, as well as the fact that, in order to preserve the notes permanently, some sort of binding is required, we think that there is but little advantage to be gained on the score of economy.

It seems to us that the system is legitimately used chiefly for original notes or for such supplementary ones as may be given by the professors to their students. When, however, the same course of lectures is pursued year after year, and the mistakes which invariably infest papyrograph notes are finally eradicated, we think that it would be for the interest of both parties to have the notes printed. We are glad to see that Prof. Osborne has adopted this course in having his notes on "Differential Calculus," formerly given in papyrograph sheets, compactly printed in pamphlet form for the use of his classes and sold to them at a merely nominal price.

IT should be especially interesting to all connected with the Institute to notice the present earnest and widespread discussion of the question of industrial training. Until now, the instruction furnished in our schools has been mainly in subjects designed for mental discipline and general mental culture, with no attention to the education of the hands and eyes, by tool work and mechanical drawing for the boys, or sewing for the girls. Such instruction may be all that is necessary for clerks and bookkeepers; it does not, however, answer the requirements of those who are to follow trades, but who, on leaving the grammar or high

schools, know nothing of workshop appliances except what they may have picked up, apart from their school work, in odd moments or vacation. Such boys should receive some instruction in the use of tools, and in the applications of arithmetic, geometry, and physics to some of the practical points of machinery and mechanic art, with less, though sufficient, attention to the mathematics of a strictly business life; and it cannot be objected that such instruction would be special and for the benefit of a few, for it would undoubtedly be interesting and valuable to all pupils, no matter what their future occupations.

In the case of higher education the same principles apply. Surely a young man who is to be engaged in practical manufacturing, say in woollen goods, sugar, boots and shoes, would derive greater benefit from devoting more of his college course to physics, chemistry, and mechanism, and less to Greek, Latin, and mental philosophy. The same remark may be made in regard to those who are to enter mercantile life; and its truth seems demonstrated by the increasing favor with which the laboratory practice and shop work in technical schools are being viewed.

It is not, however, so much with the colleges that "the new education" concerns itself, but mainly with grammar and high schools. In most of these, at present, boys are fitted only for mercantile life; and this, together with the fact that in the United States the apprenticeship system has almost entirely died out, and a boy must pick up a trade as best he can (if, indeed, his school work has not made manual labor distasteful to him), has operated to produce a superabundance of clerks and bookkeepers, while good mechanics and other skilled workmen are not always to be so easily obtained, even for higher wages, and though their chances of promotion may be greater.

It is with the idea of bettering this condition of affairs that public and private enterprises are now endeavoring to bring about the introduction of manual work into school exercises, and the establishment, in connection with industrial works, of evening classes, reading-rooms, and apprentice schools. As instances of the former may be mentioned the Manual Training Schools of St. Louis and Chicago, the Working Men's School of New York, and our school of Mechanic Arts; an excellent example of the latter is the Apprentice School of the Brooks Locomotive Works, at Dunkirk, New York. This firm takes youths of good habits and with a natural aptitude for machinery, and instructs them for three years as apprentices in its processes of manufacture, in drawing and the principles of mechanical construction, furnishing books, tuition, and use of reading-rooms gratis, paying for their services seven and a half, nine and ten and a quarter cents per hour during the first, second- and third years respectively, and offering rewards for proficiency. The general adoption of such a plan by similar firms would contribute to greatly increase the intelligence and efficiency of workmen, and to the maintenance of good-feeling between employer and employed, both of which are essential conditions to the highest success of industrial enterprises.

Experiments in this matter are now being tried in some of the Boston schools, and a law will soon be in effect empowering the school commissioners in any city in the State to test the plan, and it is to be hoped that public opinion will be favorably impressed with the undertaking.

THE necessity of devising some means for running of telegraph, telephone, and electric wires through large cities other than the present overhead system grows greater each day. New wires are constantly being added to the already overcharged roof-tops of our buildings, and if the rate of increase goes on, as it probably will, in a few years serious annoyance and danger cannot very well be avoided. Perhaps the best and almost the only means which has received serious attention for obviating this evil is that of carrying the wires underground, and, though many obstacles appear in the execution of this method, it will, doubtless, prove to be the one ultimately adopted. The American Bell Tele-

phone Company has constructed two short lines of underground wires in Boston, and these furnish a basis from which to judge of the practicability and the expense of such a system.

It has already been established that retardation and induction are both obviated by the use of double and twisted wires in metallic circuit; but as the two lines constructed in Boston are only about a quarter of a mile each in length, it was thought best to try the single-line circuits, in the hope that the retardation and induction on so short lines would not be serious. It is also found that conversation over these lines is not so easily carried on as by means of the overhead wires, and, moreover, it is frequently possible to overhear other conversation. Thus, for practical reasons, the single-wire system underground is condemned. As to the cost of this system, it is estimated that for piping and chambers it would be about $50,000 per mile, and for the cables about $150 per mile, so that in round numbers we may say that one thousand miles would cost $150,000 per mile, or $150 a mile for each circuit.

The facts above given seem to indicate that the underground system is practicable in some shape or other, and if by any means the cost can be made sufficiently low to admit of its being adopted by the various electric companies of this country, it will doubtless prove to be the most satisfactory way out of the difficulty.

IT was with some surprise and, we must add, with regret, that we read the account of the Yale alumni dinner as reported in the daily papers, on which occasion our much-esteemed president was forced to admit a feeling of homesickness for "old Yale," if we mistake not his language. For this we are sorry, but may be assured that, in whatever department the talents of our president may be employed, his whole energies will be concentrated there to the benefit of that department.

THE designs for a small museum and amphitheatre for the study of the natural sciences, which the architects have just exhibited, were especially interesting from the variety of individual character displayed in working them up. Without exception, the drawings were excellent; each designer seemed at his best. Mr. De Coster, who received the first mention, had rendered his design in his usual artistic way, soft grays and cream colors predominating; but, charming as this rendering is, one wishes he would express his ideas in other language just often enough to give piquancy to so pleasant an individuality. Mr. Ilsley's design received the second mention, and scarcely a greater contrast could be imagined than that between his design and Mr. DeCoster's. This, too, was most characteristic. Greek doric would at first thought seem the height of the inappropriate for such a purpose, especially as regards the semicircular colonnade; but Mr. Ilsley's true Greek feeling enables him to adapt his means to his ends in such a masterly way that one feels immediately that the best thing has been used in just the best place. One of the students, speaking of this design, expressed very well the feeling one has in the presence of Greek work: "You would feel as if you were in the presence of gods and goddesses when you walked along that colonnade." Mr. Green and Mr. Schmidt received the other mentions; both had very finished designs; but, after all, it was only a matter of degree, not of quality, which made one better than another; they all, as one of the professors said, deserved mention.

IT is a rather new experiment in the Institute to have a life class for the Architects. There is still something to be desired, however, in the arrangement of the class. Meeting, as it does, at present in 4 Rogers, the members are obliged to transport all their materials, boards, paper, charcoal, etc., from one building to the other, or to leave them between the meetings in the room. The latter way of getting over the difficulty has its objections, especially in the fact the drawings sometimes disappear, owing, probably, to the fineness of the students' perception of the ridiculous. If the Architectural Library could be fitted up for the purpose of the life class, the students would be saved much inconvenience.

Ode to a Senior.

AN ADAPTATION.

If you 're anxious to appear
As an economic seer
And a man of manners good,
Be advised, and do not yawn
As if fatigued, or else in scorn,
In a most annoying way.
Most of all you should not stretch
(Like a rude, untutored wretch)
Your arms above your head;
For, whatever is the matter,
It would certainly *look* better
To restrain yourself in class.
And when you walk your mystic way, etc.

P.

Synchronous Multiplex Telegraphy.

At a meeting of the Society of Arts of the Massachusetts Institute of Technology, March 13, Mr. P. B. Delany, of New York, described and exhibited in operation his new system of synchronous multiplex telegraphy, by means of which any number up to twelve independent fast Morse circuits can be simultaneously worked over a single main wire, the messages going in either direction on any circuit. A greater number of slow Morse circuits and as many as seventy-two printing circuits can be run by this arrangement.

At each end of the main line a drum, called a distributor, is maintained in uniform rotation about a vertical axis by the intermittent attraction of an electro-magnet on the toothed circumference of a horizontal iron plate. A tuning fork (85 vib. per sec.), vibrated electrically, opens the motor circuit at each vibration, and produces the intermittent action in the motor magnet driving the distributor. If the forks at the ends of the line were in absolute unison, and each toothed circumference possessed the same number of teeth, the drums would rotate synchronously The impossibility of absolute and continued unison is met by automatic regulation of the rate of vibration of the forks, the principle involved being the shunting (by means of a current sent automatically over the line from that distributor which is losing) of a resistance coil in the circuit which drives the fork. This increases the current in that circuit, and hence increases the amplitude of the vibration of the prongs of the fork, intensifies the field of magnetic force in which they vibrate, and thus diminishes (up to five per cent) the rate of vibration of the fork. This diminution of rate would immediately result in a corresponding lessening of the speed of rotation of the distributor at that end. The automatic process is effected in either direction over the line a certain maximum number of times (three in the apparatus shown), or less as may be necessary, and always tends to slow down the faster fork and distributor to synchronism with the slower.

The main principle of the multiplex use of the single line consists in giving the line synchronously and in sufficiently rapid succession to the corresponding instruments at opposite ends of the line. In the apparatus shown, the rotating drum or distributor carries a brush which trails over a circular series of eighty-four narrow, radial, metal plates or segments insulated from each other. Of these twelve were utilized in the synchronizing arrangement, and the remaining seventy-two were divided among the six circuits, the terminus of the same circuit being thus connected to twelve equidistant segments, each circuit containing merely the ordinary polarized relay and reversing key and the ground, the relay serving to close the local circuit containing, as usual, a relay to work the local sounder. Thus when the brushes at both ends of the line make contact at the same instant with any one of the twelve segments of the same circuit, that circuit and no other could be in operation. As the synchronous rotation continues, each circuit will be in turn closed through the single main line wire in succession, and each twelve times in a rotation, or thirty-four times in a second. The frequency of successive closings of the same circuit is thus so great that in the fast working of the Morse instrument at least one closing, usually several, must occur in the shortest dot, so that no signal can be missed.

The automatic synchronizing device consists in having three equidistant segments in each set about twice as broad as the others, the seg-

ment next preceding each of the three being idle. The relative positions of these broad segments is not the same in the two sets, but is complementary. In the position corresponding to every broad segment of either set is, in the other set, a narrow segment connected with a grounded battery (the same battery serving of course for all three segments of each set). The broad segments are all grounded. The two distributors will be synchronous when the brush of one is on any one of its narrow battery segments at the same instant that the brush of the other is on the idle segment next preceding the broad one. If the synchronism is perfect, both brushes will pass off these segments at the same instant. If the brush on the idle segment is ahead, it will pass on to the broad segment while yet the other brush is on the narrow battery segment; a current through the line and broad segment contact to ground will ensue. This current excites a relay (located between the broad segment and the ground) which opens a local relay circuit (normally closed). As the armature of this second relay comes sharply to its back-stop, it thus short-circuits the resistance coil previously alluded to as being in the circuit of the battery which drives the tuning fork, and thus effects a slowing down of the fork and distributor, as before described As there are three broad segments to be touched in each revolution, this synchronizing pulse may be sent three times, twice, or once, as may be necessary, in either direction in each revolution. The two distributors may thus be made to rotate together within one quarter of the width of one of the narrow segments of each, corresponding to a synchronism of about 0.001 second.

S. W. H.

A Well-Trained Dog.

A CERTAIN good New England deacon who had a weakness for fine dogs went to church one Sunday morning, and after the congregation had waited a long time for the minister, who for some reason failed to appear, he went into the pulpit to conduct the services in the pastor's absence. In the midst of the long prayer the deacon heard the church door opening with a slow and gentle creak, and, possessing the gift of seeing everything about him, with his eyes apparently closed, he beheld his favorite setter standing at the half-opened door. For an instant the good man was bathed in a cold perspiration of dread lest the dog should bound up the aisle, into the pulpit, hearing his master's voice; but a happy thought, born of desperation, struck him, and turning the course of his prayer somewhat, he went on, "O Lord, we give ourselves into Thy CHARGE!" at the word the dog seemed changed to stone; not a muscle moved though every nerve was tense. The good man continued, — "And when we return to our HOME —!" That was enough, like an arrow the setter shot through the doorway, and with an unusually fervent expression of thankfulness for mercies received the deacon concluded his prayer.

Friedrich Wöhler.

THE names of Friedrich Wöhler and Justus Liebig will forever be linked together: the work which they did in common forms an epoch in the history of chemistry, and will exercise an undying influence on the development of modern thought; yet, although bound together by ties of friendship, and influenced by each other's work in no ordinary degree, the individuality of each was such that, beyond doubt, either could have been a great figure in science if the other had never lived.

Friedrich Wöhler, the son of a leading citizen of Frankfort, was born on the thirty-first day of July, 1800. In his early youth his passion for experimenting and the tendency of his mind towards the natural sciences developed themselves to the neglect of his other studies, and throughout his school life Wöhler did not manifest any particular diligence or genius. In his twentieth year he entered the University of Marburg, where it was the wish of his family that he should study medicine Although he had no time to attend lectures on chemistry, he did not neglect this subject, but transformed his room into a laboratory, where he busied himself with the study of the compounds of cyanogen.

Attracted by the fame of Gmelin, Wöhler left Marburg for Heidelberg. His intention was to attend the lectures of Gmelin; but the latter declared that it would be an unnecessary waste of time, and so he never attended any systematic course of lectures on chemistry. He received his degree in 1823. At that time the great Swedish chemist, Berzelius, was at the height of his fame. An offer of a place in his private laboratory was gladly accepted by Wöhler, and to Stockholm he then went, where he formed a great friendship for Berzelius, and afterwards showed his gratitude to his master by making a yearly translation of his *Jahresbericht* into German.

In 1825, Wöhler was elected instructor of chemistry in the trade school at Berlin. He accepted the position, and held it for six years, during which time he did much important work, especially the synthesis of urea, — one of the most important discoveries of modern chemistry. He also isolated, for the first time, the metal aluminum.

About the same time he first met Liebig, with whom he entered into a life-long friendship and partnership in work. Their first joint work was the investigation of mellitic acid.

In 1831, Wöhler was called from Berlin to Cassel, where he was engaged in planning a new laboratory for the polytechnic school of that place. He remained at Cassel for five years, and was thence called to Göttingen as professor of chemistry. While at Cassel, he and Liebig carried on their investigation of bitter-almond oil. At Göttingen he further investigated the matter. Uric acid was the next problem attacked, and no fewer than fifteen new substances were added to the list of chemical compounds.

Wöhler turned his attention now to inorganic chemistry, and henceforth he and Liebig had little in common in their chemical work. In such a brief sketch of his life it would be impossible to make a complete account of his work. Suffice to say that he was the author of two hundred and seventy-five memoirs and papers; fifteen of these were published in concert with Liebig.

Of all the elements known in Wöhler's time, it is said that there was not one which he had not investigated.

He made Göttingen famous as a school of chemistry, and his services to science have been recognized the world over. He died on the twenty-third day of September, 1882. R.

After the Hop.

If you 're waking, call me early, call me early, brother dear,
For though this evening o'er my books I 've yawned from ear to ear,
My Trigonometry's not done; my French, too, still remains,
In spite of every goading of my rest-demanding brains.

Oh, sweet it is to closely clasp a fairy-footed girl,
And in the mystic mazes of the 'wildering waltz to whirl;
But oh! the evening's reck'ning for the afternoon's delight,
The logarithms dancing before my sleepy sight.

And I cannot dig to-morrow, but it little troubles me,
For I 'll loaf one day in seven just to spite the Faculty;
Still, Monday comes but grimly when it turns one out a dawn,
With thoughts of work unfinished such as makes the student mourn.

Yet don't forget to wake me; but be careful of the door,
And never mind the squirt-gun which you *have* used before;
It 's precious hard to have to burn the candle at both ends,
But harder still to skip the fun our Alma Mater sends.

B. C. L.

The New Cannon.

THROUGH the kindness of Capt. Lyle, several students of the Institute were enabled to see the casting of the twelve-inch mortar at the South Boston Iron Works on a recent Saturday afternoon.

This is the first and smallest of the five experimental guns to be made for the U. S. Government, authorized by Act of the Forty-seventh Congress, and is the first gun cast in these works in seven years.

The furnace, charged with twenty-seven tons of metal, pieces of old cannon principally, was

started at 4 30 A. M., with the expectation of being ready to tap at 2 P. M. Early in the afternoon a series of tests was begun to see when the metal was in proper condition to run. At intervals of about one half hour small pyramids one foot high and two inches square at the base were cast, cooled rapidly and broken across their length by hammering. The sections thus shown were carefully examined by eye and magnifying-glass to judge of hardness and other condition of the metal. At base of pyramid the iron was uniformily black, but in sections near apex it was mottled gray and black The desired condition of the iron would be reached when this mottled appearance should be seen in a section about one and one fourth inches square. Pyramid after pyramid was cast and broken, the fires meanwhile being urged to their utmost. The mottled appearance was seen successively extending down to the one-half, three-fourths, seven-eighths and one inch section, then seemed to retreat a little, but finally about 7 P. M. the iron was pronounced to be in the desired state of hardness, but by the great heating had become too fluid. The fires were allowed to go down a little and at precisely 8 P. M., the word was given to tap the furnace. The fluid was conducted in iron troughs lined with baked sand, into the mould, men being stationed along the line to skim out the slag. In sixteen minutes the mould was full and the extra two tons of metal were poured out upon the floor in form of pigs.

Water from the hydrant was run into the hollow core of the casting in order to cool the gun from the inside, and a fire was to be built around the mould in the pit to keep the outside from cooling too fast. This is a reversal of the old way of casting the gun solid, cooling of course from exterior, and then boring out the core. In the old way the outside, cooling around an expanded semifluid interior, was too large for that interior when cold, causing a state of tension, a tangential compression of the outer layers and strain of the inner layers. In the new method, the inside cooling first, the outer coatings are, as they cool successively, "shrunk on" like a hot tire on a wheel, giving greater strength for the same weight of material.

The temperature of the water, entering at about thirty-six degrees Fahrenheit, and leaving at about seventy-five degrees, the amount of flow, the time of cooling, and numerous details of the casting are minutely noted down, so that if this gun is a success the same routine may be followed with the next. In this establishment fifty cannon are being altered from smooth bore to rifled. The breech is bored out and a rifled steel tube is fitted through the gun. This tube is held by large screw threads at the breach, by a steel collar at the muzzle, and any turning due to the reaction of the rotating shot as it leaves the gun is prevented by pins put through the sides of the gun into the tube.

F. H. NEWELL.

Recrimination.

I SAW thee in the morning light:
Thy simulated love had fired me;
I longed to bask me in thy sight,—
That thou wouldst be my soul's chief might,
The thought inspired me.
No more! No more!
For alas! Thou didst conquer my heart
As tidals a smiling shore.

I saw thee by the heat of noon:
Thy mantling cheeks were glowing flames;
I saw thy proud lips curl too soon,—
They rounded like the crescent moon
At my bold claims.
No more! No more!
For alas! Thou hadst stricken my heart
As billows a sandy shore.

I saw thee by the gloom of eve:
Thy golden eyes shot softened glances;
I saw thy swelling bosom heave,—
Ah! can it be that thou didst grieve
O'er thy past fancies?
Oh! more! Oh! more!
For be sure thou hast stricken my heart
As wavelets a rocky shore.

J. G. H.

WE are in receipt of the Directory of the Class of '79, containing an interesting account of the annual reunion and other matters, for which we are indebted to Mr. H. H. Campbell, secretary.

Department Notes.

The *Iron Age* for March 6 devotes several columns to a description and drawings of a testing machine designed by Mr. A. V. Abbott for Fairbanks & Co., of New York. The machine can apply any stress up to 200,000 lbs, and records both the amount of stress and its effects on the specimen. Accurate registering of the stress is secured automatically; inside the poise which surrounds the scale-beam are two electro-magnets and some clock-work; when the beam rises, a steel pin at its extremity dips into a mercury cup and completes an electric circuit, exciting one of the magnets and throwing into operation the clock-work, which moves the poise forward; when the beam falls connection is made through a cup below, the other magnet excited and the poise moved backward, these motions alternating until exact equilibrium exists.

The *Manufacturers' Gazette*, to which has been added the title of *Cotton Spinner and Steam User*, has recently changed hands, and is now edited by Thomas Pray, Jr., formerly editor of *Cotton, Wool, and Iron.*

Prof. Wilson, geologist, of Chicago, has discovered a 38-inch vein of sapphire corundum on the farm of Samuel Herb, near Line Mountain, Northumberland County. A Boston company has purchased the tract of land. This is the second discovery of this kind in America.

The superintendents of the various life-saving stations have been instructed to furnish, for scientific purposes, samples of the so-called "singing-sands," wherever found. These sands get their names from the peculiar sound which they give forth when walked upon or disturbed in any way. This property is possessed only by dry sand found between the water line and extreme high-tide marks along the sea-coast and the shores of the great lakes. Already twenty-six samples of this sort have been received, indicating its existence in as many different localities in this country. Heretofore these singing-beaches have only been known to exist in two places, one in this country and the other in Europe.

The lowest barometric depression ever recorded occurred in Scotland, Jan. 26 and 27. At Edinburgh a reading of 27.427 inches was made, while previously the barometer has rarely fallen below twenty-eight inches. This extraordinary atmospheric disturbance was not attended by a storm of corresponding severity, though there was a heavy gale throughout Scotland.

No mention has ever been made, says an exchange, of the difference in diameter between the cylinder of a steam engine hot and the same when cold. In small engines this change of dimension would not be great, but in large ones, and with the high pressures now carried, it cannot be ignored. A cylinder seventy-two inches in diameter has 4,072 square inches area; supposing it to expand only one eighth of an inch, which is quite within bounds, it is then 4,085 inches in area, thirteen square inches larger. When this is converted into foot-pounds and pressures, it represents an item of no small importance. Since all calculations are made upon the basis of the bored diameter, it follows that it cannot be correct, and that the power is greater by the amount of the relative expansions in the cylinder diameter at extremes of temperature. A thorough study of the matter would be of great interest.

We advise our readers to look over the "Literary Notes" in the *Chronicle*, if they would find a good compendium of the latest publications. The criticisms are discriminating and good.

The *American Engineer* has in its last few numbers a couple of continued articles which are well worth the attention of the civils. They are, "Notes on the Construction and Equipment of Narrow-Gauge Railways," and "Foundations for River Bridge Piers." The *Railroad Gazette*, beginning March 7, gives many particulars about the Niagara Falls Cantilever Bridge, accompanied by drawings of many of the details. The same number also contains an article upon the merits and faults of cantilever bridges.

We think that few travellers going South by rail reflect that, as the gauge of the Southern roads differs from the standard gauge, it is necessary to change the trucks of all through cars. Knowing that this change was made at Wilmington, N. C., we got the porter of our Pullman to wake us at midnight, and, though in a somewhat dazed condition, we managed to make out how the thing was done. First, it should be stated that we were coming North over a five-foot gauge, which may be termed the Southern standard. It was therefore necessary to adapt the car to the Northern standard gauge of four feet eight and one half inches. To do this our sleeper was run into an inclined pit having too sets of rails corresponding to the Northern and Southern standards, — bars of railroad iron having previously been put under the body of the car, the ends resting on trucks which ran on a double set of rails on the edge of the pit. The chains having been disconnected, the car trucks, relieved of their load, rolled from under the car down the incline, and were hauled out by a shifting engine; while the new standard trucks were at the same time rolled down on the standard gauge from the opposite end of the pit, their chains secured, and car and trucks pulled out together, — the whole operation occupying scarcely ten minutes. This change is made on all Pullman cars passing through Wilmington. In the case of freight cars, however, the freight is generally transferred to other cars.

E. R. E. Cowell, of the Michigan Central Railroad, has invented a speed-gauge for locomotives, so that the engineer may have in front of him at all times the exact speed per hour of his engine; and, whether the night be dark or foggy, there need be no guessing at the speed, and no disobeying orders as to speed through ignorance. He believes that a speed-gauge is as much a necessity as a steam-gauge, and that the future locomotive will not be complete without it.

The production of petroleum in the region of the Caucasus Mountains increased from 500,000 barrels in 1873 to 4,000,000 in 1881.

Communication.

[*The Editors do not hold themselves responsible for opinions expressed by correspondents.*]

Mr. Editor, — The last issue of The Tech contains an editorial urging that the minimum age at which a student can enter the Institute should be raised. It gives many arguments in favor of this change, but it seems to me that a good deal may be said on the other side.

An age requirement is one which must be based on the principle either that the examinations at the Institute are not sufficiently comprehensive and searching to determine whether a man is prepared for the work of the school, or else, that men not having reached a certain age may be able to do the work, and yet not be sufficiently mature to derive the full benefit of the work received. If the former be the reason, is it not a confession by the Faculty that the examinations are not up to their proper standard? Many things go to show that they are not, but the remedy is plainly not to raise the age requirement, but to so increase the severity of the examinations that they shall thoroughly test the fitness of the applicant for admission.

An age requirement is something entirely absolute, and considering how much different students of the same age vary as to maturity, it is evident how unjust it is to say, that because at eighteen a man is more mature than he was at sixteen, therefore all men of eighteen are more mature than those of sixteen. In the English High School, where the individual ages vary from fifteen to twenty, it is not found that the younger boys rank lower in the class, or that they do not comprehend their studies as well as the others. On the contrary, it has been my experience, that, while they get along fully as well as the average, they are by no means the hardest students, but that their position in the same class as those older than themselves is due to other causes, — favorable circumstances, natural ability, or often both.

Coming back to the Institute, is it not found that those of the younger men, entering fully

prepared, have to work no harder for the same results than their older classmates?

The editorial states that doctors, lawyers, and clergymen seldom enter their respective professions under twenty-four, but the reason of this is not that they must be of a certain age before they are allowed to enter the necessary institutions, but that they are unable to complete earlier the requisite course of study. And no man is delayed in entering upon the practice of his profession upon the principle recently expressed by one of our own professors, who told a student that he was so young he could afford to study an extra year for his degree, even, if he were prepared to graduate this year.

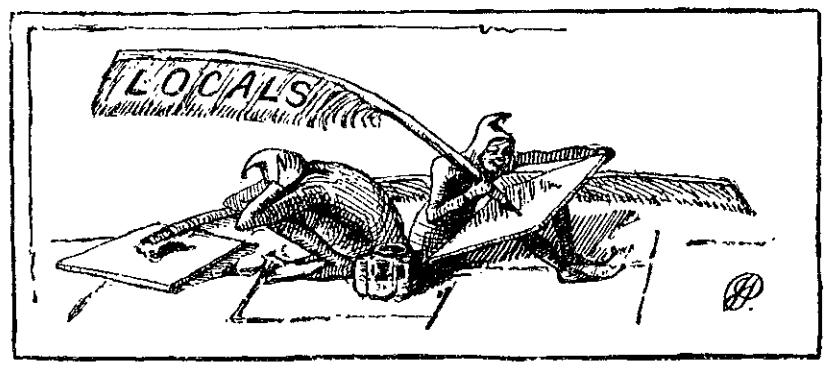
To see what the loss of a year would mean to the student, let us suppose two cases in which he is equally fitted for active life, but a year older in the second case than in the first.

In each instance he must spend a number of years in getting skill and experience before his powers are fully developed, and he then remains in his prime until, let us say, fifty years of age.

The difference will be that in the first case his time of greatest usefulness lasts just a year longer than in the second; whence it is evident that the loss of a year in his preparation is practically the loss of one of the best years of a man's life. Not that I would assert the extra school year to be a total loss, as the student must of necessity learn something in that time; but what, with the discouragement naturally accompanying enforced delay, and his inability to employ his time to the best advantage, enough loss would occur to far overbalance the good accomplished.

We would not ask that any man in the least behind in his work should receive a degree on the plea that the extra year's time necessary to obtain it would be so great a loss to him, but would simply desire to emphasize the fact that "time is money," and demand that we younger men be allowed to compete with the others on an equal footing. Let every one have a fair chance and stand or fall by his merits alone, whether a child or as old as Methuselah.

A. B., '85.



Have you seen Whitney's calorimeter?

Only one more holiday this term,—Fast Day, April 3.

The second-year mechanicals will soon commence their foundry work.

The second-year miners and civils will soon begin their spring field-work in levelling.

'87 has contributed $140 towards the Senior ball,—more than one half thus far contributed.

The Sophomore and Junior mechanicals are doing about the same work in drawing this year.

We understand that six or more graduates from Phillips-Exeter Academy are to join M. I. T., '88.

Whistling matches, three times a week, in the third-year mechanical drawing-room. Admission free.

The third-year mechanicals find that filing is more tiresome than forging, and lacks its muscular exercise.

The gymnasium presents an active scene every afternoon. A large number of men are in daily training.

The class in weaving at the School of Design have some fine specimens of woollen goods which they have recently made.

The Harvard '84 tug-of-war team have been over to our gymnasium two or three times during the past week to be coached by our team.

A Soph, on being told that the German word for an ambassador meant "A sent one," asked the professor if they did n't have any higher priced.

We have seen a large number of Freshmen eating "rock and rye drops,"—all Freshmen classes do it. A recent analysis in Brooklyn of these drops showed that they contained a very dangerous amount of fusil oil: Freshmen, beware!

As the notice for the suspension of exercises on Washington's birthday is still pasted on the bulletin board, we suppose that it is intended for next year.

The 2 G. Society held its regular meeting at Young's, on Tuesday, the 18th. Papers were read by C. S. Robinson, '84; Sturgis, '84; and Capt. Lyle, '84.

President Walker's series of lectures, delivered before the Harvard Finance Club last May, have been published in book form under the title of "Land and its Rent."

Owing to the efforts of Mr. H. P. Barr, who has generously devoted considerable time to the matter, '85 has now class note-paper, — gray, with a cardinal-red monogram, and very neat and pretty in appearance. The paper can be obtained of Mr. Barr at ninety cents for thirty sheets with envelopes.

The second concert of the Glee Club will be held April 23, at 8 P. M., in Association Hall, B. Y. M. C. A. Sale of reserved seats will take place Thursday, Friday, and Saturday, March, 27, 28, 29, at one o'clock at the box office B. Y. M. C. A. Reserved seats 50 cents and 35 cents. Admission 25 cents.

The class spirit, which was so high in '86 at about the time of the class dinner, appears to have somewhat cooled, as three class meetings, last week, had to be adjourned on account of lack of quorum.

Signs of spring: When the windows of Rogers Building are washed; when the students collect on the front steps of Rogers to smoke the wily cigarette; and when the civils shoulder their barber's poles and heavy transits, and march out to the sand lots to survey, and wish they had taken some other course.

Mr. C. Wood, '86, has made a very pretty and original design for the Senior ball order of dances. The affair promises to be one of the most successful ever given.

Capt. Lyle, '84, while charging the furnace during Mr. C. S. Robinson's run of lead matte, narrowly escaped serious injury from an explosion of gas at the mouth of the furnace. As it was, he was considerably singed about the face.

The Junior class supper at Young's last Friday evening was an entire success and amply rewarded the labors of the committee. Fifty-seven past and present members were there, and showed by their words and actions that, in this class at least, there was a bond of union for them in the words, "He is an '85 man." Under the able guidance of Mr. Litchfield, the toasts were a brilliant success, and caused, from the members who responded to them, a witty commentary upon past and present events in the life of the class. The innovation of the committee, in the class cake, was received with great applause, and the roars of laughter which greeted each fresh disclosure of mineral or china treasures convinced them of the success of their *chef-d'œuvre*.

Delaney's new synchronous-multiplex telegraph apparatus, recently on exhibition in the new building, attracted much attention from undergraduates as well as from the scientific people of the city. The electricals, who "knew all about it," were just in their element in explaining the instrument to the less enlightened miners, chemists, civils, etc.

In the shops the Third Year are well along in their filing and the Second Year are about to begin foundry work. Mr. Smith, who has had charge of the wood working ever since the shops were started, has left, and Mr. Maxwell, his assistant, is now the head of the carpenter shop. Mr. Sanborn has recently made some excellent photographs of the shops and several classes.

The strength of the miners was rather severely taxed last week. Mr. Sturgis's "run" at copper refining lasted thirty hours, during which time there were six shifts of five hours each, three men on each shift. The ore was put in at 8.15, March 11, and was not taken out again till 2.15, March 13. Up to 10.30 P. M., everything had been running well, and much satisfaction was expressed by those present; but when the ladling was begun the ore was found to be not wholly free from slag. This necessitated the repetition of most of the process; more copper scraps were added, and the batch worked over again, requiring about six hours' extra work.

The College World.

HARVARD. — Dr. Sargent has addressed the captain of the nine, stating that they are at liberty to arrange games as heretofore, except that no games are to be played with professional nines. — Prof. Smith's collection of meteorites, the largest in the world, has been bought by the University. — The price of board at Memorial Hall for March was $4.10 per week. — Benjamin Woodbridge graduated from Harvard in 1642, the first person to graduate from the college. — The Junior crew averages one hundred and sixty six and one half pounds in weight. — Prof. R. C. Jebb, the distinguished Oxford scholar, will deliver the oration before the Harvard chapter of Phi Beta Kappa next commencement. — It is proposed to add a large swimming tank to the Harvard College Gymnasium.

YALE. — The chapter of Phi Beta Kappa has been reorganized.—Quip has been decided on as the name for the new comic paper. — Oliver Dyer, a student, was killed while sparring at the recent athletic games. — Twenty men are training for the lacrosse team — Mrs. Lawrence, mother of the late Mr. Lawrence, '84, has given the college $50,000 for a new dormitory.

PRINCETON. — At a recent mass meeting resolutions were passed apologizing to the Faculty and dean for the charges recently made against them. — Princeton contemplates extensive changes in its curriculum. Fewer studies and more hours a week to each is proposed. — The winter athletic games had but twenty-five entries. — Pneumatic rowing machines have been put in the gymnasium.

WILLIAMS is the next college on the list that has adopted the new system of college government. Committees have been appointed by the members of each class, who are to confer with the Faculty in regard to the internal management of the college. The Faculty still retains the governing power however. — The Freshmen and Sophomore classes of Williams have also passed resolutions to prevent future "disorderly conflicts" between each other. Suppose this means straight fight.

CORNELL. — The *Era* denies the report that the tendency of that college is to substitute the study of the sciences for Greek and Latin

DARTMOUTH. — President Bartlett has just been appointed associate member of the Victoria Institute or Philosophical Society of Great Britain, an organization which comprises the leading biblical scholars of that country. — The *Dartmouth* states that a larger proportion of their graduates are employed as teachers than those from any other country college. We thought so; they can be found almost anywhere in the country. — The *Dartmouth* of this issue contains a learned treatise on agnosticism and a pleasant account of one of the old presidents, Rev. Nathan Lord, from 1828–1863.

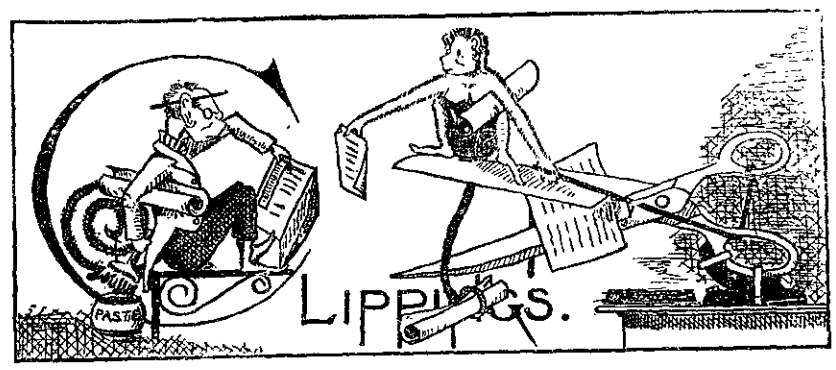
NOTES. — Lehigh has applied for admission to the Intercollegiate Lawn Tennis Association. — The gymnasium at Cornell is lighted by electricity.—Amherst is to have a $95,000 gymnasium. — The largest observatory dome in the world is now being made for the University of Virginia It weighs ten tons and measures forty-five feet at the base. — The University of Pennsylvania has 1,000 students and 132 professors. — The Hamilton Seniors have unconditionally surrendered to the Faculty. — Prof. March, of Lafayette, is to assist in editing the great dictionary of the Philological Society of London. — Dartmouth has been readmitted to the base-ball league. $1,250 have already been subscribed for the support of the nine. — Columbia has some very fine athletes in the Freshman class. One is said to have defeated the intercollegiate tennis champion at tennis. — Several Dartmouth Juniors have been suspended for dishonesty in examinations. — Prof. E. J. James, while on a visit to Germany last summer, asked the professors of twelve German universities, "Do you think that too many young men are studying at the universities?" Almost uniformly the answer was, "There is no doubt of it." Germany, said one of the professors, is fostering the growth of a class of professionally educated men for whom there is no room in the profession, and who are too proud to go into business of any sort. Result, poverty

or suicide. — This can never be the case at the Institute, where the professions are so numerous and varied and the fields so wide. — The late Otis P. Lord, of Salem, ex-judge of the Supreme Court, graduated at Amherst. — Oxford University has decided to grant to women the same examination for admission as is accorded to men. — *Ex.* — In the mean time, while Williams is considering the advisability of extending the elective system to the Junior class, Dr. Hopkins comes out with a letter calling this system "a jumble of miscellaneous, high-school, and professional training." — The *University Magazine* thinks that intercollegiate championship will cease to exist, now that professional training is not to be permitted in some colleges, while it is allowed in others. — At the intercollegiate Athletic Associstion held in New York, Feb. 23, the sentiments expressed by the several representatives were without exception violently opposed to the suppression of the employment of professional trainers. — And still, year by year, the standard of college education is raised higher and higher. Columbia has just organized a banjo club. — *Burlington Hawkeye.*

The Yale *Courant* has offered thirty dollars in rewards for literary work An entertainment, consisting of minstrels and a play entitled "Baker's Daughter," is to be produced shortly at Yale for the benefit of the navy.

An attempted organization of the sub-Freshmen class at college of the City of New York ended in the customary fizzle, on account of adjournment of meeting by college authorities because of its stormy character.

The Senior class at Hamilton College, which, on account of the expulsion of one of its members, resulting as they said from a misunderstanding by the Faculty, have returned with unconditional surrender, after endeavoring to enter both Amherst and Union Colleges without success. — Dartmouth is to erect a $50,000 library, also a new chapel. — In the medical and dental departments of the University of Pennsylvania, there are fifteen graduates of the University of Pennsylvania, six of Lafayette, and forty-seven of other colleges.



The Dude.

(*From an old poem.*)

Ev'ry morning does
This fellow put himself upon the rack,
With putting on 's apparel, and manfully
Endures his taylor, when he screws and wrests
His body into the fashion of
His doublet.

War News. — El Mahdi-gras occupied New Orleans last week. — *Puck.*

From the *Nursery:* Dude (*posing for a bold, bad man*). "How does water taste, Miss Belasys?" Miss B. "You don't mean to say they 've brought you up all this time on milk!" —*Life.*

Texas Siftings says that about a month ago Tom Keene performed at Austin as Richard III. Among the audience were several members of the Texas Legislature. When Richard exclaimed, "A horse! a horse! My kingdom for a horse," the Solons nudged each other and whispered, "That 's an old joke. I 've heard that one before."

Paris green, — the fellow that eloped with Helen. — *Life.*

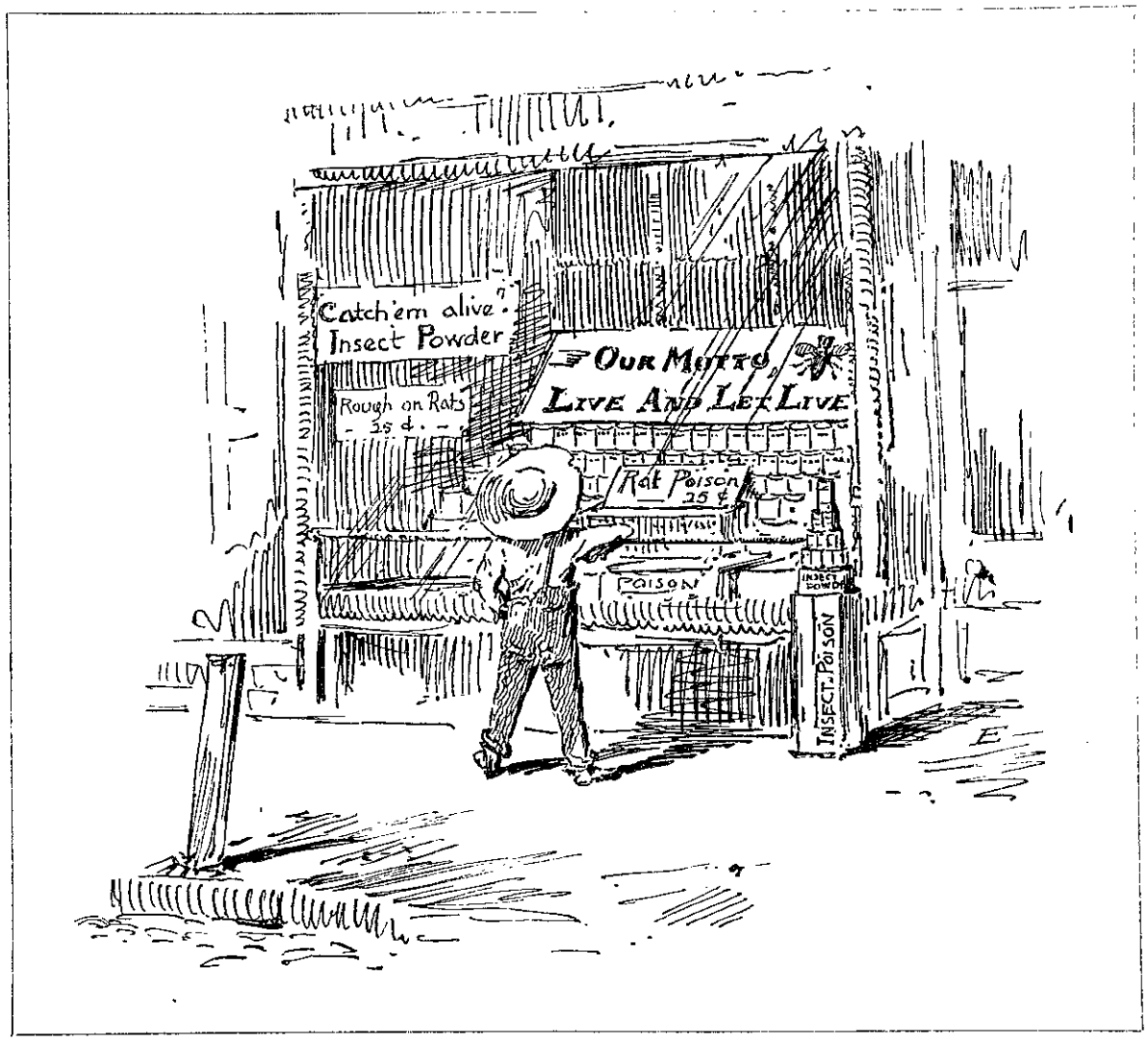
The Esquimau make a light breakfast off six tallow candles. — *Puck.*

Professor in Greek to Sophomore: "What is the trouble with this lesson?" Soph.: "Did n't have time to get it." Prof.: "Perhaps we can give you another year." Soph faints. — *Sun.*

"Piscatorial Spheroids" are what the Vassar girl calls fish-balls.

Of all sad words of tongue or pen,
The saddest are these, "I 've flunked again." — *Ex.*

FATHER: "I had no idea that your studies would cost so much money." STUDENT: "Yes, and I don't study so very much either."—*Fliegende Blätter.*



What an observant Freshman saw on Hanover Street.

Why was Jupiter like one of the political parties of to-day? Because he wanted a Leda. — *Life.*

The Æsculapian: Kiss from your doctor, not valued very highly; generally given as an encouragement to take a pill.

"These are good strawberries," said a countryman to a keeper of a fruit store as he helped himself to two or three. "Very good," replied the store-keeper; "seventy-five cents apiece; take another." The countryman thought he would n't.

Brown is very absent-minded, and it was not strange that he should do it, but it made the congregation laugh to hear him say, when he laid a quarter on the contribution plate, "Tickets, please — one out." — *Boston Transcript.*

When a candidate gets into the hands of his friends, the next move is to get their hands in his pockets. — *Newman Independent.*

Professor explaining point in physiology: "Now take my arm." A co-ed. who has been dozing on the back seat rouses up and murmurs: "Thank you, I guess I will: it is rather slippery"; and then, seeing the whole class look round, subsides into blushes. — *Ex.*

Old lady: "Only think, one missionary for 10,000 cannibals!" Young lady: "Mercy! they must have terrible light appetites, or awful big missionaries." — *Puck.*

What is the difference between a town and a city? Oh, that is easy enough! A town is governed by selectmen, while the rulers of a city are not always men who are remarkably select. — *Boston Transcript.*

And now it is proposed to resurrect the whipping-post in Massachusetts for the benefit of men who beat their wives; but no law has yet been passed to protect poor, innocent husbands from such abuse.

THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY,

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THIS school of industrial science was opened in February, 1865. The first class graduated in 1868. The school is devoted to the teaching of science as applied to the various engineering professions: viz., civil, mechanical, and mining engineering, as well as to architecture, chemistry, and natural history, physics and electrical engineering, and metallurgy.

Besides the above distinctly professional courses, the Institute offers scientific courses of a less technical character, designed to give students a preparation for business callings. A four-years' course in biology, chemistry, and physics has been established, as preparatory to the professional study of medicine.

Modern languages are taught so far as is needed for the ready and accurate reading of scientific works and periodicals, and may be further pursued as a means of general training.

The constitutional and political history of England and the United States, political economy, and international law are taught, in a measure, to the students of all regular courses.

Applicants for admission to the Institute are examined in English grammar, geography, French, arithmetic, algebra, and geometry. A fuller statement of the requirements for admission will be found in the catalogue, which will be sent without charge on application.

A clear admission paper from any college of recognized character will be accepted as evidence of preparation, in place of an examination.

Graduates of colleges conferring degrees are presumed to have the necessary qualifications for entering the third-year class in any of the regular courses of the Institute, and will be so admitted provisionally, on the presentation of their diplomas.

The feature of instruction which has been most largely developed in the school is laboratory training, shop-work and field practice, to supplement, to illustrate, and to emphasize the instruction of the recitation and lecture room.

Surveying instruments are provided for field work in civil and topographical engineering. Extensive shops have been fitted up for the use of both hand and machine tools; and a laboratory of steam engineering has been established as a part of the instruction in mechanical engineering. Several steam boilers and steam engines of various types are available for experiments and tests. The department of mining engineering and metallurgy has the use of laboratories in which the milling and smelting of lead, copper, silver, and other ores, in economic quantities, are regularly performed by the students themselves. The classes in architecture supplement the work of the drawing and designing rooms by the examination of structures completed or in course of erection, and by practical experiment in the laboratory of applied mechanics, testing the strength of materials and working out problems in construction. The Kidder Chemical Laboratories, just completed, contain desks for four hundred and twenty-six students, and afford the best modern facilities for the study of general, analytical, and organic chemistry. The Rogers Physical Laboratory has been greatly extended in every department during the past year, especially in respect to facilities for instruction and research in electrical science.

On the successful completion of any one of the four-year courses of the Institute, a degree of bachelor of science will be conferred. The Institute is also empowered to confer the degree of doctor of science. Special students are allowed to enter special divisions of any of the courses, on giving evidence that they are prepared to pursue with advantage the studies selected.

The Institute of Technology, as a recipient of a portion of the United States grant to colleges of agriculture and the mechanic arts, gives instruction in military tactics.

The fee for tuition of students taking the full course is $200 a year. Besides this, $25 or $30 are needed for books and instruments. There are no separate laboratory fees. Only payment for articles broken is required.

Attached to the Institute are also two special schools: viz., the "School of Mechanic Arts." and the "Lowell School of Industrial Design." The former gives a training in the use of tools, together with elementary mathematics and drawing. English, French, and geography are also taught in this school. The fees for tuition are $150 a year. The Lowell School teaches the making of designs for prints, carpets, wall-papers, laces, ginghams, and other woven goods. A weaving department with a variety of looms is connected with this school. No charge for instruction is made.

FRANCIS A. WALKER, President.

Several students of the Institute enjoyed the presentation of "Mein Leopold" at the little theatre of the German Turn-Verein a week ago Monday. In the midst of the play, two little girls dressed as boys came on the stage and a small child in the audience, apparently recognizing one of them as her sister in spite of strange attire, sung out "O Mary!" to the great amusement of the whole audience.

Estimations of the working strength are like the Irishman's measurement of a roof-brace: he wanted it exactly three times the length of his shovel, twice the length of his hammer, the length of a trowel, and a *bit* more.

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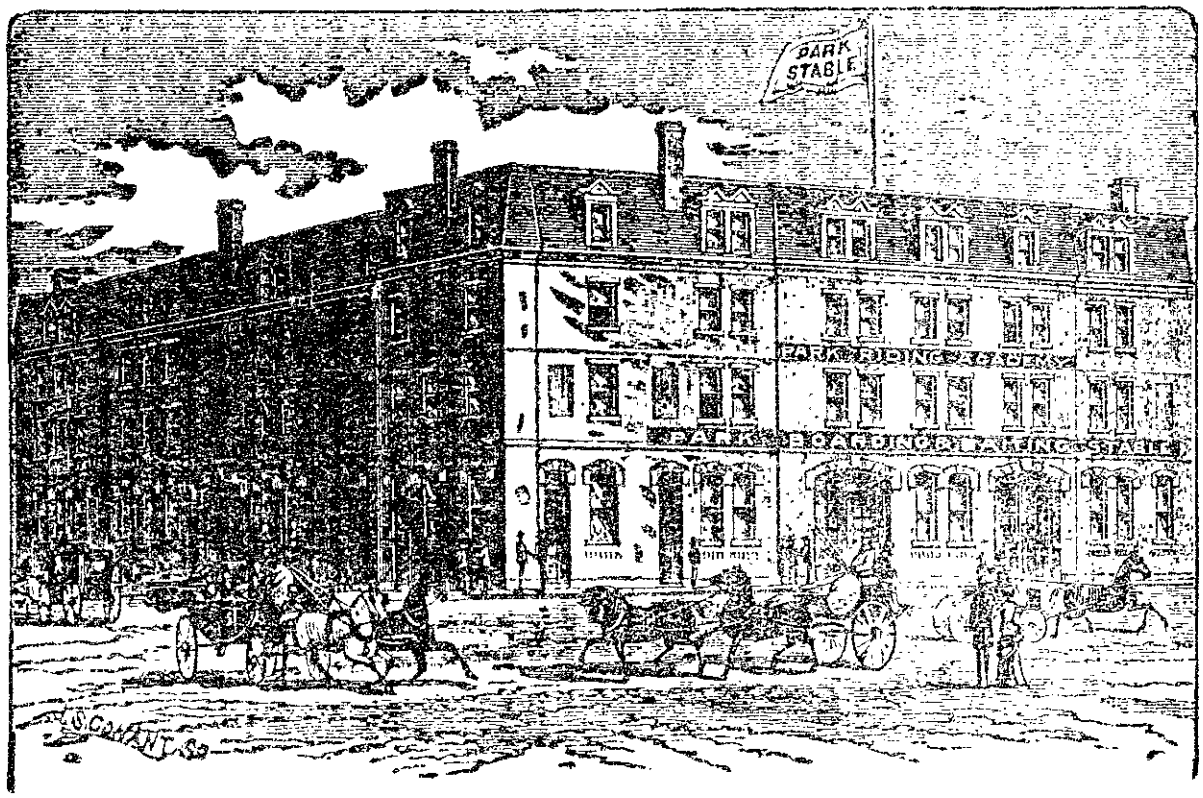

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