The Chicago Board of Education finally reached the text-book issue last Thursday evening, and resolved to oust the objectionable arithmetic referred to in our criticism of last week and several weeks previous—the Model Elementary Arithmetic being substituted for Robinson's Elements of Arithmetic. It also voted to introduce Wells' Shorter Course in English Grammar. Several members of the Board have plainly said that this was done mainly as an expression of regard for ex-Superintendent Wells, who, during his superintendency of the city schools, and in his connection with the Board of Education since then, has laid the people of this city under great obligation to him. This feeling for Professor Wells is highly commendable, but it should not have been suffered to determine a question of this sort. The grammar should have gone into the schools upon its merits. If the book that is now in, and which joins so perfectly to the work of the next higher classes, where the next of the same series of grammars still remains, is even as good, not to say better, than Professor Wells' grammar, it should certainly have been allowed to remain. Substantial reasons should appear in the character of the new grammar itself to commend the change. Such reasons are not obvious to one who gives this book a careful inspection. It is plainly an attempt to combine the principles of the little primary books, passing among the schools as "Language Lessons," with a modern introductory work on grammar. It turns out to be neither the one thing nor the other. Least of all is it well calculated to prepare the pupils of the lower grades for the next higher work on grammar which follows it in the higher grades. Pupils trained in this work must inevitably lose time in passing from its terms and methods to the terms and methods of the higher grammar. The author has not thoroughly digested his work. It looks too much like the ill-digested, ill-graded arithmetic just ousted, in the composition of which, if we are not mistaken, Professor Wells took some part. Let other ways be discovered to reward Professor Wells than the adoption of his text-books.

Any one who has read "A Mouthful of Bread," or any other of the object lesson books of M. Jean Mace, knows how skillful and ingenious he is as a teacher. In 1866, before the Franco-German war and the fearful days to France of 1870, he instituted a Ligue de l'enseignement, having for its object the diffusion of education throughout the country as a necessary complement to universal suffrage. Under the republic this league has greatly extended. It includes now 415 local societies. At a general reunion in the Trocadero, Paris, held lately, M. Gambetta made an address full of sentiment and encouragement. A few passages will illustrate the opinions of the statesman who will, in all probability, become a future president of the French Republic.

"Those who think that universal suffrage should not exist until education has become universal as a preparation, should consider that the suffrage is a native right which must, therefore, naturally lead. It may err, but it is still a right inalienable but by actual crime. We cannot touch it, but we can go on educating each the other, and not only on the highways but in every byway.

In doing this, you are making not elections but electors, as is your admirable formula of expression, deserving to be your motto. You do not meddle with transient politics, or rather you support the principles of the only real democracy, which can only have its full expansion under the flag of the republic. It is touching to hear M. Mace tell the story of the origin of this movement which is now extending so widely and beneficently. A poor stone-cutter, a patrolman, and a modest worker by the job, by their talk with each other and with M. Mace opened the way. It is but another example of how the most truly useful institutions have had their birth amid the sufferings and needs of the lowest of the people. As once, about the year A. D. 1000 the agencies of the preceding centuries, and the influence of the priesthood covered the land with churches, so now, after the terror of 1798 and 1870 it is being covered with schools; and the state, leaving dogmas, symbols, and catechisms aside, will devote itself religiously to the culture of all the intellect of France; leaving no mind fallow; for the neglect of an intelligence is a robbery of the state, and waste of a treasure. Henceforward the teacher will rise in honor; and no title of dignity will be more glorious than those won by devotion and success in instructing the youth of the country.

Among these, women will excel. They can best impart the early lessons in those delicacies of moral, social, and thoughtful
education which tend to secure usefulness, respect, and happiness to all individuals and so to all our country. Here are his own words on the subject of woman’s civil capacities and prospects.

"Sans tomber dans les chemises ne dans les exagérations, il est certain, messieurs— I am not addressing the ladies just now—il est certain qu’a ce point de vue des reformes doivent être introduites dans notre droit public, dans notre législation, reformes qui, une fois accomplis, donneraient à la femme, non-seulement tout son prestige, toute son autorité, toute sa compétence, mais le besoin de les faire valoir. (Vifs applaudissements.)"

But to advance we must instruct, instruct each the other, and all others, and repeat continually. For talk is ineffectual, and all the reason on our side cannot carry conviction and decision, while the general mind is not matured and a majority remains doubtful. We may have reason, but reason cannot prevail against a majority.

THE TONIC SOL-FA SYSTEM.

T. F. SEWARD, ORANGE, N. J.

For The Educational Weekly.

ORANGE, N. J., June 14th.—The tonic sol-fa system of teaching music is attracting much attention at the present time, and doubtless any light thrown on the subject will be welcomed by your readers. I therefore write to say that I have tested the system thoroughly during the past year, and find it to be all and more than is claimed for it. I have taught it in two large public schools, in four private schools, and in various evening classes, in the old fashioned singing school style. The results are truly remarkable, and if the time-worn ejaculation, eureka, can ever be permitted in these modern times, it must be employed in this case. It is the first thought of every earnest teacher who begins to use it and sees its capabilities opening before him; "We have found it." And what have we found that stirs our enthusiasm to such an unbounded degree? We have found something that makes music just as simple as we have always in our hearts believed it to be, but which the old methods have tried to prove it not to be, unfortunately succeeding quite too well in the false impression they have created on the public mind.

I will not occupy your valuable space with any theories of my own, but simply state what the tonic sol-fa system invariably proves wherever it is intelligently used.

1st. It proves that the study of music can be made just as easy and comprehensible to the average mind as any other study.

2d. It proves that music is a language, and that the reading of that language can be made as much a matter of certainty as the reading of English or French, and in much less time.

3d. It proves itself to be in the highest and best sense of the term a natural method of study, and demonstrates that only by such a method can the mysteries of the staff notation be grasped by nineteen-twentieths of the human race.

4th. It proves that because it is a natural method, a good teacher can teach it whether especially musical or not, (given, of course, sufficient musical ear to sing the scale correctly.)

Therefore, by reason of the complications of the staff notation, none but musicians could undertake to teach music. But one may be a thorough musician and yet lack every qualification of a good teacher. Tonic sol-fa puts the subject in such a shape that the teacher can teach it. As this is an educational journal, the importance of the above principal will be recognized without any necessity for further explanation.

At a concert at our public hall on the 16th of last month, I gave what our English friends are accustomed to call a "demonstration" of the tonic sol-fa system and its results. The class (of nearly 100) sang with great accuracy diatonic and chromatic tones, in every possible order, as called for by name and by "manual signs." Changes of key were made in obedience to signs of the hand so rapidly that no professional musician could follow them. A sight reading exercise is thus described by one of our local papers:

"The climax was reached, when folded papers containing an original exercise, filled with all manner of sharps and flats and naturals were passed to the pupils, opened at a given signal, and sung at first sight by the full chorus without the least hesitation. Copies of the music, in staff notation, were in the hands of the audience, and the accuracy of the rendering was apparent to every one at all acquainted with music. It seemed almost incredible that these pupils had not previously seen and practiced this exercise, but we are assured that they knew nothing of its character, and certainly they were not given time even to look it through. Prof. Seward, moreover, informed the audience that he had shown the exercise, after composing it, to a number of professional musicians, and not one of them had been able to read it right off. There must be some unrecognized excellence in a system which can thus enable children to overcome the ordinary difficulties of singing by note, and render a piece full of accidentals without hesitation or mistake."

A very important question, one which may be regarded as a test question as to the adaptability of the tonic sol-fa system to public schools, is this, "What impression does it make upon the regular teachers, who must direct the daily practice, if there is any, and who are the best judges of the practical results of the system?" My answer to that question is the following testimonial, in my possession, which is signed by every teacher who had anything to do with the music in the six schools in which the system has been taught:

"We, the undersigned, having witnessed the results of the tonic sol-fa system of teaching music in our schools during the past year, gladly give our testimony to the value of the system. It presents the facts and principles of music so naturally that all classes of minds seem to grasp them with ease and pleasure. It is so easily comprehended that the interest of the pupil is awakened at once, and is never afterwards diminished. Classes are enthusiastic in the study where they were formerly indifferent and restless. The ability to read music seems to be placed by this method on the same plane as the reading of language, and we see no reason why it should not become as universal. The longer the study of the system is continued the greater is the development of intelligence in the pupils, and the results become more surprising with each step of progress that is made."

I do not wish to trespass upon your space, but if music can be brought in this way within the reach of all, the "good news" ought certainly to be spread far and wide, and it is believed that teachers generally will be glad to learn that arrangements have been made to teach the system at Chautauqua this summer, both during the Teachers' Retreat and the "Assembly."

This will afford an opportunity for many teachers to acquire it sufficiently to begin at once to use it in their schools.

The first consideration with a knife is how to help himself, and the second, how to do it with an appearance of helping you.
THE EDUCATIONAL WEEKLY.

THE TEACHER'S HABITS.

Some shrewd philosopher once remarked—"Happy is the man whose habits are his friends." In the case of the teacher, it may be said that if his habits are not his friends they are his enemies. If they do not recommend him to favor, they will certainly bring disfavor upon him. And we may lay it down as a positive principle, that there ought never to be anything in a teacher's habits that would naturally arouse prejudice and give offense. He should have no petty vices, no objectionable practices. His personal habits should be neat and orderly; he should have little eccentricities, or disagreeable peculiarities of manner. It is not enough that he is as good in morals or as amiable in manners as the average man, but he should be better, more amiable. All men are more or less observed by their fellows, but few are so largely the center of observation as the teacher is. Not only his pupils, but all the members of their families, "their sisters and their cousins and their aunts," are keenly noting his every action, ready to criticise it as deserving of praise or of blame. Is it not, then, worth his while to endeavor to be a model in every respect? Perhaps you may say that we, as well as many of these self-appointed critics, expect too much. But we do not, we make no demand that every teacher shall be a genius or even a person of extraordinary talents and attainments, but we do claim that he should have no bad habits. What we ask is within the reach of all. Every man and woman, though possessed of no remarkable gifts, can always be clean in person and in dress; can be orderly, courteous, polite in language and in bearing, setting an example in the little things of life—which are often, alas! far too much neglected—that all their pupils will do well to follow.

SELF-GOVERNMENT IN SCHOOLS.

THE EXPERIMENT OF ROWLAND HILL—THE REPUBLICAN SCHOOL AT HOFWYL—SELF-GOVERNMENT IN ALL SCHOOLS AND COLLEGES, WITH THE BEST RESULTS.

Another method of teaching self-government is to have public discussions of disputed points.

My partner recently asked me what I did in cases of prompting the boys. I replied that I tried to convince the prompter that he was doing harm, and thus induce him to refrain. If this did not succeed he was sent from class and heard after school. With all this it has always seemed a good plan to "poke fun" at him about his being so full of knowledge that it "slopped" over on his neighbors, or that he is a gallant knight rushing to the rescue of the unfortunate, etc. My partner said he was astonished at one of his best boys defending this practice.

I told him the best remedy for that was a public discussion. This was arranged for the next Friday.

The best order in these public discussions has been found to be to call upon the youngest to speak first, so that they may be able to set forth arguments that lie upon the surface, and thus oblige the older boys to avoid the shame of mere repetition by delving deeper or illustrating more forcibly the "stock arguments.

No school time is lost by such a discussion, for it takes the place of the ordinary declamation, and is of course far superior to it as a means of teaching public speaking. Each boy gets his mark for his speech according to its intrinsic excellence, and if there is time to speak more than once, he gets his average. On this occasion about one-fifth of the boys defended prompting, and two of them did it very shrewdly and ingeniously. One, in fact, held his own very well against the mass of the boys and against three teachers, parrying their thrusts and putting in his own blows in the most approved style.

The result of the discussion was that a very small minority still clung to its defense and professed their perfect willingness to endure all consequences of their persistence.

Some years ago a little fellow spoke of the pleasure of stealing apples. When found fault with he said the other boys thought it right, too. On asking for those who thought it right to rob an orchard such a number held up their hands that it was evident a public discussion was needed to clear the moral atmosphere.

When the time came, I was listening carefully to all the sophisms so as to answer them effectually when my time came.

It so happened that the oldest boy, who spoke just before me, was a son of an old pupil and friend. My astonishment may be imagined when this boy took up every sophism in the order in which it had been uttered and demolished each with such a sledge-hammer blow that nothing was left for me to do. I was obliged to confess that Al had "stolen all my thunder." It was certainly one of the most striking instances of mature action in an immature mind that I had ever witnessed.

It is a pity that some of our college authorities have not the nerve to try some mode of self-government with their students. The desire to cut loose from all authority is a perfectly natural human feeling, through which teachers it seems horrible. Even children at a certain age try to free themselves from leading-strings, and those who resist such impulses are simply resisting healthy growth.

Up to a certain age a boy clings to his mother. Gradually he goes more with his father. Then, when he gets larger, he prefers to go off by himself, to show that he is big enough and old enough to care of himself. If, when first the father began to avoid my society I was quite hurt until sober second thought showed me that it was simply the regular outgrowth of that manly independence that we all admire.

Some years ago I read that among the Circassians when a boy reaches the age of 16 his father seeks out a man in some neighboring village who is willing to take charge of him for two years. When such a man is found a feast is prepared, and the boy is solemnly entrusted to him, well provided with horse and weapons. His guardian teaches him to be a daring rider and a good shot, and in all things to bear himself like a man. At the end of two years he brings him back again to his village, where he takes his place thenceforth as a man.

Our boys go forth at such an age to college. They find themselves under authority which is not always judicious and which this natural desire for independence tempts them to resist. They take refuge from all authority in secret societies, where they govern themselves entirely, and where they are beyond all control. They thus teach each other what the college authorities ought to teach them, and that is, the great and noble art of self-government. What reading of political economy, or expounding of constitutions, or learned lectures from dogmatic professors, can possibly teach them as much as their own constitutions, their own laws, their own judgments of disputed cases, their own rightings of wrongs, their own punishments, which prepare them for the study of all punishments and crimes, and generally of all jurisdiction? If boys can be taught this, certainly young men can also.

Nor are precedents wanting; if argument is insufficient. After reasoning out and practising this system of self-government in my school for some years, I met with a most interesting account of similar methods employed in a school near Manchester, in England, kept by two brothers named Hill, one of whom—Rowland Hill—afterward became celebrated as either the originator or the warmest advocate of cheap postage.

These gentlemen not only entrusted the entire government of their school to their boys, but had nerve enough to take up the subject of fighting, and actually succeedd in reducing it to a matter of simply by authority.

When any contest began it was the duty of the oldest boy present, under a heavy penalty, to convey immediate information

*Mr. MacMullen betrays entire ignorance of the system of self-government that has long been in practice at the University of Virginia, the students' self-government at Illinois State University, and other examples that might be named.—EDITOR WEEKLY.*
to the magistrate, so that the parties might be separated. If they insisted upon fighting, each had to give six hours' notice, and a six in school marks was required in advance. During this interval it was the duty of the magistrate to attempt a reconciliation.

One can readily understand the cooling influence of having to pay out even school money, as well as of the lapse of time, and the soothing arguments of the calm young magistrate.

If the combat did take place no one was allowed to be present before the magistrate. There was no one to say, 'Hit him again, Billy,' or 'give it to him, Dick,' and a very dreading thought must have been hit at one another in silence in the presence of a solitary, disapproving individual, for any other student caught peeping was heavily fined.

The result of this experiment was that during the first few months the number of battles was not materially checked, four of them occurring in two months, or one each fortnight; but in the next three years and ten months only two contests took place in a school containing 120 boys.

The following case arose in connection: A day scholar, whose father's grounds adjoined the school, was discovered by the magistrate to have witnessed a battle from a tree which he had climbed for that purpose. The magistrate fined him. He appealed, and the question of his liability was again argued at length. The ground which the appellant took was that no day scholar could be amenable to the laws of the school except during the hours of business or while on the school grounds, whereas, the alleged offense was committed out of school hours and on the school campus. Public opinion ran in his favor. The plea that he was on his father's land seemed to have great weight with his school-fellows. To fine a boy in such circumstances appeared to them like an attempt to invade the parental sanctity, and the motion for quashing the conviction seemed likely to prevail.

On the other hand, it was argued that it is desirable that the laws should be obeyed at all times and in all places. As these laws had the happiness of the scholars in view, any breach of them must be in some degree destructive of the general good. To allow impunity to certain individuals would be unjust to others and injurious to themselves. What was wrong in the school-room or on the play-ground at 11 in the morning, could not be right in the fields at 6 in the afternoon, and whether or not a magistrate has the power to fine a person for a breach of the laws when he is at a distance from the school, it is certainly desirable that the laws should be obeyed at all times and in all places. The principle was admitted. Attention was then directed to the fact that in no single instance had the laws made any difference to the day-boys. They universally began by saying that, if "any boy," or "any pupil," or "any day-boy," shall commit such offense, etc., and not "any boarder" or "any day-boy." This also was admitted. The question, therefore, was very much narrowed, and, as to the power of the magistrate, it was argued that he had the actual power, for he had already done so, and the question was now whether the general welfare of the school would not be injured by taking away this power. This view finally prevailed, and the action of the magistrate was sanctioned.

More interesting still, perhaps, was the experiment made by Von Fellenberg, at Hofwyl, of which such an interesting personal fortunate has been given by our adopted citizen, Robert Dale Owen, who was for some time our Ambassador at Naples. In this case, the ages of the students ranged from 15 to 20, thus equaling the ages of our college students. The entire government of the school was in their hands, the head of the institution having a veto power, which was, however, never exercised, simply because there was no occasion for it. In this place, young of various nations and of various ranks met on the common level of culture and republic. They gave ready and implicit obedience to their own laws. The utmost freedom insured the utmost order.

Mr. Owen says that on one occasion a fellow-student had sought, with himself, an explanation of a difficult point in mathematics from the professor of that branch. The worthy man did not succeed in making it clear to them even after a second effort. As they retired, Owen said to his companion, De Sausure, grandson of the eminent Swiss naturalist of that name: "You were not satisfied with that explanation.

""Of course not," was the reply, "but you have had me, before the class, shame the good man who takes so much pains with us, and is usually so clear-headed? We must work it out for ourselves to-night."

Any institution or any system that can produce such a feeling as this in its pupils leaves little to be desired. Two young German princes, already out at night to enjoy the delights of a beer saloon. They were discovered, and notified to appear before the court. Having plenty of money, they stole away and went home. They were let severely alone, and left to tell their own story. The result was that in a few weeks their father brought back the runaways and requested as a favor that they should be taken back. They were received quietly by all parties, no further notice being taken of their "escaped," than to consider as vacated a certain small office held by one of them. They remained for several years quiet and law-abiding citizens of this republic, but neither ever rose again to any office.

On one occasion some courtiers came to see a young prince, and, donning their plumed hats, stood bowing to the young man, who kept on his little cap. Some of his fellow-students immediately called out to him to take off his cap, which he was forced to do, much to the astonishment of the courtiers.

The school was, in fact, too republican to last in the midst of monarchical, and a formal communication was received from the Austrian government stating that thereafter no Austrian subject would be allowed to study at that school."

One of these occurred in three years. One of these was begun by a youth fresh from an English school. The other occurred one evening, in a private room, between a Prussian Count and a sturdy Swiss. When the dispute grew warm their younger companions pounced upon the combatants, carried them off, each to his own room, and there with a hearty laugh set them down to cool. It was so good-humoredly done that they could not help joining in the merriment.

Mr. Owen, in speaking of the general management of the institution, says:

"It would usually be pronounced a dangerous experiment; the more dangerous because of the heterogeneous materials that had come together at Hofwyl from half the nations of the world—Swis, Germans, Russians, Prussians, French, Dutch, Italians, Greeks, English and others—some have been nursed and petted in luxury, others sent hither, probably, because their parents could not manage them at home. The difficulties were the more extraordinary, as the parents, who paid two-thirds of the fees of their children, were expected to pay all the expenses of their children, and this was done."

The nobler elements of our nature had been appealed to, and the response was prompt and ardent.

Another experiment in the same direction was made seven years ago at our own doors, and with some of the worst trait in our community.

The late Mr. Joseph Curtis, whom some of my readers may recall as one of the earliest, foremost and firmest friends of our public schools, and who did so much good work in many ways, especially for the young, accepted the position of Superintendent of the House of Refuge, of which he seems to have been the founder, with the belief that he could accomplish more than had been done before. He found the boys rough and coarse, accustomed to harsh treatment, closely watched, making incessant efforts to escape, and using the harshest discipline. He succeeded in producing so complete a reform that he did away with all watchmen, being able to trust the entire guardianship to the older and better boys, who took charge of the new-comers and of all that needed watching, and did their duty as faithfully as the best men had done it.

He finally so trained them in self-government as to leave all
cases that came up to a jury of the boys themselves, each case being carefully argued and examined into, and the boys themselves settling the amount of punishment. He succeeded in proving himself a strong feeling among these abandoned boys that, as he told me himself in an interesting conversation had with him a few years before his death, he was able to venture successfully upon the hazardous experiment of vicarious punishment.

Thus, some new-comer, when condemned to bread and water at any public or private trial, was astonished at finding the usual vandals set against him, but very much annoyed at the various expressions of disgust from those around him, who directed his attention to Mr. Curtis quietly munching a piece of bread at a side-table. He would thus be driven by sheer force of public opinion to get up and beg Mr. Curtis to let him take his place, a favor which was only accorded after a sufficient expression of regret and a promise of future amendment.

The Governing Committee of the House of Refuge, however, had the same feeling as the Austrian government, and insisted that Mr. Curtis must flog the boys and keep them shut up. They finally drove him to resign, and no one since has had the hardihood to attempt any practical teaching of self-government to these unfortunate citizens, but poor benighted boys.

Mr. Curtis showed conclusively that this great lesson could be taught to young convicts, and with the happiest results. Can there be any reasonable doubt that it could be taught in all our schools if we so chose?

If must be understood, however, that this is no easy task. It requires the greatest patience, firmness, gentleness, and tact. This is a matter that needs not only the glove of velvet and the hand of steel, but a careful, thoughtful, observant feeling of one's way. There is an amusing story (I do not know how true) of a teacher who began too abruptly the practice of vicarious punishment, and who received such a tremendous castigation from the stout and ill-chosen subject of his experiment, that he was obliged to leave that district, which had ceased to be to him a "sphere of usefulness."

If vicarious punishment ought ever to be attempted in a school which is intended to fit boys for real life, it certainly should not be attempted until such a moral atmosphere has been slowly created that any suffering on the part of the teacher is felt as suffering by all his scholars, which must be considered an extremely unusual condition.

A brother teacher, to whom, some years ago, I recommended the teaching of self-government in his school, chose to try it just before Christmas, and requested his scholars to choose for themselves the boy who should receive the highest price, which was a valuable book. The boys picked out the lowest boy in the class, who became angry, rated them soundly, and refused to give that boy the book. Now, there is nothing boys like so much as fun, and in any ordinary school to make any teacher "hopping mad," gives them intense delight. In this case, had the teacher "accepted the situation," he had presented the boy with the book, delivering at the same time a speech of mock congratulation to the recipient and to his fellows, who had been able to perceive so many virtues, where others could see none, he would have "turned the tables" upon them; he would have shown himself capable of taking a joke, and they would have said: "Well, after all, he's a good fellow, and has some fun in him."

This same element of fun is a very important one in teaching. A teacher can often turn away a lot of trouble by a joke, and a very small witicism will sometimes do away with a very great difficulty.

If this teacher had said in addition, "Now, gentlemen, since you have shown to all so clearly the sort of standard you propose to follow in life, I propose to give another prize of equal value to the one who seems to me to deserve it most," he would have kept his promise, which is a very important matter with boys, and have made the most rewarding true merit. He should not have begun this system without due thought and preparation, arranging for each step in advance and not allowing himself to be Talked or overthrown by his first difficulty. In fact, the frank confession of defeat often disarms one's adversaries. Had he said, "Well, gentlemen, I must confess myself defeated on this occasion, I must try to do better next time," he would have given them a good lesson in the conduct of affairs by his own example, and made his present defeat a stepping-stone to future success.

That this thing can be done is certain from what has been set forth in these articles, and it is well worth all the pains and trouble that may be required to ensure success, for surely no man can better illustrate the "Patriotism of Peace" than by training citizens to future usefulness.

**MATHEMATICAL DEPARTMENT.**

**TRIGONOMETRY.**

All works on trigonometry give tables of natural sines, tangents, etc. It may occur to the student in trigonometry to ask what useful purpose is served by such tables when tables of the logarithms of the circular functions are given also. An example or two will show that the natural sines, etc., are convenient at times. Suppose we wish to find the area of a quadrilateral when the diagonals are known, and also the angle at the intersection of the diagonals. The rule is—multiply half the product of the diagonals by the natural sine of the angle. Let the diagonals of a quadrilateral be 674 and 398 ft. and the acute angle 67° 30'. The natural sine of this angle is 0.92388, which multiplied by 674 × 398 = 1239163288.

Another example: railroad engineers use a formula for finding the middle ordinate of a curve, viz.: $m = \frac{50}{9} \tan \frac{\varphi}{2}$. To find $m$, divide the natural tangent of $\frac{\varphi}{2}$ by 2, and move the decimal point two places to the right.

It is obvious that in examples like these the natural sines and tangents may be used with advantage.

**APPROXIMATIONS.**

Some quantities in mathematics can be determined only approximately, like the value of $\pi$, which can be found however to any degree of nearness required, while others which can be ascertained exactly are sometimes, for convenience, found only approximately. In some problems in engineering it is assumed that angles inscribed in a circle are proportional to the chords of the arcs on which they stand. The error arising from this supposition may often be too small to be regarded. Again, if we extend a tangent from one extremity of an arc until a perpendicular let fall from the other extremity of the tangent meets the other extremity of the arc, the tangent so drawn may be considered equal to the chord of the arc, except in curves of small radius, and no great error will result.

The true length of such a tangent can be found if required. The $n^{th}$ root of an imperfect $n^{th}$ power cannot of course be found exactly, but it can be found to any desired degree of nearness. Some approximations, then, are by necessity, while others are such for convenience.

An even root of a negative cannot be expressed approximately or otherwise but such a root may be assumed to exist, and it can be indicated and used with as much propriety as any other quantity. Thus it appears that there is some elasticity in mathematics as well as in other subjects.

He that studies books alone will know how things ought to be, and he that studies men will know how things are.
Mr. T. M. Cook, one of the highest authorities on statistical matters, says the United States is the third among the nations of the world in regard to national wealth. According to this authority, the United Kingdom of Great Britain and Ireland stands first, with a capital valued at $14,400,000,000; France, next, with $25,700,000,000. Then follows the United States, with $32,000,000,000; Germany, with $25,000,000,000; Russia, with $15,500,000,000, and the Low Countries, with $11,150,000,000. The Census Bureau of the United States estimates its realized wealth at several millions more than the above amount, but its estimate is based on Mr. Cook's showing, while this country stands third in total capital, it equals the best in the per capita valuation of wealth; our annual average being $125 per inhabitant; that of the United Kingdom, the same; that of the Low Countries, $130; that of France, $225; that of the British Colonies, $90; that of Germany and the Scandinavian countries, $85. The ratio of accumulation in Germany is $200,000,000 per annum; in the United Kingdom it is $325,000,000; in France it is $375,000,000, and in the United States, $385,000,000, which shows that we shall soon distance the world in the race for wealth.

An English writer, of high standing in economic matters, says that the increase of wealth in the United States since 1850 has been "sufficient to purchase the entire German empire, with its farms, cities, banks, shipping, factories, etc." The annual accumulation has been $325,000,000, and therefore each decade adds more wealth to the United States than the capital value of Italy or Spain.

The Italian exploring party which started from Assab Bay, Abyssinia, consisting of two native officers, ten sailors, and four soldiers, has been massacred in the interior. The particulars are not known. Following so soon after the massacre of the French exploring party under Col. Flatters, this is calculated to make African exploration rate as "extra hazardous." The U.S. commissioners, accompanied by Sapanavaro, Colomar, and other chiefs, are on the march to Grand River to locate a new reservation.

Anaying D. Roberson, a nephew of the ex-Secretary of the Navy, who was killed at Hunnewell, Kan., by a stroke of lightning. His clothing was stripped from his body, his watch-chain melted, and his horse killed at his side. A man named Elenefal was struck lifeless while standing under a tree near Fort Atkinson, Wis., and Miss Hutchinson and Miss Cox were similarly dispatched at Hamilton, Tex.

Terrible storms have destroyed the entire harvest in the district of Temesvar, south Hungary. Sixty Cherokee noblemen and gentlemen of rank, have visited Japan to inform themselves thoroughly as to the results for good or ill to that country, from the opening of Japan to foreign commerce. This is preparatory to the settlement of the policy of Korea in the future, which is important to throw itself open to commerce, but has hitherto obstinately refused to do so.

The Atlantic cable is burdened with stories of uprisings in Ireland, and there is no less a matter of truth at the bottom of these statements, yet the London Times draws a different picture from the "commercial treaty," which has lapsed, and those who have lately traversed the island, and earnestly protests that there has been no serious rising, and the "Thunderer" concludes that there is a good deal of exaggeration in the reports of violence and threatened revolution.

An American horse, Iroquois, won the Derby a few days ago, and now it seems that Fushali, another American horse, has carried off the grand prize, 1,000,000 francs, in the Paris races. Among those who witnessed the sport were President Grevy, ex-Queen Isabella, Rochefort, and Marshal MacMahon.

The eclipse of the moon, last Saturday night, was not "postponed on account of the weather." Neither did the weather postpone, and it almost entirely eclipsed the eclipse, in and about Chicago.

The Khedive of Egypt is to build in the city of Cairo, at his own expense, a school for the instruction of girls of the wealthy classes.

An opportunity is offered for inventors and scientists of all nations to distinguish themselves by competing for the great prize, offered by the Royal Academy of Sciences of Turin. A prize will be given to the scientific author of the most useful work, whatever be his nationality, who during the years 1879-1882, "according to the judgment of the Royal Academy of Sciences of Turin, shall have made the most important and useful discovery, or published the most valuable work on physical and experimental science, natural history, medicine, botany, zoology, mathematics, or any other science, as well as geology, natural history, geography, and statistics." The term will be closed at the end of December, 1882. The value of the prize amounts to 12,000 lire. The prize will in no case be given to any of the national members of the Academy of Turin, resident or non-resident.

The University—Prof. Moses-Colyer's resignation of the chair of English Literature has been accepted, and Prof. J. N. Drumon has been appointed his successor. Prof. B. C. Burd, class 76, is to succeed at the assistant professorship of English Literature and Rhetoric. Victor C. Vaughan, at the same meeting of the regents, was made assistant professor in the physiologic laboratory at a salary of $6,000. He succeeds Dr. Rose, whose resignation took place Oct. 1. Byron W. Cheever was elected acting professor of metallurgy at a salary of $1,000 per year. It is proposed to establish a school of political economy, international law, etc. It is probable that at the regular June meeting of the regents, Prof. Morris, who for the past two years has been connected with the John Hopkins University, will be elected as professor of ethics, history, and such other courses as may be assigned, with his salary raised to $2,000 per annum.

The principal and committee, to devise means for increasing the revenue of the University, especially from the non-residents of the State, are working. The permanent chair of Arabic has been authorized for the examination of candidates for admission to the University at San Francisco, St. Louis, Chicago, Cincinnati, and such points of the East as they may deem desirable.

Prof. W. F. Owen has been re-elected Superintendent of the Lapier schools.

The School Board at Grand Ledge has forbidden the use of the Bible in the schools.

T. C. Gomer, of Big Rapids, has accepted the position of superintendent of the Ferlor public schools.

At Peoria, the regular June meeting of the regents, Prof. N. H. W. Walbridge will remain at Newaygo another year at an increased salary.

Salaries are looking upward in the State in the case of teachers of all nations to dis-
Chas. P. Fish, of Chicopee, Mass., is to succeed Mr. Roberts as principal of the high-school, and J.ames Montgomery succeeds A. W. Brayton as teacher of natural science. The high-school is to be run on a new and improved plan this year, and half-day attendance is allowed. The school is the third year of the seven years administration of the retiring principal, Prof. J. B. Roberts.

Number of new students, 330; total number of students, 1,289; number of graduates, 44

Pennsylvania has been decided, lately, in a Pennsylvania court: that the law prohibiting the maintenance of separate schools for white and colored children is unconstitutional.

The Boston Natural History Society opens a seaside laboratory at Alinqua, Miss. The summer session of the school begins September 24. Its object is to provide opportunities for the study and observation of the development, anatomy, and habits of the common marine animals, under the direction of skilled naturalists.

In Berlin, Mass., there are 75,000 French Canadians among the pupils. They have just petitioned the town council to permit them to have a French school, as they do not like to have their children lose the knowledge of their mother tongue. The school has a list of thirty families to receive the names of all their families, to restore such as have become Americanized in spelling or pronunciation.

Am. Exchange says: Cornell University, Ithaca, N. Y., has been running down greatly of late years. Ten years ago, when only males were admitted, there were 500 students; last year there were but 399 of both sexes. Of the staff of eminent teachers which it had a decade since, but one, Prof. Goldsmith, now remains. One great cause of this decadence is said to be the fact that the greater part of the college funds has been expended on fine buildings, and comparatively little on salaries.

The Holyoke Mass. has 75,000 French Canadians among the pupils. They have just petitioned the town council to permit them to have a French school, as they do not like to have their children lose the knowledge of their mother tongue. They have appointed a committee to examine the names of all their families, to restore such as have become Americanized in spelling or pronunciation.

In Hungary, the Jews form less than 5 per cent. of the population, but they furnish 15 per cent. of the university students. It was a very forcible saying of Edward G. Burt, that "The world is the smaller need be the prison wall." The Chinese government has established a school of engineering at Han, and on Sun; a school of commerce and of arts and sciences in the city of Alinqua, Miss.

The most successful last year, at the Industrial College in Maine was very successful last year, and it is thought it will be even more so during this year. Last year it not only paid its own expenses, but earned over $200 surplus.

The Iron City College, of Pittsburgh, Pa., has no vacations. The school is always in session, and scholars are taken any time of the year.

Philadelphia is soon to have a technical school of mechanics to be under the care of a corps of experienced workmen as instructors. The course of study is to be of thirty-two weeks duration, including lecture and study hours, divided into terms of ten weeks each, to cost the sum of $150. This also includes the use of materials and tools.

The Indian school in Carlisle, Pa., has proved quite a success. The schools of the wild tribes of the plains become speedily subdued when put upon a milk diet, and judiciously tutored in the catechism.

A training school for young ladies, where they may be taught the art of good farming, is to be established at Hartford, Ct. A fund was devised for the purpose twenty-four years ago by David Waterman, with the condition that it must not be used until it should amount to $100,000. This amount is now credited to the fund.

The Anniversary of the American Education Society, of Boston, was held in the Tremont Temple, Wednesday afternoon. At 2:30 a.m., a statement of the condition of the society by Rev. J. N. Torrey. In the college department there has been unprecedented prosperity; one legacy from Mrs. Stone, of Malden, yielding $165,000. The year was begun with a deficit of $1,350, and ended with a surplus of $35,250, the income of both departments was $56,165,92; disbursements, 254,75. Two hundred and sixteen students have been added with $18,980. The scholarship fund now amounts to $71,000, and the total fund to $350,000.

In the Boston Theological school, all the members of the graduating class are anti-tobacco men.

It has been decided, lately, in a Pennsylvania court, that the law passed in that State in 1854, requiring the maintenance of separate schools for white and colored children, is unconstitutional.

The Boston Society of Natural History opens a seaside laboratory at Alinqua, Miss., this summer. Its object is to provide opportunities for the study and observation of the development, anatomy, and habits of the common marine animals, under the direction of skilled naturalists.

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THE SCHOOL ROOM.

TEACH THE CHILDREN TO SIT UP.

Recently at a meeting of the Brooklyn Teachers' Association, William Blakist, the author of "How to Get Strong and How to Stay So," gave some very pointed remarks on the subject of "Physical Education." He said, "I want you to see if in an informal talk we can hit upon some way in which we can bring the physical education of children down to a practical basis. Our children who are healthy and buxom when they begin school work, come out pale, sickly, and with round shoulders. If you require the children under you to sit far back on a chair and to hold their chins up you will cure them of being round-shouldered, and the lungs and other vital organs will be free and healthy play. Another simple plan is to have the children sit over backwards until they can see the ceiling. This exercise for a few minutes a day will work a wonderful transformation. If a well qualified teacher could be employed to superintend the physical development of the children the best results would be seen."

CULTIVATING THE CONSCIENCE.

**The School Room.**

Every teacher who justly estimates the responsibilities of his profession, and his duty to the young natures entrusted to his guiding hand, should endeavor to cultivate the conscience of his pupils. We assume, by laying this down as unquestioned, that the fact that the teacher himself is a man of principle, is also beyond question. No man, who refuses to guide his action according to the laws of moral principle, has a right to be a teacher.

Every teacher, then, acknowledging the guidance of an unerring conscience should so influence and instruct his pupils that they will follow the same guide. To do this, sermons and homilies are not needed; the fact is, school-boys will pay little attention to them, but the teacher must have sufficient knowledge of human nature to be able to use other methods successfully.

Before all things he must place the mighty power of example. He must show the pupils that his actions are governed by the strict law of right. In laying down rules for the school, he must take pains to show that these rules are built on the foundation principle of justice to all. When trouble arises between pupils, when any one of the boys refuses to submit patiently to any regulation of the school, the appeal should always be made to the refractory one's sense of right before any threat of punishment is offered.

In nine cases out of ten, when the appeal is made to the sense of right and justice, in the minds of the pupils themselves, no punishment will be found necessary. The moral perceptions of children are susceptible of careful cultivation. The oftener the conscience is called into exercise, the more readily and accurately does it judge. The oftener that the teacher calls it into action, the more ready is it to act in governing the everyday acts and thoughts of the children.

And the good which is accomplished by such wise and careful methods of developing the conscience, who can measure it? For it does not end with the better discipline of the school, with the smoothing of the school work so that it moves on with no hitch or trouble; but it reaches out through the lives of the pupils, on into manhood and womanhood, eye, into eternity itself, blessing and enabling them and fashioning them more, newly into the glorious image of the Creator.

NATURAL HISTORY.

NATURAL HISTORY FOR COMMON SCHOOLS.

**Some Insect-eating Animals.**

The fourth order of the Mammalia is known by the name of Insectivora, that is, the insect-eaters. As far as the name is concerned, we will give a few words of description.

The animals of this order are for the most part nocturnal animals, as the bats are, that is, they sleep during the daytime, and in the night they search for their prey. They do not seek for it in the air—naturally, being without wings—but upon or under the ground. For nearly all of these animals are burrowers, that is, they live in holes in which they live. Like all burrowing animals they have a true clavicle or collar bone, which is given them for the purpose of strengthening their forelegs, or hands, in the process of digging. The teeth in this order are similar to those of the Chem, roptera, the front molars being quite sharp, and the others being supplied with small raised points, for the purpose of crushing the hard outer skin of insects. The order further resembles that of bats in its custom of spending the winter, or after the severe climates, in a torpid state.

There are four families in this order: the Euphrax, the Hinfenidae, and the Tupaiatidtce. The Euphrax includes the tribe known by the common name of moles. These are small animals, living in underground burrows, which they dig for themselves. They are provided for this purpose with a long and pointed snout, which they use to bore through the earth, a long flat front paw, having, flat nails that are also very strong and sharp. The flat surface, or palm, of this paw or hand, is always either turned outward or backward, and the animal acts as a spade, with which it drags the earth behind it as it goes. The arm supporting this paw is short, and the shoulder-blade and collar-bone are very strong. The front part of the body of this animal, in fact, seems to have all of its muscular power. Its hind legs are short and less powerful than the forefeet; and it moves slowly and awkwardly, but in its burrow it uses these legs to push itself forward.

The mole has very soft, silky hair, which is so thick and short that it will lie smooth in any direction, and repels rather than holds dust. It has no external ear, but seems to have, nevertheless, a fairly acute sense of hearing. Its sight is poor, the eyes being very small, and so effectually concealed, in fact, that for a long time it was supposed to be totally blind. The sense of smell, on the other hand, is very highly developed, and the animal probably depends more on this sense for its knowledge and guide to its actions than upon all the others. The mole of the mole is principally earth-worms and beetles, but it also feeds to some degree on vegetable substance, and, impelled by hunger, will attack mice, frogs, or even small birds, if it can get them.

The Tupaiatidtce is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout. The common mole, the arm, is a family of few species, but very numerous. All these animals are small, much resembling mice, but with a much longer and more pointed snout.
GOOD READING.

BOOKS FOR YOUR PEOPLE TO READ.

"Can't you give me a list of books for my boy to read?" wrote a gentleman to the editor. "I don't want him to read 'Oliver Optic.' I want him to read books that will build him up, educate him, make a man of him. He is in his 14th year, and is eager to read everything." It was not an unreasonable request, and the list has been prepared with some care in response to this and similar appeals. What boys and girls are to read is a matter of the greatest importance. Reading, rightly carried on, is education. Young persons from 10 to 14 are in most receptive periods of their lives. The opening of mind and heart, which makes one susceptible to temptation in society, makes one, perhaps, far more susceptible when the companion is a silent, but interesting and influential book. The good book is quite likely to give a boy or girl the first step in life, or to prove the turning point in character, while the taste for flabby or exciting reading, if duly developed, may lead to everything that is bad. The Pomeroy boy admitted that he had been fed on dime novels, and many a youth is to be found in all parts of the country with a novel in his hand and for whose future you could speak nothing good. This is a reading age, and young people are our chief readers. The point of anxiety is their choice of books. The list here given can be education during late years. There is now a recommended list. White, "Rifle," from his 14th book, admitted after the palace of the Grand Duke it was not a book usually for a girl to read. "..."...

RIFLE, "All the world around," is a book for boys, and girls. "Gulliver's Travels" and "Dick Whittington" are excellent. The Pomeroy boy admitted it was not to be closed altogether; as soon as those untrained teachers are beginning to become scarce.

"..."

GOOD EDUCATIONAL NOTES.

The people of Northwestern India have made astonishing progress in free education during late years. There is now a government school in nearly every village, wherein the rudiments of an intelligent education are taught to children of all classes.

In Austria, the cause of education is greatly neglected. So poorly are teachers paid that very few persons seek the profession as a means of livelihood. There are now in that country 6,579 schools that have no permanent teachers. The books are intended for individuals who have received no suitable training; and 1,566 schools had to be closed altogether, as even those untrained teachers are beginning to become scarce.

The new compulsory educational law in France provides, among other things, for instruction in the duties of citizenship and the constitution of the country, elementary points of political economy, and law and gymnastics.

In the province of Antwerp they have made astonishing progress during the past year. There is now a government school in nearly every village, wherein the rudiments of an intelligent education are taught.

"..."

F UNNYGRAPHS.

The following good things are from the London Teacher:

MORE.—Teacher.—Why did Moses' mother hide him among the reeds? Pupil.—Because she thought it was a good enough reason.

A SUFFICIENT REASON.—A master was explaining that the land of the world is not continuous. He asked a boy, "Now, Jack, could your father walk round the world?" Boy.—"No, sir," said the boy. "And why?" Because his father is a cobbler.

THE DESCENDANTS OF HAM.—The question was, "What people are considered to be descended from Ham?" "Niggers," answered one boy about the middle of the class. "Right," said the master, "but the correct word is 'Kneggerbockers.'"

A DANGEROUS ILLUSTRATION.—Lady Visitor (to Scripture Class).—With what weapon did Samson stay his enemies? After a period of unbroken silence:

Fair Questioner (touching her blooming cheek).—What's this? Chairman.—The jet bone of a mass, mam.

COMPARISONS ARE ODIOUS.—The correspondent who sends the following story for publication may be assured of our actual acquaintance:

Teacher.—Compare the adjective ill. Scholar.—(after a little consideration).—Will, worse, dead!

SCRIPTURE EXAMINATION.—Question.—What do you know of Jonah? Answer.—I know that Jonah hid himself for three days in the belly of a whale; at the end of this time he was hungry, and he prayed and said, "Almost thou persuadest me to be a Christian!"

PHONETIC JOKELORS.

There was a brave soldier, a colonel, Whose voice in a very mellow tone, But he never once thought, As a Christian man ought, He imperilled his own life colonel.

—Steamville Herald.

"..."

This colonel so fair, Had learned to see swear, And saddened his mother colonel.

—Rockford Courier.

GENERAL EDUCATIONAL NOTES.

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"..."
A NEW BOOK.

HOUSTON'S INTERMEDIATE LESSONS IN NATURAL PHILOSOPHY.

This is intended as an intermediate book and is designed for the use of pupils who have finished such books as Houston's "Easy Lessons in Natural Philosophy," Martindale's "First Lessons in Natural Philosophy," Swift's "First Lessons in Natural Philosophy," Holt's "First Lessons in Physics," Parker's "Natural Philosophy," (part I), Peterson's "Physics," and other similar books, but who are not sufficiently advanced to take up the larger text-books. Its publication was determined upon at the request of teachers in many parts of the country, who have felt the need of a book of this grade to meet the wants of their own classes. So far as we know, there is nothing in the market which fills the want here indicated. It is in every sense of the word a Model Text-Book. Specimen copy for examination will be sent on receipt of 50 cents.

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The Model Roll-Book No. 1 is so arranged as to show at a glance the name of each pupil for three months, allowing five weeks to each month, with space for weekly, monthly and quarterly summaries, and a blank space for remarks at the end of the quarter.

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By A. C. WEBB.


We believe this to be one of the most valuable school books for young children that has ever been published. Specimen of examination will be sent to teachers on receipt of 25 cents.

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A text-book that will gladden the hearts of both teachers and pupils. The realization of what a text-book on this subject should be. Can be mastered in less time than any other text-book on the subject. Price 75 cents.

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No. 4. On Discipline. 50 cents.
No. 5. On Class Teaching. 50 cents.

These books are worthy of the attention of teachers and all others interested in the education of the young. They are sent on receipt of price given above.

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