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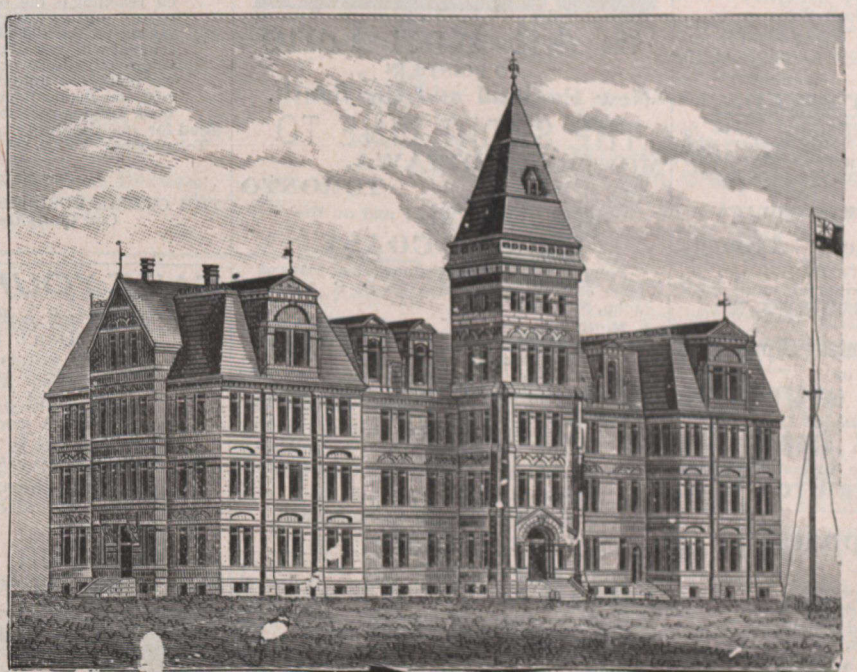

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G. U. HAY, Editor for New Brunswick.

A. McKAY, Editor for Nova Scotia

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St. John, N. B.

CONTENTS:

A PORTION of the April REVIEW will be devoted to suggestions and helps for Arbor Day.

OUR advertising columns are of more than ordinary interest this month.

THE school that is provided with Webster's International Dictionary has already a very substantial equipment.

FOUR additional pages are added to this month's REVIEW to make room for the announcement found elsewhere of a series of prizes offered by the Natural History Society of New Brunswick. A generous friend of the Society has placed in its hands the sum of $150 to be expended in prizes for the best collections of insects and plants, injurious and beneficial to agricultural interests in the province. It is to be hoped that many bright students will see the advantage of availing themselves of the offers; and teachers can do a great amount of good by circulating as widely as possible this information and encouraging intelligent students to undertake such work.

THE government of New Brunswick has decided to supply each school in the province with a copy of The Life and Times of Sir Leonard Tilley, by James Hannay. Such a life, with the lessons of patriotism that it teaches, should be an example to every youth in the province. We hope it will be the central point of interest in each library, and that where none exists, it will form the nucleus of one.

WE are indebted to the following gentlemen for recent educational reports which will receive fuller notice in our next number: Supt. J. R. Inch, New Brunswick; Hon. W. W. Stetson, Maine; Inspector D. Wilson, British Columbia; G. W. Parmlee, Esq., Quebec; Hon. G. W. Ross, Ontario; Supt. D. J. Goggin, North West Territories.

THE issue of a series of Leaflets by the REVIEW on Canadian History has been thought of for some time. The idea was suggested by the brief and unsatisfactory way in which events of surpassing interest in our history have to be condensed and shorn of that detail and freshness, which is their chief value to the youthful reader, in preparing a text-book of a certain number of pages. The names of those who are contributing to the series are a guarantee that the leaflets will be of the greatest value to students of Canadian history.

Apropos of the recent criticisms in the provincial legislature, it may be said that the good sense of the people of New Brunswick will lead them to resist any attempt to cripple the cause of higher education. If it were seriously contemplated—which it is not—to do away with the University and establish instead an agricultural college, such a step would be an acknowledgement that we are incapable of appreciating the real function of a university. Granting that an agricultural college is needed, it does not follow that the arch of our educational system is to be pulled down to supply the material.

TEACHERS will be interested in Miss Chipman's admirable plan of teaching botany, which is found in this number.

Conveying Pupils To and From School.

It is satisfactory to note that a bill has been introduced into the legislature of New Brunswick to permit districts to undertake to provide for the conveyance of pupils to and from school. The Chief Superintendent, in his report, refers to the advantages of this system, and Inspector Carter goes into the matter at some length in his. The trend of population is toward cities, towns and villages, thus weakening the country districts, not only in pupils, but in resources; and while it may not have been the intention of governing bodies, it is nevertheless true that state aid has, by the force of these circumstances, been withdrawn from the purely rural district in order to add to the resources of the centres of population, where it may be needed, but not to the same extent as in the more sparsely populated districts.

Grammar schools have always, and are still, located in towns or villages, but the disposition is to diminish the number and establish them where the population is greater. By recent regulation, too, the superior schools will no longer be found in districts where a graded school cannot be maintained. In former times, when a superior school was allowed each parish, there were vigorous country schools in various parts of each county, and the competition was keen for the grant. Quality of instruction was the incentive for work rather than quantity of pupils. It is difficult for those unacquainted with schools to estimate the amount of excellent work accomplished in one of these rural superior schools, having only one teacher, perhaps, or a teacher and an assistant. Pupils of both sexes and of more mature ages than those to be found in attendance at the graded schools, there, in the quiet country school, accomplish an amount of work that would astonish the town pupil, and it is from schools such as these that many of our most prominent men have been turned out.

It cannot be doubted but that the educational average is at present far higher in the country schools than ever before, but it also cannot be denied that the tendency is to disestablish the good old-fashioned advanced country schools, and all will admit that this is most undesirable. If it be possible for three or four country districts to unite their forces and convey pupils from a distance of from two to five miles, it will give the rural districts a renewed lease of life without taxing their resources further than at present. It was hoped a year or two ago that by an increase of the county fund that the more populous districts would contribute more toward the support of the rural districts, but this plan, for some reason, has not been carried into execution. Any plan that will prevent the passing of the advanced country school will be greeted with satisfaction by all interested in education.

Gleanings from N. B. School Report.

While there was a slight decrease in the enrolment of pupils in New Brunswick for the year, there was an increase in the number of schools. This is a pretty fair argument for a compulsory clause in the law.

There were during the year 230 schools in operation, with an average attendance of less than ten pupils. This is a good argument for the "Concord system."

In the enrolment of pupils St John comes first of the cities and towns of the province, Moncton second, Fredericton third, and Chatham fourth.

In average attendance Milltown still leads for the year. Woodstock leads the province for the December term, closely followed by Milltown.

There were sixty-eight students in attendance at the university during the year.

Grammar and first class teachers have increased 7 per cent, second class teachers have decreased 1 per cent, and third class teachers have decreased 6 per cent. There is a hint in this for teachers holding the lower classes.

The superintendent intimates his intention of recommending that all third class licenses granted prior to December 31st, 1893, shall be cancelled on the first day of July, 1899.

Of 1,890 schools reported on by inspectors, 878 are ranked "excellent," or "good," 984 as "fair," and 28 "poor." The average salaries of grammar and superior school teachers show an increase also—those of first class females,—another hint to obtain a higher class of license. Since 1891 the number of schools has increased by 13 per cent and the expenditure by 17 per cent. It is a good sign to see the expenditure keeping pace with the increase of schools.

An additional week's vacation is to be given to those teachers who attend the Dominion Educational Association in Halifax in August next. Said vacation to be taken at such time as may be agreed upon between teachers and their trustees.

The need of a school census in cities and towns is referred to. It is believed that many pupils do not attend school at all. In the City of St. John the school attendance is not so large as in 1890.

The report is concluded with an endorsation of the plan of centralization for rural schools, with facilities for transportation of pupils.

Some Day

And only the Master shall praise us and only the Master shall blame,
And no one shall work for money, and no one shall work for fame,
But each for the joy of working, and each in his separate star,
Shall draw the Thing as he sees It, for the God of Things as They Are.

—*Rudyard Kipling.*

TALKS WITH TEACHERS.

The minister of Education for Ontario has warned the teachers of that province against the use in the school-rooms of so-called "school helps," as being against the regulations and not in accord with the course of instruction. He also takes occasion to notify those who continue to use them that they will forfeit the allowance paid by the province.

Warning may be necessary in other places besides Ontario, as these little school skeletons are creeping in nearly everywhere, and are being hailed as bonanzas by those teachers who are too indolent to prepare their own work. They embody the shadow without the substance in every case. What can be more superficial or machine-like than some of the stuff that is being offered teachers on all sides to-day—outlines of history, consisting of dates and disconnected facts without ideas or inspiration of any kind? In the olden times, and less frequently in our own, teachers objected to the answers to arithmetical questions being given. Now, not only the answers but the solutions are thrust in our faces, which in nearly all cases is the reverse of complimentary to the intelligence of the teachers, at least, and must be destructive of all research and self-reliance on the part of the pupils.

Can anything be more namby-pamby than the efforts of some of these school helpers to bring to the notice of the teachers the solutions of the simplest problems in geometry, or the analysis and parsing of the easiest sentences? And the worst feature of it all is that many teachers approve of this, though, it may be added, that the majority of these are not given to preparation of school work.

What are we coming to, and what is to become of those principles of self-reliance that we are so prone to quote? Beware of all scrappy skeletons called "school helps," and "drink deep" at some richer well of knowledge!

A school principal, a few days ago, overheard two boys using improper language on the school grounds. He soundly punished both, as they deserved. The next day the father of one of the boys called upon the teacher to thank him for the admonition he had given, and requested him to repeat it should the same occasion arise. The parents of the other boy kept him from the school. Comment upon the action of the two families is scarcely necessary. Commendation is out of place in the first case, because the father could take no other course if he valued his boy's future and desired him to become a good citizen. What shall we say of the other father? If his boy grows up to defy him and become an undesirable member of society, the fault will not lie with the teacher or school, though some of it may be imputed to them. Where does the responsibility of parents come in? It may be feared that indulgence and mistaken kindness on their part will result in many future heart-burnings for them, and though they may not be conscious of it, they are responsible in that they are countenancing not only a breach of morality, but a disregard for authority, which, if carried a little further, the result in either case can readily be forecast.

For the Review.] **NATURE LESSONS.**

Pop-Gun Airs. II.

Teacher. We had some experiments showing how currents can be set up in air, you remember?

Scholar. Yes. When the air is warmed it expands and therefore becomes lighter, and the cooler air rushes in to take its place.

T. Mention some of the more common experiments which we can observe nearly any time without going to the trouble of making any apparatus to show it ourselves.

S. The draught in chimneys and stoves.

Another S. The draught in lamp chimneys and the ascent of candle flames.

A. S. The ascent of all flames and of the hot air in the school room.

T. That will do. And what does the heating which causes the currents in the air which we call winds?

S. The sun is the first cause, then the different kinds of surface of the parts of the world which is warmed by the sun.

T. That will do. You have been satisfied that if the sun heats some portions of the world's surface more than others, and thus warms some portions of air more than others, that there will be an uprising of the warm air and an inrush of colder air from some of the sides. But our point in this lesson is to discover something else which may have something to do with the rush of a current of air. If one of the boys should run across the playground, and without noticing anyone in his way come against some persons standing, what would be the result?

S. Why, he might knock them down.

T. Have you ever seen one knocked down in that manner?

S. Yes. I have both seen it and felt it.

T. Which would be the more upsetting, a big boy or a small boy supposing each to be running with the same velocity?

S. The big boy, of course.

T. Why?

S. Because he would be heavier.

T. Would the wind rushing in to take the place of rising air be likely to disturb the air on the other side of the place where the air was rising.

S. I suppose it would if it were moving faster than the air meeting it from the other side. But then air is so light that I do not see that it would make much difference.

T. Perhaps you did not consider that point any more than the other day, when you thought the soft air in the pop-gun couldn't throw a cork fast enough to hurt anybody. Air is very light, but a large quantity of it would have much weight. A cubic foot of air on an average day will weigh about 537 grains. How many grains in a pound? And how many cubic feet in a cubic mile? Some of you calculate the one, and others the other question.

S. Thirteen cubic feet of air will weigh one pound.

T. How many thirteen cubic feet are in the number of cubic feet you have found to be in a cubic mile in round numbers?

S. Over ten thousand million.

T. How many tons in that weight?

S. Five million tons.

T. Now if a cubic mile of air weighing over five million tons were rushing along faster than any boy could run, or than a horse could gallop, what would happen if it met square in front, or at an angle, another mass of air standing still or moving against it?

S. There would be a very great pressure just before the faster moving air could turn the resisting air back.

T. Correct. When you pressed the air in the barrel of the pop-gun, what happened?

S. It went into a smaller space until I pushed the piston so far that the cork bullet flew out. Then the air must have suddenly expanded for it threw the cork out with great velocity. But the swiftly moving wind was not confined in a tube like my pop-gun.

T. No; but you admitted that very vast weights were in motion, and the walls of the hurricane were the earth below and the stiller air on every other side.

S. I suppose there must be compression of air under such circumstances, followed by expansion.

T. We have a strong south-east wind to-day—quite a storm. I suppose this wind is travelling somewhere very fast. But does it blow steadily? I suppose you have all tried it with your umbrellas someway or other or at some time or other?

S. It comes in gusts. Sometimes it appears to be nearly still where you are standing, although you can hear the sound everywhere else. And then all at once it strikes you violently, and once took the umbrella out of my hands. Why should it not rush on steadily to wherever it is going?

T. Water is a little more than eight hundred times heavier than air, although it is not elastic like the air, as you have discovered. But you know what happens in the brook when the water running on smoothly meets a stone?

S. It heaps up over the stone, which delays it a little; but it rushes down faster than ever when it goes down. And when there is only sand, mud or earth below, it digs quite a little hole on the lower side of the obstacle which it overflows.

T. Yes. If the water is stopped by the obstacle, it makes up for the stoppage by falling down from a higher level with more force than if it were not stopped. In like manner the air may heap up to fall away faster than before. But the air is so elastic that it is compressed also, and wherever there is extra pressure at one instant there must be an expansion at the next. Do you see anything to interrupt the free flow of the south-east wind over us here?

S. There are hills, and trees, and houses. So the air stops against these and curls up over them, forming great air whirls, something like what we see going on in currents of water.

T. Now if we suppose that a whirl of air, only the thousandth part of a cubic mile, to be set a-spinning in the midst of the other air, would it have very much effect against, say, a broad side of a building?

S. The whirl of air would be 5,000 tons in weight, so that if it struck a building large enough to face the whole whirl, and it were moving very fast, it would throw it down, or carry it on.

T. Well, that is just the point. The unevenness of the surface of the earth sets ever so many eddies agoing in the wind, although it is all passing us in the same general direction. That is why the wind sometimes gets under the umbrellas, or behind it, when we least expect it. And if in the general motions of the atmosphere, several cubic miles of air moving rapidly in one direction met about an equal mass of air in opposite motion, there would be not only a heaping up of the air above, but a great compression, which would under certain conditions rush out sideways in whirls of tremendous violence.

S. That would be a tornado, would it not?

T. Correct. And if the whirl of air is only sent spinning with sufficient velocity, it may pick up beams and boards, and even straws, throwing them with nearly as much force as if fired from the mouth of a cannon.

S. I saw an account of a tornado in which not only were branches torn from some trees while the tree was left standing, but the bark on one side was sometimes scraped away, and splinters of wood and even straws were found sticking endwise in the stumps of trees as if they were fired into the wood from a gun.

T. Very good. Let me see how many of you can get from the papers or other books at your homes descriptions of such tornadoes. In what countries might might we expect such to occur?

S. In countries where great extents of air might be set in motion by the warming of the earth and air by the sun, like the middle of the United States.

Another S. When a shot is fired from a gun or a rifle, it is gas which blows the bullet out, How fast would the gas be moving out of the gun, then?

T. About 1,600 feet per second, more or less. A breeze blowing so fast would cause all the boulders about the school-house to fly like cannon balls. It would, of course, blow away the school-house in splinters, and uproot or snap off every tree.

S. Was there ever a wind like that?

T. There have been tornadoes recorded in which a small portion of the wind would appear to have very nearly that velocity.

And I might also mention that winds have been caused nearly as strong by a process not very unlike your pop-gun, only the barrel was the steep side of a high mountain and the still air round about.

As I will make you find out some time after this, a stone allowed to fall from a state of rest will move faster and faster as it falls. When it has been falling for one second of time it has a velocity of about thirty-two feet. To have the velocity of a gun shot—1,600 feet per second—it would be required to be falling for fifty seconds. That would require it to fall from a height of about 4,000 feet, nearly four-fifths of a mile.

Now, let us suppose that on the face of a very steep mountain ridge, about a mile high, a landslide the one thousandth part of a cubic mile should suddenly take place. Five million tons of air would have to rush into the vacant spot left by the landslide, which would be about four thousand times heavier—twenty billion tons. As this tremendous mass would be plunging downward for about a minute with a velocity increasing until it became as great as a cannon ball, the five million tons of air would be practically plunging down after it, not so fast, altogether, because the air would start to close in on each side as the mass moved down. The valley below would receive the shock of the 20,000,000,000 ton projectile, and the blast of the wind would be as the blast from the mouth of a cannon.

S. Did anything like that ever happen?

T. Yes, very much like it. Some of the landslides on the Alps come near it. The drop of the landslide is not vertical, and its course would have to be longer in order to acquire the same velocity. But within the last ten years, a great landslide came down into one of the Swiss valleys and plunged up on the other side for a very great distance; and the force of the wind on each side of the slide itself, overturned trees, snapped them off, tore the branches of others, and for a great distance bombarded forests and cliffs with flying debris carried by the wind set in motion. On a future occasion I shall read you a description of this or another landslide, to show what the gentle zephyrs can be made to do if they are only hurried fast enough. And that is the mystery of the tornado-velocity given by the motion of vast masses of air whose inertia is deflected into a comparatively small whirl which sweeps the earth. The rain and the electric display are merely the other natural accompaniments depending on the different conditions of the moving masses of air.

For the REVIEW.]

Evening Stars.

For some time back there has been a plentiful lack of evening stars in the sky, and observers have been doing quite a lot of grumbling about it. Venus has not been seen in the west after sunset since last April, Jupiter not since August, Mars not since September, and Saturn not since October, or early in November. Mercury was supposed to be doing duty as evening star from November 7th to January 6th, and during three or four weeks of that time he was bright enough, and stayed up long enough after sunset to play the part in quite good style. But our old friend, the weather-fiend, put his veto on the performance, and refused to pull up his curtain of dirty grey cloud. The curtain was up often enough during those three or four weeks, both by day and by night; but a ragged patch of it was always to be found over that part of the south-west sky where Mercury was trying to show himself during the hour or hour and an half after sunset. So, at least, it was here, where not a single observation was got; and I have not heard of any having been got anywhere else.

* * * * *

Before the end of the present month three out of the five brightest planets may be seen as evening stars. One of them is technically an evening star already, but it is not likely that she has yet been seen except by a few observers who have taken special pains to look her up, or who have been exceptionally lucky. Another one has been visible in the evening for some time, but

does not become what the almanacs call an evening star until Lady Day.

This one is Jupiter. To pick him out from the host of stars is easy enough. In the absence of the moon and Venus, he is the brightest of the whole lot. If the observer feels a doubt at present as to which of two is entitled to this distinction, he need not be in any hurry to settle this doubt. When he is better acquainted with both of them, and especially after he has tried which of them is easier to find (under similar conditions) in daylight or strong twilight, the question as to which is the brighter will no longer trouble him. But if, at present, he is in doubt as to which of the two is Jupiter, he had better settle that at once. There are several tests, some permanent, others temporary. The principal temporary one at present is that when Jupiter is in the east his rival is in the south. Of permanent tests, there are (1) difference of color, (2) difference of lustre, (3) difference in apparent size—these last two differences are most conspicuous and most striking in daylight, (4) difference in twinkling, (5) position among the stars constant or variable. The temporary test is sufficient to enable the veriest tyro to say which is Jupiter and which is Sirius. It will be good exercise for his eye and his judgment to try the permanent tests for himself. As to twinkling, he had better not be too sure at first. If repeated observations of Jupiter, in all sorts of positions and under all sorts of conditions, seem to confirm what the books teach on the subject, Venus and Mercury should be observed, too, before making up his mind about it.

* * * * *

At the beginning of the month Jupiter rose at eight o'clock. This is for the latitude of Yarmouth and for a clock set to mean time. His usual habit is to rise about two hours earlier on any date than he did a month before that date. Most of the time it is less than two hours, but just at present it is more. On the first of April he will rise here at 5.37 mean time.

He will be on the meridian at midnight on the 25th, and that event marks his passage from "morning star" to "evening star." The distinction is of no practical importance, but young students of astronomy who find it in their almanacs are often puzzled by it. If they are given to observation they find it easy to understand the distinction in the cases of Venus and Mercury. These planets swing out on the east side of the sun for a space and then swing back. During the interval they are seen in the west after sunset, and are known as evening stars. Then they swing out on the west side and back again, and while out there they are seen in the east before sunrise, and are known as morning stars. But with Mars and Jupiter and Saturn it is different. They pass the sun only from east to west. Before each passage they are left above the western horizon after sunset and are evening stars. After each passage they come above the eastern horizon before sunrise and are morning stars. When do they change their status? When should we cease saying, "after the last conjunction," and begin to say, "before the next?" When do we drop our "p. m." and begin again on "a. m.?" The answers to the second and third of these queries should help the anxious inquirer to puzzle out the first.

Jupiter is in Virgo for this year. At present he is between the stars Gamma and Eta. At the beginning of the year he passed Gamma on his way east. After a few weeks he stopped, then turned back, and passed her again on February 18th. After a six months' trip to the west he will be back to her once more in August, and then leave her for twelve years.

Those who are interested in close conjunctions should note that one will occur between Jupiter and Eta Virginis on April 11th, and another—not so close—on July 13th.

* * * * *

In the middle of February Venus passed the sun on the farther side. In almanac language she was then "in superior conjunction." She usually makes this passage closer to the sun's disc, and she always makes it at a much more leisurely rate of speed, than when moving across on the near side, as she does when "in inferior conjunction." In the latter case it sometimes happens that the patch of sky between sun and planet is wide enough at the very time of conjunction to allow star-gazers to continue their daily observation of the planet without interruption. It happened so in February, 1894. One evening after sunset I saw Venus in the west, and next morning before sunrise I saw her in the east—with the naked eye on both occasions. But she allows no such liberties as these when she is in superior conjunction. She then gets so very close to the sun's disc and moves so very slow that naked-eye observation is impossible for some time both before and after conjunction. If the question, "How much time?" be asked, the answer is that it depends on several things: partly on Venus, partly on the sun, largely on the observer, and hugely on the weather. The last superior conjunction—I mean the one before that of February 15th—occurred in 1896 on July 9. Fourteen days before that date I had an eye observation of Venus when she was less than 4° from the Sun. She was Morning Star then—as she always is just before superior conjunction—but the observation was not a morning one; it was made at midday. And the first one after that conjunction was

also at midday, but it was twenty-three days after. It was not until thirty-nine days had passed that I first saw her as Evening Star after sunset. To see her in a midday sky when only fourteen days from conjunction, and to fail to see her in a twilight sky until nearly six weeks after conjunction, may seem strange. There is nothing strange about it, however, when all the circumstances of both cases are taken into account. I don't purpose to bother my readers with an account of them all, but here is one which can be tested as to its truth or untruth by any star-gazer who cares to take a little trouble. When Venus is near the Sun's place in the sky—say within 10° of inferior conjunction, or 5° of superior conjunction—it is often easier to see her at midday than in the morning or evening.

It is safe betting that no naked eye has seen Venus within two or even three weeks of her recent superior conjunction. When I saw her at midday two weeks before the previous conjunction she was only 20° from the zenith, and when I saw her again at midday, three weeks after that conjunction, she was 27° from the zenith. Two weeks before the recent conjunction the zenith distance of Venus at midday was 63°; three weeks after this conjunction it was 48°. Very little experience is needed in observation to understand that what is visible at 27° from the zenith may not be visible at 48°, and that what is easy at 20° may be impossible at 63°.

But I take it that most readers are more interested in evening than in midday observations of Venus, and that they would like to know when they might hope to have their first sight of her after sunset. In a clear western sky it may be possible to see her with the naked eye on March 8th. During the next month she will become fairly easy, and quite easy after that. For the early dates she should be looked for a little south of west, and about a quarter of an hour after the sun disappears. By the end of the month no directions will be needed. She will then be on view for nearly an hour after sunset.

* * * * *

And then she will have a companion. During the last week of March and the first two weeks of April observers will have the best opportunity of the year for seeing Mercury. He passes the sun on the 16th, overtakes Venus on the 26th, gains on her until April 8th, drops behind and is overtaken by her on the 18th, and swings back into line with the sun on May 1st. He may be picked up in a clear sky two or three days before his conjunction with Venus, and will be visible after that on every clear evening until about April 20th. A. CAMERON.

Yarmouth, N. S., March 1, 1898.

P. S.—I saw Venus this afternoon (Saturday, 5th,) half an hour before sunset, with a field glass. A. C.

P. S.—Saw her for ten minutes to-day (Sunday, 6th,) in a yellow sky, with a mite of an opera glass, which I can put in my vest pocket. A. C.

For the REVIEW.]

A Lesson in English Literature.

MILTON'S SONNET ON HIS OWN BLINDNESS.

Much has been written to guide the student and teacher of literature, so much that one is easily bewildered by conflicting counsels. Prof. Dowden's essay on "The Teaching of Literature, in his New Studies in Literature"; Prof. Corson's "Aims of Literary Study," and J. W. Hales' introduction to his "Longer English Poems," may be recommended as the words of men who are at once scholars and experienced teachers.

Mr. Hales gives an elaborate analysis of one of Scott's ballads, apparently exhaustive in the different ways of presenting it, and showing what a wide field for study opens out from one single poem.

This illustration of his plan of teaching will repay careful consideration and pains in selecting from the many lines of study which he points out, those best suited to the class to be taught.

As an example of the teaching of a shorter poem, we will take up Milton's sonnet on "His Own Blindness."

"When I consider how my light is spent
Ere half my days, in this dark world and wide,
And that one talent, which is death to hide,
Lodged with me useless, though my soul more bent
To serve therewith my Maker, and present
My true account, lest He returning chide,—
Doth God exact day-labour, light denied?
I fondly ask;—But Patience, to prevent
That murmur, soon replies: God doth not need
Either man's work, or his own gifts: who best
Bear His mild yoke, they serve Him best; His state
Is kingly; thousands at His bidding speed
And post o'er land and ocean without rest;—
They also serve who only stand and wait."

It is a good plan to dictate the poem to younger pupils, or have them copy it from the blackboard. During the course of the year they may thus compile books of their own, which they will value highly. Preface the dictation or copying with the story of Milton's life, briefly and simply told, dwelling on the facts of his strong feeling of responsibility in regard to his work, his diligent preparation for it, his earnest desire that he might be able to leave something to after ages that they would not willingly let die, the troubled times in which he lived, and his great affliction. Note the date of the sonnet, the exact meaning of the words "spent," "talent," "bent," "fondly," "prevent," "post." What does "Ere half my days" mean? What is the reference in the third and three following lines? Let the children tell the parable of the talents, or read it, if they do not remember it. Who are the thousands? Why does he call the world "dark and wide?"

After some such study as this, in which children of ten or eleven may readily be interested, let the sonnet be memorized.

Professor Gayley, of the University of California, speaks thus forcibly of the memorizing of poetry: "If fewer things were despatched, and if more were entrusted to the memory, *there would be something to assimilate, and time to assimilate it.* In our apprehension lest children should turn out parrots, we have too often turned them out loons. While we insist, properly enough, that youth is the seed-time of observation, we seem to have forgotten that it is also the harvest-time of memory."

According to the pupils' ages and capacities, more study may be given both to the matter and form of the poem. With lines 1 and 2 compare the "Oh dark, dark, dark, amid the blaze of noon," in Samson Agonistes; with lines 13 and 14, the last line of the Hymn on the Nativity and Faerie Queene, Bk. 2, Canto VIII, stanzas 1 and 2, beginning "And is there care in heaven."

With the whole poem, compare Whittier's "Waiting" and Browning's "The Boy and the Angel." Notice how far the thought in these differs. Note the personification of Patience, the construction in lines 7, 11 and 12, and the character of the vocabulary.

With older pupils draw attention to the sonnet form, letting them discover as much as possible for themselves from this and other sonnets, as to the number of lines, syllables, accents, and rhymes and the arrangement of the latter.

A counsel of perfection, insisted on by many teachers, is "never tell a child anything he can find out for himself." In literature, at least, a good deal of discretion may be used in applying it. Certainly, if the child has access to a good dictionary, it is foolish to tell him the meaning of a word, and it is encouraging laziness to explain the connection or force of a sentence that a little study will show, but when references and allusions are to be looked up, a good deal of help should be given at first, and the children gradually accustomed to using reference books and finding parallels, else much time may be wasted and the literature lesson made a weariness, which is above all things to be avoided.

Do not try to make the children see all that you see in a piece of literature; you have a head start of some years and of some experience.

Do not moralize over the poem, let it speak for itself.

Do not make them paraphase it as an exercise in composition. The writer ran aground on this rock years ago, when a matter of-fact child wrote as follows: "Milton had only one talent, that of writing poetry; if he could not see to write poetry he could not earn his living, and he would starve to death." That was her version of "that one talent which is death to hide."

Paraphrasing was useful that time to show the teacher her failure, but one would prefer to learn one's failures in a less painful way.

ELEANOR ROBINSON.

Methods of Teaching Botany.

BY MISS INA CHIPMAN (B. A. WELLESLEY).

(Read before the Teachers' Institute at Hantsport, December 23rd, 1897.)

"Most young people find botany a dull study," says John Burroughs, the great naturalist. "So it is," he continues, "as taught from the text-books in the school, but if studied in the fields and woods, it is a source of perennial delight." There is no doubt but that, studied as it used to be, botany *was* dull, for then, as one writer says, it stood for "a science of diagnosis, of herb gathering, of petal pulling, of herbarium making;" but studied as it now is, under modern methods, it has become one of the most delightful and profitable of all studies. Now the laboratory reveals continued surprises; the microscope presents the infinitely small; the communion with Nature even in the walk by the common wayside shows that "the world we live in is a fairy-land of exquisite beauty," that we have only to *know* Nature to enjoy and appreciate the beauties and wonder which surround us.

Every flower has its message or mystery; every bee or butterfly, or small insect, which alights on the blossom tells a truth which cannot be learned from books; and literally every flower lives in a color atmosphere of its own creation, quite different from the colorless one we breathe. Can we, then, who love nature render her better service than by striving to inculcate in our school children the habit of carefully and closely observing nature in its varied form? How can we arouse an interest in even the commonest plants and flowers?

The task is not an easy or a rapid one. It is argued by some that botany, in connection with other sciences, should not be taught so early as the primary and intermediate grades. It is a question if bringing small children into the realms of science does not take away much of the pleasure and enthusiasm of later study and cause them to grow tired of science before they can fully appreciate it. But surely botany should not be one of the neglected studies. Observation is one of the most natural powers of children; train this carefully and teach botany in the simplest way, and the children's love for flowers, together with their early enthusiasm, will not only be retained, but also increase. We have then to show how botany need not be a dull study, how step by step through the different grades new interest may be aroused, how observation may be cultivated and new knowledge gained — and lastly how the text-book used in our schools may be made practical and interesting.

Since the text-book, until the ninth grade, is practically useless, let the children in the primary and inter-

mediate grades learn entirely through observation. Cultivate a love for nature by bringing them in contact with nature. A little school-room work in germination will give an increased interest to the naturally observant child, and open the duller eyes of his companions. If botany is to be taught only in the spring—as it unfortunately too often is—April is the time to begin, because it is so soon afterwards that the countless seedlings of maples and other plants are the most important phase of plant life.

In the lower grades too much detail must be avoided. Let the children, however, first see and study the appearance of the seeds to be planted; let them open soaked seeds which reveal within the tiny plant. Previous to the beginning of these lessons, some seeds, as beans, peas, etc., should be planted, so that the seedlings will be ready for study as soon as the work on the seed is done. How interested the children will be in noticing the change of color in the cotyledons, and how closely these hold themselves over the plantlet until the tender little thing is far out of the ground. This indoor work opens mind and heart to the beginning of life out doors with which they soon come into daily contact. With opened eyes the child now goes out to observe, and delights in what the untrained child quite fails to see.

A little later flowers will form the chief attraction to the children, and many of the most happy lesson hours can here be spent. It is not necessary to burden a child's mind in the lower grades with the names of the parts of the flowers, for this knowledge will be of little use. Interest the children rather in the color, the habits and haunts of the flowers, and the order in which the flowers come. Take, for example, the violets, which can be abundantly found. They will soon learn and will not easily forget that the violets are among the earliest flowers, that the sweet-scented, small, white ones grow in wet, swampy places, and that the blue violets, with short stems, prefer the sandy places, while others, with long stems, grow in the wet places with the white ones. If the haunts of many flowers are marked and remembered, the later seasons will reveal the fruit. It is evident that we must teach children to *love* plants if we would have them *know* plants; we must inspire them with a sort of interest which results almost in devotion; we must keep their observing powers ever on the alert.

The work thus begun in the lower grades may be carried on in the fifth, sixth, seventh and eighth grades with advance steps in each. The interest must still be maintained by simple, plain teaching. In connection now with the learning of the parts of the flower may be taught the function of each part. The children in the country may not have observed the insects' visits to the flowers, and even if they have, may not know how important a part bees, butterflies and many insects play in carrying the pollen from one flower to another, and thus fertilizing it. The bumble bee, for instance, is the only insect which can cross fertilize the red color; thistles are beloved of butterflies; the common Blue Flag, or Iris, from its large and showy blossom, from its size and shape, from its *blue* color, maks itself especially attractive to the bee, and because of the position of its stamens and pistils cannot be fertilized in any other way than by insect visits. Teach children that the colors of flowers are intended only indirectly for our pleasure, that "Nature's first consideration is the bee;" that she uses her color to attract the insect and the bird for purely practical purposes. In this simple study of the flower a teacher could linger for many lessons over the significance of the color, form and fragrance of flowers. Interest the children in the color in the large proportion of sweet-scented white flowers—a proportion of 14.6 of white to 8.2 of red—a fact accounted for by the need of making themselves conspicuous because of their dependence upon night flying insects; interest them also in the bright markings of the nectar guides, which lead an insect to the nectar, and at the same time insures cross fertilization. These wonders which lie at our very feet are not too difficult for children to learn. Through these channels an almost irresistible charm is, early in life, attached to the flowers.

Then, too, in these grades the variety of form and shapes of leaves may be studied; the stem and twigs, the roots and rootlets. Here in the teaching of nature lessons belongs the composition work. After a lesson taught, for instance, on the lilac twig, with its almost bursting buds covered by scales to protect from winter's cold the delicate leaves and flowers—after this study, I found the children anxious and proud to sketch the twig and tell of the change which spring would bring. In no way can they so well impress upon their minds the points which they have observed as by careful and frequent sketching.

Nature, so far, has altogether been the teacher, but in the ninth grade the text-book must be used. We cannot, however, teach Gray's "How Plants Grow," without still learning from Nature. We regret the absence of laboratory and microscope in the school-room, for their importance cannot be too highly estimated. These bring, what is always so welcome, first-hand knowledge and the power to be an investigator; the result is the gaining of accuracy in statement, the power to reason, and the priceless habit of observation.

Without these usual helps there were three points which I decided when I began in September to teach botany from the text-book. First, I changed the order of the book; second, I required out-door individual work; third, I combined the drawing lessons with botany. I began the work with the leaves, their parts, structure and variety. The autumn tints were lending wonderful beauty and glory to the leaves, and it seemed the right time to study and collect them. Examples of the different shapes, apex, margin, base, etc., were required day after day from each pupil.

I found this a success, for it took them from the text-book to Nature, and thus in the very beginning made their work an enjoyment. It also taught them far more than memorizing text-book definitions, and satisfied them that Nature makes no two leaves alike, but gives up an endless variety of shape. (These sheets show the work of one of the class.)

Hand in hand with this out-door work came the *sketching* of the leaves. To me botany and drawing are inseparable—the value of their being taught together cannot be too strongly urged. In my own experience I have not seen half as good results follow from book measuring and copying as I have from taking the simple objects from Nature and sketching them. In Nature-drawing two good results follow—new knowledge is gained and accurate observation is tested and trained. Many in my class did not notice at first that in a palmately netted veined leaf like the maple the veins started from a common centre, where the footstalk joins the blade. Description written below.

The arrangement of the *leaf* in the *bud* was next studied and sketched, and many were the delightful surprises found on opening the buds of the lilac. Some of the class found, what they had never noticed before, that the flower cluster was wrapped within the leaves and these surrounded with scales, and all would be ready to burst into new life in the spring. To take the buds of different trees and notice their covering and protection forms an interesting study; as, for instance, the horse chestnut, with its sticky outside covering and the soft, downy winter clothing within.

The *seeds* were next in order, because so many found in the fall could not be found at any other time in the year. Encourage the pupils to bring examples, and especially any kinds which interest them. Show the use of the silky tuft on many of the seeds of the compositæ—how these "sky rovers" are carried far from their own flower and settle into some ground where they, in many cases, have to battle with numerous other seeds for their life, which afterwards become a nuisance to the farmer. Only a few examples of the seed were sketched, those which served to illustrate the fleshy and dry fruits, the berry, pome and bean. With the heart opened and the intelligence quickened the pupils will next turn to the study of *germination*, and find it one of the most pleasurable in the book. With their previous knowledge they may quickly go on to appreciate the details of a deeper study. In no way can the life of all growth be as well understood as to watch it. A box of seedlings with their slow, yet apparent growth, may become a daily marvel. The common bean reveals such clever contrivances that it can be used again for study. A glass can show each seed in plain sight, and the process of swelling, sprouting and embryo developing gives a better idea of the growth of seedlings than pages of book description. I used in germination work a tabulated blackboard outline like the following. These outlines hold the attention of the class, and classify to them what oftentimes seems vague and separated. Have ready for study bean pods, dry and soaked beans and seedlings, both for study and sketching:

I. Bean Pod (the natural cradle)—
   1. Hilum or scar.

II. Dry Bean—
   1. Color, shape, size, structure.
   2. Micropyle.
   3. Comparison with other seeds.

III. Soaked Bean—
   1. Condition of skin (ruffled, increases in size before body does).
      1′. Translucent.
      2′. Venation (veins run to scar, channel by which mother plant sent food to seed).
      3′. Two coats (on one shows toughness, to hold together the parts to protect embryo).
   2. Micropyle (passage of pollen tube through skin to bring life to seed).
   3. Cotyledons.
      1′. Size, purpose.
   4. Embryo.
      1′. Parts radicle, plumule consisting of two leaves with veining, outer wrapped around smaller.

IV. Seedling—
   1. First appearance (backs out of ground).
      1′. Radicle (pushing into earth).
      2′. Cotyledons.
         1″. Change of color (from white to green).
         2″. Position (hold themselves over embryo till it is out of ground, then slowly separate so sun can reach plumule).

Then try original work, anything *outside* the book interests and attracts.

V. Experiments with Seedlings—
   1. In sawdust (flourishes till food of cotyledons is exhausted then "shrink)."
   2. In sand-siftings mixed with gravel (same).
   3. Rich earth (flourishes with roots).
   4. Cut off cotyledons, die.
   5. Lessons learned.
      1′. Cotyledons—warm house for embryo, storehouse of food.
      2′. Soil provides food.

This work reveals new and countless interesting facts which Nature has to teach. "Devotion," says one writer, "is the keystone of character; a child who has given care, protection and love to the puniest plant is thereby a better soul."

Germination should next be followed by the *after growth of the plant*—the stem and the root. (Drawings in connection with root and stem). By this time, having watched a seed, under the protection of heat and the moisture of the earth come into life, rise above the ground into a plantlet with organs the same as a large tree, and having seen the plant silently and slowly expanding, adding new leaves and stem, and then accomplish its object in life, to re-produce flowers and seed of its own kind, having seen all this, the pupils have had their interest stimulated to study the flowers in order to understand where the seeds come from. In this way the life history of a plant, from seed to seed, is studied.

The time for the study of the ever-fascinating flowers will probably now come when Nature withholds her outdoor treasures from us. The chapters in the book, however, can be studied with profit, and then when spring comes with its wealth of flowers no time will be lost in studying from the book the somewhat dry details, but we can say to our pupils, as Wordsworth has said to us,

> "Come forth into the light of lights,
> Let Nature be your teacher."

One of the most beautiful things in flower study in the spring is to watch "the procession of the flowers," and in no better way can we teach our classes. "From the time when October has effloresced into witch hazel there is an absolute reserve of blossom until the alders wave again." These "drooping tresses" of alders which have waited so patiently are the first from their thousand boughs to wave defiance to the winter. Here, as in the case of insects, can be taught from the gracefully formed catkins the agency of the wind in carrying pollen and thus aiding cross fertilization. Remembering their study in the early grades, the pupils will know what flowers to look for first and what will follow. The first wild flower—our own Mayflower—is the one for which country children have an almost hearty passion. From the beginning of the flowers in April there is no break, and thus they afford constant study. All the parts, forms, kinds of flower clusters, etc., described in the text-book can be found in the flowers as they come. These will afford ample opportunity for *sketching*, and here some of the most delicate spring flowers make beautiful drawings. The common dandelion, from its color and its structure, gives an interesting example for study. Its structure accounts, in a great measure, for the brilliancy of its color. This brightness is in the middle of the flower, centered there by the strap-shaped corollas reflecting back and forth the rays of sunlight until they are intensified seven-fold. This is what attracts the bee to the exact spot where the golden pollen hides, ready to powder his back.

Help our school children thus to understand some of the mysteries of plant life—in germination, in growth, in cross fertilization, in significance of color and form in flowers—and we will help them to appreciate the chapter, "Why plants grow and what they do." The part which plant life plays in our life, in purifying the air, in furnishing food, clothing, fuel, etc., will help them also to realize our Heavenly Father's care over His children.

It is with pleasure we notice that the study of cryptogamic botany is being slowly introduced into the school. But there is not enough of it. The mosses, toadstools, lichens, are plants as well as butter-cups and daisies. From lower to higher in the order of study gives the best idea of the evolution of the plant kingdom. One writer strongly states that there is "no proper notion of higher plants without previous study of lower ones." The study can be made very simple. The steady rising in the scale of plants may be studied:

1. Simplest forms, or slimes.
2. Green, brown and red algæ, or sea weeds.
3. Fungi or mildews, lichens, rust.
4. Chara or Nitella (little water plant).
5. Mosses.
6. Ferns.
7. Pines (connecting link between the Cryptogams and Phenogams).
8. Phenogams or flowering plants.

In conclusion let me briefly summarize. In the grades from I to VII only the simplest forms of botany should be taught—growth, haunts and habits of flowers; grades VII and VIII should have more advanced work in growth, parts of flowers, relation of insects to flowers in cross fertilization, and with the sketching of flowers studied and the expression of their knowledge in writing. The ninth grade takes up the text-book.

With this work surely the results must be those which were aimed for in the beginning of study, *i. e.*, greater observing powers, greater curiosity and interest, greater love for nature and nature's children—the plants and flowers—and greater desire to peer into and understand the wonders and mysteries which are everywhere around us. It is surprising how little country children know of the common things about them. "It is no wonder," says one writer, "that there is so little substantial enjoyment of nature in the community when we feed children on grammars and dictionaries only and take no pains to train them to see that which is before their eyes." The latter part is not now literally true. But are we doing our best to train the school children in the valuable habit of observation, which will mean everything to them in their later life? We who are teachers must also be students—students of nature in the deepest and truest sense of the word—and then shall we be able to teach the children greater knowledge than they can ever learn from books.

Inspector R. P. Steeves, M. A.

Mr. R. P. Steeves is the efficient inspector of District No. 3, New Brunswick, which comprises Albert county, Kings county (except the parishes of Greenwich and Westfield) and Queens county, except the four parishes of Canning, Gagetown, Hampstead and Petersville. He was born at Harvey, Albert county, June 8th, 1858, and received his early education at the village and grammar schools at that place. He entered as a student at Sackville in August, 1873, and was graduated B. A. in 1877. In November of that year he began to teach at Riverside, Albert county, and three years after was appointed principal of the superior school at Hopewell Hill, which position he held until January, 1888, when he was appointed principal of the Carleton county grammar school at Woodstock, and a short time after was made, in addition, superintendent of the Woodstock schools. In June, 1893, he resigned this position to become inspector of schools. He received his M. A. degree from Sackville in 1888.

In October, 1883, Mr. Steeves was married to Minnie, youngest daughter of Jas. McNaughton, Esq., of Salisbury, N. B. They have a pleasant home at Sussex, and three children are the offspring of their union. Mr. Steeves is an active member of the community in which he lives: a member of the Methodist church; interested in Sunday-school work; a member of the S. S. County Executive in Kings, and a past master of Albert Lodge, F. & A. M.

Mr. Steeves' success — and he has been very successful as a teacher and inspector — lies in his tact and skill as an organizer, his accurate scholarship and thorough methods of teaching, and in the power which he possesses of inspiring an enthusiasm for learning. The efficiency and excellent standing of the schools of Woodstock are a testimony of his creative genius and wise administration. Many of his pupils have become successful teachers, and his students have entered not only the University of New Brunswick, but all the universities of the Maritime Provinces, and McGill. In the larger field of inspectoral work he has developed, in a comparatively short time, a capability which, added to his industry and his success as an administrator, has given him a wide influence already in the schools of his large and important inspectorate.

Natural History Society of New Brunswick.

$120 in Prizes for Insects and Plants.

A gentleman interested in Natural science and its relation to farming and fruit growing has given to the Natural History Society of New Brunswick the sum of $150, to be distributed in prizes, after deducting $30 for expenses, for collections of insects, fungi and weeds. His chief stipulation is that the schools shall be interested in this work, so that the advantages shall be educational as far as possible; and that the young people, and through them their elders, shall be led to take an interest in those forms of insect and plant life both injurious and beneficial, that effect so largely our agricultural and horticultural interests.

The Society is fully alive to the importance of the work everywhere being undertaken by governments, societies and individuals to grapple with the pests that annually entail such loss to farmers and fruit growers, and it hopes that this, the first systematic attempt in this province to create a general and practical interest in this direction, will call forth the active interest and co-operation of farmers, teachers and students throughout New Brunswick, so that the fullest advantage may reaped from this generous offer.

The Society takes this early opportunity to issue the following plan governing the conditions and distribution of the prizes, with directions to students intending to compete for them:

CONDITIONS.

1. The competition is open to the province.
2. All specimens are to be collected in New Brunswick and exhibited by the collector.

3. The collections are to be handed in not later than the 15th of September, and are to be exhibited at the Exhibition to opened in St. John about that time.

4. The given amount—$150—is to be apportioned as follows: $60 for insect collections; $60 for plants (fungi and weeds), and $30 for expenses.

(a) Insects.—The collection of insects is to be divided into three groups representing (1) injurious, (2) beneficial and (3) other insects, with labels showing the name, locality and date of capture.

Note.—The naming of the more difficult species will be a matter of some concern to younger students especially, but that need not deter them from making and handing in collections, but the prizes will be awarded to those best fulfilling the conditions set forth above.

A first prize of $25 will be awarded for the best and most complete collection of insects; $10 for the second, and five additional prizes ($7, $6, $5, $4, $3) for other collections in order of merit.

(b) Fungi.—Collections of fungi must be made on full sized botanical mounting paper—if large. Smaller specimens may be mounted on sheets one-half or one-fourth the size of above according to size of specimen. As in the case of insects, the fungi are to be divided into three groups—injurious, beneficial, and others not included in these two classes.

A first prize of $20 will be awarded to the best and most complete collection; $10 for the second, and two prizes ($6 and $4) for the next collections in order of merit.

(c) Weeds.—The collections of weeds dried, and mounted on standard sized paper, are to be properly labelled with name, habitat, place and date of collection.

A prize of $10 will be given for the best and most complete collection of weeds, and two prizes ($6 and $4) for the second and third.

Notes.—Additional value will be given to any of the above collections if they are accompanied by short notes, descriptive of the habitat, ravages, habits, etc., of each species, such as a student would make for his own information, as well as to cultivate habits of observation and make the collections of more service to himself and others.

If in the opinion of the judges any collection be considered lacking in merit, it shall not receive a prize.

Directions for Collecting and Preserving Insects.

For collecting insects the following articles are required for practical work:

The Butterfly Net.—This is used for capturing flying insects. A cheap and useful home-made net may be constructed as follows: Take forty inches of strong iron or brass wire; at each end bend about four inches at right angles; bring these ends together, thus forming a circle; this may be strongly bound to a light bamboo stick about four feet long. The bag or net may be made of silk gauze or leno, and should taper to the bottom. The length should be twice the diameter of the hoop. A more convenient net may be made by having the ring soldered to a tin or brass ferule, which may be made to fit the end of the bamboo rod, and thus can be detached when not in use.

The Sweeping Net may be constructed on the same principle as the butterfly net, but with a shorter handle, and is used by holding the handle of the net firmly in one hand and quickly sweeping the tops of grass and other low-growing plants, first from right to left, and then, after quickly turning the net again, sweeping from left to right. The sweeping net should be made of stronger material than the butterfly net.

The Water Net is used for capturing insects or insect larvæ which live in the water. It may be made in the same way as the other nets, with this exception: that the bag may be shorter and of coarser material, such as "grass cloth," or coarse millinet.

The Umbrella is one of the most useful instruments of the collector. It is used as follows: The open and inverted umbrella is held with the left hand under the branches of trees or shrubs which the collector intends to relieve of its insect inhabitants, while the right hand, armed with a heavy stick, is free to properly shake the branch.

The Chisel is used for securing the insects living or hiding under the bark of dead or decaying trees.

The Trowel is used in digging for the burrowing beetles, ants, crickets, and the many insects which construct subterranean nests.

The Collecting Tweezers are for picking up specimens and transferring them into the various bottles, vials or boxes which the collector carries for the reception of material collected.

The Killing Bottle.—Perhaps the best method of killing is by the use of cyanide of potassium. Large specimens are killed by simply putting them in what is known as the "cyanide bottle." This may be constructed as follows: Take a short, wide-mouthed bottle; break up a quantity of cyanide of potassium into pieces of convenient size; place a layer of these in the bottom of the bottle; then mix a quantity of plaster of Paris with water—just sufficient to make the mixture semi-fluid—and pour it over the cyanide so as to cover it. The bottle is then left open for an hour or two until the plaster is thoroughly dry.

Mounting Insects.—In mounting insects for the cabinet, entomological pins, made expressly for the purpose,

should be used. Nos. 1, 2, 3 and 4 are the sizes most commonly required. After returning from a collecting excursion the specimens should be prepared as soon as possible. Take the specimens from the collecting bottles and spread out on a sheet of white blotting paper, and with a soft, dry brush cleanse from any adhering impurities. Specimens with hard covering may be washed with benzine. Insects should be pinned through the centre of the thorax, when, as is more generally the case, this portion is largely developed. Beetles (*Coleoptera*) and bugs (*Hemiptera*) should, however, be pinned—the former through the right elytron, or wing cover, and the latter through the scutel, or triangular piece behind the thorax. The specimens look pretty with all the legs spread out, but for practical purposes it is better to let them dry in a natural, partly bent position. The pin should project about three-eighths of one inch above the the insect, to make handling easy, and uniformity in this particular will have much to do with the neat appearance of the collection.

Mounting on Points.—Most insects which are too small to be pinned may be fastened to cardboard points by liquid glue. Only the very best cardboard should be used for this purpose. These points can easily be cut by hand to a convenient size—say one-fourth of an inch long by one-sixteenth wide at the largest end, and tapering to a more or less acute point, according to the size of insect to be mounted. A No. 2 or 3 pin is then thrust through the wide end of the triangle, and the cardboard point, or triangle, directed to the left. The insect is then glued to the point, lying evenly balanced on the end of the little slip of cardboard, with the head pointed forward.

Setting of Insects.—For the proper setting of insects with broad wings, such as butterflies and moths, a spreading-board is necessary, and may be made as follows: Take two pieces of thin pine board, fourteen inches long and one and a half inches wide, nail these upon end pieces three inches long and one and a half inches deep at each end, narrowing to one inch and one-eighth in the middle. When the top pieces are nailed on these ends, an opening is left in the centre wide enough to admit the bodies of insects to be spread. Strips of cork or pith in which to fasten the pins may then be tacked or glued below so as to cover the intervening space. These spreading-boards are made of different sizes to accommodate different sizes of insects. In spreading insects on these boards, first pin the insect, then shove the pin through the cork, allowing the body to fit into the groove in the setting-board. The wings can then be pinned and kept in position by strips of paper. To obtain uniformity in the position of the wings, have the inner margins of the front wings as nearly as possible on a straight line. When the specimens are thoroughly dry they may be removed from the boards.

Preserving in Alcohol.—This means of preserving caterpillars and the many soft bodied insects and insect larvae is too well known to require any extended mention here. Specimens which are to be preserved in this way should be kept for a day or two in alcohol diluted with seventy per cent. of water and afterwards removed to alcohol containing forty per cent. of water.

Labelling Specimens.—Specimens will be of very little value, no matter how much care and pains have been taken in preparing them, if not properly labelled giving information as to locality, date of capture, and collector's name with a number referring to a note-book where any observations made should be carefully recorded. This habit cannot be too strongly emphasized. The collector should never be without his note-book. More profitless work can scarcely be imagined than collecting natural history specimens without some specific object, for a properly kept record forms an indispensable part of every well made collection. A good method is to use two labels for every insect. The upper label should indicate on the first line the sex-mark and locality, as St. J. (St. John). The second line, date of capture, and third line number referring to note-book, and initials of collector. The lower label bears the name of the insect. These labels are fastened to the pin on which the specimen is mounted.

Insect Cases.—A convenient size for these cases is eighteen inches by twelve, outside measurement. They should be perfectly tight and not over two and a half inches deep on the inside. The top may be of glassand the bottom lined with cork or some material which will hold the pins. The whole inside should be lined with white paper.

Arrangement of Insects in Cases.—The almost universal custom of collectors is to arrange insects in parallel columns in the cases. In regard to the smaller forms, as coleoptera, hymenoptera, diptera, two and a half to three inches in width is allowed for the columns, and for the larger insects as lepidoptera, and orthoptera, four to five inches will be found necessary. With alcoholic material, a similar arrangement may be followed. It is advisable to have at least four specimens of a species, which, entomologically speaking, constitute a set. As far as the conditions of the competition will allow, the collections should be arranged in a systematic manner, the order, family, sub-family and genus being indicated as far as known. The species should be arranged serially in accordance with the latest catalogue obtainable.

For the prevention of injury by insect pests the collection should be kept in tight boxes, and naphthaline cones pinned in convenient corners in the cases.

Of necessity the foregoing remarks on entomotaxy have been very brief, and consequently incomplete.

There is much that the young student will have to learn—from books, from experience and by putting himself in communication with experienced entomologists. Of books the following are recommended: Packard's Entomology for Beginners, price $1.40; Comstock's Manual for the Study of Insects, $3.40.

Pins, labels and other supplies may be obtained from J. Abbott Fraser, 93 Sudbury street, Boston.

Directions for Collecting and Preserving Fungi.

It would be impossible within the limits of this article to give more than a few general directions for the collection and preservation of some of the commoner forms of fungi. No time of the year, except when the ground is covered with snow, is barren of fungi, but it is in midsummer, and from that time till frosts set in, that their ravages are most apparent and destructive, when as *rusts*, *smuts*, *mildews*, *blights*, etc., they are such a source of injury to cultivated plants.

The collector may be provided with an ordinary collecting box, such as is used for flowering plants, but for Agarics (mushrooms, etc.,) an open shallow basket is preferable. A great number of woody kinds may be carried in the coat pocket, and the ordinary kinds that have their habitat on leaves, may be placed between the leaves of a pocket book, from which they may be transferred to driers on the return home, and dried and mounted in the same way as flowering plants.

The Fleshy Fungi.—In order to preserve the fleshy fungi for the herbarium the following method is usually adopted: The agaric, or other similar fungus, is cut perpendicularly from the pileus (cap) downward through the stem. A second cut in the same direction removes a thin slice which represents a section of the fungus; this may be laid on blotting or other plant-drying paper and put under a slight pressure to dry. From one half the fungus the pileus is removed, and with a sharp knife the gills and fleshy portion of the pileus are cut away. In the same manner the inner flesh of the half stem are also cleared. When dried, the half of the pileus is placed in its natural position on the top of the half stem, and thus a portrait of the growing fungus is secured, whilst the section shows the arrangement of the hymenium (spore-bearing surface) and the character of the stem. The other half of the hymenium may be placed, gills downward, on a piece of black paper, and allowed to rest there during the night. In the morning the spores will have been thrown down upon the paper, which should be placed with the other portions of the specimens. When dry, the section, profile and spore paper may be mounted together on a piece of stiff paper (botanical mounting paper is the best) and the name, locality and date written on the label below with other particulars. When dried, either before or after mounting, the specimens should be poisoned to preserve them from the attacks of insects. The best application for this purpose is perhaps carbolic acid laid on with a small dog-hair brush. If there is an objection to the use of such a dangerous poison — and there always is — spirits of camphor is sufficient, but as it is volatile, it is not to be trusted as a permanent preservative.

Leaf Parasites, so common on strawberry, blackberry, grass, and other leaves, may be dried between leaves of books as indicated above or in the usual way for drying plants—between the folds of bibulous paper; ordinary newspaper will do. It may sometimes be necessary with dead leaves to throw them in water, in order that they may be flattened without breaking, and then dry them in the same manner as green leaves. All species found growing on wood bark, etc., should have as much as possible of the hard host substance pared away so that the specimens may lie flat in the herbarium.

The Puff-balls are troublesome to preserve, and if mounted on paper are soon spoiled. It is a good plan to provide small cardboard boxes, of not more than a quarter of an inch in depth. Glue the specimen when collected to the bottom, allowing it to dry in that position before replacing the cover.

Moulds.—These are difficult to preserve. A good plan is to go out provided with small wooden boxes, corked at top and bottom, such as entomologists use, and some common pins. When a delicate mould is collected from a decayed fruit or other substance cut away all unnecessary portions of the host or matrix, and pin down the specimen to the cork in one of the boxes. Another method is to wrap the delicate moulds in tissue paper and place the specimens loosely in pill boxes. (This will be found to be a very good plan with many other delicate species of fungi, which at best cannot be preserved permanently, unless portions of them are mounted on microscopic slides.)

Microscopic Fungi.—Those who attempt to use the microscope and make collections of the smaller fungi, are referred to Cooke's Microscopic Fungi, and other works, for directions in detail.

Value of Drawings.—For fleshy fungi, faithfully colored drawings side by side with the dried specimens, will make up for loss or change of color which most species undergo in the process of drying. A series of

photographic groups of such fungi, taken with a kodak, would also add much interest to a collection.

Books.—One of the best books in studying the fungi, is "Fungi: their Nature and Uses," by M. C. Cooke, edited by Rev. M. J. Berkeley. Published by D. Appleton & Co., New York (International Scientific Series). The price is about $1.50.

WEEDS — HOW TO DISTINGUISH AND PRESERVE THEM.

It may be difficult for the young student to answer the question What is a weed? In general it may be said that a weed is any plant that interferes with the operations of agriculture or gardening. Some plants are weeds because by their rapid growth; they thrive and drive out other less aggressive or more useful plants. Others, from their unsightly appearance and uselessness may be termed weeds. Some by their beautiful flowers may win our regard and be less offensive though they are none the less weeds, as the dandelion, cotton thistle, coneflower, and several varieties of daisy. Again, a weed which is troublesome in one place need not be so in another where the conditions for its exuberant growth are not fulfilled. Bluets, Eyebright and other plants, not usually considered weeds, sometimes occupy fields to the exclusion of almost every other plant. Of course in such situations they are weeds.

As weeds are collected and mounted like other flowering plants, the following directions may serve as a guide:

To *collect* plants one should have a note-book and a tin box (that in the form of a cylinder is the most convenient), eighteen inches long and six inches deep, with a strap fastened to each end, for carrying over the shoulder. To *examine and identify* plants a pocket magnifying glass is needed (one costing from twenty-five to fifty cents is sufficient), and a Gray's Manual and Lessons, which costs from two to three dollars. A trowel for digging up plants, a sharp pocket-knife, a needle fitted in a wooden handle for separating the parts of plants are necessary. To *dry* plants a press and abundance of paper to absorb moisture are required. For the former, two smooth boards that will not warp, 20x14 inches, with a flat stone or other weight of twenty-five or thirty pounds will serve all purposes. Old newspapers, uncut, and folded in quarto form will do for dryers. That completes the outfit.

Most of our worst weeds belong to the Composite Family of plants, which needs a brief explanation here. What is popularly taken for the flower in this family is really a cluster of flowers. Take the Ox-eye Daisy which is so abundant in this province. Each of the white rays round the margin represents an entire flower and each has a pistil and produces one seed. The yellow central portion consists of many tube-shaped flowers, each of which has its stamens and pistil and produces one seed. So that there are many hundreds of flowers, producing hundreds of seeds in one flower head; and the same is true of the thistle and other weeds that belong to this family. Hence their power of reproducing themselves is manifold.

Collect only good specimens, and be sure to have root, stem, leaves, flowers, and, if possible, the fruit. If the plant is over fifteen or sixteen inches long, bend it before putting in the tin box or press so that one length shall be about fifteen inches. Returning from a collecting trip put the plants in press. On one of the boards place two newspapers (eight thicknesses). On this place a plant, or several if the size will permit, arranging as natural as possible, and showing both under and upper surfaces of leaves and flowers. Cover with a newspaper (four thicknesses, or eight if the plant is thick and juicy).

Put a label with each species and proceed thus until all the day's collection is enclosed. Then place on top the second board with the weight and put it in a spot where it will receive plenty of sun and air. Change the drying papers every twelve hours for a day or two, every twenty-four hours for a few following days, and every forty-eight hours after, until the plants are completely dried, which process will take from ten to twelve days.

Plants may be mounted at leisure on botanical mounting paper, 17x11½ inches. This is called the herbarium size, and is used by botanists everywhere. It may be obtained from the Cambridge (Mass.) Supply Company for about $4.50 a ream. But perhaps nearly as good an article may be obtained from local dealers at a much less price. These sheets should be enclosed in manilla covers to protect them.

The Committee of the Natural History Society of New Brunswick to whom has been entrusted the making out of this scheme, has taken pains to be as full and explicit in the directions above given as possible in the short time allotted for preparation. It hopes that there will be a great interest aroused in all parts of the province, and that there will be many competitors for the prizes offered.

G. U. HAY,
G. F. MATTHEW,
W. MCINTOSH,
S. W. KAIN,
} *Committee.*

St. John, N. B., March 10th, 1898.

Recently in Montgomery, Ala., a boy was indicted by the grand jury for frightening his school teacher with a mouse. The boy took the mouse to school in his pocket and laid it on the teacher's desk. When she saw it she fled in terror to the police. The boy was held in $200 bail. The parents being unable to furnish this, he was sent to jail.

PRIMARY DEPARTMENT.

Primary Work.

Some of the ways that I have found to interest little ones are these, and perhaps they may help busy teachers, who, from their own experience, can improve on them :

(1) When one letter was learned, exercises in printing all words that contained that letter were given ; then the other letters in a given word printed five, six or seven times. This printing of words can be greatly enlarged upon, as printing all words of four, three, two letters, words that contain i, a, e, w, t, etc. Beside reprinting the list of words from the board the pupils will find them in their primers.

(2) The little ones took great interest in learning to print and spell their own names. This was an exercise that they would do again and again without tiring. One little fellow—a very mite in size—bore the cumbersome name of Alexander, and the untiring patience with which he would persist in printing and spelling that name, which he could not clearly pronounce, was surprising, and laughable, too.

(2) Drawing was the chief delight of both young and old, and many "odd minutes" would they fill in with it. They had permission to make up their own designs for busy work or draw from objects in the room or elsewhere. One little chap, who lived on the shore of the Bay of Fundy, liked best to draw pictures of ships, schooners, etc., and very correct ones they were, worthy of any member of the advanced classes. Then the children would gather leaves, as drawing copies, and press some for winter use.

J. M. J.

St. John Co.

We must remember that the little bodies are fresh from the home-life, and the change is great from utmost freedom to the necessary restraints of the school-room life ; therefore strive to secure very frequent periods in which the child may stand ; exercise in various ways.

We all do better work when happy; then aim to make the little ones happy. Have sympathy with their little wants ; encourage them to observe lovely things, as the sunshine, flowers, birds, sky, sunrise, sunset, autumn leaves, animals, stones, clouds, and an indefinite number of the beauties of nature. Give many object lessons — their language lessons, number work, and much more may be given by means of objects.

Order is heaven's first law, and should begin at the start of school life. It is almost impossible, or at least very difficult, to secure perfect order after the child has become accustomed to bad habits in school.

Watch the very beginnings of anything wrong, and do not allow it to become a habit. If the first year's work is right, the later work will be pleasure, not torture.—*Jessie E. Barber in Primary Education.*

EDUCATIONAL OPINION.

It may be said, generally, that Arnold's (Thomas) conception of a school was that it should be first of all a place for the formation of character, and, next, a place for learning and study, as a means for the attainment of this higher end. Discipline and guidance were in his view still more prominently the business of a schoolmaster than the impartation of knowledge. The motives he sought to develop and strengthen were the love of righteousness, the admiration of valor, genius, and patriotism, the sense of duty to others, and the scorn of what was little, untruthful, mean, or base in daily action.—*Fitch's Thomas and Matthew Arnold.*

A child naturally loves study—loves to learn something new—is hungry for knowledge. If he is not—if he hates study, he has been taught to hate it and is therefore intellectually sick. A poor appetite for knowledge is a bad mental symptom just as a poor appetite for food is a bad physical sympton. "To scold a child for 'gagging,'" at a lesson is just as bad as to rebuke a child for being sick at the stomach.

When things go wrong in the schoolroom, the why is probably behind the desk on the teacher's platform.—*Alice Freeman Palmer.*

Too many teachers draw their ideas of education from the deep wells of their imagination or from the shallow pools of their experience.—*Superintendent Benjamin Baker*, Newport, R. I.

You must look at pictures studiously, earnestly, honestly. It will be years before you come to a full appreciation of art, but when at last you have it, you will be possessed of one of the purest, loftiest, and most ennobling pleasures that the civilized world can offer.—*John C. Van Dyke.*

The teacher needs not only exactness of method, but spontaneity of life ; not knowledge alone, but power ; not information only, but inspiration. Above all, he must possess that power and enthusiasm of heart and mind that "shall transmit knowledge into wisdom, ethics into goodness of life, and noble thoughts and purposes into a will power used in just, and pure, and noble living."—*Superintendent R. B. Dudgeon*, Madison, Wis.

Sir John Gorst, M. P., speaking recently at Bristol, said the promotion of technical education was confronted by two obstacles—the backward condition of elementary education and the want of organization in the provision of secondary education. The improvement of

the organization of secondary schools was really a matter for the people themselves.

There is always danger of teaching too much of mathematical geography at altogether too early an age. The mind should be mature and strong to picture in the mind even so simple a combination as the plane of the earth's orbit, the plane of the equator extended in the heavens, or the pole of the earth and the axis of the plane of the orbit. How many teachers actually have a mental picture of these?—*N. E. Journal of Education.*

One of the greatest faults in modern education is that everything is made of equal importance. In language work, for instance, the punctuation, capitalization, etc., are made of equal value with the English used.—*Dr. Jas. M. Milne.*

Examinations are a guide to the student, with respect to the thoroughness of his work and the extent and accuracy of his acquirements, and a guarantee to the public of adequate scholarship.—*Hon. G. W. Ross, LL.D.*, Minister of Education, Province of Ontario.

THE 'ROUND TABLE TALKS

BETWEEN EDITORS AND READERS.

A. C. S.—Are we to have no leap-year until 1904?

There is a touch of pathos in this question, coming from a lady teacher. No, we shall have no leap-year until 1904. The ordinary rule, that if a year is divisible by 4 without a remainder it is a leap-year, does not apply to 1900, nor did it apply to the years 1800, or 1700. But the year 1600 was a leap-year, and so will 2000 be a leap-year. The reason for this is not difficult to understand. By reckoning $365\frac{1}{4}$ days to every civil year, we are going too fast by a little over 11 minutes in each year, as the true solar year is 365 days 5 hours 48 minutes and 46 seconds long. This error amounts to about three days in 400 years, hence three days have to be taken out in four centuries to make the proper correction, according to the Gregorian calendar. The century years divisible by 400 are leap-years, as 1600 and 2000. Those not exactly divisible by 400, as 1700, 1800 and 1900 are ordinary years of 365 days each.

L. D.—I have received your bill of $——. I did not know that the REVIEW was coming to ———, my former address, and I have only received one or two copies during the year. Must I pay it?

That depends upon yourself. You should read the notice on the first page. The REVIEW is sent to subscribers regularly until it is ordered discontinued. That is the usual custom among newspapers, unless there is a definite arrangement at the time of subscribing, and it is satisfactory. The subscriber is relieved from any trouble of renewing when perhaps other matters are occupying his attention. When the paper is no longer wanted a notice of discontinuance on a postal is sufficient to stop it, provided all arrearages are paid.

X. Y. Z.—Parse the underlined words in the following:

(*a*) If once owning herself a praedial servant, she would be sensible that this confession extended by probability in the hearer's thoughts to the *having incurred* indignities of this horrible kind.

(*b*) We utterly reject the legend *as* a *fact*.

(*c*) Under the keel, nine fathoms *deep*, the spirit slid.

(*a*) A past-participle: "to (herself) having incurred." Its adjectival use may be seen by turning it into the passive form or using it with a relative, as indignities *having been incurred*, or *which have been incurred* (by herself). (*b*) *As* is an adverbial conjunction. Supplying the necessary ellipsis the meaning is plain: (if we are asked to consider it in the light of) a fact. The construction of *fact* is plain when we supply the ellipsis. (*c*) An adjective used in its adverbial sense—*in depth*, or *to the depth of*.

C. R.—Kindly answer the following:

(*a*) In how many ways may the word "like" be used?

(*b*) In the following sentence—

> "Haroun, who felt that on a soul *like* this
> The mightiest vengeance could but fall amiss,
> Now deigned to smile, *as* one great lord of fate
> Might smile upon another half *as* great."

What parts of speech are "like," "as," and "as"?

(*a*) As an adjective, noun, adverb, verb.

(*b*) Here it is an adjective with *to* understood; *as*, a conjunction; *as*, an adverb.

J. S. K.—Perhaps you will think this explanation, which seems to be more plain and reasonable than that given in Part II. Arithmetic, worthy of a corner in the REVIEW:

To reduce a fraction to an equal fraction having a different denominator.

E. G.—Reduce $\frac{3}{8}$ to fraction having 24 for a denominator.

$$1 = \frac{8}{8}$$
$$1 = \frac{2}{2}\frac{4}{4}$$
$$\frac{8}{8} = \frac{2}{2}\frac{4}{4}$$
$$\frac{1}{8} = \frac{3}{2}\frac{}{4}$$
$$\frac{3}{8} = \frac{9}{2}\frac{}{4}.$$—Ans.

J. A. B.—(1) What is "standard time"?

Since the line representing the equator on a parallel of latitude is divided into 360° and the day into 24 hours, every 15° represents the difference of an hour in time. The meridian at Greenwich being taken as the zero line on the centre of the zero zone, the United States is divided into four zones, in which the time is designated as follows: Eastern time ($67\frac{1}{2}$° to $82\frac{1}{2}$° west longitude), Central time ($82\frac{1}{2}$° to $97\frac{1}{2}$°), Mountain time

($97\frac{1}{2}^\circ$ to $112\frac{1}{2}^\circ$), and Pacific time ($112\frac{1}{2}^\circ$ to $127\frac{1}{2}^\circ$). Within each of these zones the time changes by one hour.

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(2) Show that Euclid I. 11, is a particular case of I. 9.

In proposition 9 we draw a straight line making equal angles with the two straight lines that meet at the angular point. In proposition 11 consider the given point to correspond to the angular point in 9 and the two lines making one and the same straight line to meet there. Then the straight line which we draw from the given point in 11 makes two equal angles as in 9.

J. A. P.—(1) What quantities of coffee, with 23 and 35 cents, respectively, per pound, must be mixed together so that the compound may be sold for 30 cents per pound?

By selling for 30 cents what cost 23, the gain would be 7 cents on a pound, or 1 cent on $\frac{1}{7}$ of a pound. By selling at 30 cents what cost 35 the loss would be 5 cents on a pound, or 1 cent on $\frac{1}{5}$ of a pound. To make the loss balance the gain there must be $\frac{1}{7}$ pound at 23 cents and $\frac{1}{5}$ pound at 35 cents. If it is required to have whole numbers, multiply by the L. C. M. of 7 and 5, which is 35, and the result will be 5 pounds at 23 cents and 7 pounds at 35 cents.

Note.—The next exercise is solved in a similar manner.

C. S. B.—I notice in the EDUCATIONAL REVIEW of this month a solution of No. 18, page 86, of Eaton's Practical Mathematics. With your consent, I will submit this solution of the same problem for the consideration of your readers:

Let A denote the top peg, B and C the lateral pegs, and D the point of attachment of weight—5 lbs. The weight—5 lbs.—is the resultant of the tensions along DB and DC at angle 60°. Hence find tensions along DB and DC to be each $\frac{5}{\sqrt{3}}$ lbs. The tensions along AB, AC, DB and DC are equal to one another. Now, the pressure on pegs B and C will each be the resultant of two equal tensions, $\frac{5}{\sqrt{3}}$ lbs., acting at an angle of 120°. Hence the pressures on B and C are each $\frac{5}{\sqrt{3}}$ lbs.

Again, the pressure on A is the resultant of equal tensions, $\frac{5}{\sqrt{3}}$ lbs., acting at angle 60°. Hence pressure on A is 5 lbs.

This solution, you will observe, is different from the one you gave. I have never attempted to verify it experimentally, but theoretically it seems to me to be a sound one.

Kindly let me have your opinion, and oblige.

Shelburne, N. S.

[*Note.*—The solution by C. S. B. is correct. In the solution given in the February number of the REVIEW 5 was inadvertently used instead of $\frac{5}{2}$. Of course, the base of the equilateral triangle is bisected by the perpendicular upon it. The statement in the text-book is inaccurate. The tension of the cord, and not the pressure, is the unknown quantity sought. This tension is shown by C. S. B.. to be $\frac{5}{3}\sqrt{3}$, and not $\frac{10}{3}\sqrt{3}$. The pressure, or inward thrust, on the lateral pegs is also $\frac{5}{3}\sqrt{3}$, and of the top peg it is 5.—MATH. EDITOR.]

SUBSCRIBER.—Is it natural, or a freak of nature? An acacia plant was got from a hot-house in Truro in the spring of 1895. It developed the ordinary twice pinnate leaf until it was about two feet high, when it got slightly chilled, after which it began to send out an occasional single-bladed leaf about the size and shape of a willow leaf, being parallel-veined and arranged on the stem vertically instead of horizontally to the earth. A few of the leaves are half one kind and half the other, the parallel-veined half-blade being attached to the stem. The blades have increased so that they nearly equal in number the natural leaves, and are found on the lateral branches down to the foot-stalk. I can find no person who has ever seen or heard of anything like it, and would be pleased to hear from any person who has any knowledge of such botanical curiosities.

Kings Co., N. S.

The genus Acacia is very large, including 420 species. Some live in shady, sub-tropical forests, and possess pinnately-compound leaves; others live on very dry, open plains, and bear only what seem to be entire simple leaves set vertically on the stem, but which in reality are the flattened petioles of compound leaves from which the blades are gone. The latter species are believed to have been derived in time from the former. The reason for the vertical position and absence of numerous blades is found in economy of the precious water, for thus not only do the leaves expose less surface to the sun, but they present to it only the edge instead of the face during the time of day when it is strongest and hence most powerful in evaporating water from the plant. Between the kinds with compound leaves and those with petioles every gradation exists, and in some species all the intermediate kinds occur upon one plant. In others the compound leaves are made only while the plant is young, and as it grows older it gradually begins to make the flattened petioles, and finally makes no more new blades. The plant mentioned by our correspondent is evidently one of this kind, and the chill it experienced had nothing to do with the case. The different species showing the gradations between the kinds are common in the greenhouses attached to botanic gardens. Some of the species bear only one or two compound leaves in the seedling, and only flattened petioles thereafter; and such cases are of much interest to botanists as examples of the repetition of phylogeny or race history, in ontogeny or the development of the individual, a subject of importance in connection with the study of evolution. W. F. G.

K.—(1) It is said that at the equinoxes day and night are equal at all places, each day being twelve hours long. Also, that at the poles the year is divided into two periods, six months' day and six months' night. Explain these contradictory statements.

If the sun *remained* directly over the equator the days and nights *would* be equal all over the world, excepting that the sun, being larger than the earth, there

would be perpetual day for some space around the poles. But the sun is continually changing its relation to the axis of the earth; therefore the relative lengths of day and night are also continually changing, As a matter of fact, the day at the poles is a little longer than six months, on account of the sun's diameter being so much larger than the earth's diameter, and on account of the refraction of the sun's rays in passing through our atmosphere.

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(2) What advantage in respect to the sun's rays has the northern hemisphere over the southern, and why?

The sun is north of the equator from 21st March to 22nd of September — 185 days. It is south of the equator from 22nd of September to 21st March — 180 days. The earth in its aphelion has a longer course to travel than when in perihelion. It also travels more slowly in aphelion. The greater length of the northern summer more than counterbalances the disadvantage of the greater distance from the sun.

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(3) At what parallel of latitude will the sun set on the longest day of the year and, without any intervening night, rise again in the same part of the horizon?

About $66\frac{1}{2}$ degrees from the equator. When the sun is at the tropics it will shine $23\frac{1}{2}$ degrees beyond the poles. The further one goes north or south the more oblique does the sun's course seem to become, dipping each day less and less below the horizon, until at last it seems to go round and round the horizon without any night.

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(4) A man arrives at the railway station nearest to his house $1\frac{1}{2}$ hours before the time at which he had ordered his carriage to meet him. He sets out at once to walk at the rate of 4 miles an hour, and, meeting his carriage when it had travelled 8 miles, reaches home exactly one hour earlier than he had originally expected. How far is the house from the station, and at what rate was his carriage driven?

Let x = miles from station to house, and y the miles per hour which the horse travels. Then the man travels $(x - 8)$ miles.

If the horse had gone the whole distance and back the time required would have been $\frac{2x}{y}$ hrs. But the time for the 8 miles and back was $\frac{16}{y}$ hrs. Therefore $\frac{2x}{y} - \frac{16}{y} = 1$ hr., the time gained.

Again, by walking $(x - 8)$ miles he was half an hour longer on the road than if he had ridden that distance. Therefore $\frac{x-8}{4} - \frac{x-8}{y} = \frac{1}{2}$ From these two equations x is found = 12, and $y = 8$.

SCHOOL AND COLLEGE.

Miss Flora Boyd, teacher at Bay Road, Charlotte County, by means of a very successful school entertainment, has raised enough to provide an ample supply of slate blackboard for her schoolroom.

The school at Albert Mines, Albert Co., W. C. Jonah, teacher, raised the sum of $80 for school purposes, to be expended in blackboards and other apparatus. This has recently been made a graded school.

Not to be outdone by the Upper Bayside school, Miss Blanche Rigby, teacher at Lower Bayside, Charlotte County, has, by means of a concert, provided her school with a fine flag, and made a beginning toward a school library.

Miss Grace Wilson, teacher at Scotch Ridge, Charlotte Co., has recently provided her school with an excellent terrestrial globe.

During the remainder of March and the first part of April, Inspector Morse will be engaged in the work of inspection in the Annapolis Valley. During the last half of April he expects to visit the schools on Digby Neck, and on Long and Briar Islands, N. S.

Miss Maud Gibson, teacher at Mouth Nerepis, Westfield, Kings County, has, by means of a school concert, been able to procure for her school a fine globe and some slate blackboards.

Slate blackboard surface has been purchased recently by Mahogany, South Bay, and Otter Lake schools, St. John Co.

Miss Mary McLeod, teacher at Silver Falls, St. John Co., has provided her school, by means of an entertainment, with slate blackboard surface.

Principal H. B. Hogg, who took charge of Digby County Academy at the beginning of the current school year, has been successful in founding a school library and a gymnasium in connection with the public school system of that town. The library is already stocked with Chambers' Encyclopædia, and with the "Encyclopædia of English Literature," together with quite a collection of monographs and magazines. The gymnasium is fairly well provided with apparatus, to which will be added more equipment in the near future. Funds for the fore going purposes have been largely provided by means of public entertainments furnished by the pupils of the town schools, supervised and directed by Principal Hogg and his staff of teachers.

A gentleman interested in a children's home in Los Angeles relates to us the following incident: He had just succeeded in finding a home for a little boy of three and a half years old, but, before taking him to his new home, it was thought best to exchange his dress for trousers. When almost at his destination, his childish strength was exhausted, and he complained that he was very tired. The gentleman, to encourage him, told him that the only difference between them now since he had discarded dresses was that one was a big man and the other a little man, and that men must not grow tired so easily. After a few moments' silence, in which the little one's steps grew still more dragging, he exclaimed, "Well, take my pants off and carry me!"—*Child Study Monthly.*

RECENT BOOKS.

Canadians generally, and New Brunswickers in particular, are sure to find Prof. Davidson's book[1] an interesting one. It is written by one who has the happy art of writing clearly and interestingly. Its illustrations are chiefly Canadian. Three chapters contain very valuable statistical matter relating to migration of labor and its effect on wages in Canada, and to the methods of the payment of wages, particularly the truck system of the mining companies of Great Britain. Hitherto the trained economists of Canada have done but little towards studying the economic facts of this country. The banking system, however, has been fairly well discussed. The Ontario government, as well as the Dominion, has done something towards accumulating valuable economic data. Of course our public reports are valuable; but hitherto this Yukon of economic wealth has hardly been explored. Dr. Davidson has set an excellent example. We hope he will place us under an additional obligation by publishing his studies on the history of Britain's commercial relations with her colonies.

The wages question, with the possible exceptions of rent and prices, has been more thoroughly threshed out by economists than any other. One expects to find new books on the subject more or less uninteresting restatements in a feebler style of old conclusions. Here is a book, fresh, suggestive and really illuminating. The success of Dr. Davidson's treatment is due in great measure to his determination to consider the question historically. He has skilfully separated what is permanently valuable from the accidental in each of the three historic theories. This has enabled him to reconcile them to a certain extent. The Bargain Theory is the result.

Space does not permit a technical discussion of the theory. One, however, cannot refrain from saying that Dr. Davidson's theory appeals to common sense and avoids the dangerous extremes of some of its predecessors. Briefly, though a bald statement without its setting robs the theory of much of its suggestiveness. The Bargain Theory says: "The price of labor is determined somewhere between two estimates placed upon it—the estimate of the employer and the estimate of the laborer." "Between these two estimates the value of labor is determined by the forces by which all exchanges are effected." Labor as a commodity, however, differs from all other commodities in several important particulars; and it is because of these differences that economists have wandered in quest of strange theories. Perhaps one of the best parts of the book is the clear analysis of these differences.

Dr. Davidson has been very happy in naming the different theories. A name is very frequently as suggestive as pages of explanation. The name of his own theory is nearly as potent as his arguments. The subsistence theory has been very happily characterized. The name does not prejudice the theory like the old name "Iron Law," or "Living Wage." The least happy is the "Productivity of Labor," and yet it is quite descriptive.

W. C. MURRAY.

If anything should give Canadians a pardonable pride and arouse their patriotism it is the progress that this country is making, not only in material, but in intellectual advancement. Not only does its literary activity find an outlet in poetry and romance, but in historical research there is a growing spirit of enquiry to delve anew into the rich history of the past, as well as to seize upon the materials at hand that possess a more living interest, and that are daily giving promise of a fuller national development.

The illustrated historical review of Canada during the Victorian Era[1], from the pen of that distinguished Canadian, Dr. Bourinot, cannot fail to impress one with our intellectual as well as material progress. With judgment and discretion he has singled out men and events, and, within a compass of less than forty pages, he has presented the salient features of sixty years of progress. The illustrations are admirable, both in choice and execution.

The N. B. Historical Society has just issued Part 3 of its volume of collections[2]. This contains an article on The Medical Men of St. John in Its First Half Century, by the late Joseph W. Lawrence; Selections from the Papers and Correspondence of Jas. White, 1762-1783, by Rev. W. O. Raymond; and Letters and Documents relating to the History and Settlement of the Island of Grand Manan, by Jonas Howe. These papers are very valuable, and throw much light on the early history of New Brunswick. This society is to be congratulated on the work that it is doing in historical research.

Mr. R. E. Gosnell in his admirable year book[3] has taken the tide at the flood. He has presented a mass of information with regard to British Columbia that he must have foreseen would be required, if not this year, at least in the near future. Beginning with a historical review, extending over 300 years back, he ends with a discussion of the available routes to the Klondyke, with items of outfit and expenses. In the 500 closely printed pages and illustrations there is evidently nothing omitted that one would expect to find in such a book. The development in that province of its history, laws, education, trade, railways, forest and mineral wealth, its fisheries, agriculture, are fully given, and must be of the greatest advantage to those who are seeking information about the west. The scientific reader will find much of interest in the lists of plants, fishes, birds, mammals, etc., given in this comprehensive work.

Prof. Penhallow in his Review of Canadian Botany[4] has performed a service that will be gratefully appreciated by every botanist in the Dominion. With industry and care he has gathered together the scattered fragments relating to botanical research in the early part of the century, and incorporated them with what has since been done in this science. It forms an excellent starting-point for and should stimulate further investigation.

Those who were fortunate enough to obtain a copy of the Hand-Book of Canada[5], prepared for the information of the British Association for the Advancement of Science, are in possession of an excellent compendium on our resources and institutions, compiled by Director G. M. Dawson, W. Bell Dawson, Prof. R. Ramsay Wright, Prof. J. Macoun, Dr. Bourinot, Hon. G. W. Ross, Sir Donald Smith, Dr. Saunders, and others.

H.

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[1] THE BARGAIN THEORY OF WAGES. By John Davidson, M. A., D. Phil. New York and London. G. P. Putnam's Sons; pp. v, 319.

[1] CANADA DURING THE VICTORIAN ERA. A Historical Review, illustrated. By J. G. Bourinot, C. M. G., LL. D., D. C. L., Lit. D. (Laval). Ottawa, 1897.

[2] COLLECTIONS OF THE NEW BRUNSWICK HISTORICAL SOCIETY, Vol. I., No. 3. St. John, N. B., 1897.

[3] THE YEAR-BOOK OF BRITISH COLUMBIA, by R. E. Gosnell, Librarian Legislative Assembly and Secretary Bureau Statistics. Victoria, B. C., 1897.

[4] A REVIEW OF CANADIAN BOTANY FROM 1800 to 1895, by D. P. Penhallow, D. Sc., McGill University. From the Transactions of the Royal Society of Canada. Ottawa. 1897.

[5] HAND-BOOK OF CANADA, published by the Local Executive of the British Association. Toronto, 1897.

OFFICIAL HAND-BOOK OF THE DOMINION OF CANADA. Government Printing Bureau. Ottawa, 1897.

[Other Reviews crowded out will appear in April.]

The March Magazines.

The *Canadian Magazine* for March is a superior number, full of excellent reading matter and illustrations. Dr. Bourinot's fifth paper on The Makers of the Dominion of Canada, deals with the Founders of Nova Scotia, and is in the writer's best vein. Mr. J. Vroom, in a brief but interesting article, tells of the Fenian raid on the St. Croix....The *Atlantic Monthly* opens with a brilliant paper on English as against French Literature....In the *Popular Science Monthly* there are several articles of great interest, educational and scientific, among them Physical Training in the Colleges, Sketch and portrait of Sir Joseph Lister, etc....The *Century* is a Klondyke number, and has two interesting pictorial articles, illustrative of the adventurous life of the Voyageur to that Arctic El Dorado. ....The *Forum* represents probably the tone of the United States press and people in its article, Our Duty to Cuba, by Senator H. D. Money....In *Littell's Living Age* for February 26th there is a suggestive and readable sketch on The Higher Education of Women in Russia.

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The Forge in the Forest.	An Acadian Romance. By Chas. G. D. Roberts. Paper, 60c. Cloth, $1.25.
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Official Notices.

I. DEPARTMENTAL EXAMINATIONS.

(*a*) *Closing Examinations for License.*—The Closing Examinations for License, and for Advance of Class, will be held at the Normal School, Fredericton, and at the Grammar School buildings in St. John and Chatham, beginning on Tuesday the 14th day of June, 1898.

The English Literature required for First Class candidates is Shakespeare's Henry V., and Byron's Childe Harold, Canto IV.

(*b*) *Normal School Entrance Examinations and Preliminary Examinations for Advance of Class.*—These examinations will be held at the usual stations throughout the Province, beginning on Tuesday, July 5th, 1898, at 9 o'clock a. m.

Candidates are required to give notice to the Inspector within whose inspectoral district they wish to be examined not later than the 24th day of May. A fee of one dollar must be sent to the Inspector with the application.

(*c*) *Junior Leaving Examinations.*—Held at the same time and stations as the Entrance examinations.

The Junior Leaving Examinations are based upon the requirements of the course of study for Grammar and High Schools as given in the syllabus for Grades IX and X, and will include the following subjects: English Grammar and Analysis; English Composition and Literature; Arithmetic and Book-keeping; Algebra and Geometry; History and Geography; Botany; Physiology and Hygiene; and any *two* of the following: Latin, Greek, French, Chemistry, Physics. (Nine papers in all)

The pupils of any school in the province are eligible for admission to this examination. Diplomas are granted to successful candidates.

Fee of Two Dollars to be sent with application to Inspector, not later than the 24th of May.

The English Literature for the Junior Leaving Examinations will be Select Poems of Goldsmith, Wordsworth and Scott, as found in collection published by W. J. Gage Co., 1897.

(*d*) *University Matriculation Examinations*—Held at the same time and stations as Entrance examinations. Application to be made to Inspector, with fee of two dollars, not later than May 24th.

The Junior Matriculation Examinations are based on the requirements for matriculation in the University of New Brunswick, as laid down in the University calendar. (Candidates will receive a calendar upon application to the Chancellor of the University, or to the Education Office.)

The English Literature subjects are, Shakespeare, Henry V. or Richard II., Rolfe Edition, and Byron's Childe Harold, Canto IV., Gage, Toronto, 1897, *or* Selections from Tennyson, Gage, Toronto, 1895.

☞ The Department will supply the necessary stationery to the candidates at the July examinations, and all answers must be written upon the paper supplied by the Supervising Examiners.

In the June examinations the candidates will supply their own stationery.

☞ Examinations for Superior School License will be held both at the June and July examinations. The First Book of Cæsar's Gallic War will be required in both cases.

Forms of application for the July examinations will be sent to candidates upon application to the Inspectors, or to the Education office.

(*e*) *High School Entrance Examinations.*—These examinations will be held at the several Grammar and other High Schools, beginning on Wednesday, June 15th, at 9 o'clock a. m. Under the provisions of the Regulation passed by the Board of Education in April 1896, question papers will be provided by the department. The Principals of the Grammar and High Schools are requested to notify the Chief Superintendent not later than June 1st, as to the probable number of candidates

II. THIRD CLASS TEACHERS.

Regulation 33. Employment of Third Class Teachers.—Add to Regulation 33 the following Sections:

6 Third Class Teachers shall not be employed (except as class room assistants) in Districts having an assessable valuation of fifteen thousand dollars or upwards, unless by the written consent of the Chief Superintendent.

7. Third Class Teachers who have received License after attendance at the French Department of the Normal School, and who have not subsequently passed through the English Department of the Normal School, shall be employed only in Acadian Districts or in Districts in which the French language is the language in common use by a majority of the people, unless by the written consent of the Chief Superintendent; and no such teacher shall be employed in any District, whether such District is Acadian or French speaking as aforesaid, or otherwise, if the Chief Superintendent shall notify the Trustees of such District that no such teacher shall be employed therein; provided that if such teacher is engaged under contract entered into with the District prior to the giving of such notice the employment of such teacher shall continue only to the end of the term current when such notice is given, and shall then terminate, unless previously terminated by the terms of the contract itself.

J. R. INCH,
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THE University of Mount Allison College offers to students, whether desiring to take a full under-graduate course or a partial course limited to special studies, advantages unsurpassed in the Maritime Provinces. The brilliant record of Mount Allison men at some of the leading Universities of England, Scotland, Germany and United States, as well as the success of her under-graduates in competitive examinations elsewhere, establish beyond question the thoroughness and comprehensiveness of the education received at this Unversity.

A Gymnasium erected and furnished with all modern appliances for physical development, during the past year, has proved to be an important auxiliary to the educational work. Further efforts will be made during the present year to increase the efficiency of the Institution and to add to the comfort of students.

The new University Residence construcued and furnished with every provision for comfort, convenience and health, is now ready for occupation.

Winter Session, 1898, begins January 6th.

Mount Allison Ladies' College, Owens Art Institution and Conservatory of Music.

REV. B. C. BORDEN, D. D., PRINCIPAL.

OVER 30 years of progressive Educational work have given this Institution an unrivalled position in the public confidence. Instruction is imparted on subjects ranging from the primary English branches through the whole University Curriculum to the Degree of B.A. Young ladies studying for the purpose of qualifying themselves to teach may here combine the accomplishments with the thorough drill necessary to their profession.

Elocution is taught by one of the most accomplished graduates of the Boston School of Oratory. THE CONSERVATORY OF MUSIC is under the direction of a strong staff of experienced teachers, representing the best conservatories and teachers on both sides of the Atlantic. The courses of instruction embrace instrumental music (Piano-forte, Pipe Organ and Violin), Vocal Culture, Class Singing, Harmony, Analysis, Composition, etc. The Fine Arts Department is under the direction of Prof. John Hammond, R.C.A., an exhibitor in the Paris Salon; Royal Academy, London; National Academy of Design, New York, etc. Art students have the inspiration which comes with constant contact with the splendid paintings which constitute the Owen's gallery.

Mount Allison Wesleyan Academy.

JAMES M. PALMER, M. A., HEAD MASTER.

NO Institution of learning in the country has had a more successful history and none is more worthy of patronage for the future. Many of the most prominent men now in professional, commercial and political life in Canada, and in other lands, had their training at Mount Allison Academy. The arrangements for the future are such as will guarantee a continuation and extension of the efficiency of the Institution. A thorough English and Commercial Education is imparted, and students are prepared for College Matriculation and for Civil Service examination. If desirable, students can take, in addition to their work in the Academy, one or more classes and lectures in College. Every care is given to the private interests of the boys, so as to ensure their comfort and happiness.

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EXHIBITIONS AND SCHOLARSHIPS **(value from $90 to $125)** will be offered in competition at the opening of the Session, September, 1897. Copies of the Circular giving full particulars of subjects required, etc., can be obtained on application to -:- -:- -:-

(Address McGill College, Montreal.)

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For Calendar giving full information, write to **A. COHOON, Sec. Ex. Committee, Wolfville, N. S.**

University of New Brunswick.

Full Information concerning these Departments is given in the University Calendar Copies of which may be Obtained from the Undersigned.

The next Academic year, '98-'99, begins September 29th, 1898 when the Scholarships for the Counties of Restigouche, Gloucester, Northumberland, Kent, Westmorland, Albert, Charlotte, St. John, Kings, Queens, Sunbury, York, Carleton and Victoria will be vacant.

The Departments of **CIVIL** and **ELECTRICAL ENGINEERING** are now open to properly qualified students.

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ON and after Monday, the 4th October, 1897, the trains of this Railway will run daily, [Sunday excepted] as follows :

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Express for Halifax,..... 13.10
Express for Sussex,..... 16.35
Express for Quebec and Montreal,.....17 10

Passengers from St. John for Quebec and Montreal take through Sleeping Car at Moncton at 20.10 o'clock.

TRAINS WILL ARRIVE AT ST. JOHN.

Express from Sussex,..... 8.30
Express from Montreal and Quebec, (Monday excepted)..... 10.30
Express from Moncton, daily, ... 10.30
Express from Halifax,..... 16.00
Express from Halifax, Pictou and Camp'ton 18.30
Accommodation from Moncton... ..... 24.20

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All Trains are run by Eastern Standard Time.

Railway Office, Moncton, N. B.. 30th September, 1897.

D. POTTINGER, General Manager.

Harvard Summer School.

The authorities at Harvard are gradually increasing the courses offered in their Summer School, and widening the scope of the instruction. During the early years of the school's existence only a few elementary courses in science were taught, but the list of courses to be given in 1898 contains the names of thirty-eight courses in arts and sciences, embracing almost all the subjects taught at the university. Modern languages are represented, as well as the Classics, History and Civil Government, Psychology, Pedagogy, Mathematics, Topographical Surveying, and the whole range of sciences.

The school has become very popular with the more enterprising teachers, who go there for inspiration and to learn the Harvard methods. In the list of 717 students who were registered there last year, are the names of several professors and a large number of superintendents of schools and principals of high schools and grammar schools.

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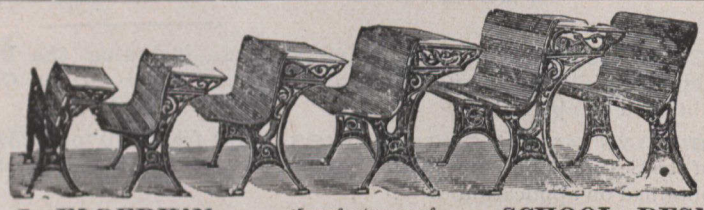

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