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## CONTENTS OF THIS NUMBER.

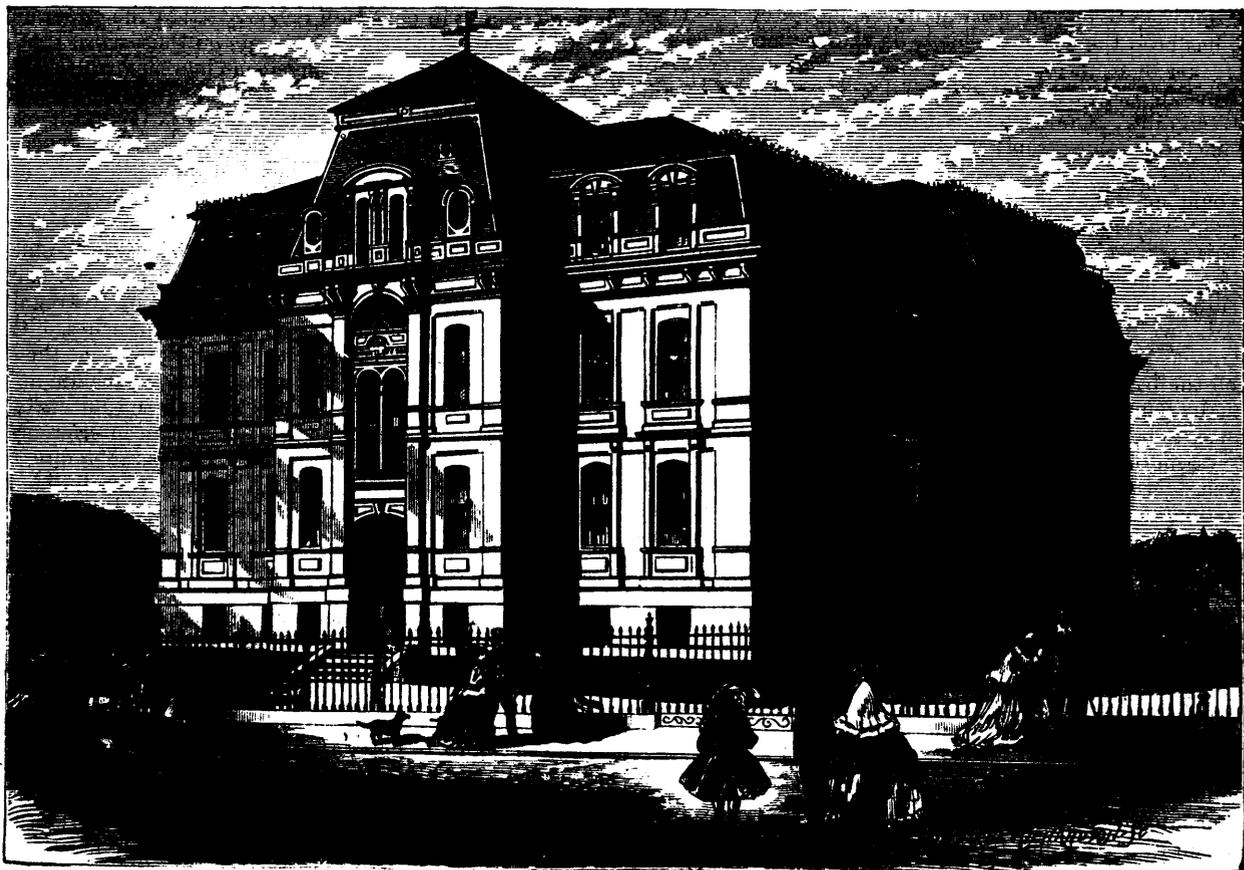
I. HIGH SCHOOLS.—(1) Condition of our High Schools. (2) Suggestions for the Improvement of our High Schools. (3) System of Payment by Results..	17
II. IMPROVEMENT OF SCHOOL HOUSE ARCHITECTURE. (2) English Hints on School Building. (3) Rules in Planning a School .....	23
III. PAPERS ON SEATING AND VENTILATION.—(1) Mistake in Seating Children in a School-Room. (2) Simplest Plan of Ventilating School-Rooms. (3) Necessity for Teaching the Elements of Natural Science; Warmth and Ventilation. (4) Plant Trees .....	26
IV. PAPERS ON PRACTICAL EDUCATION.—(1) Teaching from Real Objects. (2) Teachers' Rules. (3) Increase of Technical Education in Germany. (4) Manners.....	27
V. MONTHLY REPORT ON METEOROLOGY OF THE PROVINCE OF ONTARIO .....	28
VI. HIGH SCHOOL ATTENDANCE AND APPORTIONMENT FOR 1872 .....	29
VII. MATHEMATICAL DEPARTMENT.....	30
VIII. EDUCATIONAL INTELLIGENCE.....	32
IX. DEPARTMENTAL NOTICES .....	32

## CONDITION OF OUR HIGH SCHOOLS.

The anomalous and unsatisfactory condition of our High Schools has within the last two or three years called forth a good deal of discussion and unfriendly criticism. Several articles have recently appeared in the newspapers and other publications on the subject. But as there are several facts connected with the history and proceedings of these schools, and many features of their present condition that have been but imperfectly touched upon or illustrated, we purpose to supply these omissions in as brief a manner as possible.

## OUR COMMON INTEREST IN THE PROSPERITY OF HIGH AND PUBLIC SCHOOLS.

We have all a common interest in the prosperity and success of our Educational Institutions—in our High as well as in our Public Schools; and no true friends of these institutions will be disposed to absolve those from blame who have allowed private



THE SHURTLEFF GRAMMAR SCHOOL HOUSE, BOSTON.

views or personal interests to interpose barriers to the healthy development and free expansion of the High any more than the Public School, department of our educational system.

#### THE EDUCATIONAL ANACHRONISM OF 1807.

The early promoters of education in this Province—though it was with a laudable zeal they acted—perpetrated a memorable anachronism, the effects of which, on the character and popularity of our Grammar Schools, it has taken years to moderate and in part to remove. Even now we suffer from the untoward bias which that educational mistake gave to our High Schools as “Class Schools,” in after years.

In 1807, or nine years before a single public elementary school of any kind (except some small scattered private schools) existed in the country as a feeder to a higher class of schools, the Legislature was induced to authorize the establishment of “District” Grammar Schools in different parts of the Province. These schools under the circumstances of their establishment, necessarily partook somewhat of the character of class schools (as we have indicated); and, for that reason, having no hold on public sympathy or support, they were never popular, except in a few individual cases. They continued to exist without much change or improvement in their condition for years; nor were there any efforts made to popularize them until 1853. In that year legislation took place, by which their character was somewhat improved, their condition elevated, and they themselves were incorporated into our educational system. Owing, however, to their continued unpopularity they were not well sustained, and the county councils declined, except in a few cases, to support them. Various plans were from time to time adopted by their friends to keep them in funds, but they maintained a bare existence, and struggled on for years in poverty and consequent inefficiency.

#### CHARACTER OF THE EFFORTS MADE TO SUSTAIN THE HIGH SCHOOLS.

One fatal cause, which has operated of late years to paralyse the healthful growth and natural development of the High Schools, has been the anxiety, chiefly on the part of the friends of the weaker ones, to force into them the greatest number of pupils, so as individually to absorb the largest amount of the Legislative grant. The friends of the High Schools generally (with some honourable exceptions) quietly laboured with increased earnestness in this direction, in the hope that their neighbours would not take the alarm and outstrip them, and that a larger grant would be the reward of their increased exertions. But in this they were disappointed. The vigilance of the rival schools for an increased grant was also aroused; and the numbers of ill-prepared pupils which were crowded into these rival schools also were found to have so far exceeded what was anticipated, that the enlarged Parliamentary grant, (when apportioned on the basis of the average attendance at each school), was actually found in individual cases, even with their increased attendance, to be less than what the school had received under the old system of apportionment which had been so strongly denounced. Much chagrin was felt at the result, and much unjust odium fell upon the Education Department, on the ground, as was stated, that the grant was not fairly and equitably divided by it. But for this reproach there was not a shadow of reason. In the scramble for the grant, the less unscrupulous were generally the winners, and the Department was powerless to prevent the unseemly strife, although it was held responsible for the alleged losses to individual schools.\*

#### OTHER STEPS TAKEN TO INCREASE THE GRANTS TO INDIVIDUAL SCHOOLS.

In carrying out this suicidal policy for increasing the funds of individual schools, the first step taken was to attack the classical character and standard of the High Schools; the next was to assail as a grievance the policy of the exclusion of girls from these schools. Both points were at length conceded.

The main purpose however for which these attacks were made having signally failed, others followed with more or less success; but the final step taken was to object to the supervision of the High School Inspectors over the admission of pupils to the schools.

This official supervision was urged to be an unjust interference with the schools themselves; and it was even held that it cast a slur upon the character and impartiality of the local examiners! At length even this necessary and wholesome restraint was removed. No one pretends to say that the character or standard of these schools has been improved by these successive assaults on the system—assaults made chiefly with a view to better the financial condition of the schools—or that the schools themselves, as “higher” educational institutions, have benefited by these downward changes. Combined (as these changes unfortunately have been) they have almost indefinitely postponed the reasonable chances for improvement in the schools for some time to come. The opinion of our best High School masters and educators, so far as we have heard them, unite in deprecating in the strongest terms the destructive character and demoralizing influences of these recent changes and levelling “ameliorations.”

#### OBJECTIONS TO THE HIGH SCHOOL PROGRAMME.

Again, objection has been made, and is still strongly urged to the programme itself, and to the necessity of employing a sufficient number of masters in the High Schools to carry out that programme.

To these objections we propose to reply separately.

First, as to the programme itself. This has been objected to as quite too “high” and exclusive in its character.

Those who urge these objections forget two things:

First, that High Schools are not, and cannot, under the statute, be made elementary schools, any more than can Colleges and Universities be legitimately made High Schools; and secondly, that it is the Legislature, and not the Council of Public Instruction, which has prescribed what subjects shall be exclusively taught in our High Schools,—that the programme is not an arbitrary dictation of subjects on the part of that Council, but is simply the mere arrangement, in a convenient and intelligible form, of the subjects which the Legislature itself has decided to be the essential subjects of study in High Schools. The Legislature has declared that in each High School there shall be taught “*all of the higher branches of a good English and commercial education.*” As an evidence of the flexibility of the High School law, the Legislature has further provided most liberally that some of these schools may be classical, and some of them English High Schools. No provision has, however, been made by the Legislature, nor authorized by the regulations for giving instruction in the elementary branches, either in “preparatory,” or other unauthorized classes in the High Schools. The Legislature has already made such ample provision in our Public Schools for teaching these subjects, that to teach them in the High Schools would be an interference with the province of the Public Schools. It has, therefore, wisely restricted the teaching in the High Schools to “*all the higher branches of a good English and Commercial Education,*” etc. The Council of Public Instruction, if it has erred at all, has done so in the direction rather of lowering than of maintaining the proper standard of High School instruction which the Legislature has set up. Thus for instance the Legislature has declared that in the High Schools shall be taught “*all the higher branches of an English and Commercial Education,*” &c. And yet the Council has fixed the standard of admission to High Schools quite below these “higher branches;” for it has permitted pupils to enter High Schools from a point midway between the 3rd and 4th (out of the six) classes which are prescribed for the Public Schools. Formerly pupils were only admitted to the High Schools after they had completed the public school programme, now they enter after they have only little more than half completed that programme. We have, therefore, the singular fact presented to us, that both Public and

\* For List of Apportionments to High Schools in 1872, see page 29.

High Schools are doing substantially the same work as laid down for the 4th, (in part) 5th and 6th classes of the Public Schools, and for the 1st, 2nd and 3rd classes of the High Schools!

As to the financial aspect of this question, and as to the way in which even the low standard of admission has been kept up in various High Schools, we shall refer further on.

#### OBJECTION AS TO THE NUMBER OF TEACHERS IN THE HIGH SCHOOLS.

Secondly, objection has been made to the number of teachers to be employed in the High Schools. On this point the Legislature has given no doubtful expression of its opinion. In the statute of 1853, as consolidated in 1859, it prescribed certain subjects of instruction for the High Schools, and declared that provision should be made for teaching these subjects according to a programme and general regulations prescribed by the Council of Public Instruction, and in a subsequent part of the Act, it specifically defined the duties of trustees, and distinctly declared that it should be "the duty of each High School Board [in making provision for teaching the prescribed subjects according to the programme and general regulation], to appoint the master and other teachers in such school, and to fix their salaries and prescribe their duties."

Each Board was also authorized "to appoint such other officers and servants as they shall judge expedient," &c.,—thus giving them a discretion in regard to the latter but none whatever in regard to "the masters and teachers," whom they were required by law to appoint in each High School.

It further requires them to apply "the moneys received" towards making up "the salaries of teachers" etc. (not "a teacher,") and it requires trustees, on the union of a High and Public School, to make "ample provision" for giving instruction to the pupils in the elementary English branches of the Public School department "by duly qualified English teachers." The Act of 1865 further provides for the settlement of all differences between trustees and "head masters and teachers" in regard to salary. As each school must have a head-master, (whose qualifications are prescribed), the "teachers" referred to in that statute must, in all cases, be the assistants provided for in the Act of 1859. Further, the Act of 1871 prescribed certain additional subjects to be taught in the High Schools, and provides that "the Council of Public Instruction shall have power to exempt any High School which shall not have the necessary funds to provide the necessary qualified teachers from the obligation to teach the German and French languages." Apart, therefore, from the provisions of the statute which (speaking of the duty of each High School Board) makes it obligatory on such Board to "appoint the master and other teachers in such school," the subjects themselves (which the Legislature has prescribed to be taught in each High School), require the full time of the head-master, and at the least that of one or more assistants to teach them to the pupils. The number of pupils attending the school is immaterial, as the same subjects (which are prescribed by the Legislature) and the same number of classes are required in each school according to the programme, whether the pupils in attendance be many or few.

#### AMPLE PROVISION NOW MADE BY THE LEGISLATURE FOR THE SUPPORT OF HIGH SCHOOLS.

Up to 1871, it was urged with some force that, while the Legislature required the High School Boards to do certain things, it left them powerless to provide the necessary means to defraying the expenses of doing so. This was doubtless true to some extent in past years, but in 1871 it left the Boards without a shadow of excuse on this ground. The statute of that year, as we have shewn, prescribed certain additional subjects of instruction for the High Schools, (which gave a symmetry and completeness to the course of study in them), but it also provided most liberally for enabling the trustees to support these schools and pay their teachers. Not only did it in that very year increase the High School grant from \$57,000 to

\$70,000, but it also required the county and city councils to provide by local assessment, and to furnish the trustees with \$35,000 more—making a total of \$105,000, or an average of \$1,000 for each High School!

Further, for the first time the Legislature authorized each High School Board to call upon the council or councils of the municipality or municipalities in which the High School was situated, to provide whatever additional sum it might require "for the school accommodation and maintenance" of the High School; and it made it the imperative duty of the council to provide these sums without question. While, therefore, the Legislature required each High School Board to provide for teaching "all the higher branches of an English and commercial [or classical] education," and to employ a head "master and teachers" to do so, it also (in the school legislation of 1871) provided the ample means (as we have shewn) of \$105,000, as a preliminary fund, at the rate of about \$30 per pupil, for the support of the High Schools.

#### THE TRUE PLACE OF THE HIGH SCHOOLS IN OUR NATIONAL SYSTEM OF EDUCATION.

Again, it has been urged that the Legislature has fixed the educational standard of our High Schools quite too "high"—that a lower grade if not a narrower range of subjects would be quite sufficient for the wants of the country, etc.; and that it is unreasonable to require High School Boards to bring these schools up to the prescribed Legislative standard, as laid down in the official programme.\*

A more unwise and untenable objection could not have been urged. Those who do so look at the question from a purely local and narrow standard point. They forget that the fundamental principle involved in the adoption by the country of a complete "national system" of education, stands opposed to such views, and that a national system must of necessity leave no room for private or denominational efforts to supplement it, but must include within itself a systematic and complete gradation of schools from the lowest elementary school up to the university itself, without a missing link, or break in the chain. They either forget or ignore the fact that this is the theory—the very fundamental principle on which our Canadian "national system" of education is based; and that while the Legislature has strictly defined the limits and functions of each class of its national schools, it has most liberally provided in an ascending scale of remuneration for the support of each class.

Thus, it provides for the elementary public schools, and declares that they shall be free to every youth in the land. Next it provides specifically for a superior grade known as "High Schools," which shall form the connecting link between the elementary schools and the university, and declares that these schools shall teach such "higher" subjects, and such "higher" subjects only as it prescribes. Lastly, it sets apart a liberal portion of the public domain for the maintenance of a Provincial College and University (the functions of which are also defined by Parliament itself.)

These Institutions in their teaching are not allowed, nor do they dream of interfering with, or trenching on the domain of the High Schools, as do many High Schools on that of the Public Schools, even beyond that point which is allowed by the Council, (as is urged) as a matter of right and of expediency.

#### VAST DIFFERENCE IN THE RATIO OF THE GRANT TO HIGH AND PUBLIC SCHOOLS.

We will now contrast the liberality of the Legislature as shewn to the High and to the Public Schools. It has been often said that the Legislature is willing to do anything for the Public Schools, but is chary of its favours to the High Schools. This we will shew to be simply a mistake,—a popular error. The Legislature has indeed liberally fostered the Public Schools, and the policy of the Education Department in the adminis-

\* The whole question as to the necessity for a more complete and extended programme of studies for our High and Public Schools is discussed at length in the last Report of the Chief Superintendent.

tration of the law has always been to stimulate local exertion, and to encourage a general interest in these "colleges of the people." In this matter success has signally crowned its efforts; and the Public Schools of to-day stand well in popular esteem, and our school system as a whole maintains a high reputation abroad. But in the matter of Legislative aid to the Public and to High Schools, the latter have immeasurably the advantage, proving that the favour shewn to them rather than to the Public Schools has been very marked and decided. Thus, while the Legislative grant to the Public Schools in 1872 was only forty cents (40 cts.) per pupil, it was within a fraction of twenty dollars (\$20) per pupil to the High Schools! Even with the addition to the Legislative grant of the prescribed municipal assessment, the Public Schools only received at the rate of eighty cents (80 cts.) per pupil, while the High Schools generally received within a trifle of thirty dollars (\$30) and several of them more; for as each High School is entitled by law to a minimum grant at the rate of at least \$400 per annum, no matter how small its average attendance may be, it has followed that some schools have received (including the county assessment) an aggregate sum of from \$35 to even \$45 per pupil in average attendance! We leave it to the judgment of any candid man, whether under these circumstances it is reasonable, just or fair to allow High Schools to do Public School work, and yet receive between thirty to forty times as much as the Public Schools receive for doing that work.

#### INEXPEDIENCY OF ALLOWING HIGH SCHOOLS TO ADMIT THEIR OWN PUPILS.

We have just shewn that for each pupil attending the Public Schools, the trustees of these schools are only allowed eighty cents, yet when the same pupil is admitted to a High School the board of such school is entitled according to the average attendance of that pupil, to an aggregate sum including the county assessment, varying from \$30 up to \$45 per pupil, although that pupil may be only in classes identical with those in the Public School which he had left! With such strong financial motives to withdraw pupils from the Public Schools and to force them into the High Schools, great efforts are of course made to admit as many as possible to these High Schools. Quite a number of the best schools, even in the face of this strong temptation to be lax in their standards of admission, have faithfully and conscientiously adhered to the requirements of the programme and regulations in the admission of their pupils. But others have not, and great injustice has, therefore, been done to that very class of superior schools which it is the wise policy of the country to foster and support. From a recent return on this subject, which has been ordered by (and which has been laid before) the House of Assembly, we learn that even in the standards of admission adopted in the various High Schools, the greatest diversity has existed. For instance (1) in some schools the pupils for admission were only examined in certain of the prescribed subjects; (2) the character, extent and value of the questions shewed great inequality; (3) in some the questions were written or printed, and in some they were *viva voce*; and (4) the percentage of the value of the answers assigned to the questions ranged from 33 to 80 per cent. The enormous number of 2,000 pupils passed into the High Schools as the result of these examinations!

As to the qualifications of the pupils admitted, and the character of the examination held, we quote from the return laid before the House of Assembly, the following Report on the subject from the Inspectors of High Schools. For obvious reasons we give no names:—

#### REPORT OF J. A. MCLELLAN, ESQ., M.A., LL.B.

*At School No. 1.*—Found a class of about twenty in training for the entrance examination by the masters, who assured me that "all of them would be admitted on the following day." The reading of nearly all these twenty (whom the regular pupils hardly surpassed) was very bad. Pupils not familiar with common words—pronunciation atrocious—*violence* for violence; *turnt* for torrent; *genus* for genius; *laborisky* for laboriously, &c.

In *Grammar*, I gave the "candidates," "Few and short were the prayers we said." This sentence too difficult;—*e. g.*, "few a preposition gov. prayers;" "short a preposition, do.;" "were, a transitive verb gov. prayers;" said an intransitive verb, passive voice." None of the candidates could parse *said*; only 12 of *all school* (50) could solve question in subtraction of fractions; and only 8 could find cost of 5,250 lbs. coal at \$7 50 per ton of 2,000 lbs. You can imagine how much the "candidates" knew.

*School No. 2.*—The trustees of this school rejoice that the checks to entrance have been removed. 4 candidates for entrance, 20 pupils present. The examination showed that even with the "hard checks" to entrance which formerly existed, the pupils had not been stringently dealt with in their entrance examination.

*School No. 3.*—22 admitted; 79 on roll; about 60 present. The entrants did badly; *analysis* and parsing by *whole school* anything but good.

*School No. 4.*—72 admitted after my visit. I have not seen the papers. There were already admitted as high school pupils a large number who could not have passed (and cannot pass) a fair entrance examination.

*School No. 5.*—15 admitted; 61 on roll. The examination was better than some others, but much below what it should have been.

*School No. 6.*—19 admitted; 40 on roll. *Reading* very bad; history, do.; geography, do. 8 in *whole school* found the difference between  $2,275\frac{5}{16}$  and  $2,174\frac{11}{16}$ . Judge what the entrants could do. *Grammar* was very bad.

*School No. 7.*—87 on roll; 38 admitted; nearly whole of senior public school division. Examination papers fair, but pupils not up to papers. Query, had the 38 been aided by teachers? *That has been done.* A year ago there were 28 pupils on roll, now 87. Even the old pupils did badly. I gave an exercise in grammar: "and first one universal shriek there rushed louder than the loud ocean, like a crash of echoing thunder." *All failed* in analysis; a large number failed in "*universal*," "*first*," "*shriek*," "*there*," "*like*."

*School No. 8.*—44 on roll; 8 admitted, not one of whom were qualified. 24 were present. *Reading* utterly bad; only 7 got subtraction question. *Grammar* was a poor performance, nearly all failed to parse *first* (see above), and *all* (in "and then *all* was hushed," &c.)—"universal is a noun, 3rd sing," "louder" too much for many, "ocean, noun, obj. case after rose," "crash noun obj. after rose," "crash noun, nom. case to was understood," etc., etc.

*School No. 9.*—36 on roll; about 30 to be admitted. These were already in high school. Parsing was an utter failure.—"shriek objective case governed by one," "universal, a verb in the possessive case," "first, a preposition governing one." I gave "few and short were," etc. It was too difficult for nearly whole school, certainly for all the candidates. A more deplorable exhibition of grammatical ignorance could not be imagined. This school was of course glad that restraints as to admission have been done away with. Only 3 in the school got above questions in subtraction.

*School No. 10.*—40 on roll, 23 of whom were admitted. A fair examination would have excluded 20 of the 23.

*Schools 11, 12, 13, 14, 15.*—Had the same examination. One question in grammar and one in arithmetic constituted the whole examination, *e. g.*, add  $\frac{2}{3}$ ,  $\frac{4}{7}$ ,  $\frac{3}{5}$ , 1. No. 11 had no candidates for admission, probably because it was not a union school. No. 14 was held in check by its master, who is determined to admit none but qualified pupils. School 16 admitted 5, all far below the mark. No. 12 admitted 47, and has now on roll 188, about three times as many as it had a year and a-half ago.

*School No. 17.*—39 were on roll, (23 girls), 22 admitted. The trustees and master admitted that these were far below the legal standard, but "had to have two teachers, and must give them something to do; would soon work the juniors up, etc." The teacher gave "to love our enemies is a command given." "to" a preposition gov. noun "*love*;" to love an intransitive verbal noun;" "command, objective case, governed by is."

*We must obey our rulers.* "Must obey," intransitive verb, indicative mood, etc. "The boy with long black hair was found in the wood." All the entrants failed to parse boy; "hair" is a verb, third person singular, objective case, governed by "with." *John runs swiftly.* "John," a verb, third person singular, etc. None of these entrants could do the elementary questions above mentioned; many of them could not get through the multiplication table.

*School No. 18.*—36 were on the roll, 25 admitted. Only 7 of the whole school got the subtraction question. The admitted pupils were far below the legal standard; arithmetic and grammar were utterly bad.

*School No. 19.*—38 were on roll, 20 admitted. There was an utter failure by the entrants, and by whole school: "few and short," etc. was altogether too difficult—bad as No. 17. Most of pupils were mere children, requiring at least a *two years'* course in a good Public School.

The above facts will enable you to form an opinion of the disastrous effects upon the High Schools, which have been the too certain results of the removal of all checks upon the admission of pupils. When it is considered that through the laxity of the old system of admitting pupils to the Grammar Schools, a very large number of totally unqualified pupils were found in the High Schools, even after the new law had been in operation for a year; and that the number of the unqualified pupils has been very largely increased during the present half year, in consequence of the examinations for entrance being free from almost all control by disinterested parties, it can be readily inferred that many of the schools have been so far degraded that it is simply a perversion of language to call them High Schools; and that unless the serious evil be promptly and effectually remedied, we shall soon have a High School system only in name. Some of the school authorities—the masters particularly—have acted nobly. They have refused to take advantage of the powers unhappily placed in their hands, and preferring a high standing for their schools to any merely pecuniary advantages, have exacted a high standard of candidates for entrance. But the general tendency is towards degradation. Some of the best masters have informed me that they had resisted, *with great difficulty*, the pressure brought to bear upon them, to admit unqualified pupils in order to increase the numbers, and as a consequence, the allowance from the public funds. If I might venture to offer any suggestions for the improvement of the High Schools, I should say:—(1) Let there be a *uniform* examination for entrance conducted by an *independent* examiner (or examiners). (2) Let there be two masters for even the smallest school, and the masters to be increased, one when pupils reach a certain number. (3) Something more is required than a University Degree to qualify Head Masters—many innocents fresh from College Halls in charge of High Schools—many with little scholarship, and more with less experience. I presume but few of our Head Masters could take a "First A" under the new law. Let every High School master be required to, in addition to his degree, hold a First Class Provincial Certificate, or to teach a year (or so) as assistant master, before he becomes qualified for a High School mastership. It is insisted that a person shall have a Second Class Provincial Certificate to qualify for a First Class; why should not a candidate for High School Certificate, be required to hold the highest grade of Public School Certificate, in order to qualify for the highest educational positions?

The subjects generally taught in the High Schools are identical (except a smattering in most cases, of classics and French) with those required in the examination for First Provincial Certificates; and I unhesitatingly assert (and my notes will prove it) that a *great majority* of our University Graduates are not as well qualified to teach these subjects, as public school teachers holding "1st A" Certificate under the new law. And yet a great many of these men prate about the "indignity" of having Public School Inspectors associated with them in the examining board on terms of perfect equality! A great many of the High Schools of the country would, under present cir-

cumstances, be far better off, more rapidly "worked up" if under the charge of First Class Provincial Teachers.

(4.) Let the number of High Schools be limited—not too rapidly increased in number. Under present circumstances every little village in the country, even though it has not had the spirit and liberality to keep up a *decent* Public School, must have its "High" School, especially since "it pays the authors of such young efforts" to "promote higher education," are sure of at least \$600 a year, and "that will pay the High School Master"—*i. e.*, a master to do a *low grade* Public School work, hence

(5.) I would do away with the \$400 minimum, or in the classification of schools let those that fall before a certain standard receive no Government aid, and die a deserved death, or let schools be established according to population. Say one school to every 15,000 or 20,000 inhabitants. *Two good schools* in a county would be of infinitely greater benefit than half-a-dozen poor ones.

(6.) Let "*union*" schools be no more. I am more and more convinced that there should be a total separation of the High and the Public School.

(7.) *Coll. Institutes*, now are only High Schools with larger attendance of pupils than in ordinary schools. If continued, there ought to be regulations as to number and qualifications of masters. Imagine a certain Collegiate Institute with only *four* masters doing High School (or College) work for 188 pupils, etc.

As at present constituted, Collegiate Institutes seem to be not in harmony with our High School system—many places, which have "populous" union schools are ambitious to become Institutes, etc.

(8.) The County Councils should be compelled by law to carry out its wise design.

#### REPORT OF THE LATE REV. J. G. MACKENZIE, M.A.

[As regards the *Parsing*, it may be well to state that for *Reading* the "Trial Scene in the Merchant of Venice" was selected; and, for convenience sake, the italic words in the following—no very difficult test certainly—were given to the Juniors recently admitted to the Schools.]

1. "Give me your hand! Come you from old Bellario?"
2. "Are you acquainted with the difference *that* holds this present question in the Court?"
3. "*Which* is the Merchant here?"
4. "Shylock is my *name*."
5. "It is *twice* blessed?"

*School No. 20.*—Signal failure in *dictation*.

*School No. 21.*—12 admitted; 2 only at all satisfactory in *spelling*. Almost everything in *grammar* missed.

*School No. 22.*—18 admitted. I question whether I should have sanctioned the admission of one-half of these. *Spelling* and *parsing* both deficient. *Dictation* amongst the worst I have had. Everything in *parsing* missed except, "Give me," and "*twice*" by one; one only could give the principal parts of "to flow."

*School No. 23.*—6 admitted; 3 below 50% in arithmetic, and 1 in *grammar*. *Dictation* very poor. Next to nothing done for me in *parsing*. One only could give mood and tense of "Come" in "Come you," &c. None knew when "that" is used as a relative. One only could give principal parts of "to flow."

*School No. 24.*—6 admitted; general failure both in *spelling* and *parsing*.

*School No. 25.*—14 admitted; Public School Inspector not present. Questions prepared by Chairman and head master alone.

*School No. 26.*—17 admitted; 11 of these were present when I made my inspection. I found these, with some two or three exceptions, amazingly weak in *arithmetic*. I required them to give the *parsing* of the following simple sentence in writing:—"Our earth is a planet of the solar system." 6 missed the predicate nominative; one considered our a preposition; *is* was treated in the same way by another.

*School No. 27.*—19 admitted; 16 present at inspection. Dictation, with one very creditable exception, quite poor; in several instances, indescribably bad.

*School No. 28* (a Collegiate Institute.)—The deficiencies of the "entrance" pupils in this case took me much by surprise. 25 were present at the inspection, and were subjected in the first instance to an oral examination in parsing, with the exception of the relative "that" everything was missed except by some two or three. I then tried them with written work, the result being not much more satisfactory. Arithmetic also was weak. So glaring were the deficiencies of these pupils that one of the masters confessed they were the worst of the kind they had ever had.

Other cases might be cited, showing how very necessary it is that High School Inspectors' veto should be maintained.

#### PREPARATORY CLASSES IN HIGH SCHOOLS.

In the last number of this *Journal* we published a strong protest of the Ottawa Public School Board sent to the Lieutenant-Governor, against the establishment of a Preparatory School in High Schools or Collegiate Institutes. Such classes are clearly unauthorized under the High School Act.

It is a principle of law that no corporation can exceed the powers conferred upon it by the Legislature, or other competent authority. Now the Act under which the High School Board is constituted makes it the duty of that Board "to make provision for giving to both male and female pupils \* \* \* instruction in all the higher branches of a practical English and commercial education \* \* \* according to a programme, rules and regulations, prescribed by the Council of Public Instruction," etc. The Act gives no other authority on this point; nor does it even give any authority to provide for giving instruction in the "higher" ones, in accordance with a prescribed programme. The law, further, only provides for the admission of pupils to the High School on their coming up to a certain standard, fixed by the Council of Public Instruction. The statute and regulations provide also for the employment (during their whole time), and payment of teachers to perform the necessary duties under the Act, and declares that "no High School shall receive any portion of the grant which is not conducted according to law and the regulations."

The Education Department has invariably resisted the establishment of preparatory classes in High Schools; and under no circumstances has it consented to allow any of the time of the masters or teachers of a High School to be taken from their regular classes, and given to the teaching of an unauthorized private or preparatory classes in the school.

The Legislature has made ample provision for the establishment and maintenance of elementary classes in the Public Schools, but it has restricted the High Schools to the teaching of the "higher" branches of an English and commercial education."

#### ATTACKS ON THE EDUCATION DEPARTMENT.

We have already in this paper met and exposed the injustice of one class of attacks upon the Education Department in connection with the apportionments to High Schools. Another one equally unjust and unfair has appeared in the *Canadian Monthly* magazine for January. It is as follows:—

"To what do we attribute the failure in framing the laws? to the neglect of the subject by Parliament and its *mismanagement by the Education Department*. The various measures proposed by the Chief Superintendent have all *betrayed a certain crudity and lack of precision* which have been fatal to their success. The head of the Education Department \* \* \* has often, I fear, been led astray by his hobbies and by the advice of incompetent subordinates \* \* \* the clerical element (in the Council of Public Instruction) has an unfairly strong representation in the Council, *while the lay element is illiterate* \* \* \* it does not consist of men able to advise Dr. Ryerson and it is therefore no check at all on *bureaucratic mismanagement*."

The anonymous writer of these unjust and improper remarks has not ventured to offer a single proof of their correctness.

He sets up a man of straw for the pleasure of showing his skill in knocking him down. For instance, he speaks of the Council of Public Instruction giving the Chief Superintendent "advice" in framing his educational measures, when in point of fact not a single member of the Council has ever offered any advice or given any opinion to him on the subject! Their functions are entirely different and are prescribed by statute. Then again, any one at all acquainted with the processes of legislation knows how well nigh impossible it is to get a measure through the House without mutilation. In the case of the School Bills it was stated that the alleged mutilation which the measures received in 1860 and 1871, were so many that they could not be "recognized." No wonder, then, that after thus running the gauntlet they should betray "a certain crudity and lack of precision." A dozen men with different views "amending" a measure before the House—(the more symmetrical it might be in its original form the worse for it)—would soon reduce it to a mass of "crudity" and destroy whatever "precision" any part of it might possess. This requires no demonstration, and yet the Chief Superintendent is made responsible for all the "crudities" and "lack of precision" which might be embodied in a measure under such circumstances!

In speaking of the application of the elective principle to the Council of Public Instruction, a "Head Master" gives expression to the following sensible views in which we heartily coincide:—

"It would, in my opinion, be exceedingly injurious to place a teacher engaged in the exercise of his profession in the Council. He would have a voice in the appointment of his own inspectors; would have access to the private reports of the inspectors, and would be in a position to obtain information which might give his school an unfair advantage over others, and he might assist in passing measures which would be for his personal interest."

#### SUGGESTIONS FOR THE IMPROVEMENT OF THE HIGH SCHOOLS.

In regard to this point we cannot do better than append the following suggestions on the subject from the Chief Superintendent's last report. He recommends:—

1. That the standard of admission to the High Schools and Collegiate Institutes be uniform throughout the Province.
2. That no pupils be admitted to the High Schools except on satisfactorily passing a written examination, and obtaining a minimum of fifty per cent. of the value of the papers.
3. That suitable accommodation be provided, in all cases, for the High Schools.
4. That the programme of studies and limit table, when finally prepared and authorized, be strictly adhered to, except by permission obtained upon the report and recommendation of the Inspector.
5. That at least two competent masters be employed in every High School.
6. That before the principle of "payment by results" be applied to High Schools, their status and classification (as a starting point,) be ascertained by a written examination of the pupils in one or more of the classes.
7. That in all cases the Council of Public Instruction shall have the right, through its inspectors, to determine whether the answers given in a written examination come up or not to the minimum standard.
8. That an additional High School Inspector be appointed, in order that effect may be given to the new system of payment by results; and that the three inspectors be authorized and required, in places where there are High Schools or Collegiate Institutes, to enquire into the condition and efficiency, of the Public and Separate Schools, which are entitled to prepare and send pupils to the High Schools or Collegiate Institutes.
9. That masters of High Schools should, before appointment, be required to furnish some evidence of a knowledge of the art of teaching.

## 3. SYSTEM OF PAYMENT BY RESULTS.

(To the Editor of the Globe.)

SIR,—In reply to a letter signed "Fair Play," in Saturday's *Globe*, I desire to say that there is not a shadow of foundation for "Fair Play's" unjust statement that the Education Department is about "springing a sudden change upon High School teachers in the middle of the year," in the adoption of a system of "payment by results." The Department has not "concluded" to do anything of the kind, nor has it ever given the slightest intimation of its intentions on the subject, except to the effect that full and ample notice will be given to all parties concerned before the system is put in force.

The system of "payment by results"—the principle of which is the only just and equitable mode of distributing the High School grant—has been maintained by the Department for years. It was under consideration in 1865; and the principle would have been incorporated in the Grammar School Act of 1865, had it not been thought that the important reform effected by the Bill of that year in the mode of paying the grant to High Schools, was about as far as it was prudent to go at that time. I was deputed by the Chief Superintendent to take charge of the Bill at Quebec in that year, and I took pains to prepare a scheme on which to base a system of "payment by results" from the English education reports and other information which I obtained in the Parliamentary library. But the Chief Superintendent thought it on the whole advisable to defer its adoption for the reason which I have given. The matter was not lost sight of, however, and in that same year (1865) Mr. (now Bishop) Fraser, who was in Canada at that time as an English Education Commissioner, was consulted on the subject. In 1868 the matter was referred to Rev. Prof. Young, then Inspector of Schools, for his report on

it, which he made in 1869. In 1871, the principle was adopted and embodied in the Act of that year. It involves payments to High Schools according—

1. To the average attendance of pupils;
2. Their proficiency in the various branches of study;
3. The length of time each High School is kept open as compared with other High Schools.

As it was clearly impossible equitably to apply this new principle of "payment by results" until a classification of the High Schools was made, the inspectors were requested to make such classification and report the result to the Chief Superintendent. This was done, but it is still felt to be impossible to do full justice to each of the schools until the whole of the pupils in them are subjected to a uniform test examination on questions prepared and printed for that purpose. With that view further legislation will be required before the new system can be adopted, and this is proposed and recommended in the Chief Superintendent's last report. On page 97 of that report, among nine recommendations relating to High Schools, is the following, and it is the only authoritative opinion which the Department has given on the subject:—

"6. That, before the principle of "payment by results" be applied to High Schools, their status and classification (as a starting point) be ascertained by a written examination of the pupils in one or more, if not all, of the classes."

Such a recommendation does not look like "springing a sudden change upon High School teachers."

Your obedient servant,  
J. GEORGE HODGINS,  
*Deputy Superintendent.*

Toronto, March 8, 1873.

[NOTE.—For List of Apportionments to High Schools in 1872, see page 29.]

## II. IMPROVEMENT OF SCHOOL HOUSE ARCHITECTURE.

Country schools generally need accommodations for from forty to eighty pupils. In the ground plan given below sixty seats are provided. The room is thirty-four by thirty-eight feet, and by slight changes in size it may be contracted or expanded. By adding three feet to the length space is given for ten additional seats, and by making the building four feet narrower there would still be sufficient room for four rows of desks, accommodating forty-eight pupils.

In this design two entrances are provided in front, each of which opens into a room which is at once an entry-way and a lobby for clothes. The space between the two entry-ways can be used for recitations, and a room may be finished in the basement, or added to the rear for the storing of fuel.

The design is well adapted to sections in which the attendance is large during one portion of the year, and small at other times. The recitation-room gives an opportunity for the employment of an extra teacher, as required by law, when the school has an average attendance of over fifty pupils. The front and back walls of the school-room, between the two doors, should be occupied by black boards. The stoves are placed in the front corners of the room, and the ventilators in the opposite corners. This room is supplied with two back entrances opening respectively into the boys' and the girls' play-grounds.

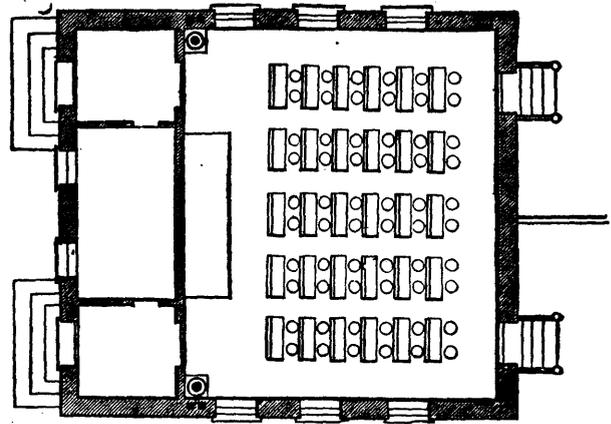
ELEVATION No. 5.—This elevation represents a plain but neat and substantial building of wood. The roof has the plain wide, projecting cornice and eaves which protect the walls of the building,



Elevation 5.



and at the same time give it an appearance of comfort and solidity. The finish may be of battens, as in the engraving, or it may be of clapboards, or substantially the same building may be made of brick. This elevation is represented as standing on a hill-side which slopes downward and backward from the house. In situations of this kind the back entrance may be omitted, and the basement may be fitted up for a wood-room. The nearly square form of this elevation, the perfectly plain finish, the arrangement of everything beneath a single roof, and the entire lack of ornamentation, render this one of the cheapest buildings which can be erected. If anything cheaper is attempted it will be by the use of poor materials, by scrimping just proportions, or by diminishing



GROUND PLAN.

the size, so as to deprive pupils of their due proportion of pure air, and of their freedom of movement. In either case the interests of the school will suffer, and present saving will be effected at a fearful future cost to the children.

**ELEVATION No. 6.**—This is another very plain and cheap structure of wood, finished with clapboards. The bell-tower gives dignity to the building, and should not be omitted. The roof is the ordinary pitch and may be covered with slate or shingles.

In finishing wood structures in this manner, the clapboards should be laid with but little exposure to the weather. This arrangement gives tighter joints, and makes the building much warmer. In some sections buildings designed for habitation are covered with a coating of tarred paper before the siding is laid, and this renders them almost air-tight. This covering is recommended for school-houses built in our northern climate, and in exposed locations. By its use the school-room will be made more comfortable, and a large saving in fuel will be made.

**ELEVATION No. 7.**—This building, in form, is but a slight variation from No. 6. The corners of the gables have been cut off, which is a mistake, and the form of the cupola changed; but otherwise it is substantially the same. The finish in the engraving is made to represent brick, but wood or stone may be used.

In the erection of brick walls care must be taken to have the walls hollow, or formed so that a space of air may be confined within them, otherwise the walls will be damp and the room unhealthy. The precaution should also be taken to have the foundation laid in hydraulic cement as high as the water-table to prevent the moisture of the ground from permeating the entire walls of the building. The effect of the moisture is not only deleterious to health, but combined with the action of frost, it has a tendency to crack and destroy the walls of the building.

## 2. ENGLISH HINTS ON SCHOOL-BUILDING.

Before a school-room is planned,—and the observation applies equally to alterations in the internal fittings of an existing school room,—the number of children who are likely to occupy it; the number of classes into which they ought to be grouped; whether the school should be "mixed," or the boys and girls taught in different rooms; are points that require to be carefully considered and determined, in order that the arrangements of the school may be designed accordingly.

Every class, when in operation, requires a separate teacher, be it only a monitor acting for the hour. Without some such provision it is impossible to keep all the children in a school actively employed at the same time.



Elevation 6.



Elevation 7.

The apprenticeship of pupil teachers, therefore, is merely an improved method of meeting what is, under any circumstances, a necessity of the case; and where such assistants are maintained at the public expense, it becomes of increased importance to furnish them with all the mechanical appliances that have been found by experience to be the best calculated to give effect to their services.

The main end to be attained is the concentration of the attention of the teacher upon his own separate class, and of the class upon its teacher, to the exclusion of distracting sounds and objects, and without obstruction to the head master's power of superintending the whole of the classes and their teachers. This concentration would be effected most completely if each teacher held his class in a separate room; but such an arrangement would be inconsistent with a proper superintendence, and would be open to other objections. The common school-room should, therefore, be planned and fitted to realise, as nearly as may be, the combined advantages of isolation and of superintendence, without destroying its use for such purposes as may require a large apartment. *The best shape is an oblong.* Groups of benches and desks should be arranged along one of the walls. Each group should be divided from the adjacent group or groups by an alley in which a light curtain can be drawn forward or back. Each class, when seated in a group of desks, can thus be isolated on its sides from the rest of the school, its teachers standing in front of it, where the vacant floor allows him to place his easel for the suspension of diagrams and the use of the black board, or to draw out the children occasionally from their desks and to instruct them standing, for the sake of relief by change of position. The seats at the desks and the vacant floor in front of each group are both needed, and should therefore be allowed for in calculating the space requisite for each class.

The Committee of Council do not recommend that the benches and desks should be immovably fixed to the floor in any schools. They ought to be so constructed as to admit of being readily removed when necessary, but not so as to be easily pushed out of place by accident, or to be shaken by the movements of the children when seated at them.

By drawing back the curtain between two groups of desks, the principal teacher can combine two classes into one for the purpose of a gallery lesson; or a gallery (doubling the depth of benches, and omitting desks), may be substituted for one of the groups. For simultaneous instruction, such a gallery is better than the combination of two groups by the withdrawal of the intermediate curtain; because the combined length of the two groups (if more than fifteen feet) is greater than will allow the teacher to command at a glance all the children sitting in the same line. It is advisable, therefore, always to provide a gallery; but this is best placed in a class-room.

The master of a school should never be allowed to organise it so as to provide for carrying out the entire business of instruction without his own direct intervention in giving the lessons. He ought, as a rule, to have one or more of the classes (to be varied from time to time) in a group, or in the gallery under his own immediate charge. He must indeed at times leave himself at liberty to observe the manner in which his assistants or apprentices teach, and serve the collective working of his school. But his duties will be very ill-performed if (what is called) general superintendence forms the sum, or principal part of them.

The reasons of the following rules will be readily inferred from these preliminary explanations, and the annexed plans have been prepared to illustrate the rules of the board as regards the arrangement of the buildings and the internal fittings of schools and class-rooms.

### 3. RULES IN PLANNING A SCHOOL.

(a) In planning a school-room, it must be borne in mind that the capacity of the room, and the number of children it can accommodate, depends not merely on its area, but on its area, its shape, and the positions of the doors and fireplaces.

(b) The best width for a school-room intended to accommodate any number of children between 48 and 144 is from 16 to 20 feet. This gives sufficient space for each group of benches and desks to be ranged three rows deep along one wall, for the teachers to stand at a proper distance from their classes, and for the classes to be drawn out, when necessary, in front of the desks, around the master or pupil teachers. (No additional accommodation being gained by greater width in the room, the cost of such an increase in the dimensions is thrown away.)

(c) A school not receiving infants should generally be divided into at least four classes. (The varying capacities of children between seven and thirteen years old will be found to require at least thus much subdivision.)

(d) Benches and desks, graduated according to the ages of the children, should be provided for all the scholars in actual attendance and therefore a school-room should contain at least four groups.

(e.) An allowance of 18 inches on each desk and bench will suffice for the junior classes, but not less than 22 inches for the senior classes; otherwise they may be cramped in writing.

The length therefore of each group should be some multiple of 18 or 22 inches respectively.

Thus, at 18 inches per child,

A group 6 ft. 0 in. long will accommodate	4	} Children in a row.
“ 7 6 “ “	5	
“ 9 0 “ “	6	
“ 10 6 “ “	7	
“ 12 0 “ “	8	

At 22 inches per child,

A group 7 ft. 4 in. long will accommodate	4
“ 9 2 “ “	5
“ 11 0 “ “	6

In the annexed plans 18 inches have been taken as the allowance per child. The withdrawal of a child from each row of this dimension will practically answer the purposes of the other dimensions.

(f.) The desks should be either quite flat or *very slightly* inclined. The objections to the inclined desk are, that pencils, pens, &c., are constantly slipping from it, and that it cannot be conveniently used as a table. The objection to the flat desk is, that it has a tendency to make the children stoop. A raised ledge in front of a desk interferes with the arm in writing.

(g.) As a general rule no benches and desks should be more than 12 feet long; and no group should contain more than three rows of benches and desks (because in proportion as the depth is increased, the teacher must raise his voice to a higher pitch; and this becomes exhausting to himself, while at the same time it adds inconveniently to the general noise).

(h.) Each group of desks should be separated from the contiguous group, either by an alley 18 inches wide for the passage of the children, or by a space of 3 inches sufficient for drawing and withdrawing the curtains.

(i.) The curtains when drawn should not project more than 4 inches in front of the foremost desk. An alley should never be placed in the centre of a group or gallery, and the groups should never be broken by the intervention of doors and fire-places.

(j.) Where the number of children to be accommodated is too great for them to be arranged in five, or at most six, groups, an additional school-room should be built, and placed under the charge of an additional teacher, who may, however, be subordinate to the head master.

1. The walls of every school-room and class-room, if ceiled at the level of the wall-plate, must be at least 12 feet high from the level of the floor to the ceiling; and if the area contain more than 360 superficial square feet, 13 feet, and if more than 600, then 14 feet.

2. The walls of every school-room and class-room, if ceiled to the rafters, and collar beam, must be at least 11 feet high from the floor to the wall-plate, and at least, 14 feet to the ceiling across the collar beam.

3. The whole of the external walls of the school and residence if of brick, must be at least one brick and a half in thickness; and if of stone, at least 20 inches in thickness.

4. The doors and fireplaces in school-rooms for children above seven years of age must be so placed as to allow the whole of one side of the school-room being left free for the groups of benches and desks.

5. There must be no opening wider than an ordinary doorway between an infants' and any other school-room, as it is necessary to stop the sound of the infant teaching.

6. An infant school should always be on the ground floor and if exceeding 80 children in number, should have two galleries of unequal size, and a small group of benches and desks for the occasional use of the elder infants.

No infant gallery should hold more than 80 or 90 infants.

7. The width of a boys' or girls' school-room must not exceed 20 feet.

The width of an infant school-room need not be so restricted.

8. The class-rooms should never be passage-rooms from one part of the building to another, nor from the school-rooms to the playground or yard.

9. The class-rooms should be on the same level as the school-room.

10. The class-rooms should be fitted up with a gallery placed at right angles with the window.

11. Framed wood partitions are not allowed between school-rooms and class-rooms. They must be separated by lath and plaster partition or a wall.

12. Infants should never be taught in the same room with older

children, as the noise and the training of the infants disturb and injuriously affect the discipline and instruction of the older children.

13. The windows should be of glass set in wood or iron casements. Lead lights and diamond panes are not allowed.

14. The sills of the windows should be placed not less than 4 feet above the floor.

15. A large portion of each window should be made to open.

16. The doors and passages from the school-room to the privies must be separate for the two sexes. So must also be the privies themselves. If they cannot be constructed entirely apart from each other, there should be between them a dust-bin, or other sufficient obstacle to sound as well as sight.

[Water closets can now be provided at a very reduced cost, and they may be introduced with advantage wherever there is a sufficient supply of water to cleanse them thoroughly. Great attention must be paid to the drainage of them. Earthen pipes measuring 4 or 6 inches in diameter, cemented at the joints, glazed and trapped are the best for this purpose.

Earth-closets are also frequently used with success.]

17. The privies must be subdivided, having a door and light to each subdivision.

18. The children must not have to pass in front of the residence on their way to their offices.

19. The Residence for the Master or Mistress should contain a parlour, a kitchen, a scullery and three bed-rooms; and the small dimensions which their Lordships can approve are—

#### SUPERFICIAL AREA.

- (a) For the parlour ..... 12 ft. by 12 ft.  
 (b) " " kitchen ..... 12 ft. by 10 ft.  
 (c) " " One of the bed-rooms ..... 12 ft. by 10 ft.  
 (d) " " Two other bed-rooms ..... 9 ft. by 8 ft.  
 (e) 8 ft. in height to wall-plate.  
 (f) 8 ft. if ceiled at wall-plate, or 7 ft. to wall-plate, and 9 ft. to ceiling.

20. The residence must be planned so that the staircase should be immediately accessible from an entrance-lobby, and from the parlour, kitchen, and each bed-room, without making a passage of any room.

21. Each bed-room must be on the upper story, and must have a fireplace.

22. The parlour must not open directly into the kitchen or scullery.

23. There must be no internal communication between the residence and the school.

24. There must be a separate and distinct yard, with offices for the residence.

25. The porch must be external to the school-room.

26. Iron or wooden buildings cannot be approved.

27. An infants' school must have a play-ground attached to it.

28. In the case of a mixed school there must be separate play-grounds for the boys and girls.

29. The play-ground should be properly levelled, drained, and enclosed.

### III. Papers on Seating, Ventilation, etc.

#### 1. MISTAKE IN SEATING CHILDREN IN A SCHOOL-ROOM.

A great mistake has been made in some school-houses by seating them in such a way as to have all the pupils in the room face the windows. Such an arrangement cannot be otherwise than injurious to the eyes of the pupils, as the strong light is constantly shining into them. Pupils should always be seated with their backs or sides to the windows. There should be no windows in front of them.

#### 2. SIMPLEST PLAN OF VENTILATING SCHOOL-ROOMS.

The simplest plan for ventilating school-rooms where stoves are used is to commence to build the chimney on the floor, building a small fireplace and hearth. Let the fireplace be so built as to receive a register instead of an ordinary screen. This should be so set as to be easily removed when necessary. Place the stove in one corner of the room; it should be furnished with a hollow drum; into this a tin tube of the size of the opening in the drum should be inserted, coming from the outside of the house. This tube should have a damper, by means of which the air from without can be shut off when desired. Let the stove-pipes pass from the stoves to the centre of the room, and then to the chimney in the back part of the room.

#### 3. NECESSITY FOR TEACHING THE ELEMENTS OF NATURAL SCIENCE.—WARMTH AND VENTILATION.

Everybody must sincerely hope that the increased attention given to natural science in the schools and colleges of the present day will tend to the removal of ignorance on some subjects of every day importance as to which, it cannot be concealed, a great deal of misconception has hitherto existed. It is perfectly astonishing how much discomfort and worse than discomfort is often put up with, simply because the rudiments of natural philosophy or some of the most elementary principles of hygiene are unknown or misunderstood. And without some grounding in the elements of physical science, people are apt to be harmed rather than benefited by the hints they get from health magazines and the like. The indifference which results from ignorance is in some cases much preferable to an attempt to follow advice ill comprehended. A curious example of this we notice in recent English papers. Mr. Rawlinson, a gentleman of much experience in architectural matters, some time ago, addressed a letter to the *Times*, in which he recommended the admission of fresh air into houses directly from the outside, alleging that manufactured air can never be fresh air, and that therefore all stoves, hot water apparatus, or other modes of warming houses by close stove flues and pipes, manufacturing and pouring in artificially warmed air, cause offensive sensations, and to delicate constitutions prove unwholesome. "Air," he added, "is never so fresh as when it comes into a house or room direct; there is some deleterious property in flues which takes the life out of the air passed through." This was taken to mean a recommendation of open windows in all weathers, with a use of shawls and topcoats indoors for those who feel cold. A few days after his letter appeared, Mr. Rawlinson calling upon a lady found her sitting with a French window wide open, "looking anything but comfortable," and she welcomed him with a faint smile, saying, "See, Mr. Rawlinson, I am following your advice." Another lady wrote from the north of Scotland to a friend that she was "suffering from sitting with open windows, *à la* Rawlinson." A third wrote from Liverpool, "Must I understand from your letter that you have ceased to warm your once comfortable house, and sit in your top coat with the window open? If so, I do not agree with you."

Finding that he had been misunderstood, Mr. Rawlinson, in a later communication, endeavours to be more explicit, and, to illustrate his meaning, describes his own house and the appliances which exist for warmth and ventilation. His dining-room and drawing-room each contain about 5,500 cubic feet of space, and the doors are nine feet high, by four feet wide. The bedroom and dressing room contain about 6,700 cubic feet. These rooms are warmed by ordinary open fire-places. The basement, entrance hall, and staircase are warmed by hot water apparatus. The dining and drawing room doors are unusually large, for the purpose of facilitating room ventilation, the swing of so large a door moving a surface area of 36 square feet and the cube of the entire room. Then, there are means of ventilation in the basement at eight points beneath the floors, the inlet in each case being through charcoal strainers. The subsoil is covered with concrete, the sleeper blocks are vitreous earthenware, the sleeper joists are sound old ship timbers, and there is a vitreous damp-proof course above the footings in all the walls. The windows, when the weather admits of it, are opened at top and bottom. "A fire in my bed room," Mr. Rawlinson adds, "is very seldom lighted, as I find by experience that a low night temperature in a bedroom better fits me to endure a low external temperature through the day. I clothe warmly, avoid draughts, and strive to keep my sitting-room at or about 65 degrees Fahrenheit; and if, during frost, I feel roasted on one side and frozen on the other side, I sit in a top coat, but not with an open window."

These remarks apply of course to the more expensive class of houses, for strange to say, ventilation is a matter which has received very little attention in many English residences of the most costly construction. Everybody remembers the outcry occasioned at the time of the Prince of Wales' illness, the fever being traced to the foul drains and ill ventilation of the noble mansion at which he had been making a visit. Mr. Rawlinson gives a number of instances of similar neglect. In one case the occupants of a beautifully situated country mansion, after much sickness and death among their number, left the house in despair. Their successors shared the same fate, and it was not till the costly edifice, with upwards of 600 acres of land, had been sold "a great bargain," that the purchaser on examination found the entire basement one vast cess-pit of corrupt and corrupting matter, tainting air and water alike. The cesspits and cesspools were emptied and filled in with quick lime, the large sewers and foul drains, with the foul subsoil, were removed, and the entire area covered with quick lime concrete. The cost was £1,100, and a new and pure water supply was obtained at a cost of £1,500, the unhealthiness of the house being thereby

completely cured, and the purchaser left to rejoice over his bargain. It appears therefore that even wealth has not been able to secure exemption from the evils of bad ventilation and drainage. Science must come to the aid of money. The effectual manner in which it is possible to do the work when both are combined is attested by Mr. Rawlinson, when he says that gaols are about the best modern examples of artificial warming and ventilation. They are, he says, the only residences he knows of which a man can inhabit, where sewerage, drainage, water supply, warming, and ventilation are at the highest point of perfection. They are incomparably better in these means of health and comfort than many palaces, noblemen's mansions, London clubs, London West-end houses, or than town and country cottages. But there can be no difficulty in agreeing with him that there are no valid reasons why every dwelling place, from a palace to a cottage, should not be as comfortable and as wholesome as a prison. Similar knowledge and intelligence in design and execution, with similar intelligence and care in management, would produce similar results in honest men's houses. There is, however, one practical difficulty in the way of such ventilation as Mr. Rawlinson recommends. It is opposed to economy of fuel, and very expensive, especially in view of the constant increase in the price of coal and wood. The "cheerful fire" in the old English fireplace, so celebrated in song and story, and an admirable ventilator, would be much commoner than it is but for the fact that such a fireplace will require three times as much fuel as a modern grate or stove. In our severe climate the objection to open windows and open fireplaces on the score of economy is still stronger than in England. As an offset to this, however, smaller openings in cold weather suffice to admit all the air required, and with care and attention a great deal may be done in the severest weather to keep the air of the house healthful without sacrificing warmth. But to do this discreetly, some practical knowledge of the subject is necessary, and this brings us back to the hope we expressed at the outset, that so necessary and important a part of education may receive the attention to which it is entitled. With a thorough understanding of general principles, every one will soon learn to regulate such matters for himself, and architects will be forced to construct dwellings in such a manner as to conduce to the health and comfort of the inmates.—*Mont. Gazette.*

#### 4. PLANT TREES.

The Gold Hill, Nevada, *Daily News*, says: "In various parts of the country efforts are making to stimulate the cultivation of forest trees, and to check the reckless and wasteful destruction of woods for which Americans have been distinguished. California has engaged a professional arboriculturist, at a salary of \$15,000 a year, to superintend the selection and planting of trees in that State; and if the man is a master of his business, the money paid to him will be well invested. The legislatures of several States are moving in this matter, which commends itself to the favourable consideration of every practical mind.

### IV. Papers on Practical Education.

#### 1. TEACHING FROM REAL OBJECTS.

Much has been written within the past few years on the best methods of teaching the younger class of scholars, and nothing has contributed more to improve those methods than the introduction into the school-room of material objects, to be carefully examined and subsequently described. This exercise has been carried to a greater extent in the juvenile schools called *Kindergärten* than in any others, though it has been by no means confined to them, nor was the idea first suggested by the Germans. The writer well remembers exercises of this kind in a school of which he was a member over thirty-five years ago, and which redounded greatly to his own benefit, as they no doubt did to that of all who participated in them. The objects selected were nearly always natural, and he vividly recalls a very close examination which he then made of an expanded chestnut-burr which was to be the theme of his little essay on one occasion. Ever after, if not before, he too could, with the poet.

—"in the rugged burr a beauty see."

This exercise is better than any other calculated to cultivate habits of close attention, at a period when such habits are most easily acquired, and to do away forever with all possibility of those loose and superficial ones, which characterize most people throughout life, leading to continual inaccuracy and consequent misapprehension of the facts of nature and of life.

Many years after the little exercises alluded to above, the writer was teaching in a country school in Pennsylvania, which was situated in the midst of a pleasant grove—just the kind of situation, by-the-by, for a school house. Sometimes the interest of the

younger scholars in their column of the multiplication table or the spelling lesson would flag. On such occasions he found no other means of stimulating them so successful as the promise of half an hour in the woods, where they could collect wild flowers and acorn cups, and, in the fall, the beautifully tinted autumn leaves. This promise almost universally insured perfect lessons from the whole class, who were generally ready for recitation before the hour for it arrived. On their return they were allowed to lay down a scalloped maple leaf or a sinuous oak-leaf on their slates, carefully to draw the outline, and then delineate the larger veins and the stem. This exercise was to them a source of never-failing pleasure; and while, instead of interfering with the other lessons, it secured a better performance of them, it also cultivated admirably the organs of form and colour, thus training the imagination and developing æsthetic tastes as no other exercise could. I suggest it to teachers, in the hope that some of them may taste its efficacy.—*Z. in Pennsylvania School Journal.*

#### 2. TEACHERS' RULES.

1. Read these rules every morning.
2. Ventilate the school-room.
3. Inquire after absent scholars.
4. Remember the home lessons.
5. Insist on a quiet and orderly entrance and exit of the scholars, and on a proper deportment in and out of school.
6. Teach a proper manner of sitting, standing, and walking, especially while reciting.
7. Keep your scholars out of mischief, by keeping them employed.
8. Be orderly, and insist on order.
9. Never open or close your school without doing or saying something that will make a pleasing impression—be it by singing with the children, reading to them, showing them some beautiful or curious object, or making some pleasant and instructive remark.
10. Always remember the words of the poet: "Great is the slayer of lions, greater the conqueror of nations, greatest he who governs self."
11. Make the Golden Rule familiar to all; and
12. Let the only rule for the school-room be, DO RIGHT!—"PBN," in the *Chicago Schoolmaster.*

#### 3. INCREASE OF TECHNICAL EDUCATION IN GERMANY.

The tendency towards technical instruction is rapidly growing in Germany. Very successful are their schools for printers, in which the pupil is taught not only the theory and practice of printing, but knowledge of other languages and the types of all languages which he may be apt to meet in the exercise of his trade. Beside these schools, there has lately been established at Leipsic one for booksellers. Three years' study is enjoined by the course, which takes in both the literary and commercial phases of the business. The studies prescribed are terrifically numerous and comprehensive. There are the ancient and modern languages, natural sciences, mathematics, the sciences of commerce, geography, drawing, writing, bibliography, booksellers' technical information and business management, history, statistics, æsthetics, debate, elocution and the types and written characters of all languages. With acquirements like these the book-selling trade will be not merely a trade, but a most worthy and dignified profession. Nothing could be more hopeful and liberalizing in all directions than such accurate technical education.

#### 4. MANNERS.

The difference between the true manner and the false, is just that between the real features and flesh of the face and a mask. So all effective cultivation of manners must begin with man. Make him generous, intelligent, refined, affable, sympathetic, and his actions will naturally tend to politeness as the smoke curls upward. True, this is not all; but this is the alphabet of which all else is application. Having these, it needs but a constant effort to express them in the simplest, noblest, most natural manner, to acquire the best manners.

[Continued from page 28.]

23rd, 24th, 25th. Fog, 30th. Snow, 1st—3rd, 7th, 8th, 10th, 11th, 13th, 15th, 18th—23rd, 26th—28th, 30th. Difference of mean temperature from average of 11 years for December = -8° 32m., an unusually large variation.

HAMILTON.—Burlington Bay frozen and navigation suspended 12th, sleighing began 20th. Wind storms, 13th, 14th, 21st, 28th. Snow, 1st—4th, 6th, 8th—14th, 15th, 18th—23rd, 25th—30th. Rain, 2nd, 7th.

SIMCOE.—Wind storm, 21st. Snow, 18th, 20th, 21st, 27th, 30th. Rain, 3rd. The last week or ten days of December said to be the coldest known in this region for several years.

WINDSOR.—Lunar halo, 6th, 10th, 14th, 17th. Meteor in E., towards H., 11th; meteor in E., towards S. E., 20th. Wind storms, 13th, 14th, 19th, 21st, 23rd, 25th. Snow, 1st, 19th, 21st, 23rd, 26th, 30th. Navigation on the lakes closed on the 4th, the river ports open about a week later. The temperature has not been so low on the Detroit River for many years as during this month.



VI.—HIGH SCHOOL ATTENDANCE AND APPORTIONMENT FOR 1872.

SCHOOLS.	Average	Apportioned	Added for	Net Apportionment.	Average	Apportioned	Added for	Deducted as	Net Apportionment.
	First Half.	at \$9.75.	Minimum.	First Half.	Second Half.	at \$8.	Minimum.	per note below. (a)	Second Half.
		\$ cts.	\$ cts.	\$ cts.		\$ cts.	\$ cts.	\$ cts.	\$ cts.
Alexandria.....	16	156 00	44 00	200 00	10	80 00	120 00		200 00
Almonte.....	10	97 50	102 50	200 00	14	112 00	88 00		200 00
Arnprior.....	16	156 00	44 00	200 00	22	176 00	24 00		200 00
Barrie.....	41	399 75		399 75	33	264 00			264 00
Beamsville.....	29	282 75		282 75	26	208 00			208 00
Belleville.....	61	594 75		594 75	53	424 00			424 00
Berlin.....	18	175 50	24 50	200 00	15	120 00	80 00		200 00
Bowmanville.....	45	438 75		438 75	42	336 00			336 00
Bradford.....	20	195 00	5 00	200 00	18	144 00	56 00		200 00
Brampton.....	61	594 75		594 75	49	392 00			392 00
Brantford.....	61	594 75		594 75	61	488 00			488 00
Brighton.....	14	136 50	63 50	200 00	32	256 00		a 56 00	200 00
Brockville.....	60	585 00		585 00	66	528 00			528 00
Caledonia.....	28	273 00		273 00	28	224 00			224 00
Carleton Place.....	11	107 25	92 75	200 00	21	168 00	32 00		200 00
Cayuga.....	30	292 50		292 50	25	200 00			200 00
Chatham.....	45	438 75		438 75	40	320 00			320 00
Clinton.....	31	302 25		302 25	33	264 00			264 00
Cobourg.....	103	1004 25		1004 25	84	672 00			672 00
Colborne.....	38	370 50		370 50	24	192 00			b 192 00
Collingwood.....	18	175 50	24 50	200 00	24	192 00	8 00		200 00
Cornwall.....	13	126 75	73 25	200 00	no return				
Drummondville.....	29	282 75		282 75	23	184 00			b 184 00
Dundas.....	64	624 00		624 00	56	448 00			448 00
Dunnville.....	28	273 00		273 00	21	168 00			b 168 00
Elora.....	20	195 00	5 00	200 00	19	152 00	48 00		200 00
Farmersville.....	30	292 50		292 50	26	208 00			208 00
Fergus.....	25	243 75		243 75	15	120 00	36 25		b 156 25
Fonthill.....	20	195 00	5 00	200 00	15	120 00	80 00		200 00
Galt.....	121	1179 75		1179 75	138	1104 00			1104 00
Gananoque.....	39	380 25		380 25	42	336 00			336 00
Goderich.....	31	302 25		302 25	38	304 00			304 00
Grimsby.....	38	370 50		370 50	22	176 00			b 176 00
Guelph.....	30	292 50		292 50	37	296 00			296 00
Hamilton.....	130	1267 50		1267 50	129	1032 00			1032 00
Ingersoll.....	41	399 75		399 75	52	416 00			416 00
Iroquois.....	64	624 00		624 00	54	432 00			432 00
Kemptville.....	20	195 00	5 00	200 00	20	160 00	40 00		200 00
Kincardine.....	26	253 50		253 50	20	160 00			b 160 00
Kingston.....	71	692 25		692 25	70	560 00			560 00
Lindsay.....	30	292 50		292 50	40	320 00			320 00
London.....	162	1579 50		1579 50	151	1208 00			1208 00
L'Orignal.....	16	156 00	44 00	200 00	17	136 00	64 00		200 00
Manilla.....	24	234 00		234 00	20	160 00	6 00		166 00
Markham.....	25	243 75		243 75	23	184 00			b 184 00
Metcalfe.....	14	136 50	63 50	200 00	no return				
Milton.....	20	195 00	5 00	200 00	13	104 00	96 00		200 00
Morrisburgh.....	31	302 25		302 25	31	248 00			248 00
Mount Pleasant.....	23	224 25		224 25	30	240 00			240 00
Napanee.....	114	1111 50		1111 50	70	560 00			560 00
Newburgh.....	40	390 00		390 00	30	240 00			240 00
Newcastle.....	29	282 75		282 75	17	136 00			b 136 00
Newmarket.....	34	331 50		331 50	32	256 00			256 00
Niagara.....	14	136 50	63 50	200 00	15	120 00	80 00		200 00
Norwood.....	26	253 50		253 50	31	248 00			248 00
Oakville.....	21	204 75		204 75	33	264 00			264 00
Oakwood.....	12	117 00	83 00	200 00	11	88 00	112 00		200 00
Ormeau.....	41	399 75		399 75	40	320 00			320 00
Orangeville.....	15	146 25	53 75	200 00	13	104 00	96 00		200 00
Osborne.....	15	146 25	53 75	200 00	11	88 00	112 00		200 00
Oshawa.....	67	653 25		653 25	54	432 00			432 00
Ottawa.....	77	750 00		750 00	68	544 00			544 00
Owen Sound.....	67	653 25		653 25	87	696 00			696 00
Pakenham.....	17	165 75	34 25	200 00	9	72 00	128 00		200 00
Paris.....	37	360 75		360 75	32	256 00			256 00
Parkhill.....	new school				21	168 00	32 00		200 00
Pembroke.....	10	97 50	102 50	200 00	10	80 00	120 00		200 00
Perth.....	49	477 75		477 75	53	424 00			424 00
Peterborough.....	112	1092 00		1092 00	166	1328 00			1328 00
Picton.....	63	614 25		614 25	40	320 00			320 00
Port Dover.....	22	214 50		214 50	16	128 00	57 50		b 185 50
Port Hope.....	62	604 50		604 50	59	472 00			472 00
Port Perry.....	19	185 25	14 75	200 00	33	264 00		14 75	249 25
Port Rowan.....	19	185 25	14 75	200 00	10	80 00	120 00		200 00
Prescott.....	28	273 00		273 00	38	304 00			304 00
Renfrew.....	17	165 75	34 25	200 00	29	232 00		32 00	200 00
Richmond Hill.....	23	224 25		224 25	22	176 00			b 176 00
Sarnia.....	33	321 75		321 75	49	392 00			392 00
Scotland.....	24	234 00		234 00	16	128 00	38 00		b 166 00
Simcoe.....	51	497 25		497 25	36	288 00			288 00
Smith's Falls.....	40	390 00		390 00	30	240 00			240 00
Smithville.....	27	263 25		263 25	24	192 00			b 192 00
Stirling.....	15	146 25	53 75	200 00	15	120 00	80 00		200 00
Stratford.....	58	565 50		565 50	54	432 00			432 00
Strathroy.....	27	263 25		263 25	31	248 00			248 00
Streetsville.....	13	126 75	73 25	200 00	no return				
St. Catharine's.....	134	1306 50		1306 50	135	1080 00			1080 00
St. Mary's.....	36	351 00		351 00	37	296 00			296 00
St. Thomas.....	53	516 75		516 75	37	296 00			296 00
Thorold.....	37	360 75		360 75	20	160 00			b 160 00

## HIGH SCHOOL ATTENDANCE AND APPORTIONMENT FOR 1872.—Continued.

SCHOOLS.	Average	Apportioned	Added for	Net Appor-	Average	Apportioned	Added for	Deducted as	Net Appor-
	First Half.	at \$9.75.	Minimum.	tionment.	Second Half.	at \$8.	Minimum.	per note be-	tionment.
	\$ cts.	\$ cts.	\$ cts.	First Half.		\$ cts.	\$ cts.	low. (a)	Second Half.
								\$ cts.	\$ cts.
Toronto .....	111	1082 25		1082 25	129	1032 00			1032 00
Trenton .....	22	214 50		214 50	44	352 00			352 00
Uxbridge .....	22	214 50		214 50	23	184 00	1 50		b 185 50
Vankleekhill .....	18	156 00	44 00	200 00	22	176 00	24 00		200 00
Vienna .....	32	312 00		312 00	28	224 00			224 00
Walkerton .....	new school				20	160 00	40 00		200 00
Wardville .....	28	273 00		273 00	24	192 00			b 192 00
Waterdown .....	25	243 75		243 75	24	192 00			b 192 00
Welland .....	40	390 00		390 00	38	304 00			304 00
Weston .....	32	312 00		312 00	25	200 00			200 00
Whitby .....	93	906 75		906 75	92	736 00			736 00
Williamstown .....	32	312 00		312 00	35	280 00			280 00
Windsor .....	19	185 25	14 75	200 00	48	384 00		14 75	369 25
Woodstock .....	42	409 50		409 50	36	288 00			288 00

NOTE.—The apportionment for the first half-year, distributed in July, was at the rate of \$9 per pupil. Towards the close of the year, a balance remaining in consequence of certain projected new schools not having gone into operation, it was decided to distribute the money, which would otherwise have lapsed on 31st December, before the second half-year's returns had been received.

The balance was accordingly apportioned as follows:—

First.—A grant, at the rate of 75 cents per pupil (average attendance), in the first half-year of 1872, was made; and, secondly, those schools which did not thus obtain an apportionment of at least \$200 (half of the legal minimum at the rate of \$400), were allowed the difference, so that all should receive at least at the rate of \$200 each for the half year. The balance was thus absorbed.

Some new schools being now about to go into operation, the rate per pupil, at least for the last half of 1872, had to be placed at \$8, the grant being paid out of the vote of the current year. Should the attendance and the number of schools allow of a larger grant for the next half-year, an increased rate will be adopted.

a In the column for deductions are entered those amounts by which the grants on the basis of attendance for the second half-year were diminished, in consequence of the sums added to make up the \$200 for the first half-year, together with the sum earned by attendance for the second half-year, exceeding the minimum at the rate of \$400. No deduction is made where the attendance, without any added grant, has obtained a grant exceeding the rate of \$400 for the year.

b Certain of the apportionments for the second half-year were less than \$200, those for the first half being in excess; but in all cases the minimum at the rate of \$400 for the year was granted to each of those schools.

## VII. Mathematical Department.

(To the Editor of the Journal of Education.)

SIR,—I herewith send you for publication in the *Journal of Education* the solutions of the questions in Natural Philosophy and Algebra, proposed to candidates for First-class Certificates, at the recent examination of Public School Teachers.

It will be observed, that, instead of offering any solutions of my own of the questions in Natural Philosophy, I have transmitted, without alteration, the papers of Mr. Somerville, who has answered with substantial accuracy eight out of the nine questions proposed, and would undoubtedly have answered the remaining question also, had he not, in reading the question, inadvertently changed *cylinder into cone*. What he has written on this, the only problem which he did not succeed in solving, shows that he understood the principle involved; and, as the working of the problem happens to be extremely simple, he may be regarded as having virtually floored the paper. As Mr. Somerville was a pupil in the Normal School, I think it may fairly be inferred, from his admirable performance, that the instruction given in Natural Philosophy in the Normal School is of a very superior order.

The greatest number of marks, over the whole field, was obtained by a lady, Miss Anna Living. It is somewhat noteworthy that, in Algebra, among other subjects, she was decidedly ahead of all her competitors. You will find specimens of her work in the paper of solutions herewith transmitted. I send you also, for publication, specimens of her answers to the questions in History and English Literature. \*They will show intending candidates for First-class certificates what sort of answers the examiners regard with satisfaction, and will, at the same time, convince intelligent persons throughout the Province that the examiners are faithfully observing the instructions they have received from the Council of Public Instruction, to place no candidates in the First-class who have not attained to a high degree of excellence.

I have the honour to be, Sir,  
Your obedient servant,  
GEORGE PAXTON YOUNG.

Toronto, 22nd Jan., 1873.

Mr. SOMERVILLE'S answers to the questions in Natural Philosophy:—

1st. Since the pressure of the air is equivalent to the weight of a column of mercury  $2\frac{1}{2}$  feet high, it would balance a column of water  $13.57 \times 2\frac{1}{2} = 33.925$  feet high.

\* Deferred for want of space until next month.—Ed. *Journal of Education*.

But a cubic foot of water weighs 1000 oz. ∴ the pressure of the air is 33925 oz. on each square foot of surface.

Now, the surface of the sphere is  $1^2 \times 3.1416 = 3.1416$  sq-feet. ∴ the pressure on it when in free external air would be  $3.1416 \times 33,925$  oz.

But the pressure of the air in the receiver is only  $\frac{1}{3.1416}$  that of the external air ∴ the pressure on the sphere is

$$\frac{3.1416 \times 33,925}{3.1416} = 33,925 \text{ oz. Ans.}$$

2nd. Since No. 1 floats with  $\frac{7}{10}$  of its volume immersed, its S. G. is  $\frac{7}{11}$ .

And since No. 2 floats in salt water with  $\frac{2}{11}$  of its volume immersed, and that salt water is 1.025 times as heavy as fresh water ∴ its S. G. is

$$\frac{26}{41} \times \frac{1025}{1000} = .65 \text{ or } \frac{13}{20}$$

Now, let  $x$  = weight of No. 1; then  $x - 10$  = weight of No. 2. And since the weight of a body, divided by its S. G., gives the volume, and the volume of each is the same ∴

$$\begin{aligned} \frac{10}{7}x &= \frac{20}{13}(x - 10) \\ \text{or } 130x &= 140x - 1400 \\ \therefore 10x &= 1400 \\ \text{and } x &= 140 \end{aligned} \quad \text{Ans.}$$

3rd. The C. G. of a sphere filled with water is in the centre, ∴ the pressure of the inner surface of a sphere is

$\pi d^2 \times \frac{1}{2}d \times$  weight of one cubic foot of water, because, to find the pressure, we multiply the area of the surface pressed ( $\pi d^2$ ) by the depth of the C. G. below the upper surface, and that by the weight of a cubic foot of water. And the weight of the water is  $\frac{\pi d^3}{6} \times$  weight of 1 cubic foot of water; but the pressure on the

inner surface of the sphere is  $\frac{1}{2} \pi d^3 \times$  weight of a cubic foot of water, ∴ the pressure on the inner surface is equal to three times the weight of the water.

4th. A uniformly accelerating force is measured by considering how much the velocity is increased in one unit of time.

When a body is moving with a velocity which is not uniform, its velocity at any instant is measured by considering how far it would

move in the next unit of time if the velocity were to remain uniformly the same as it was at that instant.

$$v^2 = V^2 - 2fs,$$

$$\therefore 8^2 = V^2 - 64 \times 63,$$

$$\therefore V^2 = 64 \times 62.$$

$$\therefore V = 62.9 \text{ Ans.}$$

[*NOTE.*—In transposing, in the last line but one, Mr. Somerville, by a manifest inadvertence, neglected to change the sign of one of the terms. Had it not been for this oversight, he would have got  $V^2 = 64 \times 64$ , which gives  $V = 64$ , the correct answer. G. P. Y.]

5th.

$$S = Vt + \frac{1}{2}ft^2$$

$$\therefore S_1 = 44t + 16t^2$$

$$S_2 = 20t + 16t^2$$

Since each particle was moving the same length of time, "t" is the same in each equation.

Let  $x = S_1$   
 then  $480 - x = S_2$   
 then  $16t^2 + 44t = x$   
 and  $16t^2 + 20t = 480 - x$

(adding)  $32t^2 + 64t = 480$   
 $\therefore t^2 + 2t = 15$   
 $\therefore t = 3 \text{ sec.}$   
 Now  $S_1 = 44t + 16t^2$   
 $= 132 + 144$   
 $= 276 \text{ ft}$   
 And  $S_2 = 20t + 16t^2$   
 $= 60 + 144$   
 $= 204 \text{ ft}$   
 $\therefore$  One moves  $276 \text{ ft}$  } *Ans.*  
 and the other  $204 \text{ ft}$  }

6th. Since "C" is the fulcrum, and the lever is in equilibrium, the resultant of P and W is P + W acting at the point C.

And, the moment of the resultant of any two forces about a point in their plane, is equal to the sum of the moments of the forces about the same point.  $\therefore$  taking the moments about the point "D" we have

$$P \times AD + W \times BD = (P + W) \times DC.$$

Q. E. D.

7th. Mr. Somerville draws F E G at right angles to AB through the point E, and then proceeds as follows:—

Resolve along AB and along FG.  $10\sqrt{5}$  resolved along AB will be  $10\sqrt{5} \times \frac{1}{\sqrt{5}} = 10 \text{ lbs}$ , acting in the direction of E B.

And, resolved along FG it would be  $10\sqrt{5} \times \frac{2}{\sqrt{5}} = 20 \text{ lbs}$ , because the Cos. of the angle CEF is  $\frac{2}{\sqrt{5}}$ .

Again,  $5\sqrt{5}$  resolved along AB is  $5\sqrt{5} \times \frac{1}{\sqrt{5}} = 5 \text{ lbs}$  in the direction of E A, and there is also another force of 5 lbs acting along E A.  $\therefore$  the whole force acting in the direction E A is 10 lbs; but there is 10 lbs acting along E B.  $\therefore$  these neutralize each other, and the R is along F G at right angles to A B. And the result is

$$10\sqrt{5} \times \frac{2}{\sqrt{5}} + 5\sqrt{5} \times \frac{2}{\sqrt{5}} = 20 + 10 = 30 \text{ lbs.}$$

[*NOTE.*—This is substantially correct; but the cosine of the angle CEF is not  $\frac{2}{\sqrt{5}}$ , but  $\frac{2}{5}$ , which makes the resolved portion in the direction F G 20 lbs, as Mr. Somerville finds. G. P. Y.]

8th. Since the C. G. of a cone is  $\frac{3}{4}$  of its  $\perp r$  height from the apex, it follows, that if the cone were laid with its axis horizontal, the radius of the base would need to be  $\frac{3}{4}$  of the  $\perp r$  height. But, if laid on its side, it would not need to be so long since the C. G. is lowered.

As the time is up, I have no more time to investigate it.  
 G. A. S.

[*NOTE.*—Mr. Somerville unfortunately mistook the problem, by substituting the word cone for cylinder. Had it not been for this oversight it seems evident that he would have solved the question proposed, as he shows, by what he has written, that he understands the principle involved. G. P. Y.]

9th. Taking the moments around the point A we have

$$192 \times 2\frac{1}{2} = T \times 12$$

$$\therefore 24T = 960$$

$$\text{and } T = 40 \text{ lbs} = \text{tension on B C.}$$

Now, taking moments around L we have

$$192 \times 2\frac{1}{2} = F \times 12$$

$$\therefore F = 40 \text{ lbs} = \text{friction at A.}$$

Again, taking moments around B we have

$$R \times 5 = 192 \times 2\frac{1}{2} + F \times 12$$

$$= 480 + 480$$

$$= 960$$

$\therefore R = 192 \text{ lbs} = \text{re-action on beam at A.}$

$\therefore$  Re-action on beam at A = 192 lbs } *Ans.*  
 Tension on string C B = 40 " }

[*NOTE.*—Why does not Mr. Somerville apply his principles more boldly? Is it not obvious that the re-action must be equal to the weight of the beam, as the re-action and the weight are the only vertical forces (which must, therefore, counter-balance one another), all the other forces being in a horizontal direction? G. P. Y.]

SOLUTIONS OF THE QUESTIONS IN ALGEBRA.

1. The H. C. M., found by the ordinary rule, is  $x^2 - x - 1$ .
2. The three values of the cube root of unity are the roots of the equation,  $x^3 - 1 = 0$ . But,

$$x^3 - 1 = (x - 1)(x^2 + x + 1) = 0.$$

Therefore, the required roots are found by the solution of the equations,  $x - 1 = 0$ , and  $x^2 + x + 1 = 0$ .

3. Let the reciprocals of the required numbers be

$$x, x + y, x + 2y, x + 3y.$$

Then, by the second condition of the question—

$$2x + 3y = 7;$$

And, by the first condition—

$$15x^2 = 4(x + y)(x + 3y).$$

The elimination of y from these equations gives us

$$x^2 = 4 \therefore x = 2 \therefore y = 1;$$

Hence, the required numbers are  $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ .

Another solution, by Miss Anna Living, is as follows:—

Let x = the first number.  
 y = the common difference of the reciprocals.

then  $\frac{1}{x}$  = first reciprocal,

$\frac{1 + xy}{x}$  = second "

$\frac{1 + 2xy}{x}$  = third "

$\frac{1 + 3xy}{x}$  = fourth "

$$15 \left( \frac{x}{1 + xy} + \frac{x}{1 + 3xy} \right) = 8x + 16x^2y$$

$$15 = 4 + 16xy + 12x^2y^2$$

$$x^2y^2 + \frac{4}{3}xy = \frac{11}{12} \therefore xy = \frac{1}{2}$$

$$\text{And } \frac{1}{x} + \frac{1 + xy}{x} + \frac{1 + 2xy}{x} + \frac{1 + 3xy}{x} = 14$$

$$2 + 3xy = 7x \text{ and } xy = \frac{1}{2}$$

$$\therefore 2 + \frac{3}{2} = 7x \therefore \frac{1}{2} = x, \text{ and } 1 = y.$$

$\therefore$  the four numbers are  $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ .

5. The following solution of this question is by Mr. James Ferrie:—As the minute and the hour hands are together four times in the course of 12 hours, between 4 and 5 o'clock, the time will be  $\frac{4}{11}$  of an hour past 4 o'clock, i.e. 4 h. 21 m.  $49\frac{1}{11}$  sec. by the watch going too fast. And, as the watch losing time shows 59 minutes 59 seconds, when the other shows 60 minutes 1 second, we find the time on the watch going too slow by the proportions

$$60 \text{ m. } 1 \text{ sec.} : 59 \text{ m. } 59 \text{ sec.} :: 4 \text{ h. } 21 \text{ m. } 49\frac{1}{11} \text{ sec.,}$$

which gives for answer 4 h. 21 m.  $40\frac{14590}{338811}$  sec.

6. When  $p + q\sqrt{-1}$  is substituted in the given equation, the result is of the form—

$$A + B\sqrt{-1} = 0,$$

A and B being rational. But, in order that this equation may subsist, A and B must each be zero. Now, if  $p - q\sqrt{-1}$  be substituted in the given equation, the result is

$$A - B\sqrt{-1} = 0.$$

But, A and B each being zero, the equation  $A - B\sqrt{-1} = 0$  subsists.

Therefore, the given equation is satisfied by the value of x,  $p - q\sqrt{-1}$ .

The roots of the equation,  $x^2 - \frac{52x}{7} + m = 0$ , remain real, so long as  $\left(\frac{26}{7}\right)^2 - m$  is positive. When this expression is zero, the roots are equal; and for every value of m greater than  $\left(\frac{26}{7}\right)^2$ , the roots are imaginary.

6. The first part of this question is familiar book work. The second part may be solved as follows:—

$$\frac{1-x}{1-y} = \frac{(2-9x+x^2)+(5+10x-x^2)}{(2-7y+y^2)+(1+8y-y^2)} = \frac{7+x}{3+y}$$

$$\therefore 7-7y+x-xy=3+y-3x-xy$$

$$\therefore x=2y-1.$$

Substitute this value of  $x$  in the equation

$$\frac{1-x}{1-y} = \frac{2-9x+x^2}{2-7y+y^2}.$$

Then  $y^2-4y+4=0 \therefore y=2$ ; and  $x=2y-1=3$ .

Another Method.—Miss Anna Living solves the problem by putting

$$\frac{1-x}{1-y} = \frac{2-9x+x^2}{2-7y+y^2} \text{ and } \frac{1-x}{1-y} = \frac{5+10x-x^2}{1+8y-y^2}.$$

She clears the equations of fractions, and, by combining the results, obtains  $2y=x+1$ , the same result as was found above. From this, the values of the  $x$  and  $y$  are easily deduced.

7. The following solutions is from the papers of Mr. George A. Somerville:—

Let  $p$  and  $q$  be the roots of  $x^2 + \frac{b}{a}x + \frac{c}{a} = 0$ .

$$\text{Then } p+q = -\frac{b}{a}, \text{ and } pq = \frac{c}{a}$$

$$\therefore a(p+q) = -b, \text{ and } apq = c \therefore \frac{p+q}{pq} = -\frac{b}{c}$$

In like manner, assuming  $p$  and  $r$  to be the roots of the equation

$$x^2 + \frac{nx}{m} + \frac{nc}{mb} = 0, \text{ Mr. Somerville shows that } \frac{p+r}{pr} = -\frac{b}{c}.$$

$$\therefore \frac{p+q}{pq} = \frac{p+r}{pr} \therefore p^2r + pqr = p^2q + pqr \therefore r = q.$$

8. The first of the given equations can be put in the form,

$$(x+y)(x^2-xy+y^2) + xy(x+y) = 108.$$

$$\therefore (x+y)(x^2+y^2) = 108.$$

If, now, we put  $z$  for  $x+y$ , and  $v$  for  $x^2+y^2$ , this becomes

$$vz = 108.$$

But, we have also given  $v+z = 24$

$$\therefore v=18, \text{ and } z=6 \therefore x=y=3.$$

9. Mr. Arthur Brown alone has solved this question. His solution is correct, except for a slight mistake in the working, towards the close. The following is the solution:—

Multiply both sides by  $\sqrt{1-x-1}$ ;

$$\text{then } n+1 - \sqrt{1+x} = n\sqrt{1-x}.$$

By squaring both sides,

$$2(n+1) + x(n^2+1) = 2(n+1)\sqrt{1+x}.$$

Square again, and transpose. Then

$$x^2(n^2+1)^2 + 4nx(n^2-1) = 0.$$

$$\therefore x = -\frac{4n(n^2-1)}{(n^2+1)^2}$$

10. The following solution, which, though correct, is awkward, is from the papers of Mr. George A. Somerville:—

Let  $x$  = distance from  $A$  to  $B$ .

$y$  = distance from  $B$  to  $C$ .

$\therefore 2y-x$  = distance from  $C$  to  $D$ .

$$\text{Then, } \frac{2y-x}{3\frac{1}{2}} = \text{Q's rate at first.}$$

$$\therefore \frac{6y-3x-5}{10} = \text{Q's rate in the second case.}$$

$$\text{And, } \frac{3y}{10} = \text{P's rate at first.}$$

$$\frac{3y}{10} + 2 = \text{P's rate in the second case.}$$

Mr. Somerville then obtains the equations—

$$\frac{10y}{6y-3x-5} + \frac{1}{2} = \frac{20y-10x}{3y+20}$$

$$\text{And, } \frac{10x+10y}{6y-3x-5} = \frac{20y-10x}{3y+20} + 3$$

Mr. Somerville did not finish the solution, but his equations give  $x=5$ , and  $y=10$ ; hence, the required distance is 30.

Another solution, by Miss Anna Living, is as follows:—

Let  $x$  = the distance from  $A$  to  $B$ ,

$y$  = the distance from  $C$  to  $D$ ,

$$\text{Then, } \frac{x+y}{2} = \text{the distance from } B \text{ to } C,$$

$$\frac{3x+3y}{20} = \text{P's rate per hour.}$$

$$\frac{3y}{10} = \text{Q's rate per hour.}$$

$$\frac{3y-5}{10} = \text{Q's decreased rate per hour.}$$

$$\frac{3x+3y+40}{20} = \text{P's increased rate per hour.}$$

$$\frac{5x+5y}{3y-5} = \text{Q's time to reach } B.$$

$$\frac{15x+5y}{3y-5} = \text{Q's time to reach } A.$$

$$\frac{3x+3y+40}{20y} = \text{P's time to reach } D.$$

$$\frac{5x+5y}{3y-5} + \frac{1}{2} = \frac{20y}{3x+3y+40} = \frac{15x+5y}{3y-5} - \frac{3}{4}.$$

From which equations, Miss Living finds:—

$x=5$ ,  $y=15$ , and  $\therefore$  the distance from  $A$  to  $D=30$  miles.

### VIII. Educational Intelligence.

TRINITY COLLEGE.—The annual convocation of Trinity College University was held in the Hall of the College at the usual time, the Chancellor of the University, the Hon. J. H. Cameron, Q.C., D.C.L., presiding.

The Provost having read prayers, the following degrees were conferred in the usual manner:—

B.A.—William Cartwright Allen, Rev. Robert Doherty, Frederick M. Morson and Alex. B. Chafee.

M.A.—Rev. Wm. Stephen Westney. M.B.—Egerton R. Griffiin. M.D.—Joseph Allright, Logan Murray Moore, Charles William Marlatt, Hugh Lang, Samuel Shakespere Stephenson, Geo. Steacy, Jas. McLaren Wallace, Archibald Sinclair Campbell.

D.C.—Salter J. Vankoughnet.

Admitted to the Divinity Class.—W. C. Allen, A. B. Chafee, J. H. Fletcher, W. E. Grahame, W. M. Tooke and W. Jupp.

The Chancellor then presented the following prizes, addressing a few congratulatory remarks to each recipient:—Ogden Pulteney Ford, B.A., the Hamilton Memorial Prize for 1872. Ogden P. Ford, B.A., the Bishop of Toronto's prize for Divinity. John Austin Worrell, the Prince of Wales' prize for 1st class in Classical Honours, 1871. Reginald Gourlay, prize poem for English subjects. W. C. Allen, the Prince of Wales' prize for 1st class in Classical Honours, 1872. W. C. Allen, Classical prize for third year. Chas. John Logan, Classical prize for second year. Clarendon L. Worrell, Mathematical prize for second year. Several students having matriculated, the Chancellor briefly addressed those assembled, expressing the pleasure he felt at seeing so many students matriculating and taking the degree of M.D. It showed a clear indication of the good work which was being done by the College. He referred in very appropriate terms to the munificent bequest to the College of \$4,000 by the late Mr. T. C. Street, and concluded by expressing a hope that a new Convocation Hall would soon be provided. The Convocation was then adjourned.

### IX. Departmental Notices.

#### TEACHERS' GOLD MEDAL FOR COMPETITION.

As already intimated in this Journal, we desire to state that William McCabe, Esq., LL.B. (a former successful teacher) has intimated to the department his intention to offer a gold medal, to the most successful candidate for a First Class Certificate of the highest grade, at the July examinations of this year. We hope that this generous offer will stimulate a large number of our teachers to endeavour to obtain the very highest place in their profession.

#### NEW SCHOOL MANUAL.

In answer to various inquiries on the subject of a new School Manual we would say, that as the School Law will likely be revised and consolidated at the next session of the Legislature in 1874, it is not thought desirable to publish a School Manual at present. Such a Manual should include in it the official regulations, but as they will not be revised until about the close of the present year (1874), or later, they cannot be embodied in the manual until then.