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COLLEGE OF TECHNOLOGY FOR ONTARIO.

So much general interest has been felt in regard to the establishment of the proposed College of Technology for Ontario, that we desire to devote some attention to the subject in this number of the *Journal*. With this view we have collected, and insert a number of extracts and papers relating to Technology, and the proposed School of Technical Science. These papers, we trust, will afford some valuable information on the subject.

As the name implies, Technology relates to the useful arts, to various kinds of handicraft, and to the scientific professions,—such as civil engineering, etc. A College or School of Technology has, therefore, to do with the practical instruction and training of persons in any particular art, handicraft, or scientific profession which they may choose.

The object of the proposed School of Technology for this Province is so concisely set forth in the following circular from the Department of Agriculture and Public Works that we insert it in this place:—

CIRCULAR FROM THE HON. MR. CARLING IN REGARD TO THE SCHOOL OF TECHNOLOGY.

(Addressed to the Manufacturers of Ontario.)

"You are doubtless aware that the Legislature, during its late Session, voted the sum of \$50,000 for the purpose of erecting suitable buildings, and to provide the necessary apparatus, for a Technical (or Industrial Science) School or College.

"So as to enable the Government more effectively to carry out the intentions of the Legislature, I take the liberty of calling your attention to the general purpose and objects of the proposed School, and request that you will furnish me some information in regard to

the want of trained or skilled persons in the branch of manufactures or business, which you carry on, as well as such other information as may aid in rendering the proposed institution most useful to the numerous class of manufactures now springing up in various parts of the country. For greater convenience I have ventured to append a few questions on a separate sheet of paper, which I shall thank you to answer and return to this Department.

"I may state, generally, that the object of the proposed School of Industrial Science will be to provide, in a two-fold form, for the education of Mining and Civil and Mechanical Engineers; of Manipulation in Metals; of Workers in Wood, Leather, Woollen and Flax fibres; of Designers, Modellers, and Carvers in the Decorative and Industrial Arts; and of persons desirous of studying Chemistry as applied to our various manufactures. The instruction in these several matters may be given in either of two ways, or in both combined, viz. :—

"1st. By means of popular Lectures and Classes in the evening, illustrating them by a collection of models and diagrams of various kinds of machinery, and by examples of the principles on which mechanical contrivances are constructed; and by the most approved examples in Drawing, Designing, Carving and Modelling.

"2nd. By means of a prescribed course of daily study and lectures, with a view to provide for the better instruction of those who evince an aptitude for Mechanical, Engineering, or Scientific pursuits; or who indicate a taste for Designing, or for the Decorative Department of manufactures.

"To those who would desire to prepare themselves in any of these branches of education, such an Institution, and such a course of study, would be invaluable. By its means we would be enabled to largely develop in our midst a great amount of useful talent, now lying dormant, which would prove eminently serviceable in promoting the best interests and success of Industrial Art and Manufactures among us.

"Being anxious, therefore, to obtain all the information possible on the foregoing subjects, I take the liberty of asking that you will have the goodness to communicate to me, at your earliest convenience (in addition to the questions proposed), your views as to the actual requirements of the profession or business in which you are engaged, and of the course or kind of studies which you would recommend as the best adapted to secure the end in view, namely:—The advancement of the Mining, Engineering and Manufacturing and Arts interests in this Province."

ANSWERS TO THE FOREGOING CIRCULAR.

We have much pleasure in inserting the following extracts from answers received by the Hon. Mr. Carling's Department to the foregoing circular. They are from Engineers, Mechanics, and other practical men, representing all the important, professional, and industrial interests which the proposed College is designed to promote. Their perusal will shew how deep a feeling there exists throughout the country, in regard to the necessity for such an Institution. The surprise expressed is that no practical movement had ever before been made to supply, so effectively as is proposed, a want which is found to exist so extensively among all classes of our industrial population.

The extracts, as it will be seen, relate only to the necessity which is felt to exist on the part of manufacturers and others, for a technical education of their workmen and other employés. We have not thought it necessary to give those parts of the replies received which relate to the course of studies which it is thought to be most desirable to adopt in the Institution proposed to be established. That is a matter of detail which can be arranged at the proper time by the Government and the authorities of the Technical College.

A number of other replies have been received from parties representing several of the most important industries in the Province, giving the respective number of employes, that it would be advantageous to their business, or calling, to have educated in the several departments of study proposed to be taught in the Technical School. These and the replies from which the following extracts have been taken are in the possession of Mr. Edwards, Secretary, Department of Public Works, Toronto, where anyone desiring it can refer to them.

EXTRACTS FROM ANSWERS TO QUESTIONS ON
TECHNICAL EDUCATION.

1. *From a Civil Engineer.*—"I consider the establishment of such a School would be an inestimable blessing to the Province. From the want of such a School, coupled with the peculiar circumstances of the Country, I believe there is a rapid depreciation in the theoretical knowledge, as well as in the manipulative skill, of those engaged in the various occupations proposed to be improved by the different classes of studies named in the subjoined list."
2. *From a Civil Engineer.*—"I am only surprised that this School was never encouraged in Canada years ago. I am now glad to think we shall soon be able to get at home, men of more practical and useful knowledge than formerly, without having to invite parties from abroad. Were there space, I might write pages in favor of it."
3. *From a Civil Engineer.*—"All the subjects mentioned would be of great importance to the Surveyor, Civil Engineer or Architect."
4. *From a Civil Engineer.*—"Will be one of the most useful Intitutes in the Dominion. In a word, the College you purpose erecting is a Canadian necessity,—the inauguration of which reflects credit upon the Ministry."
5. *From a Civil Engineer.*—"Recommends that students should have opportunities, during their course of study, of seeing actual work. Also recommends periodical visits to public works in progress."
6. *From a Civil Engineer.*—"It is not possible for an enquirer to know too much."
7. *From a Civil Engineer.*—"To those intending to adopt the profession of Civil Engineer or Land Surveyor, a knowledge of Geology and the practical working of mines would be advantageous."
8. *From a Civil Engineer and Provincial Land Surveyor.*—"My opinion is that it would be highly beneficial and useful to have such a School established in this Province."
9. *From a Civil Engineer and Provincial Land Surveyor.*—"I consider that the Government deserve the greatest credit for the establishment of an Institution which must necessarily prove a monument to its honor, and confer lasting benefits on society."
10. *From a Civil Engineer and Architect.*—"In conclusion I may say that I hail with great pleasure the opening of a School or College, with the necessary Library, apparatus, &c., such as now contemplated, as it will give the artisan or mechanic an opportunity of improving himself in the various branches of his particular trade or profession, and which, I have no doubt, will be gladly availed of by large numbers."
11. *From a Civil Engineer.*—"There are about 200 mechanics employed in the undermentioned establishment, all of whom would be benefited, more or less, by the establishment of Evening Lectures and Classes, illustrated by models and diagrams, where the subjects mentioned would be taught."
12. *From a Civil Engineer.*—"The Establishment, in addition to Class and Lecture Rooms and their accessories, should contain a Library of reference, a Laboratory, with the necessary furnishings, and a Museum for Geological and Mineralogical specimens, and for models of all such objects of Art and Nature as it may be deemed desirable to acquire and preserve."
13. *From a Civil Engineer and Provincial Land Surveyor.*—"It seems evident that the Institution proposed to be established cannot fail to be beneficial to the Province in several respects. To myself, great inconvenience has occurred through want of assistants, having a correct general knowledge of the first principles of Geometry and of Mathematics."
14. *From a Civil Engineer.*—"I think the efforts of such a School should be to supply a knowledge of such matters as are not likely to be obtained from a professional man in active employment, rather than profess to turn out men qualified, in all respects, to practice the respective professions. Workshops would be indispensable to the student of Civil and Mechanical Engineering."
15. *From a Civil Engineer.*—"This School will be most invaluable."
16. *From a Civil Engineer and Provincial Land Surveyor.*—"I would respectfully suggest that at least one of the Professors be an Engineer of acknowledged ability, and one who understands the climatic difficulties of this country. There is now no School in the Country where young men, intending to make Engineering their business for life, can acquire the necessary theoretical education. This is very important to the Country, as so many public works must yet be built and maintained."
17. *From a Civil Engineer.*—"In France and Germany all Engineers are required to pass through a course of study, such as above described, at some of the numerous Schools of Science, Schools of

Mines and Machinery, which are plentifully distributed throughout Central Europe and France. In Canada a School of Technical Science would unquestionably be of very great service in providing for the future Engineers and Manufacturers of the Dominion, such a thorough knowledge of the scientific foundation of their respective pursuits, as is now furnished alike in Europe and the United States."

18. *From a Civil Engineer and Provincial Land Surveyor.*—"The time has arrived in this Country when persons, desirous of being engaged in any of the learned professions, will have to get a more suitable education than heretofore. In fact, in every department of Science and Art it is essential that a more elevated education be obtained."
19. *From a Mechanical Engineer.*—"A School of Technology must be of an eminently practical nature, both by Lecture, Study and, above all, good Models to illustrate all the various branches of Mechanics and especially Engineering, and by practical men or none. The theory for quite a season should play only a subordinate part,—it will mature as the Institution gets consolidated."
20. *From a Professor of Natural Science.*—"As a general answer, I should consider a School, such as is proposed, most important for the young men of Canada. It may furnish a most important supplement to that higher education which falls within the province of a Faculty of Arts in a University, and it may afford a special education of a high order to those who have not the time or means to pursue a University curriculum. Its indirect influence on the intellectual character of the working classes will also be a great benefit."
21. *From a Superintendent of Mines.*—"There is a great want of Superintendents and Firemen with even elementary knowledge of mining. A want which the proposed School would seem well calculated to supply."
22. *From a Provincial Land Surveyor.*—"In so far as our own profession appertains to the foundation of a College, of the style contemplated, we consider it would be invaluable, as at present there is no Institution in the Province that has a regular course of study suitable for the requirements of a Provincial Land Surveyor. We should recommend for this branch, as a course of study, all the subjects required by statute for final examination in our profession, with the addition of Algebra."
23. *From a Provincial Land Surveyor.*—"I am certain that our present training and practice in Astronomical Surveying is too slight, and a more thorough knowledge of the practical part of it would greatly assist our profession to come up to its proper standard."
24. *From a Provincial Land Surveyor.*—"Any one who has given the subject any thought cannot but be of the opinion that such a School is in every way desirable and is very much needed."
25. *From a Woollen Manufacturer.*—"It will be of much advantage to the Woollen Manufacturer to study Chemistry as applied to colouring, and the effect of different oils on wool, also designing new patterns."
26. *From a Woollen Manufacturer.*—"It would be a great advantage to us if our employees were more skilled in Mechanics, not merely that there will be less breakage to the Machinery, but also, because a skilful operative is very apt to discover readily any improvement that may be made. Nearly all of the improved Woollen Machinery now in use, has been brought to its present perfect state by skilful operatives."
27. *From a Woollen Manufacturer.*—"A thorough knowledge of Mechanical Engineering, Chemistry as applied to Manufactures, and Figure and Decorative Drawing and Designing would be of immense benefit to one or two of my leading hands."
28. *From a Cloth Manufacturer.*—"I think it would be of great benefit to the Manufacturing interests of the Province to have a School where Mechanics and Chemistry would be taught."
29. *From a Woollen Manufacturer.*—"Superior scholarship in any and all branches is the true foundation of mechanical excellence as well as professional."
30. *From a Woollen Manufacturer.*—"In this Country, factories are generally superintended by persons who have risen from a lower employment by their perseverance and natural abilities, but are consequently wanting in theoretical or scientific knowledge, and therefore are too apt to work as they have seen done before, instead of striking out improvements, or adapting methods of foreign manufactures which require to be varied to suit the trade of the Country. The course of instruction you propose would in a great measure overcome this fault."
31. *From a Woollen Manufacturer.*—"Dyeing is an important part of our work and no one, we think, can be a really good dyer who has not a knowledge of Chemistry."
32. *From a Woollen Manufacturer.*—"We are sure that such a School will be very much approved. We find it very much to our disadvantage in having none that are well educated in those different branches."
33. *From a Woollen Manufacturer.*—"A knowledge of Mechanics would be a valuable acquisition to a number of our employees. It would give a better understanding of the laws which govern the working of the Machinery with which they are daily connected. Chemistry would suit our dyers. Few practical dyers have more than a very limited knowledge of the science. A good dyer with a knowledge of Chemistry would always command a large salary."

34. *From a Manufacturer of Knitted Wools, Yarns, &c.*—"It would be of considerable advantage to me and to them if all those who are connected with the running of my Machinery, say the Superintendent Carder, three Spinners, Knitter and Engineer, were educated and imbued with the general principles of Mechanics, Chemistry as applicable to dyeing, &c., is one of the most important subjects named herein so far as Canadian Manufacture is concerned, and in none are we more lamentably deficient. A thorough analysis of our natural elements and their adaptability as well as a knowledge of chemical combination is required, and in this a system of practical illustration and experience is peculiarly feasible and cannot be too strenuously urged."
35. *From a Woollen Manufacturer.*—"There is a great want in the Woollen Manufacture in Ontario at present for a practical designer."
36. *From a Woollen Manufacturer.*—"We would say that it would be a great advantage were all to study the general laws of Mechanics and Chemistry, especially the latter as required in our dye-works. We find great difficulty in obtaining practical dyers who have a thorough knowledge of Chemistry,—this is also the case in regard to Designing."
37. *From a Railroad Iron Manufacturer.*—"There is no doubt but that such a School as proposed, would help to develop the mineral resources and manufacturing interests of the Province, and for the rising generation, a course of daily study, under competent teachers, would seem the best; but to reach those who are already laboring in our manufactures, a course of evening lectures, with appropriate diagrams, models &c., and devoid of anything but what may be readily comprehended by comparatively uneducated minds, would be necessary."
38. *From a Lock and Hardware Manufacturer.*—"I consider the field opened in the study of Chemistry, as applied to manufactures, is an almost unlimited one, and, when with prudence applied to metals, is the real Philosopher's Stone, turning everything into gold. The supply of mineral wealth in Canada is almost unbounded, and is immense in the Province of Ontario; and the manipulator, working in metals, does so to great advantage if he has some good general ideas of Chemistry. Most of the iron producers and workers in metals in Great Britain regularly employ a chemist for the purpose of not going blindfold to their work, and find it profitable to do so."
39. *From a Lock and Hardware Manufacturer.*—"In answer to Question No. 1, on Mines and Mineralogy:—Yes, and a very general benefit, as it would materially aid in lessening the cost to all consumers of metal goods, especially of iron manufacture. In answer to Question No. 3, on Mechanics and Mechanical Engineering:—Yes, in every way, if Canada is ever to hold her own in the world. And in answer to Question No. 4, on Chemistry as applied to Manufactures:—Yes, getting to be almost an essential."
40. *From a Manufacturer of Agricultural Implements.*—"There are here six or eight firms manufacturing various articles, the raw material being iron and steel, using up say three to four thousand tons of iron and a thousand tons of steel annually, employing 250 to 300 men. Many of these machines have been designed by men of a good deal of practical skill but no education or scientific attainments, and we greatly need men educated for the business of designing heavy machines; for the manipulating in metals, young men prepared by education for designing machinery of this kind and acting as foremen in Iron Manufactories. There is really a great want of young men of this stamp, and this want is likely to increase, for manufactories of this kind have heretofore increased, and, I think, are likely to increase for some years to come, to far greater extent, than manufactories of wool or cotton. I have no doubt the School you refer to will be of great advantage, and I trust that the particular branch to which I refer will not be lost sight of."
41. *From Manufacturers of Farming Implements and Edge Tools.*—"In answer to Question No. 3, on Mechanics and Mechanical Engineering:—Yes, several of our employes would be benefited by such an establishment. We employ between 90 and 100 men,—most of whom require to be skilled workmen. One of the difficulties in the way of manufacturing in Canada is the scarcity of skilled labor amongst our own people. We believe the scheme suggested in your circular of 28th inst., would be well calculated to benefit our Country, by encouraging, developing and utilising genius amongst our own resident and rising population, which, otherwise, may be indifferently, if at all, brought out. The history of such Institutions in England, France, Prussia and Austria affords ample proof of their advantages."
42. *From Carriage Manufacturers.*—"In answer to Question No. 5, on Geometrical and Mechanical Drawing and Designing:—Absolutely necessary in the wood branch of our business. In answer to Question No. 6, on Figure and Decorative Drawing and Designing:—Very much required in our painting department. And in answer to Question No. 7, on Carving in Wood or Stone and Modelling:—This is also required to be successful in the wood-work department. We are glad to learn that there has been a move made towards the better education of mechanics amongst us."
43. *From a Manufacturer of Mathematical and Philosophical Instruments, &c.*—"In my line of business first-class workmen only prove satisfactory and profitable, as I find from experience that a man who combines too many branches is generally deficient in all,—it is far better for him to perfect himself in one or two branches than only know a little of all."
44. *From a Glass Stainer.*—"In answer to the Question No. 6 on Figure and Decorative Drawing and Designing:—It would be a decided advantage to my business as a Glass Stainer if some of my employes were to attend a class in Figure and Decorative Drawing and Designing. I believe that three or four would gladly avail themselves of the opportunity."
45. *From a Manufacturer of Agricultural Implements.*—"While I shall ever contend that a thorough knowledge of Geometrical and Mechanical Drawing is absolutely indispensable, I would strongly urge upon you the constant practice of sketching, or off-hand drawing, that is the ability, readily to take pencil and draft the important points in any Machine."
46. *From a Civil Engineer and Artist.*—"I rejoice to see so many much needed courses of study advocated by the Government. Having served my time in one of the largest works in England, where I was obliged to work practically at all the different trades connected with Railways, and having paid a fee of £700 Sterling, I can well see the great advantages the youth of Canada will have in obtaining so much useful knowledge, as is proposed to be taught in the Technical School without payment of a large fee. As Canada now takes the fourth place, with her Mercantile Marine, in the world, I think it would be useful to add to the course of study the knowledge of draughting and making ships' models, from lines."
47. *From Founders, Millwrights and Machinists.*—"A thorough knowledge of Decimals, Square and Cube Roots, Geometry, Hydraulics and Mechanical Drawing is necessary for every Master Millwright and Mechanical Engineer. Your College will doubtless do a great deal of good, and supply a want much felt in this Country."
48. *From Foundrymen and Machinists.*—"We are of opinion that the establishment of the proposed College will meet a growing want of this Country, and give an impetus to Mechanical Science, which must be attended with beneficial consequences. In the higher branches of Mechanics, especially in Engineering, it has been found necessary to pass over native talent and employ those of foreign training, owing to their superiority in scientific education. Believing the time has come when the demand for such scientific training is sufficiently large as to justify the establishment, by the Government, of a special School of Science, we very heartily approve of the action of the Legislature in the matter."
49. *From a Machinist.*—"I should propose that should a lad feel disposed to learn the branch of business I am engaged in, his first thought should be turned to the study of Mechanical Engineering, Mathematics, Figures and Mechanical Drawing. All this should be thoroughly mastered, and then he will be enabled to go through the branches and be qualified to fill any situation that may offer itself after he is out of his apprenticeship."
50. *From a Machinist.*—"My opinion is that such an Institution as the one proposed would be of the greatest acquisition the Province could possess for the full and perfect development of the various Arts and Manufactures calculated to be taught therein. One subject I would urgently suggest, that is a thorough knowledge of the theory, construction, manufacture and management of Steam Engines and Boilers, and I would also suggest in connection with the Institution, a course of lessons on the various Arts and Sciences similar to that so successfully carried on by the Science and Art School, Kensington, London, England, that is of issuing these lessons for competition all over the United Kingdom."
51. *From a Machinist.*—"I have long felt that there was a want of a proper School where our young men could get a thorough training, theoretically and practically, and it will have a tendency to stimulate our young men to seek a good sound Education and aspire to a place amongst us." In answer to Question No. 2 on Civil Engineering and Surveying. "In our branch of business, Draughting is necessary and indispensable." In answer to Question No. 5 on Geometrical and Mechanical Drawing or Designing. "This is an important branch in our business and one that can only be acquired by the way which is proposed, namely, Technical Education." And in answer to Question No. 7 on Carving in Wood or Stone and Modelling. "Modelling is required and necessary in our business. We require models for everything in our business in Moulding and Finishing."
52. *From Iron Founders.*—"Young men of ability usually go to the United States where they have a wider field. We have long wished that our Government could see this and apply a remedy to keep our young men of mechanical ability at home, and we think this School will materially aid in creating a taste for the finer Drawings and Modelling in Ornamental Work which we now depend on getting from the United States and Europe. We think the School should be free that all who have talent can avail themselves of its advantages."
53. *From Iron Founders and Store Manufacturers.*—"In answer to Question No. 3, on Mechanics or Mechanical Engineering:—It would be an advantage if our better class of employes possessed a knowledge of Mechanics. In answer to Question No. 5, on Geometrical and Mechanical Drawing or Designing:—This is an important branch, and would advance the interests of persons engaged in iron-founding. And in answer to Question No. 7, on Carving in Wood or Stone and Modelling:—This branch, or, at least, a know-

- ledge of it, would be a great advantage as we find it difficult to get persons capable of Carving in Wood and Modelling. If an Iron-founder understood Mineralogy, Mechanics and Mechanical Drawing and Designing and Carving in Wood and Modelling, it would enable him to manage his business much better than most Founders are capable of doing in Canada at present."
54. *From a Machinist.*—"In my capacity as Machinist or Engine Fitter, I have often deplored the loss to this City (Toronto) in particular, and the country in general, of such a School as the one now proposed to be established."
55. *From a Founder and Machinist.*—"I think that such a School is badly wanted as we are in want of greater skill than formerly, and are fast growing up to be a manufacturing people. I have felt the want of it myself while I was an employe."
56. *From Founders.*—"In answer to Question No. 3, on Mechanics or Mechanical Engineering:—This branch would be a useful one for a class of our mechanics to perfect themselves in. And in answer to Question No. 6, on Figure and Decorative Drawing and Designing:—This, along with No. 3 and 7, would make our foremen, stove-fitters and others an almost invaluable lot of men. Any system which could be adopted to induce mechanics to avail themselves of the immense advantages to be derived from the use of an Institution, such as the one proposed, would be most effective."
57. *From a Machinist.*—"We will give our best support to a Government that has the interest of the education of our mechanics, and the development of our manufacturing interests, at heart, as the present one has shown by its measures heretofore to have."
58. *From Manufacturers of Flax, Twine, Yarns and Cordage.*—"Education on subjects contained in Questions Nos. 3, 4 and 5, would be useful to persons employed by us as foremen or managers."
59. *From a Wood Carver and Designer.*—"Such a School, as the one proposed to be established, is much needed, and would be of great benefit both to the employer and employe. If I could further the interests of such a School in any way, I would be happy to render my services."
60. *From Planing Mills and Manufacturers of Shingles, Staves, Barrel-heading, &c.*—"In answer to Question No. 3, on Mechanics or Mechanical Engineering:—We feel the want very much of practical Engineers,—cannot get one out of ten that can run an engine and keep it in order. It is very difficult to get good men to work our machines even at very high wages."
61. *From a Sash and Door Manufacturer.*—"If every man in the shop had a good knowledge of Drawing and Designing, it would make them much more efficient, and be a great convenience to them and me both."
62. *From an Oil Refiner.*—"Usual course. Natural Philosophy, which would necessarily include Pneumatics, Hydraulics, Steam Power, &c., Chemistry, Hydro-Carbon Oils."
63. *Rectifier.*—"It should be very much on the principle of our common schools. The more wide spread, cheap and easy of access, the better will be the result. I look upon the design as a necessity of the times, and heartily wish success to its fulfilment."
64. *From Oil Refiners and Manufacturers of Lubricating Oils.*—"We cannot find either time or space fully to enter upon this most important subject, and therefore must be content by summing it up in two words: "Economy and Efficiency." It should be a cheap school so that its advantages should be within the reach of even the poorest classes. The teachers should be men eminent for their abilities to impart knowledge, for the most clever men are not always the best school-masters, and if the heads of the various departments are not efficient, the scholars will not be so."
65. *Tanners and Curriers.*—"He would say a school of this kind is very much wanted in the Province, but would further state the practical parts should be carried out by actual application, combined in such a manner that the learner would be fully master of whatever he professed. The writer has six sons, all intended to be tanners; and would wish to send one or two of them to such a school, if established."
66. *From Tanners.*—"We are very much pleased to see that such an Institution as this is about to be put in operation. We think that it is just what the country requires. Hoping you may meet with all possible success in the matter."
67. *From a Brick Manufacturer.*—"There are two branches of industrial science, Mechanics and Geometrical Drawing, which I consider lay the foundation for all designs, modelling, &c., and feel very anxious in seeing such a school in operation."
68. *From a Soap Manufacturer.*—"We think it might be made a great assistance to the next generation, as we have not a doubt all manufacturers would send their boys, if they intend them to adopt their trade."
69. *From a Tallow Chandler.*—"In answer to Question No. 4 on Chemistry, as applied to Manufacturers:—"It would be the very life of the business to understand Chemistry in a Chandler's shop." During 20 years in business I have not met one person in the trade that had any education in the line of this manufacture. It is just a venture without any study of the science of the nature of chemistry. Chemistry, if understood, would be of mighty importance to our public institutions in saving expense and utilizing much that is thrown away."
70. *From a General Agent.*—"I am satisfied that all the branches proposed to be taught will tend to the elevation of our Canadian youth."
71. *From an Agriculturist.*—"Would be pleased to have all in my employ educated in all or any of the above questions to which I have given my opinion."
72. *From a Druggist.*—"The only suggestion I would make is that existing schools such as our Albert College here (Belleville) should be affiliated with the proposed Technical School, so that young men when so situated might prepare themselves at home for graduation."
73. *From Druggists.*—"We believe the proposed College will supply a want long felt. In our business there is not one out of a hundred know anything about chemistry—even as applied to drugs and medicines they are daily handling and dispensing. Botany is also a study greatly neglected by those of our profession."
74. *From a Millwright.*—"With regard to the school proposed, in my opinion, all those branches of business are of great advantage to the rising generation, and especially in millwright business."
75. *From a Miller.*—"I am very glad to see that you are going to establish such a school, for I think it will be a great advantage. Hoping the school will be a great success."
76. *From a Physician and Surgeon.*—"I fully approve of the steps which have been taken to establish an Institution for Technical Education. I believe that a course of study in the Technical School would more fully prepare young men for the study and practice of the medical profession."
77. *From a Miller.*—"I am of opinion that the Ministry have acted wisely and judiciously in establishing an Institution, or Technical School, where those arts and sciences as proposed will be taught, which of itself will have a tendency to improve and further the best interests and welfare of the country at large."
78. *From a Contractor.*—"I consider the proposed scheme for Technical Education a great boon, and will supply (under competent instructors) the greatest want that exists in the Educational system."
79. *From a Builder.*—"I very much approve of the suggestion for the formation of Evening Classes, as it would afford the young men an opportunity of attending without interfering with their daily labour, and an opportunity thus afforded would enable them to take a higher position as artisans."
80. *From a Chemist.*—"I cannot too strongly impress upon the Government the great advantage of a general knowledge of chemistry."
81. *From a Principal of College.*—"1st. The prescribed course of daily study and lectures, &c., may be carried out in the University of Toronto—an institution fully under the control of the Government. 2nd. The popular lectures and classes in the evening, &c., may be carried out in the Upper Canada College—an institution fully under the control of the Government. By this arrangement an immense saving may be obtained, while the efficiency need not be impaired, and an excellent opportunity would thus be afforded to the students in the residence or College boarding house to avail themselves of the evening lectures and classes. They would constitute a permanent nucleus, and coming as they do from all parts of the Province, they would be the means of spreading a scientific taste and spirit in their respective neighbourhoods."
82. *From a Cooper.*—"I have no doubt whatever but said school would be of great advantage to many."
83. *From a Lumberman, &c.*—"In my business I have often cause to regret that I had not the opportunity of studying Mechanics, and Mechanical Engineering in particular. My business is lumbering, building, furnishing material for building out and out, and am often required to get up plans, designs, &c., and if I should have to put it in the care of a foreman, I should certainly prefer one educated as I wish I had been."
84. *From a Minister of the Gospel.*—"I have only to say that such an institution would prove highly beneficial to the country, and calculated to promote the object contemplated."
85. *From a Contractor.*—"With regard to the Technical School, I beg to assure you that I will give it my hearty support. An institution of the kind has long been wanting in Canada, and will be invaluable."
86. *From a Wood Engraver.*—"It would be advantageous to those engaged in our business if a School were established where they could learn both Technical and Figure Drawing, but especially the latter. The best way of teaching is to avoid the use of copies as much as possible, keeping a few only for the merest beginners, and placing all pupils as soon as possible to draw from good life size plaster casts, and then from the living human figure, and still life such as birds, fruit, &c. This is the plan pursued in England with distinguished success by the President of the New Water Colour Society, Mr. Henry Warren."
87. *From a Produce and Land Agent, &c.*—"It would be a great advantage to myself and all others interested in Mineral and Oil territory to be able to obtain men of scientific education, at reasonable rates, qualified to examine mines, report upon their value, and if found promising to superintend the working of them."
88. *Founders, Engineers, Millwrights, &c.*—"Without reply *seriatim* to the various questions proposed, we would simply state that we are pleased to learn that it is proposed to establish a Technical School in Ontario. We are not prepared to say that such an Institution would be of much service to the great mass of workmen such as we employ, and judging from the neglect with which our Mechanic Institutes are treated, we fear that few would avail themselves of it. We have no

doubt, however, that it will be of very general service to the country, in affording opportunities of home instruction, to the sons of persons of means, destined for the professions of Engineering, Surveying, &c.; or to others who manifest special aptitudes for such studies. We think the programme of instruction outlined embraces everything thing necessary at present. The teaching should of course, be very thorough, and examinations for diplomas stringent."

89. *Publishers and Stationers.*—In answer to question No. 3, on Mechanics or Mechanical Engineering. "A knowledge of Machinery as applied to printing and book-binding, would be of much value to us." In answer to Question No. 3, on Chemistry, as applied to manufactures. "Chemistry as applied to paper-making, would be of much service to us." In answer to Question No. 5, on Geometrical and Mechanical Drawing or Designing. "We require designs for book illustrations and covers, and have to get them from Britain at present. It would be of great advantage to us to have them done here." In answer to Question No. 7, on carving in wood, or stone, and modelling. "Wood cutting and engraving on brass and steel, are much wanted by us, and cannot at present be done satisfactorily in Canada." "The branch of study that would most nearly affect our business, would be designing, and the establishment of a School of Design would probably enable us to secure here what we have to spend many thousands of dollars in Britain and elsewhere for."

I. Papers on the Technical College.

1. REPORT ON THE PROPOSED COLLEGE.

Being anxious to obtain information on the subject of the proposed School of Technology, the Government of Ontario sent two Commissioners to the United States in January, to visit the Technical Schools there, and to report the result of their observations. The following analysis of the report which was made, we take from the *Leader* :—

"Some six or eight weeks ago Drs. J. G. Hodgins and Alex. T. Machattie were deputed by the Commissioner of Public Works and Agriculture to proceed to the United States to inspect and report upon any Technical or Science Schools in operation there, in view of establishing a similar institution in Ontario. The report of the Commissioners is now in print. They visited no fewer than eight of these schools, four in the State of New York, three in Massachusetts, and one in Connecticut, "the great manufacturing and industrial centres of the Union."

"From the investigation made, the Commissioners report upon the following as the subjects which ought to be taught in the proposed institution :—Pure and applied mathematics, architecture and drawing, pure and applied chemistry, natural science, modern languages. They recommend, for the sake of economy, that the number of teachers should at first be small, and that the instruction should be as practical as possible. In the Industrial Science institutions of the United States much prominence is given to the study of modern languages, because of the high value of the scientific literature of France and Germany.

"The Commissioners say they have had in all their enquiries special reference to the character, cost and convenience of the proposed building for this Province. They do not think it would be desirable or expedient to erect a building capable of accommodating less than from 120 to 150 students. By a proper division of labour among the professors, which is sketched out, instruction would be given to architects; civil, mechanical and mining engineers; chemists, metallurgists, and teachers of science. The Commissioners map out a plan of the building, which they estimate would cost about \$50,000, and they estimate the annual expenditure as follows :—

Salaries of 3 professors and servants from	\$7,000 to \$8,000
Apparatus, chemicals, and models...	1,500 to 2,000
Fire, water and light.....	2,000 to 2,500
Repairs and furnishing.....	800 to 1,000
Contingencies, printing, &c.,.....	800 to 1,000

Total.....\$12,000 to \$14,500

"The minimum age at which students are admitted to the several institutions visited is from 16 to 18 years. In all cases they are required to pass a prescribed examination chiefly in Arithmetic, Algebra (to quadratic equations,) Geometry, English Grammar and Geography. The fees payable annually by each student (when not a state beneficiary) varies from \$100 to \$200. A first supply of apparatus and chemicals is usually given to each student; subsequent supplies have to be paid for at about cost prices, while

breakages are at the risk of the student. The School term in each of the Institutions visited generally extends from July or August to September or October giving to the students a vacation of about two months in summer, and an interval of two weeks, or more, at Christmas.

"Considerable detailed information is given in the report as to the discipline in the American institutions, the mode of teaching, examination, and the management and government of Technical Schools. As to whether such schools have been an assured success in the United States, the Commissioners give an almost unqualified answer in the affirmative, and they add: "We have the strongest testimony as to the necessity of keeping institutions for technical education entirely apart from, and independent of, any other literary or scientific schools or colleges." The fact is these schools are designed mainly for young men who desire to enter upon the practical business of life before passing through a collegiate or university course. Respecting the desirability of establishing an Industrial Science School in Ontario, the Commissioners say :—

"No one who has attentively studied the educational progress which we made during the last ten years, or carefully watched the development of the material resources and manufacturing industries of this Province, but must have been painfully struck with the fact that, while we have liberally provided for the merely intellectual wants of our people, we have almost entirely neglected making any provision for training, and then turning to practical account that superior scientific and industrial skill among ourselves, which in other countries contribute so largely and effectively to develop their physical and industrial resources. We have hitherto been content to receive our supply of such skilled assistance from abroad; and we have left to European and American Institutions the duty of developing the Canadian talent and ability of such of our youths as have enterprise and means enough to go abroad to acquire that practical knowledge of the industrial arts, which we deny to them in their native land.

"In this respect our American neighbours furnish a favourable contrast, and display their usual national sagacity. In their great industrial and manufacturing centres, they have established institutions devoted to industrial science and education. Nor have they been content with a meagre provision in this respect. In the small State of Massachusetts, (with a population in 1870 of 1,457,000,) they have already established three such institutions as the Government now propose to establish in this Province. In the neighbouring State of New York, they have no less than four Schools of Technology (more or less extensive), one of which was established nearly fifty years ago. The result has been that in all their great civil, military, engineering and industrial and mining projects, they have been able at all times to command the best skill and talent among themselves; and that talent always receives a sufficient encouragement by being constantly employed either in the service of the State, or in the great railway, mining or industrial enterprises which are so largely developed and encouraged in the United States. The Commissioners in their report further say :—

"QUESTION AS TO THE ADVISABILITY OF MACHINE SHOPS.

"The only Institution which we visited to which a Machine Shop was attached was that at Worcester, Massachusetts. In one or two others a small work shop (with lathes, tools, &c.) was provided. The general feeling on the subject is, that they are expensive and of doubtful utility, and that, if introduced at all, it should be to a very limited extent, and not for the purpose of training skilled mechanics. At Worcester, where a good machine shop exists, it is to some extent made available for the younger students, who are treated as apprentices. But, even there the shop is deemed an experiment. As the work done in the shop is thorough and of a saleable description, it competes in the open market, and brings its full value. The labor being cheaper than in other machine shops, it would appear that such a shop might not only be self-supporting, but profitable. There is, however, one serious drawback to this, that the experienced workmen are compelled to devote much time to novices and apprentices; but as the primary object of the machine shop is, not to make money, but to teach—the want of profit can scarcely be regarded in the light of a failure.

"As a substitute for machines in the other Institutions, tools, models, and drawings are freely provided. The students are also required, as a regular part of their class training (and with a view to familiarize them with the actual details of work), to make regular visits of inspection in the neighbourhood to machine shops, engines, mills, furnaces, chemical works, &c. And when practical (especially during the holidays), facilities or encouragements are given to the students to visit with a professor, mining districts, large engineering constructions, important buildings, &c.

"NOTE.—Students in the Engineering and Surveying Departments are steadily assigned given sections of country, in which they are required to "locate" a line of railway, or to make a topographical survey of it, as the case may be.

"NECESSITY FOR MODELS OF MACHINERY, LATHES, COLLECTIONS OF TOOLS, &c.

"As already intimated, a substitute for machine shops (in connection with the students' visits of inspection to manufactories, mills, &c.), a collection of enlarged models of engines, and machinery of various kinds, is absolutely necessary. These models should be of sufficient size and construction to enable the student easily to understand the details of their mechanism, to take them apart and reconstruct them, to make sketches, isometric, perspective and working drawings of them, with the necessary details of plans and sections, &c.

"In addition to these enlarged models, small models, charts, diagrams and photographs of works and machinery, &c., should be procured. Whenever practical original working plans and drawings, with the estimate (or copies), and specifications of engineering works, or machinery, which have been actually constructed, should also be obtained. The latter, in the hands of students, give a reality to their theoretical instruction, which is invaluable to them in the progress of their studies. After a study of such plans and drawings, a visit of inspection to the work or machinery itself, will more deeply impress on the student's mind the minutiae of its details, and familiarize him more with the intricacy, and yet simplicity, of its parts, than a week's laborious study of the theory of the construction of the same piece of machinery or work.

"LABORATORIES FOR STUDENTS—METALLURGY.

"We have before briefly referred to the subject of students' laboratories, and the necessity of a mineralogical and metallurgical collection of models and specimens. We cannot too strongly press upon your notice the necessity of providing amply for this department of instruction in the proposed Institution. The students should have every facility for pursuing their practical studies in chemistry and metallurgy, in the laboratories which we have already named. In a country like ours, whose mining interests are yet in their infancy, and which must every year increase in magnitude, we should seek to train skilled men, who, by their knowledge and ability, can so materially aid in the development of this most important department of national wealth and industry.

"PERSONS TO BE BENEFITED BY THE COLLEGE OF TECHNOLOGY.

"To these suggestions on the appliances of Technical Education, it may be well to add some of the advantages which, in our opinion, are likely to result from founding a Technical School or College in Ontario. We should anticipate, from what we have seen elsewhere, and from the character of the rapidly increasing industries of Canada, great benefits, both to the students themselves, and to the country generally. Graduates and students of a well conducted and efficient Technical School necessarily share in its reputation; and a diploma or certificate from a good school is usually a passport to remunerative employment. A glance at the record of the after history of the graduates of some of the Technical Schools in the United States is amply sufficient to establish this statement. At one which we visited, we were informed that the Principal was quite unable to supply the constant demand for students to fill professional situations of a high and lucrative character. That the students themselves are sensible of the value of the training, is almost always shown by after donations to the museum or scientific collections, and, in some cases, where they have obtained pecuniary assistance in their studies, by afterwards contributing in money the amount of the fees which they had while students been unable to pay.

"To the general community a School of Industrial Science is of great value as a central source of information to manufacturers and others on all new discoveries pertaining to their pursuits. From the Professors in such a School, advice and opinions on scientific questions can be had, and in well trained students is to be obtained the scientific and practical assistance required in most manufacturing establishments. The students themselves become teachers of science; and both they and their professors extend the limits of science by original investigation. Every civilized country is devoting increased attention to this kind of education, as the best means of keeping their industries abreast of the general and rapid progress in all the industrial arts and manufactures; and we, therefore, believe for this, and for the other reasons given above, that a Technical College for the Province of Ontario is not only likely to prove beneficial and successful, but is an obvious and growing necessity.

"It may, nevertheless, be asked: what particular classes of our population are likely to be benefitted by the projected School of Technology? We have in part anticipated a reply to this question in what we have already stated. It may, however, be desirable briefly to enumerate the various professions and callings which it is designed practically to benefit by the proposed Institution. They

may (following the classification at the Yale Scientific School) be grouped together as follows:—

1. *Civil Engineers*.—Those who have to do with the construction of roads and bridges, railways, aqueducts, reservoirs, drainage systems and public works in general.
2. *Mechanical Engineers*.—With reference to the superintendence of manufactories, workshops, machine shops; the invention and construction of machinery, the applications of steam, &c.
3. *Mining Engineers*.—With reference to the development of the mineral wealth of the country, the superintendence of mines.
4. *Metallurgists and Assayers*.—Those who have to do with the analysis of iron, lead, copper, gold and silver ores.
5. *Chemists*.—With reference to agriculture, manufactures, pharmacy and various commercial pursuits.
6. *Physicians and Sanitary Advisers*.—In certain preparatory studies in physics, chemistry, botany, &c.
7. *Men of Science*.—Either as professors, teachers, explorers, investigators, etc.

"VALUE OF SUCH SCHOOLS ELSEWHERE.

"It is not necessary in this report to refer except briefly to the invaluable results which have flowed in Europe from the establishment of such schools. In England (without referring to the newer departments of science in the National Universities, and other valuable science education agencies), the Department of Science and Art, and its latest development (as a great school of observation), of the South Kensington Museum, have given an immense impetus to industrial education and instruction in practical science in all the large cities and towns of the three kingdoms. In Prussia, Switzerland, and other parts of the Continent of Europe, the progress in this direction has been of late years greater than in the mother country. But the recent work of Scott Russell Esq., shewing the present unsatisfactory state of technical science and instruction in Great Britain, as compared with its higher development in other parts of Europe, has stimulated scientific men in Britain; and there is no doubt that the next few years will witness a vast improvement in this respect.

"During our recent visit to the United States we made particular enquiries into the value and results to the community of the establishment of Technical Schools in that country. The replies received from the authorities of those institutions which had been long enough in existence to render any appreciable service were most gratifying. They furnished us in most cases with details showing where and how their students and graduates were employed after they had left the institution concerned. Numbers of them were professors, assistant professors and instructors elsewhere; many were employed by the Federal and State Governments on explorations in the distant Territories and in surveys elsewhere; numbers more were employed on railways, in manufactories, in mining, assaying and in public works requiring the highest engineering skill. On this latter part, one fact was mentioned which practically illustrated the great value of such schools. The planning and construction of the great suspension bridge, which it is designed to throw across the East River, at New York, to connect that city with Brooklyn, has been confided solely to the engineering skill of the graduates of the Rensselaer Polytechnic Institute, at Troy, N. Y. The chief engineer of that extensive work (W. A. Roebling, Esq.) and all his assistants are from that one Institution; and they have, we understand, fully and satisfactorily solved the problem of the practicability of that great work. Of the other graduates of that and other Schools, we learned that they were employed in all the national undertakings requiring engineering skill. They are also employed as State Geologists, Surveyors-General of States, Engineers of Railways, Superintendents of Iron Works, Manufactories, etc. The development of American talent and ingenuity may be gathered from the fact that the number of patents for inventions issued by the Department at Washington each year is about 10,000.

"Rising up above this mere local view of the question, other broader and more comprehensive ones force themselves upon our attention. Are we not conscious of the extraordinary scientific and industrial progress of the present day? Do we not hope for, and predict under God's providence, a great future for this country? Have we not in the assertion of our incipient nationality, entered the lists of industrial competition with the United States, and even with England and other countries? And do we not, therefore, require to make, without delay some provision for training that class of our young men, who must in the future take the leading part in that competition? The wonderful progress of the mechanic arts, is within the memory of most of us. The marvellous revolution, caused by the practical application of steam and telegraphy (those golden links of science) to locomotion, commerce, industry, and intercommunication, has so stimulated the inventive genius of man, that we now cease to be astonished at any new discovery; and only

await each successive development of science still more wonderful than the last, to calmly discuss its merits and advantages. In this active race of competition, our Province (the leading one in the Dominion), cannot stand still. With all of our inventions, we have not yet been able to discover a royal road to learning; and our youth cannot, Minerva-like, spring fully armed into the arena of competitive science and skill. We must, therefore, provide liberally for their patient and practical instruction in every grade and department of knowledge, so that, with God's blessing, we shall not fall behind in the great race of national intelligence and progress.

"The report closes with a somewhat lengthened reference to what has been and is being, done in Great Britain and Ireland, as well as in Germany and other parts of the continent of Europe, in this direction. And thus sum up their remarks:—

"Such are the encouragements, in the mother country, to scientific education. We forbear to enter into further details in regard to the condition and progress of industrial science in other parts of Europe. Germany, supreme in the art and appliances of war, is fast becoming the work-shop of Europe. Even in these other countries, where the physical labour is abundant, science, in its application to the mechanic arts, is felt to be not so much a labour-saving as a labour-multiplying power. It is, therefore, to a new country, a substitution in part for immigration of a most valuable and substantial kind, and one which should be stimulated in every possible way. It is estimated that in the United States alone, steam and water applied to machinery, is equivalent to the power of *one hundred millions of men!* The results of labour, under such circumstances, becomes less dependent upon physical effort, than on the skill and ability of the workman in the use of tools and mechanical contrivances. The question of technical education is therefore not an open and debatable one. It is a national necessity. It is on the whole a most satisfactory document, and it is evident the investigation has been conducted in such a way as to lead to the inauguration of the School of Technology in Ontario under the very best possible auspices."

2. THE TECHNICAL COLLEGE OF ONTARIO.

From a recent speech by Adam Brown, Esq., of Hamilton, relating to the Technical College, we make the following extracts:—

"This great Dominion of Canada now comprises the whole country from the Atlantic to the Pacific. It is our duty to bind and link it together with our hands, to send the car of progress speeding across the whole broad expanse, carrying enlightenment with it, so that wherever it goes people may become better citizens and enjoy all the benefits of the progressive and enlightened age in which they live. Why, gentlemen, when I received this very day a document from the Bureau of Public Works in relation to the higher education for the humbler classes—a document asking questions concerning the Technical College—questions everyone of which I can answer—I felt a glow of satisfaction and of pride. What is Technology, gentlemen? Why it is a branch of education which teaches the principles of the useful arts. It is in fact science applied to every day industry. Through the teachings of Technology, for instance, the student not only learns the behavior of iron under heat, but also the chemical principles upon which it depends. It is a branch of learning which is rising into importance in England and the continent of Europe. The Technical School is intended to hold the same position with reference to manufactures and the useful arts that the School of Agriculture will to the tillage of the soil, the object of the one being to give instruction in the science of manufactures, of the other in the science of agriculture. As University College is the training school for the literary classes, so the Technical School will be the training school for the manufacturing class and the School of Agriculture the training school for the agricultural class. The scientific instruction to be given in the Technical School falls naturally under two heads, the chemistry of manufactures and mines and the philosophy of machinery.

"The object of the system of education now adopted by the Government is to afford the children of the poorer classes instruction in the higher branches of learning at very little cost. The time has gone by, gentlemen, when the rich only can receive a liberal education. It has now come to be recognized that all the walks of learning must be opened to poor and rich alike. That money, or position, or influence does not entitle one man to lord it over another; but that the mind makes the man. Worth, not dollars, must be the plummet by which a man's capacity should be sounded (cheers), the gauge by which his standing in the estimation of his fellows should be measured. When we see a Government that has devoted fifty thousand dollars to the purpose of giving the poor man's child the same education as the rich man's, we must confess that that is the kind of government we want. It is the kind of government which

lifts up the poor and does not depress the rich—which recognized that it is not the profession which elevates the man, but the man who elevates the profession.

The rank is but the guinea stamp—
The man's the gold for a' that.

"Well, gentlemen, what about this Technical College? Here are the questions contained in the circular to which I have alluded:—'Would it be an advantage to your business, if any number of your employes were educated in one or more of the subjects proposed to be taught in the Technical School, about to be established, and if so, how many, and in which of the subjects, namely: Mines and mineralogy; civil engineering or surveying; chemistry, as applied to manufactures; geometrical and mechanical drawing or designing; figure and decorative drawing and designing; carving in wood or stone, and modelling.'

"We have sealed up in the bosom of this great country of ours perhaps the richest part of the mineral resources of America. If technical education becomes free and general we will be able to work out those resources, adapt them to our needs and rise by their aid to wealth and greatness. That, gentlemen, is what I call practical legislation; and I would sooner hear men discussing such projects as those than wasting their time over questions created by faction."

3. TECHNICAL SCHOOLS.

The Boston *Commercial Bulletin* says:—"There is certainly a great want in this country of men thoroughly educated in those branches of practical science with which all manufacturers, but more especially those engaged in the production of textile fabrics, should be familiar. Such men can only be found abroad, or among the better classes of immigrants, but they are few in proportion to the requirements of our manufacturing industries; and to the fact that we have less highly skilled talent devoted to the improvement of manufacturing processes may be attributed the disproportion between the capital employed and the results produced in American mills and factories, as compared with those of Europe. In the manufacture of the higher grades of textile fabrics a knowledge of practical chemistry is indispensable to economy, if not to success. Costly and often disastrous experiments have to be made with chemicals and dye-stuffs, our waste of material is unnecessarily great, and in proportion to the cost of production, the average quality of our domestic fabrics is far below what it should be. It is believed by many, and with this opinion we heartily concur, that the establishment of technical schools for the scientific education of manufacturers would, in great part, obviate the difficulties now experienced by manufacturers in securing the assistance of experts to conduct these experiments and devote their attention to the improvement and simplification of manufacturing processes. Such a school, or schools, should be modelled on the plan of the great industrial schools of France and Germany, in which the course of instruction embraces weaving, spinning, dyeing, designing, drawing, mathematics, applied chemistry, &c. In such schools tuition should be free, or so nearly free as to be within the reach of all who might choose to avail themselves of the facilities they would offer for practical education. There is reason to hope that the interest now felt in this important movement, by the growers and manufacturers of textile fibres, will lead to the establishment of such a school in one of the great manufacturing centres; and should the experiment prove successful, it is probable that others of similar character will be established in other localities. But in the efforts to secure the dissemination of scientific knowledge, the necessity for the more general practical education of young men should not be overlooked. The revival of the apprenticeship system should everywhere be encouraged, for it is the highly skilled mechanics and artisans who contribute most to the industrial progress of the world, by compassing results which science alone would never reach. In order to make a man thoroughly the master of his trade, he should be taught its theory as well as its practice, and the two might well be combined by offering to apprentices the facilities for obtaining scientific instruction. The movement is certainly a good one, and if undertaken by earnest practical men it deserves and will receive the approval and co-operation of an intelligent community."

4. THE IMPORTANCE OF LEARNING A TRADE.

Why is it that there is such a repugnance on the part of parents to putting their sons to a trade? A skilled mechanic is an independent man. Go where he will, his craft will bring him support. He need ask favors of none. He has literally his fortune in his own hands. Yet foolish parents—ambitiously that their sons should "rise in the world," as they say—are more willing that they should study

for a profession, with the chances of even moderate success heavily against them, or run the risk of spending their manhood in the ignoble task of retailing dry goods, or of toiling laboriously at the accountant's desk, than learn a trade which would bring them manly strength, health, and independence. In point of fact, the method they choose is the one least likely to achieve the advancement aimed at; for the supply of candidates for positions as "errand boys," dry-goods clerks, and kindred occupations is notoriously overstocked; while, on the other hand, the demand for really skilled mechanics, of every description, is as notoriously beyond the supply. The crying need of this country to-day is for skilled labor; and that father who neglects to provide his son with a useful trade, and to see that he thoroughly masters it, does him a grievous wrong; and runs the risk of helping, by so much, to increase the stock of idle and dependent, if not vicious, members of society. It is stated in the report of the Prison Association, lately issued, that of fourteen thousand five hundred and ninety-six prisoners confined in the penitentiaries of thirty States, in 1867, seventy-seven per cent., or over ten thousand of the number, had never learned a trade. The fact conveys a lesson of profound interest to those who have in charge the training of boys, and girls too, for the active duties of life.—*Manufacturer and Builder.*

5. VALUE OF INDUSTRIAL EDUCATION.

[We find, in the *Weekly American Workman*, Dr. L. S. Batchelder's lecture before the Boston Social Science Association, upon Industrial Education, from which we give the following extract.]

The future of this republic, as regards material prosperity, depends largely on our efficiency in the industrial arts and sciences, and their diffusion among the people. Knowledge is power, while ignorance is impotence. The great problem of the day is how to elevate the masses. Labor is the great leaven that will do it,—educated labor. Every child's education is deficient who has not been taught to work; this aids in disciplining and energizing the intellect and character. The intelligent laborer learns more readily, has a higher sense of moral obligations, and is more honest as regards the interest of others.

It is the want of industrial education in this country that prevents our manufacturers from competing with other nations, and making that progress that our resources will warrant. Nature's secrets are not yet revealed to us; her forces are not all discovered or subjugated. Heat gives us in the steam engine but a fifteenth part of its intrinsic force, while some new energy will yet utilize a larger percentage.

Believing, therefore, in the dignity and importance of skilled labor, and the necessity of training the young to habits of virtue, industry, and frugality, it is proposed to establish Industrial Schools in connection with the public system of education. It is essential, while developing the mind, that the hands should be skilfully trained and the eye educated to accuracy, in order that knowing may be combined with doing. It is this which makes the successful and intelligent workman. To train children to the love of art and beauty of construction, tends to develop these individual talents, to combine art with mechanism, and to aid them in the choice of a vocation. By familiarizing children with moral and artistic enjoyments, we lift them above those sensual pleasures which so often corrupt and degrade youth, and give them instead, that *tough moral fibre* that will enable them to fight the battle of life heroically and alone.

Time is too valuable to be frittered away in so educating people as merely to fit them for the drawing-room alone. To many who have driven the plough, or worked with the chisel, intelligence has become a passion, a force, a love divine. It is from the stall, the shop, and the work-room that the most powerful minds have issued. Burns, Miller, Lincoln, Grant and other eminent men of our own day, are grand illustrations of the value of industrial training, and intellectual pursuits. The eminent men of the world, who have impressed their genius and force upon succeeding generations, have all owed that intellectual force and discipline, which made them what they were, first, to a healthy constitution; and, secondly, to their own aspirations and efforts; but the common school fails to inculcate this idea. The common school system as at present misdirected, is fast converting the minds of its pupils into mere repeating machines, and their bodies into unmuscular, resistless heaps of pulp, that a good healthy backwoodsman could almost blow away at a breath.

What the world needs, is not a community of grown-up, effeminate schoolboys, but a fair share of thinking men and women, who feel quivering, in every fibre of their being, the deep and solemn responsibilities of life. We need, then, that the country may have more mental and spiritual freedom, so that men and women may

enjoy more fully the divine privilege of shaping their own life to the needs of their individual characters and inspirations.—*Massachusetts Teacher.*

6. INDUSTRIAL OR MECHANICAL DRAWING.

The Board of Education have published in pamphlet form the papers received last year in response to a circular issued by a Committee of the Board, asking for information in reference to the expediency of requiring the cities and large towns of the Commonwealth to make provision for free instruction in mechanical drawing. These papers very well cover the whole ground, and present the subject in so clear a light that the most sceptical cannot fail of being convinced of the advantages, or even the absolute necessity, of such instruction. We present one or two statements from each paper.

Prof. C. O. Thompson, of the Worcester Technical School, says:

1. Skill in mechanical labor is always associated with a nice sense of form and proportion. This sense is to be trained by Drawing.
2. The ability in the foreman of a shop to give accurate sketches of machines, or part of machines, to a workman, is of great value. This can be gained only by the practice of Drawing.
3. It is probably true that attention to Drawing saves apprentices a good deal of time. A boy who spends two hours a week in Drawing, and the rest of the time in working at machines or at the bench, learns his business faster, and becomes more skilful in it, than one who works all the time.
4. The great bane of foremen in machine shops is the inability of nine-tenths of their workmen to read a working drawing so as to work from it. It is calculated that the productive efficiency of every machine shop would be increased *thirty-three per cent.* if journeymen could read any common working-drawing and work from it. Their present inability to do this leads to working by "rule of thumb,"—that is, to poor work.

Prof. Geo. E. Gladwin, of the same school:

Besides the regular school instruction in elementary Drawing, which should reach all classes of pupils without exception, there should be afforded an opportunity for *special instruction in Drawing* to those who have passed through their school course without this privilege, especially to our apprenticed mechanics and all of both sexes who are engaged in industrial pursuits.

A good foundation must be laid in *free hand drawing*. A definite knowledge and practice of correct form is indispensable. This can only be obtained by a bold and decided course of free-hand drawing in outline.

By this means a large measure of *artistic power* may be acquired, an element very necessary in the mechanical enterprises of the day. The end to be sought in this training, is the correct expression of real forms. A mechanic, especially, should possess the power of correctly representing, by drawing, a definite form before him, or the idea of such a form he may have in his mind.

The training then, should be early directed to Drawing from real objects.

Professor William R. Ware, of the Institute of Technology.

The introduction of drawing into school-work would also do something to mitigate the evils arising from the exclusively literary character of our public teaching. Anything that brings manual skill again into repute, and counteracts the growing disposition to discredit every means of livelihood that does not consist in "brain-work," merely, is a positive gain to our civilization.

Moreover, if there is, as there always must be, artistic talent of a higher order lying undeveloped in the community, the general diffusion of sound instruction in drawing is a sure way of finding it out and of making it serviceable. There is undoubtedly in the community at the present moment a large number of persons of great artistic capacity, whose abilities, which might have given them name and fame, and have shed lustre upon their age and country, are wasted in inefficiency and neglect. A general education in the elements of art would have given them the means of success, and created a public ready to appreciate their work.

Professor Louis Bail, of the Sheffield Scientific School, Yale College:

Why is it that a majority of our apprentices are of foreign parentage? Why is it that American boys are growing too proud to "learn a trade"? Is not the cause found in the fact that our whole system of education has quite ignored an industrial life? The only legitimate result of our educational system, will be the production of lawyers and doctors, or, at the least, clerks and school-teachers. In consequence of this defect, children receive the impression that education has no bearing upon mechanics; that a trade is only manual drudgery. The result is, that our boys select the most effeminate employments in preference to manly mechanical work.

When our educational system provides our youth with some intelligent preparation for the prosecution of industrial labor, the trades will be filled by a more cultivated class of young men, and our boys will blush to be found selling pins and needles; but they will not be ashamed to be seen using the hammer and chisel.

The whole nation is deploring the lack of good ornamental designers. We are becoming tired of sending so many millions to Europe for articles that we might produce cheaper at home if we had skilful designers. This branch of industry affects articles for the homeliest use.

Beauty of form and ornamentation is the quality always referred to as perfecting the claim to notice and value. It is hoped that the female population will, so far as possible, occupy a field so well suited to their capacity and taste.

Wm. N. Bartholomew, Teacher of Drawing in the Public Schools, Boston.

Sow the seed of an Art-Education in our primary schools, nurse and nurture it through the whole period of school life, and you educate the eye, train the hand, and cultivate the taste, of every member of society. Both duty and interest demand that Drawing should be made a *required* study in every public school in the Commonwealth. It may be said, perhaps, that it is impossible at present to introduce this study in our schools, because our teachers, as a rule, are ignorant of the art. If you wait until our teachers are well qualified to instruct their pupils in this branch of study before it is introduced, you never will cease to wait. The teachers, especially those who are instructing young children, are already in advance of their pupils. Let them begin the work of teaching, and, by study and practice, keep in advance. Certainly they ought to be able to progress as rapidly as their pupils. Want of time is sometimes urged as an objection to the introduction of this study, particularly in our grammar schools. In reply to this objection, it may be said that the help it affords in learning to write amply compensates for the time devoted to it. This is the opinion of many of our best educators. Whatever objections may be urged against the introduction of this study in the grammar schools, they can have no weight as applied to our primary schools.

Prof. John S. Woodman, of Chandler Scientific Department, Dartmouth.

The advantages of culture in Drawing are great, aside from artistic production. The training the arms, hands and fingers for any sort of work,—the eye to see and the mind to perceive and comprehend; the power to express ideas by drawing, for all the ordinary business of life; the aid in the school-room to all other branches of study; the culture of the power of attention, order, arrangement and the sense of fitness and good taste, and for rational occupation and enjoyment;—these are enough to indicate its exceeding value to every person aside from all special artistic work. It looks towards every pursuit, duty, and relation of life. The practical utility of training in the elements of free and instrumental Drawing, to every person whomsoever, is not second to that of any other subject of common school education. It is moreover, the only foundation for high success in the industrial and fine arts. To speak of a single topic,—the culture of the general and the creative imagination, exercised and trained by Drawing,—it would wake up and stimulate all the other powers and faculties in a wonderful degree, increase greatly the products of every industrial activity and the enjoyment of tasteful and artistic work, and multiply all the powers of arrangement and invention. I do not hesitate to say, that over and above the general social elevation and the increase of enjoyment, a proper training in Drawing of ten or fifteen years, in many a town in Massachusetts, might double the industrial efficiency, and put two for one on account of this influence. I know of nothing now so much needed in education as Drawing.

Mrs. J. W. Dickinson, Teacher of Drawing in the Westfield Normal School.

Our aim in the common schools must be to give the pupils, throughout their course, such a thorough training of the hand and the eye, that they will, in the end, be able to represent readily and accurately the form and appearance of any object. This is the aim in Drawing; but so many other advantages result from the training in this branch, that it is doubtful if the incidental advantages are not quite as valuable to the pupil as the end sought.

By the *training of the eye*, we mean such constant exercise of the powers of comparing and judging, that the forms, distances, directions, and positions of objects can be estimated with unerring certainty.

By the *training of the hand*, we mean such constant exercise of the muscles used in giving expression to these estimates, that the hand will obey the will with readiness and precision.

Charles A. Barry, Instructor of Drawing in the Public Schools, Boston.

Elementary Schools for the cultivation of Drawing should be

immediately established and kept in a flourishing condition, and in a very short time they would prove themselves to be vast sources of improvement, both physical and intellectual, to those who attended them.

Moreover, the nation would gain by them, as other nations have. And I urge the proper study of Art as a national benefit,—not the art of pictures and statues, but the art of design—the art that increases the adornment of the objects of our daily wants. Are we not bound to advance any scheme that will add to our honor? Do we not know that aesthetic development has not begun in our manufactures? Where, in all the world of taste and cultivation, would an American fabric, claiming to be artistic in its design and execution, sell? France would not look at it. England would not harbor it. Prussia would laugh at it. As to the French, in this connection, let me say that in all those manufactures of which taste is a principal element, they are far in advance of all civilization; and why? because the eyes and hands of all classes have been duly trained in Schools of Design. In France, children begin—almost with the commencement of their eating—to learn to see. If you doubt this, ask the first French boy you encounter in the Louvre to tell you what constitutes the difference between Ingres and Corot, to make you a sketch of Milo Venus, or one of the prancing horses at the entrance of the Champs Elysees. Ask him to draw you a tangent to an ellipse, or to find the true apex of a pyramid in perspective, to make you an acanthus leaf, or an ornamental scroll for the corner of a shawl—and then take him into the gardens of the Tuileries, and set him to telling you the characters of the flowers there, and the value of their colors in a chromatic scale. Go to England—the English boy is on the track of his French neighbor. He will quote Ruskin to you by the hour, show you the beauties of Turner and Stanfield, draw lines for you as firm as Gibson's, design a water-gate or a wind-mill—and catch him if you can on curved surface or shadow-plane. So should it be—so I hope it will some day be—with the American boy.

7. EDUCATION OF THE PEOPLE IN ART.

We must abandon the idea that art is a device of leisure and luxury,—a meretricious addition, which the palled appetite of self-indulgence and superfluous wealth makes to its weary stock of the merely useful and the necessary. It is man's inmost dream and longing for perfection, striving to realize itself in external forms. Oh, what hidden poetry there is in all souls! what latent wealth of sentiment, what sensibility to beauty, what yearning for harmony and fine effects of tones and chords in color and tune! Who does not see the secret evidence of an inexhaustible capacity for the enjoyment and use of beauty in color and form, in every lovely woman's dress, however humble; the twist and folds of her hair, the plaits in her bodice, the sweep and set of her skirts, the neatness and finish of her simplest attire? And what American home—ay, cabin—has not some shrine of taste, even though it were only the white curtains in the spare-room, the few pictures, perhaps cut from the newspaper, over the daughter's chest of drawers, or the posy stuck in a broken bottle upon the mantle-piece? * * * We commend this example, then, to our village circles. Three times in the year, at least, have a local show in your townhall. Let all the people come together. Make the occasion one of charity. Let it build up, now this, now that, religious or philanthropic cause. Let all join to aid whichever society happens to be beneficiary for the day. Mutual consideration and common charity will thus be promoted; above all, taste and beauty will creep into the community. Worship will catch unexpected inspiration; home will grow more artistic and beautiful; sparks of genius will be struck out of many cold-seeming breasts; old people will appear in new characters; many prejudices will be softened; sectarian rancor will subside; and the wealth and richness of humanity will come out of what seemed monotonous and unpromising spheres. Dull and vulgar life will put on a little bravery and ornament; the taste for pictures will grow; the better art-journals will be taken; more attention given to domestic and church music; a finer sense of color and nature be developed; and the sacred and divine mission of art be sped on its way in a country now so bare of its refining influences, yet so ready to carry it, finally, to a pitch never before realized in religion or common life.—[From "OLD AND NEW."]

8. EDUCATION OF BUSINESS MEN.

Business men constitute the vast majority of mankind. All who have to work for their living, whether as laborers, craftsmen, clerks, managers of factories or stores, professionals, sailors,

soldiers, statesmen, are in reality business men, although in the more limited sense of the word it includes only merchants and persons engaged in buying or selling, or in conducting large establishments. The number of men who are placed beyond the necessity of earning their daily bread by the use of their brains forms a very small minority of the human race; and this is a consideration of primary importance when the subject of the education of boys—those boys who are to be the world's future business men—comes up. Could a parent at the outset of his son's career foresee with certainty what it would lead to, there would be comparatively little difficulty in providing him with that kind of education best adapted to his success. But as this foresight is denied to human beings, the next best thing is to devise such a system as shall, on the average, be set for the larger number of boys.

In manufacturing branches of industry, a better educated workman is required now to do the intelligent work demanded of him than was the case fifty years ago, and in commerce generally there is a greater demand for educated men, and the directions which it now takes call forth more and more of a man's abilities. What, then, ought to be the preliminary training which will enable the business man to grasp with readiness the merits and demerits of the theories, ideas, and experiments which are constantly being suggested to him in the course of his business? Ought he to have been previously thoroughly drilled in the classics? to be a master of the intricacies of Greek grammar, and able to compose faultless Latin verses? to be able to calculate an eclipse, or to investigate the properties of a curve? or should he be content with a moderate knowledge of Greek, Latin, and mathematics, and devote a portion of his time to the "onomies" and "ologies"? or should he abstain from classics altogether, and be content with mastering his own language, and such a moderate amount of mathematics as will suffice for book-keeping, land-surveying, engineering, or navigation? Each of these plans has its advocate. In the Old World, particularly in England and Germany, a classical education is deemed of prime importance, and those youths who are not versed in ancient literature, geography, and mythology are to be looked down upon. It is not so here, however, and it is well known that many of our most successful business men and influential citizens began life with little knowledge beyond what their native sagacity enabled them to acquire for themselves. This fact is sufficient to prove that a classical education is not essential to success in business. It has pleasure and advantages which enure to the benefit of the man of leisure, or of those who devote their abilities to literature, theology, medicine, and law, but these are not properly "business men." It can not well be said that a classical education is useless, or an obstruction to a business man. It will enable him to improve his leisure hours, and it unquestionably will assist him in understanding and appreciating much of the world's art and literature, which would otherwise be imperfectly understood by him, and this is a means of refining his tastes and his pleasures.

So the study of the sciences in youth may not lead to any practical results, but it renders easy the subsequent application of them, should it be needed. A course of chemistry, for instance, undergone by a young man of twenty, may prove utterly useless to him in a business sense, because he may enter on pursuits which require no knowledge of that science, and after years the science itself will have undergone considerable transformation; yet, should he then have to turn his attention to it, his previous knowledge will make his path smooth in the future. And so with the other sciences. The elementary principles, once acquired, will always be useful in aiding the future man to understand much that he will meet with in literature, newspapers, and conversation. For these reasons the mastery of the elements of physical science ought to form a portion of every boy's education. But there is one other consideration which ought not to be overlooked, and that is, that the boy of to-day will be the citizen of to-morrow, and perhaps the legislator of the next day; therefore, it is important that he should be taught the rudiments of law and of political economy, together with a clear and sufficient explanation of the principles of the constitution and the history of this country, and of so much of that of England as will enable him to better comprehend our own. Add to this a moderate training in elocution, and the youth starts in business life with reasonable prospects of success, always providing, however, that he steers clear of vice and frivolity, and is strictly honorable; otherwise all the knowledge in the world will be but of limited benefit to him. On the other hand, a purely learned education will be of comparatively small benefit to the youth who, brought up in affluence, is, through his own or his parents' misfortune, compelled to seek his living in business. It will be to him like going to school a second time, and he will wish he knew less about Greek verbs, and more about practical affairs.—*Philadelphia Ledger*.

II. Teaching of Science in Schools.

1. THE CLAIMS OF NATURAL SCIENCE.

The claims of natural science to a place in elementary instruction in the public schools is attracting great attention at the present moment in England. In his recent Hunterian oration before the Royal College of Surgeons, the eminent anatomist, Dr. Quain, "urges that science should become the staple element in modern education." And still more recently a deputation of the British Association, consisting of Huxley, Lyell, Lubbock, Lyon Playfair, and Galton, presented to the vice-president of the council a memorial "urging the advisability of including elementary natural science among the subjects for which payments are to be made under the authority of the revised code.

2. VALUE OF ELEMENTARY SCIENTIFIC KNOWLEDGE.

That a knowledge of the sciences, underlying an occupation greatly increases the value of a laborer, is conceded without exception. It does this by enabling him to avoid dangers to which ignorant men are exposed; by enabling him to detect and remedy difficulties which otherwise would cause expense or delay; by enabling him to discover shorter and simpler methods of working, thereby increasing his powers of production; by stimulating his faculties of contrivance, so that he adjusts and modifies the tools or machines which he uses, or invents simpler and better ones, thus increasing the wealth-producing power, not only of himself, but of his fellow laborers. In this direction, it is estimated that his average value is increased 100 per cent. while in certain exceptional cases his gain is incalculable.

3. SCIENCE FOR CHILDREN.

The school-masters of the present day may be divided into two categories: those who teach, and those who hear lessons; the latter class, unfortunately for the next generation, being by far the most numerous. The mischief done to the community generally by the short comings of inefficient teachers is too well known to every one who has pierced below the surface of the great question of middle-class education. The difficulties, however, that beset a science teacher in his endeavors to force scientific truths into the unwilling and unprepared minds of boys, who have been subject to the sway of these same lesson-hearers, can only be realized by those who have gone through the task.

The case of a senior science class, which has been under my charge for some months past, will illustrate my meaning most fully. It consists of about a dozen boys, whose ages range between fourteen and seventeen years, and they receive twice a week an hour's instruction in chemistry and physics. The class may be divided into two distinct portions by a perfectly sharp line. Four of the boys have had the advantage of six or seven years training under the principal of the school, who is not only a ripe scholar, but also an efficient teacher—a very rare collocation in these days. The rest have simply learned lessons all their lives. The four boys, who have been taught, are as mentally distinct from the others as if they were different species of the same genus. The first four are bright, attentive, wide awake—I know of no other term to express exactly what I mean—logical and clear-headed; they can fairly follow a chain of scientific reasoning, and reproduce it afterwards link by link; they have a certain power of induction and deduction, although, of course, being new to science, this power is necessarily only just awakened; they can connect and correlate facts and ideas; they can enumerate a series of phenomena in logical sequence; in a word, although their industry and application are far from colossal, the task of teaching them the truths of natural science is a comparatively easy one.

The other boys, as I have said before, almost form a distinct mental species. They cannot understand the possibility of learning anything without the aid of a book, and the idea of finding out anything for themselves has never entered their heads. Still they are far from stupid boys, being all possessed of good average brains; yet their faculties have not merely been allowed to remain undeveloped, but they have been utterly entangled, stunted and stultified by their "previous school contamination." These boys, it must be understood, are the sons of parents belonging to the upper stratum of the middle class, and have mostly been to schools conducted by university men with honourable initials appended to their names—men, in fact, who are scholars, but emphatically not teachers. Their great fault is a total want of mental method, without which the greatest brain is as naught. They are at home in Virgil and Horace, some of them are fair Greek scholars; they have been "through Euclid," and can work moderately difficult

algebraical problems in a certain mechanical fashion; they are well acquainted with the leading facts of English history, and know the exact position and population of Adrianople; but as far as real mental power goes, any poor boy, who has been in a national school for three years, would beat them hollow.

These facts surely point out the absolute necessity of beginning scientific training at a very early age; and I fancy this necessity has not been sufficiently dwelt upon in the numberless essays, letters, lectures and evidences on the subject of scientific education with which we have been deluged during the past decade. There seems to have been a notion abroad, that scientific teaching should not be begun before the age of twelve or fourteen; but why, I would ask, should boys' minds be allowed to remain fallow during all these years? The minds of boys of seven and eight should surely be as carefully developed as those of their seniors, and there is certainly no means of pure mental culture so successful as scientific teaching. *A boy of this age should not be taught science so much for the sake of acquiring a certain number of facts, as of developing his powers of observation and reasoning, and giving a proper tone to his mental faculties.* A boy of eight or nine takes a morning canter of three or four miles on his pony, not for the purpose of getting over some seven thousand yards of ground, but to strengthen his muscles and improve his carriage; his science lesson should be an intellectual canter, taken with the view to improve and strengthen his mental muscles and carriage.

* * * * * It may be urged that children of eight or nine are too young for systematic science teaching, but facts prove the contrary. An ordinarily intelligent boy or girl of this age is perfectly capable of understanding the broad differences between the animal, vegetable and mineral kingdoms; that there are more gases than one in the world; that some of them are colorless, while others are brown or green; that some burn and others do not; that some plants grow from the inside, while others grow from the outside; that some animals have jointed backbones, that others have their bones outside their bodies, while others have none at all. Facts such as these are perfectly comprehensible to children even younger than those that I have named.—*Nature.*

III. Papers on Scientific Subjects, &c.

1. A SIMPLE WEATHER GLASS.

This little instrument is prepared in the following way:—Take a glass about ten inches in length, and one inch in diameter, and fill it nearly up to the top with the following liquid:—Two parts camphor, one part nitrate of potash, and one part sal ammonia, and dissolve in strong spirits of wine; then add water until you have partially precipitated the camphor. The extremity of the tube can be left open or hermetically closed. The glass tube thus prepared is then fixed in a horizontal position against the wall or a board.

The changes in the weather are thus indicated:—

1st. If the weather is to be fine, the composition of the substance will remain entirely at the bottom part of the tube, and the above liquid will be perfectly clear and transparent.

2nd. Before the weather changes to become rainy, the precipitate will rise by degrees, and small crystallizations, similar in shape to stars, will be seen to move about in the liquid.

3rd. When a storm is imminent, the precipitate will nearly all rise to the top of the tube, assuming the shape of a leaf, or an assemblage of crystals; the liquid will appear to be in a state of effervescence. This change very often takes place 24 hours before the change in the weather.

4th. The side from which the wind will blow in a squall will be also indicated through the direction and the elevation of the crystallization in the tube, the crystallization always forming on the side from which the wind will blow.

5th. In the winter season, the crystallization will maintain itself higher in the tube; snowy and freezing weather are also indicated by the particles of the substance floating in the liquid and assuming the shape of long hairy needles.

6th. In summer time, the weather being dry and warm, the crystallization will have a tendency to remain lower in the tube, and the liquid will also be more transparent.

The amount of crystallized particles which will be seen floating in the liquid is a sure indication of fine or bad weather, but will depend entirely on the suddenness of the change in the weather which is to take place, acting in the most energetic way on the composition above described.

The value of this simple instrument to forewarn of an impending storm, and also to indicate the continuance of fine weather, will be readily appreciated by those whose occupations are affected by changes in the weather.—*Journal of Applied Chemistry.*

2. SINGULAR ARITHMETICAL FACT.

Any number of figures you may wish to multiply by 5, will give the same result if divided by 2—a much quicker operation; but you must remember to annex a cypher to the answer when there is no remainder. When there is a remainder, whatever it may be, annex a five to the answer. Multiply 464 by 5, and the answer will be 2,320; divide the same by 2, and you have 232, and as there is no remainder, you add a cypher. Now take 359—multiply by 5, the answer is 1,795; on dividing this by 2, there is 179 and a remainder; you therefore place a 5 at the end of the line, and the result is again 1,795.

3. THE FIGURE NINE.

A correspondent of a Cincinnati paper says:—I have just read in your paper what has often before been published, respecting the curious properties of the figure 9. One of those properties is of importance to all book-keepers and accountants to know, and which I have never seen published. I accidentally found it out and the discovery to me (though it may have been well known to others before) has often been of essential service in settling complicated accounts. It is this:—The difference between any transposed number is a multiple of 9; for instance, suppose an accountant or book-keeper cannot prove or balance his accounts—there is a difference between his debts and credits, which he cannot account for, after careful and repeated addings. Let him then see if the difference cannot be divided by 9 without any remainder. If it can, he may be assured that his error most probably lies in his having somewhere transposed figures; that is to say, he has put down 92 for 29, 83 for 38, &c., with any other transposition. The difference of any such transposition is always a multiple of 9. The knowledge of this will at once direct attention to the true source of error, and save the labor of adding up often long columns of figures. The difference between 92 and 29 is 63, or 7 times 9; between 83 and 38 is 45, or 5 times 9: and so on between any transposed number.

4. A NEW MORSE-ALPHABET.

BY WM. BOYD, CAMBRIDGE, MASS.

A new dot-and-dash, or short-and-long, or one-note alphabet, for the electro-magnetic telegraph, and for a local telegraph by either steam-whistle, air-whistle, musical instrument (bells excepted), or light.

Respectfully proposed to the Morse electro-magnetic telegraph companies of the United States and Canada, instead of their ill-dotted, unsystematic and ambiguous (spaced) alphabet; and cordially recommended to the citizens generally of the countries named, for either public or private local-telegraphy.

LETTERS.

E	-	L	{----	V	{----
T	--	U	{-----	K	{-----
A	---	M	{-----	Q	{-----
I	----	C	{-----	J	{-----
O	-----	F	{-----	X	{-----
N	-----	W	{-----	Z	{-----
S	-----	Y	{-----	&	{-----
H	-----	P	{-----	Ch	{-----
R	-----	G	{-----		
D	-----	B	{-----		

FIGURES, ETC.

1	-----	6	{-----
2	{-----	7	{-----
3	{-----	8	{-----
4	{-----	9	{-----
5	{-----	0	{-----
\$	-----	£	-----

POINTS, ETC.

Comma	{-----	Parenthesis	{-----
Semicolon	{-----	Dash	{-----
Colon	{-----	Apostrophe	{-----
Period	{-----	Hyphen	{-----
Interrogation	{-----	Emphasis (+)	{-----
Exclamation	{-----	Quotation	{-----
Irony (+)	{-----	New Paragraph	{-----
Humor (\$)	{-----	Bracket	{-----

[As, in printing-types, dots (or periods) do not line with dashes, hyphens are here used instead.]

The English language is emphatically the language of the tele-

graph (as it is of commerce), and the above telegraphic alphabet claims to be a perfected and exhaustive one for the English language. The Roman letters are arranged, as to frequency of use in English, according to the unphonetic or common mode of spelling, from most-used to least-used;* and the telegraphic representatives of the same, with those of the figures and points, (as also the omitted ones mentioned in next paragraph,) are composed, in lowest possible numbers, of dots and dashes (or shorts and longs), and their permuted combinations. A dot counts as *one unit*; a dash is equal in length to three dots, and therefore counts as *three units*. Dots may be either staccato or more prolonged, to suit the instrument or the sounding-machine used; and dashes should of course be in exact proportion to them.

The above tables give all the (unspaced) numbers of dots and dashes in the units *one to three*, and all the (unspaced) combinations of these in the units *four to ten*, which do not contain *more than three dots in succession*,—all the numbers, or rows of dots (solely) from *four dots to ten dots* inclusive, and all the combinations of dots and dashes containing anywhere more than three successive dots, being omitted to simplify both sending and receiving. It will be observed that the units *one to eight* exactly take in the letters, or alphabet proper, (*one to seven* embrace from E to B, or the first twenty, or within one of all the most important letters); that the *nines* exactly cover the twelve figures, &c.; and that the *tens* exactly include the sixteen points, &c.

Practical electric-telegraphers could, of course, discard as much of the third table as, in their elliptical or abbreviated style, they do not use.

The German double-letter *Ch* is introduced, from the Anglo-Continental Morse alphabet (an alphabet which has only twenty-seven characters, being without either points or separate figures, but which has the sensible and eminent virtue of having no spaced or ambiguous letters).

The braces, on the left of most of the combinations, show that, where possible, such combinations are arranged in opposite pairs, to facilitate the learning of them.

In writing and in printing, it is proposed to provisionally represent the new points, Irony and Humor, the first by a dagger, and the second by a section-mark, as shown above.

No attempt is here made to tell how to work the Electric Telegraph; but the following are some

BRIEF INSTRUCTIONS FOR LOCAL TELEGRAPHY BY STEAM-WHISTLE, AIR-WHISTLE, MUSICAL INSTRUMENT, OR LIGHT.—Steam-ships (naval or other), steamboats (ocean, lake or river), revenue-cutters, surveying-vessels, tenders (light-house or other), steam tugs, steam ferry-boats, deep-sea sailing-vessels (naval or other), coasters, whalers, sealers, fishing-craft, yachts, pilot-boats, life-boats, coast-guard boats, whale-boats, men-of-war boats, light-ships, light-houses, locomotives, traction-engines, portable engines, steam fire-engines, mills, factories, steam-works of all kinds, and any public or private company, party or person whatever, may, by signal-whistles, with the above alphabet (in alphabetic cipher, or arbitrarily, if desired), telegraph most readily, accurately and effectively, either to points near or points eight or more miles off, during night or day, and in foggy weather or clear. Such whistles may be either air or steam, and should have an unmixed, powerful, pleasant, and quickly-acting note. When communicating by musical instrument to what, for such means, may be a considerable distance, a middle note will answer best for the telegraphing-note; but when the range is short, any note will do. For an instrumental telegraph in the country, a conch-shell, a tin-trumpet, or an ox's horn, will be as effective as a bugle, cornet, or other costly instrument. In telegraphing by light (which can, of course, take place after dark only), the letters, &c., are made by short and long flashes from the covered or shaded flame of a gas-burner, lamp or candle. Capital and small letters are formed alike,—the sense showing the kind intended. Count *one* to a short (or dot), and *three* to a long (or dash). Allow *three blanks* between the letters in a word; and *nine blanks* between the words in a sentence, between the sentences in a paragraph, and between the paragraphs in a despatch. When a point occurs, consider it, for blanking purposes, as the final letter in the word preceding it: and when a new-paragraph notice is required, sound it as an additional final letter (thus *before* the nine blanks, instead of *after* them, that the receiver of the despatch may have notice and opportunity to move his pencil to a new line); but it is not to be taken down, in any manner, by the reporter (or receiver). Give the parenthesis, emphasis-mark (written +), quotation-mark, and bracket, each as a word. They must severally be given after, as well as before, the words to be respectively parenthesized, emphasized, quot-

ed or bracketed. When recording emphasized words, write down the emphasis-marks as heard; and when the despatch is finished, underline (*italicize*) the words emphasized, and then strike out the emphasis-marks. If convenient, however, emphasis-marks should more properly be omitted in reporting (receiving), and the emphasized words underlined as soon as written down. Keep uniform time, at a rate of motion to suit the receiver.

September, 1870.

5. MAGIC SQUARE.

The following curious arrangement is from the *Scientific American*.

90	14	12	100	84	98	4	90	10	2
16	66	36	37	63	22	80	81	19	85
92	39	61	60	42	75	25	24	78	9
7	50	41	40	62	23	77	76	26	94
68	38	64	65	35	82	20	21	79	13
18	55	50	54	43	27	73	72	30	83
86	45	52	48	57	70	32	33	67	15
3	44	53	49	56	34	68	69	31	98
6	58	47	51	46	71	29	28	74	95
99	87	89	1	17	8	97	5	91	11

Here we have a magic square, containing a lesser magic square, and this lesser composed of four magic squares, the heavy lines indicating the several distinctions. The sum of the numbers in the largest square, whether counting upward, across, or diagonally, is 505; omitting the outside numbers, the sum is 404; in each of the four small squares the sum is 202. The entire square consists of the cardinal numbers from 1 to 100. Can any one discover the principle of arrangement?

6. PHOSPHOROUS IN THE HUMAN BODY.

Dr. Nichols, in the *Journal of Chemistry*, says the human body contains phosphorous enough for 400 ordinary two-cent packages of matches, but not quite sulphur enough for them. There is water enough to drown a person. The sodium in a human body of 154 pounds weighs 2 ounces 116 grains, but we do not know how many grains make this ounce, or how many of them make a pound. There is iron enough for a good-sized penknife blade, and enough magnetism to form the silver to a dozen rockets.

7. THE INSTINCT OF FISHES.

Fishes, it is said appear inferior to animals and birds in acuteness of sensation and instinctive sagacity; yet scarcely any animal evinces more tenderness, care, and solicitude, for its young, than the common whale. She suckles and nurses them with the greatest affection, and takes them with her wherever she goes; when pursued she carries them on her back, and supports them with her fins; when wounded, she will not relinquish her charge; and when obliged to plunge in the midst of her agonies, will clasp them more closely, and sink with them to the bottom.

IMPORTANT REFORMS IN INDIA.

An Oriental scholar, Baboo Keshub Chunder Sen, who recently returned to India after a long visit to England, has put in practice some of the lessons he learned abroad. On arriving in Calcutta, in company with some of his co-religionists, he organized an "Indian Reform Association," for the promotion of the following objects:— 1. Female improvement. 2. General and technical education. 3. Cheap literature for the poor. 4. Temperance; and 5. Clarity. Each of these sections is placed under separate managers, who also act in combination as a general committee, under the President of the Society, Baboo K. C. Sen. The sections for female improvement and cheap literature have already commenced operations, and the new journal started by the latter section, the *Sulav Sumachar* or *Cheap News*, is already a decided success. It is published weekly, and "will contain, besides miscellaneous news, easy and short essays on moral, political and social topics, and the biographies of great and good men." This journal is selling by thousands already. Morning and evening schools were shortly to be opened for the middle and labouring classes, where useful instruction of various kinds would be given.

*Arrangement or order of the Roman letters from the writer's Musical or Four-Note Local-Telegraph Alphabet, published December, 1870,—an arrangement based on the most authoritative and reliable data.

IV. Monthly Report on Meteorology of the Province of Ontario.

I. ABSTRACT OF MONTHLY METEOROLOGICAL RESULTS, compiled from the Returns of the daily observations at ten High School Stations, for JANUARY, 1871. OBSERVERS:—Pembroke—James Smith, Esq., M.A.; Cornwall—James H. Coyne, Esq., B.A.; Barrie—H. B. Spotton, Esq., M.A.; Peterborough—Ivan O'Beirne, Esq.; Belleville—A. Durton, Esq.; Goderich—James Preston, Esq., B.A.; Stratford—C. J. Macgregor, Esq., M.A.; Hamilton—A. Macallum, Esq., M.A.; Simcoe—James J. Wadsworth, Esq., M.A.; Windsor—J. Johnston, Esq., B.A.

Table with columns: STATION, ELEVATION, BAROMETER AT TEMPERATURE OF 32° FAHRENHEIT, TEMPERATURE OF THE AIR, TENSION OF VAPOUR, and MONTHLY MEANS. Rows include Pembroke, Cornwall, Barrie, Peterborough, Belleville, Goderich, Stratford, Hamilton, Simcoe, and Windsor.

Approximation. a On Lake Simcoe e Near Lake Ontario on Bay of Quinte. f On St. Lawrence. g On Lake Huron. A On Lake Ontario. i On the Ottawa River. j Close to Lake Erie. m On the Detroit River. n Inland Towns.

Table with columns: STATION, HUMIDITY OF AIR, WINDS, NUMBER OF OBSERVATIONS, ESTIMATED VELOCITY OF WIND, AMOUNT OF CLOUDINESS, RAIN, SNOW, and AURORAS. Rows include Pembroke, Cornwall, Barrie, Peterborough, Belleville, Goderich, Stratford, Hamilton, Simcoe, and Windsor.

g Where the clouds have contrary motions, the higher current is entered here. h Velocity is estimated, 0 denoting calm or light air: 10 denoting very heavy hurricane. * Observations omitted at Simcoe 5th and 6th; observer absent.

REMARKS.

PEMBROKE.—On 25th, lunar halo. 26th, solar halo and mock suns. Wind storms, 2nd and 3rd. Fog, 12th, 13th, 19th. Barrie.—Wind storms, 2nd, 27th, 31st. Snow, 2nd, 3rd, 5th, 10th, 14th, 23rd, 29th. Rain, 13th, 31st. Month severely cold; reading of minimum thermometer at 7.30 A.M. on 23rd, being the lowest recorded at this station, and the mercury being frozen at 7 A.M., it was impossible to make any calculation as to the humidity. CORNWALL.—Snow, 2nd, 5th, 11th, 14th, 16th, 21st, 24th, 26th, 30th, 31st. Rain, 30th. BARRIE.—Wind storms, 2nd, 27th, 31st. Snow, 2nd, 3rd, 5th, 10th, 14th, 23rd, 29th. Rain, 13th, 31st. Month severely cold; reading of minimum thermometer at 7.30 A.M. on 23rd, being the lowest recorded at this station, and the mercury being frozen at 7 A.M., it was impossible to make any calculation as to the humidity. PETERBOROUGH.—On 25th, lunar halo. 26th, solar halo and mock suns. Wind storms, 2nd and 3rd. Fog, 12th, 13th, 19th. BELLEVILLE.—Wind storms, 2nd, 27th, 31st. Snow, 2nd, 3rd, 5th, 10th, 14th, 23rd, 29th. Rain, 13th, 31st. Month severely cold; reading of minimum thermometer at 7.30 A.M. on 23rd, being the lowest recorded at this station, and the mercury being frozen at 7 A.M., it was impossible to make any calculation as to the humidity. GODERICH.—Wind storms, 2nd and 3rd. Fog, 12th, 13th, 19th. STRATFORD.—Wind storms, 2nd and 3rd. Fog, 12th, 13th, 19th. HAMILTON.—Wind storms, 2nd and 3rd. Fog, 12th, 13th, 19th. SIMCOE.—Wind storms, 2nd and 3rd. Fog, 12th, 13th, 19th. WINDSOR.—Wind storms, 2nd and 3rd. Fog, 12th, 13th, 19th.

BELLEVILLE.—Snow, 3rd, 4th, 10th, 16th, 21st, 24th, 26th, 27th, 30th, 31st. Rain, 11th, 12th, 15th, 16th, 20th, 31st. Very unusual height of barometer at 9 P.M., 25th, viz., 30.456. The observer gives a table of lowest temperatures for 13 years, as follows:—

1859, 10th January.....	-30° 0	1866, 8th January.....	-20° 0
1860, 5th ".....	-14° 0	1867, 30th ".....	-17° 0
1861, 8th February.....	-32° 0	1868, 28th ".....	-19° 0
1862, 4th January.....	-7° 0	1869, 22nd March.....	-7° 5
1863, 4th February.....	-24° 0	1870, 14th January.....	-17° 5
1864, 17th ".....	-19° 0	1871, 23rd ".....	-25° 0
1865, 13th ".....	-22° 0		

GODERICH.—On 7th, lunar halo. 23rd, temperature lower than at any time before for three years. 25th, highest barometer for four years. Wind storms, 2nd, 3rd, 5th, 6th, 23rd. Snow, 2nd—8th, 10th, 13th—18th, 20th—22nd, 24th, 27th, 30th, 31st. Rain, 13th, 14th, 29th, 30th, 31st. Numerous flocks of wild ducks seen during the month, flying westward.

STRATFORD.—January thaw from 11th—15th, inclusive. Wind storms, 2nd, 3rd, 5th, 23rd, 26th. Fogs, 15th, 17th, 30th, 31st. Snow, 2nd—6th, 8th, 10th, 16th, 20th, 21st, 24th. Rain, 11th, 14th, 15th, 30th, 31st. The observer gives the following table:—

Difference (from normals) of the Mean Daily Temperature, January, 1871.

Day.	Difference.	Day.	Difference.
1.....	0	17.....	0 0
2.....	+ 3 7	18.....	+ 1 1
3.....	- 5 0	19.....	+ 1 9
4.....	- 9 7	20.....	+ 11 1
5.....	+ 12 4	21.....	+ 6 6
6.....	+ 0 2	22.....
7.....	- 5 8	23.....	- 20 5
8.....	24.....	- 13 3
9.....	- 7 2	25.....	- 16 7
10.....	+ 1 2	26.....	- 12 6
11.....	+ 16 7	27.....	- 4 6
12.....	+ 20 8	28.....	- 6 4
13.....	+ 23 0	29.....
14.....	+ 12 4	30.....	+ 9 5
15.....	31.....	+ 14 5
16.....	- 4 2		

HAMILTON.—On 18th, hail. Wind storms, 2nd, 3rd, 5th, 14th, 27th, 31st. Fog, 30th. Snow, 11th, 18th, 21st, 23rd, 25th, 26th, 27th. Rain, 14th, 15th, 20th, 31st. Observation omitted at 1 P.M. on 12th. Weather during month very changeable, changes being sudden and extreme.

SIMCOE.—Wind storms, 2nd, 3rd, 10th, 14th, 16th, 21st, 23rd, 31st. Snow, 2nd, 9th, 16th, 20th, 21st, 23rd. Rain, 15th, 31st. Good sleighing first week of January, but none the rest of the month.

WINDSOR.—Lunar halo on 1st, 6th, 27th, 28th. Meteor in S towards SW on 2nd. Wind storms, 2nd, 14th, 21st, 23rd, 25th. Snow, 3rd, 7th, 8th, 9th, 16th, 21st, 23rd, 24th. Rain, 10th, 14th, 15th, 31st.

V. Biographical Sketches.

1. MISS LYMAN.

The death is announced of Miss Lyman, Lady Principal of Vassan College, Poughkeepsie, U. S., at the age of 54 years. Miss Lyman who has been one of the most successful and most popular lady teachers of the age, opened a select class in this city some eighteen or twenty years ago for the education of Young Ladies' which rapidly became so popular that she was induced to enlarge on her original plan and open a regular Seminary to which were attracted large numbers of the daughters of the most respectable families in the city. Her school was always full and her system of teaching attained a peculiarity which has rarely ever been surpassed. It was during this prosperous career that amid the deepest regret of hundreds of families she left to become the first Lady Principal of Vassan College, a position which despite failing health and a consequent inability to attend to all the duties which devolved upon her she retained up to the time of her death.—*Montreal Daily News*.

2. REV. STEPHEN MILES.

Mr. Miles was born in the State of Vermont, in the year 1789, and in early youth took a fancy to learn the art of printing, and subsequently accompanied his employer, to whom he was apprenticed, to Montreal. The *Canadian Courant* was the name of the newspaper established in Montreal by Mr. Mower, the Vermont publisher alluded to. At this time there was but one printing establishment in Montreal. How this newspaper succeeded it is not necessary to inquire. Soon after, in the year 1810, Mr. Miles accompanied by a Mr. Kendall, also a printer, left Montreal with a stock of printing material, furnished by Mr. Mower, before named, and after overcoming the difficulty of ascending the rapids of the St. Lawrence—for at this time, the reader will bear in mind, there was no artificial means of overcoming the downpouring of the waters of the St. Lawrence, such as are familiar to the present generation,

everything having had to be brought to the western part of Canada on the St. Lawrence, by means of batteaux drawn by oxen where they could be available, and by muscular strength by pulling at other times—landed his precious cargo in Kingston, and the first number of the first newspaper ever published in Kingston was issued by their joint efforts, and by so doing becoming the first newspaper publisher in this part of Canada. At this period there was just one other newspaper published in Western Canada, at the now village of Niagara, then the seat of Government of Upper Canada, but it was more a governmental newspaper than otherwise. The *Kingston Gazette* was a very small newspaper, not larger than a sheet of letter paper, but at the time we speak of, telegraphy was not in operation, mails were slow of progress, news from England was long in reaching this part of the world, and consequently an editor in those days had difficulty in providing "matter" even for a small sheet, such as we have described. The great feature, too, of "local items," peculiar to more modern journalism, was then unknown. During the war of 1812 the publication of the *Gazette* was very irregular, for the reason that, while Mr. Miles was expected to publish his newspaper at stated intervals, his duty to his adopted country also required him to carry arms in its defence. Therefore, while carrying the "stick" of the printer in the one hand, the other had always near at hand the weapon of defence of the soldier. The prevalence of the war had its influence of course in the publication of the newspaper, in withholding intelligence necessary for filling his sheet, and therefore allowing more time to our Kingston printer to perform the duties required of him as a soldier. About the year 1833 Mr. Miles separated himself entirely from business and devoted his time to doing good to his fellowmen by preaching the Gospel. Having at a very early period of his life felt that "everything is but as dross" compared with the final end of mankind, he devoted the remaining years of his life to impressing his convictions upon others, and that his efforts were not unsuccessful, the esteem in which his memory is held is a proof. He was first a local preacher, and, after what is called a "probationer" by the body to which he belonged, he was promoted to the higher rank of a minister. For many years Rev. Mr. Miles had been a superannuated minister of the W. M. Church, but, although never ceasing, to the end of his life, the calling he had adopted, during his most vigorous years, he was one of the most earnest, zealous and successful ministers of the body with which he was connected, for he put his whole soul and energies into whatever work he was for the time engaged. He was emphatically an honest earnest, zealous man, to be admired of all men. Mr. Miles published the *Gazette* till 1818, when the establishment was sold to late Hon. J. Macaulay and Mr. A. Pringle. These gentlemen changed the name of the paper to the *Kingston Chronicle*, and they were succeeded in the proprietorship by the late James Macfarlane. This latter gentleman took in Mr. F. M. Hill as a partner in 1832, and, in order to perpetuate the original name of the paper, the title was again changed to the *Chronicle and Gazette*, and was published semi-weekly. After two or three years Mr. Hill withdrew from the partnership, and Mr. Macfarlane continued the publication of the paper till his death, after which the establishment was sold to the Messrs. Rowlands, and hence the incorporation of the *Chronicle and News*. He felt great interest in the Temperance movement, and published the *Temperance Advocate* to further the cause. He afterwards removed to Prescott, where he published a paper several years. On his return to Kingston, he again entered the office which he assisted to establish, and managed the business for some time.

VI. Miscellaneous.

AN APPEAL TO TEACHERS.

Teacher! In your earnest way,
Patient, toiling day by day;
Does the field your care has sown
Seem to yield you tears alone?
Do the feet you strive to guide
Falter oft or turn aside?
Are the ears you seek to gain
Listening to some mirthful strain?
Cunning lips that silent seem,
Busy with some roguish theme?
And the task, you dwell upon,
Quite forgotten soon as done!
Is your soul within you vexed
With the oft repeated text?
Tired with urging minds to gain
What you feel they'll not retain?

Pause a moment! Drop the book!
Put aside the worried look!

Draw the minds away awhile
From the puzzling task—and smile ;
Tell in simple, childish phrase
Some little tale of other days !
Begin :—“ When I was young, like you,
I found *my* lessons puzzling too.”
You will be amazed to see
What an *instant* change there'll be.
Every surly frown will go !
Every little face will glow !
Every ear will listen well !
And every little heart will swell.
When your sympathy has drawn
Every young heart near your own ;
Then the unfinished task renew,
They'll do it *well* for love of you.

Teacher ! In the great world's mart,
Yours is a high and noble part ;
While with zeal you persevere
In your great work year by year,
Bringing Mind its powers to tell,
Educate the *Soul* as well.
When you read each little face,
Pure with Life's first tender grace,
Think of all the lines of care
Coming years will gather there !
Think how many thorns will grow
Where their tender feet must go ;
How their lips must learn to smile
With bruised hearts bleeding all the while.
Many a night, in speechless prayer,
Their hands will clasp in mute despair ;
Eager hearts will beat more slow,
Faint and fainter as they go,
Finding, as they onward press,
Less to lighten and to bless.
Plant, while you may, in every mind
Some little germ of thought refined ;
Tho' long forgotten there it lie,
While the soil is hard and dry,
It will grow in after years,
When 'tis watered well with tears.

MARY E. PERKINS.

-California Teacher.

PROCLAIMING THE EMPEROR AT VERSAILLES.

Dr. Russell has written an interesting account of the ceremonial accompanying the proclamation of King William as Emperor of Germany, in the Galerie des Glaces, at Versailles, on the 18th ult. He says :—“ A little after twelve o'clock there was a great lush, as the roll of drums was heard outside, and then the band began to sing the first verse of the chorale :—

“Choir.—Praise the Lord, all the world, &c. Glory be to the Father, and to the Son, and to the Holy Ghost. As it was in the beginning, is now, and ever shall be, world without end. Amen.

“Chorus.—Praise and honour to the highest Good, to Father of all Good, to God who doeth all wonders, to God who fills my spirit with His rich consolation, to God who stilleth all sorrow ; give honour to our God.

“The King entered and walked up with a stately, firm step through the lines of his soldiery, followed by his son and by the Princes and Generals of his Empire. He bowed to the altar, or to the eight clergy who stood on the steps, and then took up his place nearly beneath the allegorical picture, ‘*Le Roy gouverne par lui meme*,’ with ‘*L'Ordre retabli dans les Finances*’ on his left, and the ‘*Building of a navy*’ on his right. The chorale still continued. The great group formed round the King in a semi-circle, of which his figure was the central point. He wore a general's uniform, the riband of the Black Eagle, (yellow), many orders, and carried his helmet in his hand. On his right was Field Marshal the Crown Prince, now Prince Imperial of Germany, whose services have so largely contributed to this end, and there were also Prince Charles and Prince Adalbert ; on the left was the Grand Duke of Baden, and then, radiating at the sides, as it were, the Grand Duke of Coburg, the Grand Duke of Weimar, the hereditary Princes of Wurtemberg, Weimar and Mecklenburg, the Duke of Augustenburg, the Duke Eugen of Wurtemberg, and many more whose names may be written hereafter, Bavaria being fitly represented by her Princes and Generals. Outside the circle, and some distance apart on the left of it, stood Count Bismarck—very pale, I thought, but never did man seem more calm, self-possessed, elevated as it were by some internal force, which caused all eyes to turn on the great figure with that indomitable force, where the will seems to be master and lord of all. The chorale over, the Court Preacher

Rogge, who is also military chaplain, read the Lord's Prayer and a Litany, to which the responses were sung by the band and by the congregation of the Princes. The twenty-first Psalm followed, and then the reverend Chaplain delivered an impassioned discourse, ‘*Mene, Mene, Tekal, Upharsin*’ addressed to France. Then was sung a hymn, and the Lord's Prayer was said, and next came the chorale, ‘*Nun danket Gott*,’ &c., to the end. It was a very simple touching ceremonial, and there was silence as the preacher pronounced the benediction. The King then bowed and took his place on a dais, surrounded by the flags of his regiments, amid immense enthusiasm. There was a rush so great I could not hear or get near enough to see what occurred for a moment, but the King was declared to be Emperor of Germany in the name of God, with such a mighty cheering and waving of helmets as never was heard or seen within the Chateau. Kaiser Wilhelm ! And then on the tumult of voices rose the strains of what we call ‘*God save the Queen*,’ at the end of which the King received the congratulations of his Court at an impromptu levee. When he was proclaimed Emperor he seemed to be overcome with emotion, and wiped the tears from his eyes. He did this again and again, as he went round and thanked the Princes, shaking them by the hand. At 1½ o'clock the ceremony was over. There is feasting all over Versailles—State dinners, banquets and rejoicings.”

A FEW CANADIAN FIGURES.

The amazing strides our country is making towards wealth and greatness may be estimated after a perusal of an article contributed to the *Year Book* by James Young, Esq., M.P. The paper consists of a view of the position of the country, and its facts and figures are gratifying in the extreme.

Notwithstanding that a large part of our territory is a barren and inhospitable wilderness, there remains, says Mr. Young an area of fertile territory capable of supporting a population of a hundred million souls. He estimates that nearly three hundred thousand miles are covered by pine forests and thinks the placing of our annual production of lumber at \$30,000,000 entirely too low, as the amount exported in the year 1868-9 was \$19,838,963.

Of course our chief wealth and chief source of wealth are in our agriculture. The value of the farms in the Dominion Mr. Young estimates at \$672,000,000 ; live stock \$150,000,000 ; agricultural implements \$31,000,000 ; and the yearly yield of agricultural produce at \$196,789,000. “When it is remembered,” he says “that in 1861 there were only 13,000,000 of acres under cultivation, and that this comprises but a small portion of the arable lands of the four provinces, to say nothing of the millions of acres of rich lands in Manitoba and the North-west, some idea may be formed of the wealth of our undeveloped agricultural resources.”

The annual produce of our fisheries is about \$12,000,000, one-fourth of which is consumed at home, and the rest is exported. Fifty thousand men and fifteen thousand vessels and fishing boats are engaged in this branch of industry.

Our mineral resources have been but little developed, and the present yield does not exceed \$2,500,000 a year ; but there are immense deposits awaiting the miner of coal, iron and gold in the Maritime Provinces : iron, copper, silver and gold in Ontario and Quebec ; and of gold and coal in the North-west.

The total realized wealth of the country Mr. Young places at \$400 a head, or \$1,713,241,000. In the United States, Mr. Wells, late special commissioner of revenue, estimates the realized wealth at \$600, but it must be borne in mind that most property there is estimated at an inflated and often fictitious rate, owing to the disturbance of values, and the altogether conventional worth of the currency. In England the rate per capital is about \$1,000. In savings bank and other moneyed institutions our people have invested about \$65,000,000. Ten years ago the sum so invested did not exceed \$20,000,000.

As great progress has been made in our commerce. In 1850 our total trade was \$30,000,000 ; in 1860 it had increased to \$65,000,000 ; the latest returns show a business of more than \$119,000,000 ; and Mr. Young is of opinion that during the year now closed it exceeded \$130,000,000.

In canals we have expended \$20,000,000, and the improvements now in contemplation will involve the outlay of other large sums. In railways we have completed 2,950 miles, which cost \$155,000,000 ; and 1,338 miles more are under construction, which will cost \$40,000,000.

In tonnage we rank fourth among the nations, being surpassed only by Great Britain, France and the United States.

The debt of the Dominion is \$88,870,937, representing an annual per capital interest of 98 cents ; that of Great Britain costs her people \$4.28 each ; and of the United States \$3.75. To pay the national debt of England would require \$122 per head ; of France

\$73; of the United States \$64; but about \$22 a head would pay our debt. Our annual taxation for all purposes of Dominion and Provincial revenue amounts to about \$3.75 a head; in England \$14; in France \$10; and in the United States \$9.50. But in the latter country there is a State tax to be added, so that the people of the State of New York pay each \$11.10 annually. We commend this latter fact to the attention of those philosophers who are endeavoring to persuade us that we would be much better off in the Union than as we are. When they can convince us that \$11.10 is a much less sum than \$3.75 we will probably be in a mood to listen further to their arguments.—*Hamilton Spectator.*

LOVELL'S DOMINION DIRECTORY.

We have received a copy of this great work. It is a monument of mechanical perseverance, diligence and enterprize on the part of Mr. Lovell—that prince of Canadian printers and publishers.

As an analysis of this mammoth directory, we may state that it extends to 2,565 large octavo pages—equal to four large volumes of nearly 650 pages each. It is moreover a thoroughly reliable work, and its information is indispensable to public men and men of business. It is indeed more than a Dominion Directory, as its name indicates, for it includes information not only of the four Provinces of the Dominion, but also of Newfoundland and Prince Edward's Island, besides a variety of information, imperial and national in its character. As to its contents we may summarize them as follows: It contains historical sketches of the various Provinces named, lists of the railway and steamboat routes, as well as of the post offices, banks, governmental departments, houses of parliament, law courts, clergy in British America, education departments, custom houses, ports of entry, tariffs of customs, patents of invention, canals, railways, newspapers, benevolent and religious societies, statements of imports and exports, revenue, expenditure, trade, &c., &c.

As an indication of the magnitude and importance of the work, it may be remarked that it contains the names of the chief inhabitants of 4914 places in the six Provinces, divided as follows:

Province of Ontario,.....	1822
“ Quebec,	884
“ Nova Scotia,	853
“ New Brunswick,	646
“ Newfoundland,	565
“ Prince Edward Island,.....	144
	4914

Or 1414 more places than were promised when the directory was first contemplated.

It is not, however, only as a directory that the work will be found especially valuable; in it is given descriptions of every city, town and village in the above Provinces, their situation, most remarkable features, principal productions or manufactures, how and by what means they can be reached, population, &c. It thus embraces much information of interest and value to the immigrant and the traveler, and may appropriately be styled a geographical dictionary as well as directory of the Dominion of Canada and the Provinces of Newfoundland and Prince Edward Island.

The aim of the publisher clearly has been to render the work an indispensable companion to the public, professional and business men, throughout these Provinces, as well as to persons in the United States and Europe having transactions with this country, and with this end in view he has spared neither pains nor expense in making it in every part complete and reliable.

We sincerely hope that the spirited publisher, in undertaking this great national work, will not be permitted by the public to lose money by his enterprize as he did in his former excellent Directory.

VII. Departmental Notices.

NEW SCHOOL REGISTERS.

In reply to numerous applications for Public School Registers, &c., we desire to say that a new edition (including the modifications in the courses of study required by the new School Act) will be shortly prepared and published. They will be sent to the County Clerks, for distribution through the Local Superintendents or Inspectors, but none will be sent out direct to individual schools from the Education Department.

CONSOLIDATED SCHOOL ACTS.

In an early number we hope to publish the entire text of the School Acts of 1850, 1860 and 1870-1. They will be incorporated in one Act, so that Local Superintendents, Trustees, Teachers and other interested parties will be able to see at a glance what modifications in our present School Laws have been made by the new Act.

SUNDAY SCHOOL BOOKS AND REQUISITES.

Application having been frequently made to the Department for the supply from its Depository of Sunday School Library and Prize Books, Maps and other requisites, it is deemed advisable to insert the following information on the subject.

1. The Department has no authority to grant the one hundred per cent. upon any remittance for Library or Prize Books, Maps or Requisites, except on such as are received from Municipal or Public School Corporations in Upper Canada. Books, Maps and other Requisites suitable for Sunday Schools, or for Library or other similar Associations, can however, on receipt of the necessary amount, be supplied from the Depository at the net prices, that is about twenty-five or thirty per cent. less than the usual current retail prices.

2. The admirable books published in England by the Society for Promoting Christian Knowledge, and by the London Religious Tract Society, are furnished from the Societies' catalogues at currency for sterling prices (i. e. a shilling sterling book is furnished for twenty cents Canadian currency, and so on in proportion.) These two catalogues will, as far as possible, be furnished to parties applying for them. Books suitable for Sunday Schools are received from the other large religious societies, Presbyterian and Methodists, and from the various extensive publishers in Britain and the United States, but the list would be too extensive to publish separately.

3. On receiving the necessary instructions, a suitable selection can be made at the Department, subject to the approval of the parties sending the order. Any books, maps, &c., not desired which may be sent from the Depository, will be exchanged for others, if returned promptly and in good order.

Advertisements.

IMPORTANT TO TEACHERS AND SCHOOL TRUSTEES!

Ruttan's New Ventilating Stoves,

RECOMMENDED BY TORONTO BOARD OF SCHOOL TRUSTEES, who certify that they consume but 2½ Coris of wood a year. They change all the air in a room every four minutes.

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Yonge Street, Toronto.

n't. p'd.

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p'd.

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NOVEMBER, 1870.

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