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INCORPORATED BY ROYAL CHARTER.

Annual General Meeting, December 11th, 1852.

The Annual Meeting of the Canadian Institute was held in the old Government House on Saturday, December 11th. The spacious and commodious apartments in that building which have been placed at the disposal of the Institute by the Government, are more convenient and accessible than the Hall of Assembly and the adjoining rooms, which were alluded to in the November number of the *Journal.* The discussion of the Report of the Council, and the election of officers and members constituted the business of the evening. In the absence of the 1st and 2nd Vice Presidents, George Duggan, Esq., junr., was called to the chair, and the Report being read, it was adopted after the introduction of a few unimportant amendments. The Report speaks for itself, and we give it at length, in order that absent members may have an opportunity of satisfying themselves with respect to the progress of the Institute. The list of candidates for membership proposed at the last meeting was then read and the gentlemen elected members of the Institute. In addition to the names which we inserted in the October number of the *Journal*, we have now to announce the names of several other gentlemen who were proposed on Saturday, and the formality of whose election will be completed at the next meeting of the Institute. *Life Members*—John Hutchinson, George Herrick, M. D., James Cotton; *Ordinary Members*—H. S. Fripp, T. Hirschfelder. The Election of Officers was then proceeded with, which terminated as follows:—

President:
Capt. J. H. Lefroy, R.A., F.R.S.

First Vice President—Professor Cherriman.
Second Vice President—Fred. Cumberland, Esq.
Treasurer—Dalrymple Crawford, Esq.
Corresponding Secretary—Professor Croft.
Secretary—Alfred Brunel, Esq.
Curator and Librarian—Edward Cull, Esq.

Council:

Professor Hind,	Professor Buckland,
Walter Shanley, Esq.,	Rev. Professor Irving,
Sandford Fleming, Esq.,	Dr. Bovell.

Annual Report of the Council of the Canadian Institute for the year 1852.

The present Council having taken office shortly before the close of the last session of the Institute, have little more to report than their own proceedings in carrying out the objects of the Society during the recess.

In the short period which intervened between their appointment and the close of the session only four papers were read, viz.:

1. On Concrete, by Mr. Cumberland,
2. On Limestones, by Mr. Thomas.
3. On Auroras, by Capt. Lefroy.
4. On the Probable Numbers of the Indian Races Inhabiting British America, by Capt. Lefroy.

Each of the above papers, however, led to such discussion as it is the wish and the object of the Institute to elicit.

During the above mentioned short period a considerable number of new members joined the Institute, and the Council have the further pleasure of submitting a list of sixty-three candidates, the formalities of whose election could not be completed during the recess, but whose names will be brought before the meeting this evening in accordance with the by-laws of the Institute, The number of members previously on the books was one hundred and twenty-six, making in all one hundred and eighty-nine.

Among the first objects to which the attention of the Council was directed, was the provision of some means for the regular and speedy publication of the papers read before the Society subject to such regulations as might be necessary to sustain the character of its transactions. Experience appears to show that it is only by offering facilities of this nature that literary and scientific societies can for any length of time either engage the interest of the community, succeed in calling forth exertions from their members, or secure to themselves the advantage of hearing papers of permanent value read before their meetings.

As it was impossible in the infancy of the Society to sustain a regular publication by its own funds, the method was adopted after much consideration of originating a monthly periodical, which, while claiming public support upon independent grounds, should also be under the control of the Council to a sufficient extent to secure the attainment of their objects. Such is the *Canadian Journal*, which, under the editorship of Professor H. Y. Hind, to whose able and gratuitous services the Institute is most deeply indebted, has now reached its fourth number, and has been recognized in flattering terms by most of the organs of public opinion throughout the Province.

In order, still further, to extend the usefulness and increase the interest of the *Journal*, proposals have been made to the Natural History Society of Montreal, and to the Literary and Historical Society of Quebec with the view of rendering the *Canadian Journal* the organ for the publication of their proceedings. It is also proposed to make similar applications to all the Mechanics' Institutes throughout the Province.

The want of information respecting the water levels of Lake Ontario, which are variable to such an extent as seriously to affect the interests of navigation and manufacture, and greatly to embarrass the operations of engineers who, as yet, have had no standard lake-level upon which to establish their investigations, induced the Council to make enquiry of the Commissioners of Public Works as to any existing records of the levels of past years, and to suggest the propriety of establishing a future reliable system of observation and registration at various points on the lake shore. The Commissioners, however, whilst they acknowledged the importance of the proposed investigation, and referred to some special observations which had been made in connection with the construction of the Provincial canals, were not prepared to recommend the Government to take any action in the matter further than to place the services of light-house keepers in its employment at the disposal of the Institute in the pursuit of such enquiry. Such assistance would very greatly facilitate the attainment of the object in view, and the Council submit for your approval the expediency of arranging during the ensuing winter, a regular system of observation, believing that it would be productive of results very valuable to the public, and thereby justifying the expenditure of a portion of the public grant.

The Council also distributed circulars throughout the Province, requesting information respecting two subjects, the one interesting on account of its connection with the former history of the country, and the other of great value from its economic importance. The circulars respecting Indian Remains and Canadian Limestones, printed in full in the second number of the *Journal*, have been widely disseminated, and the Council are happy to state that favourable results are beginning to arise from the course adopted.

It affords the highest satisfaction to the Council to be enabled to announce that there is every probability of the early co-operation of the Society of Arts of London with the Institute in the pursuit of their mutual objects. By a correspondence which has been opened with the Institute by that Society, (under the authority of Her Majesty's Secretary of State for the Colonies, and by recommendation of His Excellency the Governor General) the Council have reason to hope that the foundation has been laid for reciprocal services of a nature which will tend "to advance the knowledge of the resources and capabilities of this Province in England, and will ensure to its inhabitants such information as the Society of Arts are enabled to furnish on subjects connected with Arts, Manufactures and Commerce." The Council being impressed with the conviction that such a co-operation will result most advantageously to the Institute, strongly recommend that it be diligently pursued; and would further suggest that so soon as the Institute shall have been brought into full and efficient action, correspondence having a like bearing, be opened with other kindred Societies in Great Britain and the United States; whose liberality in extending advice and aid to less advanced Institutions, has already been amply illustrated.

The Council have already received assurance of assistance and co-operation from the Smithsonian Institute at Washington, a copy of whose valuable transactions will also be presented to the Library of the Society.

The Council have great pleasure in announcing that the Provincial Government has not only made the liberal grant of £250 to the Institute, for the current Parliamentary year, but has also sanctioned its occupation of spacious and convenient apartments in the Old Government House, and thus afforded it every facility and accommodation for an immediate commencement of a Museum and Library.

In reference to the first of these objects, there is reason to believe that a plan is in contemplation by the Government for the formation of a general museum, which, however, in the opinion of the Council, by no means supersedes the necessity of forming a more private and special collection connected with the Institute. Such a museum need not be of so extended and various a nature as that contemplated by the Government. and might, perhaps, with propriety be confined to the products of the Province, and the illustration of those Arts and Sciences which are more especially the objects of the Institution. A private collection of this kind, freely at the use of the members, will naturally be more acceptable and more easily available than any large Public Museum.

In furtherance of this view, the Council would recommend:

1stly. That immediate formal application be made to the Government, for any Geological and Mineralogical specimens belonging to the Survey, of which they may possess duplicates.

2ndly. That circulars be sent to all members of the Institute, requesting their co-operation in the formation of a museum, by the donation of such specimens as they may be able to procure.

3rdly. That special application be made to Engineers and Surveyors, engaged on Railroads or mining operations for specimens obtained in cuttings or excavations, over which they may have superintendence, special attention being paid to Geological sections.

4thly. That such collection shall for the present comprehend all objects connected with Architecture and Engineering, Natural History and Botany, Mineralogy and Geology, Indian Antiquities, and Arts and Manufactures.

5thly. That a Museum Committee be appointed to act in conjunction with the Curator.

With reference to the Library the Council recommend that a liberal appropriation be made by their successors in office, towards the formation of such a Library of reference as will facilitate, assist and encourage the special pursuits of all classes of the members of the Institute. That standard works on practical Engineering, Architecture, Manufactures, Transactions of learned

Societies, and other similar series, such as are seldom met with in this country in private hands, be first provided, and that no expense be at present incurred in forming a Miscellaneous Library.

This Council would also recommend that application be made to Government for copies of all public documents printed by authority of Parliament, on the subject of Engineering, Architecture, Railways, Statistics, Prison Discipline, &c.

The Council have to report that they have entered into a correspondence with the Toronto Athenæum, with a view to an amalgamation of the two Societies, on terms expressed in a document to be presently laid before the meeting.

The Council have also gratefully to acknowledge the receipt of a considerable number of donations to the Institute, comprising a few books, geological reports, and meteorological observations, various mineralogical and geological specimens, some interesting Indian remains, several valuable maps, and models of the Toronto Harbour and of a locomotive.

The experience of the past year has shown, as must naturally be the case with all young societies, that the By-Laws and Regulations as at first framed, require more or less modifications. Some propositions relating to changes in the terms of subscription, and other desirable alterations will presently be brought before the meeting.

In concluding this Report, and retiring from Office, your Council cannot refrain from congratulating the Institute on the hopeful prospects that lie before it. The large and continually increasing list of members, the reasonable expectations of an assured and sufficient income, the probable incorporation with us of other societies, the establishment and successful issue of a Journal which bids fair to become the recognized organ of scientific intelligence throughout the Canadas; all these facts encourage the belief that the Society, though yet in its infancy, will soon extend its influence and usefulness to every part of the Province, and will ultimately take rank worthily among the great national societies of the world. But in order to realize this expectation, your Council would beg to urge upon the members individually, the necessity of personal exertion, each in his own department; not only in promoting the formation of a Museum and Library, but more especially with reference to papers to be read before the Society, and the discussions that may ensue thereon. The opportunity of publication now afforded by the Canadian Journal, while it offers additional inducement for the preparation of such papers, at the same time calls for judicious selection of subjects, and increased zeal in their investigation.

Subjoined will be found a statement showing the present condition of the financial affairs of the Institute.

BALANCE SHEET, *showing the Financial state of the Institute.*

		£	s.	d.			£	s.	d.
Dec'br. 1.	To outstanding acc'nt per Voucher, No. 15	3	9	11	Dec'br. 1.	By Balance in Treasurer's hands as per his account current	37	10	0
	" do. do, do. " 16	8	0	5		" Amount of uncollected subscriptions per statement No. 9	36	15	0
	" do. do. do. " 17	53	8	5		" Amount of Agricultural Association's subscription to Journal	30	0	0
	" do. do. do. " 18	1	15	0		" Parliamentary Grant now due to Institute	250	0	0
	" do. do. do. " 19	12	5	0		" Amount due for unpaid subscriptions to Journal	3	18	9
	" do. do. do. " 20	7	14	0					
	" Balance in favour of Institute	271	11	0					
		358	3	9			358	3	9
						By balance brought down	271	11	9

The Canadian Journal.

TORONTO, DECEMBER, 1852.

The Railroads of Canada.

The Legislation of the recent Session of the Provincial Parliament has been remarkable for the number of Charters granted to Railway Incorporations, and for the amendments granted to existing Companies.

The Atlantic and St. Lawrence Railway Act has been amended. This road is now under construction to the Province line, and will there connect with the Railroad to Portland, in Maine, thus connecting the City of Montreal with the Atlantic seaboard by the nearest possible route, and at the same time affording by existing Railroads, or in progress, access to the New England States, and to the Sister Provinces. The length of the St. Lawrence and Atlantic road, from Montreal to the Province line, will be about 126 miles, of which 95 miles, to Sherbrooke are constructed and in working order, the remaining portion is being pushed forward vigorously, and it is expected it will be completed during the ensuing summer, as well as that part of the line which lies in the State of Maine.

Another Act authorises the Montreal and New York Railroad Company to extend their road, and to acquire the necessary land for such extension. This road connects Montreal (via the Lachine Railroad and Ferry, to Caughnawaga,) with the Ogdensburgh road of New York, and extends southward to Plattsburgh, by it the time of travel between Montreal and the western part of the Province is materially reduced and another channel opened to the business of New York. It has already been opened for travel in connexion with the Ogdensburgh road, but we have no information as to the direction which its extension is to take.

The next, though not precisely a Railway Act, is passed "in order to enable the Town of Dundas to grant its security to the

Great Western Railroad on behalf of the Desjardines Canal Company, for certain improvements in said Canal." Such "improvements" were rendered necessary, in fact unavoidable, by the unsuccessful attempts of the Great Western Company to construct a bridge across the present Canal, at the Burlington Heights, where, after expending a large amount of money, it was found advisable to abandon the works and change the course of the Canal—this change is considered, to a certain extent, an improvement of that navigation.

"An Act to incorporate the Main Trunk Railway of Canada," is the most important Railway Act of the session, and demands more extended notice than we are now prepared to give it. The Company will be entitled to the Government guarantee of £3,000 sterling, per mile. With the political movements which accompanied its passage through the Legislature, we have nothing to do—but we may be permitted to express our satisfaction at the fair prospects opened by it for the early construction of a main line of communication through the whole length of Canada, and our hope that its final location will be determined, as well with a view to the economical construction and subsequent working of the road, as to conserve the broadest interests of the whole Province. At present, we believe, no more is known in reference to its route than that it is intended to extend from Montreal to Kingston, and thence to Toronto—below Montreal the Atlantic and St. Lawrence road, as far as Richmond, already in operation, and the Richmond and Quebec road, now under construction, will connect the Main Trunk with Quebec—below Quebec the Trois Pistoles road will carry it on to that point, and thence it is expected a road will be constructed to Miramichi, thus uniting with the roads projected and in progress in Nova Scotia and New Brunswick.

Westward of Toronto, the Toronto and Guelph road, now under contract as far as Guelph, and its recently chartered extension to Port Sarnia, will connect the Main Trunk with the waters of Lake Huron, at the head of the river St. Clair, and with the most fertile region of the Canadian Peninsula; beyond that point a short road in Michigan, (we believe now under construction to Port Huron, immediately opposite and within one-fourth of a mile of Port Sarnia,) will connect through Detroit, and by the Michigan Central Railroad, with Chicago and all the roads west and south-west of that point. From Port Huron, another road, partly constructed, extends through the heart of Michigan to Grand Haven, opposite Milwaukie, while Port Sarnia being at the foot of Lake Huron, will command a large portion of the north-western trade, borne over Lakes Michigan and Huron. The importance of such a chain of communication through the Provinces and extending into the adjoining Republic can hardly be over-rated, and the connexion which the Main Trunk has with the lines we have named, can not fail to make it a profitable speculation. These are not, however, all the sources from which it will derive support. It will be connected by a line from Toronto to Hamilton, with the *Great Western* road, which also connects via Detroit with most of the lines above named westward of that point, and though the larger portion of the Great Western's Trade may reasonably be expected to pass over its extension to the Niagara Frontier into the adjoining State—still it must, to a certain extent, be a feeder to the Grand Trunk. Many branch roads will doubtless be constructed, stretching into the interior of the country, of which some are already projected, and will become valuable contributors to the trade of the Main Line.

The distances from Trois Pistoles to Detroit, by this system of roads, will be nearly as follow:—

Trois Pistoles to Quebec, say	*145 miles.*
Quebec to Richmond	90
Richmond to Montreal	70
Montreal to Kingston	170
Kingston to Toronto	165
Via Port Sarnia:—	640
From Toronto to Guelph	47 miles.
Guelph to Sarnia	115
Sarnia to Detroit, (in Michigan)	52
Via Hamilton:—	214
From Toronto to Hamilton	40 miles.
" Hamilton to Detroit	180
	220 miles.

The Main Trunk, therefore, with its extensions, will consist of 1074 miles in Canada, of which 387 miles are under contract and in a forward state, and about 90 miles in operation.

"An Act to amend the Erie and Ontario Railroad Company," relates to a Company chartered in 1835, for the construction of a Railroad between the mouth of the Niagara River and Chippawa, thus connecting the navigation of Lakes Erie and Ontario by Railroad on the Canada side. This road will of course be in direct competition with the one already commenced on the opposite side of the river to extend from Buffalo to Youngstown.

Two Acts were passed in relation to the Bytown and Prescott Railroad, one granting certain lands in Bytown, the other amending a former charter. The Bytown and Prescott road connects the heart of the Ottawa country at Bytown, with the St. Lawrence at Prescott, immediately opposite the terminus of the Ogdensburgh road—a distance of about 54 miles. The grading of this road is in a forward state, and it is confidently asserted that it will be opened for business next season.

"An Act to incorporate the Toronto and Guelph Railway Company." *This title hardly expresses the object of the Act*, which empowers the Company previously chartered to extend their line to the waters of Lake Huron at Sarnia. We have already alluded to this in connexion with the Grand Trunk line; it will compete with the Great Western for the trade of the far west, and will undoubtedly obtain that portion of it which is destined to pass through Canada, on the other hand, the Great Western must always command such of the western business as will find a more profitable channel to market over the roads of New York.

The "*Toronto and Sarnia*" road, as it may more correctly be named, passes through the best agricultural districts in Upper Canada, and will command a profitable local business.

The next Act relates to the "Peterborough and Port Hope Railroad, a charter for which was first granted in 1846. It is an important branch road, and when constructed, will bring a rich section of Canada into communication with the navigation of Lake Ontario and with the "Main Trunk." Another act charters, or rather renews a charter, granted in 1834, for the construction of a railroad from Cobourg (only seven miles from Port Hope) to Peterborough. It is not, we presume, seriously intended to construct both lines, as in that event neither could be made profitable, and either would answer every purpose in opening the interior of the country. The rivalry is confined to the towns of Cobourg and Port Hope, which are bidding for the business of Peterborough. Neither of the lines, we believe, offer any serious engineering difficulty to their construction; and the only obstruction will be of a financial character; the first to overcome that will be the successful competitor. The engineer of the Port Hope line has made his report of a preliminary survey—we are not aware that anything has been done on the other route.

"An Act authorizing the construction of a Railway from Galt to Guelph." This line will be an extension of the branch from the Great Western to Galt, already under construction. It is an effort to obtain for the Great Western Road and the City of Hamilton, a share of the business of Guelph and its vicinity, which will otherwise be drawn off by the Toronto and Guelph line. It may therefore be considered as an extension of the charter of the Great Western Company.

The Hamilton and Toronto Railway Company has obtained a Charter for constructing a Railroad between those cities. It will be an important road, as connecting the two principal cities of Canada West, and as a link connecting the Great Western with the Main Trunk at Toronto. There are no engineering difficulties likely to make this an expensive road, and it will undoubtedly afford ample remuneration for capital invested in it. A preliminary survey has been made under the direction of Mr. Benedict—late Chief Engineer to the Great Western Company. We think Toronto would have consulted her own interests had she taken a more active part in the successful prosecution of this enterprize—it will form the connecting link between this city and the roads of the State of New York, and the interests of her business in that direction, as well as westward of Hamilton, make a fair representation in its management of great importance.

"An Act to empower any Railway Company, whose Railway forms part of the Main Trunk Line of Railway throughout this Province, to unite with any other such Company, or to purchase the property and rights of any such Company; and to repeal certain Acts therein mentioned, incorporating Railway Companies."

This Act requires no comment—it is intended to facilitate the future working of the main line through the Province, under one management.

"An Act to provide for the incorporation of a Company, to construct a Railway from opposite Quebec to Trois Pistoles, and for the extension of such Railway to the Eastern Frontier of this Province."

This has already been noticed in connexion with the Main Trunk, of which it will eventually form the eastern extension towards Halifax. We understand that the necessary capital has been subscribed towards this line, and that there is a fair prospect for its early construction. It will be entitled to the Government guarantee of £3,000 sterling, per mile. From Trois Pistoles a road to Miramachi will meet the roads of Nova Scotia and New Brunswick.

"An Act to amend and extend the Act incorporating a Company for making a railroad from the Village of Industry to the Township of Rawdon in Lower Canada." This road is nearly completed—is has only a local importance.

"An Act to amend the Act incorporating the *Ontario, Simcoe and Huron Railroad Union Company*." The amendment relates to the election of Directors, and repeals that part of the original Charter which empowered the Company to raise money by lottery. This road is in a very forward state and will doubtless be the first completed road in Upper Canada. There are already 27 miles of iron laid, and it is in contemplation to open the completed portion of it immediately, beyond this twenty-seven miles, the grading is very nearly completed as far as Barrie, (63 miles from Toronto,) thence to the waters of Lake Huron, about 30 miles, the surveys are already made, and the road will be constructed before the fall of 1853. This road will receive the Government Guarantee for one-half of the cost of its construction. It is a road of great importance, as being the nearest connecting link between the navigation of Lakes Huron and Michigan, and Ontario, and will without doubt command a large share of the business of the north-west, and all the business of the vast mineral regions of Lake Superior, since the distance by this route to the projected canal at Sault Ste. Mary, and to the Straits of Mackinaw, from New York and Boston, will be less by some 250 miles than any other route. Independently of this, however, 65 miles of the road pass through a very rich and thickly settled country, the business of which has hitherto found its way to Toronto, over the "Yonge Street Macadamized Roads."

"An Act to authorize the Brantford and Buffalo Joint Stock Railroad Company, to construct a Railway from Fort Erie to Goderich." This road had been commenced from Fort Erie to Brantford, and partly graded under the General Road Act, since repealed. The present Act empowers the Company to extend their line to Goderich—it will therefore cross both the "Great Western" and the "Toronto and Sarnia" roads at nearly right angles.

"An Act to incorporate the Grand Junction Railroad Company." The Grand Junction Railway, we believe, is intended to connect Peterborough with the waters of Lake Huron at Gloucester Bay, with Toronto, and with the Main Trunk at or near Belleville. It would undoubtedly open a vast and valuable tract of country, but we are of opinion that part of the project at least, is premature.

We have now, we believe, noticed all the Acts relating to *Railways, passed during the recent session. They embrace an* amount of Railway Legislation certainly unprecedented in a Canadian Parliament, and if all the roads projected are built, Canada will in no way be behind her neighbours in Railroad communication. It is true that some of the projects are of doubtful value, or at least, premature; but none of them are likely to be proceeded with, except such are well calculated to make a fair return for the capital invested. We give below a synopsis of the Railroads chartered and in progress in Canada, by which it will be seen that we now have 205 miles in operation; 618 miles under construction; and 1056 miles chartered.

NAME OF RAILROADS.	Miles Completed.	Miles under Construction.	Miles Chartered.	Total.
Montreal and Lachine Railroad	8			8
Champlain and St. Lawrence to Rouse's P't.	43			43
Rawdon and Industry		20		20
St. Lawrence and Atlantic	95	31		126
Montreal & New York, to Moer's Corners	32			32
Quebec and Richmond		90		90
Quebec and Trois Pistoles			145	145
Montreal to Kingston, } Main Trunk			170	170
Kingston to Toronto, } Main Trunk			165	165
Prescott and Bytown		54		54
Peterborough and Port Hope			27	27
Peterborough and Cobourg			30	30
Grand Junction, Peterboro' to Belleville			50	50
Do. Do. to Gloucester Bay			60	60
Do. Do. to Toronto			75	75
Ontario, Simcoe & Huron, Toronto to L. Hur.	27	66		93
Toronto and Sarnia, Toronto to Guelph		47		47
Guelph to Stratford			40	40
Stratford to Sarnia			75	75
Toronto and Hamilton			40	40
Great Western, Hamilton to London		76		76
London to Detroit		104		104
Hamilton to Niagara River		42		42
London to Sarnia			60	60
Junction to Galt		13		13
Galt to Guelph			16	16
Buffalo and Goderich, Buffalo to Brantford		75		75
Brantford to Stratford			40	40
Stratford to Goderich			43	43
Erie and Ontario, Niagara to Chippawa			20	20
Total	205	618	1056	1881

Perreaulx Dividing Machine.

A Dividing Machine by which any scale of equal parts whatever, not exceeding a certain value, can be graduated with the greatest facility, or any arbitrary distance be divided into any arbitrary number of equal parts, is a contrivance which offers so many facilities to scientific men, engineers, draughtsmen and others, that a short account of one which attracted much notice at the Great Exhibition, may probably be interesting to our readers. The fundamental part of Perreaulx *machine à deviser &c.*, consists of a screw of exquisite workmanship, sixty centimetres in length, (23·6 inches) and of the value of half a millimetre, nearly 0·02 inch, to one revolution. The peculiar perfection of form, as regards straightness and uniformity of value, which the artist has attained in this vital part, constitutes one of the great excellencies of the apparatus. This screw gives motion to the carriage to which the graving tool, or pen is attached, and is turned by a small winch handle connected with an ingenious micrometrical apparatus, which can be set with the greatest facility, so that the act of turning the handle shall cause the graver to advance any line or distance required, from six millimetres, 0·236 inches, down to one-eight-hundredth part of a millimetre, or about the *twenty-thousandth* part of an inch. This is effected by two circles, one divided on its circumference into 200 teeth, the other having a thread or screw of twelve turns on its circumference, and also on its face, 400 equal divisions. A fixed and a moveable stop enable the operator to adjust the space scale to any value from a fraction of one revolution to twelve, a number limited only by the number of threads on the wheel or circle above referred to. The stroke of the graver is made with great delicacy by drawing out a silk cord, and there is a mechanical contrivance by which every fifth stroke is made longer than the others. The arrangement by which a wheel with 200 teeth on its circumference, which is the medium by which the motion of the micrometer circle is communicated to the screw, is made to answer the motions of a micrometer circle divided into 400 equal parts, is very ingenious: it consists simply of two rachets, one always raised when the other is down, and one-half a tooth in advance of the other,—consequently one or other will act at every four-hundredth part of a revolution. There are two microscopes to assist the measurement of given distances, but they are not required for graduating. We may illustrate the use of the machine by referring to such operations as those of the Observatory at Toronto. A great proportion of the instruments used at that establishment measure angular deviations by the principle of reflexion, that is to say, a scale of equal linear values, generally a millimetre, is adjusted opposite to a magnet carrying a plane reflector, and a fixed telescope placed at a convenient distance for observing the particular division of the scale which is reflected from the mirror, at certain moments, from which the position of the magnet is inferred. Now the angular value of each division, obviously depends upon the distance of the scale from the reflector, and this must be governed in many cases by other considerations than that of obtaining a precisely convenient value; the consequence has been, that all sorts of inconvenient fractional units appear in the records, adding greatly to the trouble of reduction, and impeding the comparison of the results with those obtained elsewhere. The same being true of almost every similar collection of observations, the result is an incredible increase to the labour of pursuing any specific enquiry through them. Every one knows what an impediment the existence of different scales of the thermometer is to extensive comparisons of climate or temperature, and it is easy to conceive what it would become if, instead of having to deal only with Fahrenheit, Celsius, and Reaumeur, each register presented us with a different scale. Such is literally the case with the magnetical publications referred to, all of which inconvenience would probably have been saved if the machine we refer to had formed a part of the equipment of such establishments, thus allowing a scale of any special value required to be produced as often as needed—with the ordinary engines, the generation of a new scale is a serious undertaking. In fact the uses of Perreaulx machine as an addition to general philosophical apparatus, owing to the extreme minuteness and accuracy of the linear measurements of which it is capable, and the great variety of scales which can be produced are as numerous as we think they would be found in the more practical pursuits above referred to, and we should be glad to hear of some enterprizing mechanic in Canada providing one of them. The price in Paris is about £42 currency; for £20 additional the means of *circular* division are added.

Penny Wisdom.

There is a huge heap of chemical refuse now near the banks of the Tyne at Gateshead, which is not only a commercial nothing, but the manufacturer who unwillingly calls it his property, would most kindly greet any one who would take it off his hands; for he has to lease sundry acres of land for no other purpose than to deposit this refuse thereon. It is of such nothings as these that we would speak; and of the ingenuity which, from time to time, draws something therefrom. And we would also direct attention to a few miscellaneous examples of the useful application of materials long valued—the causing "a little to go a great way."

Schoolboys display great skill in breaking their slates. Shall they be allowed to continue the exercise of this interesting practice; or shall we invite them to use the new Wurtemberg slates? A manufacturer in that country has invented a mode applying a surface coating to sheet iron, which enables it to take freely the ...ark of a slate pencil; it is said to be much lighter, and much less liable to injury, than a common slate. If we have sheet iron slates, why not sheet-iron paper? Baron Von Kleist, the proprietor of some iron works at Nandeck, in Bohemia, has lately produced paper of this kind, from which great things seem to be expected. It is remarkable for its extreme thinness, flexibility and strength, and is entirely without flaws. It is used in making buttons, and various other articles shaped by stamping; and it is capable of receiving a very high polish. Whether the world is ever to see the *Times* printed on a sheet of iron, we must leave to some clairvoyante to determine; but, no sooner did our manufacturers become acquainted with this Bohemian product at the Great Exhibition, than they instantly set their wits to work to produce better and thinner sheet-iron than had before been made in England. In the Birmingham department, before the exhibition closed, there made its appearance about five inches by three, consising of 44 leaves of sheet-iron, the whole weighing about two ounces and a half. We are getting on: the age of iron literature may yet arrive.

Our learned chemists have lately discovered that, in making or smelting iron, not less than seven-eighths, of all the heat goes off in waste; only one-eighth being really made availabe for the extraction of the metal from its stong matrix. What a sad waste of good fuel is here: what a provoking mode of driving money out of one's pocket! So thought Mr. Budd, of the Ystalyfera ironworks in Wales. He found that the heat which escapes from an iron furnace is really as high as that of melting brass; and he pondered how he might compel this heat to render some of its useful services. He put a gentle check upon it just as it was about to escape at the top of the furnace; he gently enticed it to pass through a channel or pipe which bent downwards; and gently brought it under the boiler of the steam-engine which worked the blowing machine for the furnace. A clever device this; for this economised caloric heated the boiler without any other fuel whatever, and there was a saving of three hundred and fifty pounds in one year in the fuel department for one boiler alone. Mr. Budd told all about this to the British Association, at Swansea, in 1848; and at Edinburgh, in 1850, he was able to tell them much more. He stated that he had applied the method to all the nine smelting-furnaces at the Ystalyfera works; and that it has also been applied at the Dundyvan Works in Scotland. The coal used in the Scotch works is of such a kind that the wasted heat from one furnace is believed to be enough to heat the air for the hot blast, and to work the blast engines for three furnaces. Mr. Budd states that his plan enabled the Dundyvan proprietors to smelt ore with a ton and a quarter less coal to a ton of iron than by the old method; and he shows how this might arise to a saving of one hundred and thirty thousand pounds a year for the whole of Scotland. A pretty-saving this —a veritable creation of something out of a commercial nothing.

Horse-shoe nails, kicked about the world by horses innumerable, are not the useless fragments we might naturally deem them. Military men may discuss the relative merits of Minie rifles, and needle guns, and regulation-muskets; but all will agree that the material of which the barrels are made should be sound and tough, and gun-makers tell us that no iron is so well fitted for the purpose as that which is derived from horse-shoe nails, and similarly worn fragments. The nails are in the first instance made of good sound iron, and the violent concussions which they receive, when a horse is walking over a stoney road, give a peculiar annealing and toughening to the metal, highly beneficial to its subsequent use for gun barrels.

An advertisement in the *Times* notifies, that "the Committee for managing the affairs of the Bristol Gas Light Company are ready to enter into a contract for a term, from the twenty-first December next, for the sale of from sixteen thousand gallons of ammoniacal liquor, produced per month at the works of the Company." What is this ammoniacal liquor? It is a most unloveable compound, which the gas-makers must get rid of, whether it has commercial value or not. After coal has been converted into coke in the retorts of a gas-house, the vapours which escape are extraordinarily complex in their character; they comprise, not only the gas which is intended for illumination, but acids, and alkalies, and gases of many other kinds—all of which must be removed before the street gas arrives at its proper degree of purity. By washing in clean water, and washing in lime water, and other processes, this purification is gradually brought about. But then the water, which has become impregnated with ammonia, and the lime, which has become impregnated with sulphuretted hydrogen and other gases, are dolefully fœtid and repulsive; and in the early history of gas-lighting these refuse products embarrassed the gas-maker exceedingly. But now the chemists make all sorts of good things from them. The lady's smelling-bottle contains volatile salts made from this refuse ammonia, and sulphate of ammonia is another product from the same source; the tar, which is another of the ungracious consequences of gas-making, is now made to yield benezole—a remarkable volatile liquid —which manufacturers employ in making varnish, and perfumers employ in making that which is honoured by the name of oil of bitter almonds, and housewives employ in removing grease spots, and economical ladies employ in cleaning white kid gloves; the naphthaline, which annoys the gas-maker by choking up his pipes, is made to render an account of itself in the form of a beautiful red colouring matter, useful in dyeing—in short, our gas works are a sort of magical Saving's Bank, in which commercial nothings are put in, and valuable something taken out.*

Mr. Brokeden has taught us how to make pencils out of dust. Our black lead pencils, as is pretty generally known, are made chiefly from Borrowdale plumbago, brought from a mine in Cumberland. This mine is becoming exhausted; and a question has arisen how the supply shall be kept up. Various compounds have been suggested in different quarters, but Mr. Brokeden has happily hit upon an expedient which promises wonders. Although pieces of plumbago are scarce, plumbago dust is tolerably plentiful, and Mr. Brokeden operates upon this dust. He presses a mass of the powder together, then draws out the air from beneath the particles by means of an air pump, and then presses again with such enormous force as to convert the mass into a solid block, which can be cut into the oblong prisms suitable for pencils.

If a ton of lead contains three ounces of silver—one ounce in twelve thousand ounces—will it pay to dig out this silver, mechanically or chemically? Will it save a penny? Mr. Pattinson, a manufacturing chemist at Newcastle, says, and shows that it will; although, before his improvements were introduced, the attempt was a losing one, unless the lead contained at least twenty ounces of silver to the ton. Nearly all lead ore contains a trace of silver, which becomes melted and combined in the ingot or pig of lead. Vast are the arrangements which the manufacturers are willing to make to extricate this morsel of silver from the mass in which it is buried; huge furnaces, and melting vessels, and crystallizing vessels are provided, and elaborate processes are carefully conducted. The lead, itself, is all the better for losing its silvery companion; while the silver makes its appearance afterwards in the form of dazzling tea-services, and such like.

The mention of Newcastle calls to mind our opening paragraph, relating to a certain table-land of refuse. The history of this useless product carries with it the history of many other remarkable products—once useless, but now of great value. Thus it is. Sulphur is thrown into a "burning, fiery furnace;" it burns away and is converted into a gas called sulphurous acid; this, being combined with steam and water, becomes liquid sulphuric acid. So far good; there is no refuse. But let us go on. Common salt, or rather rock salt from Cheshire, is heated with this sulphuric acid in a furnace. A peculiar penetrating gas rises, which is muriatic acid; the soda makers (of whom, more presently,) did not want this troublesome gas, and they, therefore, sent it up aloft through the chimneys. But the gardeners and farmers all around complained that the muriatic acid vapours poisoned their trees and plants, and then the manufacturers were driven to construct chimneys so lofty as to overtop our loftiest steeples in order to carry away the enemy as far above the region of vegetation as possible. But good luck or good sense came to their aid; they devised a mode of combining the gas with water, and thus was produced muriatic acid or spirits of salts; and then this muriatic acid was made to yield chlorine, and the chlorine was made to form an ingredient in bleaching powder; so that by little and little, the once dreaded muriatic acid gas has become a most respectable and respected friend to the manufacturer. Meanwhile the salt and the sulphuric acid are undergoing such changes, by heatings and mixings of different kinds, that they both disappear from the scene; the useful product left behind is soda, so valuable in glass-making, and soap-making, and other processes; the useless product is an earthly substance, consisting of calcium and sulphur, which nobody can apply to any profitable purpose, nobody will buy, and nobody even accept as a gift. At a large chemical work near Newcastle, this product has been increasing at such a rapid rate that it now forms a mass six or eight acres in extent, and thirty or forty feet high: it is a mountain or rather a table-land of difficulties. Here then, we see how chemical manufacturers are saving a penny out of some of their refuse, and looking wistfully towards the day when they may perchance save a penny out of this monstrous commercial nothing.

Coal proprietors are, perhaps necessarily, very wasteful people. They accumulate around the mouths of their pits large heaps of small coal, which, formerly, rendered service to no one; and in some parts of the country they burn this coal simply to get rid of it. But, thanks to the Legislature, it sometimes does good by interfering in manufacturing affairs. It ordained that locomotives should not send forth streams of smoke into the air, and we are thus freed from a nuisance which sadly affects our river-steamers and steamer-rivers; whae, at the same time, coke being used as a non-smokable fuel, and the supply from the gas-works being too small, coke-makers have looked to the heaps of small coal at the pit's mouth; and the result is, that thousands of locomotives are now fed with coke made from the small waste coal at the collieries. The railway companies get their coke cheaper than formerly; the coal owner makes something out of a (commercial) nothing; and the ground around the coal-pits is becoming freed from an incumbrance. And what the coke makers would leave, if they leave anything, the artificial fuel makers will buy; for in most of the patent fuels now brought under public notice, coal-dust is one of the ingredients.

How to get a pennyworth of beauty out of old bones and bits of skin, is a problem which the French gelatine-makers have solved very prettily. Does the reader remember some gorgeous sheets of coloured gelatine in the French department of the Great Exhibition? We owed them to the slaughter-houses of Paris. Those establishments are so well organized and conducted, that all the refuse is carefully preserved, to be applied to any purposes for which it may be deemed fitting. Very pure gelatine is made from the waste fragments of skin, bone, tendon, ligature, and gelatinous tissue of the animals slaughtered in the Parisian abattoirs; and thin sheets of this gelatine are made to receive very rich and beautiful colours. As a gelatinous liquid, when melted, it is used in the dressing of woven stuffs, and in the clarification of wine; and, as a solid, it is cut into threads for the ornamental uses of the confectioner, or made into very thin white and transparent sheets of *papier glacé* for copying drawings, or applied in the making of artificial flowers, or used as a substitute for paper on which gold printing may be executed. In good sooth: when an ox has given us our beef, and our leather, and our tallow, his career of usefulness is by no means ended; we can get a penny out of him as long as there is a scrap of his substance above ground.

Dyers and calico-printers, like manufacturing chemists, have frequently accumulations of rubbish about their premises, which they heartily wish to get rid of at any or no price; and at intervals, by a new item added to the general stock of available knowledge, one of these accumulations becomes suddenly a commercial something. The dye material called madder will serve to illustrate this as well as anything else. Madder is the root of a plant which yields much colouring matter by steeping in water; and after being so treated, the spent madder is thrown aside as a useless refuse. The refuse is not rich enough for manure; no river conservators will allow it to be thrown into a running stream; and the dyer is thus perforce compelled to give it a homestead somewhere or other. But, some clear-headed experimenter has just found out that, actually, one-third of the colouring matter is left unused in the so-called spent madder; and he has shown how to make a pretty penny and an honest penny out of it, by the aid of certain hot acids.

* See also an article headed Gas Perfumery, in volume 3, page 334 of this Miscellany.

Whether any perfumed lady would be disconcerted at learning the sources of her perfumes, each lady must decide for herself; but it seems that Mr. De la Rue and Doctor Hoffman, in their capacities as jurors of the Great Exhibition, have made terrible havoc among the perfumery. They have found that many of the scents said to be procured from flowers and fruits, are really produced from anything but flowery sources; the perfumers are chemists enough to know that similar odours may be often produced from dissimilar substances, and if the half-crown bottle of perfume really has the required odour, the perfumer does not expect to be asked what kind of odour was emitted by the substance whence the perfume was obtained. Now, Doctor Lyon Playfair, in his summary of the jury investigation above alluded to, broadly tells us that these primary odours are often most unbearable. "A peculiarly fetid oil, termed fusel oil, is formed in making brandy and whiskey; this fusel oil, distilled with sulphuric acid and acetate of potash, gives the oil of pears. The oil of apples is made from the same fusel oil, by distillation with sulphuric acid and bichromate of potash. The oil of pine-apples is obtained from a product of the action of putrid cheese on sugar, or by making a soap with butter, and distilling it with alcohol and sulphuric acid; and is now largely employed in England in making pine-apple ale. Oil of grapes and oil of cognac, used to impart the flavour of French cognac to British brandy, are little less than fusel oil. The artificial oil of bitter almonds, now so largely employed in perfuming soap and for flavouring confectionary, is prepared by the action of nitric acid on the fetid oils of gas-tar. Many a fair forehead is damped with *eau de mille-fleurs*, without knowing that its essential ingredient is derived from the drainage of cowhouses. In all such cases as these, the chemical science involved is, really, of a high order, and the perfume produced is a bona-fide perfume, not one whit less sterling than if produced from fruits and flowers. The only question is one of commercial honesty, in giving a name no longer applicable, and charging too highly for a cheaply produced scent. This mode of saving a penny is chemically right, but commercially wrong.

The French make a large quantity of sugar from beet-root; and in the processes of manufacture there remains behind a thick, black, unctuous molasses, containing much sugar, but from other causes impregnated with a nauseous taste and a most disagreeable smell. Men will not eat it, but pigs will; and so to the pigs it has gone, until E. Dubranfaut showed (as he has lately done,) that this molasses is something better than pig's meat. He dissolves, and decomposes, and washes, and clarifies, until he ends by producing a kind of *eau sucré*, a beautiful clear and colourless syrup or sugar-liquid, containing nearly the whole of the saccharine principle from the offensive and almost valueless molasses.

How can we make one kind of paint or liquid produce many different colours, and this with an amount of material almost beneath the power of man to weigh or measure? Mr. De la Rue has solved this question by the production of his beautiful iridescent and opalescent paper. Both mechanically and optically, the production of these papers is strikingly interesting. Water is poured into a flat vessel; and, when quite tranquil, a very minute quantity of spirit varnish is sprinkled upon the surface: this, by a species of attraction between the two liquids, spreads out on all sides, and covers the whole surface in a film of exquisite thinness. A sheet of paper or a card-board, or any other article, is then dipped fairly into the water, and raised gently with that surface uppermost which is to receive the coloured adornment; it lifts up the film of varnish from off the surface of the water, and this film becomes deposited on the paper itself. The paper is held in an inclined position, to allow the water to drain off from beneath the film; and the varnish then remains permanent on the surface of the paper. Now, the paper thus coated with colourless varnish exhibits the prismatic tints with exquisite clearness; the film of varnish is so extremely thin—so far beneath anything that could be laid on with a brush or pencil—that it reflects light on the same principle as the soap-bubble, exhibiting differences of colour on account of minute differences in the thickness of the film at different parts; and not only so, but the self-same spot exhibits different tints according to the angle at which we view it. It is a lovely material, and lovely things may be produced from it. We cannot speak of it as producing something out of nothing: but it is a means of producing a beautiful result with a marvellously small expenditure of materials.

The clinkers, ashes, or cinders, which remain in furnaces after metallurgic operations have been completed, may appear to be among the most useless of all useless things. Not so, however. If they contain any metal, there are men who will ferret it out by some means or other. Not many years since, the ashes of the coke used in brass-furnaces were carted away as rubbish; but shrewd people have detected a good deal of volatilised copper mixed up therewith; and the brass-makers can now find a market for their ashes as an inferior kind of copper ore. It needs hardly to be stated that all sorts of filings and raspings, cuttings and clippings, borings and turnings, and odds and ends in the real metallic form, are all available for re-melting, whatever the metal may be—all is grist that comes to this mill. If the metal be a cheap one, it will not pay to extricate a stray per centage from ashes and clinkers; but, if it be one of the more costly metals, not only are all scraps and ashes and skimmings preserved, but particles are sought for in a way that may well astonish those to whom the subject is new. Take gold as an example. There are Jew dealers and Christian dealers also, who sedulously wait upon gilders and jewellers at intervals, to buy up everything (be it what it may) which has gold in or upon it. Old and useless gilt frames are bought; they are burnt, and the ashes so treated as to yield up all their gold. The fragments, and dust of gold, which arise during gilding, are bought and refined. The leather cushion which the gilder uses is bought when too old for use, for the sake of the gold particles which insinuate themselves into odd nooks and corners. The old leather apron of a jeweller is bought; it is a rich prize, for in spite of its dirty look, it possesses very auriferous attractions. The sweepings of the floor of a jeweller's workshop are bought; and there is probably no broom, the use of which is stipulated for with more strictness than that with which such a floor is swept. In short, there are in this world (and at no time so much as at the present) a set of very useful people, who may be designated manufacturing scavengers: they clear away refuse which would else encumber the ground and they put money into the pockets both of buyers and sellers; they do effectually create a something out of a commercial nothing.

How to save a penny by using dairy drainage, and slaughter-house drainage, and house drainage, and street drainage, and stable drainage, and old bones, and old rags, and spent tan, and flax steep-water—how to create value by using such refuse as manure for fields and gardens—is one of the great questions of the day, which no one who takes up a newspaper can fail to find elucidated in some form or other. Chemistry is here the grand economiser. Chemistry is indeed Nature's housewife, making the best of everything. "The clippings of the travelling tinker," as Dr. Playfair well says in one of his lectures, "are mixed with the parings of horses' hoofs from the smithy, or the cast-off woollen garments of the inhabitants of a sister isle, and soon afterwards, in the form of dyes of brightest blue, grace the dress of courtly dames. The main ingredient of the ink with which I now write was possibly once part of the broken hoop of an old beer barrel. The bones of dead animals yield the chief constituent of lucifer matches. The dregs of port wine—carefully rejected by the port wine drinker in decanting his favourite beverage—are taken by him in the morning, in the form of Seidlitz powders, to remove the effects of his debauch. The offal of the streets and the washings of coal-gas re-appear carefully preserved in the lady's smelling bottle, or are used by her to flavour *blanc mange* for her friends."—*Dickens' Household Words.*

We have much pleasure in inserting the following communication from Mr. Vincent Parkes, of Toronto, whose earnest desire to disseminate practical and useful information among working mechanics, has already been acknowledged by the Canadian Institute and the Toronto Mechanics' Institute. Mr. Parkes has himself constructed a beautiful little working model of a locomotive, in which the steam is generated by means of a small spirit lamp. Many of our readers will remember the interest which this little locomotive attracted at the annual exhibition of the Mechanics' Institute a year or two ago. Since that period Mr. Parkes has invented and constructed a new variety of steam-engine, a description of which forms the subject of his communication. We are happy to state that both the locomotive and the working model of his new engine, (for which he received a gold medal from the Governor General at the Canadian Industrial Exposition in 1850,) are now the property of the Canadian Institute, having been presented to that body by Mr. Parkes:—

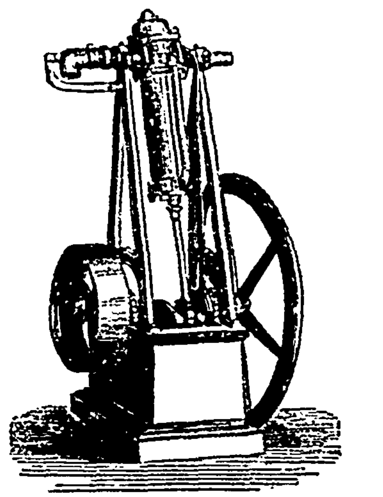

FIG 1.—Perspective view.

PENDULUM STEAM ENGINE; BY MR. VINCENT PARKES.

The object in view was to simplify the ordinary Oscillating Steam Engine. The arrangement consists in a semi-rotary slide valve moving within the steam chest, and placing the steam-chest (with its peculiar steam ports) upon the end of the steam cylinder, the steam and exhaust branch pipes of the steam-chest to form trunions upon which the steam-chest and cylinder can freely vibrate so as to conform with the position of the crank, as is illustrated by the following diagrams:—

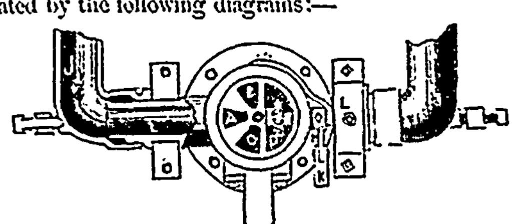

FIG 2.—Plan showing the Face of Steam-Chest, Steam-Ports, Steam and Exhaust Pipes.

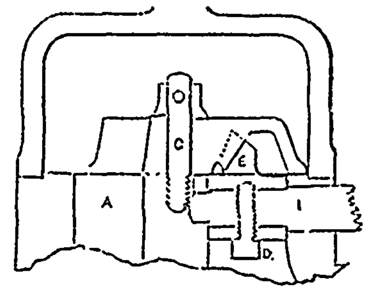

FIG 3.—Section of Steam-Chest, showing Steam and Exhaust Pipes.

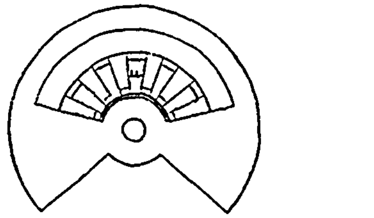

FIG 4.—Slide Valve, showing segment of Mitre Wheel cast in the cavity of the Face.

In all the diagrams, A represents the steam port, communicating from the branch pipe J to the steam-chest.

B—Steam port passing direct through, communicating from the steam-chest to the upper end of the cylinder.

C—Steam port connects with side pipe, communicating from the steam-chest to the lower end of the cylinder.

D—Exhaust port communicating with exhaust pipe.

E—Segment of mitre-wheel working into the corresponding wheel F in face of slide valve.

G—Centre pin upon which the slide valve moves secured firm into the face, with a washer secured upon the upper end to prevent the valve from rising off the face by the action of the mitre wheels.

H—Lever secured on the spindle I and connected to the eccentric rod.

I—Spindle of mitre wheel.

J—Branch pipe from boiler.

K—Upper end of eccentric rod.

L L—Trunions showing the external appearance on the exhaust side and section on the steam side.

By this arrangement the steam ways are much simplified, the trunions, cylinder, cover and steam ways are in one casting that may be finished entirely in the lathe. By the trunions being placed at the upper end of the cylinder it becomes a pendulum, and does not require the same effort of the crank to arrest the motion of the cylinder, also the angle of vibration is much less than the ordinary arrangement where the trunions are placed in the centre of the cylinder. This kind of engine, with suitable reverse gear, is particularly applicable to propellers.

The Ancient Miners of Lake Superior; by Charles Whittlesey.*

I shall not enter into a *description* of the extensive mining operations that have been carried on in very remote periods, on the shores of Lake Superior. They are of great magnitude and are found extending over a wide space. As far as at present known, the most striking remains of the ancient miners, are on

*This article, showing the connexion of the *Aztecs* or *Ancient Mexicans*, with the ancient mining operations on Lake Superior, was prepared for delivery before the American Association, at the expected meeting at Cleveland, in August last.—(*Annals of Science, Cleveland.*)

the Ontonogon River, extending 15 or 20 miles along the trap range each way from where it crosses the course of that stream.

They are also very apparent in the vicinity of Portage Lake. On Point Kewena they may be seen extending from the Forsyth location, (now Fulton,) eastward along the range about 20 miles, and across the Lake on Isle Royal, are abundant evidences of mining operations of the same era. The details, concerning the mode in which these mines were worked—the depth and extent of their excavations; the tools, implements, &c., used—may be seen in the Reports of the Government Geologists, and in Mr. Foster's paper on that subject in the Smithsonian Contributions.

I shall confine myself to the evidences which show the connexion, or rather the identity of the people who wrought these mines, with the "race of the mounds," which anciently occupied the State of Ohio, and from them to the Aztecs, the ancestors of the Mexicans.

That part of the discussion which connects the "race of the mounds" or the "mound builders" with the Aztecs, will be brief. The foundation for this relationship, is the learned work of *Mr. Delafield*, upon the Antiquities of America, where all the points bearing upon the question are most ably presented. If Mr. Delafield does not establish the point that the Mexicans are descendants of the "mound builders," he succeeds in giving his opinion as nearly the character of a demonstration, as the nature of the subject allows. Many of his proofs must, of necessity, rest upon tradition, which is always vague, upon symbolical paintings, sculptures, and characters, such as all the ancient, ignorant, and half civilized nations made use of, and which constitute *their history*, and their only history. We cannot expect, in such enquiries, the strict conviction, which is required under oral testimony in a court of law; if we did, there is little of written history that would command our belief. In affairs of such remote antiquity we must of necessity, deal in speculations and deductions, or we must abandon the subject altogether.

Nothing is better settled in ethnology, than that the North American Indian, or Northern Aborigines, belong to the *Mongolian* or Tartar family, which inhabits Northern Asia.

On the basis of craniology, according to which the human race is divided into families, by naturalists, the race of the mounds is unequivocally distinct from the North American Indian. Mr. Delafield's enquiry into the origin of the "race of the mounds," and the excellent work of Squier and Davis, upon the Ancient Monuments of the Mississippi Valley, show conclusively, that the ancient mounds of the Mississippi valley are the same as those of Mexico and Peru.

They have been examined from the western part of New York, southerly and westerly, through the States, on the Mississippi, to Texas, and thence through Mexico and Central America to Peru, and are found to have a common external appearance. The same elevated platforms of earth are seen in Ohio and in Mexico, on which, it is presumed, the same religious rites were once celebrated.

In Peru, the Spaniards, when they conquered that country, found lines and circles of embankment, with exterior ditches, situated on the summit of difficult hills, having the form and stru[illegible] of the so-called "Indian forts," that are so numerous in this [illegible]ate.

At the South, these works are built on a larger scale than they are here, but after the same general pattern.

The mounds at Grave Creek, Virginia; at Miamisburgh, Ohio; at St. Louis, Mo.; and at Moorehouse Paris, Louisiana, are exceeded in bulk by the Pyramid of Cholula, in Mexico; but all belong to the same system. The *similarity* of the earth-works, over so large a space, is one of the links in the chain of evidence adduced by Mr. Delafield.

Another point is supported by historical proof. There are among the Mexicans, national annals, which say, that about the year 600 of our era, their ancesters migrated from the north, under an Emperor named *Citin*, or *Votan*. There have been comparisons made between *three* sculls, taken from ancient mounds in the valley of the Mississippi, and that belong to the race of the mounds, if any of the relics which are found here do; and *three* others, which were procured from ancient tumuli in Peru. —*Ancient Monuments*, *see p.* 291-2. Their anatomical proportions correspond so well, that craniologists pronounce them to be of the same family.

The pyramid of Cholula, which our officers visited during the war, is built of unburnt brick and of clay. The ruins of *Aztelan* on the Rock River, Wisconsin, show that brick were used in the construction of the walls; but which were partially burnt.

The Mexicans believed in, and worshipped, an evil spirit, which they called *Tlacalcculatl* or the "rational owl," and had made images of this bad deity in the form of an owl. The "mound builders," also made and deposited in their tumuli, images of the owl, which doubtless had some connexion with their superstitions, probably the same as the Mexican owls.

These are the principal proofs that the race of the mounds were the ancestors of the Aztecs, and of the Toltecs, a branch of the same family, who inhabited the country about Copan. There is, moreover, a tradition, and also hieroglyphical maps among the Mexicans, and credited by them, showing that their progenitors, like the Mongolian ancestors of our Indians, were *emigrants from Asia*, by the way of Behring's Straits.

I adopt the conclusions of Mr. Delafield, as to the mound builders, because it is not merely an hypothesis; but is based on strong analogies, and upon many facts.

To suppose that the "race of the mounds" has become extinct would be far more unreasonable, because it is contrary to the history of nations, and is sustained by no evidence.

Here I leave the subject of *identity* between the ancient Mexicans and the ancient race of the mounds; and turn to the consideration of the question, whether they are the people who wrought the copper veins of Lake Superior in ancient times.

Mr. Delafield observes, that there are traditions among the Indians, that their ancesters drove out a people who inhabited North America, and who occupied the ancient earth-works of the west. I have never been able to verify the existence of such a tradition; but in numerous cases, where Indians have been questioned upon the subject of the mounds, they have replied that they knew nothing about them, or the people who built them. The most probably theory, on this point, is, that the country was abandoned voluntarily by the Aztecs. These military works show no signs of having been attacked, or of having undergone protracted sieges. If they had been attacked, there certainly would have been resistance; for a people so numerous, and so well fortified, would not have fled like cowards before an enemy, however numerous, in the open field. An enemy could not have invested these fortifications without constructing *similar works* of attack. A permanent fortification, of any kind, cannot be carried by storm; but only after a tedious approach, sustained by works of a like kind, such as trenches of circumvallation and contravallation.

Of works of attack there are no remains, so far as I am informed, and but one instance where earth-walls appear to have been demolished in their day; this occurs, in a short line of embankment, separating the great fortification, on the Little Miami, into two parts. The double walls across the narrow part of the works, inside, appear to have been thrown down, violently, as though a party in the north portion of the fort had succeeded in breaking into the southern portion,

There is no proof that our Indians erected works of defence until after the French and Spaniards had taught them to do so, by building stockades in their midst. Before this time, they had no need of such defences, under their mode of warfare, against each other. Of what value would picketed forts be to wandering tribes, who make war with knives and arrows; by long journeys and sudden surprises; who never accumulate provisions or attack in the open field? Much less, would they build permanent works with walls and trenches.

There are cases where our North American Indians, after the appearance of the whites, and the introduction of *fire-arms*, as a matter of necessity, have fortified themselves against other tribes, and the whites, who had musquetry as weapons of attack; but even this rude picketing which they have been forced to set up is of very rare occurrence. They make war now, in general, as they did 250 years ago, by surprise; striking a secret and terrible blow, securing the scalps of the enemy and making a sudden retreat. They have, and always have had, too little industry and forethought to make permanent defences, preferring, like the wild animals they resemble, to make strongholds of jungles and swamps—provided by the great spirit—in preference to the artificial works of their own hands. A people that does not cultivate the soil, will not be likely to construct works to protect them in the possession of it.

Neither is there any satisfactory evidence, that another people intervened between the mound builders and the Aborigines, occupying the country after the mounds were built, and before the Indians took possession of it.

If the Mexican history is true, according to which the Aztecs arrived in Central America about the year A. D. 600; or 1200 years ago, there has not been *time enough*, since their departure from the banks of the Ohio, and Mississippi, for another people to arise to occupy the same ground and to disappear. If their was such a people, the present Indians would be more likely to know something of them than their predecessors.

In the year 1001, the *Icelanders* sailing westward to Greenland, and coasting thence southward, visited the shores of New England. They found upon the Atlantic coast a savage people, who, from the description given, were the same as our Aborigines. Only five hundred years after, when Sebastian Cabot, and Americus Vespucius navigated the same seas, the same tribes inhabited the New England coasts.

About the same time Pamphileo De Narvarre and Hernando De Soto, (1528 and 1540,) traversed the interior of Florida, Mississippi, Tennessee, Arkansas, and Texas, and found there tribes that remain to this day.

The bones, and particularly the skulls, that Mr. Brainerd and myself exhumed last year in a sandstone cavern, in Elyria, Lorain Co., Ohio, noticed in the proceedings of the American Association, at the Cincinnati meeting, are in all probability those of Aborigines, and are from 1000 to 2000 years old.

All these facts go to show, that the present Indian family has occupied the country, from which the mound builders emigrated, more than 1000 years, and that they were their immediate successors.

It is not probable that they withdrew suddenly, leaving a beautiful and well cultivated country, which they owned and had strongly fortified, in one night as the Israelites did Egypt. They gradually changed their position for a still more fertile and genial region, upon the Gulf of Mexico, and the Pacific Ocean. In time the Northern Indians, who lived upon wild game and fish, and not upon the products of the soil, finding the country south of the great Lakes unoccupied, and growing up to be again a forest, where game could exist, extended themselves over it.

But, admitting that the Aborigines were the next occupants after the mound builders, is there any substantial grounds for attributing to the Indians, the ancient workings of the copper mines of Lake Superior?

If they did possess the skill to plan, and the industry to execute the immense rock excavations which are observed there, it is evident to all who know them in the present state. that they have *lost* both their skill and their industry.

Is it rational to suppose, that the same people living upon the same spot, under the same influences, would have thus changed?

The working of such extensive mines would require, not only the persevering labour of many hundred men, but the labour of as many more employed somewhere in the cultivation of the soil, or in some other mode, collecting provisions for those who wrought in the mines. Is the North American Indian capable of devising or carrying out any such prolonged and systematic plan of operations?

By what influence did he rise to that condition, so much above his present one, that would not have operated to keep him there?

In his history, from the landing of the Spaniards in 1528, to this day, he has exhibited as a great family of the human race, a most dogged indisposition to improvement, and even to change of pursuits.

He is fond of giving traditions, both fictitious and real, extending back in the history of his people many hundred years. Would he have lost, or pretended to lose, the memory of such a fact as the working of these mines?

There is an old Indian, of the Chippewa nation, who lives at the mouth of the St. Louis River, at Fond-du-Lac, of Lake Superior, by the name of "Loons Foot," who traces back his ancestors by name, about 400 years, during which time they have been like him, hereditary chiefs in his tribe.

In September, 1849, I caused him to be questioned, by a gentleman from Canada, who is his nephew, in relation to the copper mines that have been worked of old, on Lake Superior. He made a long story, as Indians generally do, with many gesticulations and embellishments, which was in substance as follows:

"A long time ago the Indians were much better off than they are now. They had copper axes, arrow heads, and spears; and also, stone axes. Until the French came here, (1641,) and blasted the rocks with powder; we have no traditions of the copper mines being worked, and don't know who did work them. Our forefathers used to build big canoes and cross the Lake over to Isle Royal, where they found more copper than anywhere else. The stone hammers that are now found in the old diggings we know nothing about. The Indians were formerly much more numerous, and happier, than they are now. They then had no wars, and such troubles as they have now."

The earliest French Missionaries found among the Indians, a very few, but very rude and illy formed copper knives. But there is no difficulty in distinguishing the implements of copper which they had from those that are found in the ancient mounds of Ohio. They are much more rude, and less perfect, in their construction. One of these knives may be seen figured by Mr. Squier, on page 201, of the Smithsonian Contributions, vol. 1.

The Indians knew of the existence of boulders or detached masses of copper, and when they found small pieces of it in the gravel, or on the pebble beach, they made use of the best skill of which they were possessed to fashion it into some useful implement.

Mr. S. W. Hill, of Eagle Harbor, Lake Superior, informed me, that in digging the foundation for a house at that place, at about four (4) feet below the surface, in the water washed sand of the Lake, there was found evidences of an attempt to melt by fire, some pieces of copper from a neighboring vein. This was, doubtless, the work of our Indians.

Mr. Bailey, of the same place, described to me an instrument of copper which he found in the gravel within Fort Williams, that appeared to have been used either for skinning animals or for dressing and working the skins. It resembled, somewhat, the circular knife of a saddler, without its wooden handle.

I have found in the soil or loose materials, pieces of native copper, that with a little beating in a cold state, might be fashioned into a rude knife or cutting instrument; and it is from such masses that I conclude all the implements known to the Indians were made. Those taken from the mounds of Ohio are much more finished and entirely different in form.

According to the relations of the Jesuit Missionaries, the Indians often preserved pieces of pure copper, which they picked up on the beech, as "manitous," or Gods, which they would not have done had this metal been so common as the working of the mines would make it.

The conjecture that the Indians knew of and worked the mines, but concealed them from the French, is not very plausible.

The entire length of the excavations now known, must be 25 or 30 miles, some of them on the coasts and navigable waters, and not easily concealed. Although the Indians are reluctant to disclose minerals to white men, they have done so in many cases of copper masses, but never of veins or ancient mines. They would be as likely to do one as the other, if they knew of them. But all of the ancient works yet explored, show that they have been *abandoned* more than 500 years, and not only before the French first heard the Indians speak of copper, but before Columbus landed on the Continent.

(To be continued.)

The Natural History of the British Seas; By Prof. E. Forbes.

The Natural History of the British Seas has for a long time been a favorite subject of investigation. Within the last fifteen years, however, fresh inquiries have been set on foot, and the details of their zoology and botany worked out to an extent beyond that to which the examination of any other marine province has been carried. Numerous and beautiful illustrated monographs, treating of their fishes, Cetacea, portions of the Articulata, the Mollusca, Radiata, Zoophytes, Sponges, and Algæ, have been published, either at private cost, or by the patriotic publishers, or by the Ray Society, such as the scientific literature of no other country can show. As these have all been the results of fresh and original research, they present a mass of valuable data sufficient to form a secure basis for important generalizations.

From these materials, and from the results of the inquiries into the distribution of creatures in the depth of our seas, conducted by a committee of the British Association, a clear notion may be formed of the elements of which our submarine population is composed. Extensive tables, exhibiting the sublittoral distribution of marine invertebrata, from the South of England along the Western coasts of Great Britain to Zetland, mainly constructed from the joint observations of Professor E. Forbes and Mr. MacAndrew, are now preparing for publication, as a first part of a general report from the committee referred to. The data embodied in these tables are the produce of researches conducted during the last eleven years, and registered systematically at the time of observation.

British marine animals and plants are distributed in depth (or bathymetrically) in a series of zones or regions which belt our shores from high water mark down to the greatest depth explored. The uppermost of these is the tract between tidemarks; this is the Littoral Zone. Whatever be the extent of rise and fall of the tide, this zone, wherever the ground is hard or rocky, thus affording security for the growth of marine plants and animals, presents similar features, and can be subdivided into a series of corresponding sub-regions; through all of which the common limpet (*Patella vulgata*) ranges, giving a character to the entire belt. Each of these sub-regions has its own characteristic animals and plants. Thus the highest is constantly characterized by the presence of the periwinkle *Littorina rudis*, (and on our western shores, *Littorina neritoides*,) along with the sea-weed *Fucus canaliculatus*. The second sub-region is marked by the seaweed *Lichina* and the common mussel (*Mytilus edulis.*) In common with the third sub-region it almost always presents rocks thickly encrusted with barnacles; so that where our shores are steep, a broad white band, entirely composed of these shell-fish, may be seen when the tide is out, marking the middle space so conspicuously as to be visible from a great distance. In the third sub-region the commonest form of wrack or kelp (*Fucus articulatus*) prevails, and the largest periwinkle (*Littorina littorea*) with the *Purpura capillus* are dominant and abundant. In the fourth and lowest sub-region the *Fucus* just mentioned gives way for another species, the *Fucus serratus*; and in like manner the shells are replaced by a fresh *Littorina* (*littoralis*) and peculiar *Trochi.*

Once below low-water mark the periwinkles become rare, or disappear, and the *Fuci* are replaced by the gigantic sea-weeds known popularly as tangles (species of *Laminaria*, *Alaria*, *&c.*,) among which live myriads of peculiar forms of animals and lesser plants. The genus *Lacuna* among shell-fish is especially characteristic of this zone. In sandy places, the *Zostera* or grass-wrack replaces the *Laminaria* The Laminarian Zone extends to a depth of about fifteen fathoms, but in its lowest part the greater sea-weeds are comparatively few, and usually the prevailing plant is the curious coral-like vegetable called Nullipore.

From 15 to 50 or more fathoms we find a zone prolific in peculiar forms of animal life, but from which conspicuous vegetables seem almost entirely banished. The majority of its inhabitants are predacious. Many of our larger fishes belong to this region, to which, on account of the plant-like zoophytes abounding in it, the name of Coralline Zone has been applied. The majority of the rarer shell-fish of our seas have been procured from this region.

Below 50 fathoms is the region of deep-sea corals, so styled because hard and strong true corals of considerable dimensions are found in its depths. In the British seas it is to be looked for around the Zetlands and Hebrides, where many of our most curious animals, forms of zoophytes and echinoderms, have been drawn up from the abysses of the ocean. Its deepest recesses have not as yet been examined. Into this region we find that not a few species extend their range from the higher zones. When they do so they often change their aspect, especially so far as color is concerned, losing brightness of hue and becoming dull-color or even colorless. In the lower zones it is the association of species rather than the presence of peculiar forms which gives them a distinctive character. All recent researches, when scientifically conducted, have confirmed this classification of provinces of depth. When we have an apparent exception, as in the case of the submarine ravine off the Mull of Galloway, dredged by Capt. Beechy and recorded by Mr. Thompson, in which, though it is 150 fathoms deep, the fauna is that of the coralline zone, we must seek for an explanation of the anomaly by inquiring into the geological history of the area in question. In this particular instance there is every reason to believe that the ravine mentioned is of very late date compared with the epoch of diffusion of the British fauna.

When we trace the horizontal distribution of creatures in the British seas, we find that though our area must be mainly or almost entirely referred to one of the great European marine provinces, that to which the lecturer has given the name of Celtic, yet there are sub-divisions within itself marked out by the presence or absence of peculiar species. The marine fauna and flora of the Channel Isles present certain differences, not numerous but not the less important, from that of the south-western shores of England, which in its turn differs from that of the Irish sea, and it again from that of the Hebrides. The Cornish and Devon sea fauna and that of the Hebrides are marked by redundancies of species; that of the eastern coast of England on the contrary by deficiencies. Along the whole of our western coasts, whether of Great Britain or Ireland, we find certain creatures prevailing, not present on our eastern shores. In the depths off the south coast of Ireland we find an assemblage of creatures which do not strictly belong to that province, but are identical with similar isolated assemblages on the west coast of Scotland. In the west of Ireland we find a district of shore distinguished from all other parts of our coasts by the presence of a peculiar sea-urchin, to find the continuance of whose range we must cross the Atlantic to Spain. In such phenomena the lecturer sees evidences of conformation of land, of outlines of coast and connections of land with land under different climatal conditions than at present prevail within our area, for an explanation of which we must go back into the history of the geological past. If we do so, we can discover reasons for these anomalies, but not otherwise.

The dredging researches about to be published, go to show that among our sublittoral animals the northern element prevails over the southern,—a fact indicated by the number of peculiar northern species; at the same time the southern forms appear to be diffusing themselves northwards more rapidly than the northern do southwards. This diffusion is mainly maintained along our western shores, and appears to be in action, not only in the British seas, but also along the shores of Norway. We must attribute it to the influence of warm currents flowing northwards, originating probably in extensions of the gulf-stream. The body of colder water in the depths of our seas preserves the original inhabitants of this area, remnants of the fauna of the glacial epoch, overlain and surrounded by a fauna of later migration, and adapted to a higher temperature. A curious fact respecting the marine creatures of the Arctic seas of Europe, viz., that the littoral and laminarian forms are peculiarly arctic, whilst the deeper species are boreal or celtic, may be explained also by the influences of warm currents flowing northwards and diffusing the germs of species of more southern regions in the coralline and deep-sea-coral zones; for in the arctic seas the temperature of the water is higher at some depth than near the surface. On the other hand, we find in a region farther to the south than Britain an outlier of the celtic fauna preserved in the bays of Asturias, where it was discovered in 1849 by Mr. MacAndrew; a very remarkable fact, and one appealed to by the lecturer as confirmatory of his theory of an ancient coast extension between Ireland and Spain.

There is still much to be done in the investigation of the natural history of our seas, and many districts remain for more minute exploration. It is chiefly among articulate animals and especially among worms, that fresh discoveries may be looked for. Yet even now, new and remarkable forms of mollusca may occasionally be procured, and, during the autumn of last year, in a cruise with Mr. Mac Andrew, no fewer than twenty additional molluscs and radiata were discovered in the Hebrides. and have just been described by the lecturer in conjunction with Professor Goodsir. Among these is one of the largest, (if not the largest) compound ascidians ever discovered. In our southernmost province, fresh and valuable researches have been conducted during the past year by Professor Acland and Dr. Carus, who, selecting the Scilly Isles as a field for exploration, have filled up a blank in our fauna.

The lecturer concluded by an expression of gratification at the spread and progress of natural history studies in Great Britain among all ranks, and at the love of science manifested in the systematic manner in which our fauna and flora have been explored, and the beautiful works which have been produced in illustration of them.

Government School of Mines.

The session of 1852-3 was opened on Wednesday, November 3rd, with an introductory lecture by Dr. Lyon Playfair, on the very appropriate subject of the industrial education on the Continent. A review was taken of the vast importance of skill and labour in the arts, by which this country was enabled to import cotton from India and America, to export it again as calico and manufactured articles; malachite and other cupriferous ores from Russia and Australia, to be sent to all parts of the world as refined copper, with many other natural products which received an equal increase in value from the hands of the artizan, rendering it of the utmost importance to cultivate the intellect, and improve industrial experience with the light of scientific truth. It was then shown that intellectual information on the Continent, as relates to the arts, existed to a greater extent than in this country, partly owing to the care bestowed on real scientific education there, and partly to the British artizan relying too much on practice, and too often sneering at the application of scientific theories, so essential for carrying out that practice to a successful issue. It was also shown that this education had led to the establishment and rapid growth of new industries abroad, by which foreign states were realizing an increasing amount of production, leaving us a decreasing standard. In describing the various continental schools, Dr. Playfair commenced with Prussia, where there are three descriptions of institutions, the Gymnasia, the Real Schools, and the Trade Schools; pupils admitted at 14 years old for two years, must have had a practical elementary education, when they receive a full course of instruction, qualifying them for miners, engineers, architects, mathematicians, or for any branch of the arts for which they may be intended. The education is not gratuitous, but does not cost each student more than from 30s. to 60s. per annum, while the cost to the State for about 1200 students is £7000 a year. Saxony also has the same three kinds of schools. Austria has no Trade Schools, but several polytechnic establishments, the one in Vienna being the largest in Europe, costing £11,000 per annum; there are also Holiday and Sunday Schools, in which the workmen take great interest, and their knowledge and research into the various sciences is a matter of astonishment to Englishmen. In Bavaria there are no Real Schools, but 26 Trade Schools, one for every large town: they are supported by the localities, the Government exercising supervision, and sending commissioners periodically to inspect. There are also Holiday Schools, and the entire number of students may be about 3000. The Baden Gymnasia, and High Standard Schools of burghers and trade were represented as the most perfect in Europe, there was an average of 41 teachers to 430 pupils; the expense to the Duchy is about £4100 per annum, and the cost to the student £6 annually. The lecturer estimated that there were 13,000 students receiving an industrial and systematic education in all Germany, and from 30,000 to 40,000 working men improving their mind by Holiday and Sunday Schools. France was next reverted to: besides the great and well-known schools of the Government, such as the *Ecole Polytechnique*, the *Ecole des Mines*, the *Ecole des Ponts et Chaussées*, and the *Conservatoire des Arts et Métres*, there is a private institution, the *Ecole Centrale des Arts et Manufactures*, established by private capital, which has obtained the most ample remuneration by its success. So important is this to the industry of France that the Government and the *Conseils Généraux* of 29 departments have established exhibitions in connection with it. The school has 300 students, taught by 40 professors of the highest eminence. So much valued are the certificated students of this school by the manufacturers of France, that they are sure of immediate and important employment. Belgium and Denmark were also noticed as having public schools; and the lecturer emphatically implied that the time had now arrived when England must no longer be supine in the matter, but take a bold step on the subject of industrial education, inculcating the principle that practical experience must go hand in hand with philosophical science to bring the arts of any country to a high standard of excellence. The course of lectures for the session of five months are—

1. Chemistry applied to Arts and Agriculture—Lyon Playfair, F.R.S.
2. Natural History applied to Geology and the Arts—Edward Forbes, F.R.S.
3. Mechanical Science, with its Applications to Mining—Robert Hunt, Keeper of Mining Records.
4. Metallurgy, with its Special Applications—Jno. Percy, M.D., F.R.S.
5. Geology, and its Practical Applications—A. C. Ramsay, F.R.S.
6. Mining and Mineralogy—Warington W. Smith, M.A., F.G.S.

Agricultural Extracts.

The Origin of some Agricultural Inventions.—A Devonshire farmer invents a modification of the rotatory churn, in which, by making it revolve in an outer casing of warm water, tempered by the aid of the thermometer, he can at all seasons of the year command the best degree of warmth for separating the butter, and thus finish the process in a time at once brief and uniform. The French minister sees this at the Society of Arts and encloses a description of it to Paris. A model is made, somewhat altered, and exhibited at the "Exposition." A Scotch director of the Highland Society has a copy made of it, carries it over to Edinburgh, where the scientific principles of its construction are highly lauded, and for the next six months all the Ayrshire amateurs are treating their friends to butter made in ten minutes, and amusing them with the wonders of the French churn. A Yorkshire smith, living in the midst of heavy land, fixes harrow teeth into a long cylindrical axle at uniform distances, and fitting two of these axles together, so that the teeth of one shall play between those of the other, when it is dragged along the land, forms a machine admirably adapted for the tearing of heavy brittle clods asunder. It is known to few, and attracts little notice at home: but it gets to Norway. Seen there by an Englishman, it is pronounced, as it is, a thing of first-rate excellence, and, under the name of the "Norwegian harrow," it obtains a distinguished place in our future agricultural shows. A Scotch Presbyterian minister puts together, in 1825, an adjustment of wheels and scissors-blades, so working that when pushed along a corn-field at harvest-time, it cuts down the grain as if done by hand, and far more cheaply and expeditiously. His brother, a farmer, improves upon, and adopts this machine, and for a dozen successive years, employs it in reaping his crops. But it, also, is seen by few. The National Society gives the inventor a prize of £50, but makes little noise about it. Nobody cares to make a fortune by pushing it, and although, in 1834, several were in operation in Forfarshire, few of the supposed wide-awake Scotch farmers thought of adopting it as a saving of labour, even when the hardest times had come. But four of the machines were sent to New York from Dundee, the chief place of manufacture. Thoughtful, pushing emigrants, settlers in the North American prairies, where wide flat fields, easily covered with waving corn, offered speedy fortunes to those who could command hands to reap it, saw, or heard, or read of these machines. The reaper was re-constructed, modified in different ways, as so complicated a machine could not fail to be, and probably for the better, by ingenious mechanics, was brought into successful operation, made by thousands for the farmers beyond the American lakes, and obtained a deservedly high reputation, as a means both of doing work well and of saving labour much. In 1849 we saw it at the great State Show in Western New York, and brought it thence to London in 1851. The *American* reaping-machine proved the main attraction of the United States department of the Great Exhibition. Implement-makers vied with each other in seeking to secure the privilege of manufacturing the patented machines for the English market; thousands of practical men became persuaded of its economical applicability to our English soil and crops; hundreds of machines were bespoken by English cultivators, and all the while no one knew that the original model machine was at the very time quietly cutting its yearly harvest on the farm of Inch Michael, in the carse of Gowrie.—*Edinburgh Review.*

Vegetable Sports—Supposed Origin of Wheat.—Some 14 or 15 years ago, Monsieur Esprit Fabre, a continental botanist of great eminence, met with a plant of the *Ægilops ovata*, or common Sicilian grass, presenting features of difference to him sufficiently marked to lead him to conclude that it was an accidental variety. He took the seeds of this plant and sowed them. The produce of this seed of the original plant exhibited still greater departure from that original than the produce of the first year. He dealt with the seed of the second year as he had done with that of the first; and so on from year to year, from 1839 to 1851; and the result of this experiment was that the *Ægilops ovata* was turned into beautiful wheat. The plant had lost all affinity with the character of the plant from which it sprung, and had assumed a new type and form; thus demonstrating that the most useful and valuable of cereal products is in fact nothing more or less than a sport from *Ægilops ovata.*

The Potato Disease.—At a late sitting of the Academy of Sciences, M. Brierre stated that, having noticed that the potato blight did not occur on lands that had been covered by the sea, he made a strong solution of salt in water, and placed the cuttings in it for some hours before planting, the result being perfect freedom from disease. At the same meeting, M. Bayard, of Chateau Gouttier, averred that the blight was owing to excessive vitality in the plant; and that, therefore, before setting, he had inserted a pea into each cutting; both plants, the graft and the potato, flourishing most healthily. As the pea vegetated first, M. Bayard supposes it carried off the superabundant moisture of the potato, and thus saved it from disease. He, in fact, acted on the principle of counteraction by means of the issue, using a pea instead of the orange-bud.

The Potato Disease, and Cutting off the Haulm.—I lately paid a visit to Mr. Diplock, of the Griffininn, Fletching, which I have done for three years in succession; and as Mr. D. has been very successful with his potatoes, not having one diseased tuber for the last three years, while his neighbours around him have had to deplore nearly the entire loss of theirs, I give you the mode whereby he prevents the ravages of the malady. As soon as the slightest symptoms of disease are manifested in the leaf, and before it has reached the stem, Mr. D. has the tops cut off close to the soil, at the same time in passing he presses in with his foot the top left behind; they are then thickly earthed over to prevent bleeding; and if the soil is observed to be damp a few days after, a fresh coat of soil is added. It is to the preventing of the bleeding that Mr. D. attributes his success, as he finds by this mode that the potatoes swell and grow as usual, while those left uncovered become exhausted by bleeding, and grow no larger. Mr. Diplock has now a fine healthy crop of potatoes, and not a diseased tuber among them, while every other grower in this neighbourhood finds theirs more or less diseased.—*Wm. Wood, Woodlands Nursery, Meresfield, near Ukefied, Sussex.*

The Effects of Liquid Manure.—An extensive landed proprietor, in Ayrshire, writes us (the *Glasgow Daily Mail*):—"You say that twenty sheep can be kept on an acre of Italian rye-grass. I know that many more than that number can be kept on a Scotch acre of it. At present there are about seventy sheep, of about twenty pounds a quarter, fed on a Scotch acre of Italian rye-grass per month. When first put up in the pens, within doors, each sheep eats twelve pounds per day of Italian rye-grass and half a pound of rape-cake; but as they take on fat they gradually fall off eating as much per day of the Italian rye-grass, and can consume not more than eight pounds per day. It is quite wonderful what a quantity of Italian rye-grass, watered with the liquid manure, can be cut from a Scotch acre. It can be cut four times in the year, and the weight of the four cuts is upwards of forty tons of moist Italian rye-grass."

CORRESPONDENCE.

Correspondence relative to the establishment of communication between the Society of Arts, Manufactures and Commerce (of London,) and the Canadian Institute, with a view to advancing the knowledge of the resources and capabilities of Canada abroad, and of promoting information on the same subject within this Province.

Copy of a Letter from the Secretary of the Colonial Committee of the Society of Arts, to the Corresponding Secretary of the Canadian Institute:

SIR,—I am instructed by the Colonial Committee of the Society of Arts, to acknowledge the receipt of your letter of the 31st July, *(see August No. of Canadian Journal,)* and the various papers which accompanied it, transmitted to the Right Hon. Sir J. Pakington. The Committee are much gratified by the cordial promise of co-operation with which their proposal has been met by the Council of the Canadian Institute and trust that the correspondence thus commenced will hereafter lead to important practical results.

The Committee consider in the first instance that it would greatly facilitate future enquiries if you would be so good as to have a general list of natural productions and raw produce of Canada prepared and sent to me. This list should include as far as possible, the name of every substance, whether mineral, vegetable, or animal, occurring or being produced in the colony, whether used or known in commerce, or not, indeed it is in fact even more important that the list should include the latter than the former, as the chief object which the Committee have in view is, to become acquainted with those productions which are not yet known in commerce. It would be of advantage if in the enumeration of these substances the local or native names were given, in addition to the English or European ones, accompanied by memoranda of any uses to which the substances are applied and of the probable facility with which they could be supplied in large quantities should a demand arise. If there are, however, any productions, not at present articles of commerce, the value of which you are desirous of having ascertained, I am desired to invite you at once to send them over to the Society, and they shall immediately be brought under the notice of competent persons for practical examination and report; as in so doing it is far more satisfactory to make trial of any new substance on a manufacturing scale, it will greatly facilitate the labours of the Committee if you will send large samples, say of at least a half a hundred weight of any gum, resin, oil, dye-stuffs, fibre, ornamental wood, and at least ten pounds of any metallic ore or stone.

I am, Sir,
Your's very faithfully,
EDWARD SOLLY, *Secretary.*

F. CUMBERLAND, ESQ.,
Canadian Institute, Toronto.

REVIEWS.

Geological Survey of Canada. Report of Progress for the years 1850-51. John Lovell: Quebec.

Another of Mr. Logan's admirable Reports of Progress made in the Geological Survey of Canada has reached us. Mr. Logan's absence from the Provinces during the year 1850-51 for the purpose of superintending the arrangement of the collection of economic materials forwarded from Canada to the Exhibition of the Industry of all Nations in London, prevented him from reporting at the usual time; and owing to the expiration of the Provincial Act of 1845, making provision for the survey, and the unavoidable lapse of time before it could be renewed, the season available for field exploration was considerably curtailed. Notwithstanding the drawback last mentioned, the Report contains some highly interesting information, and shows that considerable progress has been made in some of the important details of the survey. The subject of the distribution of gold possesses much attraction at the present period, and in its relation to Canada has received due attention from Mr. Logan. We append that part of his Report which relates to this important subject:—

"In the Report of Progress preceding this, mention is made of a partial examination of the gold-bearing drift of the Chaudière. This examination was last season continued, and the facts resulting from it constitute the only additional topic to which I have to invite your Excellency's attention. The auriferous district was found to spread over an area probably comprising between 3000 and 4000 square miles. It appears to occupy nearly the whole of that part of the Province which lies on the south-east side of the prolongation of the Green Mountains into Canada, and extends to the boundary between the colony and the United States. Two general lines of exploration were followed: one of them up the Chaudière and Rivière du Loup, from the seignory of St. Mary to the Province Line, and the other from Lake Etchemin to Sherbrooke, on the St. Francis. The former, running transverse to the rock ranges, measured about forty-five miles; and the latter, with them, about ninety miles. The transverse line was more closely examined than the other, and traces of the precious metal were met with at moderate intervals throughout the whole distance. They were not confined to the channels of the main streams merely, but those of various tributaries furnished indications sometimes for a considerable distance up.

"The lowest point in the valley of the Chaudière at which the drift yielded traces of gold was on a small stream, falling in on the left side of the river, not far within the south-eastern boundary of the seignory of St. Mary. They were found to occur on four tributaries in the seigniory of St. Joseph, for distances of one and two miles from their mouths. One of these joins the main stream on the left bank, about a quarter of a mile below the parish church, and the other three are on the right. The lowest of them is about two miles below the church; the next about the same distance above it; and the fourth is the Rivière des Plantes, about half a mile farther up, and near the south-eastern boundary of the seigniory. In Vaudreuil Beauce they were discovered on the Guillaume, much further up than previously stated, and on the Bras opposite to it. On this and some of its tributaries the metal was traced to the centre of the township of Tring, a distance of about twelve miles. Three other streams which yield it in Vaudreuil Beauce have heretofore been mentioned: they are the Ruisseau Lessard, Ruisseau du Moulin, and the Touffe des Pins, on which it was first discovered. In Aubert d'Isle it was found on the Famine and traced to Barbottles Settlement, and beyond the seigniory into Waterford, a distance altogether of about ten miles. Some particles were obtained on the Ruisseau d'Arboise, about a mile above the Famine, and it was followed about three miles up the brook commonly called Pozer's Stream, in Aubert Gallion. On the Rivière du Loup, in addition to its occurrence in a multitude of spots,—in fact almost continuously from its mouth across Jersey and Marlow,—it was found in nearly all its tributary brooks, such as the Ladyfair, the Grande Conde, the Metgermet for four miles up, the Travellers Rest, the Portage, Kempt's Stream, Oliver's Stream for four miles up, and another stream between it and the boundary of the Province. Above the Loup, on the Chaudière, it occurred at successive intervals in twenty places in sixteen miles, as far as the south-western boundary of Dorset Township.

"The localities of its observed presence on the other line of exploration were on Lake Etchemin, and along the Famine in Aubert d'Isle, and Pozer's Stream in Aubert Gallion, towards Tring, and again on the St. Francis, in Dudswell, in Westbury, and near the joint corners of Westbury, Stoke, Eaton, and Ascott, as well as in this last township near Sherbrooke.

"It is not supposed that the limits of the auriferous district have been ascertained, but that it very probably extends much farther to the north-east and attains the valley of the river St. John, while to the south-west it is known to reach Vermont, and to be traceable at intervals through the United States, even, it is said, as far as Mexico. In its breadth, however, it does not appear to cross the range of mountains with which it runs parallel, and no traces of it have been met with on their north-western flank. The deposit in which the gold occurs is part of an ancient drift, probably marine, and supposed to be of higher antiquity than that which, from the extent to which it occupies the valley of the St. Lawrence and some of its tributaries, Mr. Desor, who has recently bestowed much attention on the detrital deposits of North America, is disposed to give the name of Lawrencian. In this, alluded to in various Reports as tertiary and post-tertiary, the remains of whales, seals, and two species of fish—the capeling and the lump-sucker—and many marine shells of those species still inhabiting the Gulf of St. Lawrence, are found. The shells on the Mountain of Montreal attain a height of about 470 feet above tide level in Lake St. Peter, which is the greatest altitude known to me. None of the remains have yet been found in the Canadian gold drift; and as this appears in its lowest undisturbed parts to be at a height of about 500 feet above the sea, it is probable what is now exposed of it had emerged from the ocean before the Lawrencian drift was placed, while in lower levels it would be covered up by it.

"In the localities in which the gold occurs, the coarser materials of the drift are made up in a large degree of the debris of rocks similar to the clay slates and interstratified grey sandstones on which it rests; but these are accompanied by fragments and pebbles of fine conglomerate, talcose slate, and serpentine, which with magnetic, specular, chromic, and titaniferous iron (none of them absent when the gold is present), are derived from the mountain range, bounding it on the north-west; pebbles and fragments of white quartz are abundant, which may be derived from veins of the mineral prevailing in the mountain range, or from others on the south-east of it. With these materials there occasionally occur in the valley of the Chaudière and its tributaries large boulders of limestone conglomerate, similar to the beds of St. Giles and St. Mary; and more rarely of gneiss, identical in character with known kinds of the rock on the north side of the St. Lawrence. Not only is the gold absent from the drift on the north-west flank of the mountain range, but also are the chromic iron and the serpentine, notwithstanding that the two have been traced in association 135 miles, constituting a marked band accompanying the range from Potton to Cranbourne. On the north-west flank, however, boulders of northern gneiss are frequent; and a few of limestone have been met with even pretty high up on the hills: showing by their fossils their derivation from the Trenton limestone, the nearest exposures of which are on the north side of the St. Lawrence. In fact, in respect to the drift of the whole country, it may be said, that on southern foundations are found resting the ruins of northern; but no northern rocks are met with overlaid to any extent by debris derivable exclusively from southern. The auriferous drift shows no exception to this; and there is little doubt that causes connected with northern currents, when the rocks were beneath the surface of an ocean, have placed the whole. Ever since the surface however has risen from beneath this ocean, causes similar to those now in operation in the district have been working in a contrary course. The rivers of the district emptying into the St. Lawrence, flow north: in so far, therefore, as their forces modify the distribution of the drift, the materials of which it is composed are carried in that direction. This, no doubt, has some effect on the finer and lighter materials, and occasionally, with the assistance of ice and great freshets, on some of the coarser and heavier; but the streams, washing away the former in larger proportions than the latter, concentrate these in the valleys and channels; the gold, being the heaviest substance, is moved the least. It may occasionally be pushed along the bottom when this is smooth, but it seeks every hole and crevice in its course, and when it has once obtained shelter there it remains protected. Where the edges of the slates come to the surface, the plates have all been moved by superficial forces, and they therefore lie more or less loosely on one another, and the fine particles of gold gradually work themselves down between them, reaching sometimes as deep as three feet.

"Although it is probable the whole of the drift on the south-east of the mountain range—both that in high and that in low places—may be auriferous, it appears certain that the metal will be most concentrated in the valleys and the channels of streams; and the larger the stream,—the more frequently it has broken down its banks,—the oftener and more extensively it has changed its course,—the more important the auriferous deposit is likely to be; and it is probably only in some such situations, if any where, that it will be worked to advantage. From the combination of the materials associated with the gold in the drift, there appears a strong probability that the metal is derived from quartz veins situated in the mountain range, through the agency of some southward-moving causes; and even if traces were found north of this range in the channels of the main streams, such as the Chaudière and the St. Francis, the circumstance would not militate against the supposition, as traces in such positions may be expected from the fluviatile remodification of the drift; but with the exception of one vein in talcose slate near Sherbooke, no auriferous quartz veins have yet been discovered; and in this one there was merely a trace of the metal, so that the facts of this gold district as yet offer no contradiction to Sir Roderick I. Murchison's theory that the gold, when it was originally placed in the veins, occupied only that part of them which was towards the then existing exterior of the earth's crust; and that this part, having been subsequently worn down by various destructive causes, the productive portion of the veins has been wholly or in a great degree removed, leaving only their more quartzose continuation behind in situ; while the gold, the vein stone, and the rock enclosing it have been carried away to form the drift. In this way it is his opinion that the drift will always be more productive than the veins; but whether this is to be borne out by the facts of California and Australia, remains yet to be proved.

"The object of this examination has not been so much to ascertain the quantity as distribution; but an effective experiment being now in operation on the Rivière du Loup, under a letter of license from the Government,—one condition of the lease being that a correct return shall be made of the quantity obtained,—I am in hopes by the end of the present season to have a few such facts as will afford some criterion to determine whether there is reasonable ground for supposing the deposit in that vicinity can be worked advantageously."

Mr. Murray's investigations, during the latter part of 1850, were carried on over a very large area. The determination of the boundaries of the several formations by which the Western Peninsula is underlaid, their geographical distribution in the interior, and the nature of the economic materials the various deposits contained, were among the chief objects of his laborious investigations.

Mr. Murray considers the whole of the Western Peninsula to be equal, if not to surpass, in its capabilities of soil and climate, any other part of British America, "as the rapidity with which it has been settled, the annual increase of its products, and the growth of its numerous towns and villages abundantly testify." Valuable economic materials are abundantly distributed throughout the part of the country visited by Mr. Murray, namely, the valley of the upper portion of the Grand River, the Speed, the Saugeen, &c., and their affluents. In the seventh concession of Nassagaweya there is a vertical precipice of encrinal limestone, varying from eighty to one hundred feet in height; and in Eramosa a branch of the Speed runs between vertical and solid calcareous cliffs of sixty and eighty feet. The Credit, in Caledon, is flanked by similar cliffs, and in the valley of the Nottawasaga, in Mono, the same character prevails. Similar cliffs were observed in Mulmur and Nottawasaga, and in the valley of the Beaver river in Euphrasia and Artemesia the same limestone is at least 120 feet thick.

Mr. Murray goes on to state that huge caverns are sometimes found in this limestone, the roofs and floors being studded with small stalactitic incrustations.

The encrinal limestones are everywhere qualified to make a durable and handsome building stone, and in some parts, when sufficiently removed from atmospheric influences, might be used as a marble for common ornamental purposes. Most of its beds are likewise of good quality for burning lime.

Gypsiferous works were recognized in the Speed, the Irvine, and the Rocky Saugeen, and Mr. Murray observes, that "sharp conical hills and mounds, and large circular sinks or depressions, such as have been described in a former Report, are of frequent occurrence in the gypsiferous country, were observed in the township of Waterloo and in several parts of the Saugeen, and it is extremely probable that as improvement advances, and the hills are cut into where roads happen to intersect them, this useful mineral will eventually be found in many places."

"*Drift.*—It has already been remarked in the Report of 1843 that a great deposit of loose detrital material, consisting of clay, sand, gravel, and boulders, deeply conceals the older strata in a great many parts of Western Canada; and this remark is peculiarly applicable to the Peninsula between the Niagara Ridge and the St. Clair River. The lower portion of the more recent deposits, as exhibited on the shore of Lake Erie, where the cliffs are in many parts over 150 feet high, is a blue calcareous clay, frequently holding pebbles and small boulders of limestone, and small round fragments of granite or gneissoid rock. Clay of an ash-grey colour, when dried, but presenting a light brownish colour in the bed, succeeds the blue clay, and this again is overlaid by pale buff and occasionally yellowish tinged clay. Back from the lake these clays are capped with a stratum of sand, and the more elevated parts present beds of calcareous gravel.

"No organic remains of either marine or fresh-water origin have hitherto been observed among the superficial deposits of the Western Peninsula, with the exception of the shells which constitute the fresh-water shell marls, and the impressions of leaves and moss which are frequently preserved in the tufaceous deposits around calcareous springs and on the banks of rivulets, both of which are evidently of very recent origin. The marls are only found immediately below the vegetable mould, and contain only shells common to almost all the lakes and rivers of the present day, and in the accumulations of calcareous tufa the impressions are only of such plants as now grow in the immediate vicinity of the springs and brooks, to which the deposits owe their origin.

"The materials of economic importance, connected with the superficial deposits, are brick clays, bog iron ore, shell marl, calcareous tufa, and peat.

"All the clays are more or less calcareous; but some portions of the deposit are, nevertheless, admirably adapted for the manufacture of bricks, and are used for that purpose over a great part of the northern country.

"Bog iron ore is found in many parts of the country in greater or less abundance, along the edges of marshes or on the marshy banks of streams. It usually occurs in rough, irregular, detached masses, and of all sizes under one foot diameter, generally deposited on clay, and concealed by vegetable mould and marsh grasses.

"Fresh-water shell marls were observed at several places in the new townships of Bentinck and Brant. One bed, extending over between two and three acres, with a thickness varying from three inches to one foot, occurs on the property of Mr. Jackson, on the nineteenth lot of the first concession west of the Owen Sound Road, within a mile of the village of Durham. Another bed occurs on the fifty-ninth lot of the first concession south in Bentinck, on the Durham Road, the extent of which was not exactly ascertained, but it shews a thickness in several places on the side of the road of not less than two feet. A third bed was seen on the seventieth or seventy-first lot of the first concession south of the Durham Road in Brant. This bed is exhibited in the banks and on the bottom of a small tributary of the Saugeen, near its junction with that river, and is in some parts fully three feet in thickness. Indications of the presence of the same substance were observed likewise near the junction of the Rocky Saugeen and the main stream; and it is probable that it will be found to exist in many other parts of the region, where its value as manure will doubtless be sufficiently appreciated as the settlement advances in improvement.

"These marls, which are almost entirely composed of an aggregate of comminuted fresh-water shells, are usually concealed by a rich black vegetable mould or peat. The ground is usually swampy and sometimes assumes somewhat the character of prairie land. I was informed of some instances in which the peat is sufficiently thick and free from earthy matter to be available as a fuel, but none of these came within my observation.

"In respect to the tufa, none of the deposits that came within my notice were of sufficient importance to be deemed of economic value; but indications of it were met with on the banks of many springs and streams; and in consequence of the calcareous nature of the soil, and the adjacent rocks in so great an extent of the Western Peninsula, large deposits of it may be looked for. The material is applicable as a mineral manure, and may be resorted to for lime for mortar.

"Springs of petroleum, commonly known in the country by the designation of *oil springs*, rise in the River Thames, near its right bank, on the twenty-eighth and twenty-ninth lots of the first range of Mosa, where the bituminous oil is frequently collected on cloths from off the surface of the water, and is very generally used in the neighbourhood as a remedy for cuts and cutaneous diseases in horses. Similar springs are known to exist in the township of Enniskillen, and a deposit of mineral pitch or mineral caoutchouc is said to extend over several acres on the seventeenth lot of the second concession of the township."

The Report of T. S. Hunt, Esq., Chemist and Mineralogist to the Provincial Geological Survey, follows that of the Assistant Geologist. Mr. Hunt gives the analysis of several felspathic minerals, which were first discovered in Canada by that indefatigable collector, Dr. Wilson of Perth, and Dr. A. R. Holmes of Montreal, and first analyzed by Dr. Thomson of Glasgow. *Perthite*, Mr. Hunt states, is of the same composition as *Orthoclase*, *Peristerite* he shows to be *Albite*, *Bytownite* to be identified with *Anorthite*; *Pretinalite* a compact *Marmolite*. These minerals, suggested by Dr. Thomson to be new species, are thus found to be identical with previously described varieties. Mr. Hunt has however succeeded in discovering a new mineral, which he found in a mass of lime-stone, exposed in constructing the timber slides on the Ottawa, near the Grand Calumet. He has very appropriately named it *Loganite*.

We have not space to advert to Mr. Hunt's admirable series of analyses of mineral waters, with which the Geological Reports for the last two or three years have been enriched. We can only say, in conclusion, that the Reports are of the highest value to the commercial and scientific interests of this Province; and while they reflect great credit upon the Government which provides the means for the prosecution of the researches they detail, they will be a lasting record of the indefatigable industry and rare talent of the gentlemen engaged in the arduous work of discovering and describing the geological treasures of Canada.

American Journal of Science and Arts.—A. H. Armour & Co., Toronto. —This long established Journal, edited by Professor B. Silliman, B. Silliman, jr., and J. D. Dana, aided by Dr. Wolcott Gibbs in Chemistry and Physics, and Professor Asa Gray in Botany, is published at New Haven, Ct., in numbers of 152 pages each, every two months, commencing each year with January, making two volumes a year.—Price, $5 a year in advance,

The work embraces in its range, the departments of Chemistry, Physics, Geology, Mineralogy, and the other natural sciences. Meteorology, Astronomy, and collateral branches, with their practical applications. Each number contains various original Memoirs, besides extended selections from the scientific Journals of the other Continent, and a general exposition of the progress of science in its several departments.

This Journal was established in 1819 by Professor Silliman, and has reached its 34th year. A Second Series was commenced, January, 1846, and the 15th volume of the new series begins with the number for January, 1853. We commend this Journal to the attention and substantial support of all friends of science.

SCIENTIFIC INTELLIGENCE.

"ON THE OPTICAL PROPERTIES OF A RECENTLY-DISCOVERED SALT OF QUININE," *by Prof. Stokes.*—This salt is described by Dr. Herapath in the Philosophical Magazine, and is easily formed in the way there recommended namely, by dissolving disulphate of quinine in warm acetic acid, adding a few drops of a solution of iodine in alcohol, and allowing the liquid to cool; when the salt crystallizes in thin scales, reflecting (while immersed in the fluid) a green light with a metallic lustre. When taken out of the flui' the crystals are yellowish green by reflected light, with a metallic aspect. The following observations were made with small crystals formed in this manner:—The crystals possess in an eminent degree the property of polarizing light, so that Dr. Herapath proposed to employ them instead of tourmalines, for which they would form an admirable substitute, could they be obtained in sufficient size. They appear to belong to the prismatic system: at any rate, they are symmetrical (so far as relates to their optical properties and to the directions of their lateral faces) with respect to two rectangular planes perpendicular to the scales. These planes will here be called respectively the *principal plane of the length* and the *principal plane of the breadth*, the crystals being usually longest in the direction of the former plane. When the crystals are viewed by light directly transmitted, which is either polarized before incidence or analyzed after transmission, so as to retain only light polarized in one of the principal planes, it is found that with respect to light polarized in the principal plane of the length the crystals are transparent and nearly colourless,—at least when they are as thin as those which are usually formed by the method above mentioned. But with respect to light polarized in the principal plane of the breadth, the thicker crystals are perfectly black, the thinner ones only transmitting light, which is of a deep red colour. When the crystals are examined by the light reflected at the smallest angle with which the observation is practicable, and the reflected light is analyzed, so as to retain,—first, light polarized in the length, and secondly, light polarized in the other principal plane,—it is found that in the first case the crystals have a vitreous lustre, and the reflected light is colourless, while in the second case the light is yellowish green, and the crystals have a metallic lustre. When the plane of incidence is the principal plane of the length, and the angle of incidence is increased from 0° to 90°, the part of the reflected pencil which is polarized in the plane of incidence undergoes no remarkable change, except perhaps that the lustre becomes somewhat metallic. When the part which is polarized in a plane perpendicular to the former is examined, it is found that the crystals have no angle of polarization, the reflected light never vanishing, but only changing its colour, passing from yellowish green, which it was at first, to a deep steel blue, which colour it assumes at a considerable angle of incidence. When the light reflected in the principal plane of the breadth is examined in a similar manner, the pencil which is polarized in the plane of incidence undergoes no remarkable change, continuing to have the appearance of being reflected from a metal, while the other or colourless pencil vanishes at a certain angle and afterwards reappears, so that in this plane the crystals have a polarizing angle. If then, for distinction's sake, we call the two pencils which the crystals, as belonging to a doubly refracting medium, transmit independently of each other, *ordinary* and *extraordinary*, the former being that which is transmitted with little loss, we may say, speaking approximatively, that the medium is transparent with respect to the ordinary ray, and opaque with respect to the extraordinary, while as regards reflexion, the crystals have the properties of a transparent medium or of a metal according as the refracted ray is the ordinary or the extraordinary. If common light merely be used, both refracted pencils are produced, and the corresponding reflected pencils are mixed together; but by alyzing the reflected light, by means of a Nicol's prism, the reflected pencils may be viewed separately,—at least when the observations are confined to the principal planes. The crystals are no doubt biaxal, and the pencils here called ordinary and extraordinary are those which in the language of theory correspond to different sheets of the wave surface. The reflecting properties of the crystals may be embraced in one view, by regarding the medium as not only doubly refracting and doubly absorbing, but *doubly metallic* The *metallicity*, so to speak, of the medium of course alters continuously with the point of the wave surface to which the pencil considered belongs, and doubtless is not mathematically null even for the ordinary ray. If the reflection be really of a metallic nature, it ought to produce a relative change in the phases of vibration of light polarized in and perpendicularly to the plane of incidence. This conclusion the author has verified by means of the effect produced on the rings of calcareous spar. Since the crystals were too small for individual examination in this experiment, the observation was made with a mass of scales deposited on a flat black surface, and arranged at random as regards the azimuth of their principal planes. The direction of the change is the same as in the case of a metal, and accordingly the reverse of that which is observed in total internal reflection. In the case of the extraordinary pencil the crystals are least opaque with respect to red light, and accordingly they are less metallic with respect to red light than to light of higher refrangibility. This is shown by the green colour of the reflected light when the crystals are immersed in fluid; so that the reflexion which they exhibit as a transparent medium is in a good measure destroyed. The author has examined the crystals for a change of refrangibility, and found that they do not exhibit it. Safflower red, which possesses metallic optical properties, does change the refrangibility of a portion of the incident light; but the yellowish green light which this substance reflects is really due to its metallicity, and not to the change of refrangibility, for the light emitted from the latter cause is red, besides which it is totally different in other respects from regularly reflected light. In conclusion, the author observed that the general fact of the reflection of coloured polarized pencils had been discovered by Sir David Brewster in the case of chrysammate of potash;* and in a subsequent communication he had noticed in the case of other crystals the difference of effect depending upon the azimuth of the plane of incidence.† Accordingly, the object of the present communication was merely to point out the intimate connexion which exists (at least in the case of the salt of quinine) between the coloured reflection, the double absorption, and the metallic properties of the medium.

Specimens of Sensitive Media were exhibited by Professor Stokes. These were:—a crystal of green fluor spar, which, by the developement of blue light within it, changed its colour;—the solution of the common disulphate of quinine in acidulated water, which, by its action on the invisible rays developed blue light; and the solution of the green colouring matter of leaves in alcohol, which by a similar action became blood red.

REDUCTION OF METALS BY PHOSPHORUS AND SULPHUR.—It had been observed by Woehler that phosphorus in combination with copper excites an electrical current. M. Wicke has made the following observations:—

1. A stick of phosphorus wound round with a strip of silver was placed in a highly concentrated solution of nitrate of silver. The silver and phosphorus instantly became covered with a blackish film; afterwards silver began to be reduced in a wart-like form upon the strip of silver; and after the lapse of a few weeks it was covered with an extremely shining coating of crystalline silver, although not in immediate contact with the phosphorus. The whole of the reduced silver could be removed from the strip of silver as a compact coating with a shining inner surface. The phosphorus was only covered superficially with a thin coating of dark phosphuret of silver, and remained unchanged internally. The silver separated so evenly, and with such a shining surface, that this process might perhaps be employed for galvanoplastic purposes.

2. In a similar manner, by a combination of phosphorus and lead in a solution of nitrate of lead, the reduction of crystallized lead took place upon the lead, whilst the phosphorus was covered with a thin black film; the action, however, was weak, and soon stopped altogether.

3. A stick of phosphorus was placed on the axis of a closely-pressed mass of oxide of copper, both covered with water, with which the tube was filled, and then made air-tight; the reduction of the oxide to metallic copper was gradually effected, so that after several weeks the stick of phosphorus, which was still remaining, was surrounded by a capsule of crystalline copper.

4. Sulphur, surrounded with a strip of lead, and laid in solution of nitrate of lead, effected the reduction of lead upon the lead in form of a loose crystalline coating.

5. When a piece of sulphur, surrounded with a bright copper wire, was laid in a saturated solution of sulphate of copper, it became covered after some time, in the place where the copper touched it, with a loose crystalline coating of indigo-coloured sulphuret of copper, whilst the copper wire was dissolved. A solution of nitrate of copper

* Report of the Meeting of the British Association at Southampton in 1846 Part II., p. 7.

† Ditto Oxford, 1847.

acted still more rapidly. On the other hand, no action took place on the employment merely of dilute sulphuric acid.—*Artizan.*

THE CLOVES OF COMMERCE.—The article known in commerce as cloves, are the unopened flowers of a small evergreen that resembles in appearance the laurel of the bay. It is a native of the Molucca, or Spice Islands, but has been carried to all the warmer parts of the world, and is largely cultivated in the tropical regions of America. The flowers are small in size, and grow in large numbers in clusters at the very ends of the branches. The cloves we use are the flowers gathered before they are opened, and whilst they are still green. After being gathered, they are smoked by a wood fire, and then dried in the sun. Each clove consists of two parts, a round head, which is the four petals or leaves of the flower rolled up, inclosing a number of small stalks or filaments. The other part of the clove is terminated with four points, and is, in fact, the flower-cup, and the unripe seed-vessel. All these parts may be distinctly shown if a few leaves are soaked for a short time in hot water, when the leaves of the flower soften, and readily unroll. The smell of cloves is very strong and aromatic, but not unpleasant. Their taste is pungent, acrid, and lasting. Both the taste and smell depend on the quantity of oil they contain. Sometimes the oil is separated from the cloves before they are sold, and the odor and taste in consequence is much weakened by this proceeding.

LIQUID GLUE.—*By M. Sc. Dumoulin.*—Chemists well know that heating and cooling repeatedly a solution of glue (gelatine) in contact with the air, it loses its property of becoming a jelly. M. Gemelin has shown, that a solution of fish-glue in a sealed tube, placed in a water bath heated to the boiling point for several days, exhibits the same phenomenon i.e, the glue remains liquid,does not gelatinize upon cooling.

The change effected, is one of the most difficult problems to resolve, of organic chemistry. It appears to be a product of the action of the oxygen of the air and the water, upon the glue as demonstrated from the action of a small quantity of nitric acid, on a solution of strong glue. We know that on treating gelatine with an excess of this acid in the presence of heat, it is converted into malic and oxalic acids, fat, tannin, &c. This does not occur when we treat the glue dissolved in its weight of water, with a very small quantity of nitric acid, we obtain only a strong glue which preserves a long time its primitive qualities, and which no longer has the property of gelatinizing. In this manner the glue sold in France under the name of liquid and unchangeable glue, is fabricated. This glue is exceedingly convenient for cabinet-makers, joiners, pasteboard manufacturers, toy-makers, &c., since it can be used cold. It is prepared as follows :—

Dissolve 2 pounds of strong glue in one quart of water in a glue-kettle, or in a water-bath, when the glue is entirely melted, add little by little, to the amount of 10 ounces of strong nitric acid. This addition produces an effervescence due to the disengagement of hypo-nitric acid, when the whole of the acid is added, remove the vessel from the fire, and leave it to cool. I have preserved glue thus prepared, more than two years in a stoppered flask, without its undergoing any alteration. This liquid glue is very convenient in chemical operations. I have employed it with advantage in my laboratory, for the preservation of different gasses, the same as lute, covering the little bands of linen with the glue.—*Comptus Rendus*, Sept. 27, 1852.

The liquid glue prepared as above directed, we can recommend from our own experience; it is readily and cheaply made, and must prove an invaluable substitute for solutions of gum-arabic, paste, &c. The proportions mentioned are those best adapted for ordinary use, one need not however be very particular on this point. If the glue should gelatinize in the cold, the slightest warmth will liquefy it again.—*Br.Pa.*

PRESERVATION OF EGGS.—*By M. P. Chambordt.*—By submitting a thin stratum of the white and yoke of eggs, about one-twefth of an in. thick, upon glass or porcelain plates, to the heat of an oven, a mass will be obtained after 24 hours drying, readily pulverized, and which is not altered by the action of the air after drying again a day. Each pound of powdered egg thus prepared, when desired for use requires two pounds of cold water, with which it is to be beaten up, and is equivalent to 50 eggs, and may be used for omelettes, pastries, or other culinary purposes.—*Belgique Industrielle.*

THE NEW RAILWAY LOCOMOTIVE.—*Mr. McConnell's, by Fairbairn, of Manchester.*—The first experimental trip made with this locomotive on the London and North-Western line, from Wolverton to London, was perfectly satisfactory, and no doubt was entertained that the distance from London to Birmingham could easily be accomplished in the time suggested—two hours. The engine being new, the highest speed obtained was 60 miles per hour. One peculiar novelty is that the steam pipe presents a broad flat surface to the heated air as it passes the tubes, so that it is "dried" as it passes into the cylinder. The pistons and rods are in one piece of wrought-iron, thus diminishing the weight from 3 to 2 cwts., reducing the reciprocating resistance at a velocity of 60 miles per hour, from 140 tons to about 90 tons per minute. The springs are of India-rubber, on Coleman's pateut ; it has a Bourdon's steam-pressure meter, showing the pressure of steam in the boiler; and a Carrett and Marshall's steam-pump, to enable the driver to supply the boiler when not in motion. The cylinder-covers are of wrought-iron, only half the usual weight ; and the axles are tubular, reducing the weight one-third.

NEW METHOD OF PROPELLING VESSELS.—Professor A. Crestadoro has just secured, under the new patent law, an interesting scheme for propelling vessels. He considers the use of paddles or blades to be a mistake similar to that which prevailed so long in the application of locomotives or railroads, and which materially retarded the progress of that invention, when, taking for granted the inability of the plain circumference of the wheels to propel the carriage, much labour and skill had been wasted in the contrivance of levers which acted on the road in a manner somewhat resembling the feet of horses. Now, as the apprehended insufficiency of the adhesion of the plain circumference of the wheels with the road to propel the carriage has been proved a fallacy, so he considers the necessity of paddles or blades, of whatever description they may be, as altogether fallacious, and that the best and cheapest mode of improving the propeller is to use simply the plain circumference of cylindrical drums. It is a natural supposition that a plain round surface should have no tractic adhesion with the water ; but, on close examination it will be found that not only such is not the case, but, what is even more surprising, the tractic adhesion of a plain cylindrical drum is far greater than that of a paddle wheel of equal size. Taking for instance the steam-vessel Atlantic, whose paddle-wheels are of 35 feet diameter, and length of paddles 12 feet 6 inches, supposing a moderate immersion of 5 feet paddles—one pair of drums of equal size at equal immersion would displace a pair of cubic segments of about 135631 lbs. of water ; or, what amounts to the same thing, a pressure of not less than 60 tons would act upon the drums as a tractic adhesion, which is by far superior to that afforded by the best method of paddle-wheels in the most favourable circumstances. Now the cylindrical propeller has the substantial advantage that it can be, when reduced to a moderate diameter, applied as well totally immersed, if it be (as proposed by the patentee) fitted into a semi-cylindrical case, with only such a clearance as is just sufficient to let the drum have a proper action, the other half-drum or semi-cylinder projecting out of the case for the propelling action.—*European Times, (Liverpool,) Nov.* 12, 1852.

New System of Manufacturing Sugar.

We have been favoured, says the London *Times*, with an opportunity of witnessing an improved process for making sugar, recently invented and put in operation by Mr.H.Bessemer, civil engineer, at his premises, Baxter-house, Old St. Pancras-road, and, in common with several gentlemen practically conversant with the subject who were present, have to express the high gratification we experienced at the results brought under our notice. In the present condition of our West India colonies every improvement in the manufacture of sugar, and everything that tends to cheapen its production, cannot fail to excite interest ; and a brief description of this new process may not therefore be unacceptable to the reader. This we shall attempt to do in language as free from technicalities as the nature of the subject will admit of. In the manufacture of sugar from the cane the saccharine juice is by the usual system expressed by a roller-mill, which, on an average, obtains from 50 to 55 per cent. of juice ; whereas the cane, according to the most eminent writers, contains 90 per cent., the remaining 35 or 40 per cent. being left in the "cane trash." Mr. Bessemer, by a great improvement on his original invention of the cane-press, is now enabled to obtain, by a principal of continuous pressure, from 75 to 80 per cent. without any additional cost. In order to produce granulated sugar from the juice of the cane, it is necessary to separate a large portion of the water in which the saccharine matter is held in solution. This has hitherto been effected by boiling, the water passing off in the form of steam. It has, however, been discovered, that the heat necessary to produce ebullition effects a rapid chemical decomposition of a large portion of the sugar under operation, which assumes a dark brown or blackish colour, and is perfectly uncrystallizable, in which condition sugar is commonly known under the name of molasses or treacle, and amounts to 40 per cent. of the entire quantity of saccharine matter present in the juice. In the new process just patented by Mr. Bessemer, this separation of the aqueous portion of the fluid is no longer effected by boiling, but is dependent on that beautiful law of nature by which evaporation is carried on spontaneously, and every shower of rain again vaporized, and caused to ascend in the atmosphere. To carry this into practice, a small pan only is required, in which is placed a screw of peculiar construction, presenting about 6,000 superficial feet of surface, which is kept wetted by slowly revolving in the fluid to be evaporated ; and in contact with this wet surface some 10,000 cubic feet of warm atmospheric air is forced per minute by a common blowing fan. The aqueous portions of the solution are thus rapidly absorbed by the air, and pass off as a perfectly invisible vapor, while the temperature of the fluid is only 110 degrees Fahrenheit. The most remarkable fact is that the evaporation at this low temperature is equal to that of firepans of the same dimensions with a powerful fire beneath them. A vast amount of fuel is thus saved ; and a still more important result obtained from evaporating at this low temperature is, that none of the saccharine matter is converted into molasses, nor is there the least perceptible increase of colour. Hence, not only is the quantity increased in this single process 40 per cent., but the superior quality of it would command 7s. or 8s. per cwt. in the market over the ordinary colonial produce. In the usual mode of manufacturing sugar, after the crystallization has taken place, the "mother liquor," in which the crystals are formed, is separated by a very slow process of drainage through holes made in the bottom of the hogsheads; but as the whole of the dark viscid syrup will not drain out by the mere action of gravity, a coating is left upon the crystals, which render them brown and of less value. By another more important invention of Mr. Bessemer, this drainage is effected with extraordinary rapidity and perfection, by continuously passing a very thin stratum of sugar over a fine wire gauze surface, beneath which a partial vacuum is formed, and on which a number of fine jets of water (like a syringe) are allowed to flow; the passage of the water through the interstices between the crystals of sugar entirely removes the syrup from their surface, and renders them at once sufficiently dry for shipment. The time which the sugar is exposed to the action of the water is one-seventh of a second only, during which minute interval the water is drawn into the vacuum chamber, without being allowed sufficient time to dissolve any portion of the crystals. This instantaneous conversion of brown sugar into white must however be witnessed to be appreciated. These are the most striking as they are the most useful inventions applied by Mr. Bessemer to the manufacturing of sugar, though there are a variety of other important details, a description of which seems less called for. We understand the improvements have received the approbation of numerous scientific and practical men, several of whom have expressed their opinion that their adoption will be one of the first steps towards the restoration of that prosperity which has been so long withheld from our sugar-growing colonies.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—November, 1852.

Latitude 43 deg. 39.4 min. North. Longitude, 79 deg. 21 min. West. Elevation above Lake Ontario: 108 feet

Magnet.	Day.	Barom. at tem. of 32 deg. 6 A.M.	2 P.M.	10 P.M.	MEAN.	Temperature of the air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Tension of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Wind. 6 A.M.	2 P.M.	10 P.M.	Rain in Inch.	S'nw in Inch.
						°	°	°														
cd	1	29.410	29.375	29.250	29.315	31.8	50.4	40.4	43.97	0.185	0.289	0.277	0.257	92	81	92	89	Calm.	S S E	N E	0.145	- -
b	2	.059	28.986	.203	.086	43.4	46.7	45.9	43.40	.219	.271	.226	.219	90	86	89	89	N E	N	W N W	0.090	- -
c	3	.429	29.572	.698	.585	37.3	45.4	30.8	40.45	.193	.175	.187	.183	87	58	80	74	W b S	W b S	W	0.040	- -
c	4	.742	.697	.726	.727	38.1	45.6	45.2	41.02	.199	.210	.195	.212	87	80	79	83	Calm.	S S W	Calm	- -	- -
c	5	.691	.662	.683	.674	38.1	43.0	35.1	39.23	.182	.177	.161	.172	79	65	71	72	N N E	E	N E	Inap	- -
bd	6	.514	.222	.015	.228	37.8	40.4	43.4	41.02	.177	.232	.231	.229	79	91	91	89	E N E	E	N E b E	0.545	- -
ad	7	.083	.188			40.1	43.0			.162	.177			66	65			S W b W	W S W	W S W	Inap	- -
a	8	.573	.633	.687	.663	31.9	41.5	37.0	37.80	.192	.192	.190	.191	95	74	87	85	W b S	W b S	N N W	Inap	- -
b	9	.659	.620	.675	.651	35.2	39.3	31.2	35.37	.197	.193	.160	.185	96	81	92	90	Calm	W b S	W b S	Inap	- -
ac	10	731	.819	.870	.816	28.4	40.6	33.0	31.52	.141	.181	.155	.161	90	72	82	82	W	N N W	N b E	Inap	- -
e	11	.882	.715	.420	.656	32.3	40.7	43.8	38.93	.176	.163	.213	.193	96	65	86	81	N E	E S E	S E b E	0.050	Inap
e	12	.179	.251	.477	.321	41.7	40.1	35.2	37.90	.212	.163	.151	.170	93	66	74	74	W b S	S W b W	W b N	- -	Inap
cd	13	.425	.516	.458	.478	32.7	35.9	31.3	32.93	.174	.139	.151	.151	91	67	88	83	W	N W	N W	- -	0.4
c	14	.321	.395			29.2	31.5			.148	.158			93	89			N W b N	N W b N	N W b W	- -	Inap
b	15	.460	.478	.491	.477	31.3	34.3	30.9	32.33	.164	.136	.157	.151	91	69	91	85	N W	N W b W	W b N	- -	- -
c	16	.470	.433	.483	.467	30.7	36.0	29.6	31.70	.157	.142	.157	.158	92	67	96	89	W S W	W S W	S W b W	- -	- -
c	17	.509	.511	.551	.521	27.1	37.9	29.7	31.32	.138	.134	.136	.136	93	59	82	78	W S W	W b S	W N W	- -	- -
b	18	.551	.591	.681	.623	25.5	39.5	31.2	31.30	.129	.142	.149	.151	92	59	75	77	N	N W b N	N N E	- -	- -
a	19	.731	.735	.802	.760	32.5	39.6	29.1	33.48	.170	.175	.155	.163	93	73	96	86	N b E	S b E	N b W	- -	- -
a	20	.868	.950	30.018	.963	32.5	40.2	32.7	35.05	.159	.123	.139	.145	87	50	75	73	N b W	N N W	N W b N	- -	- -
a	21	30.120	30.081			32.1	33.7			.169	.166			91	86			N N W	N E b E	E N E	- -	- -
b	22	29.857	29.666	29.515	.678	33.9	32.7	33.4	33.37	.165	.168	.171	.168	84	91	92	88	E b S	E	E b S	- -	0.8
b	23	.6?3	.763	.920	.792	29.8	32.1	23.6	27.85	.141	.143	.109	.121	85	79	76	79	N N E	N N E	N E b N	- -	- - -
b	24	.963	.816	.700	.835	19.0	27.0	31.3	25.65	.087	.131	.151	.123	81	83	88	85	N E b N	N E b E	E b S	- -	Inap
be	25	.473	313	.285	.352	33.7	37.5	38.4	36.43	.166	.197	.211	.191	86	88	92	91	E b S	E b S	N E b E	0.570	- -
e	26	.075	28.913	.061	.021	39.1	42.4	38.4	39.93	.222	.255	.215	.230	93	96	95	91	E b S	E S E	W S W	0.335	- -
be	27	.112	29.218	.539	.332	34.8	38.1	33.0	34.87	.185	.151	.133	.151	92	68	72	75	W S W	W b S	W S W	- -	- -
b	28	.765	.800			32.8	38.3			.145	.152			78	66			S W b W	S W b W	S W	- -	0.8
a	29	.831	.857	30.003	.906	33.0	38.1	29.9	32.90	.161	.177	.131	.153	86	78	78	82	W b N	W b S	W b N	- -	- -
bd	30	30.016	.907	29.913	.911	27.1	42.9	36.3	35.00	.123	.198	.168	.160	82	72	79	78	W	W S W	W S W	- -	- -
	M	29.572	29.553	29.585	29.5734	33.23	39.53	31.95	35.80	0.172	0.180	0.175	0.176	89	74	85	83	Ml's 6.10	Ml's 7.96	Ml's 5.62	1.775	2.0

Sum of the Atmospheric Current, in miles, resolved into the four Cardinal directions.

North.	West.	South.	East.
1391.26	2327.69	827.59	1378.61

Mean velocity of the wind - - 6.50 miles per hour.
Maximum velocity - - - - - 19.5 ml's per h'r, from 2 to 3 p.m. on 27th.
Most windy day - - - - - 12th: Mean velocity, 13.91 miles per hour.
Least windy day - - - - - 4th: Mean velocity, 2.11 ditto.
Most windy hour - - - - - noon: Mean velocity, 8.59 ditto.
Least windy hour - - - - - 9 p.m. Mean velocity, 5.34 ditto.
Mean diurnal variation - - - 3.25 miles.

The column headed "Magnet" is an attempt to distinguish the character of each day, as regards the frequency or extent of the fluctuations of the Magnetic declination, indicated by the self-registering instruments at Toronto. The classification is, to some extent, arbitrary, and may require future modification, but has been found tolerably definite as far as applied. It is as follows:—

(*a*) A marked absence of Magnetical disturbance.
(*b*) Unimportant movements, not to be called disturbance.
(*c*) Marked disturbance—whether shewn by frequency or amount of deviation from the normal curve—but of no great importance.
(*d*) A greater degree of disturbance—but not of long continuance.
(*e*) Considerable disturbance—lasting more or less the whole day.
(*f*) A Magnetical disturbance of the first class.

The day is reckoned from noon to noon. If two letters are placed, the first applies to the earlier, the latter to the later part of the trace. Although the Declination is particularly referred to, it rarely happens that the same terms are not applicable to the changes of the Horizontal Force also.

(First snow storm of the season, from 6 to 9 A. M., on the 11th.)

Highest Barometer - - 30.184, at 8 A.M., on 21st } Monthly range:
Lowest Barometer - - 28.943, at 2 P.M., on 26th } 1.241 inches.

Highest observed Temp. - 50.4, at 2 P. M., on 1st } Monthly range:
Lowest regist'd Temp. - 18.2, at A.M., on 24th } 32.2
Mean Highest observed Temperature - - 39.66 } Mean daily range:
Mean Registered Minimum - - - - - 30.05 } 9.61
Greatest daily range - - - - - 20.4 from A.M., to 2 P.M., on 30th.
Warmest day - - 1st - - - Mean Temperature - 43.97 } Difference:
Coldest day - - - 24th - - - Mean Temperature - 25.65 } 18.32

The "Means" are derived from six observations daily, viz., at 6 and 8, A. M., and 2, 4, 10 and 12, P. M.

Comparative Table for November.

Ye'r	Temperature. Mean.	Max.	Min.	Range.	Rain. D'ys	Inches.	Snow. D's	Inch's	Wind. Mean Velocity.
	°	°	°	°					Miles.
1840	35.90	51.4	20.5	33.9	5	1.220	8	not regis'd	--
1841	35.35	63.2	7.6	55.6	8	2.450	5		--
1842	33.12	50.6	7.6	43.0	9	5.310	10		--
1843	33.14	51.2	14.4	36.8	10	4.765	7	1.2	--
1844	31.82	49.8	12.0	37.8	8	imperfect	4	8.0	--
1845	36.67	58.8	7.6	51.2	7	1.105	4	5.0	--
1846	40.85	55.5	18.2	37.3	12	5.805	2	0.4	--
1847	38.72	58.2	7.8	50.4	14	3.155	3	Inapp	4.77
1848	34.31	49.3	16.5	32.8	9	2.020	3	1.4	4.81
1849	42.33	56.7	28.4	28.3	10	2.815	2	1.0	4.78
1850	38.65	62.3	18.1	44.2	7	2.955	1	Inapp	5.27
1851	32.72	50.1	16.5	33.6	5	3.885	6	6.7	4.70
1852	35.80	50.4	18.7	31.7	7	1.775	3	2.0	6.50
M'n	36.34	54.65	14.92	39.74	8.5	3.105	4.5	2.6	5.14

Royal Geographical Society.

At the last meeting of the Royal Geographical Society, Captain Petermann read a paper on "Sir John Franklin, the navigableness of the Spitzbergen Sea, and the Whale Fisheries in the Arctic Regions."

The author first referred to his plan of search, which he was induced to submit again to the notice of the public for the following reasons:—First. The assumption on which that plan was based, namely, that Sir John Franklin had passed up Wellington Channel, had been strongly confirmed. Secondly. That it would take Sir E. Belcher two or three years at least to follow Sir John Franklin in his track, which had taken him six years without being able to extricate himself, and return to his country. Thirdly. That the whole of the Asiatic portion of the Arctic regions—in which the missing expedition most probably had been arrested—was at present altogether unprovided for in the search; that that portion was the nearest and most accessible to Europe, and that to it his proposed route was directed; that route went through the sea between Spitzbergen and Novaya Zembya, the subject of his present communication. As the sea under consideration had no name, and as the denomination of "Spitzbergen Sea" was superfluous in its present use, being only applied occasionally to the sea more generally called "Greenland Sea," he proposed, in his remarks, to apply that name for the sea in question. That sea had been navigated by the Dutch, Russian, and other nations, besides the English; but the author wished to impress upon the minds of his hearers, that the facts he was going to draw their attention to were exclusively derived from English authors of the highest authority, and still living. That sea was now-a-days considered by every one as altogether impenetrable and impracticable; but he would show that that assumption was entirely groundless, and rested upon the imagination, forming one of those curious geographical prejudices which, when once they took hold of the public mind, were difficult to eradicate. First, then, on the *prima facie* evidence, he considered the Spitzbergen sea to be the most practicable and easiest of all openings for vessels into the Polar regions, because it was by far the widest, indeed the only oceanic opening. He then stated that Capt. Scoresby's able work on the Arctic regions did not contain a title of evidence to justify the assumption of its being impracticable. On the contrary, it was distinctly stated in that work, that an important whale fishery had been carried on at the eastern side of Spitzbergen, in the beginning of the eighteenth century. Captain Beechey's work, the most important one on that region, contained still more definite information to support his views; and from a communication of Mr. Crowe, British Consul at Hammerfest, an establisher and proprietor of a British settlement at Spitzbergen, the following passage was quoted:—"Mr. Shordslin, an intelligent Russian, with whom I have frequently conversed, actually passed 39 winters on Spitzbergen, and resided there for fifteen years without having once left the island. He declares, that during his residence he invariably found the coasts free from ice for four and sometimes for five months in every year. I am enabled to add that my own vessels have frequently navigated the coasts from Ryke Yse's Islands, the south east extremity, round the west coast, to the Seven Islands, at the northern extremity, and that four times out of six they might have circumnavigated Spitzbergen." The author then compared Spitzbergen, reaching beyond the latitude of 80 deg., with the regions on the American side in lat. 75 deg., and stated that Sir E. Harry, in little boats, had attained the latitude of 83 deg., to the north of Spitzbergen, in a voyage which only took six months from the river Thames and back, and only cost £9,977; whereas on the American side, where all the recent expeditions had been accumulated, it had cost many hundred thousand pounds, many lives, many years and vessels to attain the latitude of only 76 deg. The voyage of Captain Wood, in 1676, the last attempt to effect the north-eastern passage, was then passed in careful review, and it was proved that that unfortunate navigator, from being disappointed in not being able to effect the passage, had given out many false and groundless statements, in order to show the impossibility of navigation in those seas, and, as Captain Beachy stated, "he seems to have been determined to create an imaginary barrier which should deter any other persons from renewing the attempt." Those false and absurd statements, the author said, seemed ever since 1676 to have influenced the minds of the public, and created the aforesaid prejudice. The author then stated that a voyage with a steamer could settle the question at issue in a fortnight, and a most trifling cost compared with the millions which had been spent in Arctic and Antarctic discoveries; and he said that, irrespectively of the Franklin search, the exploration of that large and very accessible sea, would most probably lead to results of the highest importance to the British whale fishery. The Greenland sea had been "fished out;" but in the Spitzbergen sea the whales had never been disturbed; and he adduced certain facts to show that the number of whales in that direction must be prodigious. He then alluded to the Americans, who had fished up in the Behring Straits whale-fishery the value of $8,000,000 in the short space of two years, and hoped the English would not allow themselves to be anticipated in like manner in the Spitzbergen sea. And as to geographical discovery, it was evident that when Sir E. Perry had been able to reach the latitude of 83 deg. in little boats, with the assistance of steam, results might be attained which would eclipse in interest all other Arctic discoveries yet made. This paper excited a great deal of interest, and a lively and prolonged discussion upon it followed, chiefly between the author and Captain Beechy, R. N. This gentlemen said that the Spitzbergen sea had been frequently tried without success; that Sir E. Perry had found much ice; and that, if any expedition was to be sent up that way, it should go on the western side of Spitzbergen, and not on the eastern side, as Mr. Petermann proposed. To these objections Mr. Petermann replied that since 1676 no attempt whatever had been made to proceed to the east of Spitzbergen; and that even of the slight attempts previous to that date, that of Barentz—the very first—had been exceedingly successful. Those early voyages altogether could form no just criterion for the present day. Admiral Lutke, who had been employed for four successive years in surveying Novaya Zembya, had distinctly stated that a vessel, as fitted out by the English in their Arctic expeditions, would be able to navigate those seas. As to Sir E. Perry, that gentlemen himself, at the conclusion of his work, had emphatically stated, "that a ship might have sailed to the latitude of 82 deg. almost without touching a piece of ice." At all events, he hoped that the geographers and navigators, as well as the authorities of this country, would agree with him in considering it desirable and important that the great Spitzbergen sea should be thoroughly explored, for the cause of humanity, as well as for commerce and geographical science.

The Electric Light.—Mr. Thomas Allan, of Edinburgh, who has successfully introduced several valuable modifications in the construction of the electric telegraph and its working details, has just suggested a novel arrangement for keeping up a constant and equal distance between the carbon points in the production of the electric light. The two electrodes are formed spirally, or on the principle of the screw, and each bearing its carbon point, they are placed perpendicularly to each other at a proper distance, and made to revolve slowly by a simple clock-work movement. As the distance by the action of the current is gradually being increased, the points are always gaining their proper position by the rotation of the electrodes presenting fresh points of action. The proper distance between the points, is therefore constantly kept up, and a steady, as well as a brilliant light is the result. The plan is said to promise to be highly effective for lighthouse purposes.

New Alcohol.—M. Wurtz, Professor at the Ecole de Médicine, has succeeded in extracting from the oil of potatoes a new alcohol, which he calls "Alcool entylique." It is obtained by repeated distillations. Its composition is $C_3 H_{10} O_2$.

MISCELLANEOUS INTELLIGENCE.

DOMESTIC.

Toronto Northern Railroad: Election of Directors.

On Saturday, December 10th, the election of Directors of the Ontario, Simcoe and Huron Railroad Union Company, took place at the office of the Company, on Wellington Street, in conformity with the provision of the amended Act of Incorporation. The President of the Company, Charles Berczy, Esq., presided, and explained the object of the meeting, when some desultory conversation arose, and explanations, in answer to questions, were made by Mr. Morrison, the Vice-President, and other members of the Board. Mr. Sladden officiated in his place as Secretary, and Messrs. Arnold and Miller were appointed Scrutineers. The voting was continued until four o'clock, P. M., when the Secretary and Scrutineers commenced to sum up the votes, which was an operation that occupied several hours. The return of the following names of gentlemen duly elected, to form the new Board of the Company, was formally made at eight o'clock, P. M. We put the names in the order of the votes, with the numbers opposite to each:—

B. W. Smith	5,852
Isaac Gilmor	5,747
C. J. Orton	5,729
J. C. Morrison, M. P. P.	5,699
Hugh Scobie	4,908
James Mitchell	4,891
Duncan Macdonnell	4,570
G. H. Cheney	4,298
E. C. Hancock	4,255
Angus Morrison	4,238
W. A. Baldwin	4,192

The above named gentlemen are, therefore, the members of the Board of Directors of the Ontario, Simcoe and Huron Railway Union Company.

At the first meeting of the newly elected Directors, held at the Board Room on Tuesday, December 13th, Joseph C. Morrison, Esq., was appointed President of the Company, and Hugh Scobie, Esquire, Vice President. The position of the Company is very satisfactory; and it appeared from the proceedings that the operations are such as to ensure an *early* opening of the road over a portion of the line, as far as Lake Simcoe; and the full extension of it, for traffic to Lake Huron, soon thereafter. The meeting was satisfied with these favourable prospects; and we congratulate the Company on its truly prosperous condition, which must be very gratifying to all concerned, in the success of the undertaking. The beneficial influences of the work are already felt in the country through which the line passes; and will be infinitely more so when the "Iron Horse" commences to make its regular run, day by day, between broad Ontario and Huron. There is but a very short time to elapse until this great benefit to the inhabitants of the intermediate places, and both extremities, is realized.—*Colonist.*

Canadian Canals.

The total movement on the canals for 1851, and three years previous, is as follows:—

	1848.	1849.	1850.	1851.
WELLAND CANAL.				
Tons	307,611	351,596	399,600	691,627
Passengers	2,487	1,610	1,930	4,758
Tonnage of Vessels	372,851	468,410	588,100	772,623
ST. LAWRENCE CANAL.				
Tons	161,627	213,153	288,103	450,400
Passengers	2,071	26,997	35,932	33,407
Tonnage of Vessels	5,618	5,418	6,169	6,931
CHAMBLY CANAL.				
Tons	17,835	77,216	109,010	120,720
Passengers	470	8,430	278	1,860
Tonnage of Vessels	659	1,261	2,878	1,727
The receipts of 1851 were				£76,216
Expenses				12,285
Of the gross tolls, the Welland produced				48,211
The St. Lawrence				21,276

Agricultural Products of the United States, for the year 1850:

Wheat	bushels	100,493,874
Indian Corn	do.	592,286,224
Tobacco	pounds	199,752,646
Cotton	bales	2,468,625
Wool	pounds	52,529,450
Wine	gallons	221,219
Butter	pounds	312,990,730
Hay	tons	12,739,323
Maple Sugar	pounds	33,880,617

FOREIGN.

Death of the Countess of Lovelace.

The Countess of Lovelace, the sole daughter of Lord Byron, died on Saturday, (Dec. 4.) Such is the brief announcement of the death of a lady whose rare endowments were worthy of her illustrious parentage, and who appears to have inherited, with much of the genius, much also of the moral daring which combined with it, to make him, as he proudly asserted, "not altogether of such clay" as that race of fellow men for whom he professed such unhappy contempt. Lady Lovelace, beside being one of the many to whom the authorship of that 'rock of offence' the Vestiges of Creation has been at one time attributed, a proof at least that her attainments in the subjects it treats of were of a high order, was the avowed author of works, of a character seldom to be found proceeding from a female pen, and particularly of a masterly translation of Chevalier Menabrea's 'Memoir of the Analytical Engine invented by Charles Babbage, Esq., (*Scientific Memoirs, vol. III.*) which she accompanied by elaborate and learned notes, considerably longer than the memoir itself, involving not only the applications of very high mathematics, but a thorough mastery in principle of one of the most difficult and complicated inventions of the human mind. This engine must not be confused by our readers with what is commonly called Babbage's calculating machine, it is one of a much higher order. The latter, or difference engine, in the words of the gifted lady we have now to deplore, could only tabulate *accurately* and to an *unlimited extent* all series whose general term is comprised in the formula,

$$u_z = a + bx + cx^2 + dx^3 + ex^4 + fx^5 + gx^6$$

and was chiefly designed for the calculation of nautical and astronomical tables; the former, or Analytical Engine, would be capable, if completed, of developing and tabulating any fraction whatever, being, so to speak, the embodyment of the *science of operations.* "Those," she writes "who view mathematical science not merely as a vast body of abstract and immutable truths, whose intrinsic beauty, symmetry and logical completeness, when regarded in their connection together as a whole, entitle them to a prominent place in the interest of all profound and logical minds, but as possessing a yet deeper interest for the human race, when it is remembered that this science constitutes the language through which alone we can adequately express the great facts of the natural world, and those increasing changes of mutual relationship which, visibly or invisibly, consciously or unconsciously to our immediate physical perceptions, are interminably going on in the agencies of the creation we live amidst; those who think on mathematical truth as the instrument through which the weak mind of man can most effectually read his Creator's works, will regard with especial interest all that can tend to facilitate the translation of its principles into explicit practical forms." In this high spirit did the translator undertake her laborious task. That talents so great and masculine, in union with purposes so noble, should sometimes come out of the retirement, often ignorantly associated, by the detractors of hereditary nobility, with no other idea than that of frivolous amusement or vapid idleness, is a thing we rejoice too much to see, to lose this occasion of paying it a passing tribute.

The Iron Trade.

The recent rise in the price of iron, and the discussion which it has caused respecting the stock of Scotch pig-iron have induced us to make some particular inquiries into the state of this trade, of which we subjoin the results. At the commencement of the present year 114 furnaces were in blast in Scotland. The price of G M Brands M No was 38s. per ton; but the market became more depressed and prices receded to 35s. 6d. in February; for prompt cash in exchange for store warrants f. o. b. in Glasgow. A few furnaces were soon after blown out; but large purchases having been made on speculation, at 36s. to 37s. per ton, and some English consumers having entered on large contracts, confidence was restored in the article, and with that came a demand for increased wages from the miners and iron workers, followed by improved sales of malleable iron, which, altogether, tended to advance the price of pig-iron, and secure the average quotations of subsequent months, which we subjoin. A large speculative business has been done for some time past, but upon a stronger basis than the speculations of 1845 and 1850. We are aware that at the periods in question numerous transactions occurred in pig-iron, which was not made, and was represented by the makers' engagement to deliver on demand. The present purchases are made on store-keeper's warrants, and we know that the article paid for is in existence. Since the month of February to the present time the receipts in the store-keepers' yards here have not been less than 1,000 tons daily. The production in Scotland is greatly disputed by different parties; because on that depends the question whether stocks are accumulating. Changes have been made in the construction of furnaces, and in the process of smelting during recent years, which, although not universally adopted at once in all the works, have gradually increased the aggregate make from the same number of furnaces; and the average per furnace may now be assumed at 135 to 140 tons per week. One high authority on these matters states the differences in production at from 100 tons to 180, and even 200 tons weekly per furnace. We do not think that 200 tons have been reached in many instances, or even 180; but still we think that 135 tons are probably the average production. The Scotch consumption was calculated in 1851 at 250,000 tons in all descriptions of works. The malleable works have increased their products, and the number of foundries has also increased; but, we believe, that since the recent rise in iron, as foundry goods have not gone up in an equal proportion, the supply for them has rather been contracted. The Scotch consumption during the first ten months of the present year has been estimated at 220,000 tons. A decrease of shipments during the same period of 23,000 tons has also occurred. In November the latter trade has obviously and rapidly revived; while a larger than the usual quantity now waits freight. If the present prices be permanent the production will be increased; but that cannot be done rapidly, for a number of furnaces are always out of blast. An increase of the Ayrshire furnaces is expected, but not during the currency of the present year.

The number of furnaces built at the 1st January last was 143, and building 1	144
Of which, at that date, were in blast	114
Ditto at 1st July last	104
Ditto now	112

The annual production of 112 furnaces at an average of 130 tons per week each, is annually 757,120 tons, and deducting 250,000 tons for local consumption, leaves over half a million for export, but with existing means that quantity could be greatly increased, and the yield gives an aggregate annually of probably 60 000 tons over this statement. The difference between February and present prices if the latter can be maintained is, therefore, equal to £800,000 annually to the meders.—*Expositor.*

New Thermometer for Maximum Temperatures.—Some three centuries have now passed since the invention of the thermometer by Sartorius and Drebell, in which but little improvement has been made on the original. Since the introduction of the registering thermometer no advance has been, and the steel index has been depended upon, although always liable to great incorrectness, either from becoming fixed in the tube, and the mercury passing it; or from its falling back with the mercury, and not registering at all. In the thermometer just introduced Messrs. Negretti have no needle, the mercury registering correctly itself. About an inch above the bulb a small cylinder of glass is forced into the tube, which is then bent at right angles, the graduated portion lying horizontally. With an increase of temperature, the mercury finds its way through the capillary pores left between the cylinder and the circumference of the orifice; but on a decrease, the mercury left horizontally in the tube cannot get back to the bulb, and remains at the index of the highest point of temperature it had reached since it had been previously set. In the construction of the instrument much delicacy is required; it being so arranged that the mercury, from the effects of heat, passes the glass valve, but on cooling cannot return, the resistance offered being greater than the attraction of cohesion between the particles of mercury above the bend and those below it. This instrument is most admirably adapted for ascertaining the temperature of shafts and levels in deep mines, the sea at various depths, and other like purposes. To ascertain the temperature at any moment, it is only necessary to place it vertically; the mercury instantly subsides, and a few seconds will show the precise heat of the atmosphere. This instrument has given the most complete satisfaction to the Astronomer Royal, and many other philosophical and scientific individuals and bodies, and the Council of the Meteorological Society stated that "this thermometer is the best which has yet been constructed for maximum temperatures, and particularly for sun observations; for as the reading is determined by the entire mercurial column being detained at its highest point by simple contrivance within the tube, the necessity for an index is avoided, and with it the constant and distressing recurrence of derangement attendant upon the employment of those generally in use." Almost the first important improvement made in the thermometer—that of enamelling the back of the tube, was introduced by Messrs. Negretti, but for which, as is too commonly the case, we believe they have not had that justice awarded which the idea deserved. We are led to make these observations, knowing the difficulty frequently experienced by inventors in the introduction of a new instrument, however important, when it is their wish to retain the credit of their own discovery; many objects present themselves—as the jealousy of the trade, settled prejudice against what is termed "innovation," and private interest—so that in but few instances the desired end is attained. The Exhibition Jury, in this particular class, evidently took much care in discriminating the works of different exhibitors; for here we have a firm comparatively unknown to the scientific world, proclaimed, to the surprise of many, as manufacturing instruments of this description superior to any in the Exhibition of all Nations [vide Report, page 654]—an assertion which we see fully borne out, by their now having perfected an instrument which had long been attempted in vain, most completely supplying a scientific requirement long severely felt.—*Mining Journal.*

Electric Telegraphs in India.—It has been announced that the East India Company have determined to establish immediately a very extensive system of electric telegraphs in India, under the superintendence of Dr. W. B. O'Shaughnessy, of their medical establishment. It is intended to connect Calcutta, Agra, Lahore, Bombay, and Madras, and as many of the principal towns and stations as can be embraced in the routes between these places. The distance to be traversed is upwards of 3000 miles, and it is intended to proceed with such expedition in its construction that its completion may be expected in three years from the present time. Dr. O'Shaughnessy has lately been employed in India in carrying on experiments with the electric telegraph, in order to discover the best system which could be adopted.

Charity.—Modern London contains, for its nearly three millions of inhabitants, thirteen general hospitals, all of them well appointed with every appliance for the relief of suffering humanity. In this list we include St. Bartholomew's, St. Thomas's, Guy's, the Westminster, St. George's, the London, the Middlesex, University College, Charing-cross, King's College, the Royal Free, and St. Mary's. The thirteen hospitals contain a collective staff of from 140 to 150 physicians and surgeons, all of whom we must suppose to be fitted for the highest duties of the profession. Besides the accredited medical staff of each hospital, at least an equal number of qualified medical practitioners are attached to them as resident medical officers, pathologists, registrars, and assistants of various kinds. The poor persons and others—for all hospital patients are not poor—seeking relief from our hospital system, amount to no less than the astounding number of 300,000 annually. We have extracted this amount, without any wish to exaggerate, from the best returns, as furnished by the hospitals themselves. The figures will be accredited when we state that the largest of our nosocomial establishments, the Royal Hospital of St. Bartholomew, succours nearly 5,500 in-patients annually; and that its in and out patients nearly reach 80,000 in the year. Yet this vast system of relief, and the immense amount of medical and surgical skill consumed in its bestowal, are nearly—we had almost said, entirely—gratuitous. Was ever such a spectacle of gratuitous toil exhibited as that which is involved in these figures?

Turkey in Europe.—The projected English railroad through the northern Turkish European provinces excites much attention there, and is pronounced by the *Wanderer* to be a matter even more important than the Egyptian Railway. It appears that six English engineers have already been examining the country between Constantinople and Belgrade; and in a letter from the latter city to Agram, a hope is expressed that the Servian government will also construct a line from Alexinac (probably Alexinitza, near Nissa, on the western frontier of Bulgaria) to Belgrade.

Transmission of Motive Power.—M. Fontaine-Moreau, of South-street, Finsbury, has patented a plan for the transmission of power in lieu of cog-wheels and pinions, straps and bands. This is effected by means of an angularly grooved wheel, with another working therein of a wedge form, and by the grip to be obtained any description of machinery may be set in motion.

Railway Traffic in Great Britain—The general results of traffic over all the railways in the united kingdom show that the aggregate number of passengers conveyed in 1850 amounted to 72,854,422; in 1851, to 85,391,095; being an increase of 14,536,673, or 17½ per cent. The gross receipts from passengers in 1850 amounted to £6,827,761; in 1851 to £7,940,764, showing an increase of £1,113,003, or 16·3 per cent. The gross sum received for the transport of goods amounted, in 1850, to £6,376,907, and in 1851, to £7,056,695, showing an increase of £679,788, or 10·6 per cent. The gross revenue of all the railways, arising from traffic of all descriptions, which in 1850 amounted to £13,204,668, amounted, in 1851, to £14,997,459, or very nearly £15,-000,000, showing an increase of £1,792,791, or 135 per cent.

The Debt of the United States.—According to a calculation by the New York *Times*, the total amount of the debt of that country amounts to 270,000,000 dollars. The minimum estimate of that portion of the above owned or advanced on, abroad, is as follows:—Federal loans, $40,000,000; State loans, $143,000,000; county loans and bonds, $24,000,000; country loans and bonds, $2,000,000; railroad bonds, $20,000,000: total, $225,000,000.

THE CANADIAN JOURNAL

Will be published Monthly, and furnished to Subscribers for 15s. per annum, in advance. To Members of the Canadian Institute the *Journal* will be transmitted without charge.

Persons desirous of being admitted into the Institute, as Members, are requested to communicate with the Secretary. The Entrance Fee (including one year's subscription,) is One Pound Currency.

There are three classes of persons who may with propriety join the Institute. First—Those who by their attainments, researches, or discoveries, can promote its objects by their union of labour, the weight of their support, and the aid of their experience. Second—Those who may reasonably expect to derive some share of instruction from the publication of its proceedings by the *Journal*; and an acquaintance with the improvement in Art and the rapid progress of Science in all countries,—a marked feature of the present generation. Third—Those who, although they may neither have time nor opportunity of contributing much information, may yet have an ardent desire to countenance a laudable and, to say the least, a patriotic undertaking,—a wish to encourage a Society where men of all shades of religion or politics may meet on the same friendly grounds: nothing more being required of the Members of the Canadian Institute than the means, the opportunity, or the disposition to promote those pursuits which are calculated to refine and exalt a people.

All communications relating to the Canadian Institute to be addressed to the Secretary. All communications connected with the *Journal* to be addressed to the Editor. Remittances on account of the *Journal* received by the Treasurer of the Canadian Institute, Toronto