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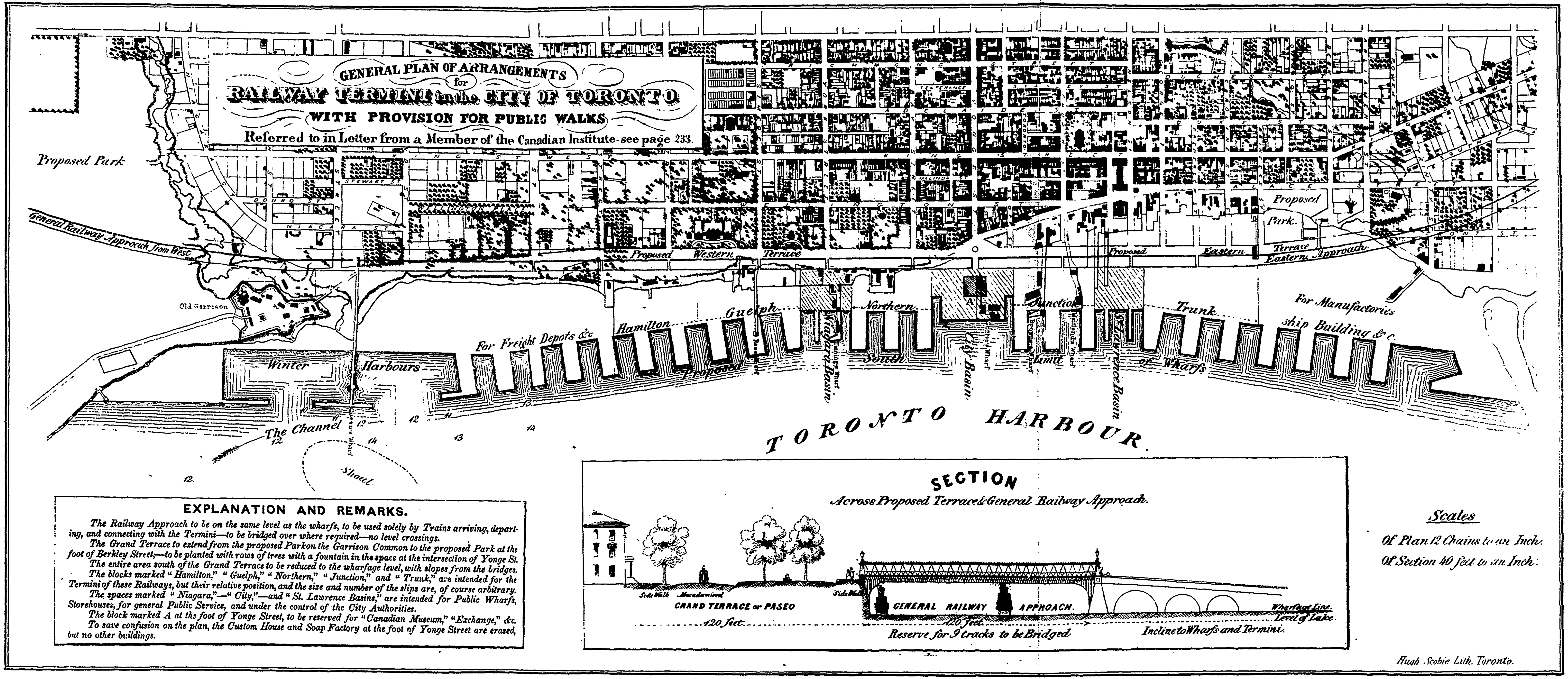
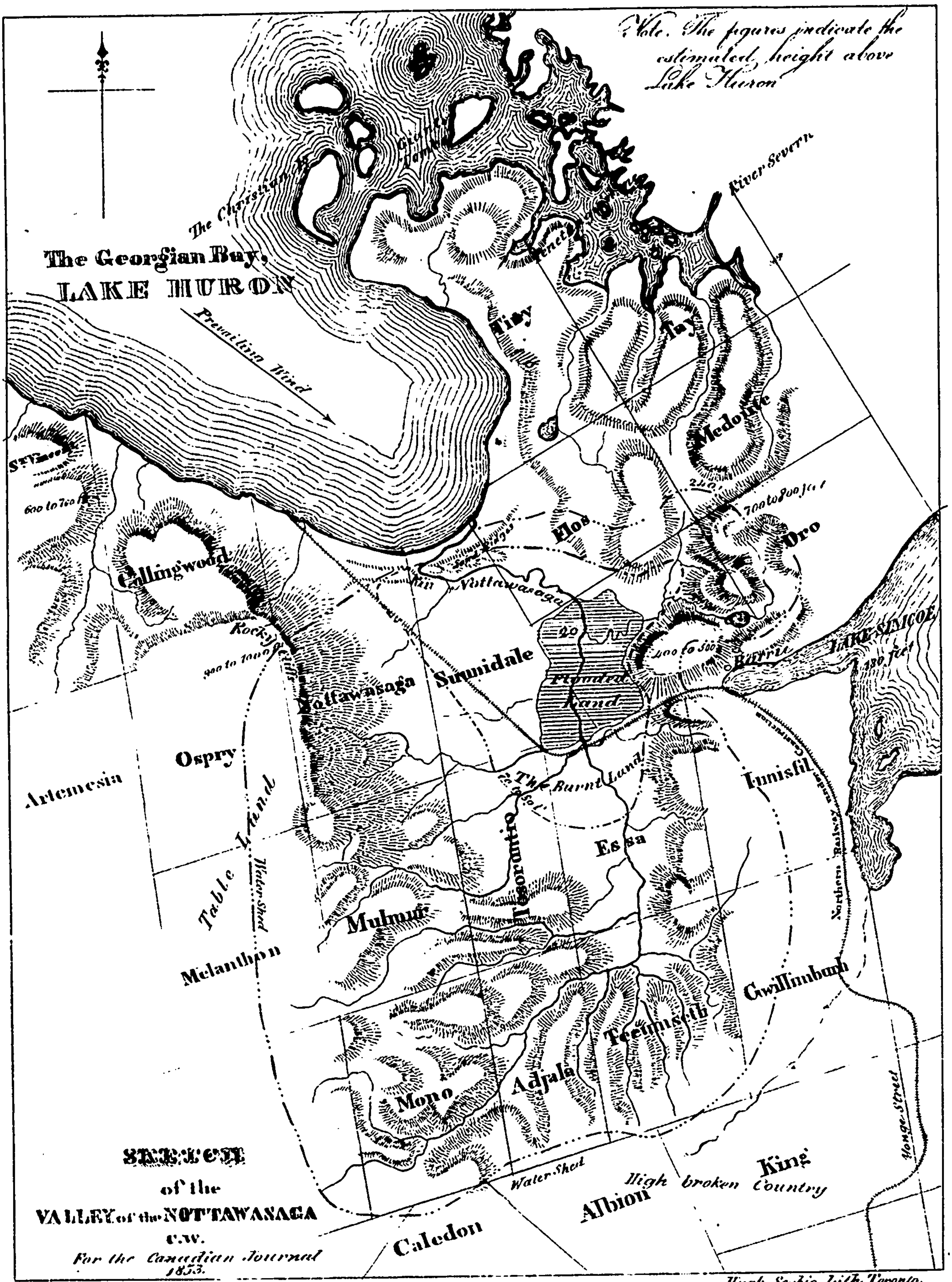

GENERAL PLAN OF ARRANGEMENTS
for
RAILWAY TERMINI in the CITY OF TORONTO
WITH PROVISION FOR PUBLIC WALKS
Referred to in Letter from a Member of the Canadian Institute - see page 233.
Proposed Park
General Railway Approach from West
Proposed Western Terrace
Proposed Eastern Terrace
Eastern Approach
Proposed Park
Old Garrison
Winter Harbours
For Freight Depots &c
Hamilton
Guelph
Northern
Junction
Trunk
For Manufactories ship Building &c.
Proposed South Limit of Wharfs
Niagara Basin
City Basin
St. Lawrence Basin
The Channel
Shoal
TORONTO HARBOUR.
EXPLANATION AND REMARKS.
The Railway Approach to be on the same level as the wharfs, to be used solely by Trains arriving, departing, and connecting with the Termini—to be bridged over where required—no level crossings.
The Grand Terrace to extend from the proposed Park on the Garrison Common to the proposed Park at the foot of Berkley Street,—to be planted with rows of trees with a fountain in the space at the intersection of Yonge St.
The entire area south of the Grand Terrace to be reduced to the wharfage level, with slopes from the bridges.
The blocks marked "Hamilton," "Guelph," "Northern," "Junction," and "Trunk," are intended for the Termini of these Railways, but their relative position, and the size and number of the slips are, of course arbitrary.
The spaces marked "Niagara,"—"City,"—and "St. Lawrence Basins," are intended for Public Wharfs, Storehouses, for general Public Service, and under the control of the City Authorities.
The block marked A at the foot of Yonge Street, to be reserved for "Canadian Museum," "Exchange," &c.
To save confusion on the plan, the Custom House and Soap Factory at the foot of Yonge Street are erased, but no other buildings.
SECTION
Across Proposed Terrace & General Railway Approach.
GRAND TERRACE or PASEO
120 feet
GENERAL RAILWAY APPROACH.
120 feet
Reserve for 9 tracks to be Bridged
Incline to Wharfs and Termini.
Wharfage Line
Level of Lake
Scales
Of Plan 12 Chains to an Inch.
Of Section 40 feet to an Inch.
Hugh Scobie Lith. Toronto.



See Page 223.

Hugh Scobie Lith Toronto.

The Canadian Journal.

TORONTO, MAY, 1853.

Address Delivered at the Annual Conversazione of the Canadian Institute, April 2nd, by Mr. Justice Draper.

MR. PRESIDENT AND GENTLEMEN,—

Our Annual Conversazione unites with the other signs of the times, to remind us that Spring is at length emerging from the icy thraldom of Winter, that the season of opening leaves and blossoming buds is just arriving. May we not, without forced analogy, trace the signs of the same spring time of the year, as applied to the state and condition of Upper Canada.

The few posts, whether military or trading, or even those of the earliest missionaries, which were established in any part of what was afterwards declared to be Upper Canada, before the peace of 1783, were too inconsiderable to require notice as forming any exception to the general proposition, that this part of Canada was then a mere wilderness, in which civilization was at Zero, and into the gloomy depths of whose primeval forests, neither the light of Science nor the radiance of Christianity had penetrated. It was after that period that the settlement of Upper Canada was begun by that loyal and devoted body of people, of whom Edmund Burke spoke as "persons who had emigrated from the United States," "who had fled from the blessings of the American Government," and with regard to whom he further observed: "there might be many causes of emigration not connected with government, such as a more fertile soil, or more congenial climate—but they had forsaken all the advantages of a more fertile soil, and more southern latitude, for the bleak and barren regions of Canada." It is to them and to their enduring efforts that this country owes its first germ of improvement. And let it be borne in mind, that they were not of a class who emigrated from the mere pressure of want, or to escape the danger of starvation—whose principal craving was to find such employment of their physical energies, that in return for their labour, they should obtain food for themselves and their little ones. They had been accustomed to the most valuable enjoyments of civilized life, to the advantages of Education and Christian teaching, and they sought in Upper Canada a home, where, in the course of years, their unremitting and fearless toil might realise for them those advantages,—which their attachment to their Sovereign, and to British institutions, had caused them to abandon. Their numbers were increased, and their exertions aided by the partial influx of other emigrants, among whom, in time, came the well-known Glengarry Highlanders, and they soon wrought a change. The luxuriant bounty of nature, as exhibited in a fertile soil, and a not unfavourable climate, was appropriated to the use of man; lands hitherto occupied by primeval forests were cultivated, schools and churches were built, and those who had struggled through the privations and hardships of the winter began to look with confident hope for the enjoyment of the spring time of this young and rising Country.

The war of 1812, however, checked for a time the progress which had been so favourably begun, and while in some respects it gave an unnatural impulse to development, it was exhausting the vital energy, so that when peace was restored, it became apparent, that if there had been no retrogression, there had been at all events little, if there was any, advance. This check was, however, but temporary. Those exertions, which for the time had been devoted to other, and in some instances, sterner pursuits, were soon restored to their proper channels, and became devoted to the improvement and development of the country. The unemployed inhabitants of the British Isles began to arrive in hundreds and thousands, to unite in the task of turning the wilderness into a smiling field; the population of Upper Canada, which, in 1791, was estimated at ten thousand, in 1824 exceeded 150,000; and in 1837, was increased to 375,000; and the observations, long before made in the House of Commons, with respect to the thirteen old Colonies, might have, with full force, applied to Upper Canada:—"Such is the strength with which population shoots in that part of the world, that state the numbers as high as we will, whilst the dispute continues, the exaggeration ends. Your children do not grow faster, from infancy to manhood, than they spread from families to communities, and from villages to nations."

In the full tide of this prosperity, however, there came another check—of no long duration fortunately—though of painful character—to which I allude only as forming a part of that truthful picture, which I am endeavouring to exhibit before you. This, as well as the war of 1812, may (in strict adherence to that analogy with which I set out) be compared to those tempests of the vernal equinox, which, though disastrous in their immediate consequences, whether to individuals or to localities, are ordered or permitted by an all-wise and overruling Providence, in furtherance of its general and beneficent designs, and now that they are passed over, and calm is restored—now that the sufferings they caused are removed or alleviated—may we not indulge ourselves in the application of the poetical imagery of Soloman:—"The winter is past—the rain is over and gone—the flowers appear on the earth—the time of the singing of birds is come, and the voice of the turtle is heard in our land."

But the song of rejoicing would lose half its power and beauty if its application were confined by us to the consideration of advancement in material prosperity alone. It is not only foreign to my present purpose, but it would occupy far more than the limited time I mean to detain you, were I to attempt even an outline of the various efforts made for public education, for intellectual, moral and Christian cultivation. It is not, however, the least significant proof of the success of those efforts that they have created and fostered an earnest longing for more extended knowledge—a desire which exhibits itself at different times, and, among other ways, in the attempts to establish societies or institutions to assist in scientific research—in intellectual development. Such was the literary and philosophical society formed more than twenty years ago by the exertions of the eccentric but talented Dr. Dunlop, and which was followed afterwards by the City of Toronto Literary Club, and the City of Toronto Ethical and Literary Society—both formed in 1836—all which, with perhaps some others I might more particularly mention, seem to have been put forth a little too prematurely, and, like precocious blossoms, to have been nipped, and to have perished without reaching any maturity. Such is—may it flourish and take deep root—the Canadian Institute, established, as you well know, principally for the purpose of promoting the physical sciences—for encouraging and advancing the industrial arts and manufactures—an establishment which I am well assured we all regard as one of the fairest promises of our spring, and to the unfolding of whose blossoms, and the perfection and maturity of whose flowers and fruit we cannot but feel it a duty—one well rewarded in its own accomplishment—to contribute our best exertions.

Among other advantages to which I look forward with great confidence as the result of the success of the Institute, is the attention it is likely to attract to this Province, and the consequent diffusion of more correct ideas—of more accurate knowledge of it, especially in the mother country. Conscious, as we may well be, of our growing strength and rapid advancement, it is, nevertheless, true and, perhaps, a little mortifying, to find much misapprehension—I had almost said ignorance—respecting even the very geography of the Province, existing in England. Were this confined to the less educated classes we should not so much wonder, and were the instance of it of an early date, and before correct information was easily attainably, we should not have any right to complain; but the fact is otherwise, as two instances I shall select will abundantly show. Half a century had elapsed from the time that Burke spoke of the "bleak and barren regions of Canada," before the publication of the last volume of that highly esteemed and valuable work, Alison's History of Europe, and from that volume I make the following extract:—"The first operations of the campaign in Canada proved singularly unfortunate to the Americans. In the end of January, Gen. Winchester with a thousand men, crossed over to attack Fort Detroit, in the Upper Province, and before any force could be assembled to resist him, made himself master of French Town, twenty-six miles from that place. General Proctor, however, who commanded the British forces in that quarter, no sooner heard of this irruption than he hastily assembled a body of 500 regulars and militia, being the Glengarry Fencibles, and 600 Indians, and commenced an attack upon the invaders two days afterwards in the fort of Ogdensburgh." To those acquainted with the events alluded to, or with the places mentioned, it is unnecessary to point out the errors which this passage contains. To some it may be useful to explain that General Winchester's advance upon Detroit was made in the (now) State of Michigan, which, though at that moment in the British possession, was nevertheless American territory,—that Fort Detroit, not long before captured by Sir Isaac Brock, is in Michigan, on the same side of the river—which there forms the boundary of Upper Canada—as General Winchester was marching on,—that Fort Detroit is nearly at the western extremity of Lake Erie, in which part of the country Colonel Proctor then commanded the British forces,—while the attack in which the Glengarry Fencibles bore so distinguished a part, and which resulted in the capture of the American position at Ogdensburg, was under the command of a different officer,—and that Ogdensburg is situated on the river St. Lawrence, at a distance exceeding the whole length of both Lakes Erie and Ontario from the scene of General Winchester's capture. A reference to the Annual Register for 1813, which is cited in the work as the authority for this passage, shows clearly enough that this error has arisen from blending into one, as if relating to the same events, two entirely distinct transactions, and, no doubt, rests with some transcriber employed by this eloquent and usually accurate historian.

Again, in another work, the second edition of which was published as late as 1845, by a gentleman who now holds the rank of Queen's Counsel, and whose pen has acquired for him a deserved reputation in works founded on other than professional subjects. The following passage occurs:—"Thus the waters which might at first have been seen forming part of the magnificent confluence of Niagara, and then precipitated amid clouds of mist and foam down its tremendous falls, and after passing over great tracts of country through innumerable channels and rivulets, serve at length quietly to turn the peasant's mill." A passage which, however well written, is nevertheless, a complete inversion of the facts since the waters which are precipitated over the Falls of Niagara flow onward, gathering as they go through Lake Ontario and the River St. Lawrence, the additions of many a tributary stream, but never diverge into any other channel in their downward course, until they expand into the Gulph and become mingled in the wide Atlantic waves.

It would be easy, especially if account was taken of the mistaken ideas respecting Canada, of individuals of less standing and pretension, to multiply such instances, but enough has been said to shew the necessity of diffusing more accurate information as a corrective of the past, and as a means of prevention for the future.

I cannot quit the subject without availing myself of this fitting occasion to express what I am sure is equally felt by all present. My sense of the obligations we owe to our President for his active exertions in support of, and his valuable contributions to the proceedings of the Canadian Institute. In leaving Upper Canada, he will, I am certain, carry with him our best wishes for his happiness and prosperity, not unaccompanied with the hope that we may be able at some future period to welcome his return among us, and to benefit by the renewal of his co-operation in the proceedings of the Society. Convinced of the excellence of the objects of the Canadian Institute, I rejoice at its present success and its future prospects. A diligent pursuit after, and a fitting employment of knowledge when gained, cannot fail to exercise an elevating influence in our relations to each other, and to lead to just conceptions of our respective duties in the various walks of life. We shall more practically feel that it is not for ourselves only, but for our fellows, that we are called upon to think and act, while we strive for our individual improvement. We shall strive also to communicate to others the benefit of what we attain, thus approximating the lofty character of those who,

"With God himself
Hold converse, grow familiar day by day,
With his conceptions, act upon his plan,
And form to his the relish of our souls."

On the Poisonous Plants which are indigenous to, or which have become naturalized, in the neighbourhood of Toronto, by Edward M. Hodder, M. C., & M. R. C. S., Professor of Obstetrics, &c., in the University of Trinity College.

(Continued from Page 204.)

(Read at the Annual Conversazione of the Canadian Institute.)

17th. Lobelia Inflata............Indian Tobacco.
Class Pentandria..........Order Monogynia.

This pretty plant varies in height from six inches to two or three feet.

The stem is erect, angular and hairy; the leaves scattered, oval sinuate, veined and hairy. The flowers in spikes, corolla bluish purple, the tube prismatic and cleft above, the segments spreading, two above lanceolate, the three lower ones oval.

The whole plant operates as a violent emetic.

The last three plants are exceedingly pungent to the taste, and in large doses are narcotico acrid poisons. It is said that in teaspoonful doses of the powder, they have proved fatal in five hours, where vomiting has not been produced. When chewed incautiously, they produce an insupportable sense of burning and distension, which extends down the gullet; nausea ensues, and vomiting generally follows, accompanied with oppressive prostration, languor of the pulse, and sweating.

Their acrid taste and emetic qualities, however, prove their safeguard; for, it is impossible to eat the plants in sufficient quantities to produce death, and which can only be occasioned by an extreme dose taken by mistake.

18th. Dracontium Fœtidum, or Setodes Fœtidus. } Skunk Cabbage.
Class IV.............Order I.

This is a strong-scented, repulsive plant, exceedingly meritorious of the name it bears.

The root is large and abrupt, with numerous, crowded, fleshy fibres. The spathe or flower which emerges from the ground some time before the leaves, is ovate, swelling, spotted, and sometimes nearly covered with dull brownish purple. The leaves make their appearance after the flowers; they are numerous, large, and crowded, oblong, heart-shaped, acute, smooth, with numerous veins of a paler colour. They continue to increase in size for a month or two after the flowering period is over, and are conspicuous in summer in every meadow, swamp or brook.

The odour depends on a volatile principle, not separable by distillation, besides which there is an acrid principle, which remains in the root when dried, and to which the plant owes its dangerous qualities when taken in over doses.

19th. Hyosciamus Niger.—Henbane. Class V. Order I., Nat. Ord. Luridæ.

This plant is not indigenous to this country, but within the last five or six years is has become naturalized in the immediate neighbourhood of this city, the only place where I have as yet found it, is on Front Street, near the Bay, and to the westward of Simcoe Street.

It belongs to the poisonous Nat. Order Luridæ, and like most of them, equally useful in medicine.

The whole plant has a glaucous or sea green colour, is hiary and viscid, and emits a rank and offensive smell.

The first leaves spread on the ground, and have some resemblance to a young thistle. The flowers are funnel shaped, irregular, with five spreading, obtuse segments, of a pale yellow or straw colour, with a beautiful network of purple veins. They are followed by a row of capsules, two celled, and covered with a lid—which is invested by its rigid prickly and persistent calyx.

The Medicinal as well as the poisonous effects of this plant are too well known to require any comment from me, particularly as the lurid aspect and the nauseous smell would in all probability ever prevent its been eaten in its natural state.

I have now, as briefly as I could, given a description of most, if not all, the noxious or poisonous plants growing near this City; yet, I should consider the list incomplete, were I to omit the mention of one which, although not generally looked upon as a poison, yet, I believe it to be the cause of more deaths in the human family than all the others put together. I mean the Secale Cornutum, or Ergot of Rye.

A good deal of uncertainty prevails as to the exact nature of this substance;—it is generally thought to arise under the influence of undue moisture, damp soils, and a rainy or misty atmosphere, especially at the time the ear is coming into flower.

The Ergot or Spur will, occasionally, in unfavourable seasons, affect all the Graminaceæ, more rarely the Cyperaceæ, and sometimes even the Palms; but it is found much more frequently, and of larger size, in rye.

Its action on the animal economy is very peculiar, and the most remarkable of these effects are those produced by its free and long continued use with the food.

Amongst cattle, it has frequently been known to produce 'black foot' and 'rot;' in other instances a cachectic state of the system has been observed, indicated by 'extreme wasting and weakness, loss of appetite, frequent pulse, fetor of the secretions and excretions, contraction of the spleen, and enlargement of the liver.' I had an admirable opportunity of observing these effects some years ago, where a large and good stock of cattle, horses, and sheep, were wintered on the straw of rye, some of which was *slightly* diseased.

In the spring of the year, the whole of the stock, without a single exception, was in the most abject state of misery; although the winter had been short and not severe, and the cows and sheep well fed with hay, the barn-yard was always kept covered with the rye straw, at which the cattle were constantly picking. The result was the loss of about ⅓ of the sheep, and ⅔ of the lambs; and both the cows and sheep brought forth their young prematurely.

In the human race two distinct diseases have been referred to its protracted use, and both of them have been observed to prevail as epidemics in various parts of the Continent, where rye constitutes a considerable proportion of the food of man.

One of these diseases, termed Convulsive Ergotism, is distinguished by the characters of an acute comatose affection, giddiness, dimness of vision, insensibility, convulsions, imperceptible pulse, and death within two days.

The other, and more common disorder, termed Gangrenous Ergotism, which commences with weariness, fever, a tendency to hemorrhage, pains in the arms and limbs, and at length dry gangrene, commencing in the fingers or toes, which drop off by the joints, and the patient either recovers slowly, or expires, worn out under the process of repair.

When given in single and large doses its effects are different, and it does not appear to be an active poison, as it required three ounces to kill a dog; and in man one ounce has only occasioned vomiting, colicy pains, headache and stupor.

It is, however, for a criminal purpose that this substance is most frequently made use of; from its well known action upon the womb, it is very often had recourse to for the purpose of procuring abortion; and I am convinced that, viewing it in this light, it is without doubt the cause of more infantile deaths than the whole of the other poisons put together.—*Here Dr. H. gave a short account of a visit he paid to the Rice Lake Indians; and spoke of their medicines, superstitions, cause of their great decrease amongst the Christian Tribes. 1st. Abortion very common; 2nd. spirits; 3rd. want of proper food.*

I feel, gentlemen, that I have trespassed too long upon your kind indulgence, and wearied you with details in which many can have felt but little interest.

It was my wish to have offered a few remarks on the advantages to be derived from the study of Natural History; but I find that I have already far exceeded the time allotted to me. It is to be hoped, however, that the time is not far distant when instruction on this subject shall occupy its true place, and receive its due share of attention in all our schools and seminaries of learning.

The celebrated Linnæus, in his 'Reflections on the Study of Nature,' observes:—'He who does not make himself acquainted with God from the consideration of nature, will scarcely acquire knowledge of Him from any other source; for, if we have no faith in the things which are seen, how should we believe those things which are not seen?'

On Accidental Discoveries.

Read at the Annual Conversazione of the Canadian Institute, April 2, 1853, by Henry Scadding, D. D., Cantab., *First Classical Master of Upper Canada College.*

(Continued from Page 207.)

Sir Francis Palegrave in his "Merchant and Friar," amusingly represent the good Abbot as scouting the idea that the *shape* had anything to do with the marvellous effect which a certain lens was discovered to have on the vision of the short-sighted young Emperor. According to the notion of the age, it was simply the innate *virtus* of the transparent gem of which the lens was composed that produced the result.

The defect of sight arising from the approach of old age, calls of course, as we all know, for a lens of the reverse shape of that required by the short-sighted. The construction of such a lens may readily have been suggested by noticing the magnifying power of a drop of water, or a globule of clear glass. A lens of this description once made, and used in frames for the correction of vision, soon led to important combinations.

An ingenious lad—the son of a spectacle-maker at Middleburgh in Holland—takes it into his head to look through two of these convex lenses at once, varying the distance between them by means of his two hands. He observes that the vane on the church steeple is brought wonderfully close to his eye—but that the image seen is reversed. The casual circumstance gives birth to a noble progeny of inventions. Here is the rudimental germ of the Telescope, the Microscope, the Cameras for various purposes.

When Lawrence Koster, at Haarlem in 1430, let fall on a piece of paper the fragment of beech bark on which he had playfully cut in relief the initials of his name, little dreamed he as the stain produced by the moist sap first attracted his attention, what a revelation had been made to him, and through him to the world. Metal types and the art of printing thus had their beginning.

Bradley, the celebrated astronomer, (1748), is amusing himself with sailing on the Thames in a pleasure boat: the wind is blowing strongly; frequent tacks are made; he notices that at every turn of the boat, the vane at the mast-head, instead of keeping steadily in the direction of the wind, exhibits an uncertain sort of motion. By a train of reasoning he arrives at an important conclusion on the subject of the aberration of light, starting a theory that has relieved astronomers from a perplexity under which they had previously laboured.

M. Malus, a French Colonel of Engineers, (1810), casually turning about in his hand a double refracting prism, as the sun is setting, observes one of the images of a window in the Palace of the Luxembourg disappear—and it leads him to the discovery which has rendered his name distinguished, of the polarization of light by reflection.

We might narrate how friction on amber originated the science and name of electricity—how experiments with jet, with sealing wax and India Rubber, might lead to the same result—how Louis Galvani, (1737) at Bologna, by taking notice of the spasmodic action of the legs of dead frogs when touched by his electrically-charged scalpel, discovered that phase of electric science that retains his name—how Maso Finiguerra, (1450) at Florence, while working at his business as an annealer of gold and silver, discovered the art of engraving on copper-plates, so as to obtain impressions on paper therefrom—how Louis Von Liegen, (1643,)—or, as some say, Prince Rupert—invented the process of mezzotint, by observing the corrosion of rust on a gun-barrel—how Alonzo Barba at Potosi, (1640,) happening to mix some powdered silver ore with quicksilver—with the view of fixing, if possible, the latter substance—found all the pure silver of the ore absorbed by the quicksilver, and so arrived at the secret of forming amalgams—how the casual observation of Francis Joseph Gall, (1757,) while yet a boy at school—to the effect that those of his companions who had prominent eyes had facility in remembering words—led at last to his curious theory of phrenology—how M. Argand, by perceiving a draught created by the passing of the neck of a broken bottle over a flame, was led to invent the well-known Argand Lamp—how M. de Courtois, (1813,) by accident detected iodine in sea-weed, from which material, since his time, it has been extensively manufactured.

These, and other equally interesting examples of happy discoveries by accident, I might narrate at length; but, I hasten to speak of the steam-engine, whose history presents us with several anecdotes in point. With these I shall conclude.

And first, the Marquis of Worcester, [1650,] while a political prisoner in the Tower, conceives from the dancing motion of the cover of the vessel in which he is cooking his dinner, the idea of a piston driven by steam—an idea that results at last in the perfect engine of James Watt.

Then, Capt. Savery, (1680,) flings into the fire a wine-flask from which he has just removed the contents; he perceives that steam is generated by a few drops which remain in it. Something prompts him at this moment to snatch it from the fire, and to plunge its neck into a bowl of water; the water rushes up into the body of the flask, a partial vacuum having been created therein. This leads him to the construction of the engine known by his name, useful for raising water from small depths.

Again, up to the time of Newcomen, (1705,) the condensation of the steam within the cylinder was effected by the external application of cold water. He observes on one occasion that the piston continued its movements after the external application had ceased; and the cause of this he finds to be a jet of water entering the cylinder through a small aperture which had escaped his notice. A well-known simplification of the engine is the consequence.

Lastly, the boy Humphrey Potter, set to open and shut the steam-valves, contrives by means of strings to make the working beam supply his place; thus originating arrangements by which the beam is made to execute several secondary offices.

The discoveries to which I have alluded, I have spoken of as accidental. This is a phraseology which we rather unreflectingly employ. Doubtless, all the capabilities of things—the agreeable as well as the useful—are intentional. They have existed from the beginning, and have been designed for the good of men; and when an individual is so fortunate as to detect any one of them, he is simply fulfilling the Divine will.

On looking back over history, I think too we can discern, in the case of several important discoveries at least, that the moment of their occurrence has not been utterly accidental. When the mariner's compass was invented, it was soon to be required. Columbus, Vasco de Gama and Cabot lived in the next age. When Lawrence Koster saw his initials impressed on paper from the piece of beech-bark, the intellect of the fifteenth century was heaving, fermenting—struggling for some means of embodying and circulating its aspirations, more rapid, more universal than the reed of the solitary scribe.

The disclosure of the continent of America itself, had it no connexion at the time with the approaching overburdened condition of the populations of the old world, with its social theories becoming obsolete and requiring a free field in which to be re-constructed?

If such a view of events be well-grounded, what are we to think of the present age? Is the curious accumulation of wonders, in the midst of which we find ourselves, accidental? Are the facilities for intercommunication among our fellow-men, accidental? Is the abundance of gold, accidental? Is the perfection to which the arts—the certainty to which the sciences—are so rapidly tending, accidental? If not, there are signs enough to invest this age with an enormous amount of interest—nay, with a degree of solemnity. For, what are our *duties* in such an age? Surely our responsibilities are greater than those of our forefathers. The facilities which we enjoy—the powers which we are enabled to exert—were not intended to be mere toys for our amusement: are we not expected to work out with them results which shall in some degree be proportionate to the trust?

An era of great importance is just opening upon ourselves. We are beginning to feel that the wave of the world's movement has reached us, and that we are being lifted forwards on its tide. Our opportunity has arrived; we shall, I doubt not, embrace it with energy.

It is in such times, in most countries, that ideas of sterling value are struck out. We may expect to see an intellectual activity among ourselves surpassing any that has as yet characterized us. One remark it will be useful to add. In every instance which I have adduced of what I have called "accidental discoveries," the accident was such as would be very unlikely to occur to an unobservant, unthinking, badly-informed person. The more observant—the more thoughtful—the more completely informed we are—each in our several professions—the more likely we may be sure, we shall be, to light on ideas that will be of practical advantage to the world.

Let each man stand, then, judiciously on the watch, and challenge every phenomenon with intelligence. Nature is not exhausted; there are yet latent secrets within her stores. Clues to additional truths are floating about in the air above, in the water beneath; let but the observer come who has the eye to see, the hand to lay hold of them. In arrangements already established, there are combinations and simplifications possible, which may eclipse the original inventions on which they are founded.

All countries have contributed names to the list of those who have made posterity mindful of them for services rendered in science and the arts. From the omens of her existing history, we cannot doubt but that Canada will contribute names to that list. In what direction will the first great manifestation be amongst us? Will it be in the mill, or the loom, or the plough? In the canal or the railway? In the modes of navigation on lake and river? In the purifying and working of the metals? Will it be in the department of the chemist, the anatomist, the therapeutist? Or will it be in the shape of literature and metaphysical speculation?

Our country has a wreath ready for each one of her sons who shall give to the question a practical response.

Note on F[illegible]s from the Ottawa River; by J. W. Salter, F.G.S., A.L.S.—(*See Canadian Journal for January.*)

Lower Silurian.—The fossils from the S.E. end of Allumette Islands, on the Ottawa River, are the only Lower Silurian fossils yet examined of Mr. Logan's large collections, and they bear out well the opinion he has expressed, that in some parts of Canada but one calcareous group can be distinguished between the Potsdam sandstone below, and the Hudson River group above, agreeing in the main with the celebrated "Trenton limestone" of New York, but possessing also many of the fossils characteristic of the lower limestones which in that country have received separate names.

For instance, one of the most abundant fossils is a species of *Scalites (Euomphalus uniangulatus*, described as a fossil of the calciferous sand-rock by Hall. The corals, again, *Stromatocerium rugosum, Columnaria alveolata,* which are very abundant, are those of the Bird's-eye and Black River limestones.—The former of these corals, too, is usually found investing (after the manner of a sponge) a large and fine species of *Maclurea*, a genus of gasteropods which in New York does not mount above the "Chazy" or lowest limestone, and is there abundant. Hall indeed expressly mentions that the *Stromatocerium* occurs in beds above those which contain the *Maclurea.* In this case, however, the parasitic zoophyte has generally selected this fine and new shell, to which I propose giving the name of its discoverer. It is well distinguished from *M. magna*, by the much more rapid increase in diameter of its whorls and its minute umbilicus. It is possessed moreover of a most peculiar operculum, which will at once establish the right of *Maclurea* to rank as a distinct genus, being furnished within with a broad and strong bony process for the muscular attachment, and being itself very strong and massive. Prof. Forbes has undertaken to compare this peculiar operculum with that of some rare living gasteropods of far inferior size, so that more need not be said of it at present.

The *Stromatocerium* affects also a small and new species of *Scalites* allied to the one above-mentioned, and frequently covers all but the mouth, so as to mask the form of the shell completely.

But it is with the Trenton limestone that the greater number of species agrees; and while a large portion of them, especially the gasteropods, appear to be undescribed in Hall's work, still the analogies are very evident. A list of ten or more *Murchisoniæ* or *Pleurotomariæ* affords one, *M. ventricosa*, characteristic of the Bird's-eye limestone; two common in the Trenton limestone, *M. bicincta* and *M. gracilis* (very abundant species), and *M. bellicincta*, Hall, a large *Turritella*-like form; the rest seem to be new; and some of them are remarkable for the tendency of the whorls to separate and become what may be called vagrant, as happens in some accidental varieties of the common snail. The shells are tolerably thick and strong.

Some smooth shells, exactly like the *Euomphali* of the carboniferous limestone, and several roughly sculptured *Turbines* or shells of apparently allied genera, occur; and one exceedingly elegant, with close thread-like lines of growth, is very common. *Holopea* of Hall, an ill-defined genus, offers one or two species of the typical form, and one closely allied to *H. bilix* of the Western States. There are three species of *Scalites*, a genus with the mouth notched like *Pleurotomaria*, but destitute of a spiral band; one is the small species so commonly encrusted over; a second, of which we have but a single specimen, is muricated with spines, like a *Delphinula*; the third is the very common *S. (Euomphalus) uniangulatus* above mentioned, which also, but rarely, shows a tendency to become spinose. There are also two or three species of the genus *Raphistoma*, which appears to be only a discoid form of *Scalites*. We have a *Turritella?* spirally ribbed, and undistinguishable in general form from living species. But the most abundant and characteristic shell is the *Maclurea*, fragments of which, with scattered opercula, occur on almost every surface.

Among bivalve shells, which chiefly belong to the *Arcacidæ*, a very interesting new genus has rewarded examination. It was found that two species resembling *Nucula* in every general character, differed from it importantly by having no internal ligament, but a very manifest exterior one; one of these species measures three inches across, and from the general analogy of several accompanying species it is believed that this form will be found common in the Silurian rocks, and will include many species now referred to *Nucula*. It might be called *Ctenodonta*. Of the same family also, a *Lyrodesma* (a genus with radiating teeth beneath the beak and synonymous with *Actinodonta*, Phillips) is closely allied to a Trenton limestone species. There is a new genus probably belonging to the *Arcacidæ*, but only possessing two or three anterior teeth; but the collection does not include any *Aviculæ*, or indeed any other of the usual Silurian genera of this order, and of the seven or eight lamellibranchiate shells none appear quite identical with those from New York; but, as might be expected, the common *Brachiopoda* of this locality are those most abundant also in the Trenton limestone. *Orthis tricenaria*, Conrad, swarms here, as does also *Leptæna filitexta*, Hall, a shell very like the common *L. alternata* of the Trenton limestone, but reversed as to the convexity of the respective valves. But the latter shell, so abundant in New York, does not occur here at all. *Atrypa hemiplicata*, Hall, and *A. increbrescens* are tolerably frequent; and there are two or three other species of *Orthis*, and some small plaited and smooth *Terebratulæ*, which require further examination.

The *Bellerophons*, two of which are probably identical with New York species, are those of the lowest or chazy limestone, namely, *B. (Bucania) sulcatina*, Emmons, and *B. rotundata*, Hall. The group to which these two belong is that of which the English *B. dilatatus* is a familiar type, the whorls scarcely enveloping each other, and the mouth wide and trumpet shaped.

There is however a true *Bellerophon* so like *B. obtectus*, Phill., from the Ludlow rocks of Pembrokeshire, that, but for its treble size, it might be taken for it.

Perhaps one of the most interesting of the mollusks is a large *Cleodora*, quite new to America, and not yet described as such from Britain. On attentively comparing the American, Irish and North Welsh specimens of this fine shell, which measures two inches across, I can find only trivial variations. It does not require a new specific name, having been figured from an imperfect specimen as *Atrypa transversa* by Portlock. It is interesting to find this species (which of course, as a Pteropod, had ready means of migration) in the two countries. There are but few other species identical with those of Great Britain, but I think I recognise *Turbo trochleatus*, and perhaps *T. tritorquatus*, McCoy, as common to the two regions.

Of the Cephalopoda, the remarkable two-edged *Orthoceras*, called *Gonioceras anceps* by Hall, is a Black River limestone species. *Cyrtoceras* is common, both smooth and ornamented; *C. annulatum* and *C. lamellosum*, the same with those of Trenton; *Orthoceras arcuo-liratum*, *bilineatum*, and *laqueatum*, Hall, are Trenton limestone species; and lastly, there are two species of *Ormoceras*, Stokes, the larger of which is in all probability *O. tenuifilum*, Hall, a species both of the Black River and Trenton beds.

Schizocrinus nodosus, Hall, of the Trenton limestone, is the common crinoid: its stems are very characteristic.

Among the corals, one or two species of *Streptolasma*, apparently the same as those of New York, and the branched varieties of *Favosites lycoperdon*, accompanying those before mentioned; and we may here notice the *Receptaculites*, already described by Hall, but not I think identical with *R. Neptuni* of Europe. The fine series brought home by Mr. Logan shows all the structural characters;—the circular expanded form and cup-like centre,—the surface composed of rhomboidal plates, which cohere by lateral processes, and which are the flattened ends of separate and equidistant columns. Unfortunately the entire structure is replaced by cycloidal silex, but perhaps it will by careful polishing enable us to *see if it be really a coral*, somewhat of the character of the *Tubiporidæ*.

To crown all these are slabs full of the large *Asaphus (Isotelus) gigas*, the characteristic trilobite of the Trenton rocks.

Upper Silurian Rocks.—Ascending the Ottawa to the head of Lake Temiscamang and so crossing the granitic axis of Canada, the first fossiliferous rock that presents itself is of a totally different character to that last described, as stated by Mr. Logan in his Report of Progress for 1845.

This limestone is weathered like the last; its siliceous fossils also stand out in bold relief; and one of the most common is the characteristic crinoid of the Trenton limestone, *Schizocrinus nodosus*, at least I believe I am correct in this reference. But along with this are abundance of *Favosites gothlandica*, *Stromatopora striatella*, *Cyathophyllum*, a *Heliolites* (*Porites*), with small tubes; *Syringopora* (*Harmodites*) with *Halysites catenulatus* (*Catenipora escharoides*), and *Strombodes striatus*, Milne Edwards, fossils characteristic of the *Niagara* and *Onondaga* limestones, and in America never found in the lower rocks; with these occur *Atrypa reticularis* in plenty, a *Terebratula* with three raised plaits, and very rarely a *Leptæna* or *Strophomena*. One or two spiral shells recall the shapes of some of Hall's species of *Holopea*, but are too imperfect for identification; and there is a long spiral shell, like *Murchisonia gracilis*. *Encrinurus punctatus* is the only trilobite.

The most striking shell perhaps is a species of *Ormoceras*, the short broad siphuncles of which are well preserved, while the shell has decayed, and these so much resemble those figured by Dr. Bigsby and Mr. Stokes in the Geological Transactions, 2nd series, vol. i. pl. 30, figs. 4, 5, 6, 7, that we think there can be no doubt of their identity. And it is very interesting, as bearing on the question of age, that these were found at Drummond Island, the only limestones of which are Upper Silurian.

Indeed the whole aspect of this collection, small as it is, is as strikingly Upper Silurian as that of the former one was Lower Silurian. The preponderance of the *Catenipora*, *Favosites* and *Stromatopora*, &c., is characteristic of the higher rocks, and they are associated with *Pentamerus oblongus* (the characteristic fossil of the Clinton group, which may be regarded as the base of the upper division), and this shell in America is far more limited in its vertical range than it is in Britain.

On the Increased Strength of Cast-iron, Produced by the Use of Improved Coke.

BY W. FAIRBAIRN, ESQ., M. INST. C.E.

At the Institution of Civil Engineers, a highly interesting paper on this subject was lately read by Mr. Fairbairn; it commenced with a communication from Mr. Grace-Calvert, on the subject of an improved system of depriving the fuel, whether used in blast furnaces or in remelting cupolas, of the deleterious substances by which the quality of the iron was deteriorated; or of the adaptation of the system to blast furnaces, when using coal for smelting iron ores.

The object was chiefly to point out, what were believed to be, the causes of the inferiority of iron in many works, apart from the varying qualities of the ores.

These were stated to be the introduction and application of the hot blast, which had enabled the ironmaster to reduce into cast and malleable iron, a very large per centage of cinders, slags, and other impurities, containing large proportions of silicate of iron, sulphur, and phosphorus, all of which tended to destroy the tenacity of the metal, and to render it either "red short" or "cold short"—and also, when sufficient attention was not devoted by those who were intrusted with the regulation and charging of the blast furnaces to the chemical composition of the ironstone by which the relative proportions of the flux and fuel employed in its reduction should be regulated; the chemical composition of the limestone, or the coal not being sufficiently known, these materials often varying in quality as much as the ironstone itself;—and the iron smelter was enabled to tell, with certainty, the quality of iron which this furnace would produce; instances had occurred, where a siliceous ore had been used for three or four hours successively, and then at once it had been replaced by an aluminous and sometimes by a calcareous ironstone, without the change being made in the proportions of limestone, or coal, which was evidently required by the different qualities of those ores.

The following analysis exhibited the different quantities of silicium existing in cast iron:—

White crude.	Monkland.	Coltness.	Eglington.	Dalmellington.
0·18	1·53	2·69	3·12	4·42

The injurious action which an impure fuel had upon the quality of the iron was particularly alluded to; and the necessity of removing the sulphur from the coal, or coke, when employed in the blast furnaces, before it could be imparted to the cast iron during the process of smelting, was strongly enforced. The difference in the quality of iron smelted with coal, and by the application of a process which had been recently introduced by Mr. Grace-Calvert, of Manchester, compared with iron smelted in the ordinary way, was exhibited in the following analysis:

PROPORTIONS OF SULPHUR.

Eglington pig-iron	Melted in the cupola with ordinary coke.	Melted with improved coke.
0·336	0·281	0·191

The following table showed the improved quality of iron, after the application of the chloride of sodium in the blast furnace; by which the proportion of sulphur had been diminished:—

Monkland without chloride.	Monkland with chloride.	Dalmellington without chloride.	Dalmellington with chloride.
0·390	0·150	0·956	0·218

And the increased bearing weight of 1 in. bars, cast from these irons:—

579	627	457	556
576	655	456	525
....		487	514
....		470	562
....		....	569

These improvements were described to have been effected, at a very small cost, by the following simple process. If the blast furnace was worked entirely with coal, chloride of sodium was added with each charge, in proportion to the quality of the ore and flux employed; but a better result was produced if the coal was previously converted into coke, and an excess of the chloride was used in its preparation, in order to act on the sulphur of the coal and of the ore, should any be found therein; and a greater improvement was manifested in the quality of the iron when only coke so prepared was used in the blast furnace.

The coke, so purified, emitted no sulphurous fumes when taken out of the coke oven, nor, when extinguished with water, did it give off the unpleasant odour of sulphuretted hydrogen, nor was there any sulphurous acid gas liberated during the operation of smelting iron in the cupola, or in raising steam in the locomotive boiler, by coke so prepared; and it was stated that these decided advantages were gained, in some cases, at an additional cost of only 1d. *per ton of fuel*.

The chemical action of the chloride of sodium was thus described.—When coal was first subjected to heat, in a coke oven, the bisulphuret of iron, contained in the coal, was decomposed into sulphur, which latter was distilled, or burned, and also into proto-sulphuret of iron, which remained in the mass, and was acted upon by the chloride of sodium, as it was volatilised at a red heat; thus chloride of iron and proto-sulphuret of sodium were produced. Then a second chemical re-action ensued: the proto-chloride of iron was decomposed into a sub-per-chloride of iron, and the chlorine gas, thus liberated, re-acted on the sulphuret of sodium, giving rise to chloride of sodium, and to chloride of sulphur, which latter was disengaged—so that the prepared coke contained less sulphur than the ordinary coke; but admitting even that a small portion remained, it would be in the state of sulphuret of sodium, which would not yield any of its sulphur during combustion, but passed into the cinders of the blast furnace, or of the cupola, and into the ashes of the fire-box, in the locomotive. Thus preventing the injurious effect of the sulphur on the fire bars and the copper of the fire-box, and on the brass tubes of the boiler of the locomotive, and the sulphur, thus fixed, did not enter into combination with the iron, preventing crystallisation during the process of smelting, and giving greater tenacity and closeness of texture both to the cast and to the malleable iron.

The second part of the paper gave the result of a series of experiments, which had been made by Mr. Fairbairn, upon trial bars 1 inch square, cast from iron melted in the cupola, with coke prepared by the process of Mr. Grace-Calvert, and exhibited specimens of the iron so prepared, when the closeness of texture and the absence of the honey-comb appearance, prevailing in the iron cast with the ordinary coke, was clearly demonstrated. The mode of experimenting was described, and the results were given very elaborately, and it was shown that the average increase of strength was from 10 to 20 per cent.

Taking the mean of the whole experiments, the following conclusions were arrived at:—

The mean breaking weight of the bars per square inch, melted with the improved coke, was .. 415·5 lbs.
Ditto ditto with ordinary coke.... 327·0 lbs.–88·5 lbs

in favour of the castings produced from the improved coke, or in the ratio of 5:4.

The experiments on the bars smelted with the improved coke, indicated iron of a high order as to strength, and might be considered equal to the strongest cold blast iron; the metal appeared to have run exceedingly close, and exhibited a compact granulated structure, with a light grey colour.

The Valley of the Nottawasaga.

BY SANDFORD FLEMING, ASSISTANT ENGINEER, NORTHERN RAILROAD.

(Read before the Canadian Institute Feb., 19th, 1853.)

I propose laying before you a brief sketch of the leading features of that tract of country which is within the water-shed of the River Nottawasaga; and the discovery at various points of ancient lake beaches, indicated by parallel terraces and sand-ridges, showing that Lake Huron at a former period stood at higher levels, with a speculation as to the geological date of these beaches.

By looking at the map of Western Canada, it will be seen that the Nottawasaga flows into the south-eastern extremity of that division of Lake Huron known as the Georgian Bay. Although no comparison can be instituted between the Nottawasaga and the chief rivers of this Province the St. Lawrence, the Niagara, the Ottawa and others, yet, of all the minor streams flowing into the great lakes, the Nottawasaga approaches more nearly the leading characteristics of a river, and passes through a country probably more diversified in character than any of them; it takes its rise in high broken ground, its numerous tributaries are scattered over a wide extent, and it flows through a boldly-marked valley, the bottom of which has a width of from 10 to 12 miles for a long distance before reaching Lake Huron. The other smaller streams, particularly those emptying into Lake Ontario, are generally found to flow through narrow ravines, cut by themselves during a long course of time, out of the beds of drift deposited on the surface.

The country drained by this river comprises an area of nearly 1200 square miles, about one-twelfth of which is under cultivation, the remainder being forest land; the settlements are generally distributed over the high-ground within the water-shed, and have a soil in most cases of the finest quality; the valley proper on the contrary, is as yet one continued dreary wild, a large portion of which, in all likelihood, will forever remain so, by reason of the extensive tracts of barren, sandy plains, and the fearful inundations which characterize other portions.

The roads in this quarter being not only few, but as they run for a limited distance in one particular direction, they cannot be followed with much advantage in pointing out the general features of the country. Such being the case, in order to facilitate description it will be convenient to depart from them, and guided by the pocket compass take two imaginary journies through the woods, one from East to West across the Valley, and another following the course of the river, from its source downwards, briefly noting the points of most interest, as we pass along—commencing with the former.

In the Township of Medonte and Oro the surface is much broken up into hill and dale; on the summit line some peaks may reach a height of from 700 to 800 feet above Lake Huron; the soil is clay, gravel or sand, in some places strewed with large boulders, and resembles in many respects the high ground (known as the ridges) which extends parallel to Lake Ontario from Rice Lake and Lake Scugog westward across Yonge Street. Along the South and West corner of Medonte a tract of flat, wet ground known as Craig's Swamp, situated between high abrupt banks, is found to be the summit of three streams, two of which flow into Gloucester Bay, the other, the Willow Creek, being a branch of the Nottawasaga. This swamp is 240 feet above Lake Huron, from which, following the latter stream, we by rapid descents arrive at a point near the centre of the Township of Vespra, not more than 20 feet above the Lake, although by the windings of the river it may be 25 miles inland. This is the eastern edge of what is called the Vespra Swamp or "flooded land"; (the position of which is shown in the accompanying map,) a high ridge separates this point from Lake Simcoe at the Town of Barrie, and so badly watered is this ridge, that the settlers have sunk wells to unusual depths with little success. The Willow Creek is about 100 feet under the level of Lake Simcoe, and only 5 or 6 miles distant therefrom. Proceeding westward along the course of this stream, the banks of which are level with the water, and covered with willows and other bushes indigenous to a rich moist soil, we arrive, after traversing its innumerable windings, at the Nottawasaga River, about the centre of the flooded land. The river is wide, black and deep; its summer level will average from 4 to 6 feet under the adjoining banks, and in Spring, after heavy freshets, from 6 to 8 feet above them, as indicated by the horizontal rings on many of the trees about this level; it is estimated that in some seasons nearly 25 thousand acres are covered with water; this. howeber, being caused by the rapid thawing of deep snow in the upper country, does not remain more than three or four days at this extraordinary height, and consequently effects no permanent injury to the description of timber with which the surface is covered. The soil is chiefly composed of decayed vegetable matter, and where not too low, supports trees of the largest dimensions. The whole area abounds with beaver, whose labours can be traced almost everwhere along the river banks, and since these yearly floods, will in all probability increase in volume as the country to the south becomes cleared, (judging from effects produced inolder settlements); and as the draining of this vast plain, (26 miles in circumference,) may prove a hopeless task, a secure retreat is thus provided by nature for the shelter of those live emblems of Canadian industry.

Leaving the western edge of the flooded land, we ascend by gentle slopes through Sunnidale to the Township of Nottawasaga, near the south-east corner of which, on the road from Cremor Mills to Mad River, a freak of nature rarely to be met with may be noted: i. e., the close proximity of two streams running in the same direction at different levels, shown by the following sectional sketch. The smallest stream is about the size of the

Singular position of two Streams.

Don where it crosses Hog's Hollow, (say 20 feet wide); it flows about 20 or 25 feet above the level of the larger, and is separated by a ridge of tenacious clay only about 12 yards in width. These streams are said to diverge after running parallel about a mile, ultimately joining at a greater distance. The remarkable singularity of their position, although at the present time in the midst of a dense forest, will, doubtless, point out the locality of a mill, or village, to some enterprising or speculative settler.

Continuing westward, across ravines and up steep ascents, we at last arrive at a large settlement on the eastern slope of the Blue Mountains, passing through which, and still ascending, we have to climb a rocky cliff, near the eastern boundary of Osprey. The rock is supposed to be a member of the Medina Sandstone, and is used in the locality for grinding-stones. Arriving at the summit, which must be 1,000 feet above Lake Huron, and looking backwarks over the country traversed, one of the most extensive, if not one of the grandest prospects to be met with in Western Canada, is presented to the traveller; the view is not restricted by too many trees in the foreground, and extending across Lake Huron as far as the Christian Islands to the north, and over the whole Valley of the Nottawasaga to the east and south, a semi-circle, whose radius may be upwards of 30 miles, is taken in, the dark foliage of the low ground far beneath contrasts boldly with the bright waters of the Georgian Bay, and the hills enclosing Lake

Simcoe, with a few isolated light spots, indicating clearances, appear blue in the distance.

As the high ground of Osprey tends to the northward, it terminates in a rocky escarpment, sweeping round through the Township of Collingwood, parallel to the shore; its base has a steep descent towards the coast, heavily wooded with pine, cedar, birch, and hardwood. Here the Trenton Limestone crops out rich in fossils, of which a variety and a specimen of Bituminous Shale, probably of the Utica Slate, are laid on the table.

Commencing at the southern extremity of the Valley, on the dividing ridge which separates the drainage into Lake Huron from that into Lake Ontario, and following the course of any of the principal branches of the Nottawasaga, we pass through a high, broken country, cut up by deep ravines. Reaching the Township of Essa, the high ground begins to recede, leaving between a perfectly level plain, about 3 miles in width, through which the River flows between banks from 50 to 70 feet high. In approaching the north end of the Township, these banks gradually fall away, and we enter a vast tract of barren land, extending westward and occupying nearly the whole of the northern half of Tosorontio and Essa; the best portions are capable only of supporting a thin growth of scrubby pines, and many thousand acres have been overrun by fires, which seem to have destroyed such meagre vegetation as may once have struggled into existence. The main highway from Barrie to Owen Sound passes through about 8 miles of this dreary waste, and all who have travelled it can testify that scarcely any road can be more lonely, and few landscapes could be more monotonous than the "burnt land." Leaving this wilderness, and following the course of the River, we enter at once into another equally uninhabitable, but of quite a different character, viz., the "flooded land." Here, necessarily in a canoe, and at least sheltered from the scorching rays of the sun (to say nothing of musquitoes) by a luxuriant vegetation, we glide smoothly along, and are amused by the picturesque forms into which the gigantic oaks are twisted and broken up by the herds of bears frequenting these groves, in certain seasons, to feed on acorns; and so stately are those noble trees, that they may, even in this country, be styled England's glory.

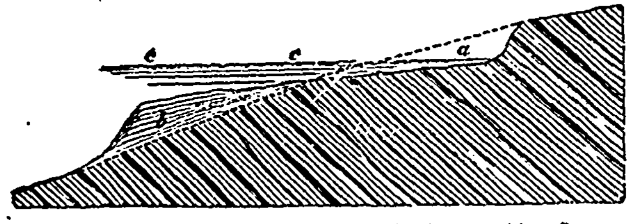
The River flows for about 12 miles through the flooded land, and enters a narrow gorge between banks about 60 or 70 feet high. The narrowness of this outlet must account, in some measure, for the annual inundations, it being insufficient in capacity for the passage of those immense volumes of water produced by the thawing of deep snows over an area of 700 or 800 square miles; and since the banks retain this height for a long distance, the possibility of draining is almost precluded.

By refering to the Map, it will be seen that at one place the River approaches within a short distance of the Lake, is deflected in an easterly direction, and ultimately finds an outlet, after running parallel to the coast about 4 miles; the whole of this spit is composed of pure sand, with a little vegitable matter mixed up with the surface at the western end. The outlet of the River is found to advance gradually eastward, and the entire area is thrown up in a series of concentric ridges, perfectly parallel, and well defined, except where broken and blown up into dunes by the wind; these ridges are, in some places, so distinctly marked, that they resemble the furrows of a ploughed field on a gigantic scale. Seeing that the ridges have every appearance of having been washed up by the Lake, that the point is yearly moving eastward, and that the coast is now no more exposed to the prevailing wind than formerly, there is every reason to believe that the whole of the deposit is due to the agency of the wind and waves. The vegetation itself tends to confirm this opinion, since, at the bend of the River (that portion supposed to be deposited first), the surface is covered with tall red pines, while, as we go eastward, these gradually diminish, both in size and numbers, until they entirely disappear. It is not here meant to be inferred that the deposit has been formed since any of these trees commenced to grow; but, that pure washed sand being at first unable to support any vegetation, through course of ages receives small accessions of organic matter, and gradually becomes more and more capable of supporting trees of stronger and stronger growth.

On the south side of that part of the River described as running parallel to the Lake, an upper and older sand ridge is found, from 80 to 100 feet above the Lake, and 40 or 60 feet above the country farther inland, its surface is cut up into sand hills which although now covered with trees have evidently been formed by the wind at a very remote period, they have all a long gentle slope towards the north-west (the prevailing wind) while the other ridge is quite precipitous—even at present the roots of the trees growing on the lee side are covered with blown sand, and those trunks which have lain on the surface for a considerable time are partially covered.

An opinion has been held by some Geologists that Dunes can only be formed on the margin of waters subject to the action of the tides, but these and other examples on the American Lakes, whose waters remain constantly about the same level, show that their formation must be referred to other causes than the rise and fall of the sea; and the discovery of these go far to confirm the opinion of those who hold that the wind is the sole agent of their formation.

There are appearances in various parts of this region which lead us to infer that the waters of Lake Huron like those of Ontario, formerly stood at higher levels than it at present occupies, parrallel terraces and ridges of sand and gravel can be traced at different places winding round the heads of bays and points of highland with perfect horizontality and resembling in every respect the present lake beaches; one of them particularly strikes the attention in the Bay of Penetanguishene, at a height of about 70 ft. above the level of the lake, it can be seen distinctly, on either side from the water, or by a spectator standing on one bank, while the sun shines obliquely on the other, so as to throw the deeper parts of the terrace in shadow. The accompanying section sketched from a cutting a little below Jeffrey's tavern in the Village of Penetanguishene, will serve to show the manner in which the soil has been removed from the side hill and deposited in a position formerly under water, by the continued mechanical action of the waves.



Section of Terrace around the high ground enclosing Penetanguishene Bay.

The dotted line represents former surface; *a*, washed out by waves and deposited at *b*; *c c*, supposed former level of lake.

Not only does the peculiar stratification of the lower part of the terrace confirm the supposition that it was deposited on the shore of an ancient lake, but the fact that such excavations have been made in this land locked position, where the waves could never have had much force, goes far to prove that the Lake stood for a long period at this high level.

Another ancient beach mark, about 15 miles inland, and as far as yet ascertained, about the same level as the one at Penetanguishine, can be traced for a long distance in the Township of Tosorontio—it passes through the tract of burnt land already described, the soil of which being pure sand, in all probability formed the shoals of a lake extending to the north and east, the outline of which is approximated by the dotted line marked from 70 to 80 feet high on the accompanying map. Nor are these the only traces of old lake beaches met with in this region, although the dense forest nearly everywhere covering the surface is a great impediment to their easy discovery. In the Township of St. Vincent, near the Village of Meaford, besides a very conspicuous one, corresponding in level with those already mentioned, several others of lesser note are found at various heights ; at Owen Sound, also, they are remarkably well defined ; while Cape Croker, on the western side of Georgian Bay, viewed even from a distance, and the well remembered shape of the Giant's Tomb, on the eastern, show striking evidences of having been acted on for ages by the storms of Lake Huron, when at a higher level.

It has been said that some of these terraces are estimated at 70 or 80 feet above the level of the Lake, by drawing a contour line coinciding with this height around the lower part of the valley

Section across sand ridge extending parallel to the shore at the mouth of the Nottawasaga River.

it is found that the high ridge of sand, now in some parts blown up into dunes near the mouth of the river, will form a narrow neck of land (supposing the lake at its former level) stretching across from shore to shore, and resembling in many respects the "Burlington Beach" on Lake Ontario, and also "Fond-du-Lac" on Lake Superior; like the first it encloses a Bay of considerable depth of water but of far greater area. That this ridge has been formed in a manner precisely similar to those two by the sand washed from the adjoining shores there is great probability, in fact there is good reason to believe that the same natural agents, at present in active operation moving the outlet of the river eastward, have also formed this upper ridge by transporting the materials, of which it is composed, from the base of the escarpment at Collingwood.

In attempting to arrive at the Geological age of these ancient Beaches, it will be necessary to show whether their position, at a considerable height above the level of the Lake, may be attributable to a gradual elevation of the land or to a subsidence of the water. The last hypothesis seems the most tenable since the first would involve a local upheaval only and an inclination of the plane of the terraces at variance with their apparent horizontality. Should further researches prove the existence of terraces or other indications of old beaches on the western margin of Lake Huron, corresponding in height with those discovered along the eastern shore; the supposition that the level of the water has been lowered by the wearing away of some barrier will be strongly supported; and if this be allowed as a reasonable explanation for these geological monuments, we have then by drawing contour lines coinciding with their level, the means of discovering the probable position of this barrier. From all that I can learn regarding the relative levels of the country these lines would pass over the peninsula between Lakes Huron and Erie, at some distance inland from the river St. Clair, and would , continued eastward along the shores of Lake Erie, fall within the summit of the neck of land, through which the chasm of the Niagara River is cut.

Thus, then, the traces of old lake beaches discovered in the valley of the Nottawasaga and adjacent country are coeval with the Niagara, and as it were a deep channel through the dividing ridge between Ontario and Erie the waters of the Upper Lakes would subside to their present levels: but this conclusion can only be confirmed by more careful and more extended researches.

That the vast beds of sand at and around the mouth of the Nottawasaga have been transported by the waves from the neighboring shores, may be questioned by those who have seen the extent of the deposit, is not unlikely, more especially since the present annual increase appears so exceedingly small when brought into comparison with the whole mass—but if it be established that a length of time equal to the age of the Niagara Falls, as estimated by Lyell, be allowed for the deposition, there will be no good reason why this should be doubted; and by the acceptance of these suppositions it will not be necessary either to disregard the analogy of existing nature, or to assume that her forces were more energetic in years gone by.

In concluding these rambling observations it may not be out of place to state that as my acquaintance with the country, bordering on the Nottawasaga, has been limited, and the duties devolving upon me while in that quarter left little time for a more careful examination of the various matters referred to, I am only enabled to draw attention to them. I trust, however, it has been shown that in this region a wide and interesting field is open for the investigation of the Geologist, and although now isolated by the very worst of roads, the Railway in progress will, in a few months, bring within a two or three hours journey of Toronto what now requires as many days of fatiguing travel to reach.

On the Electrotyping Operations of the U. S. Coast Survey.

By George Mathiot, *Electrotypist: being a Report to Major* I. I. Stevens, *Assistant in charge of the Coast Survey Office.**

In compliance with your request, I present the following report of the electrotype art as now practised in this office. Most of the apparatus and processes here used are entirely new.

To clearly exhibit the advantages derived from their introduction, it will be necessary to consider the scientific principles involved in their use, and also to take a cursory view of the history of the electrotyping art.

The art of working metals by electric currents is of very recent introduction; and although it has advanced with great rapidity, it is yet, perhaps, in a state of infancy in its applications, and of crudeness in the modes of conducting it.

The electro-deposition of metals was observed by most experimenters with the voltaic battery. As early as 1804, electro-gilding had been successfully practised; but the idea of making castings by electric currents does not seem to have occurred to any one previous to the introduction of Daniel's battery, to which electro-casting is incidental.

After the introduction of Daniel's battery, it simultaneously occurred to several persons that electric currents might be used to make castings of a finer kind than were obtained by melting and pouring. Propositions to this effect are about all that can

* Dated Electrotype Laboratory, Coast Survey Office, Washington, Nov. 29, 1851, and published as appendix 55 to Senate Document, No. 2.

be attributed to the rival claimants for the invention of electro-metallurgy; for neither the English nor Russian philosopher revealed what had not been known before.

Yet to Jacobi and Spencer is due the merit of having called public attention to the subject; for in doing this, they have conferred benefits on the world greater, perhaps, than by making an original discovery.

After the publications of Jacobi and of Spencer had called the attention of the scientific world to the new art, the principles involved in it became the study of several eminent philosophers, who disclosed the methods to be followed for obtaining reguline metal. After this, several departments of electro-metallurgy rapidly advanced. Electro-plating, and the multiplication of pages of letter-press work, as pages of type, and wood-cuts (electro-stereotyping,) were soon extensively practised; but the copying of the delicate touches of the copper-plate engraver (the electrotype proper) was beset with difficulties. On account of the great value of the engraved plate, together with the risk of its being destroyed in the attempt to copy it, and the uncertainty as to whether the duplicate would have good metallic properties, even if the operator should have the good fortune to obtain one, this department of the art (the first and most beautiful of Spencer's suggestions) was allowed to rest as an experiment or be confined to articles of small size and value.

Adhesion of Deposit to Matrix.—Electro-metallurgy requires that the deposited metal should have all its cohesive properties. If such a deposit of copper is made on a clean plate of copper, it is obvious that the deposited metal will cohere with the plate on which it is made, and an elaborately engraved plate would thus be converted into a mere mass of metal. The electrotype art, therefore, cannot exist before means are provided for preventing this destructive adhesion.

Various plans for overcoming this difficulty have been proposed All these, however, have a common feature, which is to prevent the deposit and matrix from touching by means of an intervening film of heterogeneous matter.

Mr. Smee proposes to use that coating of air which adheres so firmly to polished metals (so strikingly exhibited when the attempt is made to wet a polished knife-blade). To obtain the air coating, he directs that, after every attachment has been made to the plate, it be placed in a cool and moist celler for a few days before introducing it into the electrotype vat.

Smoke, black lead, oils, and powders, and wax, have also been proposed for covering the face of the plate.

The method used in the British ordnance survey is perhaps the best of all these. This is conducted as follows: The plate is first well oiled, and the oil well wiped away with soft bread. The plate is then heated to above the temperature of melting wax, and a cake of white wax pressed against the edge. The oil having removed the air from the plate, the wax will flash over it in an extremely thin sheet or film. All excess of wax is then to be wiped away with a fine linen cloth, free from lint. The plate must be left to cool before introducing it into the vat.

To smear the face of the finely engraved plate is in opposition to the fundamental idea of the electrotype, which is that of atomic casting. In the process of Mr. Smee, air bubbles will be retained in the fine lines of the graving, thus mutilating the copy; moreover, the face of the new plate is waved from the agitation of the stratum of air when receiving the first portion of copper.

In the waxing process it is almost impossible to free every line from excess of wax. Even days of tedious application do not insure perfection. In addition to the coarseness of these various methods, they are extremely uncertain as to whether they effect the purpose for which they are applied.

It was always observed that if the deposited metal was *not deficient* in mechanical properties, it stuck very hard to the original, and the plates had to be subjected to violent jarring, heating and beating, to separate them. But if the deposited metal was of very fine quality, then most likely the deposit was *inseparably united to it.* From these circumstances attending the adhesion of the deposit, it occurred to me that, when the cohesive force was but feebly developed in the deposited metal, then the force of cohesion or homogeneous attraction could not extend the distance presented by the thickness of the film of heterogeneous matter between the plates; but that when these forces were well developed, the spheres of homogeneous attraction of each plate would extend through the wax or air film.

It may be proper here to remark that the above views of adhesion have been applied to another department of electro-metallurgy with the most gratifying success. In electro-plating the difficulty of obtaining a firm adhesion of the film of precious metal is entirely obviated by making such arrangements as insure a rapid deposition of highly ductile metal at the moment the article to be plated is immersed in the electrolyte.

In considering the sticking of the plates, after homogeneous attraction or cohesion, heterogeneous attraction or adhesion demands attention; for two similar bodies may be separated by a film of heterogeneous matter, which binds them more firmly together than their particles are held together by cohesion, as we see in the use of cements.

This force is very powerful between some bodies, while between others it is very slight. Air adheres very strongly to metals, as before referred to; hence a film of air may unite two copper plates, even though they are separated beyond the distance at which cohesive attraction takes place.

Wax is a common ingredient in cements; its adhesive properties have become proverbial; its use is evidently improper. Therefore a substance having a strong adhesive attraction for the plates must not be on the face, and the cohesive force of the surface particles must be suspended by other methods than making the deposited metal deficient in mechanical properties.

It was hoped that a substance could be found that would act uniformly and gently on the surface of the engraved plate, and which in destroying the homogeneous attraction of the surface particles, would, by chemical union with them, form an insoluble and friable compound, having but a slight adhesion to the plate. I was led to select iodine for the experiment on account of its sparing solubility in water, its high equivalent number, and innoxious qualities. A copper plate was well cleaned, exposed to the vapor of iodine, and electrotyped; the deposit separated from it readily. This was repeated some hundred times with invariable success.

It was found in cleaning large plates for the application of the iodine vapor, that while one part of the plate was being cleaned, another part would tarnish, and hence a uniform action of the iodine could not be obtained. This led to silvering the plates before iodizing, which facilitated the cleaning and exhibited the action of the halogen. A silvered plate was washed with an alcoholic solution of iodine and electrotyped; the electrotype separated from the matrix yet more readily than before, the iodid of silver serving better to prevent adhesion than the iodid of copper.

But it was soon observed that a plate prepared on a dull day did not separate so readily as one prepared under a bright sky, and on experimenting it was found that a plate iodized and exposed to sunshine would separate with very great facility; while a plate iodized on a rainy day, and placed in a dark room for a few hours before introducing it into the vat, might stick so hard as to require some of the old resorts of heating and jarring to separate it from the matrix.

The process of iodizing and exposing to light has now been applied to a very great extent of finely engraved surface, and in no case has the least difficulty been found in lifting one plate off the other when the requisite thickness had been obtained.

I am aware that it may be thought that the iodine acts only by intervening between the plates; but the quantity of iodine applied to a plate must be thought insufficient to effect it by mere mechanical separation when we consider the large quantity of silex and carbon found in ordinary copper. If but one ounce of copper be dissolved from a square foot of ordinary plate, a very heavy deposit of impurities is left, (sometimes 5 per cent.) and the quantity of wax which may be applied to a plate, and fail to prevent sticking, is ten thousand times more than the quantity of iodine which prevents it.

In preparing our largest plates, having ten square feet of face, I use a solution of one grain of iodine in twenty thousand grains of strong alcohol. If one grain of the solution is required to wet a square foot, it will give but one-twenty-thousandth part of a grain of iodine on a square foot. But as the iodine evaporates rapidly with the alcohol, probably the actual quantity on a square foot does not exceed one-hundred-thousandth part of a grain.

Taking the weight of a cubic inch of iodine at 1,250 grains, and supposing that it remains on the silver surface in its elementary state, instead of forming iodid of silver, then we have 1,250 X144X100,000=18,000,000,000, only one-eighteen-thousand-millionth part of an inch for the thickness of the coating of iodine. Even if we suppose that the solar rays decompose the iodid of silver, and leave the iodine in vapor on the plate, it will still be only one-forty-four millionth part of an inch—a thickness to be taken as nothing in a mechanical view.

To test the effect of the chemical method of preventing adhesion on the sharpness of the engraved lines, an engraving was seven times successively transferred from plate to plate, when the closest inspection failed to show any inferiority of impressions from the last plate as compared with those from the first.

Time and expense of electro-casting.—Next in importance to securing a certain and easy separation of the matrix and casting is bringing the entire time and expense of electrotyping within the narrowest limits.

Mr. Smee and others have shown that the quality of electro-metal is determined by certain relations between the rapidity of forming the plate and the strength of the solution in which it is formed. Both the common operations of the electro-metallurgist, and the improvements he proposes, must conform to these relations.

As small quantities of electricity are easily set in motion, small-sized electro-castings are readily made in six or eight days. To make large castings in a short time requires a powerful current. To accomplish the corresponding augmentation in the effective electric action has proved a somewhat difficult matter.

At the date of the "Aide Mémoire to the Military Sciences," it is stated that in the ordnance survey one pound of copper was deposited in twenty-four hours on a plate of eight square feet, the plates being made ductile enough to bear hammering only by continued agitation of the electrolytic solutions.

At this rate, to make a plate one-eighth of an inch thick will require forty-five days. So far as I am informed, the above performance has not been excelled, as to quality and time, on large work anywhere prior to its being attained as now to be described.

The first and most obvious suggestion for increasing the rate of deposition is to enlarge the battery; this, however, is incapable of producing the desired end.

To present this subject in a clear and satisfactory manner, I will make use of the celebrated formula of Professor Ohm, who deduced from mathematical reasoning, and established by experiment, that the effective force of the current from any battery was directly as the electr motive force, and inversely as the resistance offered to that force.

To express this, he gave the equation $\frac{E}{R+r}=Q$, in which E represents the electromotive force, or affinity of acid for zinc, and $R+r$ the resistance to the current generated by that force; R representing the resistance offered to it from the liquid contained between the positive and negative elements of the battery, and r the resistance offered by the object on which the battery is working, and Q the amount of work executed, or the quantity of the current obtained.

The resistance of conductors has been found to be directly as the length, and inversely as the section.

So far as concerns form of arrangement, E is constant for the materials used, as it depends on their chemical relations, Q can therefore be favorably affected only by varying R or r. Now, as R represents the resistance of the liquid contained between the battery plates, to increase the size of the plates is only to increase the section of the liquid, or, in other words, to diminish the resistance represented by R. The expression, $\frac{E}{R+r}=Q$, shows that, if the resistance in the battery is small compared to the external resistance, the gain of effect from enlarging the battery plates is but small.

To determine the relative value of R, as compared with r, a battery was constructed so as to collect and measure the gas evolved by its action,

The plates were placed in contact with each other, and the gas evolved in thirty minutes taken as a unit of effect. As in this case the current did not pass through anything but the battery, there is no resistance to be represented by r, or r in the formula will be equal to 0 and $Q=\frac{E}{R}=1$.

The battery was then attached to a pair of electrodes, in a certain solution of sulphate of copper and sulphuric acid, especially recommended by all the writers on electro metallurgy, the arrangement being such as to produce good metal. The gas now evolved in thirty minutes was found only one-twentieth of the former amount; hence the introduction of the resistance, r, had diminished Q twenty times, and $\frac{E}{R+r}=Q=\frac{E}{20\ R}$, whence r is equal to 19 R. To exhibit the effect of battery enlargement, we now have $Q=\frac{1}{\frac{1}{m}\times 19}$. If $m=1$, then $Q=\cdot05$; if $m=2$, $Q=\cdot0512$; if $m=3$, $Q=\cdot0518$; if $m=4$, $Q=\cdot0524$, &c., &c. This shows a gain of only a fortieth from doubling the size of the batterry, &c.,—an advantage too small to repay for the enlargement. These calculations are in accordance with experimental results from small batteries, but in large ones the necessity of further separating the plates, in increasing their size, makes the resistence increase, instead of diminish, but there is consequently a loss from enlargement. It is not, therefore, by merely increasing the battery surface that the time for electrotyping can be shortened.

Mr. Smee, the distinguished writer on electro-metallurgy, by covering the negative plate of the battery with pulverulent platinum, produced a very energetic form of the instrument. When the plate is freshly platinized, it acts violently, and throws off the hydrogen in torrents. But this *increased energy of the plate* is gradually lost, from the electric current depositing upon it impurities from the zinc.

As this deposit has a strong attraction for the hydrogen, it is retained on the plate. The plate, being thus encased in air, is virtually excluded from the liquid of the battery. The ordinary solvents of the metals do not readily remove this coating of impurity. The plate can be renewed by replatinization; but, as this is both tedious and expensive, I was urged to find a menstruum which would restore the original platinum to its energy. This I attained, at length, by immersing the plate in a solution of per-chlorid of iron, which almost immediately restores the action of the plate.

The plates are now daily immersed in the chlorid of iron, by which the tone of the battery is constantly maintained.

By this last discovery, together with obtaining better solutions for the decomposing cell, the time for making a casting was reduced; but still the time required for making a plate was too long when only one electrical equivalent was employed.

The effective force of one battery may be added to another. This is increasing E in the formula, and this will sometimes increase Q.

We unite the effective force of many batteries by joining their dissimilar ends in consecutive order. As the current in such an arrangement has to traverse every battery in the chain, R will be multiplied as many times as we multiply E. The formula then becomes $Q=\frac{n\,E}{n\,R+r}$. When the value of r and R are nearly equal, and we have batteries of definite construction to work with, it becomes a matter of some importance to determine whether we shall use the whole galvanic apparatus, as a single electrical equivalent, by connecting all the similar parts of all the battery cells, or whether we shall convert it into a battery of two pairs, in consecutive order, by joining dissimilar ends. As dividing the battery is doubling R, and to double the electrical eqivalents is also to double R, we shall increase R fourfold by the double arrangement. Instead of $Q=\frac{E}{R+r}$ we have $Q=\frac{2\,E}{4\,R+r}$.

Taking $R=r$ we have $Q=\cdot50$ in the single arrangement, and $Q=\cdot40$ in the double—showing that we may double the expense, and yet make the casting more slowly than before. Conditions as above are of frequent occurrence, and a knowledge of them without experimenting is of very great importance.

For $R=10\,r$, with a single equivalent of battery, $Q=\frac{1}{1+10}=0{\cdot}0909$. For two batteries in series $Q=\frac{2}{2+10}=0{\cdot}166$. The use of two batteries in consecutive order, as thus exhibited, doubles the expense, but does not double the effect. A regard for economy prohibits us from further increasing the series. To represent an effect double of $\frac{E}{R+r}$ we have $2\left(\frac{E}{R+r}\right)=\frac{2\,E}{\frac{2\,R+r}{2}}$

As dividing R by 2 is doubling the battery surface, we may now make $Q=\cdot183$. The gain per cent., now indicated by doubling the surface, makes it advantageous to make this increase when two consecutive batteries are used.

The difficulty of obtaining large flat plates of silver proved a serious obstacle in effecting an increase of battery surface, for the irregularity of the surface requires the plate to be placed at an increased distance from the zinc, thereby augmenting R, the very thing sought to be diminished.

Plates could be made flat by the planishing hammer; but the operation being expensive, and the plates continually liable to accidents in use, economy prohibited this mode of forming flat plates. Though the plating of metallic bodies with silver had been well executed, it had not yet been determined that electro-casting of silver could be executed in a desirable manner, and at a moderate expense and trouble At first, every attempt to make plates weighing 2,500 grains to the square foot failed, on account of the impossibility of observing Mr. Smee's laws of electro-metallization for the time required.

But after modifying the solutions of silver, and using a register battery, a plate could be made in thirty hours, perfectly flat, and possessing the mechanical qualities of hardness, elasticity, and malleability, in an eminent degree, and not costing over 16 cents per ounce for the making.

The perfectly flat plates admit of a very close approximation to the zincs. Their size may therefore be increased to more than twice their former surface, as in the double arrangement, r is relatively smaller to R

Important changes have also been made in the modes of operating, and in the arrangement of the apparatus. It had early been noticed that changes of temperature influenced the rate of working; and every electro-metallurgist knows the importance of keeping the laboratory warm.

To determine where and how the effect of temperature took place, a battery, at 60 degrees Fahrenheit, was connected with a wire 120 feet long, and enclosing a galvanometer. The deflection was 40°; the battery was then cooled until the temperature was 48°; the needle was still deflected nearly 40 degrees.

This experiment indicated that the batteries were not greatly affected by ordinary variations of temperature. Advantage was then taken of this development to secure a more perfect ventilation. Accordingly, a small room, to contain the battery, was partitioned off from the general department by a glass partition, and large outward openings made at the top and at the bottom of the room, to give a circulation of air for carrying off the battery fumes.

At the stage of improvement now described, one of our medium plates, having eight square feet of surface, could be readily made in from eight to ten days. But wishing still further to quicken the process, or attain my first desire—to deposit one pound per day on the square foot, with a single equivalent of battery—improvements were again sought after. As the E of the formula has been increased to the greatest extent the cost would permit, and R had been diminished, or the plates increased in size to the greatest useful extent, it was sought to increase Q by diminishing r, or the electrolytic resistance. It was sought to increase the conducting power of the electrolyte by adding easily decomposable salts to it; but with no success. The accelerating effect of temperature being found, as above stated, to be confined chiefly to the decomposition cell, it was evident that by using the electrolyte alone, at a high temperature, a considerable advantage might ensue.

To determine the most advantageous working temperature, and the resulting gain of effect, a voltameter battery was connected to a pair of electrodes, in the solution formerly described as being generally recommended. Each electrode had five square inches of face, and was coated on the back to prevent radiation. They were placed one inch apart, and had thin plates of wood bound against their edges, to prevent any lateral spread of the current in passing between them. The following was then obtained:

Battery plates in contact			gave	300	cubic inches gas per hour.		
Electrodes in contact	do.			216	do	do. do.	
Current through electrolyte,	at	58°,	gave	16	cubic in.	gas per h.	23·15
do.	do.	60°	do.	20	do.	do.	18·15
do.	do.	100°	do.	27	do.	do.	13·00
do.	do.	175°	do.	37	do.	do.	8·96

The last column of figures shows the value of the resistance of the solution, as compared with B of the formula. This column was obtained by first uniting the battery plates, and afterwards the electrodes.

From the above table it appears that heat may be made to diminish the resistance in the decomposition cell in the proportion of 2·58 to 1; and the whole resistance by 2·25. And as $\frac{2\ E}{R+r} = \frac{E}{\frac{R+r}{2}}$; therefore, by heating the electrolyte, we may with a single electrical equivalent make a plate as rapidly as by working at atmospheric temperatures with two batteries in consecutive order, with double surfaces, (four times the battery and twice the expense.)

But as Smee's laws require that, in forming a plate, certain mutual conditions of apparatus be maintained, it follows that alterations in one element or condition must be attended by corresponding changes in the others. Hence, if the temperature of the electrolyte be raised to a certain point, and the apparatus correspondingly adjusted, it is evident that, to avoid incessant adjustment, the original temperature must be maintained.

Thus, to avail ourselves of the advantages experimentally found from heating the solutions, an apparatus for steadily maintaining a high temperature in the electrolyte through several successive days becomes indepensable.

As the electrotype operations are not suspended at night, it is important that the heating apparatus should perform its office for at least twelve hours without supervision or replenishing its fuel; and its action should be sensibly uniform, during all the time, between successive replenishings.

Such an apparatus I have devised, and is now in use. A peck of charcoal furnishes fuel for twelve hours, and maintains 100 gallons of copper solutions steadily, at any required point between 100° and 200°.

With the above arrangement in use, I have made a large reverse or alto, and returned the original to the engraving department in 55 hours from its being placed in my hands. This time included trimming the edges and the preparations to prevent adhesion.

Again recurring to Ohm's formula, the relative value of R to r was once more experimentally found. This gave $R:r::1:4$ or $Q = \frac{1}{1+4} = 0{\cdot}20$, a great improvement as compared with the first determination of $R:r::1:19$, or $Q = \frac{1}{1+19} = 0{\cdot}05$. Having now made r so small compared with R, the size of the battery can be profitably increased until the result is about 0 24. Moreover, using a double arrangement of cells with the double surfaces, for a double effect, we now have $2\left(\frac{1}{1+4}\right) = \frac{2}{2+4} = 0{\cdot}40$. As the relative resistance of the electrolyte becomes now still smaller, we may yet more increase the battery surface, until the result is nearly 0·5.

The electrotype has now ceased to be a mere experiment, uncertain, expensive, and slow. I have lately formed plates of most excellent quality, at the rate of three pounds to the square foot, in 24 hours. This rate will require but two days to form one of our largest plates, having ten square feet surface, and one-eighth of an inch thick.

Actions in the electrolytic solution.—The quality of the deposited metal is governed solely by the relations between the *quantity* of the electricity passing through any solution and the amount of metal the solution contains. The usual supposition is, that the acid of the salt goes to one electrode and the metal to the other, but it is now ascertained that no such mutual transfer takes place; for, while the acid is carried to the positive electrode, the metal is *not* carried to the negative electrode. Hence, however strong the solution on commencing the process, the negative electrode, by abstracting the metal in its vicinity, is soon surrounded with a weak solution. With a simple wire electrode, the exhausted solution surrounding the electrode is readily renewed by mere difference of specific gravity producing a flow. But, with large parallel plate electrodes, this rapid renewal of dense solution becomes impossible, and the electrode is soon surrounded with a weak solution. This state of things must be recognized in adjusting our battery arrangements. Electrotypists not aware of this fact find themselves much perplexed by failing to accomplish with large plates what is so easily done with medals or small plates.

It would, at first sight, appear that, by strengthening the solution of sulphate of copper, a more rapid supply of metal to the electrode would be obtained. Unfortunately, the effect of this is to diminish the solvent capacity of the water in the solution for the sulphate formed on the positive electrode by the action of the transferred acid. The grand essential in electrolysis is liquidity. Thus, if the quantity of free water surrounding the positive electrode be small, this electrode is soon enveloped in a saturated solution, and the newly-formed salt remains undissolved upon it. This salt, being a non-conductor, virtually excludes the electrode from the solution, and thus arrests the current, except when the efflux of saturated solution permits the salt to dissolve, and so re-opens the passage for the currentin irregular quantities. From this spasmodic action result plates of copper-sand, or sometimes copper as soft as lead.

By applying heat to the solution when this state of things exists, the solvent capacity of the water for the salt is increased, rapid diffusion takes place, the salt is carried to the negative electrode, and the exhausted water to the positive electrode; the dormant batteries rush into uninterrupted action, and in a short time a plate is deposited, having all the hardness and elasticity of hammered or rolled copper. Smee's conditions, then, seem to maintain themselves. The electrotypist's axiom of "work slowly," requires to be reversed into "the quicker the work, the better the quality."

Notice of the "Mastodon Giganteus" of Dr. J. C. Warren.*

We have already breifly announced the publication of the magnificent volume on the "Mastodon Giganteus," by the eminent surgeon and scholar, Dr. Warren. Turning aside from the profession which he has honored by his profound knowledge and successful labors, he here enters the arena of Science, and substantiates his claims to a distinguished place among the Zoologists of the age.

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*Description of a Skeleton of the Mastodon Giganteus of North America, by John C. Warren, M.D., &c. 219 pp 4to, with a frontispiece and 27 plates in 4to. Boston: 1852. J. Wilson & Son, 22 School Street.—*Sill Jour.*

Dr. Warren has the rare pleasure of possessing the noblest specimen of the Mastodon Giganteus that has yet been discovered; and fortunate it is for the old mastodon, that it has found a final resting place with one who has had the generosity and ability to raise so munificent a mausoleum to its memory. A second skeleton was afterwards purchased by Dr. Warren. to aid him in his researches; and, for the same purpose, he has also added to his collection the skeleton of an elephant. This elephant—the one accidentally drowned a few years since in the Delaware—stands in his fine hall, by the side of the huge mastodon, and although a large animal of the kind, it is a pigmy in comparison. Dr. Warren was thus well equipped for the prosecution of his researches; and no labor or expense has been spared, either in carrying forward his investigations, or in the publication of his results.

The title page of the volume presents a view of the region near Newburgh on the Hudson, where the skeleton was exhumed. Among wooded hill lies a large morass, part of which in the front of the scene, has been excavated by the removal of the surface peat of the bog, and the subjacent marl, leaving the skeleton as it was found lying sprawling out, with the ribs and nearly every bone in its place. The fore-feet extended beyond the head, and the hinder are thrown forware near the body.

It was in the summer of 1845 that this burial place of the ancient giant was first disturbed. The swampy land was then dry. Mr. Brewster, while digging in the place to obtain the earth for fertilizing his fields in the vicinity, after penetrating through two feet of peat bog, one foot red moss, and a foot of the shell marl, struck upon the head of the animal. The exhumation went on rapidly the next day, and the cranium, "bones of the spine, tail, pelvis and ribs were successively found, for the most part in their natural relation to each other;" and at the end of the second day, nearly the whole skeleton had been exposed. The bones were in an admirable state of preservation. It seems from the position, Dr. Warren observes, as if the animal had stretched out its fore feet in a forward direction, to extricate itself from a morass into which it had sunk.

Even the undigested food of the animal appears to have been partly preserved. Dr. Prime testifies that* "in the midst of the ribs, imbedded in the marl, and unmixed with shells or carbonate of lime, was a mass of matter composed principally of twigs of trees, broken into pieces of about two inches in length, and varying in size from very small twigs to half an inch in diameter. There was mixed with these a large quantity of finer vegetable substance, like finely divided leaves; the whole amounting to from four to six bushels. From the appearance of this and its situation, it was supposed to be the contents of the stomach; and this opinion was confirmed on removing the pelvis, underneath which in the direction of the last of the intestines, was a train of the same material, about three feet in length, and four inches in diameter." The subsequent examination of a portion of this material by Dr. Warren, Prof. Gray, and Dr. Carpenter, supports the opinion here expressed; and both from this case and other examples of exhumed mastodons, it is shown that the mastodon lived on stems or twigs of trees; part of the material found was probably "some kind of spruce or fir."

Such are some of the facts which are here published by Dr. Warren concerning the discovery and food of the mastodon.

In his account of the animal, after his historical sketch, and some observations on the name of the species, he enters upon the description of the various parts of the skeleton, in detail; and excellent lithographic plates illustrate these chapters. One of these plates, of very large size, represents, in admirable style, the entire skeleton. The following are some of the dimensions given:

	FEET.	INCH.
Height of Skeleton,	11	
Length from anterior extremity of face to the commencement of the tail,	17	
Circumference of the trunk around the ribs,	16	5
Length of tail,	6	8
" " trunk,	10	3
" " head from the occipital condyles in a straight line to anterior edge of tusk-socket,	3	2
Entire length of tusk,	10	11
Depth of socket of tusk,	2	3
External length of tusk,	8	8

There are 7 cervical vertebræ, 20 dorsal, 3 lumbar, and 5 sacral. The ribs are twenty in number, 13 true, and 7 false. From the 6th to the 11th their length is between 52 and 54¾ inches. The first has more the appearance of a clavical than a rib, and is 28 inches long. Bearing on the number of ribs, Dr. Warren observes, (p. 31,)

"The last two false ribs on the right side are co-ossified for the space of 8 inches;—the result of a fracture near their vertebral attachments: the union of these ribs, at its broadest part, measures 8 inches. These bones are perfectly smooth within, and without are quite strong, at the place of union and massive. This fracture is of great importance, as by the union is verified the remark of Cuvier, who found only 19 ribs, but stated that there would, in his opinion, be hereafter found twenty—a fact entirely established in this specimen, first by the articular surface on the side of the 20th dorsal vertebræ; and second, by the co-ossification of the 19th and 20th ribs."

After describing the several bones throughout the structure, the author treats at considerable length of the characters of the teeth. Those of the elephant are first described by way of comparison, their number (twenty-four exclusive of the tusks) composition, and form being considered. On taking up the ondontography of the mastodon, the author commences with some general observations, and then proceeds to a minute account of each of the teeth in succession. Omitting the mass of details, we cite the following from his General Remarks, pages 61 and 64:

"While the teeth of the elephant are, as already said, composed of three kinds of hard matter, dentine, enamel, and cement. those of the Mastodon giganteus are constituted principally of two of these substances, dentine and enamel. Prof. Owen has shown that a layer of cement invests the fangs, and is spread over the crown, but the basis of the crown and of the fangs is formed by the dentine; while in the teeth of the elephant, and some others of the Pachydermata, the cement, by it perpendicular interspersed layers, constitutes a substantial part of the body of the tooth, as well as a protecting covering to its surface. A great portion of the Mastodon tooth is formed by dentine. The maxillary eminences, or mastoid projections also have a basis of the same substance, but they are invested with a covering of enamel, which in molar teeth in my possession, measures from the sixth to the fourth of an inch in thickness. In teeth which have been worn, the enamel is ground down in various degrees; thus altering the surface of the crown to an appearance approximating, in the Mastodon giganteus, to the lozenge-shaped ridges of the African Elephant.

* * * * * *

The number of the teeth was long involved in mystery. The genius of Cuvier opened the way to a knowledge of their number, differences and developement. He advanced no farther in

* p. 144.

the path he had opened than to the fourth, or, at the utmost, fifth tooth; making the whole number to be from sixteen to twenty, exclusive of the great incisors or tusks.

In 1831, Dr. Hays, the distinguished editor of the 'American Journal of the Medical Sciences,' read a paper before the American Philosophical Society, in which he described various jaws of the Mastodon giganteus, and the teeth contained in them. He seems to have been the first writer who clearly pointed out the probability that the number of *these teeth was six on each side of* each jaw in the Mastodon giganteus, and of course the whole number twenty-four. He says 'the whole number of teeth possessed by the animal described by Dr. Godman, (Tetracaulodon) is then at least twenty; and we think that it is at least probable, that the animal possessed an intermediate tooth between the second tooth with three denticles, and that with four denticles. Should we be correct in our views, this animal possessed three teeth with three denticles in each side of each jaw, making the whole number of teeth twenty-four; but to render this certain would require specimens of intermediate ages, to those hitherto described.' These have since been obtained, and have fully confirmed the opinion suggested by the sagacity of Dr. Hays. In the collection of the Cambridge University, there is a series of jaws affording a perfect demonstration of this fact, and settling the number to be twenty-four. Professor Horner, in a paper read to the Philosophical Society, thought that there might be a greater number. De Blainville makes them twenty-four.

The specimens in the collection of the American Philosophical Society, those of Cambridge University, various others in New-York, Albany, and in my private collection, support the opinion hat the number is twenty-four, and no more.

The teeth are not all developed at the same time, but in succession, in proportion to the waste of those which have preceded. At first appear two small deciduous teeth, or milk molars; next follows a third tooth, also deciduous, larger and more complicated than the former; then a fourth tooth, of the same form as the last, though greater in size. These four teeth sometimes co-exist, as in the Tetracaulodon's jaw, from the museum in New York, originally described by Dr. Godman, and afterwards more particularly described and represented by Dr. Hays in the 'Transactions of the American Philosophical Society,' vol. iv. To the teeth already mentioned succeeds a fifth tooth, of the same form as the last, but rather longer. Before the appearance of this, and even in most cases before the fourth tooth shows itself, one or more of the first teeth have disappeared. The sixth and last tooth is much larger, and formed in a mould different from any of the others."

The plates represent in a beautiful style the dentition of several skeletons, exhibiting the jaws and teeth of different ages.

The *tusks*, which are *incisor teeth*, enormously developed, are treated in the following chapter, as follows, pp. 87—90:

"Besides the regular intermaxillary tusks, there are two very small ones, which show themselves in the upper jaw at the earliest period of life but shortly disappear and are succeeded by the permanent tusks. This is shown by cutting into the tusk-socket of our calf elephant head. The fact well established in regard to the elephant, seems to afford presumption, that besides the great intermaxillary tusks of the Mastodon, there may be others in the upper or lower jaw, which appearing at an earlier period of life, are, in the greater number of instances, lost before the animal has advanced far in its existence.

In the present specimen of the Mastodon, there are two tusks in the upper and one in the lower jaw on the left side. Two undoubtedly existed in the lower jaw, at an early period of life, as the relic of the right cavity is perfectly distinct, retaining a depth of an inch and a half, and nearly its original diameter.

The Superior Tusks.—The tusks of the upper jaw were ten feet and eleven inches long; but being broken soon after exhumation, only the anterior termination of each (in length about four feet and in diameter at the truncated extremity five inches) remains in a perfect condition. The middle portion, rather more than two fee' has crumbled. The posterior portion, of about the same *length with the anterior*, is broken into laminæ; it is flattened at the base, so as to be half an inch longer in one diameter than in the other, making the largest seven inches and a half. The bases are surrounded externally by circular elevations, at first two inches distant from each other, but gradually increasing in distance, until, at about two feet from the extremities of the bases, they disappear entirely.

The tusk is composed of laminæ which at the internal extremity of the socket, are not more than a line in thickness.—These laminæ increase in number as we advance from the butts, so that where the tusk issues from its socket at the distance of rather more than two feet from the posterior extremity, the internal cavity has diminished from seven inches in diameter to two by two and a half. The plates into which the tusk has separated in drying are generally an eighth of an inch in thickness, some of them nearly an inch. The external surface has a brown appearance; the layers which have been recently uncovered are of a lighter color.

The following analysis of a portion of the tusk has been kindly furnished me by Dr. Chas. T. Jackson:

Animal mattter (cartilage),	26·2
Phosphate and carb. of lime, fluorid of calcium, &c.,	69·2
Water	4·6
	100·0

Glass was etched with the fluorine. The constituents of the tusk are phosphate of lime, carbonate of lime, fluorid of calcium phosphate of magnesia, soda. sulphur.'

The laminæ at the anterior part of one of the tusks, which is, best preserved, are superficially not more than half a line in thickness; they are divided or split by longitudinal fissures about three-fourths of an inch apart; and they present none of the circular marks seen at the posterior extremity. The point anteriorly is worn away for the space of two inches on one side, as is generally found to occur in the tusks of the proboscidian family.

When the tusks were first discovered, they lay with their convexities outwards, their points approaching each other; having apparently turned in their sockets after the soft parts which retained them were decomposed so as to loosen their attachments. For the weight of the head inclined the butts downwards, while the resistance of the marl on their inferior and internal sides would give a rotary motion outward and upwards to a definite extent. In this direction they were placed by Dr. Prime, who had an opportunity of observing them in their original position in the embedding marl. Although the extremities of the butts are somewhat oval, the greater size of their sockets owing to the decomposition of the soft textures which lined them, would readily admit the butts of the tusks to be placed in any direction; and considering the apparent inutility and the remarkable anomaly of the position before mentioned, we thought it right to change their opposing aspect to one more consonant with the character and attitude of the skeleton.

The Inferior or Mandibular Tusk.—The small mandibular tusk has been brought into notice of late years by Dr. Godman, who considered it as characterizing a new species, to which he gave the name of Tetracaulodon, as will be shown hereafter. Professor Owen has attached a new importance to this tusk, as one distinctive character between the genus Mastodon, and the genus Elephas; a distinction which M. de Blainville, Dr. Falconer and others, have been willing to pass over. But hitherto, so far as we know, the existence of this part in the elephant has not been discovered; while it is perfectly established in regard to the principal species of Mastodon, the Mastodon giganteus, and Mastodon *angustidens*. So long as this fact remains uncontroveried, we should consider it, taken in connection with other facts, as forming an impassable boundary between the two families.

This tusk is eleven inches long, five and a half in circumference, and two in diameter at the base; being longer by an inch than the cast of a similar one in the collection of the American Philosophical Society, which was taken from the specimen originally described by Dr. Godman, and disinterred by Mr. Archibald Crawford near Newburgh. The direction of our tusk is forward and downward, forming an angle with a horizontal line of about 45°. It has a cavity an inch and a half in diameter at the internal extremity, the thickness of the edge being one-fourth of an inch; this cavity is of a conical form, and two inches deep. The rest of the tusk appears to be solid. The anterior extremity is rounded and about an inch in diameter; on one side it has been worn away to the extent of four inches. The worn surface is smooth at its extremity only, the rest being quite rough; the depth of the external layer is exposed in this abrasion, and exhibits the thickness of an eighth of an inch. Near the posterior or internal extremity are seen a number of circles, to the amount of ten or eleven, extending from the base, to two or three inches forward, and occupying that part which lay in the socket. The surface of the tusk generally exhibits longitudinal striæ, in some of which, cracks begin to appear from desiccation. These striæ are distant from each other from a fourth to an eighth of an inch. The color of the tusk is brown, excepting three inches of its anterior extremity, which are nearly black. At the fissures it is seen to be composed of laminæ about the sixth of an inch in thickness. It is perfectly firm and free from any marked evidence of decomposition."

Dr. Warren mentions more or less fully and figures other Mastodon skeletons found in the United States. Plates 16, 18, 19, are devoted to the Shawangunk head found at Scotchtown, Orange Co., New York, which is particularly described. The size of this head is not exceeded by that of any other hitherto discovered. Its greatest breadth is 31 inches, its vertical elevation 33¼ inches, and the length from the ridge of the occipital plane to the extremity of the intermaxilary bones, is 48 inches.

The characteristics of some other species of Mastodon occupy several pages of the work; and the so-called *Tetracaulodon* is recognized as the male of Mastodon giganteus.

The work closes with a dissertation on the food and supposed discovery of hair of the M. giganteus, and on its geological situation and causes of preservation. The author states that of the five skeletons known at this time, three have been found in the fresh water marshes of Orange Co., N. Y., a fourth in an interior morass in New Jersey, and the fifth near the banks of the Missouri, probably in a fresh water deposit. Scattered bones are common from various parts of the country, and even from the far north. They are reported from the surface soil, peat marshes, beds of marl or loam, etc.; but, as Lyell observes, there is yet no satisfactory evidence of their occurrence beneath the proper drift.

The North American Mastodon bones hitherto found appear to belong to the same species, excepting a single tooth, reported from Caroline County, Maryland. Dr. Warren enters into the history of this tooth, discusses the possibility of its being a stray tooth from another continent, and concludes that it is what it purports to be, a true Maryland fossil, closely related to the Mastodon Humboldtius (or M. *angustidens* if the two are one), of South America, if not identical with it.

An Appendix contains various facts of interest, and among them a description of a specimen of the Mastodon angustidens found near Turin, (called the Dusina Mastodon), taken from Sismonda's "Osteografia di un Mastodonte angustidente," published at Turin, in 1851.

CORRESPONDENCE.

The letter of a "Member of the Canadian Institute," which we publish below, together with a plan of the City Frontage on the Bay, are worthy the attention of those interested in the long talked of Esplanade project. We have not been favoured with a knowledge of the plan contemplated by the City authorities, and cannot therefore say how far the one proposed by our Correspondent may agree with it; but are of opinion that although our Correspondent's ideas may to many appear somewhat chimerical, and especially so to interested parties, yet the plan he proposes may certainly form a basis for a general arrangement highly advantageous not only to the City at large, but also to the Railway Companies. We would especially direct attention to the proposed manner of passing from the streets to the wharves *over* the Railroad tracks, thereby completely avoiding the accidents so common at level crossings on crowded thoroughfares, and infinitely increasing the facilities for business. This part of our Correspondent's plan would effect a similar object to that which it is costing the Great Western Roada, very heavy outlay to accomplish through the City of Hamilton.

We are greatly indebted to Mr. Scobie for permission to transfer a portion of his excellent map of the City as an illustration of our Correspondent's letter.

Railway Termini and Pleasure Grounds.

To the Editor of the Canadian Journal.

SIR,—Believing that one object of your Journal is to facilitate the dissemination of information relating to the public improvements of the Province, and that the Society, of which it is the official organ, is established, if not chiefly, at least to a certain extent, for that purpose. I have little hesitation in addressing you on a subject already exciting some attention in Toronto, viz.: "The Railway Termini and improvement of the water frontage of the City"; and if you should consider that the scheme propounded contains any suggestions which may be of value to those who have the carrying out of these improvements, or the subject matter of importance sufficient to enlist the attention of your readers generally, it may probably be not unworthy of a place in your columns.

The water frontage of Toronto, extending over a length of from 2 to 3 miles, and up to the present time almost unoccupied, is now about to be used for Railway purposes. Adjoining thereto, and extending about ¾ of a mile along the south side of Front Street, immediately to the east of the Old Fort, a tract of land averaging in width about 100 feet, was some years ago reserved for the public as a promenade or pleasure ground, which Reserve is also being appropriated by the Railway Companies for their own use.

Much has lately been written, and far more has been said, regarding the occupation of the water frontage by the Railway Companies, and the appropriation by them of the above mentioned Reserve—one party advocates the conversion of every foot of ground now lying waste into "track," "brick and mortar"—another party, with more concern for the healthful recreation of future generations than the convenience of the present, insists on these Reserves for pleasure grounds being retained for the purpose they were originally intended to serve. But the question is not whether the portion of ground referred to should or should not be used in the manner proposed; for the Railway Companies are empowered by their charters "to enter into and use these lands or such parts of them as may be necessary for the making and maintaining of their works," and the fact that the use intended to be made of these lands, may probably be *most* conducive to the public weal, is a mere accidental or extraneous circumstance; the lands would not be so used unless it was believed by these Companies to be conducive to their own interests.

All must admit, however, that the interests of the public and of the Railway Companies are *one* in the most important particulars, and that every facility should be afforded them in endeavouring to establish their works at the most suitable points; but if in so doing it be found expedient that these public grounds should be peaceably surrendered for the purposes of business—the life and soul of all commercial cities—it ought not to be forgotten that posterity has some claim on the representatives of the public at the present day, and surely some effort should be made, before it is too late, to provide breathing space for those who come after us. The great demand for building space, the rapid filling up of that which is vacant, and its consequent increasing value, will, in a very few years, make it next to impossible to open up grounds such as are provided for the adornment of older cities, and considered not only beneficial, but necessary for the recreation, amusement and instruction of the masses. It will, indeed, be a reproach, if within the limits of the City of Toronto, comprising an area of six square miles, and which half a century ago was just emerging from the wilderness, a few acres be not set apart and held inviolable for these purposes.

Again, without one general plan subscribed to by all parties concerned, it is not quite clear how the location of the various Railway Termini can be otherwise than fraught with litigation, inconvenience, and even difficulties of an engineering character;—the first has already commenced, but the last is in store for the future, and will, doubtless, along with the first increase in a ratio proportionate to the number of Railways from time to time constructed. In proof of which, we have only to observe what is now taking place, and what may probably follow. The Directors of the first Railway constructed take possession of the most eligible part of the water frontage, make wharfs, erect buildings, and lay down tracks leading thereto; the 2nd Railway secures space sufficient for its Terminus, but in reaching it, has to pass through the grounds of the 1st.; the 3rd Railway, with some trouble and much expense, procures length and breadth for its wharfs and buildings, but in approaching thereto has to cross the tracks and cut up the arrangements of the 1st and 2nd.; and so also with the 4th and 5th Railways constructed to the water frontage, either forced to pass along the public streets to the only available positions left, or crossing and re-crossing the tracks previously laid, and interfering with the terminal arrangements of other Railways.

The disadvantages of such a course of proceeding may be summed up in a few words:—Making and unmaking works of a costly character (reckless expenditure); crossing and re-crossing of the tracks of the various Railways, (increased chances of collision); innumerable level crossings, (danger to foot passengers and horse-vehicles); Termini improperly connected with each other, (inconvenience to travellers); and destruction of pleasure ground reserve without giving an equivalent in kind, (probably expedient, but not desirable):—all of which may be obviated by adopting in good time a plan of arrangements on a scale commensurate with the prospective business of the City; and although many years may elapse before its entire completion, yet each part could be made in accordance therewith, and in such a way as to form a portion of a grand whole.

The accompanying plan, briefly described underneath, will show how easily extensive arrangements could *now* be made without interfering with existing structures, while delay of even a few months would, to say the least, make the carrying out of any general plan a matter of some difficulty. It is unnecessary to trouble you at present with the financial portion of the scheme, or the manner in which the private holders of water lots could be fairly dealt with, since this is a matter for careful consideration and legislative enactment. That the plan proposed, embracing a space of from 250 to 300 acres, devoted chiefly to Railway terminal purposes, and shipping, will be considered by some persons far to extensive or even utopian, is not unlikely; but knowing the lavish expenditure and embarrasment which too restricted arrangements have caused in other places, and seeing the almost magical advancement which the city is now making, I venture to say, that without some comprehensive scheme, more money will eventually be sunk, directly and indirectly, than might be required to carry out step by step to completion, any plan however extensive or however costly.

It is proposed to set apart a strip of land throughout the entire length of the City, of a width sufficient to accommodate nine Railway tracks, to be level with the wharfs, to be crossed only by bridges, and to be used solely as a Railway approach and for Railway connections

Front Street straightened as shown on the plan, to be converted into a Terrace above the level of, and separated from the "Railway approach" by a retaining wall and parapet, to be 120 feet wide, and planted with rows of trees throughout its whole length.

The entire area south of the Front Street Terrace to be on the wharfage level, and reached by slopes from the bridges. The bridges may be of iron, of a simply ornamental character.

The space to be set apart for each of the Termini to be determined by the Government, the Corporation, and the agents of the Companies; the manner shown on the plan being, of course, merely arbitrary.

Each Railway to have its own particular tracks on the Approach, with sidings to the various Termini for the purpose of forming connections.

The number and size of the "slips," and the detail generally of each Terminus being governed by the requirements of the Companies, to be designed and carried out by them in accordance therewith, it being only requisite that the piers do not extend beyond certain defined limits.

It is also proposed to reserve certain portions (to be under the surveillance of the City Corporation) for the landing of steamboats unconnected with the Railroads, for private forwarders, for Baths and Washhouses or for general public service; the places allotted for this purpose on the plan, are situated at the foot of York and Yonge Streets and at the rear of the St. Lawrence Hall, and are named respectively the "Niagara," the "City," and the "St. Lawrence Basins."

No localities are better adapted for extensive arrrangements of this character, and at no future time will it be possible to carry out any general plan at so little cost, since few erections of any consequence now exist, and none need at present be interfered with. All the Railways would have free intercourse with each other, without a single level crossing. And a grand terrace, perfectly straight for upwards of two miles, planted with trees, like the "Paseo" of Havana, would be more than an equivalent for the pleasure ground reserve taken from the public for other purposes. From this terrace the fresh breezes from the lake might be enjoyed—the arrival and departure of shipping, and the marshalling and moving of trains viewed by the young and the old without fear of danger.

While contemplating improvements on so grand a scale, the selection of a site to be dedicated to a great Public Building should not be lost sight of,—I refer to one which even now the want of is felt, viz:

"The Canadian Museum," for the formation of which the Canadian Institute is making strenuous exertions,—and also a permanent home for that Society. The very best situation would doubtless be on the vacant space at the intersection of Yonge Street, with the Grand Terrace, (where the Custom House and Soap Factory now stand) or south of the Railway tracks facing the bridge from Yonge Street, as shown on the plan. There can be no good reason why the building should not be sufficiently extensive to include a Merchants' Hall and Exchange under the same roof, or offices for Telegraph Companies, Brokers, &c., in its basement—or why it should not be as ornamental and imposing as its central position would require, or the purpose of its erection demand.

It is unnessary to advocate farther the adoption of some general plan acceptable to all concerned, and suitable to the wants and wishes of the public, for the advantages must be evident and manifold. There would doubtless be considerable difficulty in bringing to a satisfactory issue, a matter involving so many different interests,—but by the union of the City Authorities with the various Chartered Companies and the appointment of a Board of Directors from among each to carry out a plan suited to their common interests the most beneficial results would be produced and instead of each acting independently of the other, and adopting various and conflicting regulations, a bond of union would be thoroughly cemented between them and plans might be matured and carried out, on a scale so extensive and so perfect as would be one of the greatest—the very greatest characteristic of Toronto.

A MEMBER OF THE CANADIAN INSTITUTE.

The Grand Trunk Railway Company.

Appendix to the Prospectus.

The Grand Trunk Railway of Canada, with the Atlantic and St. Lawrence Railway of Maine, 1,112 miles in length, with an uniform gauge of five feet six inches, as now brought under the notice of the British public, offers the most comprehensive system of railways in the world. Protected from the possibility of injurious competition, for nearly its entire length, by natural clauses as well as by Legislative enactment, it engrosses the traffic of a region extending 809 miles in one direct line from Portland to Lake Huron, containing a population of nearly three millions, in Canada, Vermont, New Hampshire and Maine. At Portland it connects with the system of railways reaching eastward towards the Province of New Brunswick, and hereafter to Halifax in Nova Scotia, as well as southward, by lines already existing to Boston and New York. At the frontier of Canada it again unites with other lines to Boston and the great manufacturing districts of New England. From Richmond it runs eastward to Quebec and Trois Pistoles, 253 miles, giving direct access to the great shipping port of Canada in Summer, and hereafter by rail to the Atlantic at Halifax by Trois Pistoles and Miramichi, forming the only route to the great fisheries of the Gulph of the St. Lawrence, and the eastern timber, coal, and mineral district of New Brunswick. At Montreal it again meets three railways now in operation between Boston and New York. At Prescott it receives the tributary line from Bytown and the west timber districts of the Ottawa, sixty miles, now in course of early completion; and on the opposite side of the St. Lawrence, the Northern New York road to Ogdensburgh will pour its stream of passenger traffic upon the Trunk Line. At Kingston the Rome and St. Vincent railroad, also from New York, becomes its tributary. From thence to Toronto it receives the entire produce of the rich country North of Lake Ontario, through the channel of Belleville and Peterborough branch, and several other new lines already in progress to construction, and all tributary to the Main Trunk Road. At Toronto, the Ontario, Simcoe, and Huron Railroad, 100 miles, now nearly finished, pours in the traffic of the region around Lake Simcoe and Georgian Bay. At the same point is also met the Great Western Railway by Hamilton to Detroit, 210 miles now in a forward state of completion, by which communication is had with the southern part of Western Canada, as well as with the Railways in operation from Detroit to the States of Michigan, Illinois, and Wisconsin.

From Toronto, westward, the line passing through the heart of the western Peninsula of Canada, ensures to the Grand Trunk the exclusive traffic of the finest part of the Province; while at its terminus at Sarnia it debouches at the very outlet at Lake Huron, avoiding the shallows of the Detroit and St. Clair Rivers below—a point the most favorably situated for the navigation extending through Lakes Huron and Michigan, and hereafter through Lake Superior. At Sarnia, the American railroads now in course of construction place the Grand Trunk Line in the most direct communication with the arterial line to the Great Western and the Mississippi, a region whose advance in population and wealth has been regarded as almost fabulous, and yet whose resources are still very partially developed; while the traffic of the copper and iron districts of Lake Superior, the most valuable and extensive in the world, with the coal of Michigan, will accumulate on the railroad at this point, reaching ocean navigation at Montreal in much less time and by the same milage that it can now pass by boat to the waters of Lake Ontario, 350 miles above that city.

The Grand Trunk Railway of Canada, it will therefore be seen, commencing at the debouche of the three largest lakes in the world, pours the accumulating traffic in one unbroken line throughout the entire length of Canada, into the St. Lawrence and Quebec, on which it rests on the north, while on the south it reaches the magnificent harbor of Portland and St. John's on the open ocean. The whole future traffic between the western regions and the east, including Lower Canada, parts of the States of Vermont and New Hampshire, the whole of the State of Maine, and the Provinces of New Brunswick, Nova Scotia, Prince Edward's Island, and Newfoundland, must therefore pass over the Grand Trunk Railway.

This great and comprehensive scheme of railway communication throughout the most wealthy, populous and important colonial dependency of Great Britain, is not now offered as a new project to the public. It comes with the guarantee of the Province of Canada, which has embarked upward of two millions sterling in the enterprise; it is supported by the most intelligent, far-sighted men in the colony; and it has the security of nearly half a million sterling of private Canadian capital invested therein, while a conviction of the great benefits of unanimous action has provided a combination of railway interests probably never before seen, and ensuring such an energetic and harmonious working of the entire line, as cannot but produce the most satisfactory results.

The Grand Trunk Railway does not rest for its success altogether on anticipations. The entire section from Portland to Montreal, of 290 miles, is now in operation for 250 miles, and will in July next be fully connected, making the shortest and most easy communication between the River St. Lawrence and the Atlantic Ocean. This part of the line forms in itself a complete railway, opening up an entirely new channel for the Western trade, and giving an outlet in winter for the produce of Eastern Canada as well as that of Western Canada east of Kingston. The line from Quebec to Richmond brings Montreal and Quebec within six hours of each other, and opens to those cities the most direct access to the ocean at Portland, Boston and New York, passing through a most populous and fertile part of Eastern Canada. To Montreal, until the completion of the western section of the Trunk Line, the produce of the countries surrounding the great lakes is brought through the most magnificent inland navigation in the world; and the opening of the line to Portland at once secures the supply of the markets of Maine, New Brunswick, and Nova Scotia with bread-stuffs, receiving in return, viz: Portland, British and American manufactured goods, West Indian produce, &c. The lines from Montreal to Portland, and from Richmond to Quebec, already known as the St. Lawrence and Atlantic and Quebec and Richmond Railways, will be in full and continuous operation in the course of the present summer, comprehending 390 miles of railway, for which the capital has been entirely provided with a very small exception. The receipts on 72 miles in Canada, from the mere local business, from the first twelve months from their opening on the 20th of October, 1851, were £31,000. On 91 miles of the line from Portland, now under lease, were, for the same period, £38,000. Assuming the same rate per mile on the entire distance of 390 miles, a gross income of £172,300 will be at once obtained from local business; while the total traffic, if estimated by the receipts per mile of the Ogdensburgh road, £25 per mile per week, the latest American railroad offering any parallel, will amount to a sum of £507,030, independent of the great future development of the country opened up by the line. It may be assumed that the revenue of the Company, from the sections to be completed in 1853, will not fall short, at once of 301,230 per annum, net, allowing 50 per cent. for working expenses, and deducting £60,000 for lease of Portland line, would leave *nearly equal to the charge for the entire mortgage debt of the Company, and thus from actual present earnings securing to the bondholders their interest on all the capital intended to be raised by debentures.*

It is proposed simultaneously with the construction of the railroad westward, to proceed with the bridge over the St. Lawrence at Montreal. A work of this stupendous character, required to span a navigable river of two miles in width, can only be undertaken by a large combined capital, and is justified by its paramount importance. The site selected is at the sole point of the river St. Lawrence, from the great lakes to its mouth, where a bridge can be placed without interfering with the navigation. And also at that point no less than 1,595 miles of continuous railway, now in operation with a very insignificant exception, from New York, Boston, Portland and Quebec, arrive on the south shore of the river opposite to Montreal, a city containing 60,000 inhabitants. On the northern shore, the railways either in progress or completed, including the western section of the Grand Trunk, number already 967 miles exclusive of projected lines. The completion of this link is essential to the satisfactory and economical working of the Grand Trunk Railway; and it has therefore been incorporated with the entire line. It will be constructed according to the plans and under the superintendence of Robert Stevenson, C. E., (who is about to visit Canada for this purpose,) and Alexander McKenzie Ross, Esq., C. E., and the structure will be of that substantial character which a work of such magnitude requires.

For the bridge an ample allowance of capital is made and the work has been provisionally contracted for with Messrs. Peto, Brassey, Betts and Jackson, on the estimate framed by Messrs. Stevenson and Ross. The Act authorizing the construction of this bridge by the Grand Trunk Railway Company, is now in progress through the Canadian Parliament, under the sanction of the Government.

The western section of the Grand Trunk Line extends from Montreal to Toronto, 315 miles, and from thence to Sarnia, 172 miles. Contracts have been executed, with the approval of the Government and the Board of Railway Commissioners in Canada, with the eminent English contracting firm of Messrs. Peto, Brassey, Betts and Jackson, for the construction of the section to Toronto, 315 miles, from Quebec and Trois Pistoles, 155 miles; and the Grand Junction, 50 miles; and with the Canadian contracting firm of C. S. Gzowski & Co., and from thence to Sarnia, 175 miles.

The conditions of these contracts are for the construction of a first class single track railway, with the foundations of all the large structures sufficient for a double line, equal in permanence and stability to any railway in England, including stations, sidings, workshops, ample roling stock, and every requisite essential to its perfect completion, to the satisfaction of the Canadian Government.

By means of the arrangements entered into with the contractors, the proprietors of the Grand Trunk line are assured that, for the capital stated they will secure the delivery of the whole railway, fully equipped and completed in every respect, and free from any further charges whatever.

The western section of the Grand Trunk commences at Montreal, and proceeds westward through the towns and villages of Lachine, St. Clair, St. Anne, New Longueil, Lancaster, Charlottenburgh, Cornwall, Osnabruck, Williamsburgh, Port Hope, Bond Head, Bowmanville, Whitby, Pickering, Scarboro' to the City of Toronto, which city contains 36,000 inhabitants.

At Toronto it meets the Great Western Railway, leading through Hamilton and the southren parts of the western peninsula of Canada to Detroit; a connection, of which the value may be judged from the favorable position in which the Great Western Railway of Canada now stands in London. This line itself forms a continuation of the Trunk line, although under a different company, for 210 miles, now approaching completion. The Trunk road also here connects with the Northern Railroad to Lakes S[illegible] and Huron, 90 miles, to be finished during 1853.

This section occupies the important position of connecting the chief emporia of Eastern and Western Canada, the cities of Montreal and Toronto, numbering together nearly 100,000 inhabitants, besides passing through the towns already enumerated; and it also passes through its entire length, through the most populous and cultivated district of the Province.

The section west of Toronto to Sarnia passess through the towns and villages of Weston, Brampton, Georgetown, Acton, Rockwood, Guelph, Berlin, Peterburg, Hamburgh to Stratford, where it is intersected by a proposed line from Goderich, 45 miles (for which £125,000 has been already raised by municipal subscription), thence through or near Downie, Fullarton, Blanchard, Usborne, Biddulph, Bosanquet, Warwick, and Plympton, to the outlet of Lake Huron, and the western extremity of the Province at Port Sarnia; the whole course of the line being through the finest section of Western Canada, a district already peopled, and most rapidly advancing in population and wealth.

It will therefore be seen that the western section of the Grand Trunk Line, in its connexions, embraces the whole of Canada West, a district of 32,000,000 of acres, with a population doubling itself every ten years, and which, with a limited exception, must find in the Grand Trunk Railway their speediest, most direct, and cheapest intercourse; having neither local railroads nor canals to compete with.

The route traversed by the Grand Trunk Railway and its tributaries will be found set forth in the accompanying map.

That portion of the Great West, situate at the western extreme of the basin of the St. Lawrence, has received a larger share than any other portion of the country of the valuable addition to its riches, arising from the industry, intelligence and wealth of the hundreds of thousands who, within a comparatively brief period, have migrated to these regions.

Independent of the local traffic peculiar to this section, both in passengers and goods, through traffic of more than ordinary extent, consequent on its geographical position, may be safely calculated upon.

Not the least important branch of traffic will arise from the ocean steamers communicating with England, making Portland, and hereafter, Halifax, the port of embarkation, as the nearest and most accessible on the continent of America.

A further and important consideration in connection with Portland, St. John's and Halifax, is that the navigation never being closed by ice, produce may on the completion of the Grand Trunk Railway, be shipped there when otherwise there would be no ready means of forwarding it to Europe.

Thus, with the exception of that portion through Nova Scotia to the port of Halifax, (about 150 miles,) the entire length of 1,100, both by the southern route through the State of Maine, and by the northern route by Trois Pistoles, is for a great part in course of construction, and the remainder will be shortly commenced under highly favorable auspices, the immediate prosecution of that portion through Nova Scotia being now under the consideration of the government of that province whose future interests are so largely compromised in the speedy and perfect completion of the project, as to ensure their best and strenuous efforts for its early accomplishment.

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*The Darien Ship Canal.**—We have now before us the "Journal of the Expedition of Inquiry," of Mr. Lionel Gisborne, C.E., the Atlantic and Pacific Junction Company's Engineer, with his report in full, just published by Saunders and Stanford, Charing-cross. The almost entire absence of any correct knowledge of that narrow neck of land which unites the two Americas, except what has been left us by the historians of the buccaneers of the sixteenth century, the difficulties of internal exploration, the hostility of the few remaining aboriginal Indians, the attractions offered to enterprise and the introduction of capital, from its reputed mineral wealth, and the short distance for uniting the two great oceans, render every information from actual description of personal research of the most interesting kind. It appears certain that, up to the period of Mr. Gisborne entering on his expedition, only one European (Dr. Cullen) had ever crossed the Isthmus of Darien; but there appears no doubt that there exists more than a single locality in this uncivilised tract where inquiry is likely to be rewarded with success; and Humboldt himself, after devoting half a century to the study of Central America, felt thoroughly satisfied that the Isthmus of Darien is superior to any portion of the entire neck for a canal. Travelling through a tropical climate, left entirely in a state of nature, it can easily be imagined is a task beset with difficulties and dangers; and throughout Mr. Gisborne's journal it is made tolerably clear that he has not been exempt from the common lot. We are happy to find, however, he has accomplished his task, returned in safety and in every point he corroborates the views of Dr. Cullen, as to the practicability of a ship canal without locks, as proposed by Mr. John Henderson; and that the Isthmus of Darien is the only point where it can be successfully carried out. In the commencement of the volume the author shows that all writers hitherto on the Isthmus are not to be relied on, appearing to vie with each other in a series of contradictions; their observations generally being totally inconsistent, breathing an obstinate and one-sided view, and their information being not founded on personal knowledge, but mere report. He then describes the several other projected routes, exposes their total impracticability, and endeavours to prove, of which we think there is little doubt, that a ship canal may be completed, at the part of the Isthmus pointed out by Dr. Cullen, 30 ft. deep at low water, 140 ft. broad at bottom, and 160 ft. at low water surface, and cut through from sea to sea a perfectly open channel, through which steamers may proceed at all times, and sailing vessels either go with the current, which will flow alternately each way, or be towed by steamers. With respect to a navigation with locks, of which Mr. Gisborne has given an estimate of £4,500,000 instead of £12,000,000, it is to be decidedly objected to, as, however well constructed, no care can guard against accident or neglect, which may obstruct the whole transit for months. Delay and risk there must be where such enormous machinery is worked; and there cannot be a doubt but shipowners would rather pay a higher toll to pass direct

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* Mining Journal.

from ocean to ocean, than run the risk, and incur the delay, of lock navigation. The volume throughout contains valuable information as to the climate and character of the country; and although the author occasionally indulges in a jocular humour hardly compatible with so commercially grave a subject, it is written in a racy and amusing style; while it conveys a tolerably clear idea of the habits of the few aborigines he met with; the products and capabilities of the country; the difficulties to be met with and surmounted; and more particularly the world-wide advantages which will accrue on the completion of this grand enterprize, for the accomplishment of which the author was sent out to make the necessary surveys. The enormous benefits to the shipping interest; the increased number of distant voyages which could be made; and the facilities afforded to commerce generally by the construction of the Darien Ship Canal, will, we have no doubt, instigate the sympathies of all, and insure the most influential support; and looking back to what has already been effected by the engineers who are taking the initiative, we leave it in good hands, and have no fear of the result.

SCIENTIFIC INTELLIGENCE.

Belcher's Artesian Well, in St. Louis, (from the St. Louis *Republican.*) —Allusion was made a few days since to the progress of the Artesian well that Mr. Wm. H. Belcher is sinking in the upper part of the city to supply his extensive sugar refinery with other than limestone water, which only can be found by the ordinary channels in this vicinity. The well, which we think was commenced early in the year 1849, has now attained the great depth of 1599 feet. The boring still progresses without intermission, night and day, the hands, six in number, relieving one another by regular watches. The iron "sinker," with which the drilling is effected, is 34 feet in length, 2½ inches in diameter, and between 700 and 800 pounds in weight. It is attached to poles, severally about 30 feet long, that are screwed to each other to extend to the full depth of the well. The whole is moved by a "doctor," worked by the boilers used for the refinery engines. Several veins of impure water have been struck in the course of the excavation, to rid the well of which, a pump, also worked by the "doctor," is constantly in operation. At the present depth of 1590 feet a pretty copious stream of sulphur water issues from the well. The water has the taste precisely of the Blue Lick water in Kentucky, though perhaps not quite so strongly impregnated with sulphur. We have obtained from the gentleman who superintends the boring, an exhibit of the different strata through which it has passed. The statement possesses sufficient interest for publication:

1st, through limestone, 28 feet; 2d, shale 2; 3d, limestone 231; 4th cherty rock 15; 5th, limestone 74; 6th, shale 30; 7th, limestone 75; 8th, shale 1½; 9th, limestone 38½; 10th, sandy shale 6½; 11th, limestone 128½; 12th, red marl 15; 13th, shale 30; 14th, red marl 50; 15th, shale 30; 16th, limestone 119; 17th, shale 66; 18th, bituminous marl 15; 19th, shale 80; 20th, limstone 134; 21st cherty rock 62; 22d, limestone 138; 23d, shale 70; 24th, limestone 20; 25th, shale 56; 26th, limestone 31; white soft sandstone 15 feet.

The well was first commenced, we understand, as a cistern. From the surface of the ground, where it is fourteen feet in diameter, it has a conical form, lessening at the depth of thirty feet to a diameter of six feet. Thence the diameter is again lessened to sixteen inches, until the depth of 78 feet from the surface is attained. From that point it is diminished to nine inches, and this diameter is preserved to the depth of 457 feet. Passing this line the diameter to the present bottom of the well, is three and a half inches.

The lowest summer stand of the Mississippi river is passed in the first strata of shale, at a depth of twenty-nine or thirty feet from the surface. The water in the well, however, is always higher than the water line of the river, and is not affected by the variations of the latter. The first appearance of gas was found at a depth of 466 feet, in a stratum of shale one and a half feet thick, which was strongly imbued with carbonated hydrogen. When about 520 feet below the surface of the earth, at the beginning of a layer of limestone, the water in the well became salty. The level of the sea—reckoned to be five hundred and thirty-two feet below the City of St. Louis—was passed farther in the same layer; two hundred feet lower still, in a bed of shale, the water contained 1⅞ per cent of salt. At a depth of 950 feet a bed of bituminous marl, 15 feet in diameter, was struck. The marl nearly resembled coal, and on being subjected to great heat, without actually burning, lost much of its weight. In the stratum of shale which followed, the salt in the water increased to 2⅓ per cent. The hardest rock passed, was a bed of chert, struck at a depth of 1179 feet from the surface, and going down 62 feet. In this layer, the salt in the water increased to full three per cent. The boring at present is, as appears by the statement above, in a bed of white soft sandstone, the most promising that has yet been struck for a supply water such as is wanted.

Observations have been made with a Celsius thermometer of the temperature of the well. At the mouth of the orifice, the thermometer made 50 degrees; at the depth of 45 feet, the heat is regular, neither increasing nor diminishing with the variations above, and at the distance of 1351 feet, the heat has increased to 69 degrees.

The Artesian well of Mr. Belcher is already one of the deepest in this country; it is considerably more than half the depth of the celebrated Artesian well in Westphalia, Germany, which is sunk 2,385 feet. If the recent indications do not deceive, a supply of sweet pure water will be soon obtained.

Royal Institution.—On one of the lecture evenings in March last the theatre of the institution was completely filled to hear Sir Charles Lyell describe some of the results of his late geological researches in North America. The immediate subject of the lecture was "On the remains of reptilians, and of a land shell, recently found in the interior of an erect fossil tree, in the coal measures of Nova Scotia;" but he took occasion to enter at considerable length into the causes of the formation of coal-beds and their intermediate strata. The coal measures of Nova Scotia, and the different strata associated with them, are three miles in thickness, the coal measures alone extending to the depth of 1,400 feet. The dip of the strata along the coast of the Bay of Fundy affords a fine opportunity for examining the whole depth of the coal measures which rise successively to the surface; and Sir Charles Lyell traced distinctly sixty-nine levels at which they have been submerged under the sea. Among the beds of the formation several are filled with the remains of a peculiar plant, to which the name "stigmaria" has been given; and it was generally considered by geologists to constitute a distinct and separate vegetable organization. Sir Charles Lyell said he had long suspected that these fossils were only the roots of trees that had been broken off and carried away by some sudden inundation. This suspicion had been confirmed by his researches in the coal measures of Nova Scotia, for he had succeeded in several instances in digging from the coal upright trunks of trees to which portions of stigmaria were attached as roots. The trees thus found were sigillaria, a plant somewhat resembling a bamboo, having a hard exterior and a soft, pithy substance inside. It was within an erect fossil tree of this kind that Sir Charles discovered the remains that formed the immediate subject of the lecture. On examining the interior of the tree, which was less completely fossilized than the exterior, he and some scientific friends who accompanied him found first the leg-bone of a reptile, and afterwards other remains which proved it to have been a water-lizard similar to a species now existing in America. Lower down they came to the land shell; though it was so mutilated that it could not be ascertained with certainty whether it was a shell or a coprolite; Sir Charles, however, being decidedly of opinion that it was a land shell. The importance of the discovery of the remains of a reptile in the fossil tree consists in its being the first time that any trace of reptilians has been found in the coal measures of America. Sir Charles Lyell accounted for the remains being in such a position by supposing that the lizard must have climbed up the tree when it was standing on the mud bank of the estuary of some great river, and that the creature had taken shelter in the inside. The deposition of the land shell he also attributed to the position of the tree at the mouth of a large river where fresh and salt water are frequently commingled. With respect to the coal measures, Sir Charles Lyell said he considered their formation to be owing to vast extents of dense vegetation growing on the mud banks deposited in the deltas of great rivers, and which having for a long time resisted the action of the water, and prevented further deposition, were at length again submerged and covered with *debris* from the mountains. As an exemplification that the cause assigned might be adequate to produce such an effect, Sir Charles instanced the quantity of solid matter carried down by the Ganges. In the elevated country where that river takes its rise it has been ascertained that the fall of rain is equal to a depth of six hundred inches in a year; and this volume of water, concentrated in the channel of the Ganges annually, forces along with it a mass of matter which it has been calculated is equal in bulk to sixty times the solid contents of the great Pyramid, of Egypt. With that known force in existence, Sir Charles Lyell thought there would be little difficulty in conceiving that by the continued operation of such a cause, through countless ages of times past —on which geologists were now permitted to draw without limitation —the immense masses of matter in the coal formation might be accumulated in successive strata.

A Scientific Golddigger.—Among the passengers by the Falcon which arrived in the Mersey a few weeks since from Sydney, was Mr. John Calvert, a geologist, who has been 11 years in the Australian colonies. During that time he has made a geological survey of all the mineral districts in Adelaide, Van Diemen's Land, Sydney, and New Zealand, and he has brought back with him a map of the western goldfields which alone is 30 feet long. He has also a large number of drawings, some of them valuable in a scientific point of view, and others pleasing and instructive, as giving a sketch of life and manners at the gold diggings. Mr. Calvert has himself been engaged for eight years in tracing the auriferous veins and in procuring gold A short time ago he sent home a block of quartz weighing a ton and a half, and he has brought home with him in the Falcon 730 nuggets of the precious metal. One of the pieces weighs 23lbs. of pure gold, and we had the opportunity of seeing a peice weighing 1½lb., which is considered one of the best specimens, being, in the state in which it was discovered, above the standard. The amount of gold brought home by Mr. Calvert is about 339 lbs. gross, between 74 lb. and 80 lb. being dross or quartz more or less mixed with the gold. The largest quantity he ever obtained in one day was 76 lb. weight. He had been led to the spot by auriferous indications, increasing as he came nearer, for a distance of nearly 40 miles. The quartz vein ran north and south, and was from about 9 to 15 feet in breadth, half a mile from where he robbed it of its precious treasure. It stands out in large blocks of from 15 to 20 feet in height, looking in the distance like white houses. This place is distant from Sydney about 215 miles, and a long way from any at present worked gold-field. During the latter part of his residence in Australia Mr. Calvert had a camp and three men as assistants, and, properly equipped, he pursued his scientific survey. Among his discoveries, he found diamonds, rubies, and many valuable minerals, in which the Australian colonies abound. We understand that Mr. Calvert will proceed direct to London, where he intends to get his drawings and maps transferred to canvass, for the purpose of exhibiting them as a panorama of the goldfields, illustrative of lectures which he intends to deliver on the origin of gold, and on the colonies towards which so many thousands of his fellow-countrymen are now turning their attention.—*Liverpool Mercury.*

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—April, 1853.

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.
"	1	29.481	29 578	29 688	29.596	34 8	46 7	34 8	38 83	0 187	0.170	0.116	0.162	93	55	56	69	N b E	N	N N W	- -	- -
"	2	.798	.795	.749	.781	31 4	43.1	31.9	36.82	.134	.203	.159	.165	79	74	89	83	N b E	E	Calm	- -	- -
"	3	.702	492			37 3	44 2			.185	.147			84	51			Calm.	E N E	—	- -	- -
"	4	.308	.146	.100	.162	36 6	38 8	35 9	37 35	.190	.202	.200	.202	88	86	95	91	NE b N	Calm.	N N W	0 175	Inap.
e	5	.041	.102	.151	.106	31.1	41 4	33.8	37.83	.173	.136	.166	.16	92	46	86	75	N N W	N W b W	Calm	0 055	Inap.
e	6	.103	.315	.523	.339	31.5	41 9	33.4	37.02	.186	.191	.123	.159	94	67	65	73	N E	N W b N	N W b N	- -	Inap.
"	7	.547	.510	.555	.547	30 5	43 6	32 1	36.12	.137	220	.171	.184	80	78	95	86	Calm.	S	Calm	- -	Inap.
"	8	.590	.191	28.918	.202	32 3	51 0	48.1	45 07	.162	.256	310	.251	89	78	94	84	Calm.	S b W	W	Inap	- -
"	9	.204	.370	29.504	.376	40.2	52 4	40.2	44.05	.188	.208	.208	.204	74	53	84	71	S W	W b S	S	- -	- -
b	10	.638	.833			33.0	39 8			.162	.186			87	77			N W	N W b W	—	- -	- -
d	11	.904	.839	.339	.761	27 0	41.9	33 3	36.07	.130	.256	.169	.185	87	87	79	81	W N W	SE b S	Calm	0.100	- -
b	12	.573	.479	.530	.526	37 3	41.1	42 2	41 18	.209	.269	.251	.242	95	94	91	91	Calm.	Calm	Calm	0 270	- -
b	13	.638	.531	.385	.513	41 5	36 0	35 1	37 75	.252	200	.181	.212	98	95	89	91	NE b N	N E	N E b N	0 715	- -
b	14	.455	.625	.759	.633	32 7	36 6	30 9	33.37	.172	.188	.154	.168	93	87	89	88	N E b N	N b W	N W b N	0.020	Inap.
a	15	.946	.847	.930	.920	30 4	40 9	31 5	36 08	.157	.122	.171	.155	93	49	86	75	N N W	S b E	Calm	- -	- -
c	16	.891	.810	.758	.813	37 0	45.9	37 0	40.32	.182	.220	.184	.204	83	71	84	81	N E b E	E b S	N E	- -	- -
b	17	.773	.755			37.4	43 4			.177	.155			73	55			N b E	S b E	—	- -	- -
c	18	.810	.752	.712	.747	32 0	48 1	34 2	39 33	.141	.218	.161	.187	78	75	81	77	N	S S E	N E b E	- -	- -
b	19	.667	.558	.531	.579	28 0	53.6	39.1	41 70	148	.212	.212	.212	96	52	90	82	Calm.	E S E	N b E	- -	- -
b	20	.553	.599	.667	.617	38 4	57 7	48.1	49 32	.174	.208	251	.217	75	48	85	65	N b E	S b W	N b E	- -	- -
d	21	.795	.658	.594	.609	34 9	60 7	48 3	49 52	.171	.285	.248	.258	85	55	87	75	Calm.	S S E	E N E	0 390	- -
d	22	.211	28 935	.343	.210	46.7	57 8	47 4	50 98	.297	.438	.270	.330	94	94	84	90	NE b E	SE b S	N W b N	0.130	- -
e	23	.659	29.722	.725	.715	31 9	41 5	35.1	37 67	.159	.187	.138	.159	89	64	79	72	N N W	N b W	N b E	- -	- -
c	24	.746	678			35·0	41 8			.148	.151			70	58			N E b E	E b S	—	0 200	1.0
ab	25	.537	578	.666	.599	34 3	41.1	32 3	36 59	.183	.198	.156	.184	94	77	85	86	N E b N	N	Calm	Inap	- -
b	26	.709	.674	.653	.678	33 4	54 2	41.1	44 02	.148	.119	.212	.194	78	34	82	69	Calm.	SE b E	Calm	- -	- -
b	27	.658	.622	.623	.612	38.1	61.4	51.7	51 58	.188	.302	.275	.274	82	57	73	73	Calm.	S S W	Calm	- -	- -
b	28	.669	.620	.582	.620	44 5	65.7	53 0	57 05	.235	.358	.420	.357	81	59	96	79	Calm	S E	Calm	0.570	- -
b	29	.553	.688	.812	.649	48.3	49 9	43.1	47 62	.321	.271	2.01	.261	93	76	73	79	N b E	N W b N	N	- -	- -
b	30	.562	.923	.958	.910	38.4	50 9	40 6	43.47	.206	.277	.166	.214	89	76	66	75	N W b N	S W	N N W	- -	- -
	M	29.579	29 531	29 575	29.5653	35 76	48 38	39 40	41 92	6	241	.205	.212	87	79	83	89	Ml's 4 05	Ml's 7.46	Ml's 3 97	2 625	1 0

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

North.	West.	South.	East.
1964.88	1172 87	621 32	895 06

Mean velocity of the wind - - 5.20 miles per hour.
Maximum velocity - - - - - 21.2 ml's per h'r, from 1 to 2 p.m. on 8th.
Most windy day - - - - - 8th : Mean velocity, 10.71 miles per hour.
Least windy day - - - - - 12th: Mean velocity, 0 29 ditto.

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.

Highest Barometer - - 29 974, at 8 A. M., on 15th } Monthly range:
Lowest Barometer - - 28 985, at 2 P.M., on 22 d } 0 989 inches.
Highest observed Temp. - 65 7, at 2 P. M., on 28th } Monthly range:
Lowest regist'd Temp. - 25 0, at A.M., on 11th } 40.7
Mean Highest observed Temperature - - 47 68 } Mean daily range:
Mean Thermometer Minimum - - - - - 33.61 } 14.07
Greatest daily range - - - - 28 8 from 4 P.M on 22nd, to A.M. of 23rd.

Warmest day - - 28th - - - Mean Temperature - 57 05 } Difference:
Coldest day - - - 14th - - - Mean Temperature - 33 37 } 23.68

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

April 5th—Frogs first heard.

Fine displays of Aurora on the 6th and 29th. Lunar Halo on 15th.

An Earthquake is stated, on good authority, to have been felt at Toronto, about 5 A. M., on the 28th. Seven distinct shocks were perceived. Any person who noticed this will please communicate it to the Observatory.

Possible to see Aurora on 12 nights. Aurora actually seen on 7 nights.

Comparative Table for April.

Ye'r	Temperature. Mean.	Max.	Min.	Range.	Rain. D'ys	Inches.	Snow. Dy's	Inch	Wind. Mean Velocity
	°	°	°	°					Miles.
1840	42 70	65.9	25 3	40 6	14	3 420	2	--	--
1841	39 40	62 9	22.1	40.8	3	1 370	3	--	--
1842	43 40	89.5	21.6	67 9	8	3 740	2	--	--
1843	41 29	70.0	15.1	54 9	7	3.185	3	0.1	--
1844	48.11	71 5	17.2	57.3	10	1 515	1	Inap	--
1845	42.13	66.0	14.8	51.2	11	3.299	4	1.5	--
1846	44.11	79.4	24.4	55 0	10	1 309	2	1.3	--
1847	39 06	65 6	8 4	57 2	8	2 870	2	4 0	--
1848	40 67	65 4	25 5	38 9	5	1 455	1	0 5	4.89
1849	38.74	70 9	23.2	47.7	10	2 655	2	1.7	7.50
1850	38 30	63 2	18 2	45 0	7	4 729	2	1 1	7.61
1851	41.67	59·2	25.8	33.4	11	2 295	3	1.2	8 07
1852	38.29	53 8	19.8	34 0	6	1.939	4	9.4	6.69
1853	41.92	65.7	27 0	38.7	10	2.625	1	1.0	5.20
M'n	41.41	68.00	20.67	47.32	8.6	2.602	2.3	1.98	6.56

Monthly Meteorological Register, St. Martin, at Isle Jesus, Canada East, April, 1853.

Nine Miles West of Montreal.

[BY CHARLES SMALLWOOD, M. D.]

*Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 ft.**

Day.	Barom: corrected and reduced to 32° Fahr. 6 A. M.	2 P. M.	10 P. M.	Temp. of the Air. 6 A. M.	2 P. M.	10 P. M.	Tension of Vapour. 6 A. M.	2 P. M.	10 P. M.	Humi'y of the Air. 6 A. M.	2 P. M.	10 P. M.	Direction of Wind. 6 A. M.	2 P. M.	10 P. M.	Velocity in Miles per Hour. 6 A. M.	2 P. M.	10 P. M.	Rain in Inch.	Snow in Inch	Weather, &c.—A cloudy sky is represented by 10; a cloudless sky by 0. 6 A. M.	2 P. M.	10 P. M.	REMARKS.
1	29.593	29.694	29.739	35	53	32	.155	.294	.160	.69	.72	.80	N E b N	S b E	N b E	10.00	5.15	0.98			Clear.	Clear.	Clear.	Swallows fi'st seen Z. Light; Au'a B's.
2	.891	.867	.847	30	51	29	.145	.216	.152	.78	.55	.85	N E	SW b W	SW b S	0.10	0.25	1.40			Clear.	Clear.	C.Z.; HH	Zod'al light diffused.
3	.788	.674	.580	36	59	39	.161	.321	.240	.69	.64	.95	S W b S	SW b S	S b W	2.00	2.61	0.97			Cir. C. 6.	C. Str. 7.	Z.C.; HH	
4	.490	296	.151	35	49	35	.213	.290	.222	.96	.80	1.00	S S E	E	N E b E	0. 6	0.7	0.27	0.410		C.C. St. 4	Str. 10.	Rain.	Rain com. 3.20 p. m.
5	28.897	28.735	28.962	31	38	38	.214	.216	.207	1.00	1.00	.81	N E	NW b W	NW b W	10.33	9.42	19.36	1.690		S.&M Sn.	Rain.	Cl'r in Z	do. cea'd 4 p m, A. ft.
6	29.299	29.476	29.538	27	50	28	.138	.304	.144	.82	.81	.83	W	W	N W	15.72	4.77	5.70			Clear.	Clear.	Clear.	Z. Light; Aur. Bor'ls.
7	.596	.580	.578	23	50	31	.144	.240	.185	1.00	.61	.96	W N W	W S W	SW b W	5.33	5.25	4.45			Clear.	Clear.	Clear.	Zo'cal Light, bright.
8	.623	.431	.283	31	55	40	.171	.351	.250	.89	.79	.96	S W	S b E	S b E	0.91	4.22	6.00			Clear.	CumStr.4	Overcast	Sl. Rain, 6 p.m. in n't.
9	.210	.294	.479	40	51	38	.245	.260	.226	.92	.69	.91	W S W	W S W	W S W	13.33	11.75	10.29	0.126		Clear.	Strat. 2.	Overcast.	
10	.594	.684	.809	36	41	27	.210	.220	.149	.91	.81	.89	NW b N	NW b W	NW b W	4.89	8.51	8.21		Inap.	Sl. Snow.	CumStr.4	Clear.	Low faint au'ra arch.
11	.959	.918	.845	28	53	35	.146	.280	.203	.85	.68	.91	NW b W	S S W	S W	0.49	3.75	2.81			Clear.	Cirr. 2.	Overcast.	
12	.721	.60·	.612	39	41	38	.241	.253	.246	.95	.92	1.00	S b W	S b W	N W	4.19	1.41	4.12	Inap.		Str. 10.	Sl't.Rain.	Hazy.	
13	.784	.706	.685	38	54	36	.207	.291	.216	.84	.68	.91	N E b N	N E b E	E	5.39	3.79	0.71			Clear.	Hazy.	Str. 4.	
14	.610	.640	.751	26	41	27	.129	.253	.156	.80	.92	.94	N E b N	N E b N	W N W	21.85	12.00	9.87		1.50	Snow.	Str. 10.	CumStr.4	
15	.935	.927	.961	27	45.5	28.5	.112	.253	.153	.67	.80	.88	NW b W	W b S	W b S	3.38	5.81	6.22			Clear.	Cir. C. 4.	Clear.	1st boat ar. Montreal.
16	.965	.904	.839	29	55	36	.152	.312	.230	.85	.70	1.00	S W	SW b S	S b W	2.07	2.51	1.77			Cir. C. 6.	CumStr2	Clear.	
17	.901	.832	.836	35	46	31	.186	.226	.192	.83	.69	1.00	N E	N E	N E	3.67	4.32	0.37			C.C. St. 4	Clear.	Clear.	
18	.960	.764	.709	28	53	39	.144	.293	.234	.83	.70	.91	NW b W	W S W	W S W	1.36	0.40	0.52			Clear.	Clear.	Clear.	
19	.741	.614	.583	37	55	42	.222	.312	.263	.95	.70	.92	W S W	W S W	W b S	6.86	5.87	5.87			Clear.	Clear.	Clear.	
20	.652	.574	.703	43	76.5	46	.243	.568	.303	.79	.78	.93	W S W	W S W	N N E	2.50	5.37	1.62			Clear.	Clear.	Clear.	
21	.839	.759	.657	39	68	50	.211	.445	.330	.81	.65	.89	N E	SW b W	SW b W	0.75	0.21	0.20			Clear.	Clear.	Cirr. 4.	
22	.532	.441	.090	47	51	45	.291	.361	.315	.86	.93	1.00	S W b W	SW b W	N N E	0.89	1.24	3.21	0.570		Str. 10.	CumStr8	Rain.	Thunder at 11.30 am.
23	.613	.700	.716	31	41	33	.152	.270	.197	.78	.90	.95	N b W	N b W	N W	4.15	16.21	12.29	0.220		Clear.	Clear.	Clear.	Frogs first heard.
24	.872	.804	.739	34	51	38	.178	.415	.230	.83	.81	.95	W b N	W b S	W	0.70	0.0-	0.12			Clear.	Clear.	Clear.	1st ship ariv. Quebec.
25	.8·1	.724	.741	32	38	28	.182	.246	.173	.93	.96	1.00	N E	N E	NW b W	0.9	Calm.	Calm.			Clear.	Str 10.	Str. 10.	
26	.814	.7 8	.700	36	57	46	.220	.380	.326	.96	.81	1.00	W	W	W b N	0.51	2.50	3.71			CumStr4	Clear.	Clear.	Zo'cal Light, bright
27	.727	.671	.679	43	73	62	.272	.628	.421	.92	.78	.75	S W	S W	S W	0.33	8.33	14.69			CumStr4	CumStr.6	C.Str. 10.	
28	.754	.697	.713	58	80	54	.437	.760	.413	.89	.77	.96	S W	W b S	N E b E	4.12	4.30	3.39			Clear.	C. Str. 4.	Str. 4.	
29	.592	.619	.727	47	50	46	.357	.352	.326	1.00	.98	1.00	N E	N E	N W	6.02	4.12	5.31	0.570		Str. 8.	Str. 10.	Str. 4.	Rain at 9, a. m.
30	.854	.916	.915	36	49	36	.215	.336	.240	.96	.93	1.00	N b W	W N W	N W	1.43	11.35	8.02			Clear.	Clear.	Clear.	

Barometer.	Highest, the 16th day	29.965
	Lowest, the 5th day	28.735
	Monthly Mean	29.654
	" Range	1.230
Thermometer	Highest, the 28th day	80.°0
	Lowest, the 7th day	21.0
	Monthly Mean	41.36
	" Range	59.00

Mean of Humidity—.858.

Greatest Intensity of the Sun's Rays—92.°0.

Amount of Evaporation—1.80 inches.

Most Prevalent wind—N. E.

Least do. do. S. S. W.

Most Windy Day—the 14th day, mean—14.58 miles per hour

Least Windy Day—25th mean—0.30 miles per hour.

Rain fell on 6 days—amounting to 3.586 inches, and was accompanied by thunder on one day.

Snow fell on 1 day—amounting to 1.50 inches.

Aurora Borealis visible at observation hour, on 4 nights.

Zodiacal Light visible on 5 nights.

The Electrical state of the Atmosphere, has been remarkable for a constant and very high Intensity of *Positive* Electricity. The Ozonometer indicated a very small amount of Ozone.

Eastern Townships.—It is not, perhaps, generally known to the public that our Provincial Geologist, Mr. Logan, has discovered materials very abundantly existing in our vicinity, so admirably adapted for the manufacture of every description of Earthenware and Glass, that a company organised for the purpose of testing the facts are only wanted to produce, according to Mr. Logan and other practical men's assurance, articles in these species of manufacture of a most superior texture and usefulness, and in abundance for export and home consumption, the production of which would, most probably, contribute towards the permanent prosperity of Sherbrooke, more than even the discovery of the auriferous deposits rich as they may be said to be found in several localities in our neighbourhood. Besides these there has been discovered lately marble of various kinds, and most superior description, suited for tombstones, mantle pieces, &c., and when I mention further, that in addition to these, Gypsum has been found to a very considerable extent in Oxford, an article hitherto imported principally from Nova Scotia, and that men of some practical experience, and at the same time possessing capital, are living in our midst, it cannot be considered too sanguine to expect that influential gentlemen will be found, during the absence of Mr. Galt in England, ready to take the initiatory before organizing. The British American Land Company have very recently, through their Chief Commissioner, signified more than usual solicitude towards establishing every species of manufacturing industry in our Town; by liberally affording every facility to the utmost extent that water privileges and aid in money can be warrantably advanced to men of practical skill and enterprise, to render Sherbrooke what nature has destined it to be, the great workshop and manufacturing Lowell of Canada.—*Cor. of the Sherbrooke Gazette.*

The Metal Trade of the United Kingdom.—The total declared value of the exports of various descriptions of metals during the month and 12 months, ending with the 5th January, is as follows:—

Years.	For the month.	For 12 months.
1853	£827,102	£9.928,405
1852	509.358	8.918.124
1851	627,354	8,767.646

These figures show an extraordinary expansion of the export trade in metals; and one of the most remarkable results consists in the fact, that in the last month the movement has been more marked than ever before known. It may be fairly assumed that the export of metals for the current year will be larger than any known in the annals of our commerce. The increase on the corresponding month of 1852 is no less than £318.714, or 62 per cent. The general increase in this branch of trade is the more worthy of notice, when it is considered that the prices of all descriptions of metals have during the last year experienced an almost unexampled rise, a circumstance which ordinarily has the effect of checking foreign demand. On a more minute analysis of the returns, we find that this check has been actually perceptible in the articles of copper, lead, and tin, but that the present tendency of these items is now in the direction of a rally, the chief increase is in the article which has also been marked by the greatest rise in price—iron. The augmentation in the shipments of this metal during the last month, more especially, is calculated to excite great attention, and fully bears out the anticipations indulged in by us on several occasions. The exports of this metal are shown below:—

Years.	For the month.	For 12 months.
1853	£530,269	£6.155,600
1852	297,588	5,414.383
1851	305,314	4,056,308

This demand is mainly owing to the vast railway works which are now being carried on by our enterprising capitalists in so many parts of the world. In fact, a large portion of the money which we have lately subscribed to foreign and colonial railway projects never leaves the country at all, but is at once invested in railway iron Again, a large portion of the American and other railway bonds lately taken up here have been paid for in our iron. The declared value of the shipments is of course increased by the enhanced prices now current for metals; but after making due allowance for this, we have still evidence of an unexampled foreign and colonial demand. The demand for iron ship-building and iron houses, is also exercising an important influence. The present position of the market for this metal is exciting so much *attention, that these returns are invested with additional interest.* The exports of copper of all kinds for the month and 12 months are thus stated:—

Years.	For the month.	For 12 months.
1853	£148.609	£1,612,732
1852	90,503	1,535,931
1851	172,747	1,851,495

In the twelve months the exports of tin have been to the extent of £83,608, against £80,047, in the corresponding period ending the 5th January, 1852, and £124.798 in 1851. Those of tin plates have been £1,103,317 against £1,020,206 and £927,202; and those of lead £353,101 against £344,315 and £387,394.

Mr. W. Pringle, of Edinburgh, writes to the Phil. Mag., the following singular account:—

"On February 20th, 1846, about 10 P. M., when looking from an eastern window, I observed a very splendid Arch in the Heavens. Its open was situated some degrees south of the zinth, its direction being nearly at right angles to the magnetic meridian. While gazing at it I was astonished to see a portion of the eastern limb at a height of about 45 deg. or 50 deg., suddenly change its character and aspect, and for an extent of perhaps 5 deg., exhibit the spectacle of a crowd of minute meteors rushing and commingling with one another; each individually, so far as the eye could detect for the rapidity and confusion of their motions, precisely resembling an ordinary shooting star, having an apparent nucleus and a luminous train following it. This sight lasted, it may be, nearly a minute. The portion of the luminous boa thus occupied was strictly confined in breadth to that of the arch: there was an obvious motion of the luminous matter of the arch itself from East to West, resembling a tremulous stream, and the cometary projections followed the same course while they lasted.

Obituary.

Von Buch.—This eminent geologist died at Berlin, on the 4th of March, aged 79 years. The following is a letter from Humboldt to Sir R. I. Murchison, announcing his death, (Athenæum, No. 1921.)

"That I should be destined—I, an old man of eighty-three—to announce to you, dear Sir Roderick, the saddest news that I could have to convey:—to you for whom M. De Buch professed a friendship so tender, and to the many admirers of his genius, his vast labours, and his noble character! Leopold De Buch was taken from us this morning by typhoid fever, so violent in its attack that two days only of danger warned us. He was at my house so lately as the 26th [ult.,] despite the snow and the distance between us, talking geology with the most lively interest. That evening he went into society; and on Sunday and Monday (the 27th and 28th) he camplained of a feverish attack, which he believed to be caused by a large chilblain swelling from which he had suffered for years. The inflammation required the application of leeches, but the pain and the fever increased. He was speechless for forty-eight hours. * * He died surrounded by his friends,—most of whom knew nothing of his danger till Wednesday evening, the 2nd of March.

"He and I were united by a friendship of sixty-three years,—a friendship which never knew interruption. I found him in 1791, in Werner's house in Freiburgh, when I entered the School of Mines. We were together in Italy, in Switzerland, in France,—four months in Saltzburg. M. De Buch was not only one of the great illustrations of his age,—he was a man of a noble soul. His mind left a track of light wherever it passed. Always in contact with Nature herself, he could well boast of having extended the limits of geological science. I grieve for him profoundly,—without him I feel desolate. I consulted him as a master; and his affection (like that of Gay Lussac and that of Arago who were also his friends) sustained me in my labours. He was four years my junior,—and nothing forewarned me of this misfortune. It is not at the distance of a few hours only from such a loss, that I can say more respecting it. Pity me,—and accept the homage of my profound respect and affectionate devotion."

THE CANADIAN JOURNAL.

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