THE

# CANADIAN JOURNAL:

A REPERTORY OF

# INDUSTRY, SCIENCE, AND ART,

AND A RECORD OF THE

# PROCEEDINGS OF THE CANADIAN INSTITUTE.

EDITED BY

HENRY YOULE HIND, M.A.,

PROFESSOR OF CHEMISTRY IN THE UNIVERSITY OF TRINITY COLLEGE;

ASSISTED BY

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# THE CANADIAN JOURNAL.

## INTRODUCTION.

"In the infancy of a state arms do flourish, in the middle-age thereof letters, in the decline and fall commerce," a true saying of the sage of Verulam, is this which we have chosen for a motto, and *arms*,—the arms, namely, that swing the axe and guide the plough—have flourished, and long may they flourish in Canada; nor has the middle-age of mental vigour, and intellectual exertion been tardy in succeeding to that first stage of advancement. It would even be well if no premature signs of undue prominence in the last of the three, already portended, like early grey hairs, the decay of a ripe and vigorous manhood. Canada has made a progress so surprizing in all that promotes, and in all that indicates, the well-being of a people: the dream of yesterday has become so often the reality of to-day, that did we not know how genial is the soil in which this prosperity is rooted, how healthy the growth which no Pactolus fosters but fevers, with its golden streams; no perpetual summer forces but withers; we might doubt whether it could long endure without those checks which in other communities have usually occurred, to throw them back in the race after wealth, and fallow as it were the ground which over-production has exhausted. It is not our intention then to dwell on a theme familiar to most of our readers; they need not be reminded by us that the generation has not yet passed away which found in Upper Canada a wilderness, where it leaves a garden; before whose steps, as by an enchanter's wand, roads have opened out, and stately edifices arisen, and abodes of elegance and comfort scattered themselves far and wide. Nor need they be told that the beneficent Fairy whose gifts these are, yet dwells among us, and by her names of Industry and Order, and Peace, may yet be invoked for other gifts, and won to carry her blessings to regions beyond their present boundary. Material prosperity never fails to develope in a community, and indeed requires for its creation a high degree of intellectual exercise. Commercial enterprise, political rivalry, the daily business of the advocate, the daily duty of the physician, all task faculties which in the quiet paths of learning or philosophy, might rear a monument of human wisdom, or win new planets from the abyss. They task, but they do not satisfy them; that they exist, is a fact to which we appeal as a proof that the *middle-age* of our state has arrived; that they do more than exist, that they absorb so greatly those faculties whose aim should be higher than the material interests of a day, or a generation, is another fact to which we appeal, in proof that the time has come when letters must urge their claim to a better representation, on peril of the place which is their birthright.

When Europe awoke from its long sleep in the thirteenth century, and in Italy and in France, in England and in Spain, gave the first tokens of dawning civilization, by the foundation of those universities and colleges, which to the number of sixteen or seventeen, date their origin from that iron-clad age, the truth that association is the guardian of literature, that the concentration of knowledge is the best preservative of its influence, and the best stimulus to its extension, appears to have been first readmitted, after ages of oblivion, to its due place in the framework of human society. It is impossible not to recognize at once a proof the possession which that discovery took of the minds of men, and of the wide diffusion of a desire to cultivate learning, in the fact that Europe, thinly peopled as she was, could boast of nearly sixty universities before the close of the fifteenth century. Those were the days, however, when society, still in its infancy, was under tutors and governors; before the veil of blind reliance, or implicit faith, in the wisdom of one or two great minds had been raised from those of their fellow men. Reason then neglected the principal field of modern science, those facts of which we can take cognizance by our senses, and the relations we can establish by experience between them, to build upon foundations as unstable as a quicksand, and to waste prodigious strength upon subtilties which vanished like a film of gossamer in the grasp. The consequence was a long delay in that acquaintance with the bounteous and varied resources of the material world, which is the reward of subsequent study of its laws and phenomena. Men were not wanting who, like our own Roger Bacon, were prematurely enlightened, but debarred from sympathy, and too divided for co-operation, while they have indeed left to posterity the shadow of a great name; to their own generation and those which immediately succeeded, they were but as light to one who is without organs of vision, or wings to one who is chained to the earth. It was in Italy, and in the latter half of the sixteenth century, that the truth which had been so long practically recognized in respect to literature, was first applied to matters of science; and if association were indeed the guardian of the one, it has ever since been the very life of the other. The Academy of the "Secrets of Nature" founded, (how are the mighty fallen!) at Naples, the present seat of all intolerance and restriction, in the year 1560, was the forerunner of those numerous enlightened bodies, which in every country of Europe were about to be drawn together by kindred impulses, and by a common want; and which were destined by the spirit of free enquiry which animated then to aid that emancipation from the bondage of tradition, which was dawning in philosophy, as it had already dawned in religion. There was a boundless field before them. If long afterwards, the greatest of philosophers could liken himself to a child gathering a few bright pebbles by the shore of the ocean, who can exaggerate the exhaustless novelty, the wonder, of nature's works, to ardent minds in which love for her beauties was a passion, and whose inspiration had already appeared by the glorious creations of Titian and Raffaelle, and Michael Angelo.

> The earth and every common sight
> To *them* did seem
> Apparelled in celestial light,
> The glory and the freshness of a dream.

These societies spread over Italy with such rapidity, that before the end of the sixteenth century there was one in almost every city of importance: nor was it long before the other countries of Europe were animated by the same spirit. In Spain, the Academy of the Wonders of Nature was founded in 1552. A similar society, with the same name, was established at Vienna in the same year. Our own Royal Society of London, the foundation of which was laid as early as 1645, dates its incorporation from 1662. Lastly, Colbert founded what is now the Institute Nationale of France in 1666. Thus, within the short space of fourteen years did these four *Mosæa Minervæ** spring forth, as it were, from the head of Europe, not quite like the Goddess of Wisdom, full armed and radiant, exempt from the weakness of infancy, and the errors of youth, but possessed at least with one of her highest lessons, an humble estimation of their actual knowledge, an unquenchable desire for further light. We need scarcely remind the reader, that the Royal Society of London was the honoured instrument of giving to the world the Principia of Newton; that from its funds, and from the assistance of its first members, was Flamstead enabled to commence those observations which have made Greenwich the classic ground of Astronomy: that wherever these institutions have existed, they have awakened talents which, but for them might never have been aroused; have promoted enquiries which individuals could not have conducted, and given to the world investigations and discoveries which, without their aid might never have seen the light. These truths are too familiar to be questioned, and without intending to pursue the history of learned societies, we have referred to them here to point out a legitimate deduction from them, namely, the importance of organizing an association capable of fulfilling those functions in our own community.

It can scarcely be denied that the pursuit and cultivation of the Physical Sciences has made comparatively little progress in Canada, and by no means attained the established place which might have been looked for at this stage of our history. It is true that two Societies, directed more or less to this subject, have existed in Lower Canada for more than twenty years—the Literary and Historical Society at Quebec founded in 1824, and the Natural History Society of Montreal founded in 1827, but we have the highest authority for inferring that the latter at least has not as yet realized the expectations of its zealous founders, nor can the last Report of the authorities of the former, be deemed entirely satisfactory. Neither has practically exercised any influence in Upper Canada. But a short time ago, a celebrated naturalist had occasion to compare the skeleton of a recent specimen of the *Delphinus Leucas*, or Beluga, with some remains found under equivocal geological circumstances in the State of Vermont. In vain did he enquire of every collection with which he was acquainted, in America; the unwieldy rarity he sought was no where to be heard of. At last he remembered a museum in Copenhagen unrivalled for its riches in marine mammalians. With the cordial liberality of a brother philosopher, the distinguished naturalist who presides over that establishment, promptly met his request for a specimen, and the precious remains were shipped with much precaution, in a number of boxes and barrels, and duly wafted from Denmark to Massachusetts. Then, and not until then, did M. Agassiz, the naturalist in question, become aware of the fact that the *Delphinus Leucas* under the name of the *White Whale* is one of the commonest frequenters of the Gulf of St. Lawrence, and that an easy journey to the banks of our noble river, would have placed him in possession of any number of specimens his researches might have required. Need we say that such a fact speaks volumes as to the neglect among us of those pursuits by which, not only are the productions of a country laid open to the use and enjoyment of its people, but the channels of scientific information kept also replenished with that knowledge of local peculiarities which is so indispensable to the progress of science.

We have referred above to the comparative non-success of the Elder Societies in Canada not in ignorance of the ability and intelligence with which ever since their formation, one zealous President or Secretary after another, has endeavoured to animate them to successful exertion, still less to undervalue those endeavours, but to enquire in perfect respect into the cause of a circumstance so frankly and honourably admitted by both, and the probability that the Canadian Institute of Upper Canada—the Society to whose recent organization we are about to refer, will be enabled to avoid a like result. First, then, it seems probable that the great vice of Society in America, that "eternal sabbathless pursuit of a man's fortune," so long ago denounced; which leaves to the mind neither leisure, taste or capacity, for the cultivation on which its happiness depends, has not failed in its effect here; not in reality devoting much of our time to anything more profitable, or half so delightful as the cultivation of literary or scientific pursuits, we have nevertheless grudged it to them, and have neglected the formation of those habits with which alone they are reconcileable. Natural History and Botany have been abandoned almost entirely to the members of an arduous and ill-remunerated profession, very few of whom can command the leisure or even incur the expenses essential to their active pursuit. The unwise habit of overtasking the strength and energy of those engaged in Instruction, or filling Professorial Chairs, as if the mind can expatiate at large, while the body is bound to a tread-mill, has had something to do with it. Scientific pursuits can never make much progress while those who are professionally devoted to them, are debarred, whether by unfortunate necessity or illiberal pressure, the opportunities of self-improvement and private progress, which the ablest value the most.

It rather appears too, and we refer to this, because it is the evil which it has been principally sought to avoid, in the constitution of the Society just referred to, that the objects expressed by the titles Natural History Society, and Literary and Historical Society, are too special to be able to stand alone in this country at present. They do not include a multitude of objects in which much of the most active talent in the country is engag-

* *Museum Minervæ* was the designation of a College or Academy founded by Charles the 1st. in 1635, for the cultivation of the Physical Sciences, but which fell to the ground in the troubles of that unhappy reign.

ed, for example, those involved in the professions of the Engineer, the Artist, the Surveyor, the Architect, all of them represented by Societies of high standing in Great Britain, and therefore capable in their nature of extending the basis of similar bodies here. It must not be forgotten that until about the year 1810, one great Society satisfied almost the entire demand for this species of organization in London itself, we might almost say Great Britain, for the local societies were few in number and limited in character. The Geological Society, (1807;) the Astronomical Society, (1820;) the Asiatic Society, (1824;) the Geographical Society, (1831;) and a host more, are of very modern foundation; it would seem, therefore, that no such limitation of object has the sanction of previous experiment, and we may hope that an attempt to unite under one roof, and in one organization a full representation of the active mind of the community, may be more fortunate. It is unhappily true that the great prominence given to classical learning in England, and in all education framed on her models, has led to a surprising want of either knowledge of, or interest in, physical or mathematical science in English Society generally; which is best attested by the almost incredibly limited sale of scientific books and periodicals: it must be therefore expected that an English Colony will yield, at first, but a slender harvest of scientific results, whether of the nature of observation, experiment, or reasoning, and furnish but a small number of minds imbued with those tastes which produce them; but there is a fund of practical knowledge and thought, a wisdom of the workshop, the field, and the loom, in every community, which deserves, while it does not claim the honours of science. It is to this also that the Canadian Institute, and this journal as its present organ, addresses itself, and to this offers a medium not only as it is hoped of instruction, but of intercommunication and publicity. In referring, however, to the causes of the difficulty experienced by Literary or Scientific Societies in this country, it is impossible not to notice the habit of reading for amusement alone, which is fostered and fed by the cheap trash which loads the tables of our booksellers, and pervades society so generally. Until parents and teachers set themselves more strongly against this habit, not only for the injury it frequently does to the moral strength of the young, but still more universally, its destruction to the intellect, there will continue to be a waste of the best faculties, and a distaste for the most rational and elevating pursuits. We might add the want of Libraries, and enquire why the Provincial University with its great endowments, has not long ago acquired something more deserving of that name. In the United States there are 234 Libraries, containing from 5,000 volumes and upwards, including five that contain more than 50,000. In the same ratio to population, there should be nearly twenty such in the two Canadas. We doubt if there are half-a-dozen. However, in these matters cause and effect follow one another, in such recurring succession, a circle, so "vicious" is maintained, that it is useless to distinguish one from the other, and we simply refer to the facts to justify the assumption with which we started, that something more is wanted, and that something, we believe, may be in part attained by the Incorporation of the Canadian Institute.

CANADIAN INSTITUTE ESTABLISHED 1849

**INCORPORATED BY ROYAL CHARTER.**

**President:**
W. E. Logan, F.R.S., F.G.S., (Director of the Geological Survey of Canada.)

**First Vice President**—Capt. Lefroy, R.A., F.R.S., (Director of the Magnetic Observatory, Toronto.)

**Second Vice President**—J. O. Browne, F.S.A.

**Corresponding Secretary**—Frederick Cumberland.

**Secretary**—Sandford Fleming.

**Assistant Secretary**—Walter Moberly.

**Treasurer**—Dalrymple Crawford.

**Curator**—F. F. Passmore.

**Council:**

| | |
|---|---|
| Alfred Brunel, | Edward L. Cull, |
| Professor Cherriman, | H. Melville, M. D. |
| Professor Croft, | William Thomas. |

As the early history of the Canadian Institute may not be uninteresting, when, in future years, the Society has assumed that important position among the Institutions of this country, which its first promoters and present Members earnestly hope for it; the subjoined brief outline of its origin is appended, as a fitting introduction to the office which this journal is destined to perform in submitting its transactions to the public.

The Canadian Institute, like many other Societies of a similar character, dates its origin from a small beginning. One or two individuals whom inclination led to seek for that intercourse between persons of a more practical and scientific turn of mind than is generally to be found in ordinary debating societies, and being themselves connected with the surveying and engineering professions, were induced to believe that the formation of a society consisting of gentlemen engaged in those pursuits, would draw together many kindred minds, and offer an opportunity of accumulating such knowledge as is necessary for the diversified practice of the professions, and of mutually benefiting each other by the interchange of individual observation and experience.

With the view of considering the establishment of such a

Society, a few Surveyors, Engineers and Architects, residing in and near Toronto, met on the 20th June and 20th July, 1849, when a Prospectus of the proposed Society was adopted, and copies forwarded to members of the profession generally, throughout the province, soliciting their advice and co-operation.

Subjoined is a copy of the Prospectus in accordance with the principles of which the Society was first organized, on the 22nd of September, 1849.

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PROSPECTUS.

To be composed—1st. Of Provincial Land Surveyors, Civil Engineers and Architects, practising in the Province, as Members.

2d. Of Members of the same profession not practising in the Province, as Corresponding Members.

3d. Of men distinguished in Science and Arts, residing in the Province, but not belonging to either of the above professions, as Honorary Members.

4th. Of Students under Articles, as Graduates.

The Officers of the Institute to consist of a President and Vice-Presidents, Council, Secretary, and two Auditors, to be elected annually.

The Treasurer to be a Chartered Bank in the City of Toronto. The Rooms of the Institute to be situated in the City of Toronto.

Libraries to be formed, and collections made of Maps, Drawings, Models, &c. A Museum to be established for the collection of Geological, Mineralogical, and other specimens.

Professional discussions to be held and papers read. Transactions to be published.

Standard Instruments to be kept for reference. Philosophical observations to be made and registered.

A Board of Arbitration to be established for the settlement of difficulties arising between members in the practice of their professions.

The Subscription of Members to be One Pound per annum. The Subscription of Graduates to be Ten Shillings per annum.

It will thus be seen that the proposed Society was strictly of a professional character. The foregoing Prospectus, with a suitable circular, was transmitted to nearly 500 persons throughout the Province; in reply, from twelve to fifteen letters only were received. The promoters were disheartened, the monthly meetings were but indifferently attended, although notices of such meetings were regularly issued, and by some of its members the society was entirely abandoned, at a time when their assistance was most needed. At last, the attendance at the monthly meetings dwindled down to two, and then the prospects of the young Institute were gloomy indeed. At that small meeting various schemes were talked of as to the ultimate chance of success, and it was then considered that by opening out the Society to those whose pursuits or studies were of a kindred character, and by holding regular weekly meetings for the reading and discussing of papers, the Society would gradually take a practical stand and proper footing. The experiment was tried, and weekly meetings were held regularly during the winter months, the attendance being occasionally good, although often dispiriting. Several interesting communications of professional and general interest were read, some of them eliciting spirited discussions. Many of the meetings were, however, occupied by discussions connected with proposed changes in the Constitution and Regulations of the Society, until at last on the 12th of April, 1851, it was determined that proper steps be taken for obtaining a Charter similar to the one the Society now enjoys. By this effort its hitherto strictly professional character was changed to one of a general description, and the way was paved for the Canadian Institute as it now exists.

On the 10th of May, 1851, the first conversazionè was held, and numerously attended. A very encouraging wish was then expressed by the friends of the members who were present, that they should earnestly continue to extend the influence and importance of the Institution.

A Royal Charter of Incorporation was granted on the 4th of November, 1851, and by it W. E. Logan, Director of the Geological Survey of Canada, was decreed First President. The remaining officers and members of the Council, required by the Charter, were elected on the 27th of March last, and accepted office the following week at a conversazionè.

Prior to the election of Officers the weekly meetings were occupied in the usual manner, and in preparing and maturing a proper code of Laws in accordance with the requirements of the Charter for the future government of the Institute.

Amongst the papers communicated during the Sessions, terminating May 10th, 1851, and April 3rd, 1852, were,—

A review of the several clauses in the Surveyor's Act of 1849, by Mr. J. Stoughton Dennis.

On the use of the Telescope, as applied to field practice, by Mr. J. O. Brown.

Upon the ameliorating influences of the climate of Canada, by Mr. F. F. Passmore.

On the formation of the Peninsula and Harbour of Toronto, by Mr. S. A. Fleming.

On Lake Harbours, &c., by Mr. Edward L. Cull.

On the Mineral Productions and Geology of Canada, illustrated by the Map and Models of his Official Survey, by Mr. Logan.

On the effects of Tides, by Mr. Ellis.

On the application of wire to the construction of Bow String Bridges, by Mr. Hanvey.

On the Geology of the Niagara Falls, by Mr. Ridout.

On the Ebb and Flow of water in the American Lakes, by Mr. Brunel.

On the management of Engineering works, by Mr. Ellis.

On Piling, as practised and applicable to works upon our lakes and navigable waters, by Mr. Kivas Tully.

On the supply of water to Toronto, by Mr. Cull.

On Crib work, as applied for foundations and piers, by Mr. Brunel.

On the works at Portsmouth Dock Yards, by Mr. Cumberland.

On Tubular Bridges, by Mr. Brunel.

On the effects of different grades upon the economical working of Railways, by Mr. J. O. Brown.

Amongst others promised and in preparation, are,—

A paper upon Concrete, as applied in foundations under water, by Mr. Cumberland.

On the economical application of native materials of construction, by Mr. Thomas.

On the varieties of native timber with specimens, by Mr. J. S. Dennis.

On the application of Screw Piles and Moorings, by Mr. Brunel.

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# The Canadian Journal.

TORONTO, AUGUST, 1852.

We cannot more appropriately introduce the Canadian Journal to the public, than by submitting a brief exposition of its claims to support, conjointly with an appeal to the professional men scattered throughout the country, whose experience and opportunities confer on them that power of co-operation upon which the ultimate success of this journal mainly rests.

If proof were wanting of the necessity which exists in this Province for a publication devoted to the Arts and Sciences of practical life, in addition to what is foreshadowed in the introduction to the present volume, it would suffice perhaps to enumerate the numerous foreign scientific and artistic periodicals which meet with a liberal patronage in Canada, and which are not unfrequently made the medium of communicating to the world the discoveries and inventions of the "sons of the soil." It might, with equal force, be urged that many useful additions to knowledge—especially the knowledge of our own country—are withheld from the light by the absence of that encouragement and assistance which the Canadian Journal aspires to contribute.

We do not, however, appeal to a spirit of nationality, deeply rooted, and most worthily so, as that sentiment is in the breasts of Canadians,—nor do we rest our claim to public encouragement upon the meritorious object of snatching original thought from obscurity, we have a more extended and far more practical design in view. We are endeavouring to supply such a publication as will afford a medium of communication between all engaged or interested in scientific or industrial pursuits, will assist, lighten and elevate the labours of the mechanic, will afford information to the manufacturer, and generally administer to the want of that already numerous and still increasing class in British America, who are desirous of becoming acquainted with the most recent inventions and improvements in the Arts, and those scientific changes and discoveries which are in progress throughout the world.*

It were vain to suppose that the professional man generally, or the enterprising manufacturer, much less the scientific farmer, or the enquiring mechanic could command needful information respecting foreign or domestic progress in practical science and art from the pages of those publications which, out of the abundance of their resources, necessarily limit their range to one or two departments of industry or knowledge; which are not generally accessible on account of their expense, and which aim at a standard adapting them to the demands of a highly artificial and wealthy condition of society, rather than to the exigencies of a young and rapidly progressive people.

Even were the excellencies of foreign periodicals presented to the Canadian public in a form accessible to all classes, yet, such a publication would not meet the demands of the present day. As a thriving agricultural and commercial people—sprung, as it were, into existence during the last half century—we require special adaptation of many artifices and inventions to those unavoidable conditions which attach themselves to communities in new and extensive countries. We require information respecting many physical features of our territory, which, in the course of time, must impress with their influence our industry and prosperity. Our commercial relations demand an intimate and widely diffused acquaintance with the advantages we enjoy in relation to geographical position, soil, climate, productions, economic mineral resources and means of communication; and lastly, the imposing increase in the population of the Canadas, which numbers, while we write very nearly two million people, imperatively solicits that exertion which, if rightly directed, may place our literary and scientific achievements usefully and even prominently before the world.

Where may we hope to look for information relating to the Canadas if Canadians themselves do not supply the materials and furnish the record? How shall we elevate our position in the world of science and of letters if the "sons of the soil" do not arouse and exert themselves?

In every part of Canada men are to be found possessing high scientific attainments or profound practical knowledge. To many such we look for co-operation with confidence, now that a fitting medium for the publicity of the information they possess and are daily acquiring is hopefully offered to them.

The stupendous railway operations now in progress in many parts of both Provinces, present rare opportunities for obtaining much needed information respecting the geological features of the country through which they pass. The frosts of a single winter will, in many instances, obliterate all surface traces of strata possessing economic importance, until accident leads to their discovery at some future and perhaps distant period. We earnestly desire to enlist amongst the contributors to this journal the gentlemen engaged in the construction of those extensive lines of communication.

The ample opportunities for observations of the most useful description which are enjoyed by surveyors, induce us respectfully to solicit their correspondence on all matters relating to the physical features and natural history of the districts in which they may be engaged.

To the operative, deriving from experience a purely practical knowledge which experience alone can give, we address ourselves in the hope of obtaining assistance and counsel in matters wherein the busy lessons of the workshop are far more valuable than the unapplied speculations of retirement and study.

It is not our intention to trespass upon the field now occupied by our contemporary the Agriculturist, yet so vast and unex-

*Vide Prospectus.

plored is the domain of Agricultural Science, that the rambler among its novelties may find, without encroachment, fruit and flowers in abundance wherewith to enrich our store and advance the public good.

To all who are interested in the objects of this journal we beg again to state, that the progressive improvement and extension of of the work will be commensurate with the support which may be accorded to it by the public, and the degree to which the Canadian Institute and the promoters of the Canadian Journal may be successful in soliciting and combining the talents of those classes to which they appeal.

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## Indian Remains.

NOTICE BY THE REV. C. DADE.

The following account of a remarkable Indian burying ground, which I visited soon after its discovery, may be interesting to you, though, no doubt it has been thoroughly ransacked since, and you may probably be acquainted with it. The spot is in Beverly Township, and was then a part of the farm of Mr. Call, ten or twelve miles from Dundas and two and a half from the Guelph road. The burying ground is situated on a ridge thickly wooded with beech, maple, &c., running east and west about a mile, and bounded by a rivulet called the Dundas Creek. On the summit I found several pits newly opened, and a vast quantity of human bones at the depth of about four feet. Among the bones were iron tomahawks, brass kettles, pipes, beads, wampum, conch shells, &c.

I brought home several specimens, and amongst the rest two skulls, (the owner of one had evidently fallen by the blow of a tomahawk,) a pipe elegantly formed of clay, a pipkin, &c. There were three or four pits which had been opened beyond the memory of the oldest settler. Trees were growing over the graves of the same size as those in the surrounding woods, (one beech being two feet in diameter.) It was thought that in the eleven pits, at least 1000 persons had been interred; in one of the smallest pits a person counted 125 skeletons. I visited this place in 1836.

P. S.—A neighbour of mine, last year, ploughed up a copper wedge, of the size and shape of common iron wedges used in splitting rails, about a quarter of a mile from the lake.

July 3rd, 1852.

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## On the Atmospheric Phenomena of Light: by J. Bradford Cherriman, M. A., F. C. P. S.,

*(Fellow of St. John's College, Cambridge, and Dep. Prof. of Mathematics and Natural Philosophy in the University of Toronto.)*

The atmosphere which surrounds the Earth possesses in common with other imperfectly transparent media the property of modifying the light which enters it, in three distinct ways, namely, by absorption, transmission and reflection, though in proportions whose amount is not exactly determinable. From the experiments of de Saussure on the plains of Germany, this much seems demonstrated, that, of the Sun's rays incident on the upper surface of the atmosphere, the Sun being in the zenith and the sky quite clear, not more than two-thirds reach the Earth, the rest being either absorbed or reflected. It is to this reflection that we owe the blue colour of the sky, the insensible gradation between day and night, and the diffused light by which objects are visible when not directly illuminated by the Sun's rays: without this, the shadow of every thick cloud would involve us in absolute darkness, and the stars would be visible all day, and at night appear as brilliant sparks in the midst of intense blackness. The amount of absorption will be greater as the density of the air which the ray traverses and the length of its path increase, and from these arise the diminished brilliancy of the Sun when on the horizon, and also the faintness of the light of distant terrestrial objects and their consequent indistinctness.

De Saussure has shewn by experiment that the blue rays of the solar light are more reflected by the atmosphere than the rest, and the red rays more easily transmitted; thus, as the depth and density of the stratum of air increases the more will the blue tint disappear and the red predominate, as we see in the Sun at its rising and setting. The blue tint is more decided in the zenith than on the horizon where the colour of the sky is sometimes quite white, and the intensity of the blue increases as we ascend from the earth; at a certain height, the sky appears nearly black.

On the evening of a clear day as the Sun approaches the horizon, the sky in his neighbourhood appears of a glowing red or orange colour, extending along the western horizon, but diminishing rapidly towards the zenith and the east: at the same time, in the point of the heavens opposite to the Sun, we often see the same red tint prevailing, and attaining its greatest intensity just at the instant of the Sun's sinking. Shortly afterwards, below this red part appears a circular segment of decided blue, the line of separation being in general sharply defined: as the Sun sinks lower, the red gradually disappears, and in the west is succeeded by a bright grey which fades off as it meets the blue eastern segment. This latter is due to the shadow of the Earth projected on the sky and coloured only by the blue diffused light; the grey, which constitutes twilight, is due to the reflection of the Sun's rays at the upper strata of the atmosphere by which we enjoy his light when it can no longer reach us by direct transmission: it deepens by degrees as the Sun sinks, and becomes altogether dark when the Sun is more than 18° below the horizon. The duration of twilight depends on the latitude of the place and the time of year; in the latitude of Toronto, the longest twilight lasts 1h. 36m. at the summer solstice; and the shortest, about 48 minutes, occurs in the present year on March 3rd and September 5th. In latitude 48½° and any place higher than this, twilight at the summer solstice will continue all night.

Sometimes, but very rarely, when the Sun has set, there is seen a pale glimmer extending upwards from him in a conical shape towards the north-west and reaching to a considerable height. A fine instance was observed in the present year; it is due, undoubtedly, to the light thrown on the sky by the strata of air actually below the horizon and directly illuminated by the Sun's rays.

When a ray of light proceeding from an object passes obliquely through a medium varying from point to point in density like the atmosphere, its path is no longer a straight line as in vacuo, but a curve whose nature depends on the law of variation of the medium, and as the direction in which the object is seen is determined by the direction of the ray on entering the eye, it follows that the places in which objects appear to be are not the places they actually occupy: the necessity of making an allowance for this gives rise to one of the most important astronomical corrections, called Refraction. The effect of this refraction is to raise all objects vertically above their real places by an amount which is greater as the object is nearer to the horizon:* thus the Sun's disc is completely visible to us when he has sunk quite below the horizon, and appears distorted in shape into a sensible oval, the horizontal

*It is recorded by a late African traveller, that in shooting on the sandy deserts there, at first he invariably fired too high, the birds appearing much above their real places from the unusually great refraction.

axis being one-eighth greater than the vertical. Various tables have been constructed for giving the amount of correction to be applied at different altitudes: the best English ones are constructed from the following expression which is to be deducted from the observed zenith-distance.

$$c.\tan.z\ (1-.00128\ \sec^2 z)$$

Where $z$ is the apparent zenith-distance, and $c$ represents the variable quantity $\frac{60''66}{1+.0020803x}\cdot\frac{h}{29.93}$ in which $x$ is the temperature of the air expressed by the number of degrees above freezing point, (Fahrenheit) and $h$ the height of mercury in the barometer in inches. This formula is obtained independently of any hypothesis as to the law of variation of density, only assuming that the density is the same at equal distances from the Earth's centre; and it is sufficiently accurate for astronomical purposes for all altitudes above 26°, but below this the law of variation must be taken into account, and as we are altogether ignorant of this law, the formulæ and tables for low altitudes are more or less empirical. A remarkable and ingenious one was constructed by Laplace (Mec. Cel.) and the French tables are founded upon it: but very near the horizon, the irregularities of refraction, arising from local and accidental circumstances, are so great as to foil all attempts to express them by a mathematical formula.

It is a singular fact that the changes of humidity in the atmosphere do not produce any sensible effect on the refraction; the reason being that the density of suspended vapour is less than that of air very nearly in the same ratio that its refractive power is greater, so that the effective refractive power of aqueous vapour is about the same as that of the atmosphere. The effects produced by refraction are sometimes exceedingly curious. When the stratum of air next the Earth differs very much in density from that above it, the rays from an object which would not otherwise reach the spectator, may be bent back from the higher stratum and thus furnish an image in addition to the one seen by direct rays, and elevated or depressed with regard to it according as the higher medium is rarer or denser than the lower one. Thus if the temperature of the sea is higher than that of the atmosphere, owing to the slower cooling of the former, the stratum of air immediately above the sea becomes rarer than the one higher up: and a spectator situated in the denser medium and looking at an object in that stratum, will see, at the same time with the image furnished by direct vision and below it, an inverted image produced by rays bent upwards from the lower medium. To this class of phenomena belong the well-known *Fata Morgana*, the appearances seen on the sandy plains of Egypt, and called by the French *Mirage*, and the *Looming* occasionally seen in parts of Great Britain.

When the higher stratum is rarer than the lower, as sometimes happens from the air above the sea being suddenly heated by the Sun, the appearances will be reversed, an inverted image being formed as before, but in this case elevated above the true image. A second sudden change of density in the ascending strata may give rise to another image still, elevated above the other two and erect, as actually observed by Captain Scoresby, who also relates an instance in which he recognized his father's vessel, when at a distance of 30 miles, and therefore far beyond the limit of direct vision, by means of an inverted image in the air, so well defined that every sail could be distinguished. This also points to the probable explanation of the remarkable case of the French sailor in the Mauritius, who was accustomed to predict the approach of vessels long before they could be detected by the telescope, and when they must have been far below the horizon.

Phenomena of a somewhat similar nature are sometimes produced by reflection, a slight haze acting as a mirror. The spectre of the Brocken is well known, and a beautiful instance is recorded as having been seen by Dr. Buchan at Brighton,(see Sir D. Brewster's Natural Magic.) The same has been observed at the Mountain-house on the Catskills, when at sunrise the face of the cliff and the front of the house were seen by the spectators standing on the ledge on which the house is built, together with their own images, vividly reflected in front of them as the morning mist just cleared away.*

The aqueous particles suspended in the air as clouds, or falling in the shape of rain or snow present many beautiful phenomena.

The gorgeous colouring of the clouds with their infinite varieties of light and shade are readily explainable on the principles above indicated, the Sun's light being transmitted in different tints according to the depth and density of the vapour through which it passes, and the clouds themselves reflecting or transmitting it variously according to the position they occupy relatively to the Sun and spectator. In the morning and evening, the clouds, floating with their largest dimensions horizontal, present greater masses of vapour to be traversed by the Sun's rays than when he is vertical, and this, along with the circumstance of the longer horizontal range of the air, gives the reason why the sky is then distinguished by richer colouring than at mid-day.

Among the arrangements of clouds which produce remarkable effects may be noticed those of diverging and converging beams, known in the country by the name of "the Sun drawing water;" they generally indicate wet weather, as they only occur when the air is charged with vapour. The former arises simply from some of the Sun's rays being stopped by clouds while others are allowed to pass through openings therein; or, to speak more correctly, from the shadows of clouds being projected on the sky so as to obscure parts of it in the neighbourhood of the Sun; it most frequently occurs when the Sun is not far from the horizon. The latter phenomenon is of much rarer occurrence, and consists of arcs of great circles apparently cutting each other in a point of the heavens below the horizon in the prolongation of the line drawn from the Sun to the spectator. This apparent convergence is purely an affect of perspective, the rays themselves being parallel but appearing to approach each other as their distance from the spectator increases, like the opposite rows of gas-lamps in a long street. Another singular form is that to which the French have given the name of *bandes polaires*, when the arrangement of the clouds is such as to cause the illuminated portion of the sky seen between them to assume the form of an auroral arch, but considerable obscurity still hangs over this phenomenon.

When a light cloud is interposed before the Sun or Moon, the disc is often surrounded by several coloured rings, each displaying the prismatic tints with the red on the inside and the violet outside, the diameter of the inner ring varying from 1½ to 4 degrees: these rings are called *coronæ*, and are most commonly seen round the Moon; when round the Sun, they are best discerned by reflection in water, and in this way Newton succeeded in detecting three at once. The cause of this appearance baffled even Newton's sagacity, and it was reserved for the famous Young to point out, that the rings resulted from his doctrine of the interference of rays on the undulatory hypothesis, the same cause that produces the colours of a soap bubble and the prismatic tints of a spider's web. Young announced from theory that the diameters of the successive rings would be as the natural numbers 1, 2, 3, 5, - - - and this prediction has been verified by the observations of M. Délegenne. The same principle explains also a phenomenon, first noticed by Bouguer, and called by him *anthélie*, that when the shadow of a spectator is thrown on a cloud, or on the ground covered with dew, the shadow of the head is seen surrounded with coloured rings, like the "glories" round the heads of saints in old pictures: a similar effect has been observed by M. Babinet when his shadow fell on the smoke of artillery,

*I cannot refrain from recommending all lovers of scenery and science to pay a visit to the Mountain House at Catskill: the view of sunrise from the platform, and the irises of the waterfall offer many curious optical appearances, and the natural beauties of the neighbourhood are not detracted from by the fact of the hotel being an excellent one.

on a bank of fog, and even on the bubbles of a small brook. Professor Necker describes another beautiful phenomenon, the explanation of which must be referred to the same principle; "If the Sun is rising behind a hill covered with trees and brushwood, a spectator just within the verge of the shadow of the hill will see all the little branches thrown into relief against the sky, not, however, dark and opaque, but glowing with a white briliancy like silver, even to the depth of several feet below the summit of the hill."

When the suspended aqueous vapour is condensed and descends in the form of rain, it gives rise to the splendid and familiar spectacle of the rainbow. This consists in general of two circular and concentric arcs, separated by a dark interval of about 8° breadth, the outer one being much the fainter of the two, and each exhibiting the prismatic colours, in the inner the violet being on the inside while in the outer the order of colour is reversed. The first person to point out the origin of the bows was Antonius de Dominis, Archbishop of Spalatro, in 1611, A. D.; his explanation was appropriated by DesCartes, but as the true theory of colours was not at that time known, it was left for Newton to give a full account of the phenomenon. It was by him shewn, beyond doubt, that the inner or primary bow is formed by the Sun's rays which reach the spectator's eye at emergence from the rain-drops under the angle of least deviation after one internal reflexion, and in like manner the outer or secondary bow by these emerging after two internal reflexions. So also a tertiary bow would be formed after three such reflexions, surrounding the Sun with an angular radius of 40° 21', but the light is so much diminished at each successive reflexion as to be too faint to make any impression on the retina, and this bow has consequently never been seen.* In some instances a coloured arch has been seen between the two bows, and not concentric with them, arising undoubtedly from the reflexion of the lower part of the primary bow which falls below the horizon at the surface of a river or lake. Sometimes, also within the primary and outside the secondary, are seen successive coloured bands, being of a reddish-purple in contact with the violet of the bows, then green, purple, and so on in the order of Newton's rings. Young shewed that these resulted from the interference of rays which undergo the same deviation at angles of incidence a little less and greater than that which furnishes the ray of least deviation. Lastly, Mr. Airy, having observed that the greatest intensity of illumination does not occur exactly in the place indicated by the geometrical construction, has investigated the whole subject as a problem of interferences on the undulatory hypothesis, and his results have been fully verified by the experiments and measurements of Professor Miller, so that the theory of the Rainbow may now be said to be complete.

Similar appearances ought to be produced when the Moon is the illuminating body, but her light is so much fainter than that of the Sun as to render the occurrence even of a primary bow very rare; so far as I am aware, the secondary and supernumerary bows have never been seen.

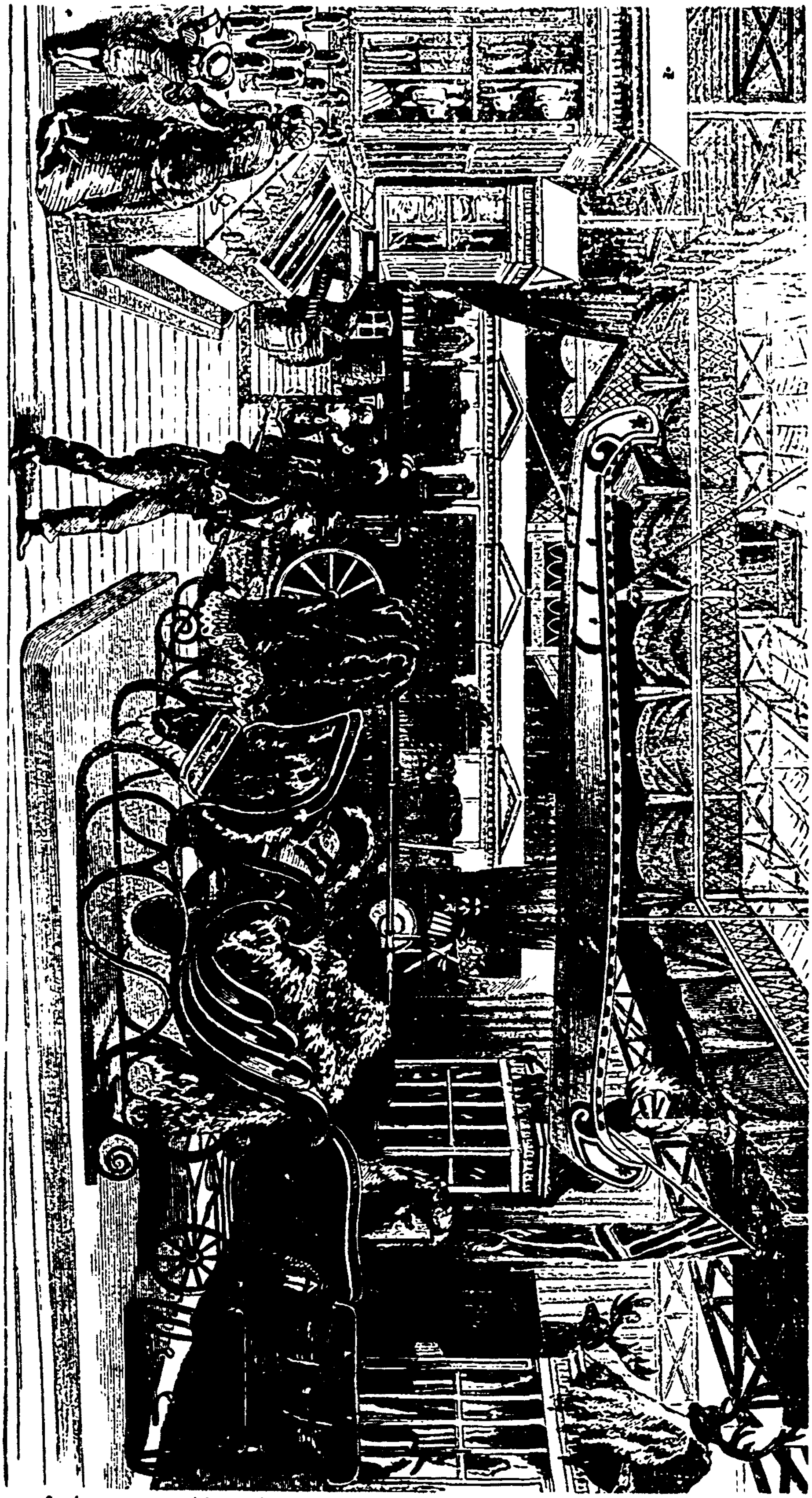
*To be continued.*

**Railway Accidents; their Cause and Means of Prevention; detailing particularly the various contrivances which are in use, and have been proposed; with the Regulations of some of the principal Lines, by Capt. M. Huish.**

(*Read before the Institution of Civil Engineers.*)

The author first considered those points connected with the road, and the machinery employed upon it, from which loss of life and injury to person and property most generally arose. With regard to the road, or permanent way, from which fewer accidents occurred than from any other cause, its complete effectiveness was the basis of all safety in railway travelling; and for keeping it up, constant vigilance was necessary, especially when any great and sudden change of weather took place, as then the weak points were sure to show themselves. It was a very rare occurrence for trains to run off the line; and when they did so, it was more generally due to obstructions designedly placed on the line than to any neglect of the superintendents or the platelayers. With respect to the rolling stock, it appeared from a return of one thousand cases of engine failures and defects within two years on the London and North-Western Railway, that burst and leaky tubes nearly doubled any other class of failure; and that these, with broken springs and broken valves, amounted to one-third of the whole number; and though they caused no direct danger to the public, yet as producing a temporary or permanent inability of the engine to carry on its train, they might be the remote cause of collision. These and other circumstances had led many persons to suggest various contrivances for communicating between the passengers, the guard, and the engine-driver, almost all of which were identical in principle, consisting of a connecting wire or rope. This plan had been tried and failed. A more feasible and favourite one was that recommended by the Railway Commissioners, which was to continue the foot-boards, so as to form a narrow platform from end to end of the train, but a committee of railway officials had subsequently expressed their unanimous condemnation of the measure. The plan now adopted on the London and North-Western Railway, was, for the guard's van, at the end of the train, to project about a foot beyond the other carriages, so that the guard looking through a window in this projection might notice the waving of a hand or a handkerchief; this was, of course, useless at night. All these causes, however, did not produce a tithe of the accidents which resulted from a want of attention to signals and a neglect of regulations, which of all sources of danger were the most prolific. The Electric Telegraph had greatly facilitated working under variable circumstances, and so beneficial had its effects been, that during the year 1851, out of 7,900,000 passengers, or nearly one-third of the population of England, who had travelled over the London and North-Western Railway, only *one* individual had met with his death (from which casualty the author also suffered) and this was the effect of the gravest disobedience of orders. In the six months during which the Exhibition was open, 775,000 persons were conveyed by excursion trains alone, in 24,000 extra carriages, all centering in a single focus, arriving at irregular hours and in almost unlimited numbers, from more than thirty railways, without the most trifling casualty, or even interruption to the ordinary extensive business of that line. The author thought undue importance had been attached to the question of irregularity in the times of the trains, as an essential element of safety, for with perfect signals and a well disciplined staff no amount of irregularity should lead to danger; but, on the contrary, it should, to a certain extent, by its very uncertainty, induce increased vigilance, and therefore greater safety. Accidents very rarely happened from foreseen circumstances, but generally from a simultaneous conjunction of several causes, and each of these was provided for as it arose. The statistics of railways, and the periodical publication of the Government returns, drew public attention very pointedly to the aggregate of accidents; but it was believed that if due regard was had to comparative results, if the accidents to steamers, or in mines, to omnibus passengers, or even to pedestrians, were as carefully recorded, that then, whether as regarded the ease and celerity of transit, or the facility of conveying numbers, the railway system, even in its present state, would be found to be incomparably safer than any other system in the previous or present history of locomotion.

* This is contrary to the statement of Dr. Lloyd, who says that tertiary rainbows have been observed; he however refers to no particular instance, and I certainly have never heard of one. M. Babinet, an acute observer, was unable under the most favorable circumstances to perceive the faintest trace of one.



The Canadian Department of the Great Exhibition.

**Extracts from Exhibition Lectures, delivered before the Society of Arts.**

Professor Owen gives the following account of a comparatively new branch of art, which promises to prove of great importance:

*Gelatines.*—Such productions as coral, shell, and pearl, are naturally attractive by their intrinsic beauty or rarity. But the most refuse and uninviting, and seemingly most worthless parts of animal bodies, are turned to uses of the most unexpected kind by the inventive skill and science of man.

The raw materials chiefly used in manufactures derived from the gelatinous textures of animal bodies, may be divided, as regards their commercial value and application, into two kinds:

1st. The gelatines and glues, properly so called, derived from the dissolution of certain animal tissues, and especially from the waste residue of parts of animals which have served for food, or for the operations of tanning, or for the fabrication, as from bones, of articles in imitation of ivory, or from the waste particles in the carving of ivory itself.

2nd. The cleaned and dried membranes of different species of fish, more especially of the sturgeon family, (*Acipenseridæ,*) preserving a peculiar texture, on which their value in the refining of fermenting liquors more especially depends; such membranes are called "isinglass."

The most remarkable progress in the economical extraction and preparation of pure gelatines and glues from the waste remnants of the skins, bones, tendons, ligaments, and other gelatinous tissues of animals, has been made in France, where the well-organized and admirably arranged establishments for the slaughter of cattle, sheep, and horses in large towns, give great and valuable facilities for the economical applications of all the waste parts of animal bodies. Among the beautiful productions of this industry, the specimens exhibited by its chief originator, M. L. F. Grenet, under No. 247, merited peculiar approbation. They included different kinds of gelatine in thin layers, adapted for the dressing of stuffs, and for gelatinous baths, in the clarification of wines which contain a sufficient quantity of tannin to precipitate the gelatine: pure and white gelatines cut into threads for the use of the confectioner: very thin white and transparent sheets called "papier glace" or ice paper, for copying drawings; and, finally, a quantity of objects of luxury or ornament formed of dyed, silvered, or gilt gelatines, adapted to a variety of purposes, and to the fabrication of artificial or fancy flowers. M. Grenet, who was the first to fabricate on a large scale, out of various residues of animal bodies of little value, these beautiful and diversified products, many of which previously had been derived from the more costly substance—isinglass, was deemed by the jury to merit the award of the council medal.

Many manufacturers in France have risen to great eminence in this line by following the processes of M. Grenet. H. Castelle, of Paris, exhibited (No. 107) a still more varied assortment of the modifications of gelatine, amongst which were particularly deserving of notice the very large sheets of transparent gelatine, colourless, white, of various well-defined colours, and embossed or stamped with elegant patterns.

Jacob Bell, Esq., M. P., in his lecture on pharmaceutical processes and products, gives a curious illustration of the extent to which the consumer is prejudiced by the obstacles which intervene between himself and producer:—

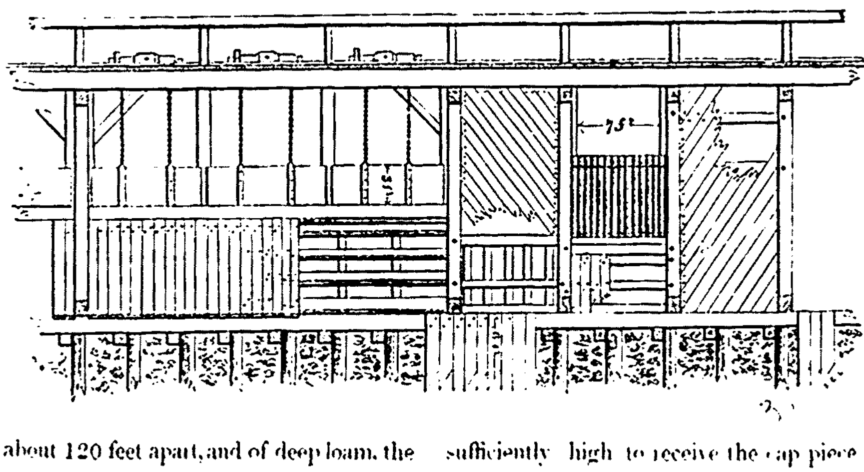
An ingenious application of the science of chemistry consists in the manufacture of artificial essences of pears, pine-apples, and other fruits. A few specimens which I have received from Mr. Piper, of Upper Winchester Street, Pentonville, are on the table. In the concentrated form, the smell is rather acrid, but when diluted, the resemblance to the fruit is recognised. The best imitations are the pine-apple and the jargonelle pear; the green gage, apricot, black currant, and mulberry, when properly mixed, are fair imitations. They are quite innocuous in the proportions used, namely a drop or half a drop to the ounce. I have been informed, that some of the ices furnished in the Great Exhibition were flavoured with these essences. The introduction of these preparations originated, I believe, in the discovery of the fact, that the peculiar flavour of "pine-apple rum" was due to butyric ether, which has since been obtained from the fruit itself. Further experiments led to the discovery of other artificial essences.

Here is a series of specimens of scammony from the English collection. No. 1 is pure; the others are more or less adulterated, down to No. 5, which is not worthy of the name of scammony. In the Turkish collection, where we might have expected to find scammony unusually fine. No. 1 is about on par with No. 3 in those above mentioned, and No. 5 would not be recognized as scammony except by the label on the botttle. It is only within a few years that pure scammony has been known in England, and its introduction arose from the circumstance of several samples of scammony being analysed, and found to be adulterated (chiefly with starch and chalk) to an extent varying from about 15 to 60 per cent. The fact being reported to the merchant abroad, he replied, that he made it to suit the demand, and mixed it according to the price. He said he would send it pure if desired, but it would be dear in proportion. From that time, "virgin scammony," as it is called, has been in the English market, but it has not yet found its way to the continent of Europe. Several foreign professors, lecturers on *materia medica*, and possessors of extensive museums, had never seen pure scammony until they saw it at the Great Exhibition, and were glad to obtain a few ounces as a specimen, to take home with them as a curiosity. Similar remarks may be made with regard to opium, of which we had specimens from various localities. This is a drug which, like many others, is adulterated to suit the demand.

NOTE.—We are indebted to the liberality and courtesy of the Proprietors of the Illustrated London News for the stereotyped plate of the Canadian Department of the Great Exhibition. We have also been favoured with stereotyped plates of various articles contributed by Canadians, which we shall introduce into the Journal as occasion offers. We beg to tender our respectful thanks to the Proprietors of the Illustrated London News.

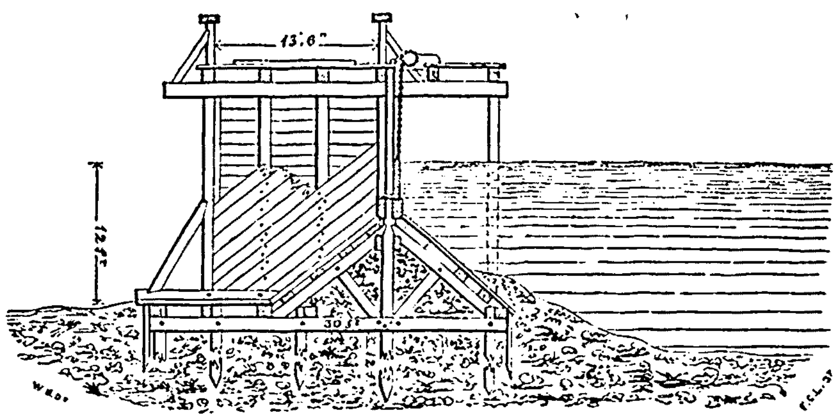
## Description of a Mill-Dam and Bridge for a Creek Fifty Feet Wide.

We would remind those of our professional brethren whose minds may soar above the preparation of a plan for a Mill-dam or a Bridge across a creek fifty feet wide, and who may be tempted to smile at the common-place nature of the work we now illustrate, that one object of the Canadian Journal is to impart information on matters of common necessity among the people, in the full conviction that the efficient and permanent construction of such humble works is as essential, in their several localities, to the general progress of the country, as are those of far greater magnitude. In furtherance of this purpose, we invite the co-operation of all whose attention has been given to these subjects, not without the confident expectation that the example set by our intelligent correspondent, whose diagrams and descriptions we give below, will be generously followed by many practical men, whose experience will enable them to furnish materials possessing that rare value which experience alone can give.



The drawings I enclose in this communication were made for a Mill-dam and Bridge across a creek, the banks of which were about 120 feet apart, and of deep loam, the bed of soft clay. A dam had been previously constructed on the same site, but had been twice carried away, owing to the sudden rise of water, washing away and undermining the banks on each side of the abutments. In order to prevent the recurrence of similar accidents it was necessary to construct a dam with a very wide water way or apron; and to connect the abutments with the banks by puddle ditches and shut piling, as well as to construct the sluices in such a manner as to admit of the water-way being readily enlarged to such an extent as to allow the passage of the water during the heaviest freshets without allowing it to rise above the abutments. These conditions are fulfilled by the design which I will now briefly describe.

The bed of the creek was first excavated to a depth of three feet below its ordinary level under the whole breadth of the dam, (one half the breadth of the creek being completed while the other half served for passing the water, which in the dry season was inconsiderable,) round piles 12 inches diameter were driven to a depth of about 12 feet, as indicated on the plan, to which the cross timbers are notched and bolted—upon these longitudinal timbers are placed and secured. The second row of piles from the upper side, being square, are left sufficiently high to receive the cap piece of the apron, which is double and securely framed to them and braced, as shown to form the apron. Three inch sheet piling was then driven above and below the dam and securely spiked to the outside longitudinal timbers, and continued well into the bank so as to prevent the water penetrating and destroying the foundation; coarse gravel and clay was closely packed among the foundation timbers and well rammed. The whole apron was also filled with the same material, and covered with five-inch plank, secured with trenails and spikes. The piers being planked inside and out are—in the absence of stone, which could not be conveniently procured—filled to the top with coarse gravel intermixed with clay; cross ties being inserted at intervals, dovetailed upon the posts to prevent the sides from spreading. A puddle ditch was made about twenty feet into the banks on each side from the land piers, and being well puddled, secured the banks from destruction in the event of an extraordinary rise of water overflowing them.



The manner in which the Bridge is placed on the piers, is made sufficiently evident from the drawings, and the accompanying estimate of the quantity of material necessary to complete the structure, will afford sufficient data from which to estimate its cost. It was deemed advisable when building this dam to avoid using any but the most simple plan for hoisting the sluice boards; at the same time, it is evident, that should it at any time be desirable to introduce a more complete apparatus, any of the numerous contrivances for that purpose may be readily adapted.

It will be seen from the drawings that the outside planking of the piers was put on diagonally, in order to brace the framing, and thus save the necessity of framing braces in the work. The whole of the planks were put on with 1⅜ inch oak trenails, the butts only being spiked.

In some cases where large stone can be conveniently obtained it may be cheaper to build a Dam of this kind without piling. Where this occurs the piles may be dispensed with, and the timber merely bedded in the bottom of the creek; the piers and apron being well packed with stone will serve to keep the dam firm: there should then, however, be a pier in the middle of the length of the dam, instead of the framing shown in the drawing, in order to keep down that part of the foundation. Since in creeks liable to heavy freshets, and where the water sometimes *backs up* below the dam to a considerable height, the whole structure being timber, becomes so buoyant that it is in danger of floating away, hence the object of the piling was more to prevent the foundation from rising than to support the weight of the superstructure, which object would of course be effected by the addition of sufficient stone as before stated.

The following is the estimate of material for the Dam and Bridge:—

| | |
|---|---|
| Round piles of hardwood 12 inches diameter, lineal feet, | 1680 |
| Square do. pinewood 12 do. do. do. | 560 |
| 3 inch sheet piling, board measure, superficial feet, - - | 5250 |
| Oak and elm squared timber, cubic feet, - - - - - | 3500 |
| Pine do. do. do. do. - - - - - - | 3450 |
| 3 inch pine plank, board measure, superficial feet - - | 42300 |
| 5 inch oak and elm do. do. - - - | 12000 |
| Wrought iron, in lbs., - - - - - - - - - - - | 1740 |
| Wrought spikes, in lbs., - - - - - - - - - - - | 500 |

*Applications of Centrifugal Action to Manfacturing purposes.*—It is well known that a centrifugal machine has been hitherto employed with much advantage for the drying of textile fabrics and for clarifying sugar; but these are not the only purposes to which it is adapted; for every day new applications of this apparatus suggest themselves, and important problems are solved by its means. We now learn that one of the most important operations of brewing may be wonderfully simplified by the use of a centrifugal apparatus. It has been hitherto considered extremely difficult to reduce the temperature of beer to the degree of coolness requisite; it has been necessary to make use of refrigerators for this purpose, and, notwithstanding all precautions, mistakes not unfrequently happen. It occurred to some English brewers that this difficult cooling process might be effected by means of a centrifugal machine. This idea has been put in practice with complete success. The beer was reduced to the desired temperature by merely passing it through the machine; and this was effected not only with great rapidity, but also with considerable economy. Some time back, M. Touche, of Paris, endeavoured to produce ice by means of a hydrofugal apparatus. He did not succeed in reducing water to the freezing point, but he cooled it to a degree far below that required in brewing beer. It would be superfluous to explain these results, for every one is acquainted with the effects of a very rapid ventilation, and the centrifugal machines are made to rotate at the rate of 3000 revolutions per minute, and even quicker. We are further informed that in certain manufactories in Alsace a hydrofugal machine is used for making starch. When the flour is stirred about in water, the different substances range themselves according to their specific gravities, unless prevented by some peculiar circumstances. Now, this is precisely the result obtained by the centrifugal machine; starch, being the heaviest substance, separates itself from the others, and is first precipitated. The centrifugal machine may also be advantageously applied for classifying grain, seed or ores, according to their respective densities, whether liquid or solid, provided they are not of a cohesive nature, or that whatever cohesiveness they possess may be easily removed. In fact, the centrifugal apparatus may be applied to so many different manufactures, that it may be justly looked upon as one of the most fortunate and fruitful inventions of modern times.—*Moniteur Industriel.*

*Syphon Filter.*—The Syphon Filter is, perhaps, the most convenient kind for general purposes, as it may be readily carried about and used by any ordinarily available pressure. The shape of the filter is that of an elongated bell. It is made of white metal; and, at the top of the bell-shaped vase, there is inserted an inflexible metal tube, furnished with a stop-cock near the end. The vase is filled with powdered quartz, of various degrees of fineness, and the mouth of it is closed with a perforated cover. When required to be used, the vase is inverted in the water to be filtered, and the tube is allowed to hang below it. When the air is withdrawn, the water rises through the powdered quartz, and fills the tube; and, by syphonic action, the water is drawn down by its superior gravity. The lower the tube the greater the pressure, for the weight of water flowing down operates on the filtering surface as directly as if the same column of fluid were placed above it. The amount of pressure is, however, limited to that of the pressure of the atmosphere; for were the tube lengthened beyond 30 feet, the column of water would separate and leave a vacuum. This filter renders the muddiest water beautifully clear when acting with the pressure of not more than two feet, at the rate of four gallons an hour.—*Report on the Great Exhibition.*

## Rodd's Registered Filter-tap.

Fig. 1 is an outside view of Mr. Rodd's filter, and fig. 2 is a section, about quarter size. It is of brass, tinned inside, to prevent the slightest contamination of the water; and is composed of three cylinders, the second one having a series of small holes, drilled laterally near the bottom, through which the water enters the filter, which may be attached directly to the cistern or butt. The course of the water is shown by the arrows. The filter is filled with peat charcoal, or other approved material. When the filthy stuff supplied by the water companies is passed thro' one of these filters, it will pass out not only mechanically, but chemically purified, from the deodorizing and purifying power of the peat charcoal, as we have on previous occasions amply shown.

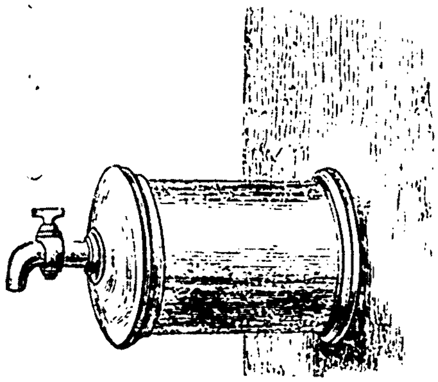


Fig. 1.

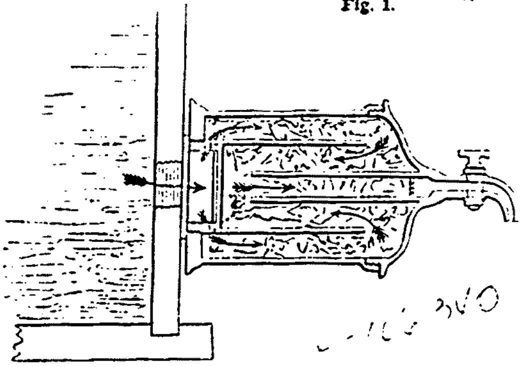


Fig. 2.

*St. Rollox Chemical Works.*—The chimney of the St. Rollox Chemical Works is the highest building in the city, and the highest of its kind in the world. Its height is 455 feet from the foundation, 435 feet from the surface of the earth, and, from the position, it must be nearly 600 feet above the level of the sea. Its diameter at the surface of the earth is 40 feet; but it tapers upwards until, at the top, the breadth is reduced to 13½ feet. This is the measurement within the walls; but, for nearly 200 feet upwards, the building is double. One chimney is built round another until the fabric reaches nearly the height mentioned. The erection occupied the greater part of two summers, and was completed at a cost of £12,000. The St. Rollox works form a vast chemical laboratory; covering twenty acres of land.—*Atheneum.*

## Agricultural Engineering.

The farm of Harold Littledale, Esq., of the County of Chester, England, furnishes an illustration of the very artificial practice now becoming by no means uncommon among the scientific Agriculturists of the day. The experiment so thoroughly and successfully carried out by Mr. Littledale, derives additional interest and importance when contemplated with regard to the proposed distribution of the sewage water of London and some of the large provincial towns, over the farms in the vicinity of those great centres of population. Canadian Farmers are not in a position to avail themselves of the expensive artifices described below. Such examples, however, serve well to encourage the enterprising in this country, to seize upon every rational means of raising the standard of Husbandry, and to arrive at that practice which secures the greatest amount of permanent remuneration with comparatively, the least expenditure of capital. The details subjoined we extracted from the report to the Board of Health on Liscard Farm near Birkenhead, by W. Lee, Esq., Superintending Inspector.

Mr. Littledale has drained all the land on this farm capable of being drained. Both pipes and tiles have been used. Some of the drains are laid only 2½ feet deep, others 4 feet, and latterly, increased as the result of experience. The average width between the drains is about 21 feet. The cost was £4 to £5 sterling per acre.

Liquid manure is preserved for distribution in a tank capable of containing 58,300 gallons. It is forced by means of steam power through iron pipes through a distance of 2 miles, serving for 150 acres. There is a hydrant for every 300 yards of main. The hydrants are so fixed that with 150 yards of hose the distributor and boy can irrigate 10 acres per day. The quantity distributed to each acre being about 4,118 gallons.

The hose pipe is of gutta percha, and consists of 75 yards, 2 inches in diameter, costing 2s. 6d. per yard, and 75 yards 1½ inch.

Mr. Littledale's capital account for irrigation stand thus :—

| | | | |
|---|---|---|---|
| Tank - - - - | £210 | 0 | 0 |
| Steam Engine - - - | 60 | 0 | 0 |
| Two Pumps - - - | 70 | 0 | 0 |
| Iron Pipes - - - | 315 | 0 | 4 |
| 75 yards of 2-inch gutta percha hose | 9 | 18 | 0 |
| 75 yards of 1½ do do | 7 | 10 | 6 |
| Total - - - | £672 | 1 | 10 |

From the data already ascertained the following will be the annual account for interest and working expenses.

| | | | |
|---|---|---|---|
| Interest upon £672 and wear and tear @ 7½ per cent. - - - | £ 50 | 8 | 0 |
| Fuel due to irrigation - - | 4 | 6 | 8 |
| Wages - - - | 13 | 4 | 4 |
| | £67 | 19 | 0 |

Divided by 150, the number of acres irrigated, the account is equal to an average of 9s. 0¾d, per acre.

The present live stock yielding manure consists of 81 milk cows, 2 bulls, nearly 100 pigs, and 12 horses. All the liquid from the stables, cow-houses, piggeries, yards, cottages, and the bailiff's house, drains underground to the tank.

As the general result of draining, liquid manures, and other improvements effected by Mr. Littledale, I (Mr. Lee) was informed that the yield of the whole farm is double what it was 10 years ago.

The liquid manure has been hitherto applied to nothing but grass. It is intended now, however, to apply it to crops.

My informant said—

"We have now 80 acres of Italian rye grass, and look to it first for food for the cows. We buy nothing for the cattle but malt grains, the annual account for which is about £130. We sell a portion of the turnips at times, but shall have none to spare this year. We also sell some potatoes and straw, but generally the crops are consumed on the farm."

The Italian rye grass has had none but liquid manure, and has been cut three or four times during the summer and autumn. The crops averaged from 2½ feet to 3 feet thick each cutting. The fourth crop from one piece was weighed, and produced 10 tons per acre.

That was the least of the crops from the same land, but the whole produce of that piece was above the average.

Many calves are sold, but the value of the young stock is low in the market, and I could not ascertain the sum realised.

From 50 to 60 pigs are killed per annum. Some few are sold as pork but the greater part is made into bacon. The average weight is about 20 stones each, and the bacon sells wholesale at *7d.*, and the hams at *9d.* per pound.

Two hundred gallons of milk per day, on the average, are sold to New Brighton and Seacombe, at 1*s.* per gallon.

The butter averages 180 lbs. per week, at 1*s.* 2*d.* per pound.

Taking the bacon and hams at 7½*d.* per lb., on the average, the annual produce of the farm in those three items alone is as follows:—

| | £ | *s.* | *d.* |
|---|---|---|---|
| Bacon - - | 481 | 5 | 0 |
| Milk - - | 3,650 | 0 | 0 |
| Butter - - | 546 | 0 | 0 |
| | £4,677 | 5 | 0 |

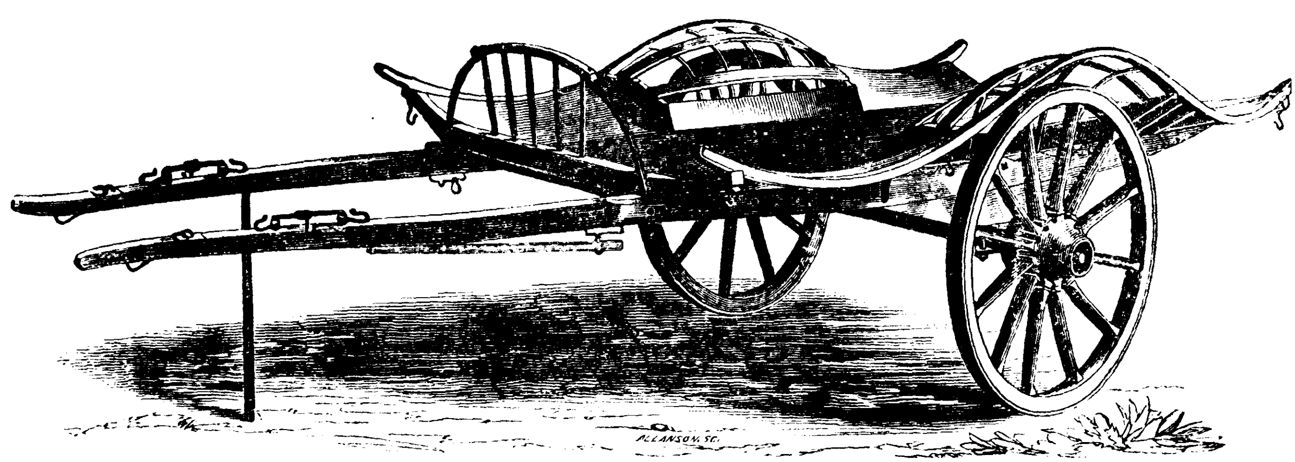
*Steam Plough.*—The first public trial of Usher's steam-plough took place at Baugholm, near Edinburgh, on the 14th of November last, when only four ploughs were used, although the locomotive is adapted for six. The amount of power that may be introduced is, of course, indefinite; and the machine might be made capable of working a series of ploughs to compass any proportionate breadth of land. The ploughshare penetrated deeper than is reached by the horse-plough, and the loam was thrown up and pulverised as loosely as if the spade had been at work. The field was level, and the operation was viewed with great interest by the spectators. A second trial took place on the same farm on the 21st of November, with similar results. Practical men present expressed their surprise at the superior manner in which the soil was stirred. Another trial took place on Friday, the 27th of February; the plough traversed the field six times with perfect success, and, as on the first occasion at Baugholm, to show its capability to travel over a soft surface, it ploughed a part of the land twice over. This experiment was supplementary to one which had taken place on the previous day, in presence of the committee of the Highland Society.

The cost of the machine is about £300, and it is adapted to ploughing, thrashing, rolling, and harrowing. It travels 2550 yards per hour, turning over 50 inches in breadth, which is equal to 7 acres in 10 hours, at a daily expense of 17s. or 18s., which is about 2s. 6d. per acre, while it costs 9s. or 10s. to plough an acre with horses. Although the first machine may not be perfect, still the fact is undeniable that the great obstacle to ploughing by steam has been got over, and with a little improvement the inventor has no doubt of making the machine perfect.

The cost of the steam-plough per day is estimated as follows:—

| | | |
|---|---|---|
| 12 cwt. coals - - - | 6s. | 0d. |
| Engineer - - - | 3s. | 6d. |
| Two laborers - - - | 4s. | 0d. |
| Horse, two hours - - - | 1s. | 6d. |
| Interest on machine and repairs - | 2s. | 6d. |
| | 17s. | 6d. |

*Farm Machinery.*—The portable farming produce mill, from Mr. Crosskill, of Beverley, has been tried at Canterbury, in the presence of many of the leading agriculturists in the neighbourhood. The experiment was very satisfactory; it ground oats and beans, and, to show what it was capable of doing, flint stones were ground to fine powder, by putting different kinds of grinding plates in, an operation which was attested in 15 minutes; and from which, it appears, any substance can be ground, from flint stones to barley meal. The mill was driven by the portable steam-engine belonging to Mr. Neame, of Selling, who, we are informed, has purchased the mill. At a private trial at Mr. Neame's farm, at Selling, the mill crushed oats at the rate of 30 bushels per hour, and split beans at the rate of 60 bushels per hour, and ground barley to fine meal at the rate of 8 bushels per hour, besides grinding bones, and crushing flint stones, bricks, &c.



**Ransome and May's One-Horse Harvest Cart.**

This cart is very useful and well adapted for carrying large loads from the harvest fields. It is made very light in weight, and, from the best materials being used, and good workmanship is strong. It may be more readily loaded than the waggons in ordinary use. It is manufactured by Messrs. Ransome & May, of Ipswich, who obtained the gold medal of the Royal Agricultural Society of England at the general meeting at Oxford, and a second time at Derby. The price of the cart is not necessarily much higher than those of the older and less efficient vehicles. Flat carts were used in many parts of the country for the harvest home, but they obviously incurred more or less damage to the crop. Frames projecting at an angle from the body of the cart were subsequently employed to accomplish one of the objects obtained by Messrs. Ransome & May's cart; which secures not only great width in loading, but a perfect guard to the wheels. In the present state of agricultural affairs, small savings are of great importance to farmers, who may soon economise the cost of a cart in the saving of labour and time, and the safety to crops obtained in conveying them by proper vehicles from the field to the farmyard.

## CORRESPONDENCE.

For many years the people of Canada have had just cause to regret, that information respecting the resources of the vast territory they possess, should have had such a limited circulation in the Mother Country. It is needless now to enquire into the minor causes of the extraordinary ignorance which but too generally prevails in England of the progress of the Canadas, and of the admirable opportunities they offer for the safe and remunerative investment of capital, or the exercise of well-applied industry. We are willing to rest satisfied with the explanation, which at the first blush suggests itself, that the commercial and industrial classes at home are so completely engaged with their present relations, that without their attention is pointedly drawn to a new field for enterprize, by authority upon which they can rely with confidence, they do not care to embark in projects which appear doubtful or visionary, through ignorance of the circumstances under which they are to be pursued.

It is with peculiar pleasure that we have now the opportunity of calling the attention of the Canadian public to the proposition of the Society of Arts, embraced in the subjoined correspondence. We are there told that "the correspondence which has taken place with the Colonies, on account of the Exhibition, has brought to notice that those by whom it has been conducted are capable of affording a vast amount of information, which only requires to be collected and printed to make it of great use to this country." We are further informed, that among the principal objects which the Council of the Society of Arts have in view in establishing the Colonial Committee, are,—

1st. To make known to the mercantile and general public of Great Britain and Ireland, the principal products of each of the Colonies, and the facilities for obtaining them.

2nd. To point out to the Colonists any of those products which may be advantageously imported into England.

3rd. To afford such information as any Colony may require in regard to Implements, Machinery, Chemical or other processes necessary to the prosecution of its special branches of industry.

It is almost unnecessary for us to urge upon our fellow-countrymen the importance of availing themselves to the uttermost, of the opportunities presented by the Society of Arts, through whose agency the British people may be made acquainted, not only with our progress in the Industrial Arts, but more especially with the nature and extent of those vacant and neglected fields of enterprize in which this country abounds.

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

GOVERNMENT HOUSE,
QUEBEC, 17th July, 1852.

SIR,—

I am directed by the Governor General to transmit to you as Corresponding Secretary of the Canadian Institute, the enclosed copy of a letter from the Secretary to the Society of Arts, Manufactures and Commerce, to Her Majesty's Principal Secretary of State for the Colonies, with enclosures having reference to the establishment of a Correspondence between the Society of Arts, and similar institutions in the Colonies. His Excellency is desirous to ascertain, through you, whether the Canadian Institute will be disposed to engage in the proposed Correspondence with the Society of Arts, as he believes that the objects of the Institute and the interests of the Province would be promoted thereby.

I have the honor to be, Sir,

Your most obedient humble Servant,

R. BRUCE,
*Gov. Secretary.*

F. CUMBERLAND, Esq.,
*Corresponding Secretary,*
Canadian Institute.

*Copy of a Letter from the Secretary to the Society of Arts, Manufactures and Commerce, to Her Majesty's Principal Secretary of State for the Colonies.*

Society of Arts, John Street Adelphi, London,
26th March, 1852.

SIR,—

I am directed by the Council of the Society of Arts to acquaint you, that they have appointed a Committee of the following Members of the Society, viz:—

| | |
|---|---|
| The Earl Grey | Joseph Glynn, Esq. F. R. S. |
| Robert Stephenson, Esq. M. P. | Wyndham Harding, Esq. |
| Dr J. F. Royle, F. R. S. | Nathaniel Lindley, Esq. |
| Professor Solly, F. R. S. | Alfred Reade, Esq |
| John Bell, Esq. | Lieut. Tyler, Royal Engineers. |
| C. Wentworth Dilke, Esq. | |

to consider the best means of making the Society useful in advancing the knowledge of the resources and capabilities of the numerous British Colonies in all quarters of the world, and in furnishing the Colonies themselves with such information as may be required on subjects connected with Arts, Manufactures and Commerce.

The accompanying Enclosures, Nos. 1 and 2, will explain the Constitution of the Society, the objects they have in view in adopting the present measure, and the means which they possess of carrying them into effect.

The Council conceive that one of the first steps towards the attainment of their Objects, will be the establishment of a Correspondence with similar Institutions in the Colonies; or, in the smaller Colonies, where no such Institutions exist, with a Committee consisting of three or more Members, in all cases where volunteers for such a purpose can be found.

I am therefore, to express the hope of the Council, that you will be pleased to accord to the Society the advantages of that co-operation and assistance which the Colonial Office is so well able to afford, to enable them to place themselves thus in correspondence with the numerous Colonies. And, as the readiest means of doing so, I am directed to transmit to you Printed Copies of the present letter and its Enclosures, which the Council trusts you will have the goodness to forward to the Governors of Colonies, with such instructions for their judicious distribution as may appear best calculated to ensure their practical utility.

I have the honor to be, Sir,

Your most obedient Servant,

GEORGE GROVE,

*Secretary.*

ENCLOSURE No. 1.

Brief Statement of the Objects, Government, Revenue and mode of Action of the Society for the Encouragement of Arts, Manufactures, and Commerce:

*Objects:*—The Society for the encouragement of Arts, Manufactures and Commerce was founded in 1754, and incorporated under the above name by Royal Charter in 1847, they are summed up in the Charter as —" Generally to assist in the advancement, development and practical application of Science in connection with the Arts, Manufactures and Commerce of the Country."

*Government:*—It is governed by a President, Vice-Presidents, two Treasurers, two Auditors, and from twelve to twenty-four other Members, who form a Council elected annually by ballot at a General Meeting of the Society. The Secretary and Collector are elected in a similar manner, and are the only officers who receive any salary. The following are the Officers for the present year:—

PRESIDENT.—His Royal Highness Prince Albert. VICE-PRESIDENTS. —The Duke of Buccleuch, The Earl of Carlisle, The Earl of Ellesmere, The Earl Granville, The Lord Colborne, The Lord Overstone, Sir J. P. Boilean, Bart., Right Hon. E. Strutt, M. P., Right Hon. T. Milner Gibson, M. P., H. T. Hope, M. P., George Moffatt, M. P., S. M. Peto, M. P., Robert Stephenson, M. P., Beriah Botfield, Sir C. Barry, R. A., I. K. Brunel, F. R. S., Thomas Creswick, R. A., W. F. Cooke Chas. Dickens, C. Wentworth Dilke, M. Faraday, F. R. S., Owen Jones, J. M. Rendel, Pres. Inst. C. Engrs., W. Tooke, F. R. S.

COUNCIL.—John Bell, Thomas Cubitt, Joseph Glynn, F. R. S., W. Harding, C. E., Professor T. H. Henry, F. R. S., Capt. Henry C. Owen, R. E., Dr. Lyon Playfair, C. B., J. Scott Russell, F. R. S., W. W. Saunders, Sydney Smirke, R. A., Professor Edward Solly, F. R. S., Thomas Twining, jun.

TREASURERS.—P. Le Neve Foster, M. A., Henry Cole, C. B.

AUDITORS.—Thomas Winkworth, Samuel Rengrave.

SECRETARY.—George Grove.

*Revenue:*—The Society consists at present of 1200 Members, and its revenue is about £2000 a year,—mainly derived from their individual contributions.

*Mode of Action:*—The Council appoint annually Standing Committees to report upon the various Departments of the Arts and Manufactures, and has lately adopted for this purpose the Classification of the late Exhibition, the Committees being thirty in number, to correspond with the thirty Classes.

These various Committees examine and report on the merits of all useful inventions and discoveries, which are publicly exhibited at certain periods by the Society. And upon the reports of the Committees the Council award Medals and other rewards for inventions, treatises, or other objects calculated to advance the interests of the Arts, Manufactures and Commerce.

The Society by these means has been the first and principal medium for introducing to public notice the principal discoveries in Arts and Manufactures which have been brought to light during the present century in this country.

The Council further appoint from time to time Committees for various Special purposes; among others may be named that for Elementary Drawing Schools, and those for Foreign, Colonial, and Provincial Correspondence.

ENCLOSURE No. 2.

The principal objects which the Council have in view in establishing the Colonial Committee may be generally enumerated under the following heads:—

1. To make known to the Mercantile and general Public of this Country the principal products of each of the Colonies, and the facilities for obtaining them.

2. To point out to the Colonists any of those Products which may be advantageously imported into England.

3. To afford such information as any Colony may require in regard to Implements, Machinery, Chemical or other processes necessary to the prosecution of its special branches of Industry.

4. To exhibit and make known to the British Public, Inventions which Colonists have otherwise great difficulty in introducing into notice, that being one of the principal branches of the Society's operations.

5. To collect for the Thirty Standing Committees, information relative to the various departments of Trade in the Colonies.

6. To make a comparison of Coins, Weights and Measures, as used in the Colonies, and to receive and discuss propositions for giving them uniformity.

7. To investigate and report upon the operations of the Patent Laws in the Colonies.

It is hoped that the periodical transmission of the printed Proceedings of the Society of Arts may often convey valuable information to distant Colonies, and the Society hope to enrich their own Annual Volume by communications from kindred Associations, and from Individuals in the Colonies.

The Council feel confident that these measures cannot fail to be of use both to the Mother Country and to the Colonies, and that should they be unsuccessful in some of the objects above enumerated, benefit will ensue from the remainder.

It may be desirable here to state the reasons which induce the Council to originate the present scheme.

It was as President to the Society of Arts, that His Royal Highness Prince Albert first announced to the World the project of the Exhibition of 1851. The Society had a considerable share in the early progress of the Exhibition, and counts amongst its Members a large proportion of those who took an active part in that great Work.

The Society also contains many Members eminent in the several branches of science, and influential in the Country, and consequently the Society possesses the means of making extensively known, amongst the Manufacturers and Public of Great Britain, any new or important products which may be made available in the Arts, Commerce, or Manufactures of the Country. As a recent instance of this nature, it may be mentioned that Gutta Percha and its valuable properties were made known through the exertions of the Society.

The Correspondence that has taken place with the Colonies, on account of the Exhibition, has brought to notice that those by whom it has been conducted are capable of affording a vast amount of information, which only requires to be collected and printed, to make it of great use to this Country. And the anxiety which has been evinced for such information as, it is hoped, may be advantageously furnished by Members of the Society, has directed attention to the fact that they have now no direct means of obtaining such information. The Society feels confident, that those who took an active part in the promotion of the Exhibition, will be the first to come forward and render assistance to any scheme such as the present, by which efforts are made to perpetuate its results.

It may be interesting also here to refer to a few of the advantages which have been actually derived from the display of Colonial Produce at the Great Exhibition.

Isinglass had hitherto been regarded as obtainable principally from the fish of the Russian rivers. But it has been ascertained that the rivers of Canada abound with fish producing Isinglass of the first quality, and that a new industrial occupation is thus open to the Canadians, whilst a supply of Isinglass can be furnished to this country at a much more reasonable price than hitherto.

Another remarkable instance is the discovery that Corundum, which has served many of the purposes of diamond and emery powder in India for a long period, might also be brought into use in this country; a mineral with which it is believed but a very small portion of the British public had hitherto been acquainted, and which it is suspected has in some instances been sold to our large firms under the name of Diamond powder.

Amongst the substances from the Colonies which have been brought into notice, may be also mentioned walrus skin, porpoise leather from the St. Lawrence, the resins and fatty substances and vegetable waxes from Australia, all of which appear likely to excite attention in the commercial world.

Notwithstanding that these and other substances have been brought into notice, Colonial Produce was on the whole but indifferently represented in the Exhibition, and the Council confidently hope that the means they have now adopted may lead to the formation, at some future period, of a permanent Exhibition of Colonial Produce, either separately, or what would perhaps be preferable, as part of The Collection arising out of the Great Exhibition, from the exertions of The Royal Commissioners.

(Signed)

GEORGE GROVE,

*Secretary Society of Arts.*

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CANADIAN INSTITUTE,
TORONTO, 31st July, 1852.

SIR,—

I have the honor to acknowledge the receipt of your Letter of the 17th instant, with enclosures transmitted by command of His

Excellency the Governor General, having reference to the establishment of a Correspondence between the Society of Arts and the Canadian Institute, for certain purposes connected with Arts, Manufactures and Commerce, therein set forth, and in reply to inform you, that having submitted the same to the Council of the Canadian Institute, I am directed to request that you will assure His Excellency that the Council will gladly take every means in its power of promoting the intentions of the Society of Arts; that it will be happy to receive any communications and act upon the suggestions of that Society; and is prepared to become the medium of transmission to it of information relative to the productions and resources of Canada; of the inventions of persons resident in the Province, together with whatever else of local interest may appear to fall within the scope of its enquiries, or be deserving of its notice.

I am further directed to transmit for the information of the Society of Arts, a Copy of a Charter of Incorporation of the Canadian Institute, of its By-laws, and of a Circular of Enquiry lately issued under the authority of the Council, by which it will appear that the Institute is already in some degree engaged in the pursuit of those objects which the Society of Arts contemplates, and the attainment of which the co-operation and support of that Society will most powerfully and opportunely advance.

I have the honor to be, Sir,
Your most obedient humble Servant,
FRED. CUMBERLAND,
*Corresponding Secretary.*

THE HON. R. BRUCE,
*Governor's Secretary,*
Quebec.

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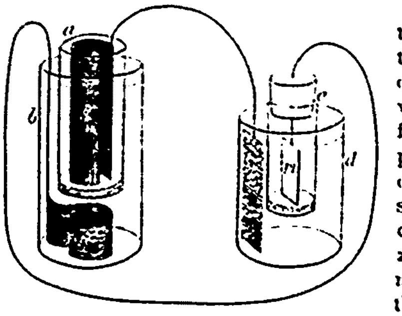
## SCIENTIFIC INTELLIGENCE.

### Chemistry and Physics.

*Golding Bird's battery and decomposing cell.*—This apparatus which can be constructed in half an hour at a very trifling expense, is exceedingly interesting as affording a constant current for a long period of time and effecting decompositions which batteries of the ordinary form and of considerable magnitude often fail in producing. The battery consists of an outer jar (*b*) of glass 8 inches deep by 2 inches in diameter, the inner cylinder (*a*) is four inches long and 1½ in diameter, closed at one end by a plug of plaster of Paris seven tenths of an inch thick, and fastened into the outer jar by means of pieces of cork. Into the inner cylinder is placed a slip of sheet copper (*c*) 4 inches by 3 with an attached conducting wire also of copper. In the outer jar, below the inner cylinder is placed a coil of sheet zinc furnished with a conducting wire. The inner cylinder is filled with a saturated solution of sulphate of copper, the outer jar with a weak solution of common salt, both fluids standing at the same level. After some weeks beautiful crystals of metallic copper, red sub-oxide, and of sulphate of soda are found adhering to the copper plate in the inner cylinder.




The decomposing cell is the counterpart of the battery itself, the inner cylinder (*c*) being about ½ inch wide and 3 inches long and furnished with a platinum plate (*pl*,) the outer cylinder (*d*) is filled with a weak solution of common salt and contains an amalgamated zinc plate (*z*) The connections will be seen from the engraving; the inner cylinder is intended to receive the metallic or other solution which is to be decomposed, and the battery and cell form together an arrangement of two active cells with four elements. When the inner cylinder of the decomposing cell is filled with solutions of the nitrates of iron, copper, tin, zinc, bismuth, antimony, lead or silver, the metals are deposited on the platinum frequently in a crystalline form. This is especially the case with copper and silver. An alcoholic solution of fluoride of silicon gives in 24 hours a black deposit of free silicon exhibiting a tendency to crystalize. An aqueous solution of the same gives rise to the formation of minute crystals of quartz sufficiently hard to scratch glass.

By a slight modification of the apparatus, Dr. Bird succeeded in effecting the decomposition of the bichlorides of potassium and ammonium. A funnel is substituted for the inner cylinder in the decomposing cell, the bottom is closed by plaster or stucco, and a piece of test tube containing mercury is put in the place of the platinum plate (*pl*,) being connected with the conducting wire by means of a spiral wire of platinum. With such an arrangement it is only requisite to leave the battery in action for a few hours to obtain in the one case the amalgam of potassium, in the other the bulky compound of mercury and ammonium.

*Use of Oxide of Zinc as a Pigment.*—The poisonous nature of the carbonate of lead, or white lead, renders the manufacture of this most valuable pigment exceedingly injurious and often fatal to the workmen, and it has long been wished that some innocuous compound might be discovered which could be substituted for it. The peculiar property which renders the carbonate of lead so valuable, is what is tecnically called its "body," viz., the power of completely covering and concealing any other even dark color, when applied in a thin coating after having been rubbed up with oil. Many other substances might be applied as a white paint if they possessed this property, but as yet all but the oxide of zinc have been found deficient, for instance the sulphate of Baryta (Heavy Spar) which is found in large quantities as a mineral and in a state of great purity, is sometimes sold instead of white lead, for which it might easily be mistaken on account of its high specific gravity, it possesses however no body. The carbonate of zinc obtained by precipitation is equally useless from the same cause, but it has been found that the oxide produced by the combustion or oxidation either of metallic zinc or of some of its ores, can be employed with advantage.

The manufacture of this substance as a pigment is now carried on to a considerable extent on this continent by the New Jersey Zinc Company, the quantity produced daily amounting to 5000 pounds. (Silliman's Journal, May 1852.)

The ovens are of brick and very low, but of large superficial area, they are heated both above and below by anthracite fire. Each oven is charged with 1000 pounds of the crushed ore, (Red Zinc and Franklinite) mixed with an equal bulk of anthracite coal dust. A current of atmospheric air is established by pipes of iron proceeding from each oven to a large tube, in which a stream of air is kept moving by means of a fan wheel. The carbon of the anthracite reddens the ores and forms metallic zinc which, however, is immediately burnt by the oxygen of the air and produces the oxide; that is carried off by the current through long tubes into sacks of closely woven muslin out of which it is from time to time removed into casks. The oxide is never perfectly pure, from small particles of dust being carried along with it.

Although oxide of zinc is decidedly preferable to carbonate of lead on account of its salubrity, yet it does not appear that it is entirely free from all poisonous properties, for several cases of severe colic have been observed, evidently resulting from exposure to its influence. One case was that of a man employed in putting the oxide into barrels, who was effected with all the symptoms of violent colic. Other instances were observed among workmen employed in cutting and twisting the wires used for securing champagne casks. Formerly common iron wire was employed, but in 1850 galvanized iron was substituted, (i. e. wire covered with zinc). The wire was covered with a white dust containing oxide and carbonate of zinc but no lead. In a few days they were all affected with colic. On working with some wire freed from this adhering dust, no ill effects were observed.

*Magnetic Science yet in its infancy.*—An important discovery, it is said, has been made by Mr. George Little, the electrical engineer, in which continuous streams of electricity can be produced from single magnets, and be made to decompose water, precipitate metals from solution, produce constant power in electro-magnets, and work the chemical printing and double-needle telegraph. Magnetic science is but in its infancy, and we should not be surprised, as before said, to find it evolve almost magical results. Dr. Faraday lately showed the possibility of literally collecting the terrestrial magnetism, and accumulating its force in apparatus used for the purpose. This he showed could be done by revolving a wheel in a certain direction, cutting the lines of magnetic force, or winding them up as it were on the disc or wheel while placed in the proper direction, and not in any other. Here is something that almost looks like that reality of which the circling manœuvres of the magician's wand were but a superstitious and vain foreshadowing!

*Lightning Conduction.*—A discovery akin to that of Mr. G. Little—lately noticed in our columns—is said to have been made by Mr Roger Brown, of Sheffield; namely, that magnetised steel has pre-eminent power to attract the lightning when used in conductors instead of the ordinary article. By this means, and by multiplying the number of points in the head of the conductor, its attractive power is said to be tripled in intensity, its influence extending to some distance round the spot where it is fixed.—*Builder.*

*New Application of the Water Gas.*—Mr. Samuel Cunliffe Lister, of Bradford, has most successfully applied Mr. White's patent water gas—obtained by decomposing water on incandescent charcoal or coke—to the heating of his machines for preparing and combing wool, in place of using fire from charcoal, as is the general practice in Yorkshire. This must be a very great improvement indeed, avoiding all dust and filth at present so troublesome from the use of charcoal, and avoiding the very deleterious influence of generating such a mass of carbonic acid, so perilous to the workpeople, and from which so many of them suffer severely. A gentleman who went last week to Addingham Mill to see this gas in operation, as applied to the heating of the combs, speaks most decidedly in its favor; and Mr. Lister so highly approves it, after a full trial, that he is about erecting it at several of his other establishments for the same purpose. It is stated to be very easily and very rapidly made, one retort of six feet long making 200 to 300 feet an hour, and at a trifling expense, while the intensity of the heat given out is certainly double that of ordinary gas. A piece of iron or copper wire held to the jet is almost instantly ignited, while the gas is so pure as in no way to injure the finest machinery with which it comes in contact. We cannot doubt but an improvement so decided must make rapid way in Yorkshire. The same gas for all purposes of singeing is stated as far superior to coal or cannel gas, and never fills up the small apertures of the singeing machines, Messrs. Gardiner and Bazley, of Dean Mills, Bolton, are using it extensively for singeing their yarns.—*Leeds Mercury.*

*Ozone.*—In a Lecture lately delivered by the Rev. Mr. Sidney at the Royal Institution, the Rev. gentleman announced his belief in the existence, diffused through plants, of that wonderful condition of oxygen gas called ozone, and which recently has attracted so much attention, not only in the scientific but in the manufacturing world, inasmuch as there now appears some probability of its becoming applied as a bleaching agent, instead of chlorine.

*New Voltaic Battery.*—A party of scientific gentlemen were recently invited by Mr. Martyn Roberts to witness a voltaic battery of new construction, professedly of great economy, which he has at present in action in the neighborhood of Great Portland Street. The battery consisted of fifty plates of tin, about 6 inches by 4,—each plate being adjusted between two plates of platinum of the same size. These were placed in stoneware cells about two feet deep, which were filled with diluted nitric acid. The object of these deep cells was, to obtain a marketable product which should be sufficiently valuable to cover the cost of the agents employed to effect the development of electricity. The upper stratum of nitric acid acts on the tin, and forms with that metal an oxide, which falls off from the plate the moment it is formed, and is precipitated as an hydrated oxide of tin to the bottom of the cell. The oxide is combined with soda; and as stannate of soda is extensively employed in dying and calico-printing, it is stated that this product will yield a profit of 20 per cent, on the cost of the battery by which it is produced;—but this is a point which we are not at present in a position to determine. The electrical action of the fifty pairs of plates was considerable. The current was employed to exhibit the electrical light,—and the effects produced were certainly very brilliant. It was not possible to compare it with the result obtained from a Grove's battery, but we judge their powers to be nearly equal. An experiment made on the decomposition of water gave about 7 cubic inches of the mixed gases, oxygen and hydrogen, per minute. We cannot but regard this very ingenious arrangement as an improvement on the ordinary batteries, as far as economy is concerned, where an electric current is required, since the stannate formed must always be of considerable commercial value. It is curious, too, that the stratum of fluid in the immediate neighborhood of the voltaic plates is kept uniformly of the same specific gravity, notwithstanding that the acid is rapidly removed. The oxide of tin formed takes down water with it, and at the same time establishes a current by which fresh acid is supplied to the plates.—We are informed that the battery continued in most uniform action for sixteen hours.—*Athenæum.*

*Artificial Preparation of the Flavoring Matters of Fruits.*—One of the most remarkable and interesting achievements of chemistry in the most recent times has been the preparation of certain liquids possessing the flavors of various fruits. So close indeed is the resemblance that we are almost warranted in supposing the flavor of the fruits to be actually caused by the presence of a trace of the above liquids. Several of these articles are employed in confectionary, and are manufactured on a tolerably large scale. **The acetate of amylic oxide, when dissolved in six times its bulk of alcohol, emits a most powerful and agreeable odour of Jargonelle pears, and is used in flavoring *pear-drops*. The valerianate of amyle, dissolved in alcohol, gives the scent and flavor of apples.** Butyric ether communicates the flavor of the pine-apple, and is used in the preparation of various beverages. Various other compounds of the so-called fatty acids, with the oxides of amyle and ethyle, possess very pleasing odours, and as they can be prepared at a reasonable price, may probably admit of extensive application in perfumery.

## GEOLOGY.

*Distribution of Gold.*—Since the astounding discoveries in California and Australia, it has been clearly shown to the public, in numerous well-written articles in the daily journals, in periodicals and reviews, that though gold is the most universally distributed of the metals, with the exception of iron, yet that it only occurs, in quantities sufficient to be remunerative, in rocks of a certain antiquity, which have been crystalised by the action of intense subterranean heat. The rocks of North Devon are of this antiquity and character. Much popular error still prevails with regard to other laws which govern gold. It is generally believed that the same rule which regulates silver, iron, and other metals, applies to gold—namely, that the vein or lode increases in richness the deeper the mine descends. The converse of this is, in reality, the true geological principle, and gold decreases in value and yield as the vein or lode descends; the upper portion alone being prolific, and generally terminating in some baser metal. The only exception to the rule that we are aware of is that of the Morro Velho lode in Brazil, belonging to the St. John del Rey Company; but as it has been fairly remarked, if there be one admitted exception, another may exist; and, therefore, it may still be questioned whether the Britannia lode is within or without the accepted principle in geology, for the strong similarity of the Britannia and the Morro Velho lodes, in all their bearings, is undoubted.

There are two sources from which gold is derived: it is found in alluvial deposits, formed from extensive abrasion of the rocks beneath the waters of past ages, or it is disseminated through the solid rock. Although, in some localities of North Devon, gold may be found in alluvial deposits, yet, in all probability, it is principally confined to the rock; and, owing to the prevailing error to which we have just alluded, it is believed by the unexperienced that much gold is only to be expected from very high mountains, and that it is, consequently, absurd to anticipate that the "mole hills" of Devonshire will compensate for the expense of working. This argument, however, is not sustained by general experience or actual facts. In the Ural, which is in the heart of a large continent, and, therefore, may be expected to reach a considerable height, some of the most prolific sources of the gold are at an elevation under 1000 feet above the level of the sea. Miask and Ekaterinburgh are each below that level, while Kyshluirsk is only 630 feet, and Bogoslovsk 500 feet. Although there are high points in the Ural, as well as in Australia and California, at which gold is found, yet the most productive localities in all these regions are of very moderate elevation. The gold district now revealed in Devonshire reaches an elevation of 700 feet above the sea. There is nothing valid, therefore, in the assertion of "mole-hills" being presumptive evidence of the non-existence of gold; and we do not hesitate to declare our firm conviction that a brief time will establish the Britannia gold-field as one of several localities among the hills of North Devon in which gold will repay the enterprise and industry of those who search for it.—*Mining Journal.*

*Volcanic Eruption in the Sandwich Islands.*—By an accurate measurement of the enormous jet of glowing lava where it first broke forth on the side of Mauna Loa, it was ascertained to be 500 feet high. This was upon the supposition that it was 30 miles distant. We are of the opinion that it was at a greater distance—say from 40 to 60 miles. With a glass the play of this jet at night was distinctly observed, and a more sublime sight can scarcely be imagined. A column of molten lava, glowing with the most intense heat, and projected into the air to a distance of 500 feet, was a sight so rare, and at the same time so awfully grand, as to excite the most lively feelings of awe and admiration, even when viewed at a distance of 40 or 50 miles. The diameter of this jet is supposed to be over 100 feet. In some places this river is a mile wide, and in others more contracted. At some points it has filled up ravines of 100, 200, and 300 feet in depth, and still it flowed on. It entered a heavy forest, and the giant growth of centuries was cut down before it like grass before the mower's scythe. No obstacle can arrest it in its descent to the sea. Mounds are covered over, ravines are filled up, forests are destroyed, and the habitations of man are consumed like flax in the furnace. Truly, "He toucheth the hills, and they smoke." We have not yet heard of any destruction of life from the eruption now in progress. A rumor has reached us that a small native village has been destroyed, but of this we have no authentic intelligence. Two vessels had sailed from Hilo, both filled to their utmost capacity with people who desired to witness this great eruption. The eruption seems to have broken out through an old fissure, about one-third down the side of Mauna Loa, on the north-west side, and not from the old crater on the summit, called Mocquowcowco. The altitude of the present eruption is about 10,000 feet above the level of the sea, and from the bay of Hilo (Byron's Bay) must be some 50 or 60 miles. If it succeed in reaching the ocean at the point supposed, after having filled up all the ravines, gulches, and inequalities of a very broken country, it will undoubtedly be one of the most extensive eruptions of modern times. —*Polynesian.*

*Iron.*—In the recently discovered Iron Districts of Cleveland, Yorkshire, the beds are found to lie nearly level, varying in thickness from 12 feet to no less than 20 feet of ironstone, the most remarkable feature is that the ore is got by open quarrying; and is estimated that 10,000,000 tons may be got with the same facility. There is no limestone or coal in the district though geologists consider that they may yet be reached. The operations were commenced in April 1851 and the traffic of ironstone up the Stockton, Darlington Railway has since been at the rate of 200,000 tons per annum.

## ZOOLOGY.

*Infusoria the Larvæ of Intestinal Worms.*—Among the most interesting of Agassiz's discoveries in embryology and the metamorphoses of the different lower orders of animals, the fact that Infusoria are nothing more than the Larvæ or young of Intestinal Worms, is perhaps one of the most important. Agassiz remarks that it is curious that the two types of the Animal Kingdom so long considered as the fundamental supporters of the theory of spontaneous generation should have finally been brought into such close connection, and that one of them —the Infusoria—should in the end turn out to be the earliest condition of the other—the intestinal worms being the parents of the Infusoria. The latter class may now be considered as entirely dissolved.—*Silliman's Journal, May,* 1852.

*Artificial Breeding of Fish.*—At a recent meeting of the Society of Arts, a paper was read by Mr. W. Boccius, "On the Artificial Breeding and Rearing of Fish, and the method to be adopted to preserve and improve the Fisheries of this country, and also of the colonies." Mr. Boccius commenced by calling attention to the decline which has taken place in all the fisheries of the United Kingdom, and proceeded to point out the means by which any sort of fish might be restored to a stream or river in one season, and the eggs transmitted from one part of the kingdom to another, or from one country to another, without the least injury to them. The main feature in artificial breeding was to have a pure spring of water, uncontaminated with vegetable or animal matter, at a temperature of 54° to 56°. At this warmth the salmon egg came into life in 100 days, trout in 50 days, and many other sort of fish in 42 days; but this was only the case when the water underwent no change of temperature. By the plan of artificial spawning which he proposed to adopt, the crossing of various breeds of fish of distant countries might be effected. Having found a pure spring of water, his method was to place boxes containing the spawn bed in the stream, in such a manner that there should be a constant flow of fresh water through the boxes. He next took two fish, and separated the spawn and the milt from them into a basin containing sufficient water to dilute the milt that might be absorbed by the egg. The eggs were then placed in the coarse clean gravel, three inches deep, and allowed to remain so until they were bred out. The brood was then left—of salmon, 30 days; of trout, 15 days—and afterwards put into a yearling stream, the small left to migrate, and the trout sent out into the main stream or river at the season following. If his system of artificial spawning were adopted, a vast amount of labour would be required, and a great additional quantity of food produced, while the gain to the proprietor of the water would be much increased. Supposing 300,000 eggs to be spawned, the produce of 12 salmon, of 25 lb. each, in two years these fish would give 3,000,000 lb. weight, and at that time they in turn would be capable of depositing the enormous quantity of three billions of eggs; and yet, with this great procreative power, the salmon and all other fish were fast decreasing in our rivers and streams. It was with a view to remedy this evil, that he desired to carry his plan into effect, and he had already adopted it successfully on the estates of the Duke of Rutland, the Duke of Devonshire, Earl Ducie, and many other persons of distinction and property in England. At the conclusion of the paper a vote of thanks was passed to Mr. Boccius, and after some little discussion the business of the evening terminated.

Naturalists will be pleased to learn, that in the course of the past month a young grass paroquet, of the Australian species, has been produced in the Zoological Gardens, Regent's Park; and also a pair of Mandarin ducks. One of the ostriches recently brought from Egypt, has, during the month, deposited four eggs, which have been placed in one of Cantelo's Hydro-Incubators. The result of the experiment is expected to be known in a few days, and is awaited with considerable interest.

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

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

| Magnet | Day. | Barom. at tem. of 32 deg. 6 A.M. | 2 P.M. | 10 P.M. | MEAN. | Temperature of the air. 6 A.M. | 2 P.M. | 10 P.M. | M'N. | Tension of Vapour. 6 A.M. | 2 P.M. | 10 P.M. | M'N. | Humidity of Air. 6 A.M. | 2 P.M. | 10 P.M. | M'N. | Wind. 6 A.M. | 2 P.M. | 10 P.M. | Rain in Inch. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ° | ° | ° | | | | | | | | | | | | | |
| c | 1 | 29.573 | 29.503 | 29.430 | 29.491 | 55.8 | 60.0 | 54.2 | 57.1 | 0.381 | 0.439 | 0.359 | 0.388 | 87 | 87 | 87 | 85 | N b E | NE b N | N | 0.590 |
| c | 2 | .425 | .455 | .505 | .465 | 55.0 | 66.0 | 55.7 | 58.9 | .350 | .360 | .256 | .319 | 82 | 57 | 60 | 66 | NW | W NW | W b S | - - |
| c | 3 | .565 | .579 | .606 | .583 | 51.0 | 70.6 | 55.6 | 59.2 | .259 | .417 | .372 | .345 | 70 | 53 | 86 | 70 | W | W | Calm | - - |
| c | 4 | .664 | .642 | | | 56.4 | 72.4 | | | .375 | .490 | ... | .. | 84 | 63 | .. | .. | Calm. | S | S | - - |
| d | 5 | .659 | .651 | .635 | .647 | 55.6 | 71.8 | 72.1 | 63.1 | .396 | .497 | .416 | .439 | 92 | 65 | 77 | 78 | Calm. | E SE | Calm | Inap |
| c | 6 | .651 | .651 | .617 | .637 | 61.5 | 71.3 | 65.3 | 67.6 | .415 | .613 | .506 | .511 | 84 | 75 | 81 | 78 | Calm. | Calm | Calm | 0.200 |
| c | 7 | .661 | .638 | .630 | .611 | 62.4 | 85.1 | 69.6 | 73.0 | .492 | .808 | .612 | .647 | 90 | 69 | 88 | 82 | Calm. | Calm | Calm | - - |
| a | 8 | .655 | .678 | .555 | .591 | 69.3 | 84.4 | 71.4 | 75.9 | .567 | .798 | .605 | .666 | 81 | 69 | 81 | 76 | Calm. | S SE | Calm | - - |
| d | 9 | .573 | .636 | .609 | .595 | 69.8 | 67.3 | 68.3 | 69.6 | .589 | .608 | .641 | .622 | 84 | 93 | 96 | 89 | Calm | S b W | Calm | 0.960 |
| e | 10 | .685 | .693 | .635 | .668 | 67.3 | 78.6 | 68.5 | 72.1 | .496 | .634 | .535 | .564 | 76 | 67 | 79 | 74 | N b E | E b S | N NE | - - |
| c | 11 | .580 | .460 | | | 67.0 | 80.8 | | | .576 | .752 | ... | .. | 90 | 53 | .. | .. | E b N | S SE | W by N | 0.180 |
| d | 12 | .839 | .827 | .733 | .791 | 58.4 | 67.5 | 58.6 | 62.5 | .421 | .457 | .401 | .425 | 90 | 71 | 83 | 78 | W b S | SE b E | Calm | 0.005 |
| c | 13 | .619 | .557 | .558 | .580 | 61.4 | 66.2 | 65.0 | 63.6 | .460 | .546 | .486 | .498 | 87 | 87 | 81 | 86 | E b N | E | N NW | 0.130 |
| d | 14 | .635 | .651 | .711 | .670 | 58.5 | 76.6 | 62.8 | 67.2 | .437 | .432 | .408 | .411 | 91 | 49 | 73 | 66 | NW b W | NW b N | N b W | - - |
| d | 15 | .799 | .827 | .826 | .818 | 63.2 | 71.0 | 57.8 | 65.8 | .429 | .485 | .336 | .417 | 76 | 59 | 72 | 67 | N | S b E | Calm | - - |
| — | 16 | .816 | .793 | .677 | .761 | 56.2 | 77.9 | 55.7 | 65.1 | .365 | .442 | .361 | .400 | 82 | 48 | 83 | 68 | Calm. | S SE | E b N | - - |
| c | 17 | .618 | .576 | .603 | .597 | 60.1 | 76.1 | 68.6 | 69.3 | .377 | .500 | .505 | .477 | 73 | 57 | 71 | 68 | N b E | S SE | N | - - |
| a | 18 | .716 | .809 | | | 59.5 | 66.2 | | | .329 | .439 | ... | .. | 65 | 71 | .. | .. | NE b N | SE b S | Calm | - - |
| a | 19 | .902 | .918 | .851 | .885 | 52.3 | 68.9 | 56.1 | 61.1 | .315 | .362 | .357 | .357 | 81 | 53 | 81 | 69 | Calm | E SE | E N E | - - |
| a | 20 | .864 | .825 | .749 | .808 | 51.8 | 78.8 | 65.9 | 69.1 | .375 | .574 | .529 | .500 | 90 | 61 | 85 | 75 | Calm | S b E | S | - - |
| a | 21 | .723 | .612 | .596 | .617 | 63.9 | 89.0 | 72.2 | 76.7 | .521 | .516 | .497 | .528 | 90 | 39 | 65 | 63 | Calm | SW b W | Calm | - - |
| a | 22 | .608 | .572 | .559 | .584 | 70.8 | 82.9 | 66.9 | 74.9 | .517 | .629 | .401 | .488 | 75 | 57 | 62 | 58 | Calm | S | NW b N | - - |
| b | 23 | .625 | .626 | .662 | .613 | 60.7 | 76.5 | 64.3 | 69.2 | .403 | .533 | .451 | .461 | 78 | 60 | 77 | 67 | Calm | S SE | N | - - |
| b | 24 | .723 | .699 | .648 | .686 | 57.8 | 71.8 | 60.2 | 65.7 | .348 | .428 | .411 | .415 | 74 | 51 | 81 | 68 | N b E | SE | Calm | - - |
| b | 25 | .609 | .555 | | | 60.3 | 68.7 | | | .426 | .516 | ... | .. | 83 | 81 | .. | .. | Calm | Calm | Calm | 0.100 |
| b | 26 | .410 | .477 | .514 | .479 | 62.5 | 77.6 | 61.5 | 67.7 | .503 | .456 | .316 | .433 | 91 | 49 | 65 | 67 | Calm | N NW | N NW | - - |
| c | 27 | .598 | .620 | .686 | .636 | 56.9 | 76.5 | 56.4 | 63.0 | .331 | .485 | .323 | .373 | 74 | 64 | 73 | 66 | NW b N | S b E | NE | - - |
| c | 28 | .701 | .652 | .508 | .608 | 58.1 | 76.1 | 62.3 | 66.9 | .375 | .466 | .467 | .417 | 79 | 53 | 85 | 71 | Calm | SE b E | Calm | - - |
| d | 29 | .388 | .275 | .175 | .255 | 66.3 | 79.0 | 70.5 | 72.9 | .511 | .679 | .261 | .572 | 86 | 71 | 72 | 78 | Calm | S | W NW | 1.860 |
| c | 30 | .139 | .215 | .332 | .241 | 61.6 | 72.9 | 61.4 | 66.3 | .510 | .413 | .383 | .418 | 91 | 52 | 72 | 66 | SW b S | W b N | NW | - - |
| c | 31 | .409 | .489 | .560 | .493 | 51.3 | 63.6 | 50.9 | 56.5 | .356 | .323 | .297 | .329 | 86 | 57 | 81 | 75 | Calm | W b N | Calm | - - |
| | M | 29.626 | 29.616 | 29.600 | 29.6148 | 60.31 | 75.29 | 62.51 | 66.68 | 0.431 | 0.515 | 0.427 | 0.461 | 83 | 63 | 77 | 72 | MPs 1.68 | MPs 5.83 | MPs 1.84 | 4.025 |

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

| North. | West. | South. | East. |
|---|---|---|---|
| 1063.59 | 977.60 | 651.28 | 505.17 |

Mean velocity of the wind - - 3.33 miles per hour.
Maximum velocity - - - - - 17.9 miles per hour, from 2 to 3 p.m. on 30th
Most windy day - - - - - 30th: Mean velocity, 10.16 miles per hour.
Least windy day - - - - - 25th: Mean velocity, 0.20 ditto.
Hour of greatest mean velocity - 3, p.m. Mean velocity, 5.81 ditto.
Hour of least - - - - - - 4, a.m. Mean velocity, 1.10 ditto.
Mean diurnal variation - - - 4.74 miles.

The Velocity of the Wind for a space of four minutes during the Thunder Storm on the night of the 29th, was at the rate of 38 miles per hour.

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 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.

*Thunder Storms.*—6th Thunder Storm 7 A. M.
9th Heavy Thunder Storm, 1 to 3 P. M. Rain and Hail.
11th Thunder Storm, Lightning and Rain 3 to 3—30 P. M.
29th Thunder Storm, 2 to 4 P. M. Tremendous Thunder Storm with Hail, Rain and high wind, from 10—30 P. M. till about midnight.

Highest Barometer - - 29.918, at 8 A. M., on 19th } Monthly range:
Lowest Barometer - - 29.135, at midnight on 29th } 0.783 inches.
Highest observed Temp. - 90.1, at 3h. 35m., P. M., on 21st } Monthly range:
Lowest regist'd Temp. - 48.5, at midnight on 31st } 41.6
Mean Highest observed Temperature - - 74.99 } Mean daily range:
Mean Minimum Thermometer - - - - 56.66 } 18.33
Greatest daily range - - 24.3 from 1h. 30m., P.M., of 22nd to A.M. of 23rd.
Warmest day - - 21st - - Mean Temperature - 76.72 } Difference:
Coldest day - - - 31st - - Mean Temperature - 56.47 } 20.25
18th—At 9h. P. M., large Meteor in N. falling in a line from *alpha* Lyrae, through Polaris.

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

**Comparative Table for July.**

| Year. | Temperature. Mean. | Max. | Min. | Range. | Rain. Days. | Inches. | Wind. Mean Velocity. |
|---|---|---|---|---|---|---|---|
| | ° | ° | ° | ° | | | Miles. |
| 1840 | 65.52 | 79.4 | 48.2 | 31.2 | 6 | 5.270 | -- |
| 1841 | 65.91 | 86.3 | 43.2 | 43.1 | 10 | 8.150 | -- |
| 1842 | 64.25 | 90.5 | 42.0 | 48.5 | 4 | 3.050 | -- |
| 1843 | 64.13 | 86.1 | 40.2 | 45.9 | 8 | 4.995 | -- |
| 1844 | 65.61 | 86.1 | 40.5 | 45.6 | 12 | 2.815 | -- |
| 1845 | 66.22 | 91.6 | 45.6 | 49.0 | 7 | 2.195 | -- |
| 1846 | 67.72 | 91.0 | 41.9 | 49.1 | 9 | 2.895 | -- |
| 1847 | 67.92 | 87.5 | 43.8 | 43.7 | 8 | 3.355 | -- |
| 1848 | 65.83 | 82.7 | 46.7 | 36.0 | 10 | 1.899 | 4.91 |
| 1849 | 68.32 | 89.4 | 51.0 | 38.4 | 4 | 3.115 | 3.52 |
| 1850 | 69.01 | 84.9 | 52.8 | 32.1 | 12 | 5.270 | 4.56 |
| 1851 | 65.46 | 82.7 | 52.1 | 30.6 | 12 | 3.625 | 4.13 |
| 1852 | 66.68 | 90.1 | 49.5 | 40.6 | 8 | 4.025 | 3.33 |
| Mean | 66.31 | 87.23 | 46.19 | 41.01 | 8.5 | 3.889 | 4.10 |

## REVIEWS.

*Graham's Elements of Chemistry. Second American Edition. Edited with notes, by Robert Bridges, M. D. Blanchard & Lea, Philadelphia.*

This work is undoubtedly one of the most valuable additions to Chemical Literature, that has been made for some years, and fully sustains the high character of its talented author. Mr. Graham, since the death of Edward Turner, has occupied the Chair of Chemistry in University College, London, he has long occupied a prominent position among the chemists of Europe, and many years experience in teaching have given him a remarkable facility of imparting knowledge in the most clear and comprehensive manner. There are many facts and theories connected with Chemistry and Chemical Physics which it is exceedingly difficult to render intelligible to the majority of students; such, for instance, as the action of the Galvanic Battery; the doctrine of chemical equivalents, &c., &c.; and we may safely assert that we know of no work in which these subjects are so clearly and elegantly described as in the one before us.

In the part now published, we have an excellent treatise on heat, in which all the more recent and interesting researches are fully noticed. Such, for instance, as the investigations of Natterer and Faraday, on the production of cold; Regnault on specific heats; and many others still more recent.

The chapters on the Effusion, Diffusion, and Transpiration of Gases, are exceedingly full and interesting, this being a part of science that has been more particularly studied and elucidated by the author. As connected with ventilation this portion of the work is of great importance. The chapter on Vapours and Hygrometers is excellent, but we think that the treatise on light as well as that on the transmission of heat, might with propriety have been considerably increased, inasmuch as both these branches have been so materially extended of late years, and are both intimately connected with Chemistry.

We are glad to observe that Professor Graham, in almost all cases, adheres to old nomenclature and rejects such newfangled names as chlohydric, sulphydric, which are in no respect preferable to those at present in use.

After a clear digest of Isomorphism, Isomerism, and Allatropism, the salt theories are described and apparently the author is inclined to favour the salt radical hypothesis, and adduces some strong arguments in its favour; we cannot but think, however, that the counter-arguments brought forward by the American editor are of still greater weight. It may be remarked that the notes appended by Dr. Bridges are numerous, and tend greatly to increase the value of the work. The chapter on chemical affinity, together with the explanation of the voltaic circle by means of chemical polarity, is perhaps the best in the whole work. As a method of instruction, it seems far more simple than any other plan, although few may be inclined to adopt so freely the purely chemical theory of the galvanic battery. We intend making a few extracts from this and other portions of the work—one on Golding Bird's battery, will be found at page 16, of the present No.

The remainder of the work treats of Chemistry proper, and extends to the Earths; it is equally excellent with the rest, and with some few exceptions may be considered as faithfully representing the present state of our knowledge of these subjects.

It is scarcely necessary to add, that the work is got up in Lea & Blanchard's usual excellent style, and is illustrated with a large number of engravings. We consider it without exception the best "Elements of Chemistry" yet published.

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*Report of the Toronto and Guelph Railway—by W. Shanley, Esq., Chief Engineer.*

We have received a copy of the Report of the Chief Engineer (Walter Shanley, Esq.) just issued, and regret that time will not permit us to consider it in detail. We have seen sufficient of it, however, to justify us in saying, that it is an able and highly interesting document. We perceive that Mr. Shanley makes a proposition (open to future consideration) in reference to the location of the Toronto Depot, which would involve the construction of a water frontage throughout the length of the city, somewhat after the manner of the long talked of "Esplanade." We should rejoice to see his suggestions acted upon, but we think that in a matter involving such extensive public and individual interests, a unity of action should be required therein between all the Railway Companies proposing to establish Depôts, the Harbor Commissioners and the City authorities. It will be highly important as well for the convenience of the public as of the respective Companies that some plan common and acceptable to all should be adopted, and as the trade and revenues of the city are involved in the matter, such a course should be pursued as would secure to its inhabitants an arrangement suitable to their wants. Perhaps the economy of such a combination in the work would induce the ready assent of all parties, at any rate we may hope to hear more about it shortly, as we understand that negociations are already entered upon in the matter, between the Chief Engineers of the Railways having Termini in the City. We shall return to Mr. Shanley's Report in our next number.

## MISCELLANEOUS INTELLIGENCE.

### DOMESTIC.

### GREAT WESTERN RAILROAD.

SYNOPSIS OF THE REPORT OF ROWSELL G. BENEDICT, ESQ., CHIEF ENGINEER, JUNE 10, 1852.

*To the Directors of the Great Western Rail Road Company.*

GENTLEMEN:—

I have the honor to submit the following Report of the state and progress of the work on the line of the Great Western Railroad, as called for in the Resolution of the Board of Directors, dated 13th ultimo:—

Since my report of May 30th, 1851, until February, 1852, the expenditure, for construction, upon the road, has been confined entirely to the Central Division between Hamilton and London, a distance of 75 miles, and the Galt Branch, 12 miles; every effort being made to expedite the completion of the road, by continuing the work to the heavy points, leaving the lighter and more easily graded sections, until the position of the Company should warrant their commencement. The work, upon every section of these Divisions, is now in a forward state, and the grading can be completed if necessary, ready to commence laying the Superstructure, before next December, with the exception of a few deep cuttings, between Hamilton and Copetown.

In February last, the contractors for the Eastern Division, from the Niagara River to Hamilton, and for the Western Division, from London to Detroit River, were notified to commence their work and carry it forward with energy. I have the pleasure of reporting, that operations have commenced, and that the work of construction is now being vigorously carried on, on every section of the line from the Niagara to the Detroit Rivers, and the Galt Branch, a distance of 240 miles

The extreme and long continued high water in Lake St. Clair and its tributaries, during the present season, has retarded our operations on the Western Division materially, but I hope to be able to complete 100 miles of the road from the Detroit River east, by the 1st day of January, 1853. The work upon the remaining portion of this Division is of a heavy character, and will require until the summer of 1853 to complete. The most formidable part of it is within eight miles of London, and consists of heavy excavations, two bridges over the River Thames, and a large culvert at Woodhull's Creek.

Upon the Eastern Division, the contractors are making every preparation to secure an early completion of their heavy work, and during the present month two Steam Excavators will be at work between St. Catharines and the Niagara River. The grading from Hamilton to the Twenty Mile Creek—25 miles—will be ready for the Superstructure by the 1st day of October next.

The remainder of this Division, from the Twenty Mile Creek to the Niagara River, will require as long time for its completion as any other part of the road, comprising as it does several heavy sections and important structures.

The bridge to be erected over the Twenty Mile Creek will be 1200 feet in length and 60 feet high, and the bridge over the Sixteen Mile Creek 800 feet in length and of the same height. These two bridges are to be built with trusses of 100 feet span, and will contain upwards of one million feet of timber, which is now being prepared and delivered. The vallies of the Fifteen, Twelve and Ten Mile Creeks are crossed by embankments of about the same height, with culverts of sufficient capacity to pass the water of the Creeks at their greatest flow. The stones for these culverts, as likewise for the bridge over the Welland Canal, the St. David's road viaduct, and a great number of smaller culverts, are being placed upon the ground, and with three exceptions I hope to have the masonry on the entire line of road out of the way before next December, and to have the whole completed by June, 1853.

In January, 1852, the Desjardins Canal Company opened a negotiation with the Directors of the Rail Road Company for the purpose of endeavoring to secure a new and direct channel through the Burlington Heights for their Canal, which would allow the Railroad Company to fill up the present channel, and make a solid embankment for the track of their road from the Heights to the opposite shore; this proposition was rejected, your board preferring the original plan, with the prospect of ultimately having a bridge without a draw, although at an increased cost. During the suspension of the work on said section No. 1, and before it was relet, these negotiations were opened in different form, and the Directors of the Railroad, having satisfied themselves that they could not obtain the bridge as they wished, closed an arrangement with the Canal Company, whereby the site of the bridge is to be changed. This arrangement disposes of the only point on the line of the Railroad where the highest rate of speed could not be maintained without liability to accident. By the alteration, the present bridge will be placed at a point where it can be seen by trains approaching from the East and West, and notwithstanding some £4,500 have been expended in the foundations and preparations for the old bridge, by this agreement with the Canal Company the new bridge will cost when completed less than to have proceeded with the work as originally intended, and the Railroad Company will effect a material saving, besides having a much safer bridge.

The grading done on the Railroad up to June 1st, 1852, is as follows :

Total number of cubic yards moved,..............2,673,616
Rock and indurated earth of this amount,.......... 310,493

The amount of Masonry laid, to June 1st, is as follows ;

Total number of cubic yards, 14,780,

In addition to this amount of masonry, a large quantity of stone has been delivered, and is on hand, as well as timber and plank for foundations.

Total amount of Feet, board measure 1,086,378.

The total amount of expenditure for Grading, Masonry, Bridging, Superstructure, Fencing, Engineering, and Building, up to June 1st, according to the books of my Department, is as follows :

| | £ | s | d |
|---|---|---|---|
| For Grading, including grubbing and clearing.......... | 169562 | 12 | 5 |
| " Masonry, including foundations and stone delivered.. | 32041 | 19 | 5 |
| " Bridging, including timber delivered,............... | 7420 | 2 | 11 |
| " Superstructure.................................. | 4687 | 0 | 0 |
| " Fencing.......................................... | 3906 | 17 | 5 |
| " Engineering, etc ................................. | 23087 | 4 | 7 |
| " Building......................................... | 179 | 8 | 0 |
| Total....................................... | £239885 | 1 | 9 |

The Engineer department of the line now consists of the Chief Engineer, Associate Engineer, nine resident Engineers, eighteen Assistant Engineers, seven Draftsmen, two Office Clerks, and the usual number of Rod and Tapemen for each Assistant.

An Assistant and party are stationed at the following points : Stamford, St. Catherines, Grimsby, Stoney Creek, Hamilton, Dundas, Fairchild's Creek, Galt, Paris, Eastwood, Ingersoll, Hoffman's, London, Wardsville, Thamesville, Chatham Light-house and Windsor. Two or three additional parties may be required after the 1st of July, until the 1st of January next. The Draftsmen are employed at Hamilton, where all of the plans and maps are made.

In addition to the above Engineering force, two Land Surveyors, with parties, have been in the field obtaining and defining boundaries. Maps of the different Townships through which the line runs from Niagara River to Chatham, have been completed to place on file in the offices of the County Registrars, showing the width of land taken on each lot—the number of the lot—the concession, and the name of the owner.

By resolution of your Board, passed in April last, all of the bridges and culverts on the road, from the Niagara River to Woodhull's Creek, west of London, a distance of 128 miles, are being constructed for a double track ; those already built can be enlarged without material additional expense, when required.

Notwithstanding the unprecedented freshets during the last twelve months, and the remarkably severe winter just passed, the works upon the line have passed the ordeal without injury, except a slide at the Flamboro' road, which may cost from £1,250, to £1,500 to remove, and make the road permanent.

I was directed by your Board on the 15th of March last, to advertise for tenders for such buildings as would be required by the Company for the manufacture of the Cars necessary for an outfit, the Directors having decided to have them built in Hamilton, where they could be more directly under the supervision and inspection of the Engineer or some one appointed to overlook their construction. These Car shops consist of one building, 50 by 150 feet—two stories—with Engine house attached, 25 by 40 ; one building, 75 by 121 feet ; and two buildings, 40 by 160 feet each. The first two are to be made of stone, and the last two of wood. On the first day of April, the contracts for these were given to Messrs. Searth and Firth for the stone buildings, and William Dodds for the wood, who have commenced erecting the same on the grounds of the Company, and will complete them by the first day of August next. The necessary machinery, Engine, &c., will then be ready to put up.

On the 20th of April by order of the Board I advertised for tenders for the following cars, to wit :

25 Passenger Cars.
4 Express and Mail Cars.
8 Baggage Cars.
20 Emigrant Cars.
100 Platform, Lumber and Iron Cars.
150 House Freight Cars.
100 Gravel Cars.
25 Repair Cars.
15 Hand Cars.

These Cars with the exception of the Gravel, Repair and Hand Cars, are to be of the large size, with 8 wheels and of the best description, the Passenger, Express, Baggage and Emigrant Cars to have the first quality of wrought iron wheels

The competition for building these cars was spirited, and the contract was given to McQuesten, Williams, Dutton, and Brainard, who are now making contracts for the necessary machinery and materials. The rate at which this contract was given out is highly favourable to the Company, and is considered as low as the same quality of Cars can be purchased in the United States, thereby saving the Company the transportation and duties, which items in themselves will more than repay the cost of the buildings to be erected, even were they not needed by the Company on the completion of the road.

In pursuance of a resolution of the Board I shall immediately contract for such Locomotive Engines as will be required on the road before the opening of navigation in 1853.

The contractor for the piling in Burlington Bay is now at work, the necessary piles and timber for completing the docks having been contracted for during the past winter. It is my intention to have the station grounds of the Company in Hamilton filled up, and the wharves completed, by the 1st day of November next

The iron rails, weighing from 65 to 80 pounds to the yard, purchased by the Company last winter are coming forward, and will be delivered at Hamilton, Dundas, Welland Canal, Windsor and Chatham during the course of the summer.

From a knowledge of the character of the work, and taking into consideration the difficulties to be encountered in the prosecution of the same, I do not think it prudent to name a day for the opening of the whole line before August 1853, during which month, unless difficulties now unforseen and not anticipated, should arise, I do not doubt trains will make their regular trips between the Niagara and Detroit rivers.

Since the commencement of the work in 1850 I have had an opportunity of carefully overlooking the plans, estimates, and calculations of my predecessor Mr. Stuart, and I feel no hesitation in saying that I think his estimates were sufficient to complete the work upon the plan and in the manner specified by him. Some alterations have been made whereby the cost of the work will be increased, in other cases reductions have been made ; but after making allowances for the increase of cost in consequence of building Bridges and Culverts for double track, for the substitution of culverts and embankments in many cases for temporary trestle work, for stone instead of brick work, etc., the cost of the road will not exceed the original estimate.

All of which is respectfully submitted.

ROSWELL G. BENEDICT,
*Chief Engineer.*

Engineer's Office, G. W. R. R.
Hamilton, June 10, 1852.

**Present State and Progress of Telegraph Lines in Canada.—2,437 Miles of Wire.**

Lines in Canada were first established some six years ago, commencing at Montreal and extending westward, and to the Niagara River, and subsequently to Quebec, and on the Ottawa River. The lines from Quebec, Montreal, Toronto, Hamilton, and to Buffalo, have proved lucrative to the stock-holders from the date of their construction. The line west from Hamilton to London, has not done as well so far as profits are concerned, from the fact that there has been no branch wires leading to it, and no through connection with the American line at the West. This, however, is about being remedied, and the line extended to Detroit, and there connect with five lines that now pass through that city. The original capital of the present lines in Canada, was double per mile what is now required, on account of the reduction of prices for all kinds of material. The last report of the Montreal Company exhibits the following.

| | | |
|---|---|---|
| Capital of the Company | ................ | $60,000 |
| Profits of 1849 | ........................ | 17 per cent |
| do 1850 | ........................ | $17\frac{1}{2}$ do |
| do 1851 | ........................ | $20\frac{1}{2}$ do |

The three year's profits 55 per cent. The Company report a reserve fund on hand of $15,800 equal to 27 per cent. of the original capital after paying dividends. It is understood the stock has been mostly bought up, and is now in some eight or ten hands. The Toronto, Hamilton and Buffalo Telegraph Company Stock, has been recently consolidated with the Montreal Company. The present Telegraph Companies after a monopoly of six years, are now destined to find a powerful and energetic rival interest in the field. Through the influence of several wealthy gentlemen residing in the Upper and Lower Provinces, Mr. Snow, who has been extensively engaged in getting up companies in the States, and connected with the construction of over 5000 miles, was induced to visit Canada, with the view of establishing a grand Trunk Telegraph Line, from the Detroit River and the foot of Lake Huron to Quebec, connecting with the American Lines at various points, and also with the Line from Quebec to Halifax, with branches from the Trunk line to all the important towns and villages in Canada. Since he came among us, he has exhibited an energy and perseverance rarely equalled, in the prosecution of his mission, visiting most of our towns and villages, while the enterprising portion of our citizens have vied with each other in seconding his endeavors to make "*Canada a Telegraphic net work.*" Mr. Snow has performed an immense amount of travel and labor, and succeeded in organizing Companies for the construction of Lines on twelve routes, amounting to near 1600 *miles!* The stock on most of them being filled and on the other portion, but a small addition is wanted. On some of the routes poles are being set, while on others wire is now being strung upon the poles. The longest line is the Grand Trunk, over 800 miles in length from Port Sarnia to Quebec, by way of Prince Edward's county. Eleven branches radiate from it making some 800 miles more. Wiring is to commence on the Trunk Line west, from Kingston this month, under the direction of A. F. Dwight, Esq, one of the energetic and enterprising Contractors. William Weller, Esq., of Cobourg, is President of the Grand Trunk Line; and Cecil Mortimer, Esq., of the Bank Agency at Picton, Treasurer. The Directors are all gentlemen of wealth, and the highest respectability, who reside on the Line. The following are the distances of the Grand Trunk Line and tributaries in Canada in addition to the American Lines. All are under contract to be in operation by April 1853.

| TRUNK LINE. | MILES. |
|---|---|
| Port Sarnia to Hamilton | 142 |
| Hamilton to Toronto | 48 |
| Toronto to Kingston by Picton | 210 |
| Kingston to Montreal | 190 |
| Montreal to Quebec | 200 |
| TRIBUTARIES TO TRUNK LINE. | |
| On the Ottawa | 150 |
| Cobourg to Peterborough | 30 |
| Toronto to Barrie and Lake Huron | 95 |
| Toronto to Guelph and Goderich | 130 |
| Hamilton to Buffalo | 70 |
| Brantford and Buffalo Railroad | 72 |
| Brantford to Simcoe and Dover | 33 |
| Port Dover to Port Burwell | 45 |
| Port Burwell to Ingersoll | 35 |
| Port Stanley to London | 27 |
| London to Windsor | 120 |
| Miles of New Lines | 1598 |
| Miles now in operation | 840 |
| Total miles | 2137 |
| CAPITAL INVESTED. | |
| For Lines now in operation | $130,000 |
| Do. in progress | 160,000 |
| | $290,000 |

The investment in these new Lines cannot but pay a handsome interest, while the public will be vastly accommodated, and put Canada at least on an equal footing with the States for transmission of intelligence, and all the important cities, towns, and villages, within a moment's distance of each other. Who would have imagined it two years ago?—*Simcoe Standard.*

### The Trunk Line of Railway.

In consequence of the negociations which took place in London some time since between the Delegates of the Provincial Government and the leading firms of English Railway Contractors, Mr. Ross, Civil Engineer, has on behalf of Messrs Jackson, Peto, Brassey and others, made a tour of the Province with a view to ascertain the prospects and facilities which it affords for Railway construction. Mr. Ross has been accompanied by Mr. Thomas Keefer, C. E., and they have together visited the lines in both provinces already in course of construction, and the routes suggested for those in contemplation. Mr. Ross has already taken the contract for the Quebec and Richmond Railway, and it is inferred from the very favorable opinions that he has expressed, that the parties for whom he acts will be prepared at a very early date to enter largely upon the construction of other lines. Mr. Ross goes to England immediately, but is expected to return to Canada after a session there of three or four weeks.

### Northern Railway.

Some new appointments have been lately made on this line, consequent upon the resignation of the Honorable H. C. Seymour late Engineer in Chief, whose heavy engagements in the United States induced him to retire from that office. The Company has appointed F. W. Cumberland, Esq. as his successor, and we understand that that gentleman has already entered upon his duties. It is not improbable that the line to Bradford (31 miles) will be opened on the 25th September, and it is intended to complete the remainder of the length to Barrie (69 miles) early in the ensuing winter. Four miles of the permanent way has already been laid, and the first Locomotive Engine is daily expected. The Toronto Depot and Road Stations are to be constructed immediately.

### St. Lawrence and Lake Huron and Peterborough Junction Lines.

The Report of the Engineer of the St. Lawrence and Lake Huron Line has been issued. It is proposed to connect the Ogdensburgh route with Peterborough and the Georgian Bay. It has not yet been determined where the Southern Terminus shall be located, whether at Kingston or Prescott; the original proposition was to the latter town, but in view of the early Construction of the Trunk line, Kingston may it is said be selected, as saving distance and answering the whole purpose. An application is about to be made to Parliament for a Charter to construct a Junction Line between Toronto and Peterborough—and a reconaisance has already been made of the route. Whether as a portion of a traffic line (by which it is affirmed the distance would be less than by the Lake shore) or a loop line to it, by which to connect the back Townships with Toronto and Kingston respectively, the scheme appears to be well worthy of favorable consideration.

### The Great Western.

The works on this line are progressing with great rapidity. The Carriage Factories at the Hamilton Depôt are nearly complete, and the car builders will be put in early possession. All the arrangements have been made with reference to Locomotive power and general rolling stock, and throughout the whole length of the line there is full evidence of the most energetic action on the part of all concerned. Engineers in connection with this Company are now engaged on a survey between Toronto and Hamilton, and a charter will probably be obtained during the ensuing Session of Parliament authorizing its construction. In this route the two cities will be united at an early date, and (taking the whole length from the Detroit River to Toronto) a large instalment of the Trunk line will be secured.

### The Brock Monument.

The Committee appointed to select a new design for the Monument to be erected to the memory of the late General Sir Isaac Brock, at Queenstown Heights, met last week at the Parliament Buildings, Toronto.

Considering the nature of the work to be constructed, and how seldom an opportunity is afforded for the exercise of taste in so popular and attractive a subject, the competition appears to have signally failed. This may probably be traced to the fact that most of the Architects declined to interfere in consequence of the claims of one of their number, whose design was approved and accepted some years since. Seven designs only were submitted and these were but from four Architects, and one Sculptor. One a Grecian Doric column, chaste and effective in character—by Mr. Young, (the author of the design originally adopted). Two from Mr. Thomas, the first a composite column on a high pedestal and stylobate, extremely graceful in design, of great attitude, but perhaps somewhat too delicately enriched, and the second, an arch surmounted by an Equestrian Statue of the General—which could not be said to offer any rivalry to the before mentioned work by the same master. Another design—a Greek column—of no established order—but elegant in outline and detail, by Mr. Hutchinson Clarke, of Hamilton, two by an anonymous contributor—a Corinthian column with a garland wreathed around the shaft, (!) and a Gothic Mausoleum of most wretched character and miserably rendered; with a Doric column having Sculptural ornamentation by a Boston Sculptor, completed the number of essays submitted for this unquestionably attractive subject. From amongst these the Committee has selected Mr. Thomas' Composite column, the construction of which is to be immediately commenced, and which when completed will doubtless approve itself to the public as worthy of its purpose and of the high reputation of its author.

### Farmer's Associations.

We perceive by the Woodstock *Western Progress* of the 12th inst. that a Farmer's Association has been just formed in the Township of East Oxford, in the County of Oxford. This is a step in the right direction. We have time after time urged upon our agricultural friends the vast importance of the formation of similar associations throughout Canada, and we are pleased to see that farmers are at length beginning to comprehend the solid advantages likely to flow from them. Besides the diffusion of useful agricultural knowledge, the farmers' clubs promote a desirable friendly intercourse and sociability among farmers wherever they exist, from which the greatest good often flows. No community of farmers should be without one, and we trust that before long every township in Upper Canada will have its agricultural association. It has been said that union is strength, and with equal truth it may be said that union is knowledge, a union amongst farmers promotes a knowledge of farming, and when it is well known that this is so, we are rather surprised that farmers associations are not more favorably considered by the generality of farmers than they are in some places at present. At the formation of the East Oxford Association, Mr. Alexander, who was subsequently appointed its President, delivered an admirable address on the benefit of Farmers Associations.—*Colonist.*

### Provincial Exhibition.

The Annual Exhibition of the Provincial Agricultural Association, will be held in Toronto, on the 21st, 22nd, 23rd, and 24th of September. Extensive arrangements have been made to ensure a display of the produce and industry of the country, commensurate with the extraordinary increase in its population and wealth, since the last Exhibition held in this city four years ago.

The Local Committee in their address to the Citizens of Toronto express their confident expectation that the Ontario, Simcoe and Lake Huron Railroad will be opened, and the Locomotive in operation as far as Bradford, by the time fixed for the fair. A very large number of visitors from all parts of Canada and the United States is looked for, and (for the purpose of affording every facility to strangers to procure suitable accomodation) the Local Committee have announced their intention to keep a record of all Houses of entertainment in the city and Environs, as also the extent of accommodation each possesses and the charges for the same.

### Premiums to be awarded by the Provincial Agricultural Association.

*For Agricultural Reports of Counties in Upper Canada, for 1853. Open to general competition.*

| | | |
|---|---|---|
| For the best County Report, (Wellington and Hastings excepted,) | £20 | 0 0 |
| 2nd Do | 15 | 0 0 |
| 3rd Do | 10 | 0 0 |
| 4th Do | 5 | 0 0 |

These Reports, in addition to the usual information required respecting the condition of Agricultural Societies within their range, should describe the various soils of the County; modes of Farming; value of land; amount of tillage and average of crops; breeds of live stock; implements and machines in use; methods of preserving and applying manures; sketch of past progress, with suggestions for future improvement. The manufacturing and commercial condition and capabilities of the County should likewise be stated, together with any other facts that would illustrate its past history or present condition.

All statistical information should be condensed as much as possible, and when practicable, put into a tabulated form. The main object of each report should be to afford any intelligent stranger that might read it, a concise, yet *an adequately truthful* view of the Agricultural condition and *Industrial pursuits* of the County. While all unnecessary particulars are to be avoided in the preparation of these Reports, *completeness* should as much as possible be kept in view.

The Reports must be sent in to the Secretary of the Board of Agriculture, accompanied by a sealed note containing the name and address of the writer, *on or before the 1st of April*, 1853; and no report will be received after that date. Such reports as obtain premiums will become the property of the Board.—*Agriculturist.*

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## FOREIGN.

*Accidents in Mines.*—Not less than 6000 of our fellow-creatures have been destroyed in the mines during the last ten years. Some of them have been shattered to pieces in the mine—projected against the sides of this terrible piece of ordnance; while others, out of its immediate range, in another part of the workings, have been instantly poisoned by the gaseous productions of the explosion. Others, again, have been drowned in the depth of the mine, and some have fallen many hundred feet and been bruised to death, while many have been crushed under tons of fallen roof, and the very likeness of man been destroyed.

At this juncture, as if guided by a special Providence, a strong and national society is preparing to make this subject its peculiar care. Practical and scientific men, as if anticipating its increased necessity, held a preliminary meeting in Westminster, on Wednesday, last week, to form a Society for the preservation of life from explosion and other accidents in mines. It was there resolved that a society having these objects in view, should have its seat in London, and its ramifications in every mining district.

We have the names of some of the first practical and scientific men of the day, as well as of Members of Parliament, who are prepared to support this Society. In London we have a concentration of the science of Europe, and the influence and the power of the kingdom, that will tender to the miners all human means and appliances suited for their dangerous condition; while practical knowledge and experience from the mines will offer to science the elements for experiment and calculation. Thus reflecting on each other, and proceeding hand in hand, they will bring to light a better and more secure mode for working our dangerous mines. Science, thus led by practical knowledge, enabled M. Jars, the French academician, to discover the laws of the natural ventilation of mines, and their dangerous condition at certain seasons. So led, Sir Humphrey Davy and Mr. G. Stevenson discovered the safety-lamp; and so led, Professor Bischoff, of Bonn, detected bi-carburetted hydrogen in some of the continental mines, that rendered the safety-lamp in them an instrument of danger. It was this which discovered that the same safety-lamp became a source of explosion in the hands of the miner, when passing through an explosive atmosphere of more than 3 ft. a second. It was this combination of science and practical knowledge that has given to the mines their various means of ventilation—the furnace, the fan, the ventilating-pump, the elevated chimney, and the steam-jet. It is this which has enabled us to penetrate nearly 2000 feet into the bowels of the earth, through quicksands and feeders of water, some of them 6000 gallons per minute, and to extract therefrom the minerals so important to the individual man and to the country. It is this combination that is the hope of the future.

A national society for the miners, inspired by humanity, and so influenced and guided, cannot but be productive of the most beneficial results.—*Mining Journal.*

*Railway Statistics.*—The length of railway open at the end of 1851 was 6890 miles; end of 1850, 6621 miles; and end of 1849, 6032 miles—showing an increase in mileage in 1851 over 1850 of 269 miles, and end of 1850 over 1849 of 589 miles.

*Passengers.*—The number of passengers conveyed on railways in the United Kingdom for the half-year ending the 31st Dec., 1851, was 47,509,392; for the corresponding period of 1850, 41,087,919; and for the corresponding period of 1849, 35,073,672—showing an increase in the half-year ending the 31st Dec., 1851, over the corresponding period in 1850 of 6,421,473 passengers, and for the half-year ending the 31st Dec., 1850, over the corresponding period of 1849 of 6,014,247 passengers.

*Accidents.*—In the half year ending the 31st December, the number of persons killed was 113, and 261 injured. There were 8 passengers killed and 113 injured, from causes beyond their own control; 9 passengers were killed and 14 injured, owing to their own misconduct or want of caution; 30 servants of companions or of contractors were killed and 17 injured, from causes beyond their own control; 32 servants of companions or of contractors were killed and 11 injured, owing to their own misconduct or want of caution; 33 trespassers and other persons, neither passengers nor servants of the companies, were killed and 9 injured, by crossing or walking on railways. There was one suicide.

*The Gold Fields of Australia.*—The Victoria gold fields still engross the chief attention of fortune-hunters, and really the outmovings appear to be immense. In five months—say, from October, 1851, to the beginning of March, 1852—the Victoria diggings yielded the enormous amount of 653,270 ounces of gold, which is valued at £2,319,10810s., or nearly $10,000,000.

The Bathurst and Turon diggings, which have been longer and more extensively worked than those of Victoria, have yielded up to March nearly 1,000,000 ounces of gold; the actual exports to March 20 being 1,125,317 ounces. These diggings yield as plentiful as ever, and new localities, abounding in rich deposits, are being met with in abundance.

In Van Dieman's Land gold has been discovered, but we have little more than the announcement. Large parties had gone out in different directions, with the view of prospecting.

*Statistics.*—In England, in the six years 1839 to 1841 the average number married annually was 1,546 in every 100,000 persons, composed of equal proportions of the sexes; whilst the greatest deviation in *excess* from the average was only 51, and in *deficiency* only 74, in the whole six years. The same singular uniformity was remarked in the number of persons married at different ages, in the proportion of men at one age with females at another age, and even between the conditions of persons marrying, viz.:—bachelors with spinsters, bachelors with widows, widowers with spinsters, and widowers with widows. The proportions are shown by tables to differ in a very slight degree in several successive years, and at different periods of age. Other kinds of observations may be pointed out, in which the action of the will is observed to be in such strict accordance with a general law, that calculation, though it might be at fault in a few cases, would be almost absolutely correct in predicting the results in a large population. The crimes of which persons are accused vary in their nature according to the age and sex; but during the twenty years in which they were registered in France, and during which the number accused was about equal to that of the deaths of males registered in Paris, the former results were found to fluctuate less than the latter. The proportion of suicides to deaths (1 in 70 amongst males, 1 in 125 amongst females) and the age at which they are committed, the mode of death, and even the causes which lead to them, vary only in accordance with some general laws. Few know that in every seven minutes of the day a child is born in London, and in every nine minutes one of its inhabitants dies! The population of London is, roundly, 2,362,000. If the averages of the past 50 years continue, in 31 years from this time *as many persons as now compose its population will have died in it,* and yet in about 39 years from this time, if the present rate of progress continue, the metropolis will contain twice as many persons as it does now. The whole population of Liverpool in 1851 numbered 255,000; while the increase of inhabitants in the metropolis between 1841 and and 1851 was 413,000. It is truly marvellous! Where it will stop, and how food and shelter are provided for these masses, are subjects for speculation.

*The Amazon.*—Professor Graham has presented a chemical report to the Board of Trade on the cause of the burning of the ship *Amazon*, in which, after investigating the evidence on the subject, he comes to the conclusion that the origin of the fire must remain a matter of speculation and conjecture. He does not think that it originated in the spontaneous combustion of the coals, because they were Welsh, which are not remarkable for this property, and were shipped in a dry and dusty state. He conceives that the sudden and powerful burst of flame from the store-room, which occurred at the very outset of the conflagration, is strongly suggestive of a volatile combustible, which, according to two witnesses, was in the store-room, though this is denied by a third. Professor Graham found on trial that the vapour given off by oil of turpentine is sufficiently dense at a temperature somewhat below 110° to make air explosive on the approach of a light.

*Prevention of Incrustations in Steam-Boilers.*—M. Delandre states that he has succeeded in preserving tubular boilers, free from incrustation, by placing 2 lbs. of protochloride of tin in a boiler, which works 12 hours daily, with a pressure of 3 atmospheres, consuming in this time 1,500 to 1,600 quarts of water, and is only emptied and refilled once in eight days. For steam boilers which are emptied daily, and are of great power, the consumption of protochloride should be calculated at half a pound, for every cubic metre of water evaporated. The protocloride of tin is changed by the water into an insoluble basis and a soluble acid salt; the latter dissolves the earthy and calcareous salts. —*Artizan.*

Dr. Babbington, of London, some time since took out a patent for preventing incrustation by volaic agency. For iron boilers he recommends a plate of zinc 16 oz. the square foot, to be attached by one of its edges by solder, to the interior of the boiler; and both sides of the plates being left exposed to the action of the iron and water, voltaic agency thus excited, is said to have the desired effect. For large boilers, two three or more plates may be used as necessary.

*Steam-Boiler Explosions.*—An invention has been registered by Mr. Dangerfield, of West Bromwich, for the prevention of steam-boiler explosions. The apparatus is very simple, consisting of a valve, which is screwed to the top of the boiler, over which stands a hollow fluted column about 3 feet high, forming a box to contain the weights on the valve, and a pillar for a wheel, over which works a flat chain connected with the buoy in the boiler, having at equal distances two long links, one on each side of the pillar. Two levers, connected with the valve, and fixed on centres, pass between the long link, so that the water in the boiler, rising or falling beyond a given level, depresses the lever, opens the valve, and permits the steam to escape. An index is fixed on the wheel which gives the height of the water in the boiler; the steam is also weighed without the addition of levers, and the weights are securely locked in the pillar to prevent alteration.

*New Planet*—Mr. J. R. Hind has announced that a few nigh s ago he "discovered a new planet on the borders of the constellations Aquila and Serpens, about 5 degrees east of the star Tau in Ophiuchus. It shines as a fine star of between the eighth and ninth magnitudes, and has a very steady yellow light. At moments it appeared to have a disc, but the night was not sufficiently favorable for high magnifiers. At 13h. 13m. 16s. mean time, its right ascension was 18h. 12m. 58 8s., and its north polar distance 98 deg. 17m 09s. The diurnal motion in R. A. is about 1m. 2s. towards the west, and in N. P. D. two or three minutes towards the south."

At a meeting of the Society of Antiquaries, lately held in London, Mr. Wright, by permission of the owner, exhibited a sword, a spear-head, and what he denominated an arrow-head of the Anglo-Saxon period, from whence he argued that the Anglo-Saxons used bows and arrows. Mr. Akerman expressed more than strong doubts on the question, and was of opinion that the so-called arrow-head had belonged to a small javelin. Our notion is that of Mr. Wright,—and it is very well ascertained that the Ancient Britons, whatever might have been the practice of the Saxons, employed bows and arrows, and pointed the latter with flint.

An account of the receipts and disbursements of the home treasury of the East India Company, from the 1st of May, 1851, to the 30th of April, 1852, shows that the receipts have been £6,099,852 8s. 5d., and the disbursements, £3,734,003 14s. 6d., leaving a balance in favor of the company, on the 30th of April, 1852, of £2 365,848 11s. It is estimated that the receipts of the home Treasury from the 1st of May last to the 30th of April, 1853, will be £3,858,521, which, with the balance in hand, will make the total amount £6,224,369. The disbursements for the same period are estimated at £4,139,272, which will leave a balance in favor of the company on the 30th of April, 1852, of £1,785,097.

The great Fire at the Printing Office of Messrs Clowes, in London, in the month of June last, by which property to the value of £50,000 was destroyed, has, it appears, a more direct interest for Canadians, than the readers of the announcement in the papers, were probably conscious of. A part of the twenty thousand reams of paper consumed, consisted of the sheets of 157 pages of the forthcoming Volume of observations at H. M. Magnetical Observatory at Toronto, the whole of which have therefore to be reprinted.

It appears from the returns prepared by the Board of Trade, that during the five months ended the 5th of June last, we imported no less than 52,338,676 eggs, the whole of which were entered for home consumption. Of these, two-thirds were delivered to supply the London markets. The average monthly consumption of foreign eggs is 15,000,000. The importations of butter during the first five months of the present year were 117,797 cwt., against 129,936 cwt., in the corresponding period of last year.

It is stated that arrangements are in progress for extending the privileges of sending books, magazines, and pamphlets by post, at the low rates adopted for inland carriage of these articles, to the settlements of Australia.

From official returns just published, it appears that the Irish emigration in ten years (1841 to 1751) numbered 1,289,133 persons. The decrease in the population of Ireland between 1841 and 1851 was 1,659,330.

It is said that Col. Rawlinson has opened out the entire place of sepulture of the Kings and Queens of Assyria. There they lie "in huge stone sarcophagi, with ponderous lids decorated with the Royal ornaments and costume, just as they were deposited more than 3000 years ago."

It is proposed to construct a new Bridge on or near the site of Blackfriars bridge, to be of cast iron, and have only five arches instead of seven. The centre arch would thus be 150 feet open and the two side arches 140 and 130 feet respectively.

Mr. A. W. Pugin, the celebrated Architect, has become the inmate of a Public Hospital. His mind having given way under an excessive strain of professional and nervous excitement.

## ERRATA.

Page 10—Line 40.—For "shut," read "sheet."
*Page 16—Line 10.—For "bichlorides," read "chlorides."*

## THE CANADIAN JOURNAL

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

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

There are three classes of persons who may with propriety join the Institute,—1st. Those who by their attainments, researches, or discoveries, can promote its objects by their union of labour, the weight of their support, and the aid of their experience. 2nd. Those who may reasonably expect to derive some share of instruction from the publication of its proceedings by the *Journal*; and an acquaintance with the improvement in Art and the rapid progress of Science in all countries, a marked feature of the present generation. 3rd. Those who, although they may neither have time nor opportunity of contributing much information, may yet have an ardent desire to countenance a laudable, and to say the least, a patriotic undertaking—a wish to encourage a Society, where men of all shades of religion or politics may meet on the same friendly grounds, nothing more being required of the Members of the CANADIAN INSTITUTE than the means the opportunity, or the disposition, to promote those pursuits which are calculated to refine and exalt a people.

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