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The Canadian Journal.

TORONTO, NOVEMBER, 1852.

The Canadian Institute has just completed its first year of existence under the Royal Charter of Incorporation, which was granted in November of last year. It was not until the beginning of April, 1852, that the officers required by the Charter for the government of the Institute entered upon their duties.

Thus far its pecuniary resources have been limited to the annual subscriptions of its members, and its hope of future usefulness and success in the great work of collecting and diffusing useful information, to the zeal of a few whose confidence in the possibility of organizing a powerful scientific and literary society, with ramifications throughout the country, has been sufficiently warm and vigorous to infuse into them that ardour which almost invariably commands success.

We shall not anticipate the report of the Council to be laid before the Institute on Saturday, Dec. 11th; it is our grateful privilege, however, to announce that one oppressing difficulty towards the extension of the Canadian Institute has been most happily removed.

The Provincial Parliament has generously responded to the petition of the Institute for pecuniary encouragement, and by voting Two Hundred and Fifty Pounds for the purposes of the Institute, gives to it the means of developing its latent resources and enables it to call at once into vigorous and united action, a large amount of native wealth and native-power in science and literature, which languish only for the want of opportunity to bring them to the light, and direction to indicate the course they should pursue.

We have also much pleasure in announcing that the future meetings of the Canadian Institute will be held in the Hall of Assembly, Parliament Buildings, Toronto. That magnificent apartment, together with three adjoining rooms, having been kindly placed at the disposal of the Institute by the Commissioners of Public Works. Subjoined is the reply to the application of Capt. Lefroy, R. A., F. R. S., on the part of the Institute:—

PUBLIC WORKS,
QUEBEC, 11th Nov., 1852.

SIR,—

I am directed to acknowledge the receipt of your letter of the 10th instant, applying, on the part of the "Canadian Institute," for permission to occupy the Chamber in the Parliament Buildings at Toronto, together with some other rooms, and in reply, I have to inform you that the Commissioners are willing to grant you the use of the Hall of Assembly, with the three rooms adjoining it, to be occupied by the "Canadian Institute," so long as it may not be required by the Government; and upon condition that the former shall make an arrangement with the Insurance Company relative to any additional risk. The Institute will also be required to arrange with Mrs. McElderry, the Keeper of

the building, as to the times when they will use the building, in order that they may not meet with any difficulty as to access, &c.

I have the honour to be, Sir,
Your obedient Servant,
THOMAS BEGLY,
Secretary.

Captain Lefroy, R. A.

The second session of the Canadian Institute will commence most auspiciously, and if from the present we may draw conclusions respecting the future, this new proof which we have just recorded, of the desire of the Provincial Government to advance the interests of Science, Literature and Art in the Canadas, coupled with the willing courtesy of the Commissioners of Public Works, will unquestionably awaken both far and near a spirit of enquiry, annually producing useful and interesting results, if not—as we would hope—results of moment to the people of British America.

The Treasures of our Forests.

The products of the forest embrace the most important items of Canadian exports, and from their bulky nature secure to us a greater amount of intercourse with Great Britain than all other articles of export or import collectively.

The relation which the products of the forest bear to other productions, in a commercial point of view, is represented below for the years 1849, 1850, and 1851:—

1849.	
Value of the products of the forest exported	£1,327,537
" of all other productions	1,000,027
Balance in favour of the products of the forest	£327,510
Value of the products of the forest exported to Great Britain, not including ships built at Quebec	£1,009,669
Value of all other productions exported to Great Britain	338,755
Balance in favour of productions of the forest exported to Great Britain	£670,914
1850.	
Value of the products of the forest exported	£1,360,734
" of all other productions	1,309,264
Balance in favour of products of the forest	£51,470
Value of the products of the forest exported to Great Britain, not including ships built at Quebec	£971,375
Value of all other productions exported	229,474
Balance in favour of products of the forest exported to Great Britain	£741,901
1851.	
Value of the products of the forest exported	£1,509,545
" of all other productions	1,315,085
Balance in favour of products of the forest	£184,460
Value of the products of the forest exported to Great Britain, not including ships built at Quebec	£1,180,000
Value of all other productions exported	325,350
Balance in favour of products of the forest exported to Great Britain	£854,658

Hence, it appears, that the value of the products of the forest exported to Great Britain, has steadily increased during the last three years; the numbers indicating those values, being in 1849, £670,914; in 1850, £741,091; in 1851, £854,658.

Table showing the kinds of forest productions exported, in 1851:—

ARTICLES.		Value of Exports.	Value of Exports to G. B.
Ashes, Pots, brls.	27,911	£172,496	£153,528
Pearls, do.	8,163	43,865	42,282
Timber, Ash, tons	3,018	3,726	3,710
Birch, do.	4,013	5,505	5,501
Elm, do.	35,644	49,146	49,072
Maple, do.	449	435	404
Oak, do.	40,976	57,460	47,425
Pine, White, do.	453,435	400,972	381,370
Red, do.	91,145	114,875	114,521
Tamarack, do.	4,356	1,415	517
Walnut, M feet	1,191	5,931	113
Basswood, Butternut and Hickory, do.	79	243	43
Staves, Standard, Mlle.	1,195	20,769	15,519
Other, do.	4,509	92,011	88,213
Battens, Knees, Scantling, Tree Nails, &c., pieces	729,059	11,060	525
Deals, do.	3,526,647	239,369	238,931
Planks and Boards, Sup. Feet	120,175,596	209,103	855
Spars, Masts and Handspikes, pieces	9,482	11,101	12,505
Lath and Firewood, cords	17,356	11,641	8,142
Shingles, mille	20,972	7,880	......
Saw Logs, No.	31,425	8,642	......
Other Woods	......	11,364	887
Furs and Skins	......	28,085	7,939
Total		£1,510,135	£1,171,998

It is thus seen at a glance that forest productions, exclusive of Pot and Pearl Ashes, and the Furs and Skins of animals, are of the highest economic importance to us, and yet who, that is acquainted with the diversified trees of our forests, can fail to perceive that very extensive sources of revenue are neglected from ignorance of the value of many species of wood, which are especially adapted to the peculiar purposes of artificers in Great Britain, but do not appear in the enumerated list of exports.

We are led to these remarks in consequence of the information respecting forest productions which the recent Exhibition of All Nations in London has brought to light.

Not less than one hundred and thirty varieties of British wood were exhibited at that magnificent exposition of industry. Among them, it may be well to mention, specimens of apple, pear, plum, and apricot trees were introduced, in consequence of those woods being much sought after by toy manufacturers, turners, &c. For obvious reasons, such woods would possess little value in this country, either as an article of export or for the purposes of domestic manufacture.

Europe contributed forty-nine varieties of wood, most of them used in ship building, carpentry, furniture, and dyeing.

Asia contributed about two hundred specimens. The United States forty-two. Canada thirty-one.

We subjoin a list of the woods sent from the United States and Canada, remarking however, that some of the species enumerated in the attached list and credited to the United States, grow well and are abundant in Canada.

WOODS OF NORTH AMERICA.*

NAME AND PLACE OF GROWTH.	Weight per Cub. Ft. lbs.	oz.	Specific Gravity.	REMARKS AND WHAT USED FOR.
Ash, American (Fraxinus)	35	10	·570	Tough, elastic, much used.
Ash, white—Upper Canada	30	14	·491	
Balsam (Picea balsamea)—Upper Canada	19	0	·304	Carpentry.
Bass Wood (Tilia)—U. C.	25	0	·400	Even grain, like common limewood
Beech, white (Fagus americana)—U. S.	42	2	·671	
Beech (Fagus ferruginea)—Upper Canada	36	9	·585	Dry carpentry; the wood has more rufous tint than common beech
Birch, black (Betula nigra)	35	7	.567	Shipbuildin , i Canada and Nova Scotia, but not a durable wood
Birch (Betula ——?)—U. C.	30	11	·491	An inferior wood
Box elder, ash leaved maple (Acer Negundo)—U. S.	21	0	·384	
Butter nut (Juglans cinerea) Upper Canada	23	8	·376	
Butter wood	28	12	·460	Shipbuilding
Button wood, sycamore (Platanus occidentalis)—U. S.	26	8	·424	Much used for making bedsteads
Cedar (Larix ——?)—U. C.	18	6	·294	
Cedar, red or pencil (Juniperus bermudiana)—Bermuda	34	15	·559	Shipbuilding and for making pencils
Cedar, red (Juniperus virginiana)—U. S.	26	10	·426	For making pencils, but not so good as the junip. bermudiana
Cherry wood (Prunus ——?) Upp. Canada	29	15	·479	
Cherry, wild (Cerasus virginiana) United States	32	3	·515	
Chesnut (Castanea vesca) U. S.	25	4	·401	
Coffee tree (Gymnocladus canadensis)—U. S.	40	7	·647	Hard, compact, strong, tough
Cypress (Cupressus disticha)—U. S.	22	13	·365	Grows to an immense size
Dogwood (Cornus florida)—U. S.	47	4	·756	Hard, close-grained strong
Elm (Ulmus americana)—U. C.	36	11	·587	
Elm, american rock	36	3	·579	Shipbuilding
Elm, rock	37	10	·602	"
Elm, swamp	33	10	·538	" preferred to English elm
Elm, white	34	5	·549	By wheelwrights
Elm, red (Ulmus fulva) U. S.	42	8	·680	
" " "	31	2	·498	
Gum tree, sour, or black (Nyssa multiflora)—U. S.	40	6	·646	
Hack-berry (Celtis crassifolia)—U. S.	38	6	·614	Tough, elastic
Hackmatack (Larix americana)	37	9	·601	
do. do. do.	36	2	·578	Esteemed in British North America for shipbuilding
Hazel, wych, or Quebec rock elm Ulmus ?—Canada	31	2	·516	Shipbuilding
" " " "	43	11	·699	
" " " "	51	6	·822	
Hemlock (Abies canadensis) U. S.	23	0	·368	
Hemlock spruce—U. C.	23	0	·368	Common carpentry
Hickory (Carya amara) U. S.	..		..	
Hickory, pignut (Carya porcina)—U. S.	49	8	·792	Stronger and better than any other kind of hickory
Hickory, shell-bark (Carya sulcata)—U. S.	43	2	·690	
Hickory ?	47	8	·760	
Hickory (Juglans alba)—U. C.	48	2	·770	
Honey locust (Gleditschia triacanthus)—U. S.	40	6	·646	Very hard, splits with great facility

* Labelled and Classified by Mr. W. W. Saunders, at the Great Exhibition.

NAME, AND PLACE OF GROWTH.	Weight per Cub. Ft. lbs.	oz.	Specific Gravity.	REMARKS AND WHAT USED FOR.
Iron wood (Ostrya virginica)—U. S.	48	11	·779	
Judas tree, or red bud (Ceris canadensis)—U. S.	33	7	·535	Close-grained, compact
Locust (Robinia pseud-acacia)—U. S.	45	8	·728	Shipbuilding occasionally, chiefly for treenails
" " " "	41	11	·667	
Maple, soft (Acer eriocarpum)—U. C.	36	14	·590	
Maple, red, (Acer rubrum)—U. S.	38	5	·613	
Maple, sugar (Acer secharinum)—U. S.	38	6	·614	
" " " "	39	6	·630	
Maple, bird's eye—U. C.	40	15	·655	Ornamental work by carpenters and joiners
Maple, curly—U. C.	36	10	·586	Common carpentry
Maple, var. bird's eye	36	0	·576	Ornamental work; a peculiar growth of the tree
Maple, hard—U. C.	39	10	·634	
Mulberry, red (Morus rubra)—U. S.	35	1	·561	
Oak (Quercus alba)—U. S.	47	14	·766	
Oak, white—U. S.	40	1	·641	
Oak, white—U. C.	44	4	·708	Shipbuilding
Oak, Quebec—Canada	33	11	·539	Shipbuilding, but not d'rble
" "	45	5	·725	Specimen of an inferior quality
" "	39	5	·629	Shipbuilding, but not in repute
Oak, Quebec white—Canada	53	12	·860	Shipbuilding
" " "	54	6	·870	"
Oak, red (Quercus rubra)—U. S.	32	2	·514	
Oak, black (Quer. tinctoria)—U. S.	34	14	·558	
Oak, live (Quercus virens)—U. S.	56	4	·900	Heaviest and hardest of the oaks
" " "	51	11	·827	
Pawpaw (Uvaria triloba)—U. S.	22	7	·359	
Persimon (Diospyrus virginiana)—U. S.	44	6	·710	Hard, close-grained
Pine, yellow (Pinus mitis)	23	8	·376	Carpentry work
Pine, Amer. yellow "	22	15	·367	"
Pine, red (Pinus resinosa)—U. S.	28	7	·455	Carpentry; strong
Pine, Amer. red "	26	11	·427	Carpentry
Pine, pitch (Pinus rigida)—South Carolina	32	0	·512	Strong and durable
" "	42	2	·674	Much used in shipbuilding
Pine, Virginia " .	34	6	·550	
Pine ?—Upper Canada	22	8	·360	Same purposes as common deal
Poplar, yell'w (Liriodendron tulipifera)—U. S.	24	3	·387	
Poplar (Populus ——?)—U. C.	20	11	·331	
" " "	19	4	·318	Light, inferior wood
Red bud, *see* Judas tree				
Sassafras (officinale)—U. S.	37	4	·596	From a young tree
Spruce, white (Abies alba)	23	13	·381	
Sycamore, *see* Button wood				
Tamarac (Larix americana)—U. C.	23	15	·383	Good for shipbuilding purposes
Treenail (Robinia pseud-acacia)—U. C.	41	8	·664	Treenails for shipbuilding
Walnut, white—U. S.	30	5	·485	From a young tree
Walnut, black (Juglans nigra)—U. S.	28	15	·463	Strong, tough, not liable to split
" " Upper Canada	28	11	·459	

The foregoing list contains a very imperfect enumeration of Canadian woods; it will serve, however, as a beginning of what may be made an exceedingly interesting and highly important kind of information, and easily susceptible of considerable extension, if the Canadian Institute can succeed in collecting, through its members, an assortment of woods, to be deposited in the museum in progress of formation, with duplicate specimens for contribution to the Sydenham Crystal Palace, where the British public may be made familiar with the numerous and extensive, but comparatively little known, treasures of our forests.

Remarks on Thermometric Registers; by Captain J. H. Lefroy, R. A., F. R. S.

(Continued from Page 31.)

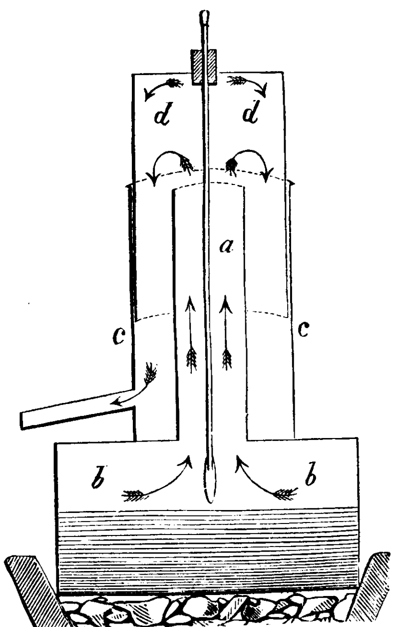
The Committee of the British Association having very recently announced its readiness to supply true standard Thermometers to members of that body and others, at a low rate, it may be hoped that these instruments will soon be found in the apartments of Scientific and Literary Societies in Canada: § it may be desirable therefore to refer somewhat more fully to their verification, than was done in the previous part of this article.

(1.) To determine the zero point, if the thermometer is one with an arbitrary scale, or verify it, if it is graduated to Fahrenheit.

Fill a quart measure or similar vessel, with ice that has been pounded fine in a bag or cloth, the finer and more uniform the better. Add a little water, immerse the thermometer, standing upright, in this, up to the point 32° on the scale, and after allowing it a little time to settle, read the scale to the nearest tenth of a division: take several readings, with an interval of a minute or two between them, and note them all in the register, whether they vary or not. The observation cannot be made very accurately in the summer, and the nearer the temperature of the air in the room at the time is to 32° Fahr. the better.

(2.) To determine the boiling point on the scale of the thermometer.

Get any tinsmith to make a vessel for generating steam, after the drawing given below. It consists of a boiler holding about



half a gallon, (*b*) to which is added a tube (*a*) about three inches in diameter and ten high; exterior to this, but not communicat-

§ Regulation of Council.—That Standard Thermometers made at Kew, be supplied on application to members of the British Association, and Fellows of the Royal Society, at £1 stg. each. Report, &c., Belfast Meeting, September, 1852.

ing with the boiler, is a second tube (*c*) of the same height, but large enough to have a space of an inch or more clear between the two, at the bottom of this outer tube is a small pipe for the escape of the steam; it may be three-quarters of an inch in diameter at the orifice. Lastly, a cap tube (*d*) closed at top, is made to fit the exterior tube, and slide upon it tightly enough to stand at any height at which it may be set. In the centre of the top of this latter tube is made an orifice large enough to receive a common quart bottle cork, and a short neck soldered on to hold it firmly. The boiler then being half or two-thirds filled with hot rain or snow water, the thermometer is passed through a cork, and slipped down through the orifice just mentioned, until the ball nearly, but not quite, dips in the water, the exterior tin tube being at the same time drawn out so that no more of the tube of the thermometer is above the cork than is absolutely necessary. The apparatus is then set over a braizer's furnace or something of the same nature, until the water boils briskly and the steam by degrees expels the whole of the air, and escapes freely by the pipe left for the purpose. If the size of this escape pipe is properly proportioned, which does not appear to be a matter of much nicety, the vessel will now be filled with steam of an elasticity precisely represented by the Barometric pressure at the moment; and the mercury in the thermometer, rising just above the cork, will stand at the boiling point. It is desirable to ascertain whether the escape tube is rightly proportioned by partially stopping it; if two or three such alterations of its size have no visible effect upon the reading of the thermometer, we may be satisfied. In finished instruments a mercurial syphon guage is attached.

The following table, calculated by M. Regneault, contains the true temperature of steam. of elasticity corresponding to the barometric pressures annexed; in other words, the temperature which should be indicated by a thermometer plunged in the steam of such a vessel as is described above, when the elasticity of such steam, (measured by the exterior Barometer) is equal to the pressure stated. The English equivalents of the French measures are given for convenience.

TEMPER'TURE.		PRESSURE.		Diff.	TEMPER'TURE.		PRESSURE.		Diff.
Cent.	Fahr.	Millim	Inches.	Inch.	Cent.	Fahr.	Millim	Inches.	Inch.
°	°				°	°			
99.0	210.20	733.21	28.8671		100.0	212.00	760.00	29.9218	
99.1	210.38	735.85	28.9710	.10[illegible]	100.1	212.18	762.73	30.0293	.1075
99.2	210.56	738.50	29.0753	.104[illegible]	100.2	212.36	765.46	30.1367	.1074
99.3	210.74	741.16	29.1798	.104[illegible]	100.3	212.54	768.20	30.2447	.1080
99.4	210.92	743.83	29.2846	.104[illegible]	100.4	212.72	770.95	30.3529	.1082
99.5	211.10	746.50	29.3903	.105[illegible]	100.5	212.90	773.71	30.4615	.1037
99.6	211.28	749.18	29.4956	.106[illegible]	100.6	213.08	776.48	30.5705	.1090
99.7	211.46	751.87	29.6017	.106[illegible]	100.7	213.26	779.26	30.6800	.1095
99.8	211.64	754.57	29.7080	.106[illegible]	100.8	213.44	782.04	30.7894	.1094
99.9	211.82	757.28	29.8147	.106[illegible]	100.9	213.62	784.83	30.8994	.1100
100.0	212.00	760.00	29.9218	.107	101.0	213.80	787.63	81.1096	.1102

Suppose then that the mean of several readings of the thermometer over the boiling water is 211°.50; the Barometer, reduced to 32°, giving a pressure of 29.826 at the time. The temperature of steam, of elasticity equal to 29.826, we see by the above table, falls between 211°.82 and 212°.00: it will be precisely 211°.84, which is, therefore, the true temperature, and the thermometers reads 0°.34 too low: this is not, however, the true *boiling point*, the pressure being less than the standard pressure; the reduction is—

$$0.18 + \frac{09}{407} = 0.16$$

The true boiling point upon this thermometer, is, therefore, 211°.66 instead of 212°, showing, as before, an error of graduation of —0°.34. As one-tenth of a degree is a very sensible quantity in the scale of these thermometers, and the perfect fixity of the mercury in the steam, as long as the pressure remains the same, enables an observation to be made with great precision: the above apparatus can be employed for determining differences of level, upon occasion—allowing 511 feet for the first degree, 513 feet for the second, 515 feet for the third—from 212° downwards: but the observer must be careful in this climate to choose very settled weather for the purpose, or a change of the Barometer may introduce an error larger than the quantity to be measured.

The freezing and the boiling points of the standard thermometer should be verified occasionally, and all other thermometers carefully compared with it, at several points on the scale. So little have even the best instruments of the best makers, heretofore justified in all cases, their title, or their cost, that instances have been recently adduced of the Standard Thermometers of more than one Observatory, being a degree or two in error at the extremes of their scales. That of Toronto was found to be 1°.8 too high at —10°, that of Makerstoun to be 0°.97 too high at 90°, it cannot be therefore too strongly insisted on at the outset of Meteorological Observations, that the accuracy of the instrument demands the first care.

II. *Position of Thermometers.*—The object of the register being to obtain the true temperature of the air of the locality; the thermometer must be guarded, first, from influences which affect the instrument more than they affect the air; its power of radiation and absorption being greater; secondly, from causes which make the air in which it is immersed, an unsuitable example of the temperature of the neighbourhood. As when, for example, it is placed in a narrow court yard, with buildings sometimes reflecting heat, sometimes evaporating moisture, all round it. It should be placed on the north side of a building to avoid reflected heat; but where there is a free circulation of air, otherwise such a situation is apt to be damper, and therefore colder than is natural: at the same time it should itself be secured from wind. It should be detached six inches *at least*, from the wall or other support, and fixed, not hung, upon a bracket. The almost universal practice of English observers is to place the bulb at four feet above the ground. The official instructions to the observers in Prussia, (Regent's Reports, 1850,) direct, however, the height to be not less than twelve or fifteen feet,—a first floor window is therefore not inadmissible, and has indeed been selected in several instances, where local circumstances made it convenient, by the able superintendent of the State Meteorological Observations of New York and Massachusetts, Professor Guyot. The decrease of mean temperature, as we ascend, being only one degree for 280 feet or thereabouts, a difference of ten or twelve feet would be entirely insignificant, were it not that the air within a few feet of the ground is warmed by day and cooled by night, by causes which vary sensibly within that range. Thus a thermometer fully exposed to the sky, at *one* foot above long grass, was found by Mr. Glaisher in his elaborate experiments on radiation, (Phil. trans. 1847,) to read at night 1°.68 *lower* than it would have done, but for the abstraction of heat, by the grass, from the air in contact with it, to compensate for its own loss of heat by radiation into space.

At two feet, it read 1.32 lower,
four " " 1.18 lower,
six " " 1.03 lower,
eight " " 0.73 lower,

than the standard, and he was led to the important conclusion, that "if a thermometer be freely suspended in the air with its bulb at the height of thirteen feet above the soil, and far from any object to reflect heat to it, its readings will represent the true temperature of the air at the time, and much more truly than those of any one placed near the ground, or within a few feet of walls or buildings." The thermometer in this situation is not supposed to be protected from the sun or from rain. It has also been shown by the same experiments that a thermometer radiates its heat into space at the rate of one-tenth of a degree for every tenth of unclouded sky visible from the bulb. Other experiments have established the law that the cooling of bodies by radiation at night, is always in the same proportion to the clearness of the sky, whatever be the actual temperature. Hence a thermometer should be so placed that no portion of the sky shall be visible from the bulb: that it must be screened from rain is self-evident, and the same arrangement will fulfil both purposes, but it is not necessary for the former of them that the covering should be of a substantial nature, the very thinnest substance that can be interposed being sufficient to arrest entirely the radiation of heat into space.

Such, then, being the principles upon which the place of a thermometer should be determined, it will be acknowledged that a great proportion of those consulted for private information, whatever else they may indicate, do not indicate the true temperature of the air, in the sense understood by Meteorologists: and hence a large proportion of the discrepancies and anomalies which make the collation of any collection of observations so discouraging a task. For example, in some observations made at Quebec—1828-1836—(*Trans. Hist. Soc., Vol. III,*) we find a sudden fall of two and a half degrees in the mean annual temperature for the latter half of the series.

Mean Temper. 9 A. M.	°	Mean Temper. 9 A. M.	°
—	—	1832	35.87
1828	37.90	1833	35.85
1829	37.81	1834	35.98
1830	38 24	1835	35.06
1831	38.43	1836	34.83
Mean	38.09	Mean	35.52

This must have been caused by some change of the Instrument, or of its exposure, but no explanation is given of the circumstances. In a similar manner the mean temperature at Ancaster, C.W., rose three or four degrees in 1839, according to the observations of Dr. Craigie, published in *Hall's Medical Journal*, 1846, and which are, in other respects, deserving of every confidence.

Mean Temper. 9 A. M.	°	Mean Temper. 9 A. M.	°
—	—	1839	47.59
—	—	1840	47.94
—	—	1841	47.66
1835	44.09	1842	47.22
1836	43.41	1843	45.80
1837	43.45	1844	48.18
1838	44.75	1845	48.33
Mean	44.17	Mean	47.53

The difference in this case is equivalent to a change in geographical position of about 150 miles, or to a removal from Ancaster to Ohio. Errors of position generally affect the final result with their full weight—errors of graduation sometimes balance one another upon the whole; it is, therefore, of great importance that the former be reduced, by attention to all the circumstances indicated. Practically, a box with lattice sides, not too contracted, excluding rain and sun, but allowing free circulation of air, while it checks the force of the wind, will generally answer, but the observer must exercise his own judgment as to whether heat is *reflected into this box from the wall* or window it faces, and place it so as to render that effect, which is appreciable from a considerable distance, almost impossible.

The following table contains the *horary corrections* to observations of the thermometer in Canada, or the corrections necessary to reduce the mean temperature, derived from observations at certain incomplete hours of the day, to *true means*. They are derived from the seven years of hourly observations at Toronto:

	5 A. M.	6 A. M.	7 A. M.	8 A. M.	9 A. M.	10 A. M.	11 A. M.	Noon.	1 P. M.	2 P. M.	3 P. M.	4 P. M.	8 P. M.	9 P. M.	10 P. M.	11 P. M.	Midn.
		°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
January	+2.46	+1.83	+1 91	+ .66	+0.63	−0.59	−1.70	−2.43	−2.92	−3.20	−3.16	−2.63	−0.12	+0.07	+0.44	+0.77	+1.47
February	+3. 2	+1 23	+4 31	+3.29	+1.62	−0.95	−2.41	−3 56	−4.49	−4.88	−4.90	−4.47	−0.13	+0.52	+1 06	+1.60	+1.73
March	+1 35	+1.75	+3.93	+1.89	−0.25	−1.91	−3.14	−4.15	−4.79	−5.31	−5.15	−4.65	+0.03	+1.00	+1.63	+2 01	+2.63
April	+5.75	+5 48	+3.22	+1.69	−1.01	−2.45	−3.65	−4 86	−5 72	−6.14	−6.16	−5.81	+0.66	+1.78	+2 59	+3.07	+3.22
May	+7 83	+5.40	+2.43	+4.06	−2 11	−3.81	−4 92	−5 87	−6 83	−7.13	−7.20	−7.17	+0.43	+2.31	+3.29	+4.20	+5.02
June	+7 88	+5.21	+2 41	+0.10	−1.82	−3.49	−4.77	−5 85	−6 59	−7 03	−7.37	−7.60	+0.33	+2.41	+3 80	+1.76	+5.15
July	+9 02	+5 92	+2 38	−3 31	−2 39	−3.98	−5.49	−6.72	−7 58	−8 26	−8.31	−8.25	+0.68	+2 99	+1 21	+5.21	+5.37
August	+7 89	+5 57	+3 28	+3.21	−2 26	−4. 8	−5 57	−6.39	−7 11	−7 62	−7 98	−7.79	+1.23	+2.70	+3.73	+1.54	+5.33
September	+6 77	+6.17	+3 68	+ .02	−1 52	−3.47	−4.85	−5.95	−6.58	−6.96	−7.01	−6.75	+0.81	+1.99	+2 91	+3.61	+3.96
October	+1.77	+1.71	+3 91	+1 66	−1.0	−2.43	−4.33	−5 36	−5 76	−6.04	−5.85	−5.17	+0.48	+1.25	+1 97	+2.68	+3.22
November	+2.7	+2.52	+2 52	+1 53	+0 01	−1.41	−2.44	−3 31	−3.74	−3 82	−3 61	−2.83	+0.19	+0.44	+0.78	+1.13	+1.80
December	+2.07	+2.39	+2 55	+2 12	+0 92	−0.53	−1.72	−2.52	−3.06	−3.31	−3.13	−2.17	−0.12	+0.18	+0.47	+0.59	+0.90

It will be seen that, at 8 A. M. in the summer, and at 8 P. M. in the winter, the correction is extremely small. Observations made regularly at those two hours throughout the year, if a greater number are not convenient, will therefore furnish very accurate means and they are, perhaps, the most convenient hours in the twenty-four. Any three equidistant observations furnish a true mean, such as 6 A. M., 2 P. M. and 10 P. M., or 7 A. M., 3 P. M., 11 P. M.; of these, the first is now generally adopted.

NOTE.—At p 30, second column, line 25, for 29 992 read 29 922, p. 31, in reference to the freezing mixture of 1 part salt, 2 parts snow, producing a temperature of —4°, or as some authorities give it —5°, it should have been added, that *equal* weights of snow and salt reduce to 0 0, or zero: both mixtures should be tried if possible.

Gas Patents, by Henry Croft, D. C. L., Professor of Chemistry in the University of Toronto.—(*Continued.*)

The principal object intended to be effected by the various contrivances already mentioned, as applied to the purification of gas, is the separation of the two gases carbonic acid and sulphuretted hydrogen; the former, not being combustible, does not in any way contribute to, but rather diminishes the brilliancy of the gas, while the latter is objectionable, inasmuch as the light which it gives out during burning is very feeble, a suffocating compound (sulphurous acid) is formed during the combustion, and moreover, it possesses a disagreeable smell and poisonous properties. In the older plans the ammonia was not separated, only lime purifiers being used, but it was absorbed by the water in the gasometer; its economic value is now so great, that as before described, it is separated by a special apparatus.

Besides these substances which are thus removed from the gaseous mixture, there are several other bodies which are deposited either in the hydraulic main, in the coolers, or in the purifiers, and which of themselves possess very great illuminating power, from containing a large proportion of carbon. These bodies will burn with a brighter flame than even pure olefiant gas, and it would therefore appear that the processes of cooling and purifying have had the effect of diminishing the excellence of the gas by removing these so-called hydrocarbons from the mixture.

In 1826, Faraday discovered various compounds of this nature in the liquid obtained by compressing oil gas, and among others a substance which was afterwards formed by Mitscherlich from the decomposition of benzoic acid, viz., benzine. This substance was proved by Hoffmann to be present (mixed with a variety of bodies of a similar nature) in common naptha or coal tar oil, which is obtained in large quantities during the distillation of tar, and it has lately been obtained from that source in large quantities by Mansfield. This body possesses in an eminent degree the illuminating power when burnt in a good draught, and as it is a very volatile substance, it would be better fitted for "napthalizing" the gas than any of the other hydrocarbons with which it is associated. On account of economy, however, the rectified coal tar oil is used without further purification. The process of napthalizing consists simply in saturating the purified coal gas with the vapours of some of those substances from which it had been freed in a previous part of the process, and this is effected either by filling the meter by which the gas is measured with the naptha, or by passing it through a kind of closet containing shelves, on which are placed pieces of sponge or of pumice stone soaked in that liquid. In one contrivance the gas is freed from ammonia by passing over pumice stone soaked in sulphuric acid, contained in one-half of the apparatus, and is then *napthalized* by being carried through the other half filled with sponge or pumice stone saturated with coal tar oil.

An application of this napthalizing process has been made in a plan for preparing gas, which has attracted a good deal of attention in the States of late years; viz., Paine's process for preparing gas fitted for illumination from water. Paine claims to have discovered a method by means of a magneto electric machine, of converting water *entirely* into oxygen or hydrogen by merely changing the electrical poles. No one would have been astonished if such a statement had been made in the times of Geber or Albertus Magnus, but that the possibility of such a conversion of elements should for one moment be entertained at the present day, seems rather curious. The water having by this incredible process been converted into hydrogen, a gas which gives out little or no light in burning, is then endowed with illuminating powers by a process little less incredible. The gas is passed through oil of turpentine and becomes, as Paine says, *catalized*, the applicability of which term, derived from a Greek word, signifying to loosen or dissolve, seems more than doubtful. By this process, *without taking up any turpentine, although it acquires its smell*, the gas is said to become capable of emitting a powerful light on combustion. According to the best information that we as yet possess on the subject, the whole invention may be designated as humbug.

Another plan in which water is employed is more feasible, viz., that invented by Gilliard, which depends upon the intense light emitted by platinum rendered incandescent in the flame of hydrogen.

The hydrogen is obtained by passing the vapour of water over heated coke, by which means a mixture of hydrogen, carbonic acid, carbonic oxide, with a small trace of carburetted hydrogen, is produced. By the ordinary lime purifiers it is freed from carbonic acid, and is burnt in jets, over which are suspended cages of platinum wire. There can be no doubt of the brilliancy of the light emitted, but the safety of the process seems somewhat doubtful, when we consider the explosive qualities of hydrogen when mixed with air, and the remarkable ease and rapidity with which this gas escapes through the finest crevices, and when under pressure through tissues, which to other gases are totally impervious. This gas has also been applied to heating metallic plates placed in a grate so as to replace burning coals, and apparently with some success.

In the former paper a plan was mentioned by which water was resolved into its elements by passing through one half of a retort filled with incandescent coke, and a modification of this process seems to be that adopted at the Astor House in New York, and alluded to in the Annual of Scientific Discovery for 1851. It is clear that the process is incorrectly described in that work, but it seems to consist of a combination of the water-decomposing process by means of hot coke, and the production of ordinary gas by the destructive distillation of melted rosin.

Various substances of a nature similar to rosin, such as asphalt, bituminous slate, oils, fats, &c., have been employed at times for the preparation of gas, but although each may be more particularly applicable in certain localities and under peculiar circumstances, yet, as a general means of preparing gas they cannot compete with coal.

Since writing the first part of this paper I have found that a process for making gas from wood has been invented by Pettenhofer, and is being extensively employed in various parts of Germany.

The gases evolved from the destructive destillation of any animal or vegetable substance will always be essentially the same, differing in the relative proportions of the gases, and in those compounds which are formed in small quantities during the process, and are either mixed with the gas or deposited with the tar. The general process for purifying and collecting remains the same as above described.

A few words might be said in reference to the uses of the different substances produced during the formation of gas, as some which were formerly considered as useless have lately been proved to be of considerable value.

The coke which remains behind is exceedingly valuable as a fuel, from the fact of its having been deprived of all volatile ingredients, and therefore forming little or no smoke when burnt. In England large quantities of the best cannel coal are coked without collecting the gas for the use of the railroad locomotives.

The tar is frequently returned into the retorts or else employed in keeping up the fire, the coking furnaces mentioned in the last paragraph are sometimes fed by means of it. When distilled it yields a residue of pitch and a volatile liquid called naptha, from its resemblance to mineral naptha. This substance is a mixture of a variety of interesting chemical compounds, and is applied to several useful purposes in the arts; such as the solution of caoutchouc and gutta percha. The gas liquor, which is the aqueous portion of the contents of the hydraulic main, contains a variety of compounds, and possesses a most disagreeable odour, it was formerly thrown away, and often allowed to run into rivers to the destruction of fish and the entire deterioration of the water for domestic purposes. Even at the present day this nuisance exists to a certain extent in London. The greater portion of it, however, is employed in the manufacture of sal ammoniac. The gas liquor of itself contains a considerable quantity of this salt, but a much larger proportion is obtained by the addition of muriatic acid, evaporation, heating until charring commences, and resolution in water, crystalization or sublimation. Iodine and Bromine have lately been discovered in the gas liquor, and whether these valuable medicinal bodies can be economically obtained from it, remains yet to be proved.

The refuse lime from the purifiers is used for agricultural purposes, and in some instances has been found efficacious in the destruction of the wire worm; it must, however, be employed with caution. By exposing it to the air for some time, a large quantity of a peculiar salt, the hyposulphite of lime, is generated, from which may be prepared the corresponding compound of soda, a substance which finds rather an extensive use in Photography and the preparation of Daguerreotypes.

The separation of ammonia from the gaseous mixture has been already described.

Hints to the beginner in Water Colour.

A Landscape is divided into three parts, distance, middle and foreground, one-fourth for light, one-fourth for shadow, and half for middle tint, or medium between light and darkness.

Azure distances require autumnal tinted foliage, between Sienna and Gamboge.

Trees most green at prominent parts, grey at top and sides.

If a tree is required on a blue sky, let it be yellower than otherwise.

If dark foliage on yellow ground, bluer.

The sky near the zenith blue, but paler as it nears the horizon.

The general shade tint, Indigo and Indian red, the general glazing yellow-ochre and lake.

Vivid blues, reds, greens, and yellows used sparingly.

Highest lights not profusely scattered over the picture.

The principal object to be placed in the best possible view.

The effect is bad when the parts are many.

Warm effect of colours, white, yellow, orange, red, purple and black.

Cold effect of colours, black, dark blue, blue, green, yellow pale yellow and white.

In general warm colours must predominate; red is medium in a warm effect, green a medium between light and dark.

Cold tints are made with blue and yellow, blue, and warm tints with yellow and red.

Greys are warm as they contain orange, cold as they contain purple or green.

Pure tones are those that approach purple, heavy as they near to green. Avoid greenish blues and yellows; and green, between blue and yellow that they produce.

Red becomes more rich as it tends to blue—brilliant as it advances to yellow.

Purple and orange are pleasant in all their tints, but green only as it becomes yellow.

Indian red, indigo and yellow-ochre are the primitives for mixing, the following being produced by their combinations:—

Orange	by	Yellow	and	Red.
Green	"	Yellow	"	Blue,
Purple	"	Red	"	Blue,
Brown	"	Orange	"	Purple,
Olive	"	Green	"	Orange,
Slate	"	Green	"	Purple,
Black	"	Olive	"	Brown and Slate,
White	"	Black diluted to the highest tint.		

Colours most vivid by contrast:

Yellow	when	opposed	by	Purple,
Red	"	"	"	Green,
Blue	"	"	"	Orange,
Dark Orange	"	"	"	Warm Green,
Red Brown	"	"	"	Dark Green,
Red Purple	"	"	"	Yellow Green,
Dark Purple	"	"	"	Warm Brown.

The opposite of either primitive is made by the other two.

Plants and Botanists.*

The beginning of a creature, whether animal or vegetable, is a mystery seemingly unfathomable. Nevertheless, continued microscopic research is gradually revealing indications, dim yet not uncertain, of the phenomena that are grouped around the genesis of the germ. Every new fact brought to light through the laborious perseverance of indefatigable observers, raises more and more our astonishment at the mingled simplicity and complexity of procreating nature. Within the last ten, or rather within five years, great advances have been made in the study of embryology. German botanists have especially chosen this line of research, and their endeavours have been rewarded with no small amount of success. The scientific naturalist, to whom their writings, mostly in the form of scattered memoirs and short papers may be inaccessible, will find an excellent digest of the results arrived at in two very able reports by Mr. Henfrey, a young English botanist, who is earning well-deserved laurels by his zealous labours in this difficult department. It is not easy to make clear to the general reader the particulars of such inquiries, although the conclusions which have been induced from them are of remarkable interest. We shall endeavour, nevertheless, to present, in plain and untechnical shape, one of these curious histories, and tell the story of the beginning of a pine-tree, for the benefit of lovers of Nature, whose time and tastes are so employed as to prevent their seeking perso‹na›lly for these flower-born truths.

Plants that have distinct and unmistakeable flowers produce their eggs (ovules) either within a nursery-cradle (ovary or germen,) constituted out of metamorphosed leaves, or unprotected and exposed—foundling fashion. Among the latter are firs, pines, cedars, junipers, yews, cypresses, and similar cone-bearing trees; these cones being whorls of scale-like leaves arranged to serve as screens to the little eggs that are the essence of the cone, or else to the little anthers that originate the potent dust or "pollen," which is destined to fertilize the eggs and convert them into seeds. The grains of pollen-dust, though microscopic in their dimensions, are by no means simple in their structure, for their is, as it were, organ within organ, included within their diminutive frames. Each consists of an outer coat and an inner one, the latter endowed with a marvellous ability of growth and extension; elongating, when set free, its filmy membrane into delicate tubes that grow with magical quickness, and transmit through their cavities the still minuter vivifying particles that live within them. The poet sings a libel when he makes his talking tree

> "*Languidly* adjust,
> It vapid vegetable loves
> With anthers and with dust."

Not until the pollen grain has fallen upon the ovule (in anglospermous plants upon the stigma or viscid disc that crowns the ovary) does the embryo of the future plant begin in any way to be manifested. The former event may be said invariably to precede the latter, the relation between them being one of cause and effect. The anomalies, are obscure and exceedingly few, so that they cannot be accepted as objections to this rule. So far we are repeating what every youth, acquainted with the rudiments of botany, knows. This knowledge was the starting point for those who would investigate the mystery.

The egg of the pine is an assemblage of minute cells forming a kernel enveloped in a single cellular coat. Deep in its substance is a row of cells that combine to make a special sac or cavity. When the grains of pollen have fallen upon the egg they burst, and their inner linings protrude in the shape of tubes, and penetrate its substance. Soon after, the sac that lies within it becomes filled up with new-born cells. A year rolls away in

* Westminster Review—October.

the life of the parent tree; the cells of various kinds—those external to the central sac and those of its interior—have multiplied abundantly, and enlarged their several dimensions. The sac itself has become twenty times as large as it was formerly, and is filled with lesser cells, among which a change commences. Certain of them (the number varying in different tribes) grow larger than the others, and those that are between their larger cells (corpuscles) and the wall of the containing sac divide themselves each into four by transverse vertical partitions. The purpose of this division is the construction of an avenue of approach, guarded by four new cells, and leading into the greater cell or corpuscle that lies below.

All this cell-making, and changing, and re-arranging, is preparatory to the inauguration of the germ of the future pine-tree. But other changes must be effected before that germ can begin. In the cavity of each corpuscle new free cells are produced, among which one—the lowermost—has a special mission of its own. After the pollen tubes have forced their way, guided by unerring instinct, through the substance of the egg-mass, through the wall of the included sac, and through the canal formed by the four cells that separate each corpuscle from that wall, this one begins to enlarge. *Against* the membrane of the corpuscle itself the extremity of the pollen-tube lies. It is then that the lowermost of the new-born cells within the corpuscle begins to grow and to produce within itself a new generation of cells, commencing with a free cell that divides itself into two; these re-dividing, make four, from which, by a fresh operation of division, result eight. Of these eight, the four lower ones divide again, until, by force of pressure, the mother-cell is burst, and its matricidal progeny, combined among themselves, lodge in the dissolving membrane of the egg-mass.

This is the beginning of the end. The mass of cells thus lodged has a four-fold constitution, being made up of four rows that separate from each other like so many filaments. And now the end is in view. For the lowermost cell of each of these filaments (suspensors) becomes, by a new process of division and multiplication, the embryo, the germ of the future pine-tree.

But Nature, after an intricate and seemingly tiresome series of proceedings, having at length given birth to the germ—there being as many stages in its manufacture as in a complicated machinery process devised by inventive man for some very simple though profitable result—is not content with her labours of multiplication and germ creation. No sooner is the beginning of the new being perfected, than a work of fearful destruction commences.

Four times as many germ-plants have been produced as there were "corpuscles" in the sac within the egg. For each of the cells so styled has resulted in giving origin to a body that has divided into four sections, and each of its four filamentous segments has developed a true germ at its extremity. In some of the pines there are as many as five corpuscles formed in every egg-mass; in some of the junipers, as many as eight of these bodies. The result of the fertilization of the egg is, therefore, the production in the former of as many as twenty pine-germs—in the latter, of as many as thirty incipient junipers. But the world is not destined to have the benefit of these baby plantations. Out of the twenty germs in the pine-eggs, and the thirty in the juniper egg, only one, in each case, is intended to survive. One favoured infant, although as yet a microscopic embryo, is nurtured and reared at the expense of all its brethren. That tyrant one arrests their growth, and pushes them rudely aside. They waste away, and soon cease to exist: the chosen one only has a chance of growing up into a tree.*

Such are the lately announced fruits of the minute researches of Hofmeister, a German botanist, who has worthily following in the wake of Robert Brown. The complexity of the changes, the simplicity of the operations and organs by which they are brought about, and the strangeness of the result, leave an impression of amazement on the mind of the botanist, knowing, as he does, that in many plants, yet higher in the scale of vegetable organization, the process of reproduction is comparatively simple, though sufficiently wonderful and mysterious. By endeavouring to describe these phenomena in unscientific language, we cannot but fail to convey anything like a full sense of their singularity. Our attempt, may, however, serve to show, by example, how wondrous are the minute secrets into which the microscopic observer endeavours, not wholly without success, to penetrate.

And now a word about the investigators of plants.

Of all orders of naturalists, that of botanists is most prolific in individuals. There is scarcely a town of moderate dimensions in Europe which is not the home of one or more votaries of the graceful and gentle science. The same may be said of North America, or, at least, of the United States. Natural history is a religion, and Botany is one of its sects. But, unlike the sects of most religions, there is neither hate nor jealousy between them. The botanist, the zoologist, and the geologist, can all worship side by side, and offer homage to the same Great God, according to their several faiths and forms, without seeking to close the doors of Nature's temple against each other. Botany is a religion of love. It is the life so beautifully defined in the moral of the "Ancient Mariner:"—

> "He liveth best who loveth best
> All things both great and small;
> For the great God who loveth us,
> He made and loveth all."

If moroseness, or viciousness, or indigestion, or envy, (for naturalists being mortals, are afflicted occasionally with these original sins,) will sometimes work in the brains or stomachs of its devotees, and make an occasional delinquent prick the soul of his neighbour with the stiletto of harsh and galling criticism, it is not on account of that neighbour's shade of belief. That, at least, matters not. But though a Schleiden, intellectually athletic, yet ill-regulated in his strength, may delight in his striking out at random,—or a Watson, indefatigable and deservedly illustrious in statistics, but grown misanthrophic by working overmuch when in ill humour, find a melancholy in attributing evil motives to his fellow-labourers—the great congregation of botanists is at peace with itself and friendly with its philosophical neighbours. The wanderer among them who shares in their tastes, needs no introduction, not even the mention of his name, to ensure a welcome. His fame may have spread among the gatherers of flowers in all climates, and he may find his physiognomy framed and glazed, occupying an honourable place among the Lares and Penates of his entertainer—or he may be utterly undistinguished, the author of neither book, nor paper, nor communication, as yet undignified by having genus or even species named after him—famous or obscure, provided that he show proof of the true faith of a botanist—and all who trust in the same creed, will cherish him as the early Christians did a stranger-believer. Let him only exhibit his vasculum and folio, and he will be joyously received, nay, in many instances, find bed and board freely offered. We speak from experience. More than once, in countries where we could ill express our wants in intelligible language, our damp sheets of drying paper spread out on the bench by the inn doors, and our well filled vasculum, have served us in good stead and secured for us hospitable entertainers, workers in the same pleasant field, who now, after a lapse of years, are numbered among our firm and valued friends.

Nor is Botany the science only of a class, even, though, perhaps, on the whole the doctors have the best of it. In its train are representatives of all ranks and all professions—monarchs and artizans, priests and soldiers. There is one king in Europe who is a good practical botanist, and who must look back upon the hours spent in the arrangement of his fine herbarium with far more pleasure, than upon those wasted in a vain and retrograde course of politics. The monarch in question is His Majesty of Saxony, who, in his scientific career at least, has gained honour and respect. Many is the Story told by his subjects of their ruler's adventures when following his favourite and harmless hobby;—how, more than once, astray from his yawning courtiers, he had wandered in search of some vegetable rarity, across the frontier of his legitimate dominions, and on attempting to return was locked up by his own guards, as a spy or a smuggler, since he could produce no passport, nor give any more probable account of himself than the preposterous assertion that he was their king! Fifteen years ago he made a famous excursion to the stony and piratical little republic of Monte Negro. It was literally a voyage of botanical discovery, and the potentate sailed down the Adriatic in a ste mer, fitted out wi' all the appliances of scientific investigation. On its deck he might be seen busily engaged in laying out his plants, ably and zealously assisted by his equerries and aids-de-camps, and guided by the advice of eminent botanists, who accompanied him as members of his suite. Such a kingly progress had surely never been seen before, unless Alexander the Great may have relieved the monotony of conquering by making occasional natural history excursions with his quondam tutor, Aristotle. The Monte-Negriotes, on ordinary occasions very troublesome and by no means trustworthy people—folks who still keep many of the worst habits of the old Scottish Highlanders—were mystified into tranquility by the peculiar proceedings of their royal visitor and his noble attendants. Resolved, however, to render due honour to so distinguished and unusual a guest, they furnished a guard of state to accompany him in all his peregrinations, and wherever his botanical Majesty stooped to gather a new or rare species, the soldiers halted, and with much ceremony presented arms!

Were some mighty member of England's over-proud peerage to be told this true tale of kingly amusement, it would probably be received with a smile of mingled pity and scorn, and an expression of compassion for such "sad trifling." Give credit where credit is due, whether to king or caitiff. Which is the real trifler?—the man who, fortunate in having leisure hours and months of vacation, degrades the healthful exercise he seeks by tainting it with the barbarous pleasure of torturing the beasts of the chase and the birds of the moor, multiplied and cherished through a demoralizing system of "preservation," protected by vicious laws:—or he who gains exercise as healthful when seeking to extend his knowledge of the wondrous variety of creation, and to delight his eye and improve his mind by searching out in their native wilds the living evidences of the exquisite beauty and curious workings of Nature?

We may suppose the hypothetical opposite of an absolute king to be embodied in a journeyman tailor. In a diagram constructed like that made by Mr. Owen Jones, for the department of Practical Art, these personages would hold much the same relative places as the "primary red" and "secondary green"—if, indeed, our tailor might not be better paralleled by "tertiary russet." However different in their respective compositions, the pleasant tint of happiness may be given to the lives of both kings and tailors by the same pure ingredient. If royalty grows earnest and simple in the pursuit of herbary, so also can similar tastes make a poor tailor as happy as a king. In a town far north, many years ago, we were present at the anniversary of a Mechanics' Institution, and had to say a few words about flowers and trees. It was well on towards midnight ere the proceedings closed, when a dapper wiry little man rushed out from among the crowd, and invited us, as one naturalist invites another, to visit his humble home, and share his frugal supper. Gladly was the invitation accepted: for the earnest and intellectual look of our evidently poor host excited no small interest and some curiosity. He led his guests through long, dreary, tortuous, and unsavoury alleys, and then up an interminable stair, faintly illumined by the moonlight that seemed to ooze through loopholes. In the story nearest the sky was the home of this student of nature—a journeyman tailor, with a wife and innumerable children, the eldest of whom was a fine intelligent lad, verging upon manhood, assisting the work, and sharing in the tastes of his father. Their favourite studies were manifested by the conversion of an old cupboard into the case of a well-arranged herbarium, by a glazed cabin t filled with stuffed birds and rows of impaled insects, and by a shelf of well-selected scientific books, the purchase of which must have absorbed the profits of many a close day's work. The matron of the family, a smiling, courteous dame, seemed to participate in the evident delight of her husband and first-born, and to take pride in a heartfelt approval of their studies. On the round deal table a clean white cloth was spread, with simple food to grace it; and two pleasant hours were spent in lively discourse, larded with hard scientific names, well understood, though strangely pronounced. The happiness of the whole family was, we believe, visibly increased when, a few weeks afterwards, it became our duty to announce to the head of it, that he had been elected honorary member of a distinguished scientific society.

Who that has read the story of "Mary Barton," does not recollect the admirable picture of the quaint old artisan-naturalist, Job Leigh? There are literally hundreds of such men scattered over the land—and they are a blessing to it. At almost every meeting of the British Association for the Advancement of Science, some worthies of this class may be seen enjoying the happiest day of their lives, by listening to dry and seemingly obstruse discourses in the Natural History section. Most welcome are they when they appear; and there is no more thoroughly hearty welcome, unspoiled by offensive savour of social inequality than that given by philosophers of fame to their brethren of humble worldly position.

> "The nature of flowers Dame Physic doth shew:
> She teacheth them all to make known to a few."

Such was the homely view of botany taken by most of our ancestors, and set into rugged rhymes by quaint old Tusser. The chivalrous Lord Herbert of Cherbury entertained more exalted notions of the fair science, for, writes he in his delightful "Life," "it is a fine study, and worthy of gentleman," who according to his lordship, ought "to know the nature of all plants, being our fellow-creatures, and made for man." We maintain the same position, and humbly submit that even the few instances of the fineness of the study, and its worthiness for gentlemen—our king and our tailor both deserve that often-abused though most honorable of titles—which our space has permitted us to cite, are unassailable evidences of its truth.

Twenty Second Meeting

Of the British Association for the advancement of Science

(Extracts from the President's Address.)

Hitherto the researches of Sidereal Astronomy, even in their widest extension, had manifested the existence of those forces only with which we are familiar in our solar system. The refinements of modern observation and the perfection of theoretical representation had assured us that the orbits in which the double stars, immeasurably distant from us, revolve around each other, are governed by the same laws of molecular attraction which determine the orbits of the planetary bodies of our own system. But the Nebulæ have revealed to us the probable existence in the yet more distant universe of forces with which we were previously unacquainted. The highest authorities in this most advanced of all the sciences acknowledge themselves unable even to conjecture the nature of the forces which have produced and maintain the diverse, yet obviously systematic, arrangement of the hosts of stars which constitute those few of the Spiral Nebulæ which have been hitherto examined. Hence the importance of increasing our knowledge of the variety of forms in which the phenomena present themselves, by a similar examination of the Southern Heavens to that which Lord Rosse is accomplishing in the Northern Heavens; hence also, we may believe, in great measure the devotion with which his Lordship has directed the unprecedented instrumental power which he has created almost exclusively to the observation of nebulæ. But whilst we cannot but admire the steadiness of purpose with which an object regarded as of paramount importance is undeviatingly pursued, we can scarcely forbear to covet at least an occasional glance at bodies which from their greater proximity have more intimate relations with ourselves, and which, when viewed with so vast an increase of optical power, may afford instruction of the highest value in many branches of physical science. In our own satellite, for example, we have the opportunity of studying the physical conformation and superficial phenomena of a body composed, as we believe mainly at least, of the same materials as those of our own globe, but possessing neither atmosphere nor sea. When we reflect how much of the surface of the earth consists of sedimentary deposits, and consequently how large a portion of the whole field of geological research is occupied with strata which owe their principal characteristics to the ocean in which they were deposited, we cannot but anticipate many instructive lessons which may be furnished by the points of contrast, as well as of resemblance, which the surface of the moon, viewed through Lord Rosse's telescope, may present to the best judgment we are able to form of what the appearance of the earth would be if similarly viewed, or—with what may be more difficult perhaps to imagine—what we may suppose the earth would appear if it could be stript of its sedimentary strata which conceal from us for the most part the traces of that internal action which has played so large a part in moulding the great outlines of the present configuration of its surface. It is understood that Lord Rosse himself participates in the wish that such an examination of the surface of the moon should be made,—and, should the desire of the Association be expressed to that effect, is willing to undertake it in conjunction with one or two other gentlemen possessing the necessary physical and geological knowledge. It will be for the members of the Association to determine the form in which a Report on the 'Physical Features of the Moon compared with those of the Earth' may most appropriately be requested.

The Mathematical and Physical Theories of *Light* have afforded subjects for many interesting and profitable discussions in Section A, and have usually had one day in the six specially allotted to them. Those discussions will derive a more than usual interest at this meeting from the remarkable discovery recently made by Prof. Stokes, that under certain circumstances a change is effected in the refrangibility of light,—and from the advantage we possess in having amongst us on this occasion the eminent mathematician and physicist by whom this most important contribution to the science of physical optics has been made. His researches took their origin from an unexplained phenomenon discovered by Sir John Herschel, and communicated by him to the Royal Society in 1845. A solution of sulphate of quinine examined by transmitted light, and held between the eye and the light, or between the eye and a white object, appears almost as transparent and colourless as water; but when viewed in certain aspects and under certain incidences of light, exhibits an extremely vivid and beautiful celestial blue colour. This colour was shown by Sir John Herschel to result from the action of the strata which the light first penetrates on entering the liquid; and the dispersion of light producing it was named by him epipolic dispersion, from the circumstance that it takes place near the surface by which the light enters. A beam of light having passed through the solution was to all appearance the same as before its entrance; nevertheless, it was found to have undergone some mysterious modification,—for an epipolized beam of light—meaning thereby a beam which had once been transmitted through a quiniferous solution, and had experienced its dispersive action—is incapable of further epipolic dispersion. In speculating on the possible nature of epipolized light, Prof. Stokes was led to conclude that it could only be light which had been deprived of certain invisible rays which in the process of dispersion had changed their refrangibility and had thereby become visible. The truth of this supposition, novel and surprising as it at first appeared, has been confirmed by a series of simple and perfectly decisive experiments; showing that it is in fact the chemical rays of the spectrum, more refrangible than the violet, and invisible in themselves, which produce the blue superficial light in the quiniferous solution. Prof. Stokes has traced this principle through a great range of analogous phenomena, including those noticed by Sir David Brewster in his papers on "Internal Dispersion;" and has distinguished between "cases of false internal dispersion" or "opalescence," in which the luminous rays are simply reflected from fine particles held in mechanical solution in the medium, and those of "true internal dispersion," or "fluorescence," as it is termed by Prof. Stokes. By suitable methods of observation the change of refrangibility was detected, as produced not only by transparent fluids and solids, but also by opaque substances; and the class of media exhibiting "fluorescence" was found to be very large, consisting chiefly of organic substances, but comprehending, though more rarely, some mineral bodies. The direct application of the fact, as we now understand it, to many highly interesting and important purposes, is obvious almost on the first announcement. The facility with which the highly refrangible invisible rays of the spectrum may be rendered visible by being passed through a solution of sulphate of quinine or other sensitive media, affords peculiar advantages for the study of those rays; the fixed lines of the invisible part of the solar spectrum may now be exhibited to our view at pleasure. The constancy with which a particular mode of changing the refrangibility of light attaches to a particular substance, exhibiting itself independently of the admixture of other substances, supplies a new method of analysis for organic compounds which may prove valuable in organic chemistry. These and other applications of the facts as they are now explained to us, will probably form subjects of notice in the Chemical and Physical Sections; and a still higher interest may be expected from the discussion of the principle itself, and of the foundation on which it rests. A discovery of this nature cannot be otherwise than extremely fertile in consequences, whether of direct application, or by giving rise to suggestions branching out more and more widely, and leading to trains of thought and experiment which may confer additional value on the original discovery by rendering it but the first step in a still more extensive generalization.

Among the subjects of chemical inquiry which may well deserve the attention of a combination of philosophers, perhaps few could more usefully occupy their joint labours than the revision of the Equivalent Numbers of the Elementary Bodies. This is a task which must necessarily require the co-operation of several properly qualified individuals, if it be accomplished in anything like a reasonable period of time. Most of the Numbers now in use depend upon experiments performed by Berzelius, at a time when the methods of research then known were inadequate, even in such hands, to determine these constants with an accuracy sufficient for the wants of science at the present day. So much has this been felt to be the case, that many of the most accomplished chemists now living have undertaken extensive and laborious, though isolated researches upon the combining quantities of some of the most important elements. But much more than has been already performed still remains undone. Such a subject, it is believed, might be highly proper for consideration by the Chemical Section; to whose notice it would be introduced by the distinguished chemist, Dr. Andrews, who presides over that Section,—and than whom no one could be named as more competent to estimate the importance of such a revision, or to judge more truly of the qualifications that would be required for its execution.

The theory of Heat has made great advances within the last ten years. Mr. Joule has by his experiments confirmed and illustrated the views demonstrated about the end of the last century by Davy and Rumford regarding the nature of heat, which are now beginning to find general acceptance. He has determined with much accuracy the numerical relation between quantities of heat and mechanical work. He has pointed out the true principles upon which the mechanical value of any chemical change is to be estimated, and by very careful experiments he has arrived at numerous expressions for the mechanical equivalents in some of the most important cases of chemical action in galvanic batteries and in combustion. These researches appear to be laying the ground-work for the ultimate formation of a *Mechanical Theory of Chemistry*, by ascertaining experimentally the mechanical equivalents expressed in absolute motive force of the thermic, electric, and magnetic forces.

In connexion with the subject of heat, I would advert to the experiments in which Mr. Hopkins is engaged for investigating the possible influence of high pressure on the temperature at which substances in a state of fusion solidify—an inquiry which was shown by Mr. Hopkins, in a report recently presented to the British Association, to have an important bearing on the questions of the original and present state of the interior of the earth. It is well known that the temperature of the earth increases as we descend, and it has been calculated that at the rate at which the increase takes place in such depths as are accessible to us, the heat at a depth of 80 or 100 miles would be such as to fuse most of the materials which form the solid crust of the globe. On the hypothesis of original fluidity, and assuming that the rate of increase known to us by observation continues farther down, and is not counterbalanced by a considerable increase in the temperature of fusion occasioned by pressure, the present state of the earth would be that of a solid crust of 80 or 100 miles in thickness enveloping a fluid nucleus. Mr. Hopkins considers this state to be inconsistent with the observed amount of the precession of the equinoxes, and infers that if the temperature of fusion be not increased considerably by pressure, the hypothesis of internal high temperature being due to primitive heat cannot be correct; whilst, on the other hand, if the temperature of fusion be considerably heightened by pressure, he considers the conclusion to be unavoidable, that the earth must be solid at the centre.

Mr. Hopkins is assisted in these experiments, which are carried on at Manchester, by the well-known engineering knowledge of Mr. Fairbairn, and the equally well-known experimental skill of Mr. Joule. The principal difficulties attending the experiments with substances of low temperatures of fusion have been overcome, and strong hopes are entertained of success with substances of more difficult fusibility. The pressures employed are from three to four tons to eight and ten tons on the square inch. The latter is probably equal to the pressure at several miles beneath the earth's surface.

From *Heat* the transition is easy, and by many may be deemed natural, to *Terrestrial Magnetism*,—a science which perhaps more than any other has profited by the impulse and systematic direction communicated to it by the British Association, and which perhaps more than any other required such external aid.

We recognize in terrestrial magnetism the existence of a power present everywhere at the surface of our globe, and producing everywhere effects indicative of a systematic action; but of the nature of this power, the character of its laws, and its economy in creation, we have as yet scarcely any knowledge. The apparent complexity of the phenomena at their first aspect may reasonably be ascribed to our ignorance of their laws, which we shall doubtless find, as we advance in knowledge, to possess the same remarkable character of simplicity which calls forth our admiration in the laws of molecular attraction. It has been frequently surmised,—and the anticipation is, I believe, a strictly philosophical one,—that a power which, so far as we have the means of judging, prevails everywhere in our own planet, may also prevail in other bodies of our system, and might become sensible to us—in the case of the sun and moon particularly—by small perturbing influences measurable by our instruments, and indicating their respective sources by their periods and their epochs. As yet we know of neither argument nor fact to invalidate this anticipation; but, on the contrary, much to invest it with a high degree of probability. Be this, however, as it may, we have in our own planet an exemplification of the phenomena which magnetism presents in one of the bodies of our system, on a scale of sufficient magnitude, and otherwise convenient for our study. Accordingly, the first object to which the British Association gave its attention was, to obtain a correct knowledge of the direction and amount of the magnetic force generally over the whole surface of the globe corresponding to a definite epoch. It has been customary to represent the results of magnetic observations by three systems of Lines, usually called isogonic, isoclinal, and isodynamic lines. (Lines of equal horizontal direction, of equal vertical direction, and of equal force.) In the maps of these lines existing in 1838, large spaces of the earth's surface were either blank, or the lines passing across them were very imperfectly supported by observations. In the more frequented parts, where observations were more numerous, the discrepancies of their dates impaired their suitability for combination: for the position and configuration of the magnetic lines have been found to undergo a *continual process of systematic change*, with the causes of which we are as yet wholly unacquainted, but which has obtained the name of *secular* change, to distinguish it from periodical variations of known and limited duration. Amongst the most marked deficiencies in these maps, were the greater part of the extra-tropical portion of the southern hemisphere,—the British possessions in North America, and British India;—magnetic surveys of these were expressly recommended, and the practicability and advantage of making the observations on board ship, and of thus extending them over the surface of the ocean, were pointed out. It is most pleasing to recall to recollection, and gratifying to acknowledge from this chair, the favourable manner in which the recommendations of the British Association were received by Her Majesty's Government and by the East India Company, and how promptly and effectually they have been carried out. The blanks in the southern hemisphere have been filled up by maritime Expeditions appointed expressly for the purpose. Magnetic surveys have been completed of British North America at the expense of our own Government,—and of the Indian Archipelago at that of the East India Company,—and India itself is now in progress: whilst owing to the zeal of our naval officers, contributions have flowed in from almost every accessible part of the ocean. The co-ordination and mutual connexion of so large a mass of materials is necessarily a work of time, but is progressing steadily towards completion, and when presented in one connected view, will form the groundwork on which will securely rest a "general theory of terrestrial magnetism" corresponding to the present epoch. The magnetic phenomena, or as it is now customary to call them, the three *magnetic elements*, appear to be everywhere and in both hemispheres the resultants of a duplicate system of magnetic forces, of which one at least undergoes a continuous and progressive translation in geographical space, the motion being from west to east in the northern hemisphere, and from west to east in the southern. It is to this motion that the secular change in all localities is chiefly if not entirely, due; affecting systematically and according to their relative positions on the globe the configurations and geographical positions of the magnetic lines, and producing conformable changes in the direction and amount of the magnetic elements in every part of the globe. The comparison of the earlier recorded observations with those of the present epoch gives reason to believe, that viewed in its generality, the motion of the system of forces which produces the secular change has been uniform, or nearly so, in the last two or three centuries. Under favourable conditions the regularity of this movement can be traced down to comparatively very minute fractions of time. By the results of careful observations continued for several years at the observatory of St. Helena,—where, in common with the greater part of the district of the South Atlantic, the secular change of the declination exceeds eight minutes in the year, and from its magnitude therefore may be advantageously studied, every fortnight of the year is found to have its precise aliquot portion of the annual amount of the secular change at the station. This phenomenon of secular change is undoubtedly one of the most remarkable features of the magnetic system; and cannot with propriety be overlooked, as it too frequently has been, by those who would connect the phenomena of terrestrial magnetism generally, mediately or immediately with climatic circumstances, relations of land and sea, or other causes to which we are assuredly in no degree entitled to ascribe secular variation,—and who reason therefore as if the great magnetic phenomena of the earth were persistent, instead of being, as they are, subject to a continual and progressive change. It may confidently be affirmed that the secular magnetic variation has no analogy with, or resemblance to, any other physical phenomenon with which we are acquainted. We appear at present to be without any clue to guide us to its *physical causes*, but the way is preparing for a future secure derivation of its *laws* to be obtained by a repetition, after a sufficient interval, of the steps which we are now taking to determine the elements corresponding to a definite epoch.

The periodical variations in the terrestrial magnetic force, which I have before adverted to as distinguished from its secular change, are small in comparison with the force itself; but they are highly deserving of attention on account of the probability that by suitable methods of investigation they may be made to reveal the sources to which they owe their origin and the agency by which they are produced. They formed accordingly the subject of a distinct recommendation from the British Association, which met with an equally favourable reception. To investigate these variations by suitable instruments and methods, to separate each from the others, and to seek its period, its epochs of maximum and minimum, the laws of its progression, and its mean numerical value or amount, constituted the chief purposes for which magnetic observatories were established for limited periods at certain stations in Her Majesty's dominions, selected in a view that by a combination of the results obtained at them a general theory of each at least of the principal periodical variations might be derived, and tests be thus supplied whereby the truth of physical theories propounded for their explanation might be examined. We are just beginning to profit by the collocation and study of the great body of facts which has been collected. Variations corresponding in period to the earth's revolution around the sun, and to its rotation around its own axis, have been ascertained to exist, and their numerical values approximately determined in each of the three elements, the Declination, Inclination, and Magnetic Force. We unhesitatingly refer these variations to the sun as their *primary source*, since we find that in whatever part of the globe the phenomena are observed, the solstices and equinoxes are the critical epochs of the variations whose period is a year, whilst the diurnal variation follows in all meridians nearly the same law of local solar hours. To these unquestionable evidences of solar influence in the magnetic affections of the earth, we have now to add the recently ascertained fact, that the magnetic storms, or disturbances, which in the absence of more correct knowledge were supposed to be wholly irregular in their occurrence, are strictly periodical phenomena, conforming with systematic regularity to laws in which the influence of local solar hours is distinctly traced.

But whilst we recognize the sun as the primary cause of variations whose periods attest the source from whence they derive their origin, the mode or modes in which the effects are produced constitute a question which has been and may still be open to a variety of opinions; the direct action of the sun as being itself a magnet—its calorific agency in occasioning thermo-electric and galvanic currents, or in alternately exalting and depressing the magnetic condition of substances near the surface of the earth or in one of the constituents of its atmosphere,—have been severally adduced as hypotheses affording plausible explanations. Of each and all such hypotheses the facts are the only true criteria; but it is right that we should bear in mind that in the present state of our knowledge, the evidence which may give a decided countenance to *one* hypothesis in preference to others does not preclude their possible co-existence. The analysis of the collected materials and the disentanglement of the various effects which are comprehended in them, is far from being yet complete. The correspondence of the critical epochs of the annual variation with the solstices and equinoxes rather than with the epochs of maximum and minimum temperature, which at the surface of the earth, in the subsoil beneath the surface, or in the atmosphere above the surface, are separated by a wide interval from the solstitial epochs, appears to favour the hypothesis of a direct action; as does also the remarkable fact which has been established, that the magnetic force is greater in both the northern and southern hemispheres in the months of December, January, and February, when the sun is nearest to the earth, than in those of May, June, and July, when he is most distant from it: whereas if the effect were due to temperature, the two hemispheres should be oppositely instead of similarly affected in each of the two periods referred to. Still, there are doubtless minor periodical irregular variations which have yet to be made out by suitable analytical processes, which, possible accordance with the epochs of maximum and minimum temperature, may support in a more limited sense, not as a sole but as a co-ordinate cause, the hypothesis of calorific agency so generally received, and so ably advocated of late in connexion with the discovery by our great chemist and philosopher of the magnetic properties of oxygen and of the manner in which they are modified and affected by differences of temperature. It may indeed be difficult to suppose that the magnetic phenomena which we measure at the surface of the globe should not be in any degree influenced by the variations in the magnetic conditions of the oxygen of the atmosphere in different seasons and at different hours of the day and night; but whether that influence be sensible or not, whether it be appreciable by our instruments or inappreciable by them, is a question which yet remains for solution by the more minute sifting of the accumulated facts which are now undergoing examination in so many quarters.

To justify the anticipation that conclusions of the most striking character, and wholly unforeseen, may yet be derivable from the materials in our possession, we need only to recall the experience of the last few months, which have brought to our knowledge the existence of what may possibly prove the most instructive, as it is certainly at first sight the least explicable of all the periodical magnetic variations with which we have become acquainted. I refer to the concurrent testimony which observations at parts of the globe the most distant from each other bear to the existence of a periodical variation or inequality, affecting alike the magnitude and frequency of the disturbances or storms. The cycle or period of this inequality appears to extend to about ten of our years; the maximum and minimum of the magnitudes affected by it being separated by an interval of about five years, and the differences being much too great, and resting on an induction far too extensive, to admit of uncertainty as to the facts themselves. The existence of a well-marked magnetic period which has certainly no counterpart in thermic conditions, appears to render still more doubtful the supposed connexion between the magnetic and calorific influences of the sun. It is not a little remarkable that this periodical magnetic variation is found to be identical in period and in epochs of maxima and minima with the periodical variation in the frequency and magnitude of the *solar spots* which Mr. Schwabe has established by twenty-six years of unremitting labour. From a cosmical connexion of this nature, supposing it to be finally established, it would follow, that the decennial period which we measure by our magnetic instruments is, in fact, a *solar period*, manifested to us also by the alternately increasing and decreasing frequency and magnitude of obscurations on the surface of the solar disc. May we not have in these phenomena the indication of a cycle or period of *secular change in the magnetism of the sun*, affecting visibly his gaseous atmosphere or photosphere, and sensibly modifying the magnetic influence which he exercises on the surface of our earth?

The determination of the figure and dimensions of the globe which we inhabit may justly be regarded as possessing a very high degree of scientific interest and value; and the measurements necessary for a correct knowledge thereof have been long looked on as proper subjects for public undertakings, and as highly honourable to the nations which have taken part in them. Inquiries in which I was formerly engaged led me fully to concur with a remark of Laplace, to the effect that it is extremely probable that the first attempts were made at a period much anterior to those of which history has preserved the record; the relation which many measures of the most remote antiquity have to each other and to the terrestrial circumference strengthens this conjecture, and seems to indicate, not only that the earth's circumference was known with a great degree of accuracy at an extremely ancient period, but that it has served as the base of a complete system of measures the vestiges of which have been found in Egypt and Asia. In modern times the merit of resuming these investigations belongs to the French nation, by whom the arc of the meridian between Formentera and Dunkirk was measured towards the close of the last century. The Trigonometrical Survey of Great Britain commenced in 1783, for the specific object of connecting the observatories of Greenwich and Paris, was speedily expanded by the able men to whom its direction was then confided into an undertaking of far greater scientific as well as topographical importance, having for its objects on the one hand the formation of correct maps of Great Britain, and on the other the measurement of an arc of the meridian having the extreme northern and southern points of the Island for its terminations. A portion of this arc, amounting to 2° 0′ 50″, viz., from Dunnose in the Isle of Wight to Clifton in Yorkshire—was published in the *Phil. Trans.* in 1803. As the whole arc, extending from Dunnose to Unst and Balta, the most northern of the Shetland Islands, would comprise more than 10°, and as nearly half a century had elapsed since the publication of the earlier part of the Survey, it is not surprising that some degree of impatience should have been felt, both by those who desired the results for scientific use and by those who were interested for the scientific character of the nation, that the general results of the survey applicable to scientific purposes shall at length be given to the world. Accordingly, at the Birmingham Meeting of the British Association in 1849 a Resolution was passed appointing a deputation to confer with the Master-General of the Ordnance, and a similar resolution was passed about the same time by the President and Council of the Royal Society. By a recent letter to my predecessor from Capt. Yolland, of the Royal Engineers, who is intrusted with the direction of the publication, I am enabled to have the pleasure of announcing that the "printing of the observations made with the Zenith Sector, for the determination of the latitudes of stations between the years 1842 and 1850 is finished, and will be presented in time for the meeting of the British Association, and that the calculations connected with the triangulation are rapidly advancing towards their completion."

In the mean time, the great arc of Eastern Europe has been advancing with unexampled rapidity, and to an extent hitherto unparalleled. Originating in topographical surveys in Esthonia and Livonia, and commenced in 1816, the operations, both geodesical and astronomical, have been completed between Izmail on the Danube and Fugleness in Finnmarken,—an extent of 25½ meridional degrees. Next to this in extent is the Indian arc of 21° 21′ between Cape Comorin and Kaliana; and the third is the French arc already referred to of 12° 22′. It appears by a note presented to the Imperial Academy of Sciences at St. Petersburgh by M. Struve, that a provisional calculation has been made of a large part of the great arc of Eastern Europe, and that it has been found to indicate for the figure of the earth a greater compression than that derived by Bessel in 1837 and 1841, from all the arcs then at his command,—Bessel's compression having also been greater than Laplace's previous deduction. It is naturally with great pleasure that I perceive that the figure of the earth derived by means of the measurement of arcs of the meridian approximates more and more nearly, as the arcs are extended in dimension, to the compression which I published in 1825 as the result of a series of Pendulum Experiments which, by the means placed by Government at my disposal, I was enabled to make from the equator to within ten degrees of the pole,—thus giving to that method its greatest practicable extension.

The observations hitherto made on the *tides of the ocean* have been insufficient to furnish such a connected knowledge of the subject as would enable us to follow the course of the tide over any considerable portion of the ocean; and in the opinion of persons most competent to judge, it is only by systematic observation, specially directed for the purpose, that this connected knowledge is likely to be obtained. The recent researches of Capt. Beechy, which have given a new and unexpected view of the tidal movements of the ocean, show how much yet remains to be learnt respecting the tides even for the practical purposes of navigation.

The facts derived a few years since from the barometrical observations at St. Helena, showing the existence of a *lunar atmospheric tide*, have been corroborated in the last year by a similar conclusion drawn by Capt. Elliott, of the Madras Engineers, from the barometrical observations at Singapore. The influence of the moon's attraction on the atmosphere produces, as might be expected, a somewhat greater effect on the barometer at Singapore, in lat. 1.° 19, than at St. Helena, in lat. 15.° 57. The barometer at the equator appears to stand on the average about 0.006 in. (more precisely 0.0057, in lat. 1°.19) higher at the moon's culminations than when she is six hours distant from the meridian.

We have received from our valued Corresponding Member Prof. Dove, for presention to this Meeting, an important continuation of his researches on the temperatures at the surface of the globe. In former communications he has furnished us with maps showing, so far as observation permits, the isothermals of the whole globe in every month of the year. He has now given us, —first, the *normal* temperatures of each parallel of latitude in each month; being the average of all the temperatures in that parallel in such month,—and, second, the *abnormal* temperatures, or the difference between the temperature of each place and the mean temperature of its parallel. From these again are formed lines of *abnormal temperature* for each month—surrounding and marking out those districts or localities which, from peculiarities of the surface or other causes affecting the distribution of heat, are characterized by excessive abnormal heat or abnormal cold. The importance of these researches on the general theory of the causes which interfere with the equable distribution of heat according to latitude, is obvious.

The activity which has prevailed so greatly of late in the collection of meteorological data has been almost exclusively confined to that portion of the surface of the globe which is occupied by land, although the portion covered by the ocean is not only much greater in extent, but is also better suited for the solution of several meteorological problems. Many striking examples might be adduced to show that it is "systematic direction," and not "*individual zeal" in naval men, which has been wanting; and* it has been therefore with great satisfaction that meteorologists have learnt that a proposition has recently been made from the United States Government, to the British Government to undertake, conjointly and in co-operation, a system of meteorological observations, to be made at sea in all ships belonging to the naval service of the two countries, and sufficiently simple to be participated in by the merchant service also. In a partial trial which has been already made of this system in the United States, it has been found to produce results which, exclusively of their scientific bearing, are of great importance to the interests of navigation and commerce, in materially shortening passages by the knowledge of prevailing winds and currents at particular seasons. The practical advantages arising from the co-ordination of the observations in the Hydrographic Office of the United States, and the circulation of the charts of the winds and currents, and of the sailing directions founded on them, have been such and so appreciated, that there are now, as it is stated, more than one thousand masters of American ships engaged in making them. The request for British co-operation in an undertaking so honourable to the country in which it originated, was referred in the spring of this year by the Earl of Malmesbury to the President and Council of the Royal Society for a Report.

Amongst the most valuable results which Physical Sciences may expect to obtain from this extensive system of nautical observation, we may reckon the construction of charts of the isothermals of the surface of the ocean corresponding to every month in the year, similar to Prof. Dove's monthly isothermals of the temperature of the air; and a knowledge of the normal condition as well as the abnormal variations, with their special causes and effects, of the great Gulf-stream which connects the shores of the Old and New World, and in its normal effects is influential in many ways on the climate of the United States and Western Europe, whilst its abnormal effects are principally known, so far as we are yet aware, by the peculiarities of climate which they occasionally produce on the European side of the Atlantic. Of the extent, depth, and limits of this remarkable current in ordinary and extraordinary years we are as yet very imperfectly informed. Of the zoology of the great tracts of ocean which are covered by its banks of seaweed, we know nothing beyond the fact that they are the habitation of a countless number of oceanic animals—giving rise possibly to deposits which may have distinctive characters from littoral deposits or from those of marine estuaries. But doubtless we can now estimate only a small part of the advantages which Terrestrial Physics as well as Hydrography and Navigation would derive from the concurrent exertions of *the two great maritime nations in the way that has been pointed* out.

The analogy of the configuration of the land and sea on the north of the continents of Asia and America has for some time past caused an opinion to be entertained that the sea on the north of the Parry Islands might be as open as it is known to be throughout the year in the same latitude on the north of the Siberian Islands. The expectation that Wellington Strait might, as a continuation of Barrow's Strait, prove a channel of communication from the Atlantic into that part of the Polar Ocean, has been considerably strengthened in the last year by the discoveries which we owe to the hardihood and intrepidity of our merchant seamen. The access to the Polar Ocean, and the degree in which it may be navigable for purposes of discovery or scientific research, are amongst the few geographical problems of high interest which remain to be solved; and we may confidently look for a solution, in the direction at least that has been adverted to, by the Expedition which has been despatched under Sir Edward Belcher to follow up the discovered traces of Sir John Franklin's vessels.

Gentlemen, I have now occupied fully as much of your time and attention as I can venture to trespass on,—and yet have found it impossible to comprehend within the limits of a discourse all the topics to which I would have gladly called your notice, even in those branches of knowledge in which I may consider myself as least uninformed, in three of the seven departments into which our science is divided. I have left wholly untouched those wide fields of Geology and Natural History, which would of themselves have furnished fitting subjects for an address of still longer duration. No one can be more sensible of this, and of many other imperfections and deficiencies, than the individual who addresses you; yet, if he has not wholly failed in the purpose he designed—if the impression which he has endeavoured to convey, however faint may be the image, be true to that which it is intended to represent—you have not failed to recognize the gratifying picture of British Science in the full career of energetic action and advancement, pressing forward in every direction to fill the full measure of the sphere of its activity in the domain of intellectual culture; regardful on the one hand of the minutest details in the patient examination of natural facts, and on the other hand diligent in combining them into generalizations of *the highest order, by the aid of those principles of inductive* philosophy which are the surest guide of the human intellect to the comprehension of the laws and order of the material universe.

Vortex Water Wheel.

On a new form of Vortex Water-Wheel. By J. THOMSON, C.E.

This wheel, Mr. Thomson observed, is a new variety of the general class of water-wheels called turbines. In this machine the moving wheel is placed within a chamber of a nearly circular form. The water is injected into the chamber tangentially at the circumference, and thus it receives a rapid motion of rotation. Retaining this motion, it passes onwards towards the centre, where alone it is free to make its exit. The wheel which is placed within the chamber, and which almost entirely fills it, is divided by thin partitions into a great number of radiating passages. Through these passages the water must flow on its course towards the centre, and in doing so imparts its own rotatory motion to the wheel. The whirlpool of water acting within the wheel-chamber being one principal feature of this turbine, leads to the name vortex as a suitable designation for the machine as a whole. For some time past there have been several of these new turbines in course of construction and erection. The one first completed and brought into action for practical use was for a new beetling-mill of Messrs. C. Hunter & Co., of Dunadry, near Antrim. It was constructed in Glasgow, and on being brought across the channel and erected at its destination, its first trial was made on the day before Christmas last. This trial proved completely successful, and the subsequent performance of the machine has been highly satisfactory.

Mr. Thomson explained that the velocity of the circumference is made the same as the velocity of the entering water, and thus there is no impact between the water and the wheel; but, on the contrary, the water enters the radiating conduits of the wheel gently, that is to say, with scarcely any motion in relation to their mouths. In order to obtain the equalization of these velocities it is necessary that the circumference of the wheel should move with the velocity which a heavy body would attain in falling through a vertical space equal to half the vertical fall of the water, or, in other words, with the velocity *due* to half the fall; and that the orifices through which the water is injected into the wheel-chamber should be conjointly of such area that when all the water required is flowing through them, it also may have a velocity due to half the fall. Thus one-half only of the fall is employed in producing velocity in the water; and, therefore, the other half still remains acting on the water within the wheel chamber at the circumference of the wheel in the condition of fluid pressure. Now, with the velocity already assigned to the wheel, it is found that this fluid pressure is exactly that which is requisite to overcome the centrifugal force of the water in the wheel, and to bring the water to a state of rest at its exit, the mechanical work due to both halves of the fall being transferred to the wheel during the combined action of the moving water and the moving wheel.

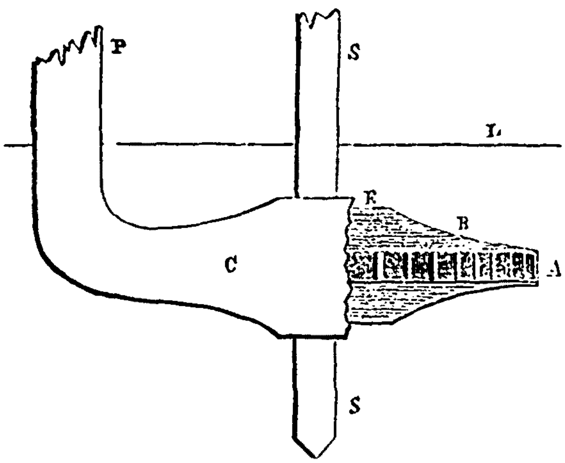


Fig. 1.—Elevation and Section.

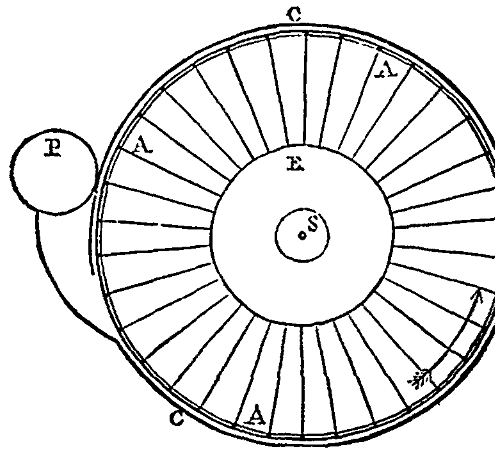
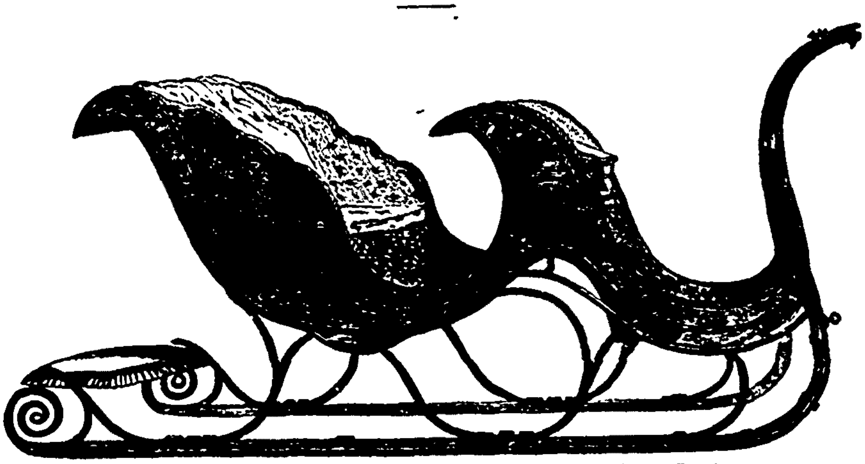


Fig. 2.—Plan.

Fig. 1, is an elevation and section, and fig. 2, a plan of this machine. B, is the body of the wheel, which is broad in the centre, and tapers off to the circumference, having a space A, of about three inches for the entrance of the water; E, is the central aperture for the discharge of the water, which flows out above and below; P, is the conduit-pipe through which the water is injected against the sides of the radiating passages A A A; C, represents a portion of the outer case; and S, is the vertical shaft fixed to the wheel, and revolves with it. The wheel is worked a few inches below the level L, of the water.—*C. E. and A. Journal.*

Sleighs and the Sleighing Season.

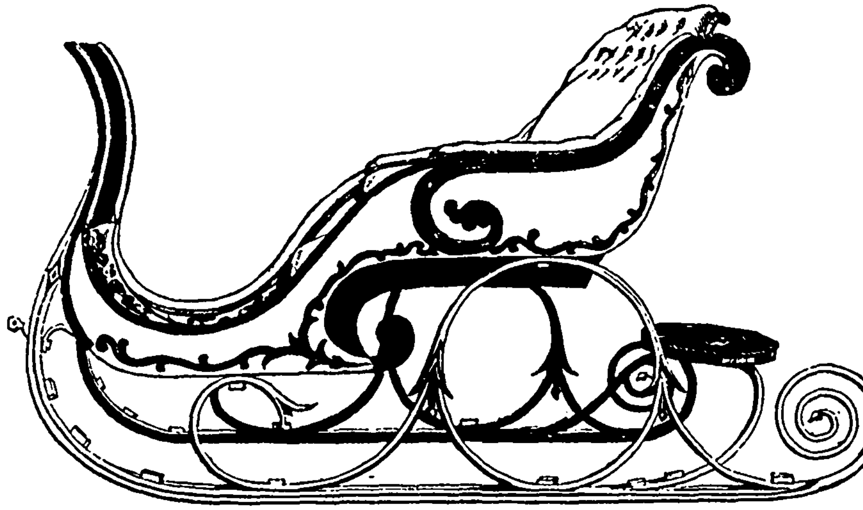


Double Sleigh, manufactured by Mr. J. J. SAURIN, of Quebec.

The snow which fell on the 27th of November, reminded us of the delightful sleighing season, which all at this period of the year, look forward to with delight. The merry bells of the sleigh enlivening our streets, give a charm to Canadian winter life, which can scarcely be understood in the more temperate, but less cheerful climate of England.

The sleighs sent from Canada to the Great Exhibition, (of which we give two illustrations,) attracted many admirers, and led to inquiries among the uninitiated curious as to their object and use.

At the commencement of winter, we constantly hear the question asked, *whether we shall have much sleighing during the* approaching season. This is indeed a momentous question to farmers and country storekeepers. No inconsiderable portion of the reward of almost a year's industry, is dependant upon good sleighing! Winter is the season when the farmers of the back townships bring their produce to market, and in the absence of sleighing, all the terrible evils of bad roads are felt in the extreme. *It were vain to attempt to satisfy ourselves respecting the pro*bability of the continuance of good sleighing weather during the coming winter. The completion of our magnificent system of Railways will render this question less important than it now is.



Single Sleigh, manufactured by Messrs. McLEAN & WRIGHT, of Montreal.

Few people have an idea of the number of days on which rain and snow falls in the vicinity of Lake Ontario during the winter months, although that number is accurately known for Toronto during a period of eleven years, yet, from such data we can scarcely form a correct idea of the duration of snow upon the ground, which determines the amount of benefit we are to derive from it as an admirable means of traffic. We give below the number of rainy and snowy days which have occurred at Toronto during the months of December, January, February and March, for the last eleven years.—(See Toronto Meteorological Reports.)

Rain.

	DECEMBER.		JANUARY.		FEBRUARY.		MARCH.	
	Days.	Inches	Days.	Inches	Days.	Inches	Days.	Inches
1840...	3	—	—	—	8	1.4	14	3.4
1841...	7	6.6	2	2.1	1	—	3	1.3
1842...	3	0.8	5	2.1	8	3.6	8	3.7
1843...	6	1.0	6	4.2	1	0.4	7	3.1
1844...	6	—	7	3.0	4	0.4	10	1.5
1845...	2	—	5	—	5	—	11	3.2
1846...	5	1.2	5	2.3	0	0.0	10	1.3
1847...	7	1.1	7	2.1	2	0.5	8	2.8
1848...	7	2.7	7	2.2	4	0.7	5	1.4
1849...	5	0.8	4	1.1	2	0.2	10	2.6
1850...	2	0.1	5	1.2	7	1.2	9	4.7
1851...	6	1.0	4	1.2	7	2.6	11	2.2
1852...	—	—	0	None	3	0.6	6	1.9

Snow.

	DECEMBER.		JANUARY.		FEBRUARY.		MARCH.	
	Days.	Inches	Days.	Inches	Days.	Inches	Days.	Inches
1840...	18		—		6		2	
1841...	5	no rec'd	14	no rec'd	9	no rec'd	3	no rec'd
1842...	17		9		9		2	
1843...	8	8.1	12	142	21	14.4	3	0.1
1844...	6	4.2	11	24.9	7	10.0	1	—
1845...	12	4.7	9	22.7	9	19.9	4	1.5
1846...	9	6.0	10	6.0	13	46.1	2	1.3
1847...	8	6.8	5	7.5	13	27.3	2	4.0
1848...	7	16.5	8	7.1	8	10.8	1	0.5
1849...	12	9.6	10	9.2	13	19.2	2	1.7
1850...	18	29.5	8	5.2	9	23.1	2	1.1
1851...	15	10.7	10	7.8	4	2.4	3	1.2
1852...	—	—	19	30.9	11	13.0	4	9.4

Cultivation of Flax.

(Extracts from a paper read at the Royal Cornwall Polytechnic Society.)

Mr. Charles Fox, exhibited a specimen of flax prepared on his farm, it being merely bruised, and the manager of M. Claussen's works in London had told him, that though not equal to their best samples, it was fit for their purpose. The manufacturers in Ireland, did not think Claussen's process would be very applicable to their purpose; they also think lightly of Schenk's process; for what reason, he (Mr. Fox) was not aware. But he was glad to find that the Irish manufacturers are extremely sanguine of the success of Watt's process. The great advantage of Watts' over Schenk's process was, that Watt's takes the straw when only deprived of the seeds by a machine costing about £10, whereas Schenk's, he apprehended, must have the straw further prepared in some way, though not retted. By Watts's process the straw is put in hot water in a close vessel, and afterwards bruised in a machine which presses out the moisture, whilst it breaks the ligneous fibre; it is then dried by hot air. Cattle are found eagerly to drink the flax soup made by this process. It is evident from paintings on the walls of some of the Egyptian tombs, that they steeped their flax in hot water even before the Exodus, and Professor Robinson has found that the fibre of some of the linen of their mummies, is finer even than that of the Decca Muslin. Mr. Fox further said the gentlemen of Belfast conceive that Watts is in earnest, for he has a thousand tons of straw on his premises to undergo the process, and has laid out £1500 in vats and other necessary things. The produce on Mr. Fox's farm had been two quarters of linseed and 2,800 lbs. of straw to a statute acre, which straw exposed to bruising machinery would give about 11-28ths of the broken stalk. The produce of seed per statute acre amounted to the value of £5 16s., which was nearly equal to the value of wheat per acre—supposing the straw valueless; having also this advantage over wheat, that the flax might be sown in the spring and pulled up even before the wheat crop. It was not to be wondered at that the farmers of this country had long ago abandoned the growth of flax, considering the trouble and expense of retting, exposed in ponds, with constant watching necessary. The seed also, which at least trouble is the most profitable part was then neglected. But if by any such plan as Mr. Watts's they could readily convert the flax straw grown in the fields to the purpose of manufactures, the objections to its growth would be greatly obviated, and it would be remunerative. In Fife they have now five hundred acres of flax grown. Some conversation then ensued. Mr. Sowell, of Penryn, said the society had offered a £5 premium, and a machine had been promised, yet although he had stimulated parties to grow flax, (nearly a ton weight growing in Constantine,) still he had received neither the £5, nor the machine. Sir C. Lemon inquired how much the bulk was diminished by the use of the simple machine Mr. Fox had spoken of? Mr. C. Fox replied, it was diminished about 17-28ths, but the whole taken away was not useless; the finer flax, however, was about 11 lbs. in 28. Maclean and Co's. machine breaks 56 lbs. of straw per hour into 22 lbs. of flax, 14 lbs. of clean tow, 12 lbs. of straw, and 8 lbs of roots and refuse. After some further inquiries in reference to the process, Sir Charles Lemon referring to what Mr. Sowell had said, stated that last year he said he would give £5 towards the purchase of a machine, and Mr. Enys said he would also give £5, it being then understood it would cost only £10. He was ready now to renew that promise. He also asked Mr. Sowell how his crop of nettles got on, which he talked about last year? Mr. Sowell said he had grown a crop of nettles this year in his garden, and they had produced excellent flax, though no seed. It was long, but considerable coarser than that grown from the flax plant.

EDITORIAL NOTICES.

In enumerating the list of members of the Canadian Institute, we omitted to place the name of Mr. Vincent Parkes, among the list of Life Members; Mr. Parkes having been elected an Honorary Life Member, on account of the services he has rendered the Institute. We shall be enabled to furnish a corrected list after the annual election of officers and members of the Institute, which will take place on Saturday, December 11th.

We regret that the October and November numbers of the Journal have been delayed beyond the time specified for their publication. The difficulty of procuring suitable paper for the Journal, and other causes over which we had no control, have led to their somewhat tardy appearance. We solicit the kind forbearance of our readers in these matters, and we hope that such measures have been taken as will secure the appearance of each future number at its appropriate season.

We are happy to have it in our power to announce that through the courtesy of a zealous member of the Canadian Institute, we shall be enabled to furnish a record of Canadian Patents in the order of their grants.

Canadian Institute.

Notice to Members.—The Session of the Canadian Institute for **1852-3 will commence on Saturday, December 4th.** Members of the **Institute will meet in the Government House.** The business of the evening will include the nomination of Officers for the ensuing year, and the discussion of matters relating to the organization of the Institute.

The Second Meeting of the Institute will take place on Saturday, December 11th. The election of officers will then be proceeded with.

REVIEWS.

Scobie's Canadian Almanac for 1853. Hugh Scobie: *Toronto.*

It speaks well for the progress of Upper Canada, that it is possible for an enterprizing publisher to have compiled and printed ninety-six octavo pages of close matter, in small type with any amount of figure, and a good map of the country got up especially for the work, and all for the paltry sum of sevenpence half-penny. And yet, such is Mr. Scobie's Almanac for 1853. The Astronomical and Meteorological portions are highly interesting. The notes appended to the Meteorological table for Balsam Lake, contain some curious and even startling records. Very delightful indeed for our Balsam Lake savans to have the opportunity of making notes like the following!—1841, Aug. 11, two calves killed by wolves; 1850, Aug. 20, *bears in the wheat*; 21st shot a bear, &c. &c. Its well for Toronto sportsmen that Balsam Lake is some 70 miles to our north-east, and sufficiently inaccessible. We notice the introduction into the Almanac before us of some admirable articles on subjects of general interest which do not usually find a place in such publications,—one on 'Gold and Silver,' and another on the 'Winter of 1851-2 in Upper Canada,' contain much interesting information of great value for reference. The Tariffs of Britain, United States, Canada, and the N. A. Provinces are given in all their important details. Besides many highly valuable tables and lists relating to representation of Law, Physic and Divinity in this Province, we find a Regnal table for computing dates; the Statistics of Schools for all the Provinces of British America: the Census Returns for 1852, together with a Statement of the Affairs of Canada and sister Provinces

An immense amount of information is compressed into an exceedingly small space, and altogether the work does infinite credit to the energy of the publisher as well as to the Province, which can so appreciate its value as to absorb an immense edition with that promptitude which renders its publication possible in the country.

"*Reports by the Juries—Exhibition of the Works of Industry of all Nations.* 1851." London: W. Clowes. 1852.

We have received a copy of this extraordinary work. It seems as though the wonders connected with the Great Exhibition are never to cease, and the Commissioners never to be weary of their labours. After all the great and glorious successes appertaining to the Exhibition, —its organization,—its building,—its wonderful collection,—the concourse of its visitors,—the order of all its details,—its catalogues,—the award of the prizes, and their distribution,—after all these, each in itself an evidence of most judicious conception and most perfect realization, we now have before us a quarto volume of nearly 900 pages, containing the principles laid down for the guidance of Jurors in making their awards, the classification of subjects in detail of the thirty classes into which the Exhibition was divided, a list of the Jurors, a list of the awards, and the explanatory and descriptive Reports of the Juries in reference to the articles rewarded, with, finally, a complete Index, which facilitates reference to every note-worthy item of the Exhibition, either by the medium of the name of the country, of the exhibitor, or of the article rewarded.

The value of these Reports cannot be too highly estimated. They embody the deliberate and unprejudiced opinions of the greatest celebrities amongst the savans of Europe, on the most recent and valuable illustrations of the Practical Science, the Industry, Ingenuity, Taste, and Skill of the world; and, as such, are alike invaluable for present teaching and Historic record.

We most strongly commend this volume to the close and careful study af all who, not content with the excitement, desire to share in the sterling and instructive results of the Exhibition; and in doing so, we must not omit to congratulate the Canadian Exhibitors, to all of whom a "Presentation Copy" is, we understand, about to be sent, as an acknowledgment by the Commissioners of their co-operation.

In most of the Reports we find some commendatory reference to Canadian contributions; but it is especially in connection with the Geological Collection formed and transmitted by Mr. Logan, that the highest honours have been accorded to the Province. "Of all the "British Colonies" (says the Report) "Canada is that whose exhibition "is the most interesting and the most complete; and we may even say "that it is superior, as far as the Mineral Kingdom is concerned, to all "countries that have forwarded their products to the Exhibition. "This arises from the fact that the collection has been made in a "systematic manner, and it results that the study of it furnishes the "means of appreciating at once the Geological structure and the "Mineral resources of Canada. It is to Mr. W. E. Logan, one of the "members of the Jury, who fills the office of Geological Surveyor of "Canada, that we are indebted for this collection; and its value arises "from the fact, that he has selected on the spot most of the specimens "that have been sent to the Exhibition, and has arranged them since "their arrival in London. The arrangement that he has adopted, "which is entirely technical, includes eight divisions" (detailed in the Report), "and all these classes include materials of great interest for "industrial purposes."

The reporter then proceeds to mention the several items of the collection. The ores of iron are noticed for their "abundance and excellent quality,"—the Marmora and St. Maurice mines being honourably referred to. The ores of zinc, lead, and copper, are respectively reported, the latter from Lakes Superior and Huron being characterized as "remarkable for their richness." The native silver from the Island of Ignatius, on Lake Superior, and the pepites of native gold from the Rivers of Canada East, are the objects of honourable mention, as also are the white quartzose sands of Messrs. Bondom and Lebare, used by them with advantage in the manufacture of flint and crown glass.

"The last award," continues the Report, "which we have to mention "in the case of Canada, is the honourable mention adjudged to Mr. "Logan, who has exhibited iron ores, lithographic stones, minerals, "and various rocks. Our colleague has not thought it right to add to "these the Geological Map he has made of Canada, a matter which the "Jury greatly regret, not because they would then have been able to "adjudge a higher reward for this beautiful work,—for the position of "Mr. Logan, as member of the Jury, would render this impossible; "but because of the great interest it would have added to the Canada "Exhibition."

"The lithographic stones exhibited by Mr. Logan belong to a "palæozoic rock, occurring at Marmora, where the magnetic iron ore "has been mentioned as forming a deposit of enormous thickness. "These stones are remarkably homogeneous and fine grained; the "degree of finish of the drawings that Mr. Logan has caused to be "made upon them giving every promise of the quality being good. "The Geological position of the stones is interesting, and the reporter "is not aware of such material having been previously found in the old "rocks, since, up to the present time, those who practise Lithography "seek for stones from rocks of the oolitic series. The discovery of Mr. "Logan, proving that the paleozoic rocks may also furnish good "Lithographic Stones, increases the resources available for this impor- "tant branch of Engraving and Drawing.

"We must also notice, amongst the articles exhibited by Mr. Logan, "a cast of the footsteps of an animal discovered in one of the argillace- "ous schists of the paleozoic period. When this schist was first laid "bare to a certain extent, Mr. Logan observed the impressions of foot- "steps repeated several times, and he had the upper bed removed to "satisfy himself as to whether they were continued. Their existence, "under these circumstances, fully proves that the markings were made "at the time of deposit of the bed, and thus carries back the existence "of quadrupedal animals to the earliest Silurian epoch. The length of "the track discovered is eight feet, and as many as twenty impressions "of each foot are traceable. Besides these is an impression between "the footmarks, which may be regarded as the trail either of the "abdomen or the tail of the animal."*

We have made these extracts (which, however, from want of space, we are unable to complete), not only because they are honourable to the Province, but because they bear evidence to the valuable services of the distinguished President of the Canadian Institute, who has, in connection with the Great Exhibition, not alone promoted the interest, of Canada, but, by his researches, has made important additions to scientific knowledge.

In the Agricultural Section, Canada is mentioned as sending "a fine "supply of Wheat, all of the ordinary English kinds, but every sample "of more than ordinary excellence." Mr. Christie's White Wheat is commended, and the Polish Oats of Mr. Watts are mentioned as being of "admirable quality," as is also the Barley exhibited.

The Canadian Buckwheat exhibited by E. Frenholme is characterized as "the finest sample" in the Exhibition, being superior to that sent from the United States, Russia, and Belgium.

The Hops, Linseed, Arrowroot, Hemlock-bark, Flax, and Timber, Raw Silk, Porpoise Oil, and Glue, are each specially commended, and some useful suggestions made with reference to their marketable value.

The Type and Stereotype Plates from the Foundry of Mr. Palsgrave of Montreal, are mentioned as being "very beautiful."

"From Canada West," says the Report, "there is a large assortment "of Axes and Tools, the former especially of excellent quality, and "proving the skill and power of her Artizans to supply those particular "articles to which her physical exigencies give the highest importance." The names of S. Shaw of Toronto, C. P. Ladd of Montreal, G. Leavitt, and Scott & Glassford, are honourably mentioned in connection with the manufacture of Axes, and A. Wallace with that of Planes.

For Stoves, the name of G. H. Cheney is honourably mentioned, as is that of Mr. Ladd of Montreal for Balance Scales.

For Coopers' Work, the name of J. Bailey stands first on the list, the Canadian Pails being reported as very superior, and, both on account of the neatness and durability of the workmanship and the cheap price at which they are sold, well calculated for extensive use in Europe.

We shall close our extracts (necessarily very imperfect) by a reference to Clay Pipes, which one of the Juries seem to have appreciated very highly; and to Confectionary, in which we do not appear to have excelled, for the Report, with very matter-of-fact facetiousness, observes that "Canada sends an unimportant contribution of Confectionary, "consisting of Horehound-Candy, reputed in that Province to be a "most excellent specific for a cold; *a merit which an experiment did not confirm!*" Perhaps we may comfort the unsuccessful exhibitor by observing, that a fair test of Canadian Horehound can only be obtained *in Canada*. Doubtless our countryman never presumed to offer it as an antidote to London fog, or a specific for its troublesome effects! As to the Clay Pipes, the amiability of the Report induces us to conclude that *"the experiment"* was very agreeable.

Report of the Commissioners of Public Works, for 1851. *Printed by order of the Honourable the Legislative Assembly. Quebec*—ROLLA CAMPBELL: 1852.

We have a copy of this important Report before us, in the shape of a very shabby looking quarto pamphlet of 91 pages, with poor typography, coarse paper, and a vulgar yellow wrapper, so unconscionably mean that it would disgrace the cheapest edition of the most trashy

* These tracks are now thought to have been produced by a gigantic Mollusk: not a quadrupedal animal.

Romance published in Yankeedom. A "State paper" of so much and such permanent importance and value as this deserves more care in its issue: a collection of these Reports embodies the history of all the public works of Canada, and is therefore, and will always be, of the highest interest. This, however, does not seem to be appreciated by the parties entrusted with the publication, for the same meanness which characterizes the mechanical execution of this Report—for which by the bye neither the Board of Works nor the printer can be held responsible—seems to have been allowed to controul its distribution, so small a number of copies having been printed, that to obtain one, even as a matter of public business or of personal favour has, from the first day of its publication, been extremely difficult. Documents of this class, as for instance, Mr. Logan's invaluable Geological Reports, Reports on Railway Enquiry and Legislation, on Prison Discipline, on Provincial Surveying, and the like—are public property, and are to a large class of persons of great practical value, and ought to be widely circulated for public information. Not one copy, however, as far as we can learn, can be obtained for any public library, unless indeed a member of parliament claims gratitude by generously foregoing his privilege in its favor. This would not be of so much importance if the documents in question could be purchased, but immediately that the small "regulation" number has been struck off, the printers' devil distributes the type, hungry libraries and scientific societies to the contrary notwithstanding, and therefore they are not to be obtained for love or money. We trust that this will speedily be amended by the *authorized distribution* of all parliamentary papers having any scientific bearing, to the respective public libraries and scientific corporations throughout the Province. We commend the subject to the consideration of our parliamentary friends—an order of the House, or even the Speaker's order, would effect the desired object.

We proceed now to consider the Report, which bears date August, 1852, and refers first, to the Welland Canal, recommending with great judgment the lighting by gas the locks on that part of it between St. Catharines and Thorold, which includes twenty-three of the locks, and other improvements calculated to facilitate its use.

The revenues are reported as steadily "continuing to increase."

In 1849, the gross tolls amounted to - - -	£34741	18	8
In 1850, do. do. 255 days navigation, -	37925	17	7
In 1851, do. do. 261 do. do. -	50160	6	8

Shewing an increase of about 10 per cent. in 1850 over 1849, and of 33 per cent in 1851 over 1850, while the receipts up to 1st August in 1852 amounted to £23,352 7s. 5d., and to the same period last year, £21,154 11s. 5d.

The expenditure on this canal in the year 1851, was £30,968 10s. 10d. The vote now required is £33,016 0s. 0d., which, with an unexpended balance from last year of £29,360 4s. 1d., gives a present contemplated outlay of £62,406 4s. 1d., for what purposes however does not clearly appear, the items of the service not being given, but the well-known voracity of the "deep cut" has not yet, we suppose, been satisfied, since we see that "the contractor Mr. French is steadily progressing with his dredging operations" to effect the deepening of that portion of the work so as to adopt Lake Erie as the summit level.

The canal, it seems, is to be crossed by two Railways now in progress,—the Brantford and Buffalo, and the Great Western. Of course the Commissioners give a mysterious hint of some threatened "obstruction of the navigation." Every Railway that was ever proposed over any canal or navigable river has appeared as "an obstruction of the navigation," *looming in the future* in the prophetic vision of some merciless official authority. Poor Stephenson and his seven hundred thousand pounds worth of tubular bridge was a victim to this sort of thing—a *fortunate* one truly, if the triumph of his skill rather than the cost of its exercise may be taken as the standard.

Happily our Commissioners are not so difficult to please in such matters;—as in duty bound they have teazed the Engineers a little about "the obstruction," but have eventually "adjusted the difficulty."

The St. Lawrence Canals are reported as having been opened throughout on 25th April, and closed on 25th November, thus affording 215 days for the season of 1851. The Tolls during that year are not specially alluded to in the body of the Report, but by appendix No. 1 they appear to have been £52,812 11s. 6d., reduced, however, by the cost of repairs, collection and management to £10,901 1s. 8d.

The "movement" on these Canals, *up and down collectively*, has suffered a diminution in 1852 as compared with 1851 of 13,630½ tons of "all property moved;" and of 10,266 in "the tonnage of vessels." In the tonnage of steamers on the contrary there was an increase of 25,354 tons, and in the number of passengers of 8059; we infer, therefore, that the decrease is due to the removal of the tug boats rather than to any other depreciation of the route, which in connection with steam is evidently growing in favour. The above statement however cannot be taken as strictly illustrative of the comparative business of the two years, for it has been made up to an arbitrary date, 1st July, in both, whereby 1851 obtains an advantage of 10 days over 1852, in consequence, probably, of an earlier opening. The Commissioners, indeed, claim a rise in the "movement," reckoning by the average daily traffic. But this manifestly gives an incorrect result, since the property in transit doubtlessly accumulated previous to the later opening in 1852, and was pushed forward with greater despatch so as to increase the daily movement in the commencement of the season of navigation. To make the comparison good the business of a like number of days from the opening in each season should be given. The amount expended on these canals in 1851, was £36,702 6s. 0d., the vote now required is £39,827 18s. 6d., which, with an unexpended balance from last year of £31,461 1s. 6d., gives a present contemplated outlay of £71,292 0s. 0d.

The clauses of the Report referring to River Lights, Slides, Roads and Bridges, demand no special comment; in the matter of the "harbours," and "piers below Quebec," however, we perceive this contrast,—that whilst the "Whitby, Dover, and the Rondeau Harbours have been sold," and the interests of navigation and commerce in connection with such works thus left in Upper Canada (we do not say unwisely) to local care and private enterprize, a large expenditure is being incurred on the banks of the St. Lawrence below Quebec in the construction of piers, with reference to which the Commissioners assert "no reasonable doubt can be entertained but that they will be of infinite importance towards *the improvement of their several respective localities*, and tend materially to *the accommodation and convenience* of the shipping navigating the river." There seems to be an inconsistency of principle here scarcely traceable to *any* but a geographical basis.

Referring to "Public Buildings," the Commissioners Report a total past expenditure on Government buildings in Toronto of £19,419 19s. 4d., and a contemplated outlay there of £10,000 on a Government House, and £2183 2s. 8d. on the Post Office, making a total of £31603 2s. 0d.

The past expenditure on similar service at Quebec appears to have been £17,427 4s. 9d., and the further outlay is estimated at £38,047 13s. 10d., making a total of £55,474 18s. 7d.

The Architectural legacies bequeathed to the Commissioners by their predecessor, seem to have been more embarrassing than profitable. The suspension of the Montreal Court House "in consequence of grave errors of design in arrangement," troubled them in that city, whilst "the total abandonment during progress of the original plans for the Parliament buildings and the substitution of others," with such mistakes at Spencer Wood as have led them to "regret that the first step taken was not that of pulling it down," would appear to have bothered them at Quebec.

We come now to the consideration of that important and interesting part of the Report relating to the construction of a Canal to connect Lake Champlain with the St. Lawrence.

"The object of a Canal," they submit, "to connect Lake Champlain with the St. Lawrence, is to furnish a cheaper, quicker and (from reduced transhipments) a more desirable route to the great trade which passes between tide-water in the Hudson River—the Railroads of New England, and the city of New York, on the one hand; and the Western States and Canada, on the other—and by so doing to bring traffic and tolls to the St. Lawrence Canals, which, by the completion of the Oswego and Erie Canals, and Ogdensburgh and other Railroads, and the want of an efficient connection between them and Lake Champlain, obtain scarcely any of the transit trade between the Atlantic and the Western States, or Canada. For this transit trade, this Canal would compete with the Erie and Oswego Canals; the Erie, New York, Central, Ogdensburgh and Cape Vincent Railways," and in this competition the Commissioners submit it would be successful.

They argue that whilst such a Canal would open the great lumbering Districts of the Ottawa, and of the Upper and Lower St. Lawrence to the greatest lumber market in the world—that of Albany and Troy—it would afford to the Districts on Lake Champlain a shorter and cheaper route for imports of coal, iron, salt, fish, oil, &c., which, in consequence of tonnage entering inwards in ballast can be laid down cheaper in Quebec than in any port of the Union.

Independently, however, of these items of traffic, the trade for which it would contend is stated to be—1st. "Through tonnage *down*" arriving at the Hudson from the Western States or Canada, via Buffalo, Oswego and Whitehall, which collectively amounted in 1851 to 1,017,684 tons of the value of £7,096,491. 2nd. "Through tonnage *up*" leaving the Hudson for the Western States or Canada, by the same inland ports collectively, in the same year, 192,023 tons, of the value of, say £15,742,460. Upon this trade of course it is fair to calculate a rise, for it has more than trebled during the last six years, and the construction of 1000 miles of Railway per annum in the North Western States, (tending as it does to the direction of the Ohio and Mississippi trade to the Lakes in preference to New Orleans) cannot but exercise a powerful influence in its favour.

It is found that the traffic of the Welland Canal has increased in a greater ratio than the Erie Canal, as the Oswego route has progressed more rapidly than that by Buffalo, simply because the Boat Canal navigation has thereby been shortened 151 miles, but this Canal would diminish the Boat Canal navigation 297 miles.

In point of *time*, a freight steamer from Cleveland would deliver her cargo in 4½ days at Whitehall, whence it would reach Albany in 1½ days more, making six days time against nine days by Buffalo and the Erie Canal.

In point of *expense*, the whole cost of the carriage of a barrel of flour from Hamilton to New York, is 3s. 3d., via Ogdensburgh and Whitehall. By this canal it would be 2s. 9d. The cost of a barrel of flour from Cleveland to New York via Buffalo and Albany, is 3s. 0d., by this canal it would be 2s. 5d.

As in competition with the Railroad route, one transhipment is saved, and as in competition with the Erie Canal, a length of 297 miles of boat navigation is avoided.

In convenience, expense, and time, therefore, the Commissioners claim for the Champlain Canal the superiority over all its rivals, even without referance to the enlargement of the canal from Whitehall to Troy. If, however, this latter should be effected, the "through transport" without transhipment from the Upper Lakes to New York in 500 ton steamers would be secured, placing the route above all rivalry as an unequalled chain of inland navigation *towards New York*.

The cost of the work is estimated at £160,000,—but no sooner do the Commissioners make this announcement than they drop the subject. After the pains they had taken to prove the case, we were prepared for a strong recommendation that the work should be undertaken, but we find that they *only* intended to submit "their views and suggestions" without any effort to give them a practical application.

Favourable, however, as is the view which they have taken of this subject, in connection, and indeed *solely* in connection with the trade of the Hudson River and New York, we cannot help thinking they might with some advantage have turned their eyes towards the Lower St. Lawrence. Whilst most anxious to *divert* the carrying trade *from* the Erie Canal and the Railroads of the State of New York *to* the St. Lawrence, they only indulge that river as far as Lake St. Louis, whence the trade is again to be diverted *from* it, and thrown into the lap of the city of New York, that on the way it may swell the revenues of the Champlain Canal. The St. Lawrence might be dammed at Lake St. Louis for all they seem to care. No mention made or hope expressed of the lower waters, no Gulf! no Ocean! except indeed, where with great complacency they remind us (as an argument *in favour* of their project) that "tonnage *enters inwards* at Quebec in ballast! Colonel Phillpots in 1839* was bold enough to declare "that when once the inland navigation has been so far improved as to render it possible to bring the trade of the west by this route," (the Welland and St. Lawrence) "the western merchant and farmer would find as good a market at Montreal and Quebec as at New York or elsewhere." And again, "there can be no doubt that a very large portion of this vast trade (the western) will pass this way,—the cheapest and most convenient route to the Atlantic, and that Montreal and Quebec will become two of the greatest emporiums in North America."(!)

A more recent writer,† himself a strenuous advocate of the Champlain and St. Lawrence Canal, (for which, in one part of his essay, he claims this trade, and therefore, in some degree, damages the value of his opinion) asserts that on view of all the rival routes he "sees no reason to believe that the trade will leave the St. Lawrence for the American routes," declaring that it cannot be supposed "that the main body of western exports will leave the broad bosom of our river to climb over the table lands of New York; a respectable portion of it will exude through the Gulf of St. Lawrence."

We may smile at the enthusiasm of Col. Phillpots, but the summit of the ocean trade by the St. Lawrence has not yet been reached, and his prophetic errors may be errors only in dates:—we may reject the double reasoning of Mr. Keefer and satisfying ourselves with one of his opinions, that "the trade will exude through our Gulf," make a present of the other to the Commissioners; but we are not prepared to accept the foreign pilotage of these gentlemen, and after travelling with them (as we do heartily) from the far west to the foot of Lake St. Louis, there turn our backs on the St. Lawrence, and having just brushed, as it were, the borders of tide water, clamber with them over the green mountains in search of the seaboard!

We could have wished to have seen the Commissioners treat this project with less manifest partiality; they have put a case as advocates which they should have argued as judges, and this is the more unfortunate as they coquet with and would gilt the St. Lawrence to wed the Hudson.

The Report of the Commissioners in relation to "A Provincial Line of Ocean Steamers" is most satisfactory and unexceptionable. The contract provides for *fourteen* fortnightly summer trips from Liverpool to Quebec *and* Montreal; and *five* monthly winter trips to Portland in the State of Maine, connecting there with the Portland and Montreal Railroad. This service is to be performed by a Line of Screw Steamers of not less than 1500 tons burthen, capable of carrying 1000 tons of

* The Canal Navigation of the Canadas; by Lieut. Col. Phillpots, R. E. WEALE—London: 1840.

† The Canals of Canada; by Thomas C. Keefer. C. E. ARMOUR—Toronto: 1850.

cargo. The accommodation for passengers is to be of three classes, rates not exceeding the following fares respectively,—cabin, £21 ; 2nd cabin, £12 12 : and steerage, £6 6s., every requisite being found, and a mail and mail officer being carried free of charge. The freight from Liverpool not to exceed 60s. per ton measurement, nor the freight of produce above that demanded by sailing vessels. For this service the contractors are to receive £24,000 sterling per annum, to which sum the St. Lawrence and Atlantic Railroad Company and the City of Portland are to contribute £5000 stg., leaving the balance (£19,000 stg.) as the annual Provincial charge.

By the Straits of Belle Isle the distance from Liverpool to Quebec is nearly 400 miles less than that to Boston, which, with smooth water from the Straits to Quebec, and vessels of equal speed, will give a saving of 2½ days in the voyage. We may, therefore, hope to establish an improved mail line for the Province, and perhaps ultimately when our Railroads shall have been completed, instead of paying for transit of our mails through the States be enabled to make a profit on the carriage of an American Mail to the west. One great improvement resulting from the contract will be the erection of proper lighthouses throughout the Lower St. Lawrence and the Straits of Belle Isle, whereby the character of the navigation will be improved, insurances reduced, and the whole shipping interest served. We can imagine nothing more judicious than the completion of the contract and the manner of it—the realization of the enterprize and its success is fraught with advantages direct and indirect affecting every interest in the Province.

After recommending an expenditure of £30,000 on the rapids of the St. Lawrence, with the view of obtaining a safe and facile channel throughout, for vessels drawing 10 feet of water, an improvement well worth the outlay, the Commissioners proceed to consider the propriety of the construction of the proposed canal at the Sault Ste. Marie. As in the case of the Champlain Canal, however, so in this. They no sooner state the cost than they drop the subject. A survey has been made and an "ad interim" report submitted by Mr. S. Keefer, but all to no purpose—the Commissioners will not be tempted or driven to a judgment. We are glad to see that Mr. Keefer insists upon Lockage of the fullest capacity for the largest class of steamboats on our lakes. The obstacles and inconveniences, nay, we may even say, the positive losses resulting from a contrary course on other canals, prove the wisdom of at once making a permanent sufficient provision in these particulars; besides, if the estimates may be relied on, and we infer that they may, the extra expense is unworthy of consideration : for while the cost of this canal 120 feet wide, with locks 250×55×9 will be £100,000, that involved in a width of 150 feet with locks 100 feet longer, 11 feet wider, and with one foot additional draught of water, viz : 350×66×10, would only be £20,000 more, or £120,000.

In the estimate of "Prospective Revenue," we find some interesting information in connection with the Mining Companies of Lake Superior. The population now engaged *on the South side*, numbers 2500. Thirty-seven Mining Companies have been there formed, of which fifteen have commenced operations, and will produce this year (1852) about 2000 tons of copper, worth at Pittsburgh £120 per ton. Two Iron Companies (also on the *South* side) expect to produce 1000 tons of "blooms" this season (1852) which sell at Detroit for £16 5s.* per ton. "The proprietors of the Iron Mountain are sanguine in their expectations of transporting 100,000 tons (!) of this ore eastward immediately upon the opening of the canal. They expect to be able to manufacture it into railway bars at the cost of £7 10s. per ton, and thereby to revolutionize the iron trade."

This Iron has, it is said, been ascertained by experiment to possess an ultimate tenacity when rolled into bars of 89 882 lbs. upon the square inch—while that of the best Russian is but 79.000 lbs., and of the best English 57.000 lbs.;—and in its native state to contain 69 per cent. of pure Iron.

We trust these "sanguine expectations" may be realized, and the truth of these experiments substantiated. But why so much about the operations on the *South* shore, and nothing, *positively nothing*, about those on the north? Did Mr. Keefer see too much or too little of these North shore operations?—perhaps both—perhaps he saw too much of *how little was doing*, and thought it more prudent or more charitable to give *our* companies the go-by. Strange, that in an estimate of the "Prospective Revenue" of *a Canadian Canal* at the Sault Ste. Marie, the only references made to the sources whence that revenue is to be derived, should be in connection with "*the South shore!*" Have they on the North shore no "sanguine expectations" on a large scale? no realizations on a small one? We were prepared to hear (whenever we heard *anything* in connection with our Superior Mines *but "calls"*) that *very little* had been done, but we are now obliged to infer, from Mr. Keefer's silence, that *nothing is expected!*

We have thus given an abstract of this important and valuable Report, venturing our own impressions in relation to such parts of it as seemed to demand comment, and if we have extended our notice to an unusual length, we rest our excuse on the public interest of the subjects, and the very great difficulty (to which we have before referred) of obtaining a copy of the document.

Improved Railroad.—Mr. Carpenter, of Rome (N. Y.) has made an improvement in the ordinary iron railroad, calculated greatly to diminish the liability, if not utterly preclude the possibility of a train running of the track, under any circumstances. The improvement consists of a middle rail of iron or wood, running the whole length of the track, precisely in its centre, and raised a foot or so above the side or bearing rails. Friction rollers are attached to the engine and cars beneath, to play upon the sides of the middle, or guiding rail, whereby the motion of each car is steadied, and any tendency to fly the track at once arrested. Experienced and competent engineers concur in the opinion that the adoption of this invention would add greatly to the safety and security of railroads, and prevent a large class of accidents to which we are now exposed. As they now are, it is left to chance and good luck whether or not we are carried safe. If nothing happens to it—if nothing is thrown upon the track, by accident or by design—if no stone or rock should happen to roll down upon it from along its numerous banks—it no limb from a tree, or a rail or stake from a fence, is blown upon it—if no animal get upon it—if no child, in its innocent sport, should place a strip of board upon it (as was recently the case in England, thereby throwing the cars off and killing five persons)—if none of these, and numerous other similar unforeseen and unavoidable casualties should occur, we may be carried along safely enough on railways as now constructed. With this improvement the speed may be increased to almost any extent, with entire safety, so far as there would be any danger of running off. In short, without it a railroad is incomplete, so much so as a ship without a rudder or a carriage without a tongue. We are informed by Mr. Carpenter that the only objection made to his improvement, is the cost of it ; and yet he is fully of the opinion that it would be a matter of economy, and for the manifest interest of railway companies to adopt his improvement. It would not only prevent a large class of accidents, but it would prevent the wheels from wearing as they now do, the friction being much less.—*New York Tribune.*

Although the above paragraph has recently appeared in several of the American and English journals, yet it occurred to us that a similar improvement had been proposed in Canada several years ago, and upon enquiry we found, that in the spring of 1847, a patent was secured by Mr. Sandford Fleming, of Toronto, for a centre rail railway. Mr. F went farther than to insure the safety of the train, by guide wheels acting on the middle rail ; he also proposed to have horizontal driving wheels revolving against the sides of it by which the locomotive and carriages were propelled. A model was constructed on this principle, which, we are told, elucidated the mode of propulsion satisfactorily ; but it must be admitted that there are difficulties to encounter before the details of this proposed system of locomotion could be properly carried out ; yet if the extra cost of an additional rail was not sufficient to preclude its adoption, the liability of trains to run off the track, would doubtless be greatly diminished, and consequently the safety of passengers and property, in the same ratio, increased.

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* This price must be a misprint in the Report, it does not agree well with the statement further down that the proprietors of the iron mountain expect to furnish railway bars at £7 10s. per ton.

Monthly Meteorological Register, at Her Majesty's Magnetical Observatory, Toronto, Canada West.—October, 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	29.856	29.851	29.861	29.862	41.9	61.4	53.8	53.4	0.282	0.388	0.313	0.339	95	73	85	84	N E b E	E b S	Calm	- -
c	2	.892	.853	.861	.873	49.2	67.8	60.6	59.6	.305	.514	.474	.432	89	78	92	86	Calm.	S E b S	Calm	Inap
cd	3	.871	.824			56.1	63.9			410	536			93	93			Calm.	S	S S W	0.350
c	4	.717	.568	.588	.613	53.1	65.2	45.4	51.9	.371	.319	.215	.298	93	63	72	71	Calm	W b S	Calm	- -
c	5	.518	.394	.321	.401	42.6	57.1	51.7	51.2	.231	.326	.289	.284	85	71	77	76	Calm	S	Calm	- -
c	6	.252	.257	.424	.319	48.2	70.5	49.8	57.2	.277	.291	.281	.295	84	40	80	67	Calm	W b S	Calm	Inap
ac	7	.440	.409	.374	.410	45.7	59.6	57.1	54.6	.273	.431	.407	.373	90	86	89	88	Calm.	E b N	N E b E	0.700
b	8	.428	.567	.676	.559	55.6	61.0	51.5	56.7	.403	.374	.364	.394	93	71	97	88	N E b N	NW b N	E N E	0.220
b	9	.516	.340	.215	.347	49.5	51.6	55.6	53.2	.341	.396	.413	.381	97	94	96	95	E	E b N	E S E	1.450
b	10	226	.353			59.1	63.9			.468	.462			95	80			S	W b N	W N W	Inap
b	11	.700	.678	.664	.611	42.8	56.4	49.9	49.8	.255	.282	.289	.259	91	63	81	82	Calm	S E b S	Calm	- -
c	12	.385	635	.713	.603	51.1	52.6	35.7	47.5	.351	.377	.158	.311	96	97	75	91	Calm.	W b N	Calm	- -
a	13	.824	.769	.728	.771	34.1	49.2	37.8	41.1	.190	329	.207	.228	97	95	92	89	N W	W b N	Calm	- -
a	14	633	.539	.579	.567	37.8	50.7	42.4	43.6	.213	325	.226	.255	95	89	84	90	N E b N	Calm	N W b N	0.020
ac	15	.598	.654	.731	.672	38.8	43.4	34.1	38.9	.189	.136	.158	.158	91	49	79	68	W N W	N W b N	N W b N	- -
ac	16	.836	.884	.877	.875	30.9	41.7	34.5	36.6	.158	.200	.165	.173	92	69	82	81	N W b N	W	Calm	0.005
e	17	.804	.880			39.1	51.5			.228	.304			96	73			S	S S W	N E	Inap
c	18	.453	.141	.333	.337	49.2	61.3	52.0	55.2	.320	.449	.263	.32	93	77	69	75	E b N	S W b W	W b N	- -
c	19	.767	.863	.898	.850	43.4	51.8	37.3	43.4	.233	.223	.205	.219	83	59	93	79	N N W	N N W	Calm	- -
e	20	.903	.848	.779	.839	32.2	49.6	42.0	41.9	.177	.261	.247	.219	97	75	93	86	N E b N	E b S	Calm	Inap
c	21	.733	.631	.566	.638	39.5	51.9	48.5	48.4	.236	.312	.290	.296	28	80	86	88	Calm	E b S	N b E	0.155
a	22	.641	.759	.845	.761	45.8	48.9	39.1	45.1	.289	.249	.208	.233	95	73	88	79	N W b N	N b W	Calm	- -
ab	23	.903	.857	.793	.832	35.5	48.8	35.2	40.2	.161	.250	.185	.202	78	74	91	81	N	S b E	S b W	- -
ba	24	.730	.561			29.8	57.1			.141	.333			85	74			N b E	S b W	Calm	Inap
a	25	.655	.693	.929	.775	41.6	56.7	39.6	45.1	.218	.307	.176	.230	84	68	73	76	N N W	N b E	N N E	- -
e	26	30.040	30.012	.953	30.015	33.0	41.0	44.0	39.1	.149	.174	.201	.167	79	68	70	70	N E	E	E	- -
c	27	29.848	29.794	.763	29.798	40.6	49.2	50.7	47.3	.213	.318	.347	.298	85	92	95	90	E b S	E b S	E S E	0.120
ac	28	.731	.711	.657	.687	52.4	57.1	49.3	52.6	.358	.443	.256	.347	93	97	74	88	Calm	S,S W	N b W	0.240
cd	29	.674	.655	.536	.622	49.7	46.6	46.7	47.5	.320	.290	.253	.294	91	92	90	90	N E	E N E	E b N	1.825
c	30	.459	.423	.481	.450	45.0	47.9	46.3	46.4	.283	.308	.296	.291	92	94	95	93	E b N	N N E	E b S	0.190
e	31	.464	.435			46.0	51.3			.287	.302			94	81			E S E	S S W	Calm	0.005
	M	29.669	29.647	29.658	29.659	43.58	54.27	45.79	48.09	0.261	0.319	0.267	0.282	90	76	85	83	Ml's 3.10	Ml's 6.34	Ml's 3.00	5.280

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

North.	West.	South.	East.
1379.66	1071.35	497.96	1146.51

Mean velocity of the wind - - 4.47 miles per hour.
Maximum velocity - - - - - 18.9 ml's per h'r, from 8 to 9 p.m. on 18th.
Most windy day - - - - - 29th : Mean velocity, 10.52 miles per hour.
Least windy day - - - - - 2nd : Mean velocity, 0.83 ditto.
Most windy hour - - - - - noon: Mean velocity, 6.58 ditto.
Least windy hour - - - - - 10 p.m. Mean velocity, 3.00 ditto.
Mean diurnal variation - - - 3.58 miles.

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

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

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

Thunder Storms.—7th, thunder storm, and rain, from 5 to 7 P.M.

Highest Barometer - - 30.140, at 8 A.M., on 26th } Monthly range:
Lowest Barometer - - 29.138, at 1 P.M., on 18th } 1.002 inches.

Highest observed Temp. - 70.7, at 2 P. M., on 6th } Monthly range:
Lowest regist'd Temp. - 23.8, at A.M., on 13th } 46.9
Mean Highest observed Temperature - - 55.50 } Mean daily range:
Mean Registered Minimum - - - - - 39.80 } 15.69
Greatest daily range - - - - - 26.5 from 4 P.M., on 6th, to A.M., on 7th.
Warmest day - - 2nd - - - Mean Temperature - 59.57 } Difference:
Coldest day - - - 16th - - - Mean Temperature - 36.58 } 22.99
12th, 8h. 23m., P.M., Brilliant Meteor in S.—time of flight fully 2s.

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 October.

Ye'r	Temperature. Mean.	Max.	Min.	Range.	Rain. D'ys	Inches.	Wind. Mean Velocity.	Snow. D's	Inch's
	°	°	°	°			Miles.		
1840	44.44	68.5	23.9	44.6	13	1.860	--	3	not regist'd
1841	41.47	58.3	20.3	38.0	6	1.360	--	2	
1842	44.84	68.5	30.0	38.5	8	5.175	--	0	
1843	41.57	65.7	21.5	41.2	12	3.790	--	4	2.5
1844	43.24	69.6	17.8	51.8	7	1.245	--	4	12.0
1845	46.16	62.7	20.0	42.7	11	1.760	--	1	Inapp
1846	44.63	69.7	20.7	49.0	14	4.180	--	2	Inapp
1847	44.08	65.0	20.3	44.7	13	4.390	--	2	Inapp
1848	46.69	66.2	26.4	35.8	11	1.550	4.60	0	Non
1849	45.28	59.2	25.5	33.7	13	5.965	4 ¿6	1	Inapp
1850	45.44	66.6	24.8	41.8	10	2.085	5.30	0	None
1851	47.83	66.1	25.0	41.1	10	1.680	4.39	2	0.3
1852	48.09	70.7	29.8	40.9	12	5.280	4.47	0	None
M'n	44.90	65.60	23.77	41.83	10.8	3.101	4.70	1.6	1.48

SCIENTIFIC INTELLIGENCE.

New Species of Orang.—At a meeting of the Academy of Sciences of Philadelphia on the 3rd of February, a very interesting communication was read from Dr. H. A. Ford, dated Glasstown, Gaboon River, West Africa, respecting the characteristics of a peculiar species of Orang, the Troglodytes Gorilla, which appears to have been first noticed by Bowditch in 1817, and first described by Savage and Wyman in 1847.

The animal inhabits the range of mountains that traverses the interior of Guinea, from the Cameroons on the north to Angola on the south, and about 100 miles inland, the exact limits to which it extends have not been very accurately determined. Formerly, the animals were found only about the sources of the rivers, but lately they have descended to within a few miles of the coast, a fact which may probably account for the little that is yet known respecting them.

The name given by the natives is Ngena, when young he is black like the Troglodytes niger, but when adult of an iron grey colour, owing to the hair next the skin being white ; some are entirely white, probably from age.

The hair is of great length and thickness, and from this circumstance, together with the enormous thickness of the skin, the brute appears of an enormous size. The specimen examined, by no means a large one, measured three and a half feet across the shoulders. On the head the animal possesses a kind of crest, increasing in height from before backwards, and formed principally of a thickness in the scalp. This crest the animal draws forward when enraged, increasing his naturally hideous appearance, which is rendered still more horrible by the lower lip consisting of a huge muscular flap, very distensible and dropt over the chin in moments of anger.

The muscles of the neck, arms, thighs and trunk are enormously developed; the wrist was one foot in circumference. The specimen examined, the skeleton of which was presented to the Academy, had been eviscerated before it was brought to Dr. Ford, but even thus it weighed one hundred and eighty pounds, from which some idea may be formed of the enormous size of the animal. The arms are proportionately longer than in the Chimpanzie.

The Ngena is represented as the most terrible monster of his native forests, an idea which his hideous appearance and implacable enmity to man sufficiently justifies. The moment that he scents a man he prepares for the attack, and acts on the offensive. With crest erect and projecting forward, nostrils dilated and under lip thrown down, uttering his peculiar cry, which is more of a grunt than a growl, he rushes on his antagonist, and unless disabled by a well directed shot, generally succeeds in dashing him to the ground and tearing him to pieces with his tusks.

He is said to seize a musket and instantly crush the barrel between his teeth.

His natural enemy seems to be the leopard, with whom he wages a not always successful warfare. Young specimens have exhibited such an implacable disposition as to resist the most persevering efforts at taming them.

The flesh is by some tribes considered as delicate eating; he feeds on roots and fruits, but is evidently to some extent carnivorous.

The height of the mounted skeleton is four feet nine inches.

Proceedings of the Academy of Sciences of Philadelphia, Feb. 1852.

Human Footprints in Solid Limestone.—At a meeting of the Academy of Natural Sciences of Philadelphia on 1st June, Mr. Lea called attention to the stone slabs containing supposed imprints of human feet, deposited by him in the museum that evening. This slab is from the limestone formation immediately under-lying the coal near Alton, Illinois. The impressions have evidently been sculptured, and bear the marks of some blunt instrument with which they have been executed. Mr. Lea observed that those are not the first instances of this kind which have been noticed, and referred to a description of a similar slab published in Silliman's Journal several years since.

Dr. Owen stated that the slab of limestone alluded to by Mr. Lea, as found on the Mississippi near St. Louis, is the same which is now preserved in his (Dr. Owen's) collection, and on which two articles have appeared in Silliman's Journal; one by Mr. Schoolcraft and one by himself. Dr. Owen in that paper gave it as his opinion that these feet marks were carved on the rock by the aborigines.

Since that article appeared, Dr. Owen had obtained the most satisfactory corroboration of this inference in two large slabs of magnesian limestone of lower Silurian date, obtained at Moccasin-track Prairie in Missouri, which slabs contained a great many carvings of human feet, as well as those of animals, and rude imitations of the human form, something like figures made in gingerbread. The foot marks bear indubitable tool marks, and some are deficient in the true number of toes, while in others the foot is distorted, with the little toe standing out almost at right angles.

These specimens, as well as that of Mr. Lea's, show clearly that the aborigines of Missouri had the same propensity for carving the imprint of feet as the Southern and Western aborigines of this continent had for representing the hand on the walls of the ancient edifices, and other situations.

Any one acquainted with Indians knows that there is no subject which they study more closely than all kinds of tracks; in fact their life, their maintenance and their whole security depend upon an intimate and cunning knowlege of podology.

Proceedings of the Academy, June, 1852.

Extracts from the Proceedings of the British Association at Belfast, September, 1852.

1st.—'Anastatic Printing,' by S. Bateson, Esquire.—"The term 'Anastatic' means raising up, or a reproducing as it were, and very significantly does the name express the result; for by it any number —thousands upon thousands—of reproductions of any printed document may be obtained, each of which is a perfect *fac simile* of the original, no matter how elaborate the engraving may be, or how intricate the design. I will now endeavour to describe the actual operation of Anastatic printing. The print of which an Anastatic copy is required is first moistened with very dilute nitric acid (one part of acid to seven of water,) and then being placed between bibulous paper, all superabundance of moisture is removed. The acid being an aqueous solution, will not have attached itself to the ink on the paper, printers' ink being of an oily nature; and if the paper thus prepared be placed on a polished sheet of zinc and subjected to pressure, two results follow:—In the first place, the printed portion will leave a set-off or impression on the zinc; and secondly, the nitric acid attached to the non-printed parts of the paper will eat away and corrode the zinc, converting the whole, in fact, into a very shallow stereotype. The original being removed (perfectly uninjured,) the whole zinc plate should next be smeared with gum water, which will not stick to the printed or oily part, but will attach itself to every other portion of the plate. A charge of printers' ink being now applied, this in its turn only attaches itself to the set-off obtained from the print. The final process consists in pouring over the plate a solution of phosphorous acid, which etches or corrodes more deeply the non-printed portion of the zinc, and produces a surface to which printers' ink will not attach. The process is now complete, and from such a prepared zinc plate any number of impressions may be struck off.—The uses to which this invention may be applied are various—copies of rare prints may be obtained without the aid of an engraver. Reproductions of books, or of works out of print, may be had without setting up the type, authors may illustrate their own works, and amateur artists may have fac-similes of pen-and-ink sketches at a very inconsiderable expense.

2nd.—'On the Koh-i-noor Diamond,' by Prof. Tennant.—At the last meeting of the British Association, Dr. Beke read a paper 'On the Diamond Slab supposed to have been cut from the Koh-i-noor.' He stated:—"At the capture of Coochan there was found among the jewels of the harem of Reeza Kooli Khan, the chief of that place, a large diamond slab, supposed to have been cut from one side of the Koh-i-noor, the great Indian diamond now in the possession of Her Majesty. It weighed about 130 carats, showed the marks of cutting on the flat and largest side, and appeared to correspond in size with the Koh-i-noor." Prof. Tennant was induced to record his opinion of the probability of this being correct. He had made models in flour spar, and afterwards broken them, and obtained specimens which would correspond in cleavage, weight, and size with the Koh-i-noor. By this means he was enabled to include the piece described by Dr. Beke, and probably the large Russian diamond, as forming altogether but portions of one large diamond. The diamond belongs to the tesselar crystalline system: it yields readily to cleavage in four directions, parallel to the planes of the regular octahedron. Two of the largest planes of the Koh-i-noor, when exhibited in the Crystal Palace, were cleavage planes, —one of them had not been polished. This proved the specimen to be not a third of the weight of the original crystal, which he believed to have been a rhombic dodecahedron; and if slightly elongated, which is a common form of the diamond, would agree with Tavernier's description of it bearing some resemblance to an egg.—Sir D. Brewster made some observations, and stated that the English translation of Tavernier's work left out the minute details which were fully given in the original. Sir David expressed his satisfaction with Mr. Tennant's illustration,—which clearly proved the diamond to be only a small part of a very large and fine stone.

3rd.—'Notice of a Tree struck by Lightning in Clandeboye Park,' by Sir David Brewster.—The tree stood in a thick mass of wood, and was not the tallest of the group. The lightning bolt struck it laterally about 15 feet above the ground, exactly at the cleft where the two principal branches of the tree rose from the trunk. A large part of the bark and a piece of the solid wood were driven to some distance, and the electric fluid passed down the trunk into the ground, splitting the tree in two by a rent through the whole of its thickness. The fact contained in this notice, that an object may be struck by lightning in a locality where there are numerous conducting points more elevated than itself, shows that a lightning bolt cannot be diverted from its course by conductors, and that the protection of buildings from this species of meteor can only be effected by conductors stretching out in all directions.

4th.—'On the Aurora Borealis,' by Admiral Sir John Ross.—This was the theory of auroras originally explained by Sir John Ross at the Dublin Meeting in 1835. He gives the opinion of Schumacher in favour of his theory, and of Arago against it; and asserts that Messrs. Gaineaud, Martins and another were sent to Hammerfest in 1842 to test its accuracy, and returned impressed with the correctness of his views.

5th.—'On the Aurora,' by Lieut. W.H.H.Hooper.—This is a theory pretty nearly the same as that of Admiral Sir John Ross. The author says: "I believe the aurora borealis to be nor more nor less than moisture in some shape (whether dew or vapour, liquid or frozen,) illumined by the heavenly bodies, either directly or reflecting their rays from the frozen masses around the pole, or even from the immediate proximate snow-clad earth." This opinion he supports by facts and argument.

6th. 'On the Re-concentration of the Mechanical or Energy of the Universe,' by W. J. M. Rankine.—Mr. Rankine observed that—It has long been conjectured, and is now being established by experiment, that all forms of physical energy, whether visible motion, heat, light, magnetism, electricity, chemical action, or other forms not yet understood, are mutually convertible; that the total amount of physical energy in the universe is unchangeable, and varies merely its condition and locality, by conversion from one form to another, or by transference from one portion of matter to another. Prof. W. Thomson has pointed out, that in the present condition of the known world there is a preponderating tendency to the conversion of all other forms of energy into heat, and to the equable diffusion of all heat; a tendency which seems to lead towards the cessation of all phenomena, except stellar motions. The author of the present paper points out that all heat tends ultimately to assume the radiant form; and that, if the medium which surrounds the stars and transmits radiation between them be supposed to have bounds encircling the visible world, beyond which is empty space, then at these bounds the radiant heat will be totally reflected, and will ultimately be re-concentrated into foci; at one of which if an extinct star arrives, it will be resolved into its elements, and a store of energy re-produced.

7th. 'On the Causes of the Excess of the Mean Temperature of Rivers above that of the Atmosphere, recently observed by M. Renou,' by W. J. M. Rankine.—M. Renou having for four years observed the temperature of the River Loire, at Vendome, as compared with that of the atmosphere, has found, that the mean temperature of the river invariably exceeds that of the air, by an amount varying from 1⅓ to 3 centigrade degrees, and averaging 2°.24 centigrade, and a similar result has been deduced from observations made by M. Oscar Valin on the Loire at Tours. M. Renou and M. Babinet account for this fact by the reradiation of the bed of the river of solar heat previously absorbed by it. Mr. Rankine thinks this supposition inadequate to account for the facts; because the excess of temperature of the river over the air was considerably above its mean amount in November, and very near its maximum in December; and because the mean diurnal variation of temperature of the river was much less than that of the air. He considers that friction is more probably the principal cause of this elevation of temperature; for if water descends in an uniform channel, with an uniform velocity, from a higher level to a lower, the whole power due to its descent is expended in overcoming friction; that is to say, is converted into heat, as the experiments of Mr. Joule have proved. This must cause an elevation of temperature, which will go on until the loss of heat by radiation, conduction, and evaporation, balances the gain by friction, and at this point the temperature of the river will remain stationary.

8th. 'On Graphite Batteries,' by Mr. C. V. Walker.—After referring to the unfitness of copper, and the too great cost of the superior metals for the purpose of batteries, Mr. Walker said he had early sought a substitute for both purposes, and had found one which seemed to promise all that was required in the deposite of carbon from gas, or graphite.

The Planet of August 22nd, 1852.

To the Editor of the London Times:

Sir,—Having been deputed by Mr. Bishop to find a name for the Planet which I discovered on the 22nd of August, I propose to call it "Fortuna." The following elements of the planet's orbit have been calculated by Mr. Vogel, assistant at this observatory. In addition to our own observations, other taken at the Royal Observatory, Greenwich, and at Cambridge by Professor Challis, have been used in the computations:—

	Deg.	Min.	Sec.
Mean anomaly, counted from the perihelion, 1852, September 10, at Greenwich, noon	321	13	12
Longitude of the perihelion	30	23	29
Longitude of the ascending node	211	35	25
Inclination of the orbit	1	32	13

Eccentricity, 0.157564.
Mean distance from the sun, 2.44093.
Period of revolution, 1.393 days.

This orbit is remarkable for its small inclination to the earth's path.

I remain, Sir, your most obedient servant,

J. R. HIND.

Mr. Bishop's Observatory, Regent's Park, Oct. 5.

MISCELLANEOUS INTELLIGENCE.

The British Post Office.—In the year 1839, under the old system, 75,907,572 letters were delivered, and 6,563,024 franks. In 1840, under the new system, 168,768,344; in 1841, 196,500,191; in 1842, 208,434,451; in 1843, 220,450,306; in 1844, 242,091,684; in 1845, 271,410,789; in 1846, 299,586,762; in 1847, 322,146,243; in 1848, 328,830,184; in 1849, 337,399,199; in 1850, 347,069,071; in 1851, 360,647,187. The net revenue in each of the above years, ending the 5th of January, including the charges on the Government departments, has been—1839, under the old system, £1,659,509; 1840, including one month of the fourpenny rate, £1,633,764; 1841, under the new system, £500,789; 1842, £561,249; 1843, £600,641; 1844, £640,217; 1845, £719,957; 1846, £761,982; 1847, £825,112; 1848, £984,496; 1849, £740,429; 1850, £840,787; 1851, £803,898; 1852, £1,118,004.

Public Revenue and Expenditure of Great Britain.—The state of the public revenue and expenditure from the year 1822 to 1851, inclusive, may be seen at a glance by reference to a return, printed by order of the House of Commons. By it, it appears that in 1822 the total revenue, after deducting drawbacks and repayments, was £59,823,835, and the expenditure £55,079,316, leaving a surplus income of £4,744,518. In 1824 the revenue exceeded that of 1822 by the sum of £5857, but the expenditure was nearly £1,000,000 more. From 1824 the public income gradually declined, until in 1835 it fell to £50,408,579, showing a deficiency, as compared with 1824, of no less than £9,421,112. The expenditure, however, in 1835, was the lowest during the last 30 years, the amount being only £48,787,633 while there was a surplus income of £1,620,092. The revenue and expenditure have steadily increased since 1835, until in 1851 the revenue reached £56,729,390, and the expenditure amounted to £54,002,994, leaving a surplus of £2,726,396. In the 30 years from 1822 to 1851, inclusive, there was a surplus in 19 years, and a deficiency in 11 years. The years in which the expenditure exceeded the income of the country were 1827, 1828, and 1832, from 1837 to 1843 both inclusive, and in 1847 and 1848. The surplus revenue since 1822 exceeded £50,900,009, while the deficiencies did not amount to more than £16,000,000.

Religious Census of Upper Canada.—The following is a return of the religious census of Upper Canada, as taken under the authority of law, in the years 1842, 1848, and 1852:—

	1842.	1848.	1852.
Church of England	128,897	166,340	223,928
Methodists (all)	99,343	137,752	208,611
Presbyterians (all)	115,120	148,182	204,622
Church of Rome	78,119	119,810	167,930
Baptists	19,662	28,053	45,457
Lutherans	...	7,186	12,085
Congregationalists	5,095	5,993	7,931
Quakers	6,230	5,951	7,497
Universalists	...	2,196	2,688
Unitarians	...	678	833
Not classed	23,582	78,461	70,471
Totals	486,055	723,332	952,005

The following are the returns, according to the places of nativity:—

Natives of Upper Canada	523,357
Natives of Ireland	177,055
Natives of England	82,482
Natives of Scotland	75,700
Natives of the Untied States	43,360
French Canadians	26,500
Natives of Germany	9,721
All other countries	13,760
Total	952,005

THE CANADIAN JOURNAL

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