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The Canadian Journal.

TORONTO, JULY, 1853.

Irish Industrial Exhibition.

In the June number of the Journal we introduced a description of the Inauguration of Ireland's first Great Exhibition of the productions of her own and other nations' Industry. We now give a series of extracts from the *London Illustrated News*, descriptive of the most important Irish natural and artificial productions.

RAW MATERIALS.—1. TURF OR PEAT.

Among the many raw materials that conduce to the happiness of the human family, fuel fills, perhaps, the most important place. Turf is generally considered as particularly characteristic of Ireland, where it occupies the same position in social economy that coal fills with us. But, even independently of the various uses to which it can be applied, the large area it occupies is alone sufficient to claim more than ordinary attention. The entire surface covered by bog is estimated at 2,830,000 acres, which is nearly one-seventh of the whole of Ireland. Of this quantity, 1,576,000 acres are flat bog, spread over the central portions of the great limestone plain; and the remaining 1,254,000 acres are mountain bog, chiefly scattered over the hilly portions of the country near the coast. As compared to the other mineral substances, (among which turf may be classed), it is of a comparatively modern date. All bogs also abound in timber—principally oak, yew, pine and birch. The oak is generally as black and hard as ebony, whilst the colour of the yew is but slightly changed, to a rich brown or chocolate color. Both the oak and yew are found nearer the bottom of the bog than the pine and birch, and mostly in a position to show that the tree had been upright, even after the formation of the bog had made some progress.

As the bogs vary in depth, position, and appearance, so, too, the turf differs in its characteristics. Some turf is almost as black and hard as coal; whilst in bogs almost in the same locality the turf is soft, and formed of fibrous substances scarcely half decayed. But the chemical constituents differ still more widely, and often, too, in the same bog. Of this an example is given in the "Industrial Resources of Ireland." A section of the bog of Timahoe, forty feet deep, was tested, and the amount of ash it contained was found to vary. The portions near the surface contained 1½ per cent of ashes; the central portions 3¼ per cent; whilst the lowest ten feet contained 19 per cent of ashes. Further experiments show that the turf which is found at a depth of forty feet or more, and consequently subjected to a very great pressure, approximates very closely to coal in its composition, as well as density and color; and, accordingly, we are justified in concluding that turf might be artificially made to undergo this change.

The first difficulty which must be surmounted, before turf can become as useful as coal, is to decrease its bulk; but there is another great difficulty to be overcome. Turf, from its porous nature, retains a large quantity of water. Ordinary turf retains a fourth of its weight; and turf, carefully dried under cover, still retains a tenth; and this is a serious disadvantage, not only because it adds to the weight and bulk of the turf by the addition of a useless ingredient, but because the presence of water robs the furnace of an amount of heat (in order to expel it in the form of vapor) which would otherwise have been profitably employed.

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The most natural method of condensing turf, was the application of great pressure by means of a powerful hydraulic engine. By this means turf was not only compressed into a smaller bulk, but the water it contained was forcibly expelled. Two difficulties, however, were soon found to exist—both arising from the elasticity of the fibres in the turf—an immense power was required, and the fibres gradually expanding, attracted damp from the atmosphere.

To get rid of the difficulties that arose from the elasticity of the fibres, it was proposed to place the turf mould, as raised from the bog, in large tanks, and to have it trodden by cattle, or kept in agitation by machinery, whilst a stream of water flowed through. By this process, the light and fibrous portions were easily separated from the denser, and the latter being permitted to fall to the bottom of the tank in a sediment, was easily dried when the water was shut off. The artificial coal made by this process is hard and heavy, and possesses almost all the valuable qualities of coal.

Nor are the fibrous portions of the turf mere waste. They are at present extensively used at the paper-mills, in the manufacture of the coarser sorts of card-board, known as mill-board, and of which the covers of books, &c., are made, and generally in the manufacture of all the coarser articles made of papier mache. Many specimens of these will be found in the Exhibition.

THE DESTRUCTIVE DISTILLATION OF PEAT.

Turf occupies an intermediate position between wood and coal, the different varieties of turf approaching more or less near to each; and, as both coal and wood have long been used in various processes, it is not surprising that many similar experiments should have been made with turf. The destructive distillation of wood is carried on upon an extensive scale in many localities, both in England and Ireland, and forms an important branch of industry. Its principal products are wood-vinegar, pyroligneous acid, creosote, naphtha, and charcoal. Our readers are still more familiar with the distillation of coal, which is principally conducted upon a large scale for obtaining gas for illumination, but the manufacture of which has incidentally led to the production of several other substances, including coal-naphtha, sal ammoniac, lamp-black, &c. As both these manufactures have long existed as important branches of industry, it is surprising that more enterprising efforts were not made long since with peat, which occupied the intermediate place between the two. As it would be impossible to review the various processes, we shall rest satisfied with a glance at the experiments made by Mr. Reece, at Newtown Crommelin.

In the year 1849, Mr. Reece having brought his experiments to a satisfactory conclusion, obtained a patent for his invention of the process of distilling peat in an air blast, and thereby obtaining certain products. As the matter was one of considerable interest, and of vast importance to Ireland, his process was made the subject of scientific inquiry at the Museum of Irish Industry, and an elaborate report upon it was published. Mr. Reece proposed, instead of putting the turf into a closed vessel or retort, and distilling it as coal is distilled, by the application of external heat, to make the heat generated by its own combustion the agent in its distillation. The turf being placed in an iron cylinder, and the lower portion ignited, the heat so produced acts as the heat of an external fire would have done upon the peat lying immediately above. Thus in the upper part of the furnace, there is a simple distillation and a coking of the peat; whilst, in the lower portion, the combustion of the peat charcoal, as it descends, is going on. This process, therefore, does not materially differ from close distillation, a saving of fuel being the chief recommendation. The principal products that result from this distillation consist of sulphate of ammonia, acetate of lime, naphtha, fixed and volatile oil, and a substance called *paraffine*, which resembles bees'-wax in its outward appearance. It is more brittle, and has a very singular smell; but it is applicable to nearly the same uses.

The Exhibition possesses specimens of turf and artificial fuel, and a collection of the principal chemical products of turf, which will not fail to interest the visitor, and perhaps cause him to reflect, as he passes over the extensive wastes of bog in the Sister Isle, upon the possible future that may yet be in store for Ireland; when science will transform these solitary morasses into mines of wealth—diffusing industry and happiness, where not long since famine and misery held undisputed sway!

II.—COAL AND ANTHRACITE.

Coal in Great Britain, fills the important position we have accorded to turf in Ireland. It possesses little beauty to attract, and derives all its value from its utility alone. It is to coal that England is principally indebted, for her commercial greatness. Without it the mighty steam-engine would be an inert mass of iron—our railroads would not exist—our steamers would not plough the deep. The principal coal-mines of England are generally well known, and specimens of their produce are to be found in most geological collections.

There are seven principal coal fields in Ireland, lying nearly equally to the north and south of the metropolis. They differ materially in their geological circumstances—those to the north of the capital, yielding bituminous, or flaming coal; and those to the south, stone coal, or anthracite, which burns without flame. Notwithstanding the abundance of turf, coal was worked in Ireland at a very early period; and pits have been discovered that bear evidence, from the rude stone and wooden tools found in them, of having been worked by a race far anterior to historical records. But, from the ignorance displayed formerly, and from present want of capital or enterprise, or something else, the produce of her mines is far less than they could yield with ease; and Ireland, that possesses sufficient resources to supply her own wants, and to become, moreover, an exporting country, imports a large quantity of coals every year, said to exceed in value a million sterling. The principal coal-mines are seven: one in Leinster, occupying large portions of Kilkenny and the Queen's County, with a small part of Carlow; two in Munster—one of them in Tipperary, bordering on that in Kilkenny—and the other spread over large portions of Clare, Limerick, Cork, and Kerry, being the most extensive coal-field in the empire. All these beds yield anthracite. Of the northern coal-fields three are in Ulster: one at Coal Island, near Dungannon; the second in the northern extremity of Antrim; and the third in Monaghan. These last are small, with narrow seams; and are, consequently, of little value. The Connaught coal-field extends over a space of sixteen miles in its greatest length, and lies in the counties of Leitrim, Roscommon, Sligo, and Cavan. The total area of these coal-fields is estimated at 140,000 acres.

It is impossible to cast the eye over some interesting maps showing the geological formation of Ireland, and exhibited by the Chairman of the Board of Works, without feeling surprise at the mineral treasures that lie neglected, scarcely below the surface of the soil on which the unemployed laborer drags his weary steps.

But it is not only in the quantity of her ores that Ireland is rich, their position is even more fortunate. No river in the empire can compare with the Shannon. Its Majestic stream winds through a course of 247 miles, through fields whose fertility cannot be excelled. Here and there it expands into lakes, or more properly into inland seas. Lough Allen, in the centre of the iron-fields, covers an area of 9000 acres, and is still very inferior in size to Lough Derg or Lough Ree. Here every opportunity is offered for inland navigation, and the cheap carriage of goods. This splendid river rises among the coal-fields of Connaught, and cuts through the centre of the Munster coal formation. But still greater advantages exist. It frequently happens that the iron ore, the limestone used in smelting it, and the coal, and if necessary, turf (for the manufacture of charcoal), all exist in close contact, divided in the centre by a river that affords at once a cheap transit and water power.

III.—IRON.

Iron was formerly worked extensively in various parts of Ireland. At that time the country was covered with timber, principally oak, and as there were few roads and no other market for the timber, it was sold for a trifling sum at the mouths of the iron mines. The abundance of timber, and its cheapness led to the establishment of a number of smelting furnaces, and a great amount of prosperity succeeded, but unfortunately, with that improvidence that appeared (we hope it no longer exists) to mar every enterprise connected with Ireland, each one felled and consumed the timber, but none planted. No one reflected that the supply of full-grown oak-trees covering the mountain could ever fail. All of a sudden the manufacturers discovered that the fuel was all gone: a consternation appeared to dull their faculties and to paralyze their energies. A feeble effort was made to supply the place of timber by coal, turf, or charcoal; but in a short time ruin succeeded the shortlived prosperity. It is now upwards of a century since the last charcoal furnace was extinguished in Kerry. Since then, the iron mines of Ireland have never filled an important position as a source of national wealth.

It will be interesting to glance at the enormous additions we receive annually to our wealth from the two minerals to which we have last alluded—iron and coal.

The quantity of iron produced in England is as follows:—

1844	1,210,000 tons.
1845	1,512,000 "
1849	2,000,000 "
1850	2,250,000 "

The quantity raised this year will, probably, exceed two million and a half tons.

In 1850, the quantity of coal raised amounted to 34,750,000 tons; and the average price of coals at the mouth of the pit in England being estimated at 5s. 7d., and that of pig iron at 48s., it will follow that we aquire an annual addition to our wealth from these sources alone, amounting to the enormous sum of upwards of fifteen millions sterling a year, viz.:—

34,750,000 tons coal at 5s. 7d. per ton	£9,710,050
2,250,000 tons pig iron at 48s. "	5,400,000

And if we were to add to this the enormous enhancement of value the iron receives by the addition of labour, the sum would almost appear fabulous. The following tables we extract from the "Industrial Resources:"—

The quantity of cast-iron worth £1 becomes worth the following sums when converted into

Ordinary machinery	£4
Larger ornamental work	45
Buckles—Berlin-work	660
Neck-chains	1386
Shirt-buttons	5896

And the quantity of bar-iron worth £1 becomes worth, when formed into

Horse-shoes	£2	10
Table-knives	36	0
Needles	71	0
Penknive-blades	657	0
Polished buckles or buttons	897	0
Balance-springs of watches	50,000	0

If, then, we were to assume a moderate sum as the average value which five millions and a half pounds' worth of iron receives by the addition of labour, we should have no difficulty in satisfying ourselves, that from this one mineral a sufficient sum is produced annually to defray the whole interest of our national debt.

IV.—COPPER.

Two-thirds of the entire copper supplied to the world is from the Cornish mines. The annual production of copper from Cornwall is 12,000 tons of metal, the value of which is £800,000 sterling. This is generally smelted at Swansea, in consequence of the absence of coals near the mines, and it being found cheaper to take the ore to the coal than the coal to the ore.

The Burra-Burra mines were discovered about the year 1845, in South Australia. Their produce between that and the year 1850 amounted to 56,428 tons of ore, the greatest part of which was smelted at Swansea. Latterly, however, arrangements have been made to smelt it upon the spot, but there can be no doubt the gold diggings have seriously injured the copper mines of Australia.

In Ireland, the principal copper mines form three groups—the first in the county of Wicklow, in the picturesque valley of Ovoca; the second in the county of Waterford, occupying the district of Knockmahon; and the third is situated in the southern portion of Cork and Kerry. The copper ore from the Irish mines is exported to Swansea or to Liverpool.

V.—LEAD.

Lead is diffused through Ireland in far greater quantity than copper. The principal mines are situated in the counties of Wicklow, Down, Armagh, Kerry, Clare, Limerick, and Cork. Small veins have been opened in almost every county in Ireland at different times, but few of them have proved very profitable. At present the principal mines are worked by the Mining Company of Ireland, and with great profit. The specimens of the different ores, and the different stages through which the products of the ore pass before they find their way into the market, are all exhibited by that company. The process of smelting the lead ore is carried on by the company at Ballycorus; and the produce of the Luganure mines in the year 1851, amounted to 674 tons, which produced 460 tons of lead, equal to nearly 69 per cent. The company state the proportions of silver in the lead ore per ton amount, from the Luganure mine, to 8 oz.; Cairne, 12 oz.; Ballyhickery, 15 oz.; Shallee, 25 oz.; Kilbricken, 120 oz.; Strayford, 10 oz. The average of silver extracted amounted, in the year 1851, to 20 oz. per ton of lead; and the total quantity to 3860 oz., producing £1029.

VI.—GOLD AND SILVER.

At the close of the last century some peasants picked up a few lumps of bright metal in the Wicklow streams. It was soon discovered that this was gold—"nuggets." The peasantry from the counties round at once flocked to the "diggings;" and all agricultural operations gave place to the gold fever. In a short space of time upwards of £10,000 worth of gold was collected by the peasantry, in pieces from the size of minute grains to lumps weighing twenty-one ounces. The rumours of the mineral wealth of the district, and the demoralisation that was the natural result of this gold-hunting, soon induced the Government to take the mining into their own hands. But, whether the result of accident, mismanagement, or fraud, the project, as a monetary speculation, was a total failure. In the course of the two years the Government managed the undertaking, no more than 945 ounces of gold were collected, the value of which was only £3675, and much under the expenses of the establishment. The Government consequently abandoned the mines, which were afterwards leased to a London company, in whose hands they proved equally unproductive. They are now abandoned. It is probable that the quantity of gold found at first in the Wicklow rivers was the accumulation of ages, during which mountains may have been worn away and carried by the streams to the sea; whilst the gold, from its weight, remained behind, constantly accumulating. No veins of gold have ever been discovered, or any traces of it, except in the alluvial deposits of the river.

Silver has sometimes been found in small quantities, in a native or pure state. The quantities found have never been of sufficient value to make the working for it a profitable speculation. The silver produced in Ireland is generally found in connection with lead. The ore of some veins is so rich in silver as to be called silver-lead. Formerly the process of extracting it was wholly unknown in Ireland, and the lead, richest in silver, used to be sold in the English market, in consequence of its brittleness, at inferior price. The silver is now separated from the lead at the Irish mines, and a fine mass of silver exhibited by the Mining Company, in a single block, worth £200, attests its practical application. By this process silver, amounting to only three ounces in the ton of lead, and worth no more than 15s., may be separated with profit.

OTHER MINERAL PRODUCTS OF IRELAND.

The other mineral products of Ireland consist of nickel and manganese, in small quantities, alums in Clare and Kerry, pipe-clays and china clays, minerals of barytes and of magnesia, ochre, slates, and marbles, and some others.

It will be necessary to consider these, and, indeed, all the raw materials of which we have made mention, when we come to treat of the various manufactures, both native, British, and foreign, that adorn the Exhibition.

In the order we have preserved, we were anxious, as far as possible, to consider the metal as it leaves the miner's hands, without any consideration to the subsequent processes it may have to undergo; and, with respect to Ireland, we were anxious to put before the reader a succinct view of her natural resources almost without commentary.

It is impossible to view all these elements of national aggrandisement and wealth, without feeling that if Ireland had ever had the good fortune of possessing as many Dargans as she has had Smith O'Briens, O'Connells, and Meaghers, smiling plenty would long since have dispossessed her poverty; and that island, so long a difficulty to all governments, and a help to none, would have been our support and our pride.

THE IRISH MARBLE COURT.

At the northern side of the Great Hall is a small compartment of great interest. It contains not only a fine collection of specimens, but several larger manufactured articles, such as chimney-pieces, &c. The principal collection of specimens consists of a series of two hundred and forty-five, representing the natural rocks, minerals, soils, &c., of Dublin, collected by Henry O'Hara, Esq., C.E. A fine collection of Irish marbles, in a glass case, exhibited by the Museum of Irish Industry; some specimens of porphyry, from Lambay Island, and red conglomerate, from the same place, both the property of Lord Talbot de Malahide; a handsome doorway of Cork marble, two chimney-pieces, some pedestals, busts, panels, and slabs of various sizes, illustrate the marbles of the different counties in Ireland.

The marbles of Connemara are well represented. They consist of three kinds—the hard white, the black, and the green. The green varies very much in colour: sometimes it is almost white; again, pale yellow; at other times, bright yellow, or dark green, almost black. The most valuable specimens are generally of a bright green, almost as bright in its colour as malachite. We are convinced, if this marble existed only in the ruins of some Italian temple, it would not be less valued than the celebrated Verd-antique, than which it is not inferior in beauty. This marble exists in abundance in the Connemara mountains, near Ballynahinch and Clifden; and it works very well, and will bear turning in the lathe: it is, consequently, applied to many purposes. Two very handsome tables of Connemara marble—the slabs of green, and the pedestals of black—attest the size and perfection in which slabs may be procured. These tables will be found in the compartment we have alluded to. They are exhibited by Mr. Lambert, of Cong Abbey.

Black marbles exist in great abundance, but not in great purity, in Ireland. The most important quarries are those of Kilkenny and Galway. The Kilkenny marble when cut is perfectly black; but after a short time the whole surface, in consequence of the action of the light and atmosphere, becomes studded with the shells and organic remnants of the fossil insects imbedded in its substance. These are varied, and as curious as interesting, and in the eyes of a geologist would, probably, add much to the value of the marble. This Galway marble is exported in large quantities to New York and London. Black marbles are also found at Churchtown and Doneraile, in the county of Cork; and in several portions of the counties of Limerick, Kerry, Clare, and Tipperary.

The Armagh and Churchtown marbles are also well represented. They present a mottled surface of red, brown, and yellow, sometimes tinted with purple. They take a high polish, and are much admired. A handsome doorway, completely made of these marbles, and two mantel-pieces, will not fail to impress the visitor with admiration for this very beautiful variety of native marble.

The other marbles of Ireland are—the ash grey, with a very fine grain, in the counties of Cork and Limerick; near Shannon Harbour, fine sienna and dove-coloured marble; near Dunkerron, county of Kerry, in small quantities, a purple marble, veined with dark green, and resembling bloodstone. In addition to these marbles, which generally are mentioned as specimens of great and inexhaustible quarries, Ireland possesses a number of veins of very beautiful marbles, and porphyries, and agates, amethysts, &c., a collection of the latter being exhibited by the Lord Chancellor of Ireland. The famous Irish diamonds, or crystals, also abound in various parts of the country, and they are now extensively used to ornament the bracelets, brooches, &c., manufactured of the bog-oak.

In the Irish marbles the articles exhibited, with few exceptions, are either contributed from the Dublin Society, or the Museum of Irish Industry—both institutions wholly or in part supported by Government grants. We see also here and there a table (and some of them very beautiful) inlaid with native marbles and other articles, showing great ingenuity; but we fail to find extensive manufactories where Irish marbles are produced, not as curiosities, but to meet a fair demand in the home or English market. A visit to the principal marble yards in Dublin will surprise us still more; for here we find the artist (in a country abounding in the beautiful marbles to which we have endeavoured to direct the attention of our manufacturers) engaged in working those imported from England, Scotland, and Italy. The inferior mantel-pieces, &c., are generally of Irish marbles; but those upon which the artist lavishes all his art are for the most part of foreign materials, often very inferior to those that abound close at hand.

We sincerely trust the display of specimens from native quarries will lead to the formation, among a few spirited capitalists, of a company like the Serpentine Company, determined to force a thriving trade in Irish manufactured marble by the only practicable means—excellence in the material, cheapness in the production, and skill and elegance in the execution.

FLAX AND ITS PRODUCTS.

Ireland is peculiarly suited for the growth of flax. The light and fertile soil, the softness of the climate, and the fresh breezes of the Atlantic that fan the island, tempering the heat of the summer sun, all conduce to the health and perfection of that delicate plant. It will be interesting, before we enter into an account of the manufacture of flax, to notice briefly the progress of the growth of the raw material.

The Royal Flax Improvement Society was organised in 1841, at which period the Irish flax crop averaged about 80,000 acres annually. In two years afterwards (1843), it had increased to 112,000; and in 1844, to 122,000. Owing to the great scarcity of seed, some unprincipled merchants passed off a large quantity of spurious seed upon the growers. This seed was several years old, and, to give it the appearance of being new, had been mixed, over a fire, in pans, with some deleterious ingredients, to give it a fresh, glazed appearance—just as the Chinese glaze their green tea. This, of course, rendered it completely valueless, and the farmers suffered heavily; but the Society, having wisely prosecuted the guilty parties, obtained heavy damages against them. Nevertheless, it produced so much disappointment and loss (and in some cases insolvency), that, in the following year, the breadth sown decreased to 96,000 acres. The crop of 1846 was one of the worst that had ever been known in Ireland or on the Continent. The result of both these causes combined was, that in 1847, the sowing fell to 48,000 acres; and, in consequence of the general distressed state of the trade and commercial panic, in which the linen trade participated, prices fell so much, that farmers were discouraged, and only 53,000 acres of flax were sown in 1848. As trade recovered from its depression, prices improved, and the breadth of the flax sown in 1849 had increased to 60,000. In 1850 it amounted to 70,000, and would have far exceeded that, had seed been procurable—every available bushel having been sown; and the quantity of flax grown last year is estimated at not less than 130,000 acres. Of this, no more than 12,000 acres were grown in the provinces of Leinster, Munster, and Connaught, and the remainder in the northern province of Ulster.

The importance of this branch of national industry will be at once seen. The value of Irish flax has generally ranged from £35 to £80 per ton, according to the quality, season, demand, &c. This had been the general average for the last 15 years; but sometimes the prices have ranged so high as £120, and even, upon one occasion, £180 per ton. The importation from abroad amounted to:—

Years.	Tons.
1840	62,649
1841	67,368
1842	55,713
1849	90,340
1850	91,097

It would be difficult to come to any conclusion as to whether Ireland will soon be able to supply all the raw flax to the manu facturer, or whether she must still be dependant upon the Continent. The fact is, whilst the produce of Ireland has increased very much, the home demand has increased so much more, that, though Ireland has multiplied her produce nearly threefold, the importations from abroad have nearly doubled. We do not know on which to bestow most praise—on the landowner, who trebles his produce; or on the manufacturer, who so far outstrips the farmer, as still to require adventitious supplies, and hold out to the farmer an ever improving market.

Linen forms the most characteristic portion of the Exhibition, not only from the quality and quantity of the goods displayed, but because it affords an example of the capabilities of Irishmen, when they bring enterprise and perseverance to the task, to introduce into Ireland a great branch of industry, second to few in the empire in importance, and perhaps destined to rival our own cotton fabrics. The manufacture of linen is almost altogether confined to the north. There are a few factories in Drogheda in which about a thousand hands are employed; but the principal trade is carried on in Belfast, Lurgan, Donaghadee, &c. In Mr. Mulholland's factory, which we had the pleasure of inspecting a short time ago, there were between 800 and 1000 people at work; their cleanliness and moral superiority contrasting favorably with the lounging and listless peasantry of the south and west, we had visited a short time before. In the north, education, respect for the laws, and sturdy honesty are the rule.

Turning from the representation of the raw materials to those in a manufactured state, we have but little to greet the eye with an attractive welcome, and that little, for the most part, so ill-arranged, that it can only be seen at a disadvantage. It seems almost incredible—yet, nevertheless, it is a positive fact—that the only article in which Ireland, cuts a respectable manufacturing figure is thrust in the background, as though it were necessary to conceal it from public inspection. Instead of linens occupying a prominent position in the Exhibition, they are poked into lateral avenues and into dark recesses, which require a more than common amount of research to find them out. This singular arrangement is *more Hibernico*, in every sense of the term, and must speak for itself.

THE LINEN MANUFACTURES OF IRELAND.

We have already endeavored to date the time when the manufacture of flax became an important branch of industry; but it would be much more difficult to discover the origin of the manufacture of linen. We hear of it in the earliest accounts of Ireland extant. The principal garment worn by the ancient chieftains was a shirt made of from 20 to 30 yards of linen cloth, and sumptuary laws were even passed to set limits to the quantity which ostentation would have used. We find linen also frequently mentioned among the produce of Ireland; and Hakluyt, an ancient rhyme-writer, in the year 1430, states, that "Ireland's commodities be hides and fish, as salmon, herring or hake, wool, *linen*, cloth, and the skins of wild beasts." The cloth was probably the ancient Irish freize—of which presently.

The linen manufacture, until a few years since, was altogether confined to the cottages of the peasantry, where the peasant, in the intervals of agricultural labour, wove by the hand-loom, the yarn spun by the hands of the female and younger members of his family. No great factories existed at that time, nor in fact, until the discovery of spinning the thread by the wet spinning process, could factories have been established on their present extensive scale. About the year 1825, the system known as "wet spinning" was discovered in Manchester; the process consisted in passing the fibre through hot water whilst it was being twisted. Improvements were gradually made, and the English and Scotch factories soon began to undersell the handspun yarns in the Irish markets. It became necessary, to enable the Irish to compete successfully, to introduce this mode of manufacture; and about the year 1828, the first great spinning factory upon this system was erected at Belfast. Others followed the same example, and in 1841 there were no less than 41 mills, containing 280,000 spindles, at work in the North. In 1850, the number had increased to 73 mills, with 339,000 spindles; and in 1852, there were not less than 81 mills, having about 500,000 spindles, and representing a capital estimated at between three and four millions sterling, whilst upwards of £1,200,000 is annually paid in wages.

A large portion of the Southern Hall is dedicated to the exhibition of linen. Almost all the most eminent houses in the North have contributed some of their choicest specimens. These consist of damask table-cloths of a beauty and finish which have made them objects eagerly sought for by more than one Sovereign; of cambrics, single and double damask napkins, sheeting, quilts, muslins, and a variety of other articles.

SEWED MUSLIN.

Sewed muslin, or muslin embroidered with the needle, is an interesting branch of Irish manufacture; the extent of which is not sufficiently known, nor its value as a branch of domestic industry, enough appreciated.

Although the sewed muslin trade is carefully fostered in the south and west of the island, yet we must not conclude that for that reason it is not capable of flourishing without artificial aid. In the north it receives none: it is self-supporting in the widest sense of the word. The principal warehouses belong to Scotch manufacturers; and the works are executed generally for Scotch houses. For one article made to gratify the luxury of the great a hundred are made for the use of the million; and, in addition to this, a demand from America is daily increasing, and the trade bears all the symptoms of one with which machinery can never interfere, nor the caprice of fashionable society; but one founded on the requirements of the people, and likely to increase with the comfort and growing prosperity of the middle classes.

IRISH POPLINS AND TABINETS.

This manufacture of tabinets is almost the only one of which the Irish metropolis can now boast. There are, of course, several other branches of manufacture, but they appear to exist almost by sufferance. But that of which we are now treating has taken a healthy root.

The first object of skill that presents itself is the manufacture of poplins, which may be termed a native industry. Three Jacquard looms exhibit, in their several forms, the peculiarity of the manufacture of figured poplins; and the cases immediately adjacent contain some excellent specimens of the plain-work in their several widths and qualities. There is no great consumption, however, for this article, although it is never out of date—being considered, nearly throughout Europe, a kind of bread-and-cheese article, which can be adopted whenever the presentations of fashion happen to pall upon the taste. The principal consumption of poplins is in England; the least, perhaps, in Ireland itself. Since the application of this article to paletots the manufacture has slightly enlarged; but, as that is merely a temporary demand, the ordinary production must soon resume its level. The Messrs. Fry, perhaps, occupy the highest ground in this branch of industry, and exhibit a Jacquard-loom weaving a single-coloured, but beautifully figured, poplin, which they designate the Dargan Robe, in compliment to the lady of the spirited projector of the Exhibition, at whose order it is manufactured.

WOOLLENS.

Upon minute examination, it will be found that the woollen manufacture of Ireland, as a whole, is at a low ebb, and—with one or two exceptions—much inferior to those of England and the Continent. It was proved at the Exhibition of 1851, that the fine woollen cloths of France were, in a few instances, superior to our own; but, taking the general run of goods, we had no superior, and scarcely an equal. Ireland, on the contrary, ranks nearly in the lowest scale of European woollen-manufactures; and with the exception of her friezes and elbinas, the productions of her looms are scarcely entitled to the appellation of a manufacture. The two exceptional kinds of cloth, however, just mentioned, she manufactures of a good quality, and turns them out in a very marketable condition. There is, also, a peculiar character about the finer kinds of friezes and elbinas, which few of our English woollen fabrics can lay claim to; they are honestly put together, contain a true quality of the raw material, and in the wear maintain their beauty much longer than similar goods imitated in England and elsewhere. The same remark may be applied to her blankets, for which Ireland is entitled to great credit; they are generally finer in the texture than those of England, are much warmer, and will wear longer, although a little higher in price. One, if not the main, cause of the superiority of the Irish blankets, arises from the wool being less carded than that of the English make, and, as a consequence, its wiry elasticity and its cohesive attraction are more effectually preserved. Ireland, also, turns out some decent qualities of tweeds; but she has little chance of competing with Scotland in the manufacture of that article.

The frieze is the most ancient Irish woollen manufauture we read of. It is mentioned in several old Acts of Parliament; and, so early as the year 1382, it is stated that among the articles sent to the Pope from Ireland were five mantles of cloth, one lined with green, and one russet garment lined with Irish cloth.

The principal woollen cloths at present manufactured in Ireland consist of blankets, which are manufactured in several parts of the island, but principally in Kilkenny; flannels, drugget-cloth, hosiery, tweeds, elbinas, and friezes. Some of these, particularly the last two, reflect much credit on the exhibitors.

LACE.

The manufacture of lace in Ireland was introduced, we believe, by Mr. C. Walker, of Limerick, in 1829, and the firm of which he was then a member, employ at the present time upwards of 600 hands at that work. Preceding that period the manufacture of lace, of the character which we are about to describe, was principally confined to the Continent, as neither the Buckinghamshire nor Northamptonshire pillow lace could be compared to it in quality. France and Belgium had almost the exclusive supply of the finer kinds of thread-lace to this country, antecedent to its manufacture in Ireland; and the very names of Vallenciennes, and Brussels, are "familiar as household words" amongst the consumers of that delicate article, and still characterise a certain quality of it, wherever it may be manufactured. But Ireland has stepped beyond both these countries, and now makes a quality of lace of different kinds, which would find a ready sale in the French markets, were there no prohibitory duties to prevent it. The appliqué, the guipure, the tambour, and, above all, the beautiful Italian point, are all produced in Ireland, and are highly creditable to her industrial skill and energy. The export to England is considerable, and forms one of the most beautiful articles of female attire that we can boast of, when comparing our productions with those of foreigners.

MUSICAL INSTRUMENTS.

It must be confessed that Ireland throughout all her troubles and with all her shortcomings of industry, has preserved a nice appreciation of art. Whatever may be her delinquencies in other respects, she pays great homage to the beautiful and intellectual whether it be embodied in painting, in sculpture, or in music; and no greater proof can be adduced of the warm sympathies and mercurial feelings of the Irish character than the crowds which linger in the picture gallery, and gather round the several pieces of statuary. Nor is music less admired among our lively neighbours; for Dublin, we believe, is one of the most musical cities of Europe, although she may not indulge in so many public concerts as her more affluent contemporaries. The truth is, that music is cultivated in private life to a great extent in Dublin and other places in Ireland; and it is this kind of cultivation, more than public concerts, that stamps the musical character of a people. That this is the case in Dublin, there can be little doubt for it is a well established fact that instruments of the most expensive kind find a sale there, and that large numbers of moderate-priced ones are annually disposed of. Upwards of one thousand pianofortes are imported from the great London manufacturers every year; and that number is exclusive of other kinds of musical instruments, for which there is a considerable demand.

The display of musical instruments in the Exhibition is, therefore, somewhat imposing; and deserves a more extended notice than our space permits.

Some Remarks on the Probable Present Condition of the Planets Jupiter and Saturn, in reference to Temperature, &c.

By James Nasmyth.

Read at the Meeting of the Royal Astronomical Society.

The remarkable appearances which characterise the aspect of the planets *Jupiter* and *Saturn*, as revealed by the aid of very powerful and excellent telescopes, have induced some reflections on the subject of their probable present condition as to temperature. With a view to elicit more special and careful observation of the phenomenon in question, and promote discussion on this interesting subject, I have been tempted to hazard the following remarks, which may perhaps prove acceptable to some of the members of the Royal Astronomical Society.

"In a former communication, in reference to the structure and condition of the lunar surface, I made some remarks on the principle, which, as it appears to me, gives the law to the comparative rate of cooling of the planets: namely, that while the heat retaining quality was due to the mass of the planet, the heat-dispensing property was governed by its surface; and as the former increases as the *cube* of the diameter of the planet, while the latter increases only as the *square* of its diameter, we thus find that the length of time which would be required by such enormous planets as *Jupiter* and *Saturn* to cool down from their original molten and incandescent condition to such a temperature as would be fitted to permit their oceanic matter to permanently descend and rest upon their surface, would be vastly longer than in the case of such a comparatively small planet as the earth.

"Adopting the results which geological research has so clearly established as the original molten condition of the earth, as our guide to a knowledge of the condition of all the other planets, it appears that we may in this way be led to some very remarkable and interesting conclusions in reference to the probable present condition of such enormous planets as *Jupiter* and *Saturn*, tending to explain certain phenomena in respect to their aspect.

"Assuming as established the original molten condition of the earth, and going very far back into the remote and primitive periods of the earth's geological history, we may find glimpses of the cause of those tremendous deluges, of which geological phenomena afford such striking evidence,[*] and by whose peculiar dissolving and disintegrating action of the igneous formations which at that early period of the earth's history must have formed the only material of its crust, we may in that respect obtain some insight into the source whence the material which formed the first sedimentary strata was derived. If we only carry our minds back to that early period of the earth's geological history, when the temperature of its surface was so high as that no water in its *liquid* form could rest upon it, and follow its condition from such non-oceanic state to that period at which, by reason of the comparatively cooled-down condition of its surface, it began to be visited by partial and transient descents of the ocean, which had till then existed only in the form of a vast vapor envelope to the earth, we shall find in such considerations, not only the most sublime subject of reflection in reference to the primitive condition of our globe, but also, as it appears to me, a very legitimate basis on which to rest our speculations in regard to the probable present condition of *Jupiter* and *Saturn*,—both of which great planets, I strongly incline to consider for the reasons before stated, are yet in so hot a condition, as not only not to permit of the permanent descent of the oceanic matter, but to cause such to exist suspended as a vast vapor envelope, subject to incessant disturbances by reason of the abortive attempts which such vapor envelope may make in temporary and partial descents upon the hissing-hot surface of the planet.

"Recurring again to this early period of the earth's geological history, when it was surrounded with a vast envelope of vapor, consisting of all the water which now forms the ocean. The exterior portion of this vapor envelope must, by reason of the radiation of its heat into space, have been continually descending in the form of deluges of hot water upon the red hot surface of the earth. Such an action as this must have produced atmospheric commotions of the most fearful character; and towards the latter days of this state of things, when considerable portions of what was afterwards to form our ocean came down in torrents of water upon the then thin solid crust of the earth, the sudden contraction which such transient visits of the ocean must have produced on the crust of the earth would be followed by tremendous contortions of its surface, and belchings forth of the yet molten matter from beneath, such as yield legitimate material for the imagination, and the most sublime subject for reflection. The extraordinary contortions and confusion which characterize the more primitive sedimentary strata, such as the gneiss, schist, and mica slate, in so very remarkable a degree, shadow forth the state of things, which must have existed during that period, when the ocean held a very disputed residence on the surface of the earth.

"Could the earth have been viewed at this era of its geological history from such a distance as the planet *Mars*, I doubt not it would have yielded an aspect in no respect very dissimilar to that which we now observe in the case of *Jupiter:* namely, that while the actual body of the earth would have been hid by the vast vapor envelope then surrounding it, the tremendous convulsions going on within this veil would have been indicated by streaks and disruptions on the surface, which would be mottled over with markings such as we observe in the case of the entire surface of *Jupiter:* and by reason of the belchings forth of the monstrous volcanoes which at that period must have been so tremendously active on the earth, the vapor envelope would be most probably marked here and there with just such dingy and black-and white patches, as form such remarkable features about the equatorial region of *Jupiter*—probably the result of volcanic matter, such as ashes, &c.,—which the volcanoes about his equator may from time to time vomit forth, and send so far up into the cloudy atmosphere as to appear on the exterior, and so cause those remarkable features which so often manifest themselves on the outward surface of his vapor envelope; for I doubt if we have ever yet seen the body of *Jupiter*, which will probably remain veiled from mortal eyes for countless ages to come, or until he be so cooled down as to permit of a permanent descent on his surface, of his ocean, that is to be.

"In applying these views to *Saturn*, it occurs to me that we obtain some glimpses into the nature of those causes which have induced, and are now apparently inducing, those changes in respect to the aspect of his rings, which have more especially of late, attracted so much attention. If *Saturn* also be so hot, that his future ocean is suspended as a vast vapor envelope around him, it is possible I conceive, that some portion of this vapor may migrate, by reason of the peculiar electrical conditions which it is probable his rings may be in, in respect to the body of the planet: and that such migration of vapor in an intensely frozen state, as it must be in such situation, may not only appear from time to time, as the present *phantom ring* does, but also does incrust the inner portion of the interior old ring with such vast coatings of hoar-frost as to cause the remarkable *whiteness* which so peculiarly distinguishes that portion of his rings. In fact, such are the extraordinary phenomena presented by this planet, that one is led to hazard a conjecture or two on the subject; and, I trust such as I have now the pleasure to offer, may meet with a kind reception from the Royal Astronomical Society.

On Ericsson's Hot Air, or Caloric Engine; by William A. Norton, Professor of Civil Engineering in Yale College.[*]

(Continued from Page 249.)

PERFORMANCE.

There have been two trial trips of the Ericsson, in the New York harbor and bay, and the ship has subsequently made a successful trip to Alexandria and back. On the first occasion only the inventor, owners and crew were present. The performance on the occasion of the second trip (Jan. 11th, 1853) was witnessed by the members of the New York press, and a few other gentlemen, present by invitation. The results of the trip have been published in all the New York papers, but the different

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[*] The deluges here alluded to are quite distinct from those which have so frequently during various periods of the Earth's Geological History, swept over vast portions of its surface, and of whose tremendous violence we have such clear evidence, in the denudation of the hardest rocks, the debris of which has yielded the material of nearly every sedimentary formation, from the period of the old red sand stone formation upwards.

These vast and often repeated deluges I consider to have resulted from mighty incursions of the ocean over vast portions of the earth's surface, which till then were dry land. The retreat of the matter below the earth's surface, resulting from the progressive contraction, consequent on its gradual cooling, must have again and again permitted extensive portions of the solid crust of the earth to suddenly crush down, like an over-loaded ill-supported floor, and so allowed the ocean to rush in with fearful violence, and to occupy the place of the so submerged continent.

Judging from the facts which Geological Phenomena yield us in abundance, these incursions of the ocean must have been sudden, violent, and of frequent occurrence.

The sudden sinking down of a continent to the extent of 1000 feet in depth, would be but an insignificant adjustment of the crust of the earth to the retreating or contracting interior, as compared to its actual diameter (being only about one forty thousandth part), but yet such a subsidence occurring to any portion of a continent near the sea, would occasion a rush of waters over its surface, amply sufficient to perform all the feats of violence and denudation which have taken place during many successive periods of the earth's Geological History, and of the occurrence and action of which we have most palpable evidence, not only in the vast accumulations of debris, caused by these violent incursions of the ocean, but also in the prodigious dislocations of strata, which have resulted from the crushing down of the crust of the earth, in its attempts to follow down and fill up the void or hollow spaces caused by the contracting and retreating Nucleus, which, as before said, I consider to be the true cause of this class of deluges, the tremendous violence of which has yielded the old red sandstone; and all other sandstones, conglomerates, boulders, gravel, sand, and clay.

[*] *Sill. Jour.*

accounts disagree very materially on most of the important points. By personal inquiry and by consulting the most reliable accounts I have endeavoured to come as near to the truth as possible. The following are the principal results:

No. of revolutions of wheels per minute, (according to Ericsson,)	9¼
Same, (according to other most reliable authorities,)	9
Speed through the water, (according to Ericsson.)	8½ miles.
" " (according to other authorities,)	7 "
Working pressure in receiver, per square inch	8 lbs.
Consumption of anthracite coal in 24 hours	6 tons.

The two estimates of the speed through the water are quite different, but the number of revolutions of the paddle wheels as stated by different authorities, lies between 9 and 9¼. The number of revolutions, about which there is but little disagreement, will enable us to obtain by calculation a pretty close approximation to the speed. For this purpose we have the following data. Diameter of the wheels from centre of pressure to centre of pressure, 30¾ feet; paddles 32 in number, on each wheel, and 10½ feet long by 16 inches deep; dip of the wheels 44 inches. The following quantities were obtained by calculation, viz.: number of paddles in water on each wheel, 7; immersed paddle surface on both wheels, 196 square feet; area of midship section, at 17 feet draft, 520 square feet; ratio of immersed paddle surface to area of midship section, 1 to 2.653; same for Steamship Arctic, 1 to 1·662 (see Journal of Franklin Institute for Jan. 1853, No. 1 p. 33;) slip of wheels of Arctic, 19·32 per cent. From which we find the slip of the wheels of the Ericsson, on the trial trip to have been 25·4 per cent. The distance passed over by the centre of pressure of wheels was 9·88 miles per hour. Hence allowing for the slip, the speed of the ship was 7·47 miles per hour. If we allow for the less oblique action of the paddles in the case of the Ericsson than in that of the Arctic, we find the speed to have been 7·57 miles per hour (the slip of the wheels being reduced to about 23·4 from this cause.

There is some little uncertainty with regard to the area of the midship sections Although I have not succeeded in obtaining the data necessary for an exact calculation of this element, the information furnished me in reference to the model of the Ericsson *as compared with that of the steamers of the Collins' line*, has enabled me to approximate very nearly to a correct result. The rule by which the calculation was made has been tested by trying it upon a large number of ships. It gives results, in almost every instance, a little too small; thus for the Arctic, the result is 662, and the true area is 685. The greater "dead-rise" of the Ericsson may diminish the area, as compared with the Arctic, some 30 square feet; which would make it about 510 square feet. It in all probability, lies between 520 and 500.

If we take it at 500, the slip of the wheels comes out 23 per cent, and the speed of the ship 7·61* miles. In view of all that has now been stated, we may conclude that *the average speed of the Ericsson through the water, on the trial trip could not have exceeded 7¾ statute miles per hour,* and was most probably about 7½ miles.

Horse-power of the Ericsson's Engines, developed on the trial trip. Working pressure of air, 8 lbs.+15 lbs. Supposing the cut off to be at $\frac{15}{23}$ (=·652) of the stroke, then the mean effective pressure, in each cylinder, would be 6.4 lbs+15 lbs.; and the horse-power of both engines, calculated by the rule given on page 403, would be 311. If we take the cut off $\frac{62}{100}$, as it is stated to be in some accounts, then the mean effective pressure in the working cylinder we find to be 6.04 lbs.+15 lbs., while that in the supply cylinder remains at 6.4+15. With these data the result obtained for the horse power is 259.

For a mean effective pressure, in each cylinder, equal to 6 lbs., the result is 292; and for 6½ lbs., it is 316.

The power developed by the engines on the trial trip, was undoubtedly less than the determination above obtained (311), for the reasons mentioned on page 270; we may safely conclude that *it could not have exceeded* 300 *horses-power*. It was probably less. This is but one half of the full power of the engines, according to Captain Ericsson's estimate. This estimate supposes a working pressure of 12 lbs., to be employed, whereas, by reason of leakage, &c., but 8 lbs could be obtained. In fact, making the calculation on the supposition of a working pressure of 12 lbs., and taking the cut off at ⅔ stroke, neglecting also, the clearance, which is not known, I find the horse-power of the two engines to be 640. The allowance for clearance and other causes of reduction which have been indicated (see p. 403,) may well reduce this determination to 600.

The power, but for practical difficulties, may be indefinitely increased, by enlarging both cylinders, keeping their relative size the same.

It is stated that Captain Erricsson has fixed upon 12 lbs. as the highest limit likely to be practically reached in the working of caloric engines. This must be regarded as an indication either that it is not expected the leakage will be entirely stopped, or that it is supposed that it will not be regarded as safe and economical to work at the high temperature of 500°, and upwards, necessary to double the expansive force of the air.

Consumption of Fuel, on trial trip, 6 tons of anthracite coal per day. or 560 lbs. per hour. This amounts to 1·87 lbs. per horse-power per hour. If the full power of the engines (600) were to be developed, the expenditure would be 0·93 lbs. per horse-power per hour. On the other hand, if we allow that the excess of pressure in the receiver over that in the working cylinder, on the trial trip, was $\frac{3}{10}$ of a pound per square inch, and the excess of pressure in the supply cylinder over that in the receiver the same, we find that, with a cut off at ⅔, the horse power developed could not have been more than 248. The expenditure of fuel, answering to this determination, would be 2·26 lbs. per horse-power per hour.

COMPARISON WITH THE STEAM ENGINE.

1. Comparative consumption of Fuel. This is presented in the following table.

TABLE 1.

Name of Ship	Press of steam or air.	Horse-power.	Lbs. of bit. coal.	Equiv. lbs. of anth. coal.
	lbs.			lbs.
Ericsson	6·4	300	. .	1·87
"	6·3 & 6 9	248	. .	2·26
"	10·3	600*	. .	0·93
Humboldt, ...	22·1	2397	2 71	2·23 to 2·37
Franklin...........	20·3	1732	3·55	2·48
Washington,.......	18·3	992	3·38	2·37
Hermann,..........	17 4	994	3 42	2 39
Ohio,.............	23·4	1732	. .	2·59
Georgia...........	23·4	1732	. .	2·59
Falcon............	22 5	534	3.81	2·66
Fulton (the third,)	31.8	823	. .	2·77
South America. ...	31·8	1168	. .	2·60

The second column shows the mean effective pressure of the steam, or air, per square inch, on the piston; the third the real horse-power actually developed by the engines of each ship; the fourth the number of pounds of bituminous coal, per horse-power per hour, consumed: the fifth the equivalent amount of anthracite of coal, i. e., the number of pounds that would do the same work. These several quantities answer to the average perform-

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*If we take the number of revolutions of the paddle-wheels at 9¼, the speed comes out 7.88 miles.

ance of the engines, except in the case of the South America, (a Hudson river boat,) in which they show the maximum performance. The data for the calculations were obtained for the most part from Stuart's "Naval and Mail Steamers of the United States." The mean effective pressure of the steam, for the whole stroke, has, in each instance been diminished 2 lbs. to allow for the reaction of the imperfectly condensed steam on the other side of the piston. The reductions from the fourth to the fifth column were effected, except in the case of the Humboldt, by multiplying by $\frac{7}{10}$ (nearly in accordance with the results of certain experiments and investigations made by Charles B. Stuart, Esq., Chief Engineer of the U. S. Navy. (See work just quoted, p. 183 and 186.)

The following results were obtained by diminishing the average boiler pressure 2 lbs., which is about the usual excess of the boiler over the cylinder pressure.

TABLE II.

Name of ship.	Effec. press. of steam or air.	Horse-power.	Lbs. of bit coal	Equiv. lbs. of anth.
	lbs.		lbs.	lbs.
Ericsson, ...	6·4	300	. .	1·87
"	6·3 to 6·9	218	. .	2·26
"	10·3	600	. .	0·93
Humboldt, ...	20·5	2235	2·91	2·31 to 2·51
Franklin, ...	18·3	1607	3·82	2·67
Washington, ..	16·9	911	3·66	2·56
Hermann,.....	16·0	866	3·72	2·60
Ohio,.........	21·7	1606	. .	2·80
Georgia, ...	21·7	1606	. .	2·80
Falcon, ...	20.8	494	4·12	2·88
Mississippi ..	14·0	539	5·26	3·68
Arctic,.... ...	19·0	2290	. .	3·50
Fulton (the 3d.)	30·1	776	. .	2·93
South America.	30·1	1101	. .	2·75

In the two cases of the Arctic and Mississippi, the mean effective cylinder pressure was obtained by an indicator. The results, given for the other steam ships would doubtless be nearer the exact truth if an additional allowance of from 1 to 2 lbs. were made for the greater reaction of the partially condensed steam in the cylinder than in the condenser. If an allowance of 2 lbs. be made on this account, we obtain the following result.

TABLE III.

Name of ship.	Effects press. of steam.	Horse-power.	Lbs. of bit. coal.	Equiv. lbs. of anth.
	lbs		lbs.	lbs.
Humboldt, ...	18·5	2017	3·22	2·65 to 2·82
Franklin, ...	16·8	1436	4·27	2·99
Washington, ..	15	862	4·15	2·90
Hermann......	14	758	4·22	2·97
Ohio, ...	19·7	1458	. .	3·08
Georgia, ...	19·7	1458	. .	3·08
Falcon, ...	18·8	446	4·56	3·18
Mississippi, ...	14·0	539	5.26	3·68
Arctic,........	19	2290	. .	3·50
Fulton, ...	28·1	727	. .	3·13
South America.	23·1	1036	. .	2·94

The average consumption of anthracite coal by the several steam ships named in the table, is 3·11 lbs. per horse-power per hour. Dividing by 1·87 and 2·26, we obtain the quotient, 1·66 and 1·38. From which it would appear that the advantage is in favor of the caloric engine, in the proportion of 8 to 8·3, for the one estimate of the horse-power developed on the trial trip, and of 5 to 6·9 for the other estimate. If Ericsson's estimate of the power of the engines of the caloric ship should hereafter be realized, then the gain in the expenditure of fuel, would be in the ratio of 1 to 3·39. But we shall soon see, in another connection, that the comparison ought rather to be made with the numbers given in Table II. If this be done, (omitting the results obtained for the Mississippi and the Arctic, which correspond more nearly to the supposition made in Table III), we find the advantage in favor of the Ericsson, in so far as it has hitherto shown its capabilities, to be in the proportion of 5 to 7·3, or 5 to 6; that is, to be in all probability, in a ratio lying between these two limits. If we make a comparison with the Washington and the Humboldt, the highest admissible ratio is found to be $\frac{6·8}{5}$, and the lowest $\frac{5·7}{5.}$

We conclude therefore that the saving of fuel hitherto effected in comparison with the condensing steam engine, in its most economical operation, is not more than $\frac{1}{4}$,* and may be as low as $\frac{1}{6}$.

At the same time it is to be observed that if the supposed inherent capabilities of the new engine should be realized, the saving effected might amount to no less than 70 per cent.

2. *Weight of the Engine—Calculation of the Weight of the Engines of the Ericsson.*—Weight of hull, from 1200 to 1300 tons, as deduced from the weight of the hull of the Arctic; displacement, at 17 feet draft, 2200 tons, as calculated by the builders of the ship; ballast, 200 tons of pig iron; weight of masts and rigging, coal, &c., 100 tons, at the outside: hence weight of the engines and paddle wheels,=2200—1300—200—100=600 tons, or 2200—1200—200—100=700 tons.

I find that the same rule for the calculation of the displacement, from the length, breadth, and depth, which gives the displacement of the Arctic correctly, and a near approximation to that of American steamships generally, makes that of the Ericsson at 17 feet draft, about 2600 tons, which is 400 tons above the estimate made by the builders of the ship; a fact which is to be attributed, doubtless, to the peculiar model of the ship.

COMPARISON WITH WEIGHT OF STEAM ENGINE.

	Horse-power.	Weight	Rates of w't. to horse-pwr
Mississippi, ...	539 (developed)†	494 tons.	0·91
Missouri,......	600 (estimated)	500	0·80
Saranac, ...	605 "	367	0·61
Michigan, ...	334 "	160	0·48
Niagara, ...	1440 (developed)	150	0·10
Ericsson,‡.....	300 "	600	2·20
"	300 "	700	2·33
"	600 (estimated)	600	1·00
"	600 "	700	1·16

The numbers given in the second column include the weight of the boilers, water in boilers, coal bunkers, and all appurtenances, together with the weight of the paddle-wheels.

It appears from this comparison that, in proportion to the actual horse-power, the weight of the Ericsson's engines is about three times as great as the ordinary weight of the engines of sea steamers; and in proportion to the estimated power, more than 30 per cent. greater.

3. *Space occupied by the Engines.*—This point has been attentively considered by a correspondent of the Journal of the Franklin Institute (see the second February number of the Journal, p. 128), who shows that here also the advantage is on the

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* If the comparison be made with the Ohio and Georgia, the saving may be nearly $\frac{1}{3}$.

† This shows the horse-power of the Mississippi developed in its average performance. There can be no doubt that its full power is over 600; and therefore that the ratio of the weight to the horse-power is as low as 0·82. Besides, the weight of "wheels, tools, duplicate pieces of engine, stores of the engine department, &c.," is set down at 268 tons, which is more than 100 tons above what would be deemed a sufficient allowance. Reducing the total weight to 400 tons, we have the ratio of 0·67.

‡ If we take the lowest determination of the horse-power of the Ericsson, viz: 248, the ratio of the weight to the horse-power comes out 2·82.

side of the steam engine;—the economy of space being nearly twice as great.

4. *Friction and other Resistances.*—We may obtain an estimate of the comparative resistance, in the two forms of engine, to be overcome by the moving power, by reducing the power of the steam engines to the speed and immersed midship section of the Ericsson on the occasion of the trial trip; that is, calculate what reduced power they would have if they were just capable of propelling with a speed of 7 or 7½ miles per hour, the ships in which they are placed, if the area of the immersed midships section were the same as that of the Ericsson at 17 feet draft, i. e. 520 square feet. This may be effected by observing that the horse-power will vary nearly as the cube of the velocity multiplied into the area of the transverse midship section. This is quite near the truth, if we suppose the diminution of power to be accomplished by reducing the area of the piston, and other parts of the engine proportionally; the pressure of the steam, cut off, and all other circumstances remaining the same. The following table contains the results of a few calculations made by the rule just stated.

	Hrse-pwr.	Speed.	Area of mid. sec.	REDUCED HORSE-POWER.	
				Sp'd of 7 miles.	Sp'd of 7½ miles.
		miles.	sq ft		
Mississippi,	539	8·4	684	224	276
Arctic,.....	2290	13·4	685	215	264
Washington,	911	11·0	608	202	247
Fulton, ...	776	13·3	281	210	259
S. America.	1104	18 (as'md).	132	257	316

These determinations, although they differ considerably among themselves, as was to be expected, from the variety of size and model of the hulls of the several vessels selected, as well as of construction and operation of the different engines, and are not to be regarded as very exact, still serve to show that no just claim can be set up of superiority on the part of the hot air engine over the steam engine, on the ground that the resistance incident to the movement of the engine is decidedly less. Also, on observing that the horses-power given in Table II. were used in making the calculations for the Washington, Fulton and South America, it will be seen that the statement just made is still true if we include among the several resistances in play in the steam engine, the excess of the reaction of the partially condensed steam in the cylinder over that of the same in the condenser. We may hence conclude that we were justified in making the statement that the comparative consumption of fuel by the two engines, in producing the same useful effect, is to be ascertained by taking the determinations of expenditure given in the last column of Table II, rather than the larger values to be found in Table III.

5. *Adaptation to the production of high velocities.*—At double the speed of the Ericsson on the trial trip, that is at 14 to 15 miles per hour, the horse-power would be about eight times greater, or about 2400; and the quantity of coal consumed, deduced from the present capabilities of the engine, would be eight times greater, or 48 tons per day. This supposes the draft to remain the same, whereas it will be materially increased by the necessary augmentation of the weight of the engines. In fact the weight of the engines at the speed supposed would be about three times as great as their present weight. At her present draft, (viz., 17 feet,) an additional weight of 200 tons would sink the hull of the Ericsson one foot. Taking the lowest estimate of the weight of the present engines, (600 tons), the necessary addition of weight would not be less than 1200 tons; which would sink the hull nearly 6 feet, or increase the draft to about 23 feet, that is, make the draft after the 200 tons ballast is removed, 22 feet; which is from 1 to 2 feet deeper than the load-line. The midship section would thereby be enlarged to 720 square feet, and therefore the power necessary for the production of the double velocity augmented in the proportion of 520 to 720. If this be done, we find the required horse-power to be 3320. The corresponding consumption of coal would be 66 tons per day. Now, even at 50 tons per day, the stock of coal required for a transatlantic voyage of 12 days duration, would not be less than 600 tons; which would produce an additional depression of the hull of nearly 3 feet, or sink it some 5 feet deeper than the load-line. If it should be maintained that the weight of the engines would not be more than doubled, the depression produced by the engines and the necessary supply of coal would still be below the load-line. Again, if it should be conjectured that the consumption of coal will not be augmented, in the case of the caloric engine, in the same proportion as the real horse-power, to show that this supposition is erroneous it is only necessary to state that, as a matter of fact, the amount of coal consumed for each horse-power by the engines of the Ericsson, is even greater than that consumed by the stationary caloric engine. Ericsson gives 60 as the horse-power of the stationary engine, and 0·6 lbs. per horse-power per hour as its consumption of fuel, and 600 and 0·9 lbs. as the corresponding quantities in the case of the Ericsson's engines.

Let us now see what will be the result in case the estimated capabilities of the caloric engine should be realized. If the horse-power should be increased from 300 to 600, the speed of the ship would be increased nearly in the proportion of the $\sqrt[3]{300}$ to the $\sqrt[3]{600}$, or of 6·69 to 8·43; that is, to 8·82 or 9·45 miles per hour, according as the speed on the trial trip is taken at 7 or at 7½ miles. To obtain a speed of 15·5 miles, which is the speed of the Arctic in still water, the expenditure of fuel must be increased in the proportion of $(8{\cdot}82)^3$ to $(15{\cdot}5)^3$, or from 6 to 33 tons, disregarding the increase of draft. As a matter of fact the weight of the engines will be augmented in about a two-fold proportion, which will increase the draft nearly 3 feet; or make the draft, after the ballast is removed, about 19 feet, and thereby augment the necessary consumption of fuel to 38 tons. The supply of coal for a 12 days voyage, at 50 tons per day, would be 600 tons; this additional load would increase the draft on leaving port to 22 feet, which is some 2 feet deeper than the load-line.

If we take the other estimate of the velocity answering to 600 horses-power, viz., 9·45 miles, the amount of coal required, at the velocity of 15·5 miles in still water, will be about 30 tons per day, or 450 tons for a voyage of 15 days. The addition to weight of engines will not be less than 360 tons; and 360+450=810 tons will just sink the ship to the load-line.

The Arctic would accomplish the voyage in the same time, and carry not less than 700 tons freight. But in doing this her engines would consume about 600 tons more coal than those of the Ericsson in the case supposed. This estimate, of the highest possible performance of the Ericsson, is so near an approximation to the performance of the steam-ships of the Collins' line, that it must be admitted to be within the bounds of possibility that caloric ships may hereafter compete successfully with these celebrated steam-ships. At least this conclusion seems to follow, unless we have underrated the necessary weight of the caloric engines. It must be left to time to decide the question, whether the full estimated power of the caloric engines can be actually obtained; and whether, therefore, the results which have been indicated, will, from being a mere ideal limit, ever come to be an actual realization.

With her present capabilities the average speed of the Ericsson at sea would not exceed 6 miles per hour, (see Journal of the Franklin Institute for February, No. 2, p. 127): and she would require 24 days to perform the voyage to Liverpool (3550 statute miles.) It seems highly probable that her speed will be increased by alterations and improvements in her machinery, but it is to be observed that when depressed to her load line, the full estimated power of her engines will propel her at no more rapid rate than 8½ miles per hour, in still water, and less than 7 miles per hour at sea.

6. *Application to Inland Navigation, &c.*—The weight of the caloric engine, and the large amount of space which it requires, would seem to preclude all hope of applying it successfully, in its present form, to river or lake navigation, or to railroad locomotion. (See table on p. 408.) In its application to manufacturing purposes and to the drains of mines, &c., the same objections will have much less force, and a favourable result may therefore be more confidently expected. In this point of view, however, a comparison should be instituted between the caloric engine and the high pressure steam engine, working very expansively.

General Conclusions.—The more important general conclusions to which this comparison has conducted are,

1. That Ericsson's Hot Air engine, as compared with the condensing marine steam engine in its most economical operation, has shown the ability to do the same work with the use of from ⅙ to ⅓ less fuel; and that if its full estimated power should hereafter be developed, the saving effected would be 70 per cent.

2. That, for the same actual power, its weight is about three times as great as that of the marine steam engine, and that in case its estimated power should be obtained, its weight would be as much as 30 per cent. greater.

3. That in respect to the space occupied by the engines and coal, the advantage is decidedly in favor of the steam engine.

4. That, the great weight of the engine in proportion to the power developed, must prevent, for the present, the realization of a high speed in the propulsion of vessels. At the same time it is to be admitted that the full estimated power is adequate to the production of high velocities. Time alone can decide the question whether or not this maximum power is really obtainable.

5. The great weight of the engine, and the space occupied by it in its present form, will in all probability prevent its adoption for the purposes of inland navigation and railroad locomotion, in preference to the steam engine. If used as a land engine, these features will be less objectionable; accordingly, it is only in this form of application, and in those cases of marine navigation in which speed is likely to be sacrificed to economy of fuel, that the caloric engine may be confidently expected to achieve a decided triumph over the condensing steam engine.

Although this discussion has brought us to the conclusion that the new motor is not likely to equal the extravagant expectations which are so widely entertained with regard to its capabilities, still it must be freely conceded that the invention of a new engine, in respect to which a just claim to superiority over the steam engine can be asserted, in any particular, is a great achievement, and that the ingenuity and mechanical skill displayed in the invention and construction of the Caloric Engine cannot be too highly extolled.

Report on Table-Moving.*

When a number of persons sit or stand round a table, their fingers resting slightly upon it, it frequently, though not invariably, happens that the table begins to move; as soon as this motion is perceived, the experimenters follow its course, and turn round and round with more or less velocity; but as soon as the hands are removed from the table it gradually stops.

The latter part of the experiment—namely, the rotation of the table—involves a fallacy, for the rapidity of its movement is in no degree owing to any inherent power of motion in itself, but is solely due to the force unconsciously exerted upon it by the experimenters, and the velocity of the motion is entirely and directly proportionate to the amount of force expended upon it, in addition to the momentum it has already acquired in passing from a state of rest to one of motion. The table no more compels the persons to follow its movements than the garden-roller drags the gardener who pushes it before him; in both cases the *vis a tergo* is the moving force, and the table and the garden-roller do no more than obey the impulse communicated to them.

It must, however, be admitted, that the *first* movement of the table is not so easily explained, for the results of our own experiments, and those of other persons fully deserving of confidence, have placed the fact beyond a doubt, that this movement of the table is performed without any *conscious* effort on the part of the experimenters. It remains, therefore, to be shown by what mechanism this effect is produced, and we shall have no difficulty in solving the problem by reference to physiological principles which are well-known to the Profession. The fact is, that the movement in question is due to *involuntary* muscular action at the ends of the fingers, exerted upon the table. The *direction* of the movement is regulated, not by the *will*, but by the dominant *idea* in the mind, and the term *ideo motor* may very properly express the action in question. It is necessary, however, to explain more fully the class of effects to which the term *ideo motor* may be applied.

It is well known, that the movements of the human body may be divided into *voluntary* and *involuntary*. The actions of walking, of playing musical instruments, etc., are instances of the first; those of circulation and digestion are examples of the second. But there is also a class of actions comprising the ordinary phenomena of motion, which are certainly not under the control of the *will*, but which, nevertheless, are directed by the emotions or the *ideas*. Thus, the somnambulist walks in obedience to some mental impulse, while the will is dormant; and the person who dreams, often executes movements in which the will has no part, but which are excited by *ideas* or emotions. Again, although the will has no control over the action of the heart and arteries, yet the *ideas* and *emotions* exercise a distinct influence upon those organs; and when attention is directed to their pulsations in nervous persons, the movements have been accelerated or retarded, or have become intermittent. Now in all these cases, the ideas or the emotions act upon and direct the movements without the intervention of the will. In the case of table-turning, the ideas are concentrated upon the expected movement, and the muscular apparatus of the fingers obeys, unconsciously to the experimenter, the dominant impression in the mind.

When a table is readily moveable upon its feet, or upon castors, a small amount of force, voluntarily applied by the fingers will cause it to revolve. This mobility is still more obvious when the force is distributed uniformly by a number of persons all round the table.

The amount of muscular force necessarily concerned in accomplishing the revolution is readily procured, independently of will. Let four or five persons place their distributed fingers upon some surface, and retain their position for a few minutes, unrelieved by change; let there be an expectation of some possible result, and there will soon be perceived a tingling in the skin, along the course of the muscles, and a degree of tension, which, without volition, altogether, eventuates in *reflex*, or, as it would be styled in common language, *involuntary* action. In table-turning, there need not be any voluntary movement, for muscular tension, provoked by irritation, sensation, emotion, or fixed

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* *London Medical Journal.*

attention, will produce sufficient action to accomplish the expected result.

In order to demonstrate the true character of these phenomena, we ourselves performed some experiments, the particulars of which are subjoined.

June 3, 1853.—*First Experiment.*—Four medical gentlemen sat round a small table, having a stem with three legs, but without castors. Each person placed his fingers lightly on the table, the little fingers of one person touching the little fingers of the person next him, and the *thumbs separated by a considerable interval.* In this experiment, it was determined that no expectant idea should be entertained, that the attention should not be fixed upon the table, and that ordinary conversation should be freely carried on. After sitting for twenty minutes, no effect whatever was produced. The experiment was commenced at 25 minutes past 7, and was continued until 45 minutes past 7.

2nd Experiment.—The same gentlemen placed themselves round the table, in exactly the same position as in the last experiment. In this experiment, however, it was determined, that perfect silence should be maintained, that the thoughts should be concentrated upon *some* result, whatever it might be, but that no expectant idea should be entertained as to the direction which the table should take. The experiment was commenced at 12 minutes to 8; at 6 minutes to 8 the table began to move from right to left. After it had moved for some little time, the experiment was abandoned, as it was not thought necessary to follow its circumvolutions. Dr. C—— felt that his left arm was in a state of muscular tension before the table commenced moving. Dr. J—— felt pressure on his right little finger from Dr. C——'s left little finger, the pressure appearing to increase up to the time when the table began to move. Mr. N—— felt a tingling in the skin, as, also, a somewhat painful sense of muscular tension before the table began to move. After it began to move, his fingers and hands unintentionally, but instinctively, accommodated themselves to the movements of the table, the involuntary muscular actions being directed in the axis of movement of the table. Dr. S—— was not conscious of any movement whatever of his own muscles, or of those of the gentlemen to his right and left, and his mind was wholly indifferent as to the direction which the table would take.

3rd Experiment.—It was now determined that perfect silence should be maintained, that the thoughts should be concentrated upon the movement of the table, and that an expectant idea should be entertained of the table moving from left to right. The experiment was performed by the same gentlemen as before and in the same positions. It was commenced at 7 minutes past 8, and at 15 minutes past 8 the table began to turn from left to right, but in two minutes it suddenly reversed its direction, and turned from right to left. This latter phenomenon was owing to Mr. N——, (without mentioning the circumstance to the rest,) exerting a distinct voluntary force in the opposite direction to that in which the table was moving.

4th Experiment.—The same gentlemen sat down in the same positions as before; but on this occasion it was determined that Dr. C—— and Mr. N—— should anticipate a movement of the table from right to left, but that Dr. J—— and Dr. S—— should entertain the contrary idea. The experiment was commenced at 25 minutes past 8, and it was continued till 20 minutes to 9, but no effect whatever was produced.

June 4th, 1853.—*5th Experiment.*—This experiment was made upon a large, round, drawing-room table, moving upon castors. Eight ladies stood round it, with their fingers resting upon the table, and their little fingers in contact with the little fingers of those standing to their right and left. It was determined to will that the table should move from left to right. In one minute and a half it moved from left to right.

6th Experiment.—A lady placed both her hands flat on the table, which in this case was a small and light one; and it moved in two minutes from left to right.

7th Experiment.—Four gentlemen and four ladies placed themselves round the large drawing-room table mentioned in the 5th experiment. They assumed successively the standing, the kneeling, and the sitting postures; but, after waiting for twenty-five minutes, no result whatever was produced. The four gentlemen then withdrew, and four ladies then took their places, thus placing eight ladies round the table. It moved in two minutes.

These experiments we consider to be so conclusive, that comment is hardly necessary. The conditions of the bodies to be moved, and of the human forces by which the movement is to be accomplished, are precisely those which, *a priori*, we should have anticipated. A small table is moved more readily than a large one, and it is moved more easily upon an oil-cloth than upon a carpet; it is moved more easily by females than by males, because, in the former, the muscles are more mobile, *the will less strong*, the emotions more acute, the ideas more vivid. It is said that young persons succeed better than persons advanced in years, —a fact which may be readily explained upon the same principles.

We would especially call attention to the few words in the last sentence but one, which state our opinion, that it is *weakness* and not *strength* of will which readiness to assume these involuntary actions testifies. The more powerful the higher faculties of the mind, the less quickly do the muscles act on the impulsion of the ideas only. In men, where the intellect is naturally stronger, and in adults, where it is strengthened by use, the manifestations of ideomotor acts are repressed. And we would call attention to this fact for a practical purpose, viz., with the object of cautioning the public, through our readers, against trying these sort of experiments too often. It is very certain, that each trial renders the "table mover" more ready at exhibiting the required phenomena, more under the dominion of ideas, and less under the dominion of rational will. Each trial then must weaken the intellectual powers, must make the experimenter less a man, and more an instinct governed animal. The peculiar state of mind induced, is not, perhaps, either hysteria or insanity; but it is akin to both.

The experiment, now so often repeated, of suspending a ring by a thread coiled around the finger, placing the ring within a tumbler, and hearing it strike the glass as many times as correspond to the hour, is a phenomenon analogous to table moving, and very interesting in a physiological point of view. The person who performs the experiment exercises no *voluntary* action upon the movements of the ring; but he knows the hour, and, this acting unconsciously upon the organization, a series of involuntary muscular vibrations are produced, which result in striking the glass the required number of times.

The Progress of Geology.[*]

Geology is in the ascendant. It counts in its ranks some of the most energetic and able men of science of the day; it claims for its service the only Scientific Society that can bring together a considerable congregation of attentive and intelligent listeners; it occupies and fills, at the annual gathering of the British Association, the largest meeting hall of all the sections, and wins admiration in the Provinces by a yearly sitting of six almost consecutive days, distinguished for the liveliness of the debate and the interest of the subjects discussed; it enforces its importance

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[*] *Westminster Review.*

on the attention of Governments, and into the ears of politicians, usually dull of hearing when addressed concerning matters purely intellectual, or calculated to advance rather than impede human progress. Extensive surveys are instituted for the prosecution of geological research; noble museums are erected for the display of geological treasures; lectureships are endowed for the inculcation of geological truths. A conviction has taken root among the people, that the history of the formation of the earth, and the investigation of its structure and contents, are worthy subjects of national inquiry, and—what with practical men weighs more heavily—likely to prove more conducive to the development of national wealth. A few years ago, geology was perhaps more fashionable and more amusing; as the work became harder, and the talk less diverting, her fashionable friends fell away. But better and truer allies are arising among the masses of the people. Let geology put trust in them, work for them, teach what she has learnt to them, and there shall be greater honors in store for her than can be conferred by the applause of magnates, and the smiles of fine ladies. The hard and horny hand of the miner and mechanic will be frankly proffered for the pledge of fraternity—-no languid pressure there, but a warm grasp and hearty shake. The farmer, ever slow and suspicious, will hold back awhile; but the good sense that lies smouldering in this dullest of the avatars of John Bull will, sooner or later, burn up, and, like the light streaming from the eye of a dark lantern, shew science at hand to help, where an enemy and plunderer was suspected.

Neither man not science can work the way to permanent position without a struggle. Whatever is worth gaining must be fought for. The rest of peace, which is faith either in virtue, or in truth, or in order, must be won according to its kind by war moral, or intellectual, or physical. The man whose course through life provokes no enemy, and excites no opposition, must be a nonentity; so, too, with doctrine, discovery, and science. A late eminent and eccentric Scotch naturalist and antiquarian professed to disbelieve the results of his researches, and set about seeking for errors in them, whenever they were at once accepted without opposition or cavil. There was reason in this odd fancy—more than critics gave him credit for. Geology would not have been now what it is, had the path of its progress been less thorny, and its opponents less active. The energy and enthusiasm of geologists has made the growth of their science seem almost magical in rapidity; yet it was no unsubstantial Boletus, springing in a night, or it had been trampled down by its adversaries as fast as it grew. It had, however, its adventitious helps, that served to gain for it the attention of the unscientific and of men of the world. The younger of all the Minervas that have budded from the brain of Jupiter, Geology would have languished, and possibly pined away beneath the cold glances of her stern and mature sisters, and the more damaging enmity of her father's priests, had not paternal love endowed her with an Ægis in the shape of a winning presence, and the gift of the gab. Her missionaries during the time—scarcely yet gone by—when she won her way most rapidly into public favour, were orators and men of mark. There was no mock modesty about her; perhaps not overmuch of the reality of that virtue. Like a woman of genius—and a handsome one, too—she was opinionative and dogmatical; bold in assertions, and apt to let imagination get the mastery over judgement. But these were the failings of healthy youth—the consequences of fullness and richness of blood, and much more likely to end—as they have done—in a sound condition of ripened limb and body, than if they had been substituted by excess of caution, fear of giving offence, shrinking timidity, and dread of authority.

Of the three subjects which seem to suggest themselves most naturally to the inquisitive faculty of the human mind—the constitution of man himself, the constitution of the world upon which he lives, and the constitution of the universe, of which that world forms a part—it is remarkable that the second, and apparently easiest, should have been neglected for ages after earnest study of the other two had commenced and advanced, or was so treated as to be prolific only in vague fancies, and generate no true science. Geology, as contradistinguished from cosmogony, seems to have lain dormant during the brightest epochs of antiquity, and to have excited scarcely a spark of thought, even in the combustable brain of Aristotle himself. A shrewd and accurate observer, old Strabo, it is true, had notions about volcanoes and the isolation of morsels of land, that made a fair approach to geological theorizing; but with this almost solitary exception, it was reserved for modern—in reality, for very modern—philosophers to inaugurate a science which, during its brief infancy and shorter youth, attained the dimensions of a giant, and claimed and won an equal seat with its proudest compeers. Solitary prophets arose from time to time, and seemed in imperfectly understood predictions to foretel the advent of a new philosophy. Great men were among them; men who, in the midst of sterner and fairer pursuits, saw dim indications of mysterious and wonderful workings of the soil beneath their feet, and the mountains that cast long shadows. They asked of themselves, why should there be hills to cast these long shadows; and how grew up the mountain tops? They demanded whether there was not an anatomy to be dissected out of the corpse of mother earth, as in the bodies of her living and moving children? They ventured to think that rugosities of the world's surface were the wrinkles of age, the stamps of ancient cares, the ravages of unrecorded convulsions. They gathered petrifactions out of the rocks, and, comparing them with ejectamenta of the ocean, saw, and what is more, admitted to themselves that they saw, the unquestionable proofs of a similar organization and an identical origin. In Italy especially was a light seen dimly heralding the dawn; and foremost among those who marked the glimmer was that astonishing old painter, Leonardo da Vinci, on whose active mind all the sciences of his time and scraps of sciences then unborn, seem to have been spread in dabs, like the colors on his professional palette. It is a great glory to Italy to have played the part she did in the nursing and nourishing of infant geology. Alas! how many of the children reared by that most beautiful of mothers have been abandoned by her in their childhood, or disowned after attaining their youth or manhood. Not so with this sturdy science; Italy has still her geologists, and good ones too; yet even these might have been denied to her had the training of the infant rested in her care. Under the colder and cloudier skies, amid the rougher and sterner minds of Britain, did geology attain that vigor which has resulted in the strength of an immortal.

Astronomy was the black sheep among the sciences during the middle ages; geology has played that unpleasant part in later and more enlightened times; nay, is even shunned as disreputable by numbers of generally well-informed and well intentioned people at the present day. Although to the honor of the priesthood, not a few of its ablest advocates, and some of its earliest and boldest supporters have come from their ranks, parsons as a body still fight shy of geology and geologists, and were martyrdom by roasting in fashion, we might see Greenough, Lyell, Murchison, De la Beche, Filton, and Mantell all protesting against plutonic agencies at Smithfield, whilst Conybeare, Sedgwick, Henslow, and possibly even the Bishop of Oxford (who knows more of geology than common people give him credit for,) would be doing penance for their unsanctified acquirements in chilly dungeons on a neptunian diet of cold water. The two cardinal sins of geologists in the eyes of good people, are their belief in the world's preadamitic antiquity, and their disbelief in the universality of the deluge. The vague general distrust of them that pervades respectable country society, and concentrates into positive abhorrence in the congregations of Exeter Hall will, when minutely analyzed, be found to resolve itself into more or less clearly understood objections against the two articles just mentioned. Of course, truth must conquer, and before twenty years are over, the world's antiquity and the partiality of the deluge will be taught to children in schools with no more hesitation than is now entertained about teaching the motion of the earth round the sun. Strange to say, the first of these obnoxious doctrines was treated as an open question by many divines before geological discovery brought facts to bear upon it. Almost exactly two hundred years ago, one of the brightest and purest spirits among the clergy of the Church of England, Dr. Henry More, published his "Conjectural Essay of Interpreting the Mind of Moses."* In this singular treatise he boldly maintained that the narrative of the Creation contained in the commencing chapters of Genesis, professes on principle to describe the appearance (as distinguished from the reality) of things to sense and obvious fancies, "accommodating the outward cortex of Scripture to the most narrow and slow apprehension of the vulgar," and offering "reasons of sundry notable phenomena of nature, bearing altogether a most palatable compliance with the most rude and ignorant conceits of the vulgar." In accordance with his somewhat eccentric plan, he makes Moses interpret his history, verse by verse, for the benefit of the more enlightened. His "philosophic" interpretation of the fourth verse of the second chapter of Genesis is very remarkable:—"I (*i. e.*, Moses) do not take upon me to define the time wherein God made the heavens and the earth; for he might do it at once by his absolute omnipotency, or he might, when he had created all substance, as well material or immaterial, let them act one upon the other, and in such periods of time, as the nature of the production of the things themselves required." This curious passage (and the volume containing it) seems to have escaped the researches of Pye Smith and others who battled in controversies about scriptural geology; discussions, the only value of which is their tendency to remove the prejudices or scruples of honest but timid men who fear to confront their faith with scientific truth. Such interpretation as this may prove to them how dangerous it is to lay an overstress on the apparent meaning of passages susceptible of various readings. On the view taken by More of the meaning of the scriptural text cited, the most heretical of cosmogonists, Lamarckian transmutationists, spontaneous generationists, and believers in the doctrines the "Vestiges of Creation," might all stoutly, and with equal reason, maintain that their peculiar tenets are scriptural and orthodox. Let this be a warning to those who would dogmatically put down scientific speculations on religious grounds alone. Let it also be a warning to geologists who are over-anxious to reconcile the literal reading of the Sacred Writings with the logical interpretation of the facts revealed to them in the course of scientific research. We might extend the caution to the best informed of writers upon scriptural geology, and in that category we would place among the foremost Professor Hitchcock, whose recent work, entitled "The Religion of Geology," is the safest and best of an unsafe class. Far superior to Pye Smith in practical acquaintance with his subject, he treats it in a more masterly and convincing style, but the resulting conviction is more in favour of the earnestness of the author than of the soundness of his arguments.

Some of the older and steadier sciences, who having long ago come to years of discretion, ought to have known and behaved better, have been inclined now and then to disparage and trip up their younger and more impetuous sister, whose enthusiasm, haste, and occasional levity, excited their ill-will. The enemies of geology delighted in seeing the slight put upon her by these grave and ancient maidens, who used her very much as the proud sisters treated Cinderella. One cause of dislike arose from the circumstance that the active advocates of geology were not always trained workmen, but volunteers, who had assumed the hammar without previous preparation, or very much consideration respecting its purpose or their own. To see good work done by such undisciplined troops troubled the disciplinarians much in the manner that old soldiers become troubled when they find militia-men fighting a good battle, or amateur tacticians developing excellent plans of warfare. In truth, however, if a man had wished to educate himself regularly into a geologist during the earlier days of the science, there was no school—certainly none in England—where he could be instructed in even the elements of the subject. Things have been altered for the better since, and there are now many opportunities of acquiring the fundamental knowledge desirable for those who would enter upon geological research. In a few years a number of young men will be engaged in occupations of which geology forms, or should form, an element, better trained for their work than any of the builders-up of the science were. The examination papers submitted during this spring to the students of the newly established Government School of Mines would demand for answering a long sitting of even the leading members of the geological Society, and, (just possibly, of course,) might not be answered after all.

It was the tremendous pace at which some of the early geologists went, that threatened to kill their own, and called forth the censures of the slower sciences. They thought nothing of submitting our planet to sudden extremes of heat and cold; shivering it into small fragments as suddenly as a Prince Rupert's drop; doubling it into intricate contortions with the facility (a not unusual illustration) that a pocket-handkerchief or a sheet of paper may be crumpled; melting it down, stirring it up, and keeping a sufficient supply of internal heat to produce a hypertropical climate during immeasurable ages; killing off whole floras and faunas at a moment's notice, and creating a new batch of beasts and vegetables with equal ease and rapidity; swamping the earth with no end of universal deluges; investing it in all but unbounded fluviatile formations; or, wrapping it in a chilling chrystalline coat of solid ice. With them our unlucky planet was fast becoming—

> "A world of wonders, where creation seems
> No more the work of Nature, but her dreams;"

and there is no surer proof of the good stuff of which geology is made, than the awful trials to which she was submitted by her over-zealous disciples.

Repeopling of Streams with Fishes, or Pisciculture.

Communicated by M. J. Nicklès to Silliman's Journal for July.

In my last communication I mentioned briefly the experiments of M. Millet on the reproduction of fishes. I have said that, thanks to the modest fisherman of the Vosges, Rémy, fish is now in fact a manufacture in France,—a fact most valuable to our old Europe, which has hardly the means of sustaining its inhabitants, and whose streams have been depopulated of the good kinds of fish, the spawn having been destroyed by manufactories along the water-courses, by steamboats, drainage works and inundations.

A paper by M. Haxo, Secretary to the Société d'Emulation des Vosges, gives the history of this important invention, and reviews the means employed by Rémy for populating with trout the streams of his neighborhood. The fisherman observed the time when the female deposited its eggs; he remarked that the male then comes and spreads over it the fecundating liquid; and as our observer could but imperfectly protect these eggs from the various chances of destruction. he learned how to imitate nature,

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* "Conjectura Cabalistica; or, a Conjectural Essay of interpreting the mind of Moses, according to a three-fold Cabala—Literal, Philosophical, Mystical, or Divinely Moral. London: 1653.

by promoting the parturition of the female, and then that of the male, and placing the eggs in the conditions most favorable for their development; he had thus the happiness of seeing the breeding of a certain number of trout, and noticed their preserving under the venter a part of their eggs, and living during some time at the expense of the rest.

But this was not all. it was necessary to provide for the ulterior preservation of the young animal by a practicable process. The obscure fisherman, who hardly knew how to read, did not yield before this difficulty: he set at work observing again; he placed some frogs in the basin containing the young trout, judging with reason that the spawn of these batrachians would be a resource for the spawn of the trout; he gave them also bits of veal as they grew larger. But as these aliments, though successful, would be too expensive, Rémy, not knowing of the existence of the sciences of botany and chemistry, contrived a process based on one of the great laws of nature. He planted some herbivorous fishes in the water which contained the carnivorous trouts, and from this moment he had no more trouble with the raising of his "élèves." In the course of six years, with very limited means, Remy, who was in the interval associated with Gehin, had bred several millions of salmon and trout. After he had been for six years thus preparing the living food for his fishes, M. Haxo, made known his results to the Academy of Sciences, and the government ordered a full investigation into Remy's process. Pisciculture was established in the basins of the canal of the Rhone, on the Rhine at Luningue, in the department of the Upper Rhine, not under the direction of Remy or of Gehin, but of M. Coste, who had succeeded in appropriating to his own profit the labors of the modest fisherman. A spirited dispute ensued, which continues still, and has engaged several independent pens, as MM. Haxo, Victor Meunier, the journal *La Presse*, the Abbe Moigno, etc.. who defended the rights of the oppressed against the despoiler. Justice will be done; Remy will receive a pension as a national recompense.

The following is briefly the method employed in this new branch of industry. Through M. Millet, Inspector of Forests, the processes are become so simple that they can be executed by the most inexperienced hands. The Administration of the waters and forests, is now organizing a regular service for effecting a repeopling of the waters of navigable streams. The apparatus of M. Millet is placed in the hands of the fish-keepers, and the living alimentary material will be manufactured, so to speak, at all points. The details which follow are taken from a work yet unpublished on Millet's process, which I have seen in the course of its preparation.

Two boxes of lead, 1 meter long and 1 to 2 decimeters broad, and 5 to 6 centimeters deep, are disposed in steps in the fire-place of his apartments. Some frames or sieves of hair, flags or metallic network, etc., contain the eggs. According to the species, these eggs are immersed to a depth of one or several centimeters. These frames may be withdrawn or replaced at will, by means of strings which support them by pressing against the side of the box. A reservoir of water, furnished with charcoal and gravel, is near by, and turns into the box, drop by drop, filtered water, furnishing about 2 or 3 litres of water per hour. The water is thus always in motion, and it is only necessary to fill the reservoir each morning to keep the apparatus in action without supervision.

The total expense of the establishment is but 6 francs. With 35 litres of water for six weeks, M. Millet has bred about 25,000 trout or salmon, and he expects to breed some millions of different species in the course of the year.

In order to obtain the eggs from the female, M. Millet employs nearly the process used by Remy and Gehin. He makes the eggs to pass out only as they are mature, leaving an interval of two days between each operation, this consisting in passing the finger lightly over the surface of the abdomen of the female. Another process consists in enclosing the female in a cage with a double bottom, formed of bars rather far apart; the females drop their eggs by organic contraction, and aid themselves in it by rubbing against the bars. The eggs fall upon the frame. The males are then introduced, and often they fecundate at once the eggs, being incited to it by the presence of the female and the odor of the eggs; but if not so, it is provoked by slight friction, as in the ejection of the eggs from the female.

Another result of interest is, that M. Millet has caused trout and like species which live in running streams, to breed in standing waters, by causing some aquatic plants to grow in the water. The species which I have seen employed, was the *Lemna minor* (duck weed.)

This experiment calls to mind the *organic equilibrium* of Mr. Warrington. It is known that this chemist has for several years kept in a glass vase full of water, a small aquatic menagerie, consisting of a *Valisneria spiralis*, several fish, (species of Gasterosteus), and some aquatic univalves, without injuring the purity of the water. It is seen that the carbonic acid and azotized products given out by the animals are absorbed by the plant, which converts at the same time the carbonic acid into oxygen. The debris of the plant serves as nutriment to the snails whose eggs in their turn feed the fish.

The process of M. Millet has been put in practice in several places near Paris, and re peopling the rivers has been already begun. Contrary to the prescription of Remy and Gehin, who nourished the young for some time on the spawn of frogs and coagulated blood, after the pouch under the venter had disappeared, M. Millet commences the distribution of them whenever this period has arrived. The future will show whether the method just mentioned is wise, or whether it will not be necessary to return to the process of Remy, which consists in "sowing" herbivorous fishes in the streams populated by the trouts. M. Millet is still engaged in his labors, and we shall endeavour to keep our readers acquainted with the progress of this new branch of industry.

On the Origin of Coal-Fields.

By Sir Charles Lyell.

The force of the evidence in favour of the identity in character of the ancient coal-fields, with the deposits of modern deltas, has increased, in proportion as they have been more closely studied. They usually display a vast thickness of stratified mud and fine sand without pebbles, and in them are seen countless stems, leaves, and roots of terrestial plants, free for the most part from all intermixture of marine remains, circumstances which imply the persistency in the same region of a vast body of fresh water. This water is also charged like that of a great river with an inexhaustible supply of sediment, which had usually been transported over alluvial plains to a considerable distance from the higher grounds, so that all coarser particles and gravel were left behind. On the whole the phenomena imply the drainage and denudation of a continent or large island, having within it one or more ranges of mountains. The partial intercalation of brackish water-beds at certain points is equally consistent with the theory of a delta, the lower parts of which are always exposed to be overflowed by the sea even where no oscillations of level are experienced.

The purity of the coal itself, or the absence in it of earthly particles and sand throughout the areas of very great extent, is a a fact which has naturally appeared very difficult to explain if we attribute each coal-seam to a vegetation growing in swamps, and not to the drifting of plants. It may be asked how during river inundations capable of sweeping away the leaves of ferns and the stems and roots of Sigillariæ and other trees, could the waters fail to transport some fine mud into swamps? One generation after another of tall trees grew with their roots in mud, and they had fallen prostrate, had been turned into coal, were covered with layers of mud (now turned to shale), and yet the coal itself has remained unsoiled during these various changes. The lecturer thinks this enigma may be solved, by attending to what is now taking place in deltas. The dense growth of reeds and herbage which encompasses the margins of forest-covered swamps in the valley and delta of the Mississippi, is such, that the fluviatile waters in passing through them, are filtered and made clear to themselves, entirely before they reach the areas which vegetable matter may accumulate for centuries, forming coal if the climate be favorable. There is no possibilty of the least intermixture of earthly matter in such cases. Thus in the large submerged tract called the "Sunk Country," near New Madrid, forming part of the Western side of the valley of the Mississippi, erect trees have been standing ever since the year 1811-12, killed by the great earthquake of that date; Lacustrine and swamp plants have been growing there in the shallows, and several rivers have inundated the whole space, and yet have been unable to carry any sediment within the outer boundaries of the morass.

In the ancient coal of the South Joggins in Nova Scotia, many of the underlays show a net work of Stigmaria roots, of which some penetrate into or quite through older roots which belonged to the trees of a preceding generation. Where trunks are seen in an erect position buried in sandstone and shale, rooted Sigillariæ or Calamites, are often observed at different heights in the enveloping strata, attesting the growth of plants at several successive levels, while the process of envelopment was going on. In other cases there are proofs of the submergence of a forest under marine or brackish water, the base of the trunks of the submerged trees being covered with serpulæ or a species of spirorbis. Not unfrequently seams of coal are succeeded by beds of impure bituminous limestone, composed chiefly of compressed Modiolæ with scales and teeth of fish, these being evidently deposits of brackish or salt water origin.

The lecturer exhibited a joint of the stem of a fresh water reed (*Arundinaria mascrosperma*) covered with barnacles, which he gathered at the extremity of the delta of the Mississippi, or the Balize. He saw a cane-brake (as it is called in the country) of these tall reeds killed by salt water, and extending over several acres, the sea having advanced over a space when the discharge of fresh water had slackened for a season in one of the river's mouths. If such reeds when dead could still remain standing in the mud with barnacles attatched to them, (these crustaceæ having been in their turn destroyed by a return of the river to the same spot,) still more easily may we conceive the large and firmly rooted Sigillariæ to have continued erect for many years in the Carboniferous Period, when the sea happened to gain on any tract of submerged land.

Submergence under salt water may have been caused either by a local diminution in the discharge of a river in one of its many mouths, or more probably by subsidence, as in the case of the erect columns of the Temple of Serapis, near Naples, to which Serpulæ and other marine bodies are still found adhering.

Sir Charles next entered into some speculations respecting the probable volume of solid matter contained in the carboniferous formation of Nova Scotia. The data he said for such an estimate are as yet imperfect, but some advantages wonld be gained could we but make some slight approximation to the truth. The strata at the South Joggins are nearly three miles thick, and they are known to be also of enormous thickness in the district of the the Albion Mines near Pictou, more than one hundred miles to the eastward. There appears therefore little danger of erring on the side of excess, if we take half that amount or 7500 feet as the average thickness of the whole of the coal measures. The area of the coal-field, including part of New Brunswick, to the west, and Prince Edward's Island and the Magdalen Isles to the north, as well as the Cape Breton beds together with the connecting strata which must have been denuded or must still be concealed beneath the waters of the Gulf of St. Lawrence, may comprise about 36,000 square miles, which with the thickness of 7500 feet before assumed will give 7,527,168,000,000,000 cubic feet, (or 51,136.4 cubic miles) of solid matter as the volume of the rocks. Such an array of figures convey no distinct idea to the mind; but is interesting when we reflect that the Mississippi would take more than two million of years (2,033,000) to convey to the Gulf of Mexico, an equal quantity of solid matter in the shape of sediment, assuming the average discharge of water, in the great river, to be as calculated by Mr. Forshey, 450,000 cubic feet per second, throughout the year, and the total quantity of mud to be as estimated by Mr. Riddell, 3,702,758,400 cubic feet in the year.*

We may, however, if we desire to reduce to a minimum the possible time required for such an operation, (assuming it to be one of fluviatile denudation and deposition,) select as our agent, a river flowing from a tropical country, such as the Ganges, in the basin of which the fall of rain is much heavier, and where nearly all comes down in a third part of the year, so that the river is more turbid than if it flowed in temperate latitudes. In reference to the Ganges, also, it may be well to mention, that its delta presents in one respect a striking parallel to the Nova Scotia Coalfield, since at Calcutta the depth, of eight or ten feet from the surface, buried trees and roots have been found in digging tanks, indicating an ancient soil now underground; and in boring on the same site for an Artesian well to the depth of 481 feet, other signs of ancient forest-covered lands and peaty soils have been observed at several depths, even as far down as 300 feet and more below the level of the sea. As the strata pierced through contained fresh water remains of recent species of plants and animals, they imply a subsidence, which has been going on contemporaneously with the accumulation of fluviatile mud.

Captain Strachey of the Bengal Engineers has estimated that the Ganges must discharge 4½ times as much water into the Bay of Bengal, as the same river carries past Ghazipore, a place 500 miles above its mouth, where experiments were made on the volume of water and proportion of mud by the Rev. Mr. Everest. It is not till after it has passed Ghazipore, that the great river is joined by most of its larger tributaries. Taking the quantity of sediment at one-third less than that assigned by Mr. Everest for the Ghazipore average, the volume of solid matter conveyed to the Bay of Bengal would still amount to 20,000 millions of cubic feet annually. The Ganges therefore might accomplish in three hundred and senventy-five thousand years the task which it would take the Mississippi, according to the data before laid down, upwards of two million years to achieve.

One inducement to call attenion to such calculations is the hope of interesting engineers in making accurate measurement of the quantity of water and mud discharged by such rivers as the Ganges, Brahmapootra, Indus, and Mississippi, and to lead geologists to ascertain the number of cubic feet of solid matter, which ancient fluviatile formations, such as the coal-measures,

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*See Principles of Geology, 8th ed., p. 19.

with their associated marine strata, may contain. Sir Charles anticipates that the chronological results, derived from such sources, will be in harmony with the conclusions to which botanical and zoological considerations alone might lead us, and that the lapse of years will be found to be so vast as to have an important bearing on our reasonings in every department of geological science.

A question may be raised, how far the co-operation of the sea in the deposition of the Carboniferous Series might accelerate the process above considered. The Lecturer conceives that the intervention of the sea would not afford such favorable conditions for the speedy accumulation of a large body of sediment within a limited area, as would be obtained by the hypothesis before stated, namely, that of a great river entering a bay in which the waves, currents, and tides of the ocean should exert only a moderate degree of denuding and dispersing power.

An eminent writer, when criticising, in 1830, Sir Charles Lyell's work on the adequacy of existing causes, was at pains to assure his readers, that while he questioned the soundness of the doctrine he by no means grudged any one the appropriation of as much as he pleased of that "least valuable of all things, past time." But Sir Charles believes, notwithstanding the admission so often made in the abstract of the indefinite extent of past time, that there is, practically speaking, a rooted and perhaps unconscious reluctance, on the part of most geologists, to follow out to their legitimate consequences the proofs, daily increasing in number, of this immensity of time. It would therefore be of no small moment could we obtain even an approach to some positive measure of the number of centuries which any great operation of nature such as the accumulation of a delta or fluviatile deposit of great magnitude may require, in as much as our conceptions of the energy of aqueous or igneous causes, or of the powers of vitality in any given geological period must depend on the quantity of time assigned for their development.

Thus, for example, geologists will not deny that a vertical subsidence of three miles took place gradually at the South Joggins, during the carboniferous epoch, the lowest beds of the coal of Nova Scotia like the middle and uppermost consisting of shallow-water beds. If then this depression was brought about in the course of three hundred and seventy-five thousand years, it did not exceed the rate of four feet in a century, resembling that now experienced in certain countries where, whether the movement be upward or downward, it is quite insensible to the inhabitants, and only known by scientific inquiry. If, on the other hand, it was brought about in two millions of years according to the other standard before alluded to, the rate would be only six inches in a century. But the same movement taking place in an upward direction would be sufficient to uplift a portion of the earth's crust to the height of Mont Blanc or to a vertical elevation of three miles above the level of the sea. In like manner, if a large shoal be rising, or attempting to rise, in mid-ocean at the rate of six inches or even four feet in a hundred years, the waves may grind down to mud and sand and readily sweep away the rocks so upraised as fast as they come within the denuding action of the waves. A mass having a vertical thickness of three miles might thus be stripped off in the course of ages, and inferior rocks laid bare. So in regard to volcanic agency a certain quantity of lava is poured out annually upon the surface, or is injected into the earth's crust below the surface, and great metamorphic changes resulting from subterranean heat accompany the injection. Whether each of these effects be multiplied by fifty thousand, or by half a million or by two million of years, may entirely decide the question whether we shall or shall not be compelled to abandon the doctrine of paroxysmal violence in ancient as contrasted with modern times. Were we hastily to take for granted the paroxysmal intensity of the forces above alluded to organic and inorganic, while the ordinary course of nature may of itself afford the requisite amount of aqueous, igneous, and vital force, (if multiplied by a sufficient number of centuries,) we might find ourselves embarrassed by the possession of twice as much mechanical force and vital energy as we require for the purposes of geological interpretation.—*Sill. Jour.*

The Northern Railway.

The conveyance of a party of gentlemen from Toronto to Bradford, by a Special Train, on Wednesday, the 6th July, at the instance of the Chief Engineer and the Superintendent of this line, is an event which we chronicle with particular pleasure, and some degree of pride. It is indeed a matter of no small moment to Western Canada, and especially to Toronto, that it is now possible to pass from Lake Ontario at a speed exceeding forty miles an hour, over an elevation of more than 730 feet, to the landing place on Lake Simcoe, in direct, though not yet available communication with the world of waters to the west.

It is, however, in relation to the local advantages which the Northern Railway confers upon the fertile country through which it passes, that we are as yet enabled to speak with that certainly which actual observation and experience permit. Many portions of the extensive country traversed by the line, cannot fail to impress the passing stranger with a well grounded conviction of its admirable adaptation to support a dense and independant population. Of the wild beauty of mountain scenery Western Canada itself, can scarcely boast, and certainly none is to be found on the Northern line, as far as Bradford; but of undulating plains of extraordinary fertility, a teeming soil and a healthy, industrious population, of these lesser, but more desirable attractions, a rich share is strewn around its path.

The part of the Northern Line so rapidly passed over by the Express Train, on July 6th, is 42 miles in length, and connects Lake Ontario with Lake Simcoe. The Station on the last named Lake is very fortunately situated upon a deep and navigable river which empties itself into the Lake, about seven miles from the substantial railway bridge, recently thrown across it. Above the bridge the river is navigable for many miles, and thus establishes an easy and rapid communication between a very extensive and fertile inland country, and the only port accessible throughout the year, on the North Shore of Lake Ontario.

Although the line has been opened for a very few weeks, yet it seems to have given already an extraordinary impetus to the growth of the villages through which it passes. The present interest attached to the northern line, is not confined to the fact that it is the first railway which has been opened for so long a distance in Western Canada, or that the speed attained by a Special Train, nearly equalled the usual rapidity of the English Express trains; it is something to know that the *materiel* of the line, the Locomotive and Cars, are in themselves, admirable illustrations of the rapid progress we are making in the mechanical arts. Canadian White Oak and Bird's Eye Maple, give a lightness and brilliancy to the First Class Passenger Cars, which we have rarely seen equalled, and as to the ease and comfort of the whole of their internal arrangements, it would be gilding refined gold to have them surpassed.

As a portion of the line is still unballasted, the extraordinary rapidity with which the train moved down some of the inclines, naturally gave to it a disagreeable oscillatory movement, which will of course be materially diminished when the ballasting is completed. We do not suppose, however, that it is in contemplation at present to run regular passenger trains, at the speed we have already alluded to. After some months traffic the irregular oscillations will probably cease by the increased stability of the track.

To the enterprise and energy of Mr. Good of Toronto, the public are indebted for the construction of the powerful locomotive, which brings the lakes within an hour's ride of one another; and to Messrs. McLean and Wright, for the luxurious passenger cars, which exhibit a neat taste in design, and appropriate skill in workmanship. The gentlemen who participated in the rare pleasure of the trip, are indebted to the politeness of Mr. Cumberland, the Chief Engineer, and to Mr. Brunel, the Superintendent of the line, who added to the obligations of their guests, by providing most abundant and delicious refreshments, appropriately arranged in a second class carriage. We have been favoured with the dimensions of the curves, and data connected with the grading of the line as far as Bradford. The remarks which we have prepared on these and other associated subjects, want of space compels us to withhold, until the August number of the *Journal.*

Montreal Natural History Society.

The twenty-fifth annual report of the Natural History Society of Montreal is a very encouraging document. It indicates the revival among its present members of that vigorous spirit which inspired its first promoters, when they founded and sustained for a season, "the pioneer in this country of the development of its Natural History."

We notice with much pleasure the compliment paid by the Council to their indefatigable President, Major Lachlan. Every member of the Canadian Institute, recalling the incidents of the late Annual Conversazione, will readily acknowledge the influence which even one active and zealous individual may exercise upon the usefulness and prosperity of a Scientific Society; particularly in a country whose rich domains of Natural History and Science have hitherto found few discoverers willing to communicate to the public the results of their enquiries. We transcribe with cordial feeling, the following allusion, by the Montreal Natural History Society, to the valuable services of their President.

> "In referring to the transactions of the past year, your Council experience some difficulty in selecting those of the most interest; but they would be wanting in due regard to the general feelings of the Society, were they to refrain from asking especial attention to the very valuable services of our President, Major R. Lachlan, who succeeded to the chair in October last, consequent on the removal from the city of its former occupant, Dr. Sewell. Your President has been indefatigable in his endeavors to resuscitate the Society, his personal labors in connection therewith have been unremitting, and the value thereof is fully substantiated by, among other advantages, the greatly increased subscription list, the success of the first *soiree*, held on the evening of the 12th April last, and the prospect of a volume of Transactions being published ere long. The Council are quite convinced that the Society will fully recognize and acknowledge the merits of its Chief, who has contributed so much in reinvigorating the character of its proceedings, and giving an impetus thereto, which, it is sincerely hoped, no untoward circumstances may arise to arrest or retard."

The Museum of the Society has received many important accessions; especial reference is made by the Council to the liberality of one of its members.

> "The Council, however, trust it will not be considered invidious in making special reference to the extensive donations of Dr. Gibb, one of our members, consisting as they do of above 300 specimens in various departments of Natural History and comparative Anatomy, and an equally large collection of miscellaneous and rare articles, from all quarters of the Globe."

An extensive and well arranged museum is an admirable acquisition, and furnishes in itself a most prolific field for private study, and very desirable opportunities for illustrating public lectures. We rejoice in the renovated energies of the Montreal Natural History Society, and cordially wish that they may be sustained in healthy and vigorous action.

The Observatory.

In our last issue we informed our readers that the Magnetic Observatory at Toronto, established by the Imperial Government and supported by them for a period of twelve years, had been taken in charge by the Provincial authorities, with the intention of being retained as a permanent establishment: we are now able to give more detailed information on the subject.

Some time in February last, Captain Lefroy received orders from the home-government to pack up the instruments, dismantle the observatory and return home with the military detachment which had been, under his superintendence, employed in the observations. With his usual zeal and energy, he lost no time in bringing the matter to the notice of his Excellency the Governor General, urging the importance and interest of the scientific results that might be expected from retaining an observatory complete in all points and which had already earned a reputation second to none throughout the world. In these representations he was powerfully backed by the petitions of our own and kindred societies in both sections of the Province. With most praiseworthy promptitude and liberality, the Provincial authorities at once communicated with the Imperial Government offering to purchase the equipment of the observatory in full, and in the same spirit they were responded to, and the negociation completed without delay. The munificent sum of £2000 voted for this purpose in the last session of Parliament gives a striking and most pleasing proof of the esteem in which Science is held in this country.

In the meanwhile Captain Lefroy had returned to England, leaving, however, the Military Detachment behind, and formally placing the Observatory, according to his instructions, under the charge of Mr. Cherriman. The Magnetical Observations had been in part interrupted by the introduction of Iron during the process of packing some of the Instruments which could not be left behind, and also by nearly all the Instruments having been dismounted for the purpose of final verification. Their adjustment of course occupied some time, but it is now completed, and the full observations are now made as before. The Meteorological observations have never been at all interrupted. Instruments to replace those taken away, besides others which it has been thought advisable to introduce, have been ordered from England, and are daily expected, and certain necessary repairs and alterations will be commenced as soon as the plans for them can be procured.

The Military Detachment so long employed on this service, has been permitted by Her Majesty's Government to remain here for so long a period as may be necessary to enable Mr. Cherriman to make a report to His Excellency, of the staff that will be required, and of the steps that may be advisable to render the establishment permanently effective and complete.

We cannot conclude without congratulating the Province upon the completion of arrangements which secure to Western Canada this extensive and well appointed Magnetic and Meteorological Observatory, under a gentleman whose distinguished career at the University of Cambridge is sufficient guarantee that all the interests of Science will be as industriously and efficiently maintained as they have hitherto been, within the same walls, under that management which has given to it the wide spread and exalted reputation it now enjoys throughout the scientific world.

The Canadian Journal.

At the conclusion of the First Volume of the Canadian Journal, we have much pleasure in informing its supporters and contributors that the whole of the present edition, with the exception of a few copies, reserved for the purposes of the Institute, has been subscribed for. We may also state that it is confidently anticipated that the circulation of the journal during the year 1853-4, will be such as to cover all the ordinary expenses of its publication. In view of an extended circulation, the Council of the Institute have made arrangements for a very considerable increase in the monthly issue.

How to Preserve Potatoes from the Rot.

Thoroughly dried potatoes will always produce a crop free from disease. Such is the positive assertion of Mr. Bollman, one of the Professors in the Russian Agricultural Institution at Gorigoretsky. In a very interesting pamphlet by this gentleman, which has just reached us, it is asserted as an unquestionable fact, that mere drying, if conducted at a sufficiently high temperature, and continued long enough, is a complete antidote to the disease.

The account given by Professor Bollman of the accident which led to this discovery is as follows:—He had contrived a potatoe-setter, which had the bad quality of destroying any sprouts that might be on the sets, and even of tearing away the rind. To harden the potatoes, so as to protect them against this accident, he resolved to dry them. In the spring of 1850, he placed a lot in a very hot room, and at the end of three weeks they were dry enough to plant. The potatoes came up well, and produced as good a crop as that of the neighboring farmers, with this difference only, that they had no disease, and the crop was, therefore, upon the whole, more abundant. Professor Bollman tells us that he regarded this as a mere accident; he, however, again dried his seed potatoes in 1851, and again his crop was abundant and free from disease, while everywhere on the surrounding land they were much affected. This was too remarkable a circumstance not to excite attention, and in 1852 a third trial took place. All Mr. Bollman's own stock of potatoes being exhausted, he was obliged to purchase his seed, which bore unmistakable marks of having formed part of a crop that had been severely diseased; some, in fact, were quite rotten. After keeping them for about a month in a hot room, as before, he cut the largest potatoes into quarters, and the smaller into halves, and left them to dry for another week. Accidentally the drying was carried so far that apprehensions were entertained of a very bad crop, if any. Contrary to expectation, however, the sets pushed promptly, and grew so fast that excellent young potatoes were dug three weeks earlier than usual. Eventually, nine times the amount planted was produced, and although the neighboring fields were attacked, no trace of disease could be found on either the herbage or the potatoes themselves.

This singular result, obtained in three successive years, led to inquiry as to whether any similar cases were on record. In the course of the investigation, two other facts were elicited. It was discovered that Mr. Losovsky (living in the government of Witebsk, in the district of Sebege,) had for four years adopted the plan of drying his seed potatoes, and that during that time there had been no disease on his estate. It was again an accident which led to the practice of this gentleman. Five years ago, while his potatoes were digging, he put one in his pocket, and on returning home, threw it on his stove (*pocle*,) where it remained forgotten till the spring. Having then chanced to observe it, he had the curiosity to plant it, all dried up as it was and obtained an abundant and healthy crop; since that time the practice of drying has been continued and with great success. Professor Bollman remarks that it is usual in Russia, in many places, to smoke dry flax, wheat and rye, and, in the west of Russia, experienced proprietors prefer for seed, onions that have been kept over the winter in cottages without a chimney. Such onions are called *dymka*, which may be interpreted smoke-dried.

The second fact is this:—Mr. Wasileffsky, a gentleman residing in the government of Mohileff, is in the habit of keeping potatoes all the year round by storing them in the place where his hams are smoked. It happened that, in the spring 1852, his seed potatoes, kept in the usual manner, were insufficient; and he made up the requisite quantity with some of those which had been for a month in the smoking place. These potatoes produced a capital crop, very little diseased, while at the same time the crop from the sets which were not smoke-dried was extensively attacked by disease. Professor Bollman is of opinion that there would have been no disease at all, if the sets had been better dried.—*Gardener's Chronicle.*

Marbleized Iron and Stone.—The manufacture of iron imitations of marble has become an extensive branch of business in New York, although it is but little more than a year old. We have before alluded to the process as being chiefly used for mantlepieces, but it is anticipated that it will hereafter be applied to many other purposes; it may be used to imitate any sort of wood, or any other polished surface, as well as stone, the closeness of the imitation depending solely on the skill of the artist by whom it is prepared. Care has, however, to be taken not to hit a hard blow upon the surface and not to scratch it. If you scratch marble, the furrow only reveals the same substance as you beheld on the exterior, but with polished iron the case is very different. The same mode of giving a stony face and polish may be applied to wood, Plaster of Paris, terra cotta, and other substances, as well as iron; it is far superior to scagliola in every respect, and must expel that substance from use altogether. We look to see it applied most extensively, especially in architecture. It makes very handsome pillars, pilasters, and vases for the inside of houses. A different way of producing a result similar to that above spoken of has been discovered by Professor Freund, a Hungarian chemist, for sometime resident in New York; it is chemical and mechanical, the imitations of stone being produced entirely without the pencil of a painter. The elements of the stone desired to be imitated, are chemically combined, and finally polished by grinding or rubbing with water, pumice stone, &c., much as the stone itself would be. For architectural purposes this process produces very beautiful work, far superior to any scagliola; we have seen pillars and wainscotting with all the loveliness of the finest jaspar or agate.—*Liverpool Albion.*

The first vessel of the Australasian Steam-ship Company (Panama Sydney), about to commence operations in New York, will, it is stated, be a new one just completed, called the *Golden Age*. She is of 2561 tons burthen, and has capacity for 1200 passengers (200 first cabin, 200 second, and 200 third), with 1200 tons of coal, and 500 of cargo. It is expected she will enable the passage to Australia to be completed within thirty-five days from New York, and fifty days from England.

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

Nine Miles West of Montreal.

[BY CHARLES SMALLWOOD, M. D.]

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

Day.	Barom: corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapour.			Humi'y of the Air.			Direction of Wind.			Velocity in Miles per Hour.			Rain in Inch.	Weather, &c.—A cloudy sky is represented by 10; a cloudless sky by 0.			REMARKS.
	6 A. M.	2 P. M.	10 P.M.	6 A. M.	2. P.M.	10P.M.	6 A. M.	2 P. M.	10P.M.	6 A. M.	2 P. M.	10P.M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10P.M.		6 A. M.	2 P. M.	10 P. M.	
1	29.967	29.908	29.862	52.1	76.1	62.3	0.299	0.471	0.397	.71	.51	.71	S	E b S	E	0.65	1.00	1.39		C.C. St. 9.	Cirr. 4.	C.C. Str. 9.	
2	.875	.752	.667	58.0	79.2	66.0	.400	.568	.500	.81	.58	.73	E b N	E b S	E b S	0.17	2.03	2.77		Str. 10.	Light Cirr.	C.C. Str. 6.	
3	.569	.470	.603	65.1	83.1	60.6	.527	.617	.431	.83	.56	.79	S b. E	W S W	N E	6.81	13.33	9.70	Inap.	do 10, T'dr	C.C.S.4,T'r	C. Str. 8.	
4	.791	.864	.880	51.0	71.0	54.4	.516	.481	.373	.81	.61	.87	N E	N E	W S W	20.16	14.12	Calm.	Inap.	Str. 10,	Cum. 4.	Clear.	
5	.873	.783	.767	60.6	78.1	65.2	.407	.550	.510	.75	.58	.82	S b W	W b N	S W	0.37	2.66	0.81		Clear.	Cir. 3.	Cum Str. 4.	
6	.573	.397	.311	69.4	78.6	70.0	.513	.701	.628	.72	.74	.86	S	E N E	S b E	4.33	4.80	9.29	0.629	Light Cirr.	Cir. C. Str.	Thunder.	Storm at noon.
7	.361	.305	.336	71.0	80.7	59.2	.617	.588	.380	.82	.58	.75	S W	S W	NW b W	6.33	7.80	8.75	0.510	C. St. 9.	Thun. St'm	Clear.	
8	.615	.776	.821	52.6	68.6	55.0	.283	.470	.381	.70	.69	.86	NW b W	W b S	S W	4.62	2.97	3.13		C. St. 9.	Cum. Str. 2	Clear.	
9	.909	.767	.761	60.4	77.0	62.1	.371	.787	.415	.71	.86	.79	S S E	S E	S E	0.27	5.32	3.25		Clear.	Cum. Str. 4	Str. 2.	
10	.792	.729	.758	69.3	72.1	65.7	.461	.670	.581	.65	.86	.90	NW b W	N E b N	S E	3.73	3.80	9.38	0.186	Clear.	Showers.	Clear.	
11	.919	.889	.951	63.1	76.6	69.2	.371	.412	.571	.65	.50	.52	N E b N	E b N	E b N	8.20	5.00	0.10		Clear.	Clear.	Clear.	
12	30.070	.968	.868	56.4	77.9	60.1	.305	.607	.451	.66	.61	.86	N E	W N W	SW b S	6.79	2.68	0.67		Clear.	Clear.	Clear.	
13	29.811	.677	.712	61.8	82.2	71.3	.456	.727	.618	.84	.68	.86	W b S	W S W	W S W	2.03	10.95	8.10	0.093	Slight Rain	Clear.	Clear.	
14	.783	.692	.698	70.0	91.3	76.0	.489	.739	.727	.67	.53	.82	N E b N	S b W	S S W	1.25	1.50	3.66		Clear.	Clear.	Light Cir.	Aurora Borealis.
15	.665	.572	.573	74.8	94.8	78.1	.670	.739	.670	.78	.53	.71	S S W	W S W	W S W	5.20	5.51	4.12		Clear.	Clear.	Clear.	
16	.590	.465	.402	75.0	97.0	72.1	.670	.776	.610	.78	.56	.83	W b S	S W	SW b W	3.16	1.58	6.31	Inap.	Clear.	Clear.	C.C. Str. 3.	
17	.373	.350	.433	76.0	83.0	66.1	.628	.681	.549	.71	.61	.87	S W	W b S	N N W	2.94	7.64	7.49	0.266	Clear.	Cum. Str. 4.	CumStr.4.	
18	.573	.518	.436	56.6	72.2	61.6	.363	.450	.456	.79	.58	.84	W N W	W	W S W	10.00	7.98	5.63	Inap.	Clear.	Str 2.	C. Str. 10.	
19	.591	.552	.563	60.2	79.2	62.2	.393	.628	.421	.75	.64	.75	NW b W	W b N	S W	9.63	4.31	4.21		Cirr. 2.	C. C. Str. 2.	C. Str. 4.	
20	.455	.484	.485	63.6	86.7	78.0	.516	.787	.638	.89	.65	.67	S b W	W S W	W b N	1.65	4.43	8.73	0.066	Showers.	Cir. Str. 8.	Cir. 2	Eclipse of moon.
21	.621	.598	.618	61.0	72.3	63.7	.412	.450	.435	.76	.58	.75	N E b N	N E b N	E N E	7.91	5.43	0.75		Cir. C. 5.	C. C. Str. 4.	Str. 9.	
22	.697	.627	.633	59.0	61.1	60.9	.416	.361	.441	.84	.66	.81	N E b E	N E b E	N E b N	2.66	6.52	5.35	0.706	St. 10, Th'r.	Showers.	Clear.	
23	.498	.368	.297	60.4	90.6	74.3	.441	.854	.715	.81	.62	.86	N E b E	E b S	S b W	1.92	9.22	8.16	0.415	Clear.	Clear.	S. 4, Th'er.	
24	.418	.471	.516	59.0	71.7	59.8	.402	.559	.426	.79	.74	.84	NW b W	W N W	W	14.12	12.78	8.45	Inap.	Cir. C. Str. 4	Cir. Str. 2.	C. Str. 5.	
25	.630	.611	.722	53.6	57.8	50.0	.315	.398	.301	.76	.84	.81	W N W	W	W	5.28	9.41	5.62	0.200	Light Cir. 2	Cir. Cum. 6	Str. 3.	
26	.817	.783	.803	52.0	61.1	56.8	.301	.504	.385	.76	.84	.84	NW b W	W	W S W	7.77	5.00	6.75		Cum. Str. 5.	Cirr. Str. 5.	Cir. Str. 4.	
27	.748	.639	.661	55.7	76.3	59.7	.391	.631	.126	.88	.72	.90	N E b E	S S W	N E b E	7.91	5.43	0.75		Clear.	Cir. Cum. 4	Clear.	
28	.712	.618	.618	61.6	82.8	65.0	.431	.763	.510	.79	.71	.81	N E b E	S S W	S S W	0.12	0.63	1.22		Clear.	C. C. Str. 4.	C. Str. 8.	
29	.632	.575	.582	66.2	81.1	71.0	.489	.638	.617	.76	.61	.82	S b E	S S E	S E	0.02	2.92	5.33	Inap.	Cirr. Str. 3.	Cirr. Str. 5.	C. Str. 8.	
30	.601	.524	.487	67.1	82.2	72.6	.455	.597	.578	.69	.55	.74	S E	W S W	W S W	1.00	8.00	9.50		Cum. 2.	Cir. Cum. 1.	Clear.	Faint Aurora Bor'lis

Barometer.	Highest, the 12th day	30.070
	Lowest, the 23rd day	29.277
	Monthly Mean	29.648
	" Range	0.793
Thermometer	Highest, the 16th day	99°.2
	Lowest, the 1st day	39.0
	Monthly Mean	68.66
	" Range	60.20

Mean of Humidity—.739.
Greatest Intensity of the Sun's Rays—134°.0.
Amount of Evaporation—3.41 inches.
Most Prevalent wind—W. S. W.
Least do. do. E.

Most Windy Day—the 24th day, mean—11.78 miles per hour

Least Windy Day—28th, mean—0.65 miles per hour.

Rain fell on 15 days—amounting to 3.131 inches, and was accompanied by thunder on five days.

Aurora Borealis visible on 2 nights.

Eclipse of the moon invisible, owing to dense clouds.

Fire-flies first seen, 10th June.

The electrical state of the atmosphere has been marked *generally* by moderate intensity of Positive Electricity, and during the storms of Thunder *generally* indicated a very high tension of a negative character.

Monthly Meteorological Register, at the Provincial Magnetical Observatory, Toronto, Canada West.—June, 1853.

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

Magnet	Day.	Barom. at tem. of 32 deg.				Temperature of the air.				Tension of Vapour.				Humidity of Air.				Wind.			Rain in Inch.	S'nw in Inch.
		6 A. M.	2 P. M.	10 P. M.	MEAN.	6 A.M.	2 P.M.	10 P.M.	M'N.	6 A.M.	2 P.M.	10 P.M.	M'N	6 A.M.	2 P.M.	10 P.M.	M'N.	6 A. M.	2 P. M.	10 P. M.		
						°	°	°	°													
c	1	29.801	29.758	29.703	29.749	49.7	61.6	68.9	57.58	0.297	0.316	0.414	0.332	85	69	85	72	N E b E	NW bW	E N E	- -	- -
e	2	.709	.632	.636	.611	57.4	68.2	62 8	62.80	.389	.475	.477	.442	84	71	85	80	Calm.	E b S	Calm	0.025	- -
d	3	.620	.612	.696	.535	64.3	80.8	58.2	69.07	.513	.512	381	.467	87	60	81	69	S W bW	W b S	N N W	- -	- -
b	4	.774	.861	.837	.827	59.2	64.3	50.3	57.77	.420	.422	.287	.366	86	72	80	73	N	S S E	Calm.	- -	- -
c	5	.801	.764			55.3	58.6			.346	.338			81	70			Calm.	E b S	—	- -	- -
b	6	.490	.317	.344	.372	56.2	72.6	62.1	64.82	.430	.647	.482	.547	97	83	88	90	Calm.	S	S S W	0.210	- -
c	7	.396	.508	.688	.511	64.3	67.1	48.5	59.87	.511	.396	.286	.412	92	61	85	80	W	W N W	Calm	- -	- -
a	8	.787	.785	.763	.783	49.4	63.2	54.6	56.28	.313	.384	.312	.355	91	69	75	80	Calm.	S E b E	E b N	- -	- -
b	9	.781	.679	.649	.698	52.1	65.2	57.4	60.08	.331	.431	.403	.399	86	72	87	79	E N E	E	Calm	- -	- -
a	10	.701	.683	.755	.714	60.4	75.5	64.3	67.43	.447	.609	.467	.515	87	72	79	79	Calm	S S E	N b W	- -	- -
a	11	.815	.901	.902	.891	61.1	71.4	57.8	64.90	.364	.568	.337	.470	89	76	83	81	N b E	S E b E	E b S	- -	- -
b	12	.982	.955			61.0	69.5			.425	.458			81	65			N E b N	E	—	- -	- -
d	13	.842	.759	.753	.780	58.1	86.3	69.6	71.10	.312	.661	.557	.545	73	54	80	73	Calm	W	Calm.	Inap	- -
eb	14	.771	.729	.688	.728	66.6	83.3	71.5	75.22	.549	.761	.650	.631	87	69	87	81	S	S	N E b E	0.030	- -
ac	15	.691	.630	.544	.613	68.5	84.9	67.3	74.98	.610	.739	.522	.614	91	63	80	76	Calm	S	Calm	- -	- -
c	16	.566	.487	.405	.479	68.2	81.3	67.2	73.37	.586	.720	.618	.626	88	69	96	80	Calm	S E b E	W	0.220	-
b	17	.412	.470	.625	.510	68.9	75.4	58 2	67.15	.612	.428	.364	.455	90	50	77	71	S b E	W N W	N W b W	- -	- -
c	18	.628	.551	.515	.559	54.8	68.7	69.1	65.37	.321	.442	.452	.421	77	65	65	68	Calm	S b W	S b W	Inap	- -
c	19	.606	.679			63.9	72.3			.591	.589			87	76			Calm	S E b E	—	Inap	- -
d	20	.601	.481	.550	.511	68.2	86 3	70.4	74.65	.598	.730	.609	.666	90	61	85	81	E	S S W	N b E	- -	- -
d	21	.588	.535	.507	.550	63.0	71.2	67.2	67 97	.498	.516	.497	.523	88	70	76	79	N b W	E	N E	- -	- -
e	22	.521	.482	.463	.480	65.3	75.7	67.3	70.85	.506	.667	.561	.595	84	78	87	81	N E	E b S	E	- -	- -
b	23	.365	.269	.469	.373	70.2	78.9	60.3	68.57	.647	.686	.372	.571	90	72	73	81	E b S	S S W	N N W	0.010	- -
ca	24	.579	.553	.697	.609	51.6	69.6	49.5	59.07	.354	.421	.281	.348	85	60	81	72	NW bW	W	Calm.	- -	- -
d	25	.763	.730	.763	.758	46.2	59.8	45.2	51.48	.258	.296	.233	.273	83	59	79	73	N W	W b N	Calm.	0.045	- -
a	26	.821	.792			49 5	72.1			.284	.404			81	53			Calm	S b E	—	0.895	- -
b	27	.569	.531	.599	.562	41.9	60.4	58.9	56.43	.292	.470	.462	.427	99	91	91	91	E N E	N E b E	Calm.	0.005	- -
b	28	.646	.658	.562	.618	59.6	68 3	60.4	63.40	.473	.562	.435	.500	94	85	85	88	N N E	S E b S	Calm.	0.080	- -
a	29	.528	.659	.575	.557	62.5	77.8	68.6	70.17	.516	.730	.628	.630	91	80	93	88	N E	Calm	Calm.	- -	- -
a	30	.619	.603	.586	.599	66.1	78.0	67.8	72.38	.544	.685	.473	.559	87	74	71	73	Calm	S S W	N N E	- -	- -
																						- -
	M	29 631	29 603	29.622	29.618	59.99	72 92	61.28	65.49	0.452	0.550	0.447	0.491	88	69	82	79	Ml's 1.83	Ml's 7.08	Ml's 2.80	1.550	- -

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

North.	West.	South.	East.
985.62	876.95	798.80	831.68

Mean velocity of the wind - - 3.67 miles per hour.
Maximum velocity - - - - - 18.3 ml's per h'r, from 8 to 9 p.m. on 3rd.
Most windy day - - - - - 23rd: Mean velocity, 7.98 miles per hour.
Least windy day - - - - - 28th: Mean velocity, 1.65 ditto.

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

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

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

Highest Barometer - - 29.982, at 6 A.M., on 12th. } Monthly range:
Lowest Barometer - - 29.265, at 4 P.M., on 23d. } 0.717 inches.
Highest observed Temp.- 89.5, at 2.45 P.M., on 13th } Monthly range:
Lowest regist'd Temp. - 39.2, at A.M., on 25th } 50.3
Mean Highest observed Temperature - - 71.05 } Mean daily range:
Mean Minimum Thermometer - - - - - 51.28 } 19.77
Greatest daily range - - - - -32.8 from noon of 23rd, to A.M. of 24th.
Warmest day - - 14th - - - Mean Temperature - 75.22 } Difference:
Coldest day - - - 25th - - - Mean Temperature - 51.48 } 23.71

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 June.

Ye'r	Temperature.				Rain.		Snow.		Wind. Mean Velocity.
	Mean.	Max.	Min.	Range.	D'ys	Inches.	Dy's	Inch.	
	°	°	°	°					Miles.
1840	60.0	78.5	37.1	41.4	11	4.860	0	--	-
1841	65.6	92.8	45.7	47 1	9	1 560	0	—	--
1842	55 6	73.9	28.0	45 9	15	5.755	0	—	--
1843	58.4	81.3	28 5	52 8	12	4 595	0	--	--
1844	59.9	82.8	33.1	49.7	9	3 535	0	—	
1845	61.0	83.6	40.9	42.7	11	3.715	0	—	-
1846	63.3	83 3	41 5	41.8	10	1.920	0	--	--
1847	58.4	78.3	36.7	41.6	14	2.625	0	—	—
1848	62.9	92.5	38.3	54.2	8	1.810	0	--	4.51
1849	63.2	84.9	45.2	39.7	7	2 029	0	—	3.32
1850	64.3	83.2	49.0	34.2	10	3.345	0	--	4.54
1851	59 2	79.2	41.2	38.0	11	2 695	0	--	4.42
1852	60.8	86.1	43.6	42.5	10	3.160	0	--	4.09
1853	65.5	89.5	39 2	50.3	12	1.550	0	—	3.67
M'n	61.3	83.6	39.1	44.4	10.6	3.082	0		4.09

This month has been distinguished not only by great dryness—the amount of rain fallen being the least in the corresponding series of 13 years—but also by excessive variability of temperature on particular days above and below its normal value. It will be seen by reference to the comparative table that the mean of the whole month is the highest known since the year 1841 ; and the maximum temperature is only exceeded by 1841 and 1848, while the minimum is just at its average value, so that the range, which is excessive, lies wholly towards the high temperatures. The variations on particular days will be seen by the following table, which gives the difference of the mean temperature of each day above or below the normal temperature of that day.

June.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Difference.	0.6	5.5	11.5	-0.1	S	6.2	1.4	-2.8	0.6	7.7	4 9	S	10 5	14 4	13.9	12.0	5.5	3.4	S	12.2	5 3	7.9	5.4	-4.3	-12.1	S	-7.6	-0 9	5 7	7.8

The group ' hot days from the 13th to the 16th has never been equalled, and the group of cold days from 24th to 28th is also remarkable.

Fine display of Aurora on June 1st, accompanied by a perfect arch, stretching about N. W. and S. E., with its vertex a few degrees south of the Zenith. Possible to see Aurora on 25 nights ; Aurora actually seen on 4 nights.

At 12.30 P. M. on 23rd, a lunar halo was seen, inner radius 23° 30′; its inner rim shewed comparative darkness, being well defined: a paraselena appeared on its western edge, throwing out a tail from the moon, and having the same altitude as the moon. Shortly afterward another appeared at the same distance on the Eastern side, with an arch of a horizontal circle passing through the moon, at whose intersection with the halo the paraselena was formed. This latter exhibited the prismatic colors, red on the inside, light-green on the outside, and threw a tail from the moon along the horizontal circle.

Abstract of Meteorological Observations

Made at the Magnetical Observatory, Toronto, Canada West, from January 1840 to June 1853 inclusive.

1840.

Month	Temperature.				Range.		Warmest day.		Coldest day		Toronto Bay		Rain in inches.	No. of days.			Elasticity.	Humidity.
	Mean.	Max.	Min.	Range.	Mean Daily.	Greatest Daily.	Date.	Temp.	Date.	Temp.	Date.	Temp.		Rain.	Snow.	Fair.		
	°	°	°	°	°	°		°		°								
Jan	17.7	36.7	-18.	55.3	11.0	31.5	10	32.10	16	-3.55	not	observd	1.395	4	11	16	Imper	fect
Feb.	29.6	50.3	-10.	60.8	12.4	32.0	20	43.35	4	3.30			1.475	7	6	15		
Mar	33.4	58.6	9.2	49.4	15.0	33.7	4	44.20	11	20.60	21	36.0	1.610	5	8	13	.173	.88
Apr	42.7	68.7	22.8	45.9	15.2	27.5	23	60.30	7	31 30	23	47.0	3.420	11	2	14	.211	.76
May	54 2	76.1	31.2	45.2	18.0	31.5	27	66.60	9	41 90	21	60.0	4.150	9	..	22	.300	.73
Jun.	60.3	79.9	36.7	43.2	16.8	25.3	26	70.70	8	50.70	25	61.6	4.860	11	..	19	.402	.78
July	66.3	82.3	47.0	35.3	17.7	27 2	16	73.10	2	57.70	18	64.2	5.270	6	..	25	.407	.78
Aug	65.1	82.1	47.7	31.7	17.0	29.0	22	73 60	15	56.80	20	69.5	2.005	12	..	19	.400	.82
Sept	54.1	73.6	30.2	43.4	20.2	29.7	15	63.50	21	40.40	24	52.0	1 380	4	..	26	.347	.83
Oct.	44.9	73.0	23.0	50.0	19.0	39.3	2	60.10	26	30.60	22	50.0	1.860	13	3	15	.251	.84
Nov	36.0	56.8	19.0	37.8	13.1	23.0	4	47.00	27	27.70	27	37.0	1 220	5	8	17	.185	.86
Dec	24.8	42.1	-8.6	50.7	11.3	30.7	10	37.00	18	10 40	11	32.5	0.000	3	18	10	.122	.84
Sum or M'n	44.07	Aug 92.4	Jan. -18.6	45.07	16.13	Oct. 39.3	July 16	73.10	Jan 16	-3.55			29.575	97	56	213		

1841.

Month.	Temperature.				Range.		Warmest day.		Coldest day.		Toronto Bay.		Rain in inches.	No. of days.			Elasticity.	Humidity.
	Mean.	Max.	Min.	Range.	Mean Daily.	Greatest Daily.	Date.	Temp.	Date.	Temp	Date	Temp.		Rain.	Snow	Fair.		
	°	°	°	°	°	°		°		°		°						
Jan	25.5	42.3	-6.4	48.7	14.0	36.8	7	38.60	4	7.30	28	32.0	2.150	2	14	15	Im-per-	fect.
Feb.	23.2	41.1	-4.3	45.4	15.6	32.0	22	35.50	11	6.70	27	31.0	0.000	1	9	18	.107	.80
Mar	28.2	54.6	-6.7	61.3	16.6	27.6	29	45.10	15	11.80	25	33.5	1.170	5	7	19	.131	.79
Apr	39.4	61.8	19.9	41.9	11.1	29.0	26	52.40	10	29.60	22	41.5	1,370	3	3	24	.173	.70
May	51.1	78.0	26.5	51.5	19.0	28.8	21	64.10	3	34.60	29	60.8	2.350	11	1	19	.259	.67
Jun.	66.0	93.1	45.3	47.8	20.8	32.1	20	77.00	12	55.60	24	65.0	1.560	9	..	21	.453	.72
July	65.5	90.0	39.9	49.1	23.1	28.6	23	75.20	30	58.40	22	72.0	8.150	10	..	21	.450	.74
Aug	61.6	84.8	45.7	39.1	19.8	26.8	17	70.40	21	59.90	28	70.0	6,170	9	..	22	.483	.81
Sept	61.5	80.2	37.7	42.5	15.8	26.0	9	70.42	27	47.82	23	66.5	3.340	9	..	21	.453	.83
Oct.	41.8	59.7	20.6	39.1	16.8	21.0	11	50.00	25	28.53	21	45.5	1,360	6	2	23	.210	.78
Nov	35.4	63.8	8.5	55.3	11.7	19.3	1	54.75	29	19.05	27	35.5	2.450	8	5	17	.173	.81
Dec	29.0	46.1	3.1	43.0	11.2	24.1	14	41.03	21	11.12	23	33.0	0,000	7	5	19	.153	.86
Sum or M'n	44.31	Jun 93.1	Mar -6.7	47.31	16.54	Jan 36.8	Jun 20	77.00	Feb 11	6.70		49.61	36.670	80	46	239	..	..

1842.

Month.	Temperature.				Range.		Warmest day.		Coldest day.		Toronto Bay.		Rain in inches.	No. of days.			Elasticity.	Humidity.
	Mean.	Max.	Min.	Range.	Mean Daily.	Greatest Daily	Date.	Temp.	Date.	Temp.	Date.	Temp.		Rain.	Snow.	Fair.		
	°	°	°	°	°	°		°		°		°						
Jan.	27 8	49 4	1.9	47.5	17.80	36.1	29	41.23	3	11.82	20	34.5	2.170	5	9	17	.130	.81
Feb.	27.9	50.2	2.9	47.3	15.27	27.7	3	43.02	17	11.03	26	34.5	3.625	8	9	11	.138	.84
Mar	36 3	70.3	15.1	55.2	15.55	32 7	30	47 47	12	21.70	21	37 5	3.150	4	8	19	.162	.76
Apr	43.1	89.8	20.1	69.7	15.38	52.1	22	63 45	1	31.53	21	40.0	3.740	8	2	20	.200	.71
May	49 8	74.2	27.3	46.9	21.12	34.0	18	59.31	9	41.12	25	58 5	1.275	7	..	21	.227	.64
Jun.	56.1	76.0	28.1	47.9	21.36	33.3	30	65.74	11	45.73	23	63.5	5.755	15	..	15	.318	.76
July	64.7	91.0	42.5	48.5	23 09	31.0	20	73.91	6	55.85	21	71.0	3.054		.	27	.43-	.72
Aug	65.9	81.8	43.9	37.9	19.60	28 9	25	72 08	1	57.02	27	70.5	2.500	6	..	25	.401	[illegible]
Sept	55.6	82 0	27.9	54.7	18.14	30 1	1	72.85	22	36.66	22	56.5	6.160	12	..	18	.330	.78
Oct	45.3	68.6	27.5	41.1	17.31	26.0	7	50.03	20	37.27	20	49 0	5.173	8	..	23	.250	.83
Nov	33.2	56 8	8.1	48.7	13.46	23.6	1	45.74	27	10.93	26	31.4	5.310	9	10	11	.173	.86
Dec	25.8	40.5	4.1	36.4	13.10	32.1	2	31 71	22	0.57	22	33.0	0.880	3	17	11	.116	.77
Sum or M'n	44.34	July 91.0	Jan. 1.9	48.48	17.58	Apr 52.1	July 20	73.91	Dec. 22	0.57	..	49.32	42.790	89	55	221	.232	.77

1843.

Month.	Temperature.				Range		Warmest day.		Coldest day.		M. windy day		M. Rainy day.		Inches of		No. of days.			Mean force wind.
	Mean.	Max.	Min.	Range.	Mean Daily.	Greatest Daily.	Date.	Temp.	Date.	Temp.	Date.	Force.	Date.	Inches.	Rain.	Snow.	Rain.	Snow.	Fair.	
	°	°	°	°	°	°		°		°		lb.								lb.
Jan	28.76	55.4	1.8	53.6	12.52	27.1	21	40.7-	3	11.67	31	3.40	31	2.500	4.295	11.2	6	12	13	0.69
Feb.	15 92	38 5	-9.4	47.9	11.58	21.6	10	28.51	16	4.96	6	4.33	..	...	0.175	14 4	1	21	6	1.05
Mar	22.30	39 9	-2.5	42.4	17.08	20.2	10	32.52	2	12.45	31	1.91	..	...	0.625	25.7	2	18	11	1.19
Apr	41.29	71.6	14 7	56.9	16.10	33 4	27	55 48	1	20.12	19	2.31	..	...	3.185	0.1	7	3	20	1.95
May	49 73	79 8	20.2	59.6	20.32	33.8	15	63.10	1	38.61	..	..	..	...	1.570	..	5	..	26	1.52
Jun.	59.91	83 3	28.2	55.1	20,15	30.9	27	71.68	1	40.32	..	..	9	1.226	4.595	..	12	..	18	1.27
July	64 5-	86.9	33.7	43.1	23.57	33.1	19	72.28	11	55.81	..	..	17	1.795	4.603	..	8	..	23	0.14
Aug	66 19	83.1	44 0	39.1	21.57	24.9	31	74.01	1	59.16	..	..	27	3.230	4.530	..	4	..	27	0.12
Sept	59.08	89.0	32.2	56.8	17.91	30.9	2	74 11	27	40.92	13	2.18	14	3.100	0.760	..	10	..	20	0.57
Oct.	44.02	65.0	21.2	43.8	14.45	22.2	6	56.72	27	31.17	3	2.30	7	1.705	3.700	2.5	12	4	15	0.54
Nov	33.25	52.0	14.1	38.5	11.49	20.0	21	39.95	27	20.95	17	2.80	17	2.026	4.765	1.2	10	7	13	0.53
Dec	30.83	48 5	3.1	45.4	9 61	21.2	26	37.53	12	12.55	12	2.40	..	...	1.040	8.1	6	8	17	0.53
Sum or M'n	42.75	Sept 90 0	Feb. -9 4	49.19	16 66	Sept 39 9	Sept 2	74.11	Feb 16	-4 96	Mar 31	4.91	Aug 27	3.230	43.555	63.2	83	73	209	0.59

1844.

Month.	Temperature.				Range.		Warmest day.		Coldest day.		M. windy day		M. Rainy day.		Inches .		No. of days.			Mean force Wind.
	Mean.	Max.	Min.	Range.	Mean Daily.	Greatest Daily.	Date.	Temp.	Date.	Temp.	Date.	Force.	Date.	Inches.	Rain.	Snow	Rain.	Snow.	Fair.	
	°	°	°	°	°	°		°		°		lb.								lb.
Jan.	20.67	45.3	-7.2	52.5	14.05	32.0	16	37.45	25	0.28	13	1.92	12	1.415	3.005	24.9	7	11	13	0.70
Feb.	27.72	47.9	0.6	47.3	15.2-	24.8	20	34 33	9	12.04	27	2.27	26	0.415	0.470	10.0	4	7	18	.43
Mar	31.83	50.8	9.6	41.2	11.59	26.0	1	40.90	18	16.63	15	1.62	12	0.730	2.470	14 0	8	8	15	.57
Apr	48.11	74.6	14.9	59.7	25.79	35 9	13	59.08	1	32.79	..	..	23	0.385	1.515	in'p	10	1	19	.21
May	54.22	79.4	29.7	49.7	21.00	32.8	25	65.9-	21	40.87	..	..	11	1.660	5.670	..	14	..	17	.30
Jun.	60.41	83 3	33.2	50.1	20.69	40.6	15	70.02	10	49.91	..	..	19	1.030	3.535	..	9	..	21	.19
July	66.08	86.6	40.1	46.5	22.96	33.0	31	72.75	4	56.03	..	..	21	0.700	2.815	..	12	..	19	.19
Aug	61.16	86 8	43.5	43.3	19.75	31.7	16	71.30	27	57.49	..	..	..	..	..	..	17	..	11	.16
Sept	59.47	81.8	28.2	53.6	20.57	41.6	20	70.06	27	40.57	21	2.12	..	..	..	..	4	..	26	.26
Oct.	43 66	71.6	15.9	55 7	16.67	29 9	9	55.21	28	29.40	18	2.97	14	0.710	1.245	12.0	7	4	20	.43
Nov	34.02	56.0	12.1	43.9	13 45	27.5	7	43.30	27	17.42	23	2.63	..	..	..	8.0	9	4	13	.43
Dec	28.93	48.5	1.6	46 9	11.49	32.8	6	35.81	17	17.96	23	2.85	..	..	..	4.2	6	6	19	.40
Sum or M'n	44.69	Aug 86.8	Jan., -7.2	49.30	17.86	Sept 44.6	July 31	72.75	Jan 25	0.28	Oct 18	lb. . 97	May 11	1.660	Imper fect.		73.1	106	41	219	0.36

1845.

Month.	Temperature.				Range.		Warmest day.		Coldest day.		M. windy day		M. Rainy day.		Inches of		No. of days.			Mean force Wind.
	Mean.	Max.	Min.	Range.	Mean. Daily.	Greatest Daily.	Date.	Temp.	Date.	Temp.	Date.	Force.	Date.	Inches.	Rain.	Snow.	Rain.	Snow.	Fair.	
	°	°	°	°	°	°		°		°		lb.								lb.
Jan.	26.6-	45.7	-0.2	45.9	13 81	25.4	3	37.55	31	7.36	25	2.06	..	...	...	22.7	5	9	17	0.70
Feb.	26.45	49 1	-4.2	53.3	14.21	39.5	25	42.61	1	7.02	5	7.23	..	...	...	19.0	5	9	14	.99
Mar	35.68	59.8	6 6	53.2	16.37	29.3	31	51.68	15	20.65	15	2.02	..	...	...	2.8	5	8	18	.66
Apr	42.13	66.7	15 5	51.2	17.86	29.7	21	56 30	7	24 70	22	3.61	30	1.310	3.290	1.5	11	4	15	1.00
May	50.23	77.8	27.8	50.0	22.31	34 5	12	65 01	29	37.26	7	1.62	15	0.850	2.300	..	8	..	23	.55
Jun.	61.32	84.6	39.6	45.0	21.10	31 7	9	69.77	6	52 00	..	..	10	1.230	3.715	..	11	..	19	.27
July	66.74	95.0	45 7	49.3	22.41	31.5	12	82.32	30	55.95	..	..	..	...	2.195	..	7	..	24	.39
Aug	67.86	84.8	41 5	43.3	21.43	31 7	9	73.16	1	59.59	..	..	..	...	1.725	..	9	..	22	.19
Sept	55.91	79.6	34.0	45.6	20.43	31 5	3	67.62	21	48.10	..	..	20	1.020	6.215	..	16	..	11	.34
Oct.	46.49	61.0	19.7	41.3	18.33	24.8	10	57.65	21	28.59	..	..	..	...	1.760	in'p	11	1	19	.26
Nov	36.45	59.5	7.6	51.9	12.60	25.6	19	50.25	28	13.84	27	1.89	..	...	1.105	5.0	7	4	19	.53
Dec	21.49	39.7	-2.4	42.1	13.77	28.7	17	31.55	11	5.10	19	2.16	..	...	...	4.7	2	12	17	.70
Sum or M'n	44.79	J'ly 95.0	Feb -4.2	47.92	17.89	Feb. 39.5	July 12	82.32	Dec 11	5 10	Feb 5	lb. 7.23	Apr 30	1.310	Imper fect.		55.7	97	47	221	lb. 0.54

PUBLIC LIBRARIES.—Munich has seventeen public libraries, into every one of which strangers unquestioned may enter, peruse, and depart in peace. Of these institutions the most celebrated are lending libraries. Statistics preach where sermon does not lift its voice. Here are its words. In London, there are, in round numbers, 500,000 volumes accessible to the public, or about an average of 22 volumes to every 100 inhabitants. Dublin with all its deficiencies, has 59. In Paris, the proportion is 160 volumes to every 100 inhabitants; in Berlin, 182; in Florence, 317; in Copenhagen, 467; in Dresdren, 490; in Munich 780. So that Paris is six times better provided than London; Berlin, 7 times; Florence, 13 times; Copenhagen, 19 times; Dresden, 20 times; and Munich, 32 times.—*Correspondent of the Builder.*

1846.

Month.	Temperature.				Range.		Warm't day.		Coldest day.		M.windy day		M. Rainy day.		Inches of		No. of days.			Mean force Wind.
	Mean.	Max.	Min.	Range.	Mean Daily.	Greatest Daily.	Date.	Temp.	Date.	Temp.	Date.	Force.	Date.	Inches.	Rain.	Snow.	Rain.	Snow.	Fair.	
	°	°	°	°	°	°		°				lb.								lb.
Jan.	26.10	44.0	-1.3	45.3	13.05	29.3	30	36.12	17	9.27	6	1.68	2	0.700	2.335	6.0	5	10	16	0.55
Feb.	20.80	41.9	-16.7	58.6	18.98	31.5	3	35.09	26	-3.68	19	3.45	..	0.000	none	46.1	0	13	15	.65
Mar	33.43	49.6	7.8	41.8	14.93	24.3	12	39.79	2	17.11	24	2.24	13	0.710	1.965	2.3	9	5	17	.30
Apr	41.11	81.8	24.2	57.6	16.34	39.6	21	57.78	13	31.21	28	1.66	25	0.610	1.300	1.3	10	2	16	.55
May	55.77	79.7	33.1	46.6	17.97	32.2	27	68.08	11	41.70	9	1.93	15	1.000	4.375	..	9	..	22	.40
Jun	63.82	84.2	[illegible]	45.1	18.46	26.9	30	73.05	6	51.64	20	1.36	18	0.765	1.920	..	10	..	20	.32
July	68.22	94.6	44.5	50.1	20.85	33.1	10	78.82	14	36.47	10	0.72	29	1.400	2.893	..	9	..	22	.29
Aug	68.41	86.4	49.5	36.9	17.78	25.4	5	78.07	18	57.41	10	0.49	13	0.320	1.770	..	9	..	22	.17
Sept	63.41	84.3	37.3	47.0	16.23	27.5	2	74.85	26	37.51	9	1.23	25	1.570	4.505	..	11	..	10	.33
Oct.	41.81	70.1	20.7	49.4	14.60	31.0	7	63.58	22	30.01	31	2.91	16	1.700	4.180	In'p	14	2	15	.41
Nov	40.82	65.7	18.0	37.7	9.60	23.7	10	52.41	25	20.35	26	4.10	8	1.430	5.805	0.4	12	2	16	.64
Dec	27.61	49.4	3.9	45.5	10.72	21.1	2	40.01	15	15.61	3	2.48	7	0.405	1.215	6.0	5	9	17	.57
Sum or M'n	° 46.44	July ° 94.6	Feb. ° -16.7	° 46.80	° 15.87	Apr ° 39.6	July 10	° 78.82	Feb. 26	° -3.68	Nov 26	lb. 4.10	May 15	1.000	32.355	62.1	103	43	210	lb. 0.44

1847.

Month.	Temperature.				Range.		Warmst day.		Coldest day.		M.windy day		M. Rainy day.		Inches of		No. of days.			Mean force Wind.
	Mean.	Max.	Min.	Range.	Mean. Daily.	Greatest Daily.	Date.	Temp.	Date.	Temp.	Date.	Force.	Date.	Inches.	Rain.	Snow.	Rain.	Snow.	Fair.	
	°	°	°	°	°	°		°		°		lb.								lb.
Jan	22.87	42.9	-2.9	45.8	11.61	32.3	15	39.67	21	8.07	4	2.75	4	1.100	2.135	7.5	7	5	19	1.09
Feb.	22.12	41.1	-0.9	42.0	12.42	26.1	2	37.63	23	6.60	3	4.22	4	0.480	0.550	27.3	2	13	13	.69
Mar	26.25	43.9	5.4	38.5	13.21	23.1	25	37.13	11	15.11	27	3.03	20	0.395	0.850	4.2	5	6	20	.71
Apr.	39.06	65.1	9.3	55.8	11.02	25.8	21	55.05	1	28.12	17	1.06	22	1.070	2.870	4.0	8	2	20	.59
May	51.55	72.1	26.7	45.4	17.25	29.8	28	62.41	1	39.50	31	1.58	31	0.465	2.040	..	12	..	19	.29
Jun	58.13	77.8	36.0	41.8	15.81	29.0	26	69.88	14	45.76	14	2.31	1	0.520	2.625	..	11	..	16	.30
July	67.62	87.0	43.2	43.8	18.69	30.6	10	76.86	26	51.07	26	0.75	17	0.950	3.355	..	8	..	23	.19
Aug	63.93	82.6	44.6	38.0	17.95	26.2	16	72.77	31	51.06	18	0.71	17	0.785	2.140	..	10	..	21	.19
Sept	51.91	74.5	35.0	39.5	11.16	21.8	8	61.37	14	45.13	13	0.90	8	2.650	6.605	..	15	..	15	.33
Oct	43.71	61.6	20.2	41.4	13.31	25.3	5	59.13	26	26.21	25	0.47	6	1.180	4.390	in'p	13	2	16	.19
Nov	38.01	57.9	8.4	49.5	9.62	21.1	2	51.45	29	13.80	27	0.93	14	0.700	3.155	in'p	14	3	13	.35
Dec.	30.02	49.6	-0.3	49.9	9.10	22.7	31	43.43	26	12.29	21	1.01	2	0.360	1.185	6.9	7	8	16	.35
Sum or M'n	° 43.46	J'ly ° 87.0	Jan ° -2.9	° 44.53	° 13.91	Jan. ° 32.3	July 10	° 76.86	Feb 23	° 6.60	Feb 3	lb. 4.22	Sept 8	2.650	31.900	° 49.8	115	30	211	lb. 0.44

1848.

Month.	Temperature.				Range.		Warm't Day		Coldest Day		M.Windy Day		M.Rai'y Day.		Inches of		No. of Days.			M'n Vel.
	Mean.	Max.	Min.	Range.	Mean Daily.	Greatest Daily.	Date.	Temp.	Date.	Temp.	Date.	Velocity	Date.	Inches.	Rain.	Snow.	Rain.	Snow.	Fair.	Wind.
	°	°	°	°	°	°		°		°										
Jan	27.41	51.1	-11.	62.5	12.12	31.1	1	41.27	10	-4.50	18	12.35	11	0.830	2.245	7.1	7	8	16	5.92
Feb.	26.28	46.6	0.0	46.6	12.78	23.5	21	38.02	11	10.88	6	12.63	4	.410	0.775	10.8	4	8	17	5.00
Mar	28.62	61.6	0.0	61.6	12.31	28.3	31	46.53	14	9.90	4	10.91	20	.715	1.220	0.7	5	6	20	5.80
Apr.	40.67	65.1	22.7	42.4	17.23	31.5	10	51.35	18	29.70	18	10.97	1	.970	1.455	0.5	5	1	21	4.80
May	53.71	78.0	31.2	46.8	18.54	31.5	20	63.13	13	30.06	30	10.68	13	.435	2.520	..	13	.	18	4.03
Jun.	62.54	92.0	37.4	54.6	20.02	44.0	15	77.43	12	40.21	7	9.51	4	.760	1.810	..	8	.	22	4.51
July	65.37	92.2	44.1	48.1	17.22	29.3	20	73.47	1	51.70	7	11.31	22	.310	1.890	..	10	.	21	4.91
Aug	63.31	87.0	49.7	37.3	18.23	30.2	14	76.63	1	61.40	4	8.41	4	.455	0.855	..	8	.	23	4.55
Sept	53.30	80.4	28.1	52.3	17.77	30.5	4	69.00	26	38.00	1	9.80	18	.020	3.115	..	11	.	19	5.81
Oct.	46.38	61.8	24.5	37.3	12.57	30.1	16	57.06	18	31.45	17	10.91	31	.360	1.550	..	11	.	20	4.60
Nov	33.01	49.0	15.9	33.1	9.22	19.4	4	42.27	9	21.78	30	10.65	21	.915	2.020	1.4	9	3	18	4.81
Dec.	29.12	48.6	-1.1	49.0	11.06	26.7	8	42.20	22	10.15	2	15.30	1	1.280	2.750	16.5	7	7	17	5.44
Sum or M'n	° 44.63	Jun ° 92.0	Jan. ° -11.4	° 46.06	° 14.05	Jun ° 44.0	Jun 15	° 77.43	Jan 10	° -4.50	Dec. 2	° 15.30	Dec. 1	1.280	22.205	46.0	96	33	235	5.15

1849.

Month.	Temperature.				Range.		Warm't Day		Coldest Day		M.Windy Day.		M.Rai'y Day.		Inches of		No. of Days.			M'n Vel.
	Mean.	Max.	Min.	Range.	Mean Daily.	Greatest Daily.	Date.	Temp.	Date.	Temp.	Date.	Velocity	Date.	Inches.	Rain.	Snow.	Rain.	Snow.	Fair.	Wind.
	°	°	°	°	°	°		°		°		°								
Jan.	18.49	39.5	-14	53.7	11.45	31.2	25	35.61	11	-2.10	15	11.66	25	0.820	1.175	9.2	4	10	17	6.71
Feb.	19.99	40.6	-9.8	50.4	11.02	24.1	28	36.50	15	2.07	8	11.19	24	0.230	0.210	19.2	2	13	13	6.58
Mar	33.21	53.0	15.1	37.9	11.33	31.6	30	41.11	3	20.67	14	12.97	20	1.130	1.525	2.3	7	2	22	5.37
Apr.	38.71	72.0	15.5	56.5	13.95	38.3	30	49.66	11	21.23	15	15.63	23	0.675	2.635	1.7	10	2	18	7.50
May	48.30	72.2	27.9	44.3	13.60	28.7	21	57.17	2	30.25	5	9.31	22	1.030	5.115	..	16	..	15	5.33
Jun.	63.01	81.4	33.2	48.2	16.59	31.9	21	74.60	5	32.77	1	7.53	15	0.990	2.020	..	7	..	23	3.32
July	67.82	88.6	47.3	41.3	10.85	29.7	12	78.27	31	59.25	11	6.81	25	2.030	3.115	..	4	..	27	3.52
Aug	65.08	79.0	45.2	33.8	18.15	27.5	30	70.37	31	56.68	9	8.53	20	1.045	4.970	..	10	..	21	3.73
Sept	57.04	80.1	32.7	47.4	16.01	27.9	5	68.37	27	45.18	22	8.02	6	0.130	1.180	..	9	..	21	4.23
Oct.	44.91	58.9	25.2	33.7	13.16	24.4	16	54.07	31	28.71	6	13.25	6	3.360	5.965	In'p	13	1	17	4.76
Nov	41.87	56.4	24.2	32.2	9.19	22.2	5	53.46	[illegible]	29.77	8	17.20	24	0.730	2.815	1.0	10	2	18	4.73
Dec.	26.56	40.8	-6.5	47.3	9.03	25.8	20	37.11	26	12.43	6	12.67	16	0.270	0.840	9.6	5	12	14	6.23
Sum or M'n	° 43.76	July ° 88.6	Jan. -14.2	° 43.97	° 13.66	Apr. ° 38.3	July 12	° 78.27	June 11	° -2.10	Nov 8	17.20	Oct. 6	3.360	32.215	43.0	97	42	226	5.17

1850.

Month.	Temperature.				Range.		Warm't Day		Coldest Day		M.Windy Day		M.Rai'y Day.		Inches of		No. of Days.			M'n V
	Mean.	Max.	Min.	Range.	Mean Daily.	Greatest Daily.	Date.	Temp.	Date.	Temp.	Date.	Velocity	Date.	Inches.	Rain.	Snow.	Rain.	Snow.	Fair.	Wind.
	°	°	°	°	°	°		°		°										
Jan	29.26	46.4	9.9	36.5	11.63	22.0	25	37.20	11	17.88	12	12.51	10	0.360	1.250	5.2	5	8	18	5.80
Feb	26.58	49.6	1.2	48.4	15.41	29.2	26	38.82	4	7.52	11	16.05	28	0.500	1.235	23.1	7	9	12	7.61
Mar	29.73	46.5	7.2	39.3	11.11	20.8	11	39.08	20	19.01	1	11.55	13	0.410	0.745	11.2	2	7	22	7.62
Apr	38.30	65.7	18.0	47.7	15.90	26.7	27	53.08	8	25.83	11	13.08	3	2.330	4.720	1.1	7	2	21	7.61
May	48.61	77.8	27.5	50.3	19.91	30.7	28	64.05	20	37.02	17	12.73	19	0.270	0.515	In'p	7	1	23	6.32
Jun	61.86	85.6	34.2	51.4	22.03	40.8	19	73.35	1	53.12	10	11.13	20	1.505	3.315	..	10	..	20	4.54
July	69.01	86.2	54.6	31.6	19.22	27.0	21	75.58	26	60.19	6	8.05	17	2.730	5.270	..	12	..	19	4.58
Aug	66.55	85.0	44.0	41.0	17.29	31.2	7	73.80	27	55.16	31	7.76	13	2.100	4.355	..	13	..	18	4.16
Sept	56.54	76.0	29.5	46.5	20.10	33.1	23	67.18	30	46.20	28	9.57	1	0.130	1.735	..	11	..	19	4.75
Oct.	45.60	66.7	22.1	41.3	17.80	35.1	17	55.19	29	33.37	21	11.51	10	0.610	2.085	..	10	..	21	5.30
Nov	38.77	62.8	11.0	51.8	15.50	26.0	5	51.82	22	27.53	17	14.86	27	1.420	2.955	In'p	7	1	22	5.27
Dec	32.75	48.8	-9.0	57.8	11.83	32.1	3	40.01	30	8.22	23	16.61	2	0.140	0.190	29.5	2	18	11	7.40
Sum or M'n	° 44.72	July ° 86.2	Dec. ° -9.0	° 46.03	° 16.67	Jun ° 40.8	July 21	° 75.58	Feb 4	° 7.52	Dec 23	16.61	July 17	2.730	28.130	70.1	93	46	226	5.94

1851.

Month.	Temperature.				Range.		Warm't Day		Coldest Day		M.Windy Day.		M.Rai'y Day.		Inches of		No of Days.			M'n Vel.
	Mean.	Max.	Min.	Range.	Mean Daily.	Greatest Daily	Date.	Temp.	Date.	Temp.	Date.	Velocity	Date.	Inches.	Rain.	Snow.	Rain.	Snow.	Fair.	Wind.
	°	°	-°	°	°	°		°		°										
Jan.	25.82	43.1	-12.9	56.2	13.91	32.8	9	37.87	30	-1.25	29	16.99	16	0.585	1.275	7.8	4	10	17	7.09
Feb.	28.12	50.2	1.2	49.0	10.31	30.0	20	38.48	6	10.75	8	11.15	21	0.570	2.600	2.1	7	4	17	6.91
Mar	33.14	59.3	12.0	47.3	12.98	25.7	27	52.26	3	22.16	18	15.31	5	0.610	0.770	[illegible]	[illegible]	9	14	7.65
Apr.	41.67	59.3	25.8	33.5	12.87	21.6	21	50.22	11	31.81	19	14.73	5	0.650	2.295	1.2	11	3	16	8.67
May	52.18	73.3	28.0	45.3	16.05	26.3	13	64.25	2	37.53	1	11.16	10	0.790	2.930	0.5	12	1	18	6.31
Jun.	59.84	79.2	37.0	42.2	16.28	29.8	26	68.45	3	50.67	[illegible]	9.93	21	1.090	2.095	..	11	..	19	4.12
July	65.55	82.7	46.5	36.2	14.70	24.2	17	73.43	3	57.75	28	7.12	9	1.155	3.025	..	12	..	19	4.17
Aug	63.71	79.8	42.1	37.7	17.11	30.4	7	69.73	27	55.64	4	10.51	4	0.590	1.330	..	10	..	21	4.62
Sept	60.08	86.3	32.0	54.3	17.31	30.0	12	75.48	21	43.52	26	13.84	22	0.610	2.065	..	9	..	21	5.45
Oct.	47.83	66.2	25.2	41.0	17.86	22.7	11	57.80	27	32.22	3	10.18	30	0.320	1.680	0.3	10	2	19	4.29
Nov	32.80	50.2	13.8	36.4	9.58	22.8	1	44.42	11	24.08	2	9.57	20	2.770	3.895	6.7	5	6	19	4.70
Dec.	21.58	41.0	14.8	55.9	12.01	27.2	30	39.35	26	0.23	19	14.30	27	0.325	1.075	10.7	6	13	12	7.37
Sum or M'n	° 41.41	Sept ° 86.3	Dec. -° 14.8	° 44.93	° 13.92	Jan. ° 32.8	Sept 12	° 75.49	Jan 30	-° 1.23	Jan 29	16.99	Nov 20	2.770	26.875	38.4	100	50	215	5.99

New Planets.—A new Planet, resembling a Star of the 12th magnitude, was discovered by Professor Gasparis of Naples, on the evening of the 5th of April, 1853. The position of the Planet, when discovered, was in the Constellation Leo, in R. A. about 11h. 4m., and Decl. 6° 50'. Another Planet was discovered by M. Chacornac, at Marseilles, on the 6th of April. It resembles a Star of the 9th magnitude, and is of a bluish colour. A third Planet was discovered by Mr. Luther, at Bilk, on the 5th of May; thus making 26 members of the Asteroids Group.

BOOMERANG PROPELLER.—On a second trial of the Boomerang Propeller, in the Steamship *Genova*, the speed obtained was 10¾ knots by the log. the revolutions of the engines, being from 56 to 58, a gain of more than one knot per hour on the speed by the common screw.—*Mining Journal.*

1852.

Month.	Temperature. Mean.	Temperature. Max.	Temperature. Min.	Temperature. Range.	Range. Mean Daily.	Range. Greatest Daily.	Warm't Day Date.	Warm't Day Temp.	Coldest Day Date.	Coldest Day Temp.	M.Windy Day. Date.	M.Windy Day. Velocity	M.Rai'y Day Date.	M.Rai'y Day Inches.	Inches of Rain.	Inches of Snow.	No of Days. Rain.	No of Days. Snow.	No of Days. Fair.	M'n Vel. Wind.
	°	°	°	°	°	°		°		°										
Jan.	13.51	37.3	-10.	47.9	10.01	21.2	29	31.52	20	0 85	6	19.36		none	0 0	30.0	0	19	12	7.67
Feb.	23.82	41.2	-6.2	47.4	13.20	27.2	1	37.30	18	2.73	30	15.76	10	0.550	0.650	13.0	3	11	13	6.42
Mar	27.70	41.8	-8.0	51 8	11.00	31.1	13	39.08	2	12.70	30	15.89	13	0.954	3.650	19.3	8	12	11	5.81
Apr.	38.20	51.8	20 0	31 8	10.70	19 5	21	47.53	3	27.18	5	18 12	30	1.025	1.090	9.4	6	4	20	6.68
May	51.07	73 3	32.0	41.3	17.01	30.8	21	61.82	20	11.18	17	9 90	29	0 551	1.125	In'p	7	1	23	4.00
Jun.	60.28	80.1	37.2	42 9	14.18	29.1	15	71.21	10	19.10	22	12.28	9	0.625	3.100	..	10	..	20	1.02
July	66 18	91.1	49.5	41.6	18.31	29.3	21	70 72	31	50 17	30	10.10	29	1.560	4.025	..	8	..	23	3.31
Aug	63.35	81.2	45.8	35.1	15.77	21.9	23	72 02	2	57.38	25	8 29	6	1.035	2.605	..	9	..	22	3 30
Sept	56.02	81.8	35.8	46.0	17.73	22.1	2	71.33	29	11.06	12	9 24	26	1.167	3.630	..	10	..	20	4.60
Oct.	48.04	70.7	21.8	48.9	15 69	20.6	2	59.37	16	30.39	29	10.52	29	1.845	5.250	..	12	..	19	4.47
Nov	35.50	59.4	19.2	32 2	9.61	20.1	1	43.97	21	25 03	12	13.01	25	0 570	1.775	2.0	7	3	20	6.50
Dec.	32.27	51.0	13.2	37.8	9 00	22.2	7	47.65	21	10.72	17	11.11	27	1.100	3.035	20.1	7	10	11	6 51
Sum or M'n	° 43.84	July ° 93. 1	Jan. —° 10.6	° 42.50	11.96	Mar 31. 1	July 21	° 70.72	Jan 20	° 0.85	May 5	° 18. 12	July 29	1.860	31.405	91.0	87	60	219	5.28

1853.

Month.	Temperature. Mean.	Temperature. Max.	Temperature. Min.	Temperature. Range.	Range. Mean Daily.	Range. Greatest Daily.	Warm't Day Date.	Warm't Day Temp.	Coldest Day Date.	Coldest Day Temp.	M.Windy Day. Date.	M.Windy Day. Velocity	M.Rai'y Day Date.	M.Rai'y Day Inches.	Inches of Rain.	Inches of Snow.	No. of Days. Rain.	No. of Days. Snow.	No. of Days. Fair.	M'n Vel. Wind.
	°	°	—°	°	°	°		°												
Jan.	22.08	40.0	9.7	50.6	11.16	10.9	11	32.55	26	3.72	21	13.59	5	0.290	0.290	7.5	1	6	21	6.31
Feb.	21.08	43.4	-1.1	44.8	11.19	15.1	4	37.59	7	11.20	23	16.75	27	0.510	1.030	12.6	4	12	9	7.29
Mar	30.65	56 3	-0.1	56.4	11.82	26 0	30	43.05	15	12.65	11	15.16	15	0.110	1.050	7.1	6	8	17	5.87
Apr.	41.82	65.7	25.0	40.7	11.07	25.8	27	57.05	11	33 37	8	10.71	13	0.715	2.025	1.0	10	1	19	5.20
May	50 87	78.1	32.2	45.9	11.10	28.1	29	65.07	19	11.21	10	10.77	25	1.100	4.420	In p	17	1	13	5.11
Jun.	65 40	89.5	39.2	50.3	19.71	12.8	11	75.22	25	31.18	23	7.92	26	0.225	1.550	...	9	..	21	1.67
July																				
Aug																				
Sept																				
Oct.																				
Nov																				
Dec.																				
Sum or M'n																				

GENERAL ABSTRACT.

Year.	Temperature. Mean.	Temperature. Max.	Temperature. Min.	Temperature. Range.	Greatest D'ly Range. Date.	Greatest D'ly Range. Range.	Warmest Day Date.	Warmest Day Temp.	Coldest Day. Date.	Coldest Day. Temp.	Most Windy Day Date.	Most Windy Day Force or Velocity	Most Rainy Day Date.	Most Rainy Day Inches.	Inches of Rain.	Inches of Snow.	No. of Days. Rain.	No. of Days. Snow.	No. of Days. Fair.	Frost every Month except	Indian Summer.	Yel'w matter fell in Rain.	First Snow.	Toronto Bay frozen over.	Toronto Bay clear of Ice.
	°	°	°	°		°		°		°															
1840	11 07	82.1	18.0	101.0	Oct. 13	30.3	July 10	73.10	Jan. 16	3.85	..	..	July 13	1.890	29.575	not recorded	97	36	213	June, July & Aug	Nov. 1 to 5.	Jan. 26	Oc. 21	Dec. 4	Mar 29
1841	11 31	91.1	-6.7	99.8	Jan. 18	30.8	Jun. 20	77.06	Feb. 11	0.70	not reco	rded.	Aug 11	2.310	38.670		80	16	236	F'e Ju'y A'g&S'p	Oc.29 to No.2	not ob.	Oc. 16	Dec 18	Apr 12
1842	11.31	91.0	-1 9	92.1	Apr. 23	52.1	July 26	73.01	Dec 22	9.37	..	lbs.	Sept 12	2.380	42.790		89	55	221	July and August.	Oc.25 to No.1	Ju'e 30	Nov 8	not ob.	Mar 17
1843	12.75	80.0	-9.4	98.1	Sept 22	30 9	Sept. 2	71.11	Feb. 16	4.06	Mar 31	4.91	Aug 27	3.230	43.555	60.2	83	73	209	July, Aug & Sept	Oct. 21 to 25	Ju'e 21	Oc. 17	Dec 13	Apr 23
1844	11.62	80.8	-7.4	91.0	Sept 22	41.6	July 31	72.75	Jan. 25	0 25	Oct. 19	2.97	May 11	1.660	imp'r.	73.1	106	11	211	June, July & Aug	Oct. 22 to 26.	Ju'e 17	Oc. 11	Dec 18	not ob.
1845	11.59	93.0	-1.2	90.2	Feb. 12	30.8	July 12	81.32	Dec. 11	5.10	Feb. 5	7.25	Apr. 30	1.310	imp'r.	55.7	97	17	221	F'e Ju'y A'g&S'p	Oct. 21 to 29	J. 11,15	Oc. 15	Dec. 3	not ob
1846	10.11	91.0	-10.	111.3	Apr. 21	30.6	July 10	78.82	Feb. 26	-3.62	Nov 20	4.11	May 13	1.980	22.355	62.1	103	43	219	June, July & Aug	Nov. 1 to 7.	J. 1,12	Oc. 17	Dec 14	Apr. 8
1847	13.10	87.0	-2.9	89.9	Jan. 16	32.3	July 19	76.80	Feb. 23	0.60	Feb. 3	4.22	Sept. 8	2.650	31.060	49.9	115	39	211	F'e, Ju'y, A'g&S'p	Oct. 28 to 31	J. 18,20	Oc. 11	Dec 26	Apr 19
1848	11.63	92.0	-11.	103.4	Jun. 15	41.0	Jun. 15	77.43	Jan. 16	-4.50	Dec. 2	15.30	Dec. 1	1.280	22.265	10.0	95	39	231	June, July & Aug	Nov. 20 to 25	Jn. 26	Nov. 8	Dec 27	Mar 31
1849	13.70	88.0	-11.	102.8	Apr. 9	33 3	July 12	79.27	Jan. 11	-3.10	Nov 8	17.2	Oct. 6	1.360	32.213	13.0	97	42	226	June, July & Aug	Nov. 13 to 18	J.22,25	Oc. 31	Dec 26	Mar 29
1850	11.72	80.2	-9.0	95.2	June 3	40.8	July 21	75.59	Feb. 4	7.32	Dec 23	10 61	July 17	2.750	27.130	70.1	91	18	226	June, July & Aug	Nov 7 to 13	Jn. 20	Nov 16	Dec 13	Apr 23
1851	11.11	80.3	-11.	101.1	Jan. 20	32.8	Sept 12	73.15	Jan. 30	-1.23	Jan. 29	10.09	Nov 29	2.770	20.873	32.1	100	30	213	June, July & Aug	Oct. 6 to 11.	J.21,22	Oc. 27	Dec 13	Mar 21
1852	13.81	90.1	-10.	100.7	Mar. 7	31.1	July 21	76.72	Jan. 20	0.93	Apr. 5	18.42	July 29	1.860	31.405	91.0	87	60	219	June, July & Aug	Nov. 16 to 21	J.17,21	Nov 11	Jan. 3	Apr 17
1853																									
M'n	° 11 33	° 80.30	—° 9.52	° 98.01		° 39.57	July 23	° 76.31	Jan. 21	° 2.02	Lbs. Miles.	4.87 16.01		2.262	32 519	59 63	96	18	221	June, July & Aug	Oc.29 to No.3	Jn. 26	Oc. 27	Dec 18	Apr. 5

Proportion of Wind, in the Cardinal Directions, in Miles.

DIRECTION.	1848.	1849.	1850.	1851.	1852.	MEAN.
North.	16091.0	17400.2	18769 0	18173.3	13172.0	17221.9
West.	18680.8	17815.1	21766.5	22988.5	19185.7	20170.4
South.	12179.0	10015.1	12925.7	12322.1	11330.5	12026.5
East.	8219.0	11373.3	12118.0	12736.7	11092.0	11351.0

Toronto Observatory.

Latitude, 43°.39.4 North. Longitude, 79°.21.5 West.—Elevation above Lake Ontario, 108 feet.—Approximate elevation above the Sea, 342 feet.

CALCULATED AND ARRANGED FROM THE ORIGINAL OBSERVATIONS AND PRIVATE MEMORANDA, BY SERJEANT JAMES WALKER, ROYAL ARTILLERY.

Plastic Material for Forming various Objects.—Professor Purkinje recommends the following compound for the above purpose:—"Five parts of sifted whiting are mixed with a solution of one part of glue. When the whiting is worked up into a paste with the glue, a proportionate quantity of Venetian turpentine is added to it, by which the brittleness of the paste is destroyed. In order to prevent its clingingto the hands whilst the Venetian turpentine is being worked into the paste, a small quantity of linseed oil is added from time to time. The mass may also be colored by kneading in any color that may be desired. It may be pressed into shapes, and used for the production of bas-reliefs and other figures, such as animals, &c. It may also be worked by hand into models, during which operation the hands must be rubbed with linseed oi; the mass must also be kept warm duringthe process. When it cools and dries, which takes place in a few hours, it becomes as hard as stone, and may then be employed for themultiplication of these forms.—*Gewerbebl. aus Wurtemb.*

Tinning Iron.—Articles intended for tinning must first be rendered perfectly clean by immersion for a short time in a bath of 4 lbs. muriatic acid to three gallons of water, exposure for a short time at a red heat, steeping 10 or 12 hours in a dye of bran, and pickling (as it is called) in dilute sulphuric acid for about an hour. They are then rinsed with water, scoured with hemp and sand, and left in a bath of pure water until wanted. These various operations require some experience to manage them rightly. The plates, are then dried by rubbing with bran, and left singly, for about an hour, in pots of melted grease, which should have been slightly burnt. They are then removed with the grease adhering to them, into the metal bath, consisting of equal parts of block and grain tin, covered with grease, enough to form a layer about 4 inches deep. The bath is heated so as almost to inflame the grease. In about 90 minutes they are taken out, and plunged into another bath of pure grain tin; then rubbed with a peculiar hempen brush, plunged again into the second bath, and finally in a pot of melted tallow. Saucepans are generally tinned by cleaning the inside perfectly, heating the vessel, pouring in some melted tin, and rolling it about, rubbing the tin all over the surface with tow. Powdered resin is used to prevent the formation of oxide.—*Artizan.*