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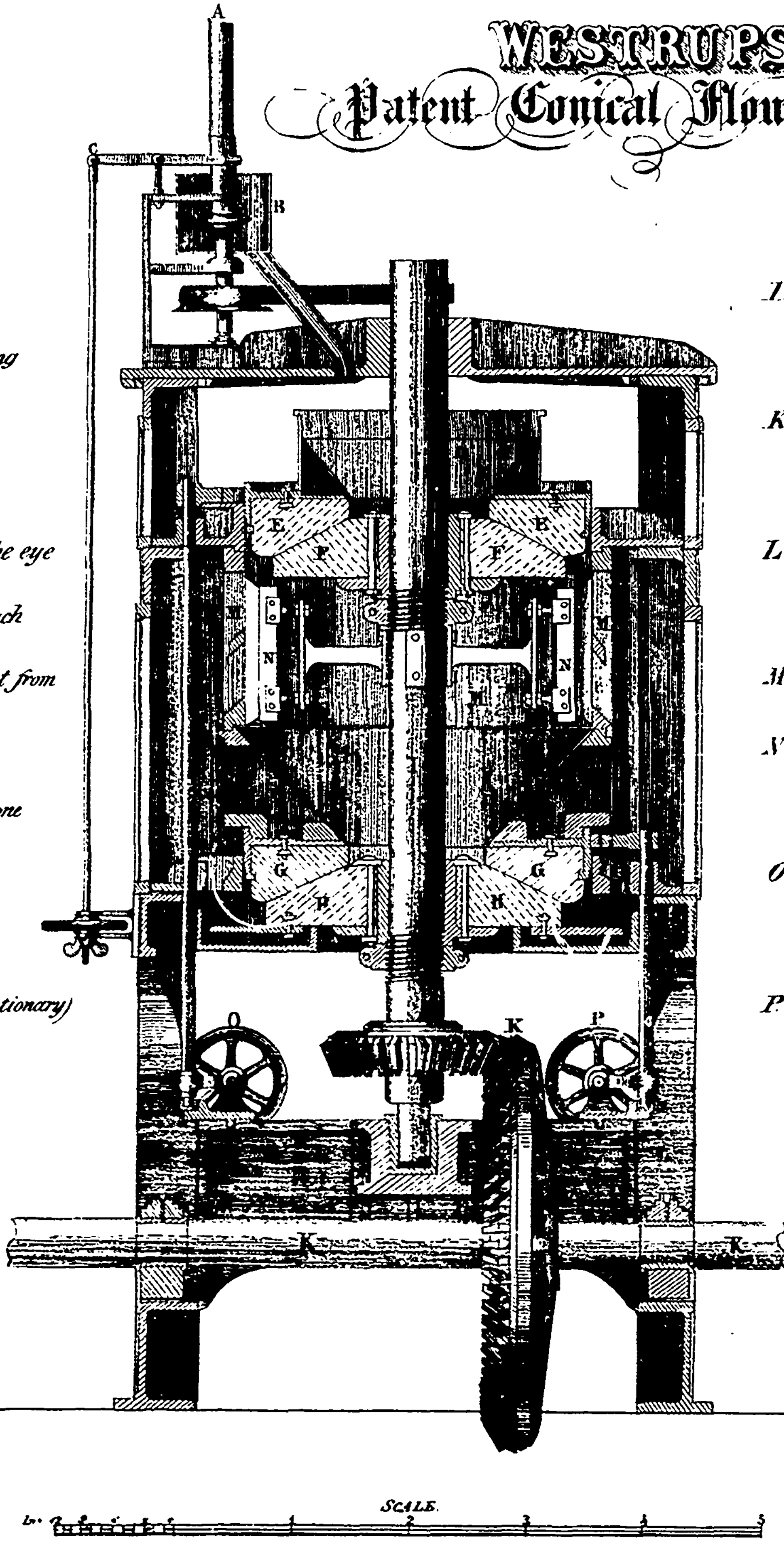
WESTRUPS Patent Conical Flour Mill.



A Feed Pipe

B. Chamber containing feed regulator.

C. Feed regulator

D. Chamber over the eye of the Stones which receives the Wheat from the regulator

E. Upper top Mill stone (stationary.

F. Upper runner.

G Lower top stone (stationary)

H. Lower runner

I. Spindles upon which runners are hung.

K. Bevil Wheels and Driving Shaft

L. Iron Frame sustaining the Whole Machine

M. Upright Wire Cylinder

N Brushes acting upon the Wire Cylinder.

O Regulator for adjusting the upper pair of Stones

P. Regulator, for adjusting the lower pair of Stones.

SCALE.

Engd. Scobie Lith Toronto

The Canadian Journal.

TORONTO, JUNE, 1853.

Correspondence Relating to the Mineral Wealth of Nova Scotia.

We warmly commend to the attention of the readers of this Journal, the following important communication from Mr. Millett, of Penzance, Cornwall, England, on the Mineral Wealth of Nova Scotia. We are aware that for some time past the reported existence of extensive beds of very pure copper ore, has attracted the notice of a wealthy English Mining Company, and that several gentlemen have been sent out at different periods to Nova Scotia for the purpose of acquiring, if possible, correct information in relation to the distribution and abundance of a variety of copper ore, called "purple copper." The exertions of the gentlemen heretofore engaged in the search do not appear to have been rewarded with the success they anticipated; but, as the letter of Mr. Millett shows, that gentleman has succeeded in discovering a large variety of minerals possessing great economic value, and destined to be of the utmost importance to the sister Province.

Steamship "Niagara," at Sea,
21st April, 1853.

To the Editor of the Canadian Journal.

Sir,—The existence of your very valuable Journal has just come to my knowledge, through the instrumentality of one of your earliest supporters and contributors; and associated as I am in my native County (Cornwall) with institutions, kindred in feeling and object, you will, I feel assured, pardon my troubling you with a few hasty notes, of an equally hasty visit to the Province of Nova Scotia, from which I am now returning (having departed from England only on the 19th ult.,) but which, I fear, will scarcely be worthy your notice.

Although an ardent admirer of, and, to some extent, a rather active promoter of the science of Natural History, the present inclement season of the year precludes the possibility of my contributing anything in this department. I would mention, however, one fact which came under my notice (on the 2nd instant) and much surprised me.

Being detained by an accident which happened to our carriage, at Schultz's Hotel, on the Grand Lake, I availed myself of the opportunity of looking into the neighbouring Forest, more particularly in quest of Ferns and Birds. The day was bright and the sun warm, and on a bank, in a sheltered dell, I surprised two beautiful Butterflies, sporting with all the life and activity of a Summer's day. I endeavoured, in vain, to catch them, their alertness baffling every attempt I made to do so.

Such an early appearance of this delicate insect, would occasion surprise in the southern parts of England; the greater, therefore, was it to myself in Nova Scotia, where Winter still existed, and the frost held entire dominion of the country.

I know not whether this occurrence is rare, or otherwise, in the locality in question; but I mention it with the idea that it may prove interesting to some of your readers, who may be pursuing the very delightful study of Entomology.

The occasion of my late visit to the Province being confined exclusively to the examination of certain of its Mineral Districts, a cursory glance at these, from the new and intense interest excited, both in England and there, on the subject, may prove acceptable to you at this moment; but, in doing so, I must speak generally, rather than in detail, of such Mineral Deposits as came under my observation.

My examinations have been confined to parts of the country lying North of the Basin of Minas, following the courses of several of the principal Rivers discharging themselves into its waters, and to the tributaries flowing into those Rivers.

From the vast extent of primitive Forest with which the whole district, forming the Mountain Range, is here covered, no other means are available for accurately examining the Mineral property it embraces. Nature, in most instances, having so arranged the courses of the Rivers as to operate as cross-cuts for the various deposits; which are thus exhibited on their banks or beds.

The existence of Coal and Iron in various parts of the Province, and in quantity and quality most bountiful and rare, is a fact patent in itself. Every day, however (from the recent explorations), adds to, and strengthens these two great elements of Human Industry and Wealth; and no limit can possibly be assigned to their extent.

The presence also of the more valuable Metallic Minerals, such as Copper, Lead, Zinc, Manganese, Sulphate of Barytes, &c., are now proved to be coëxistent with them. From the very limited operations, however, yet pursued, no data can, at present, be given to their respective extent. Metalliferous Rocks and Matrixes of the most kindly and suitable nature for their production, on a large scale, abound. *Marbles* of the purest and most compact nature, both of the White (Statuary) and Variegated, of the most beautiful and varied characters, appear to be bountifully supplied to this particular District; whilst Lime, Gypsum, Freestone, and other equally valuable products, appear scattered over various parts of it, in quantities inexhaustible, and qualities not to be surpassed.

The Barytes, Marble, Copper, Iron, and many other Mineral Deposits, I visited in the Five Islands District of the Province, far exceeded my most sanguine anticipations; and, notwithstanding the extreme difficulties I had to contend with, in consequence of the swollen state of the Rivers, the accumulation of Ice on their banks, and the Quantity of Snow remaining in the Forest, I found abundant evidence that Nature had here scattered her Mineral bounties with a most prolific hand, and that Capital and Energy combined, were alone wanting to develope the resources, and add immensely to the wealth of this highly favoured, but long neglected Country.

From the very numerous veins of Barytes already exposed to view in the banks, and their continuance through the beds of the Rivers and Tributaries, there is abundant proof that this valuable Mineral exists, in this locality, to a very considerable extent.

The greater portion of what I saw was of the purest nature, and might be rendered Merchantable at a very moderate expense; whilst other portions were slightly stained with Red Oxyde of Iron, which may be easily and economically removed before disposed of in the Market.

The various purposes for which it is applicable, in a commercial point of view, cannot fail to make it an article of considerable demand; and Markets for its disposal, when its purity and abundance of supply become generally known, will most readily be found.

The quantities hitherto exported from hence, have been so limited, and the supply so uncertain, that the article is comparatively unknown in the Market, and has been consequently confined to a few hand . But by an extension of the operations, from a proper employment of Capital, a very large and constant supply may be kept up with the mercantile community, and with the greatest facility.

Veins of Specular Iron Ore, and Copper Pyrites, occur in the same Strata as the Barytes; and the latter may be very properly looked on, if not as a Matrix, still as a very strong indication of the co-existence of other Metalliferous Deposits occupying the same channel of ground.

This is a feature of considerable importance in a mining point, of view; as the operations to be directed, in the first instance, to the Barytes most necessarily tend to the development of the Iron and Copper, and may thus be extended, by the same staff of operatives, to the working of the latter Minerals upon the most cheap and effective scale.

Their quality is undeniably rich, but nothing whatever appears to be known, at present, of their extent. From the regularity and size, of the Lodes however, already exhibited in the Banks and beds of the Rivers; added to the exceeding favourable nature of the accompanying strata, little doubt can exist (judging from parallel cases) that they are to be found here in large and productive quantities.

Rich specimens of Zinc and Manganese, are to be found likewise in this immediate locality, evidencing their presence also. But none of these deposits came under my notice, from the natural impediments before mentioned. Such specimens, however, were handed me by the inhabitants who had picked them up in the bed of the river in the summer season.

Of the various Marble beds or deposits in the Five Islands District, the *white* most undoubtedly take the pre-eminence; although the variegated, from their variety, beauty, and compactness, must always stand very high in the scale.

The White Marble is of the finest quality for purity and grain; having been pronounced by a most eminent Statuary, to combine all the requisite characteristics for the most delicate and enduring works of art. Judging from the appearances of the several beds partially opened on; and their length and breadth, traceable on the surface in the forest, and in the bed of the contiguous river, there can be no question that this most prized and valuable article, exists (in situ) here, to an extent little suspected by any one, and now, for the first time, to be developed to the world.

The Variegated Marbles present several very distinct varieties; amongst the most prominent are a most delicate Lilac (or Amethyst) ground, combined with a soft yellow, or gold colour. A pure Lilac, with a trifling admixture.

And a Lilac, blended with green, varying in deep and light shades. The former and latter of these represent a *Giallo Antico* and *Verd Antique*, of a true and unmistakeable character—involving (from their beauty) the utmost difficulty in deciding to which the palm for merit and value should be awarded.

Property, of such intrinsic value as these, can no longer be allowed to remain buried, and unknown in the bowels of the earth; and the surprise to myself is, how they can have so long escaped the prying eye of man, and wasted their hidden treasures in the desert air.

Nature has so arranged and placed these beds in the river bank, (here assuming a height of several hundred feet) as to render their being quarried with the utmost ease and cheapness. And the more so, from their immediate contiguity to each other The Layers or beds of the material lie horizontally in the face of the bank; and, judging from their compactness and nature, blocks of very large size will no doubt easily be worked out.

Harbours embracing the most advantageous positions, are everywhere almost in contact with the Mineral Districts, to which access is easy, in most cases, by gentle inclinations; and shipping for the exportation of metals or minerals abundant; and freight moderate.

The Province, from the cursory view I was enabled to take of it, appears to be bountifully supplied by Providence with wood and water, and to comprise, generally, an undulating country of upland and interval; the latter, particularly in the Truro, Onslow, Economy, and Five Islands Districts, abounding in alluvial soils of the richest description.

From the ungenial season of the year, when nature had put on her most sombre mantle—the vegetable world appeared to the least advantage to the visitor. But enough was apparent to satisfy me, that, in a few months, a total change will have overspread the scene—and that few countries can boast of greater luxuriance or beauty.

The geographical position of the Province, placed as it is, between two immensely populous and consuming quarters of the globe (Europe and America) gives it an undeniable advantage over almost every other portion of the civilized world—and *unity of purpose amongst its inhabitants;* rapid internal communication by *Railroads* (one of which latter I am happy to find, is now in actual progress, and which will, in effect, be the *Lung* giving vitality to the whole—and a main artery through which the enterprise, spirit and commercial wealth of those two most important communities must directly circulate,) and *Capital* alone, are wanting to render it most wealthy and prosperous.

I cannot conclude these hasty notes without expressing my great obligations for the uniform kindness and attention, I received at the hands of all classes of the inhabitants, (from His Excellency the Governor of the Province, to the Native Indian in his primitive Wigwam,) during my very short sojourn amongst them,—bearing out, in the fullest sense, the high character for hospitality and kindly feeling, which I had been led to anticipate from them, previously to my quitting the British Shores.

I beg to apologize for the length of this communication, which I had intended to have made much more concise, but the very great interest and importance of the subject, have led me unwittingly on.

It will afford me much pleasure to transmit to you, the published transactions of the "Penzance Natural History and Antiquarian Society," and to receive from you a copy of your's in exchange.

I am, Sir,

Your most obedient Servant,

JNO. R. A. MILLETT.

Electric Light, and Colour Manufacture.

We have perused a little pamphlet, just issued from the press, on Electrical illumination by J. J. W. Watson, Ph. D., F. G. S. &c. It gives a clear and succinct account of the process of discovery, which, according to the author, has resulted not only in the realization of the long-sought desiderata—viz., an economic and a continuous electric light—but also in the discovery of a new mode of manufacturing colours, at a cost so insignificant as to ensure a ready and inexhaustible market. These are features of exciting interest; and, if fully realised as promised, must undoubtedly be attended with important consequences, by revolutionizing the world of light and of colour.

Mr. Watson freely acknowledges what is due to other electricians. He admits that Professor Daniel's galvanic battery is distinguished for producing a continuous light; but from the expense of maintaining the action it could never be profitably applied to common uses, and was, therefore, a costly ornament, not a marketable commodity. This great distinction is, of course, fatal to its utility for the purposes of every day life. Strongly influenced by this impression, Mr. Watson turned his whole attention to the finding of means of producing this light at a small cost. We are informed that he has fully succeeded in his object; that he can produce and maintain this splendid light continuously for any required length of time, not only without cost, but actually at a profit, by the aid of a chemical transformation of the elements used in the working of the battery. These elements have hitherto consisted almost entirely of the common mineral acids, zinc and copper: occasionally iron, lead, and tin were used, but sparingly, and without any important acknowledged results. Mr. Watson's new agents, or electrolytes, are only five in number, and from these he produces no less than 100 valuable paints or pigments, of a superior quality and character, surpassing in marketable value the articles from which they are produced, and by which the light also is fed. It is, in fact, maintained that not only is the light thus created without cost, but absolutely at a profit, by the additional convertible value of the elements transformed by the chemical process. The mode also of producing these colours is asserted to be not by any subsequent mixture of the elements, but results from the actual development of the electricity in the battery, the materials employed also aiding in the galvanic effect by giving constancy, from the want of which united recommendations as Mr. Watson observes, the best form of batteries at present in use are absolutely worthless for a practical purpose such as lighting.

The nature of the action thus produced, and the mode of the process observed, is then touched on. We were also informed that the Maynooth battery is the great favorite with electrical experimentors, and that all the successful exhibitions of the electrical light have been made with this battery. Without changing its form, Mr. Watson has endeavoured to supply its deficiencies, and render economical its working.

He says: "Prussiate of potash, or, as it is known to chemists, ferro-cyanide of potassium, gives with the salts of iron a most splendid blue pigment.—Prussian blue; which, when pure, is of the greatest possible value. In the Maynooth battery we employ the prussiate of potash thus: to the iron cell we add prussiate of potash, and to the zinc cell also the same salt, although we restrict the quantity greatly, for reasons which need not be described here, but which to those having any acquaintance with the nature of galvanic arrangements will be at once apparent. Our products are Prussian blue, of a quality and colour equal, or as we have been disinterestedly informed by those dealin the article, far superior to any in the market. Our other product is a peculiar blue pigment, of a colour resembling, and from specimens which may be seen at our manufactory at Wandsworth, closely vying with the artificial ultramarines. This pigment, from its chemical constitution, as proved by our analyses, we have termed the ferro-prussiate of zinc. The insoluble nature of these pigments, and their consequent removal from the galvanic circuit by precipitation, gives to the Maynooth battery a greater constancy, as we have before described, than there remains to it in its normal state. In addition to rendering profitable the working of the battery, the prussiate of potash has a distinct galvanic action, in the manner before described.

"The discoverer of the Maynooth battery is also the inventor of another form of battery, of which we also have availed ourselves for making colours. This form consists of platinised lead and zinc, arranged precisely in the manner of a Smee's battery, and is similarly excited by nitro-sulphuric acid. In this battery our pigments are chrome yellows, produced by adding the bi-chromate of potash precisely in the same manner as with the prussiate of potash. The depth and tint of the pigments, which with chromes constitute their value in the market, we vary with the proportion of the salt added. As regards the galvanic effects of the bi-chromate of potash, it is precisely the same as with the prussiate of potash.

"The power of the two forms of battery just described, and their applicability to the purposes of electrical illumination, from their constancy and intensity, will be best appreciated when it is stated that a platinised lead battery is about fifteen times as powerful as a common Wollaston battery of the same size. A cast-iron battery is a little less powerful than the platinised lead one, but it is cheaper in its first erection, since the iron plates do not require to be platinised. Three platinised lead batteries excited by a solution of nitre and sulphuric acid, or three cast-iron batteries excited by nitric and sulphuric acid, will afford the most brilliant light, equal, at least, to 300 wax candles, whilst it requires 160 cells of Daniel's constant battery, or 250 of the ordinary Wollaston battery, to effect the same object. Three of the lead or iron batteries will occupy just one-sixth the space occupied by Daniel's arrangement, and one-twelfth of what is occupied by Wollaston's.

"The expense of constructing a platinised lead or iron battery is far less than any of the other forms of battery in use. For instance, a platinised lead or a plate of cast iron, of an efficient size, may be had for 1s., whilst a platina plate of the same dimensions will cost nearly £3. Moreover, a platinised lead or cast-iron battery, without any of the means by which we have effected an economy, may be worked for one hour with a resultant of the same power for one-tenth part of the expense of working a Grove's battery for the same time.

"In addition to the cast iron and platinised lead batteries, we employ a third form, which is identical in arrangement with the old form of Wollaston battery, but free from the defects of that instrument. The sulphate of zinc, which usually attaches itself in the form of metallic zinc to the copper-plate in Wollaston's arrangement, after the battery has been in action a short time, we find is carried down as a splendid blue pigment, much resembling the better description of "smalts," by adding prussiate of potash; hence the constancy of the battery is maintained so long as any fresh acid remains in the cells.

"It will be easy to perceive that if prussiate of potash gives with iron a blue colour, and chromate of potash with zinc a yellow, that if these salts be added in a battery of iron and zinc—the prussiate to the iron and the chromate to the zinc, the resulting products having access to each other through a diaphragm—the colour produced will be a green, of a depth of tint dependent on the quantity of the two normal colours forming the compound. In like manner, by adding prussiate of potash to the lead battery, a white pigment is produced of great body, and perfectly free from the fault of blackening by exposure to sulphuretted hydrogen, the zinc seeming to act as a protective agent. If chromate of potash alone be added to the iron battery, a deep brown colour is produced. Lastly, if lime be added, with chromate of potash, to the lead battery, a red pigment is produced, of great brilliancy and body.

"Our arrangements for filling our batteries, and drawing off the products as they are formed, are simple in design, and perfectly efficacious in practice; they consist to describe them generally, in a well-arranged system of gutta percha piping, troughs and taps. Our aim in dealing with the difficult matter of making the experimental apparatus of the lecture-room the working instrument of practice, has been to establish a thorough system of electrical engineering; and with what success will be best seen by a visit to our manufactory.

"We have now to deal with the other products of our batteries, not pigments; and although we feel great difficulty in placing this part of the subject in a garb sufficiently popular to be easily comprehended, we consider it necessary to advert to it, to render more clear what we may describe as the "profitable" portion of our invention.

"During the working of certain forms of our batteries large quantities, especially when we use nitric acid, of nitrous fumes are given off; these fumes we convey into appropriate chambers and apparatus, and convert to the following uses:—The production of nitrate of potash, and the production of sulphuric acid—substances which it will be seen are made use of in originally exciting the batteries. The hydrogen which escapes from the zinc cells we also profitably employ for the manufacture of acetic ether and ammonia. The pigments, when removed from the batteries, carry with them, of course, a large quantity of spent acid solution. This we profitably employ, after the manner described in our specification, for the manufacture of nitrate of iron, white lead, and plaster of Paris. The acid solutions also contain a large proportion of the salts of potash in the forms of nitrates and sulphates; and these salts are easily separated in the manufacture of the substances just named. It must be remembered that nitrate of potash forms one of the exciting agents in the lead battery, and that, therefore, the saving of this salt is by no means an insignificant feature in the economy of our system. We would, moreover, especially draw attention to the fact, that the potash salts from the prussiates and chromates, added to the batteries for the manufacture of the colours, contribute entirely to the formation of nitre and sulphate of potash, over and above the alkaline salt used as an excitant."

Mr. Watson then comments as follows:—"The difficulty of carrying into the wide and, it may be said, rough fields of practice an invention such as these pages are devoted to, can only be really understood by those who have experienced it. A new field of labour has to be opened, and experience and education can be the only guide of those who may engage in it. Electrical illumination consists not in the mere arrangement of certain galvanic pairs; it requires something more: system, order, and economy, must rule it, as with railways and steam navigation. The successful and permanent institution of telegraphic communication by the same mysterious force, offers the greatest possible inducement for its being taken up in the spirit that it deserves. The laying of the electrical mains, and the arrangement of a system of governors for regulating and measuring the quantity of electricity passing to the different lamps, is as much a matter of engineering as the arrangements of gas and water. It will be easily recognised, we opine, that if the manufacture of the colours which we have described can, in itself, return a profit so large as to constitute a trade monopoly, that the production of the same articles, and the gain of a new power, as an additional source of profit, is a matter worthy of every species of encouragement. We state the proposition thus generally to save ourselves the tedious details of a debtor and creditor statement, although the closest inspection of such that can be given we more than desire and court."

In conclusion Mr. Watson, recapitulates that he is able to produce the electric light steadily and uninterruptedly for any number of hours; that any little inequalities in the action of the battery, which would cause the light to flicker, are entirely removed, and rendered inoperative by his introduction of the magnet as a regulator; that he has the means resident within the lamp itself of increasing or diminishing the light; that the lamp requires no previous adjustment, when the electrode is once fixed, to render it available at a moment's notice; that the electric light has no characters in common with other artificial sources of illumination. It surpasses all other lights in brilliancy. It may be seen from a distance of 30 miles from the place of exhibition; and, what is peculiar, it requires no air to support it, and burns as well under water as it does in vacuo! That for lighthouse purposes it is invaluable. For signalising at sea, ships in convoy, lights of all kinds for vessels, for railway purposes, lighting tunnels, mines, and diving-bells, it has properties and advantages which no other description of light can command. In streets it must, with time and public favour, entirely supersede the use of gas; and for lighting public assembly-rooms, theatres, and spectacles of all kinds, it has only to be made known to ensure its adoption.

Samuelson's Patent Digging Machine.

It is well known that the produce of land cultivated by market gardeners and by cottagers far exceeds that obtained from the same area by the farmer. That excess is obtained chiefly at the expense of increased labour in deep tillage, irrigating, singling, and cleansing. It is only of late that a serious effort has been to assimilate our practice as farmers to that of the gardener. In the growth of root crops the water drill is but just beginning to perform that in the field, the omission of which in the garden would be considered as the height of neglect. In growing corn, we still adhere to the extravagant practice of thick sowing, whether broad cast or by the drill; though we may see in the labourer's allotments how much superior, both in the straw and in the ear, is the crop which he has "dibbled" with one-third the quantity of seed. The value of horse-hoeing is doubted by many who would not allow a weed to remain in their gardens; and we still endeavour to make up by waggon-loads of manure and by tons of guano for imperfect tillage and want of drainage, which permit their most valuable constituents to be washed off the surface into the ditches and streams; whereas by converting our fields by deep tillage into one vast filtering bed for their retention, we should not only avoid this waste, but avail ourselves to the utmost of the valuable dressings that descend with the rains of heaven, the ammonia contained in which, according to our chemists, represents an annual value of quite twenty shillings per acre, estimated at the price of guano.

It is to the element of cultivation, namely the effective pulverization of the soil and preparation of the seed-bed, that Mr. Samuelson the well known agricultural engineer of Banbury, has contributed the invention of his digging machine, which has been for some past at work in that neighbourhood. It consists essentially of several series of slender steel prongs, so shaped in curve and section as to penetrate the soil easily by the mere weight of the framing, which contains them; each series resembling the spokes of a wheel without the tyre, and all the wheels being caused to revolve by the draught of the horses, whilst embedded in the earth up to what may be called their naves. The spokes or prongs bring up the soil, and allow it to fall backward, thoroughly pulverized and mixed, in a form not unlike the backwater from a paddle-wheel. In the upper portion of their revolution they pass between a corresponding number of strong iron bars which scrape away any earth or weeds adhering to them. Although, like all other tillage implements, it works best in dry weather, the digger was used with advantage during the early spring, when it was hardly possible to plough at all; it also clears itself well of any stones which it may pick out of the ground.

From the description which we have given, it will appear that it is, in fact, a trenching implement, propelled by horses—loosening, and partially bringing the subsoil to the surface, and thoroughly reducing the whole, like the fork; and not merely cleaving off a slice, and reversing it like the plough : but, as it only requires four or five horses to work it when set to dig ten inches deep by three feet in width, being equal to four acres dug in a working day of seven hours, in soils where it is rare to see less than three horses ploughing only one-fourth of that breadth to a depth of barely six inches, it is obvious that, apart from the superiority of the result, there is positive economy in the power applied. Circular motion, which general accompanies the application of steam power, will, we trust, in this instance, as in that of the horse power thrashing machine, prove to be only its precursor; meanwhile, it is perhaps quite as well, with reference to the speedy and general adoption of this new cultivating machine, that its introduction is not dependant, in the first instance, upon that of the steam engine.

In conclusion, we must not omit to notice the application of the "Digger" to works of road formation and excavating generally. It moves as much surface soil in a day as would require forty to sixty men with the spade.

How to tell Gold.

Gold *invariably* exhibits something of the peculiar yellow colour which it is known to possess in a pure state; but this color is modified by various metals with which it may be mixed. Thus it may be described as having various shades of gold-yellow; occasionally approaching silver-white, occasionally resembling brass-yellow of every degree of intensity, and even verging on steel-gray in some specimens from South America.

The lustre of gold is highly metallic and shining, and owing to the small amount of oxidation at its surface, it preserves its shining lustre even after long exposure in contact with other substances. Thus the shining particles are often seen in sand when the quantity is barely sufficient to repay the cost of working notwithstanding the value of the metal. Even, however, if the surface is dull, the true color and appearance is easily restored by rubbing; and when polished it takes a very vivid lustre, which is preserved for a long time in the atmosphere.

Although in the division which has been introduced into the gold-yellow, brass-yellow and grayish yellow, native gold seems, with some slight modifications, to agree with the geological relations of its varieties; yet this mode of arrangement deserves little serious notice. The gold-yellow varieties comprise the specimens of the highest gold-yellow colors, though there are some among them which have rather a pale color; they include most of the crystals and of the imitative shapes, in fact the greater part of the species itself. The brass-yellow native gold is confined to some of the regular and imitative shapes of a pale color, (which is generally called brass-yellow,) and, it is said, has less specific gravity than the preceding one; but this does not seem to have ever been ascertained by direct experiment. The grayish yellow native gold occurs only in those small flat grains which are mixed with the native platina, and possess a yellow color a little inclining to gray; they are said to have the greatest specific gravity of them all. The real foundation of this distribution seems to be the opinion, that the first are, the purest, the second mixed with a little silver, and the third with platina. It is not known whether the latter admixture really takes place, but it is certain that several varieties of gold-yellow native gold contain an admixture of silver.

In color and lustre, inexperienced persons might mistake various substances for gold; these are chiefly iron and copper pyrites, but from them it may be readily distinguished, being softer than steel and very malleable; for, although the latter mineral yields easily to the point of a knife, it crumbles when we attempt to cut or hammer it, whereas gold may be separated in thin slices, or beaten out in thin plates by the hammer. There can thus be no possible difficulty in distinguishing these various minerals in a native state, even with nothing but an ordinary steel knife. From any other minerals, as mica, whose presence has also misled some persons, gold is easily known by very simple experiments with a pair of scales, or even by careful washing with water, for gold being much heavier than any other substance found with it, (except platina and one or two extremely rare metals,) will always fall first to the bottom, if shaken in water with mud, while mica will generally be the last material to fall. This is the case however fine or few the particles of either mineral may be.

Gold, therefore, can be distinguished by its relative weight or specific gravity, and by its relative hardness, and from other bodies which resemble it. It is described generally as soft, completely malleable, and more accurately as softer than iron, copper or silver, but harder than tin and lead. It is useful to know facts of this kind, as a simple experiment that can be made with instruments at hand, is often more valuable than a more accurate examination requiring materials not immediately available. Thus, if it is found that a specimen, (perhaps a small scale or spangle,) is readily scratched by silver, copper or iron, and scratches tin and lead, it may, if of the right color, and sinking rapidly in water, be fairly assumed to be gold.

Westrup's Patent Conical Flour Mill, with Plate.

The great interest which this invention has created in the public mind, and its adoption by various foreign States, including France, Belgium, Austria and Mexico, where mills are already erected, justify us in bestowing upon it a short notice. The bold statement to be proved before Parliament, that by the adoption of this mill, out of the same quantity of wheat consumed in England nearly eighty-two millions of quartern loaves per annum in addition may be furnished to the nation, at a money value of upwards of two millions sterling, is a matter of very great importance, exceeding any that can be brought forward by the most expert financier in lessening the national burdens.

As there is frequently in the most plausible and splendid theories, some faults or drawbacks in practice, which cannot be immediately detected, we have waited until practical experiments were made before giving our unqualified support to this invention. There have been now several of such experiments, and the conical mill at Wapping has been at work night and day for some months, supplying customers, who increase, as the Messrs. Pavitt publicly state, beyond all their powers of grinding; hence this invention may be said to be already "a great fact."

The first public experiment was attended by many scientific men, and the reporters of nearly all the daily and weekly journals, who, without a single exception, bear witness to the success and the excellence of Mr. Westrup's invention. We shall conclude this article by quoting from a scientific weekly contemporary the following report :—

"The old flat flour-mill ordinarily consists of a lower fixed circular stone, and an upper revolving one, each of about 4 ft. 6 in. in diameter. The wheat being introduced through an aperture, is drawn in, and ground between the revolving and the fixed *surfaces*. The average weight of these stones is about 14 cwt., and it is ordinarily found that the grinding surface presented, is so extended as to render the delivery of the flour extremely slow and uncertain, notwithstanding the great velocity of the running stone, which is generally 120 revolutions per minute. The evil arising from this circumstance is, that the flour, finding only a partial escape, is triturated and re-triturated to the great ultimate injury of the meal.

"Some idea of the power required to keep such massive machines in operation may be gathered from the fact, that a single pair of stones, 4 feet in diameter, require the power of a four-horse engine to maintain the needful speed. This enormous power becomes necessary, in consequence of the great weight of the 'top stone,' the rapid rate of revolution, and the very large amount of friction produced by the process of grinding so glutinous a substance as meal between such extended surfaces.

"These are the principal objections to the old flat mill system of grinding, which has been the universal one in use in all parts of the kingdom for a considerable time ; the only variation in practice consisting in the motive power. Most commonly steam power is employed, but when the locality admits of its introduction the cheaper and more uniformly certain agent, water, has been brought into action. In all other respects, the mechanical detail of the system has been uniformly the same.

"The 'conical' mill is intended to obviate these defects ; and a very few remarks will suffice to show that its inventor has not only detected their causes, but has brought into operation a most philosophic, and therefore successful, combination of grinding and separating agencies, by which these defects have disappeared to an extent which leaves little to be desired. The beneficial changes effected may be succintly enumerated. First, the reduction of the weight of the running-stone from 14 cwt. to 1½ cwt., by placing it beneath instead of upon the fixed one; second, the reduction of the size of the stones in the proportion of 3.34 to 1 ; and thirdly, the giving to the stones a new form—that of the frustum of a cone. The advantage of lessening the diameter and weight of a mass, of which the one is 4 cwt., and the other 14 cwt., will be apparent, when it is considered that its effective velocity is 120 revolutions per minute, and that this velocity must be sustained against the enormous friction of the grinding surfaces. The altered position of the running-stone admits of a much more delicate adjustment of the opposing surfaces, and gives to the miller an easy and effective control over the most important portion of his operation. The conical form facilitates the discharge of the flour, and obviates the clogging und overheating of the old practice. In addition to these advantages, by a judicious modification of the ordinary mode of dressing, or rather by a combination of the mill with the dressing machine, a perfect separation of the flour from the bran is effected at the moment the grist escapes from the stone. The bran still remains in the mill, and falls by its own gravity to a second pair of stones in all respects resembling those already described.

"Both pairs of stones are mounted upon the same spindle, and of course impelled by the same gearing. The operation of the lower pair need not be described; they complete the process, and leave nothing unconverted into flour which could add either to the weight or the quality of the loaf. In considering this arrangement, we cannot fail to be struck with the analogy subsisting between it and that which we observe in the construction of the jaws of animals—a circumstance which assures us of its philosophical superiority.

"There were three trials as regarded the old system and the new. The first experiment on the old mill gave a discharge of 16 lb of flour in five minutes, which was equal to 192 lb per hour; while upon the patent mill there was a discharge of 38½ lb in five minutes, or 462 lb per hour. The difference, therefore, on that experiment was, against the old system, 270 lb per hour. The second experiment tried was even more favourable as regarded the new system.

"Two conical mills worked against two on the flat principle for an hour, ascertained exactly, and with the following results : Conical mill (No. 1.) produced 8¾ bushels ; ditto, No. 2.) 7¾ bushels; Flat mill (No. 1.) 3 bushels; ditto, (No. 2.) 3 bushels. (See plate.)

On Fixing Photographic Drawings.

We have received from an amateur, who states he has "never yet seen the productions of any other person," some calotypes, which are to a certain extent successful. They exhibit, however, many of the faults which mark the productions of the inexperienced operator; and we are therefore induced to offer a few suggestions which may be of assistance to our correspondent, and others similarly situated.

In the first place, the specimens before us bear the evidence of having been obtained with a very imperfect lens—we should judge from appearances, a lens which has not been made for a Photographic Camera. Now, the peculiar conditions of the agent by which these pictures are produced, demand the use of lenses which have been constructed with due regard to certain known principles; otherwise a perfectly flat field, and distinctness up to the edges, cannot be obtained.

It is a mistake to attempt to adopt an ordinary lens to a photographic camera; as, by so doing, failure must follow upon failure, and the production of a good photograph is rendered impossible.

Our correspondent complains of the injury which his pictures receive in the process of fixing with the hyposulphite of Soda, and regrets that some more perfect method cannot be discovered.

We believe it will be difficult to discover any chemical agent superior to the hyposulphite of soda, which, when properly employed, ensures the utmost degree of permanence to the photograph under any circumstance of exposure. To place this clearly before our readers is our object.

1. The hyposulphites are remarkable for their property of dissolving several of the salts of silver—such as the chloride and iodide—forming with them compounds which are distinguished by their peculiar sweetness. *Negative* Talbotypes consist of an iodide of silver over all those parts which are not darkened: and of metallic silver in a state of minute division over the darkened portions. Positive pictures only differ from negatives in the general use of the chloride of silver, instead of the iodide. In either case the unchanged silver salt is to be removed, and the darkened portions disturbed as little as possible. In the process of change under the influence of the solar radiations, oxide of silver appears to be formed at first; the oxygen is then liberated and metallic silver is the final result. If much oxide of silver re-

mains on the paper, the hyposulphite of soda will dissolve some portions of it, and thus injure the picture. This is shown by the more energetic action of the hyposulphite on the positive than on the negative pictures. In the latter, by the action of the Gallic acid, or the protosulphate of iron, the complete deoxidation of the silver salt is effected. In the former, this is not the case where the exposure to sunshine has been short, or where the copy has been made by the effect of diffused daylight.

Positive photographs which are made when the sun is shining brilliantly, are far less liable to injury than such as are procured by the weak and uncertain light of a wintry day, although they may in both cases be brought to the same apparent degree of darkness.

2. As a general rule, it is advisable to expose the positive to sunshine longer than it is necessary to do, for the production of a well-defined image. If the picture has been rendered *far too dark* to be pleasant, it can be *toned* back, to use an artistic phrase, by very weak solutions of the iodide or cyanide of pottassium.

3. The photograph being removed from the copying frame, or the camera, should be first placed in some clean water, to which a small quantity of common salt has been added. By this all the free nitrate of silver is converted into a chloride; and the formation of any sulphuret of silver in the paper, by the action of the nitric acid on the sulphur salt, prevented. The picture should, after it has soaked for a little time, be removed and placed in a solution of the hyposulphite of soda, in a flat dish—about an ounce of that salt being dissolved in a quart of water—it should remain in this fluid for five or ten minutes, and then be removed to a vessel of perfectly clean water.

4. It is thought by many photographers that the addition of some chloride of silver to the hyposulphite of soda prevents its acting on the more delicate shadows of the picture. Whether this is the case or not, is somewhat uncertain; but the hyposulphite solution can be used a great many times, if after using it is poured back into a bottle, and kept from the air.

5. It becomes necessary now to remove every trace of the hyposulphite of soda and silver from the paper. Many persons are content with soaking their pictures; but by far the best practice is, to place the photographs upon a flat board, incline it to an angle of about 45°, and allow water slowly to fall upon and flow off from the pictures. By this means the salt is removed far more rapidly than by soaking and changing the water, howsoever carefully this may be done. Even after this the safest course is, to place the photograph in some clean hot water, to which a little potash has been added. This secures the removal of the last trace of the hyposulphite, and it darkens again those lines of the photograph which may have been injured by chemical action, as above described.

6. By attention to these details photographs may be fixed most permanently, without their undergoing any serious injury. The addition of neutral chloride of gold to the hyposulphite of soda bath, tends to produce a variety of purples approaching almost to black, which are of a very pleasing character. Similar results may be obtained by soaking the picture in a weak solution of the chloride of gold, upon removing it from the fixing fluids.

7. The experience derived from the photographs displayed at our late Photographic Exhibition, some of which have since been presented to the Society, convinces us that sufficient care is not generally given to secure the perfect permanence of a fine positive photograph. By the combined influence of a moist atmosphere and light, changes slowly go on from the edges of the paper spreading inwards, which eventually destroy the picture, if there is the slightest trace of the hyposulphite of silver allowed to remain on the paper. The taste is the best test that we can apply; and if after a picture has been well washed in several perfectly clean waters, we take one corner of it into the mouth and suck out some of the water, without discovering any metallic sweetness, we may be sure that our photograph will endure as long as any ordinary print.—*Journal of the Society of Arts,*

"On the nutritive value of the food of Man under different conditions of age and employment." By Dr. L. Playfair

The great importance of an attentive consideration to the kinds of food taken under different circumstances becomes evident when it is known that one class of substances supplies the fuel that maintains the heat of the body, and other substances supply the materials that form the flesh and the bones. The lungs act as a furnace, in which the process of slow combustion is always going on by the absorption of oxygen from the air into the blood and the exhalation of a portion of it, in combination with the carbon of that fluid, in the form of carbonic acid. It was stated by Dr. Playfair that the weight of oxygen absorbed by a man in this manner in a year, averages 700 lbs., and that the consumption of carbon during the process is so rapid that in the course of three days all the carbon in the blood would be exhausted, if it were not renewed by a supply of proper food. As the temperature of the body is always the same under every climate, the inhabitants of the colder regions of the earth require a larger amount of food containing carbon than those who live further south, to maintain the heat at its requisite standard. Fire and warm clothing diminishing the want of heat-producing food, therefore it becomes a question, in an economical point of view, whether it is not cheaper as well as better to keep paupers and others who are supported at the national cost, well clothed and in warm rooms, and thus to supply externally by low-priced fuel a portion of the animal heat that would otherwise have to be maintained by the more costly fuel supplied to the stomach as heat-producing food. The substances that contain the greatest amount of carbon are those which best supply heat; among these sugar and rice are prominent; whilst the flesh-giving substances are those that contain nitrogen—meat, peas, and cheese, being the most abundant sources. As different kinds of solid food produce different effects in the nutriment of the body, it is requisite in a well-regulated dietary that the proportions of flesh-giving and heat-producing food should be properly adjusted, taking into consideration age, employment, and climate. The regulations for dieting sailors exhibited, at one time, great ignorance of this requisite attention, and in the dietary equivalents of the navy in some instances, heat-producing food was substituted almost to the exclusion of flesh-giving food, all kinds of solid nutriment being ignorantly considered to operate in the same manner. Dr. Playfair noticed at considerable length the difficulty in obtaining accurate statistical statements of the dietaries of different classes, but he nevertheless exhibited numerous diagrams, representing, by differently coloured lines of various lengths, the respective quantities of food of both kinds allowed to soldiers, sailors, paupers, and prisoners in this and other countries. He pointed out strongly the facts which had come to light during Mr. Chadwick's investigations respecting the relative quantities of nutriment of agricultural labourers and prisoners. From this it appeared that whilst the agricultural labourer had a scanty allowance, scarcely sufficient to maintain vigorous life, the suspected thief was sufficiently fed, the convicted thief was still better treated, and when he arrived at the dignity of a transported convict, he has double the allowance of the hard-working labourer. Dr. Playfair mentioned a curious fact, which illustrates the inconvenience and mistakes that sometimes arise from a pedantic use of words different from their ordinary acceptations. He had been engaged with others in examining and adjusting the pauper dietaries of different parts of the kingdom, with the view to introduce uniformity in the system, and this laborious process is termed "reducing." When the official report was published, stating that the officers of the Government had been "reducing the pauper dietaries of the kingdom," it was generally supposed to be the intention to "diminish" the amount of food supplied, and such an outcry was raised against the imagined harsh measure that the report was withdrawn. Alluding to the tradition that the entire substance of the body changes in seven years, Dr. Playfair said he could not imagine on what foundation that tradition rests, for judging from the active chemical decompositions and reconstructions going on in the body, it might be assumed that an entire change takes place in forty days rather than in seven years, though some parts must undergo more rapid changes than others. In reference to the much disputed question of the relative values of animal and vegetable food, he observed that, chemically speaking, there could be no difference, for all animals derive their nutriment from vegetable matter, either eaten directly or after it has formed part of the organism of a herbivorous animal. There is, Dr. Playfair maintained, much truth in the observation that the character of a nation, depends upon the food of the people; hence we may attribute the passion for honour and glory in the French and the excitable temperament of the Irish to vegetable diet, whilst the sound sense of the Englishman may be traced to his roast beef and beer. This practical conclusion was arrived at—that the *regimen of roast beef and beer should be given to the Irish, as a* means of assimilating them in character to the English more than it is probable they can be with a continued potato diet.

On the Structure and Succession of the Lower Palæozoic Rocks of North Wales and part of Shropshire, by Prof. Ramsay.

By means of sections constructed on a scale of 6 inches to a mile, vertically and horizontally, the Harlech Grits were shown to be about 7,000 feet thick. The Lingula flags that overlie them are also 7,000 feet thick. These are overlaid on the north flanks of Cader Idris and the Arans by about 3,000 feet of calcareo-felspathic ashes and conglomerates, inter-stratified with slates. Above these lie the porphyries of the Arans, &c.,—originally sheets of felspathic lava that flowed abroad in the Lower Silurian sea-bottom. Between the Dolgelli and Bala Road and the summit of Aran Mowddwy, nearly the whole thickness of the Lingula flags, ashes, and porphyry is exposed in unbroken succession, and on the north-west side of the road the same beds are repeated by a great fault that runs from a point 6 miles south-west of Chester through Bala Lake to Cardigan Bay. It has been traced for 65 miles. Where crossed by one of the sections it is a down-throw of about 12,500 feet on the north-west, the trap of Aran Mowddwy being thrown down against the base of the Lingula beds. The Bala limestone was shown to be 6,000 feet above the Aran traps; and 8,000 feet above that, the Caradoc sandstone, which is 5,000 feet thick, appears. The igneous series of the Arans is continuous as far as Moel-wyn, where it is succeeded by the Bala beds, in which series, 6,000 feet above the Moel-wyn traps, a second volcanic set of ashes and porphyries appears. These constitute the Snowdonian series, and some of its beds are the equivalents of the Bala limestone, a fact proved both by measurement and fossils. The igneous rocks of Snowdon have heretofore been considered as the equivalents of those of the lower series. They are at least 6,000 feet higher. The lower set closed the Lingula flag period, the upper set are in the middle of the Bala beds. The intrusive bosses of Caernarvon, Lleyn, and Anglesea were then shown to be of older Silurian date, and the deep seated melted nuclei from whence the contemporaneous volcanic rocks proceeded. Also the metamorphism and foliation of some of the rocks of Caernarvonshire and Anglesea took place in Lower Silurian times. The Cambrian rocks of the Longmynd were then shown to be 26,000 feet thick, and conformably overlaid by 14,000 feet of Llandeilo flags, giving 40,000 feet in all. They are not much altered. Their base is cut off by a fault. This district formed a bold island in the midst of the Wenlock sea, and being gradually encased in Wenlock shale; and a set of beds that successively formed the margin of the Wenlock shale sea at different levels were sandy and pebbly beaches of the Wenlock period, although their fossils have a Carradoc aspect. Lastly, some of the lowest conglomerates of the Cambrian strata of Llanberis were shown to have been formed of the waste of an old land, now entirely lost, containing rocks similar to those of North Wales as it now stands.

Royal Geographical Society, April 11.

A paper on "Oceanic Currents, and their influence on the Central American Canal," by Alex. G. Findlay, Esq., F.R.G.S., *was read.* After a brief reference to the progress of the subject of currents from its origin, by Major Rennell, in 1778, to the publication of his "Investigation," published in 1832, the author proceeded to point out some deficiencies in the system as then established, and showed that the waters of the Atlantic circulated around a space having the parallel of 30 ° N. as its axis; that a portion of the Gulf-stream flows to the N.E., and ameliorates the climate of the British islands and Norway, without which influence they would be assimilated to Labrador and Greenland. The peculiarities of the Gulf-stream recently elicited were described; a nearly perpendicular wall of warm water in juxta-position with the cold Arctic waters flowing southward, between it and the coast of the United States, and another and parallel branch to the S.E. of it was noticed. The somewhat similar arrangement in the South Atlantic was alluded to, of a current revolution around the parallel of 30 ° S. The anomalous character of the Guinea current was cleared up by an analogous current in the Pacific, not hitherto noticed. This portion of the subject was illustrated by a large diagram, in which the currents and their polar or tropical *origin were very clearly marked. In describing* the currents of the Pacific, the subject was a new one, and, at least, two currents of very great magnitude had not yet been noticed, or only indirectly hinted at. A very large engraved chart contained the data. It was shown that the waters from the antartic pole flowed slowly northward and eastward, towards the lat. of 28 ° N.; that a portion of these cold waters struck the west coast of South America, or about the parallel of 40 ° S., and dividing, one branch flowed south and east, forming the eastern Cape Horn current; and the other ascending the coast, as a remarkably cold stream, was called the Peruvian or Humboldt's current; reaching to near the American isthmus, it turned past the Galapagos islands, where many singular effects were produced, but that at times a portion continued northward and flowed on to Panama. The Peruvian current *flows on westward, and forms the initial course of the great southern* equatorial current, between 40 ° N. and 26 ° S., which passing the Pacific archipelagoes, has many anomalies, but a portion striking the coast of Australia has a precise relation to the Brazil current in the South Atlantic, and circulates around the space between Australia and New Zealand. The North Equatorial Current is not well defined at its eastern end, but flows strongly towards the Philippine Islands, across the ocean between 10 ° and 24 ° N. lat., whence it turns northward towards the coast of Japan. It then forms the impetus to a current not found on physical charts, and which was here named the Japanese Current, from its analogous relation to Florida and the Atlantic Gulf Stream. This Gulf Stream of the Pacific was then traced by direct observation and inference, from numerous authorities who were quoted, across the entire breadth of the Pacific, to the N.W. coast of America. Its effect on the climate of Sitka and Prince William's Sound were shown to be similar to that on the coast of Norway. The temperature and the wrecks of Japanese junks, the drift of timber to the Sandwich Islands, &c., proved the circulation of the waters around the lat. of 30°, to be the same as in the other thermal systems described. The ocean waters flow southward, down the American coast toward the Bay of Panama or the Great Bight, formed by the American Isthmus; and the new and very important current was then described, and the numerous authorities on which it might be established were quoted. It is a zone of *easterly* drift, between lat. 50° and 60° N., extending all across the Pacific, from the Pellew Islands, nearly to the Bay of Panama, and was named the Equinoctial Counter Current. This singular current has an exact relationship to the Guinea Current, on the opposite side. The origin of this was supposed to be due to the action of the N. N. E. and S. E. trade winds, forcing the waters up to these latitudes, cause them to reverse their normal action; and thus the waters appear all to flow toward that one point, of such great interest at the present time. The navigation about Panama was shown to be very critical and difficult. Respecting the question of the level of the two oceans, if it were not for the counter current it might be reasonably supposed that the Atlantic would be several feet higher than the Pacific, from the waters in each ocean being drifted to their western sides, but which are thus almost exactly balanced. After some complimentary remarks from the President, the meeting was adjourned.

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

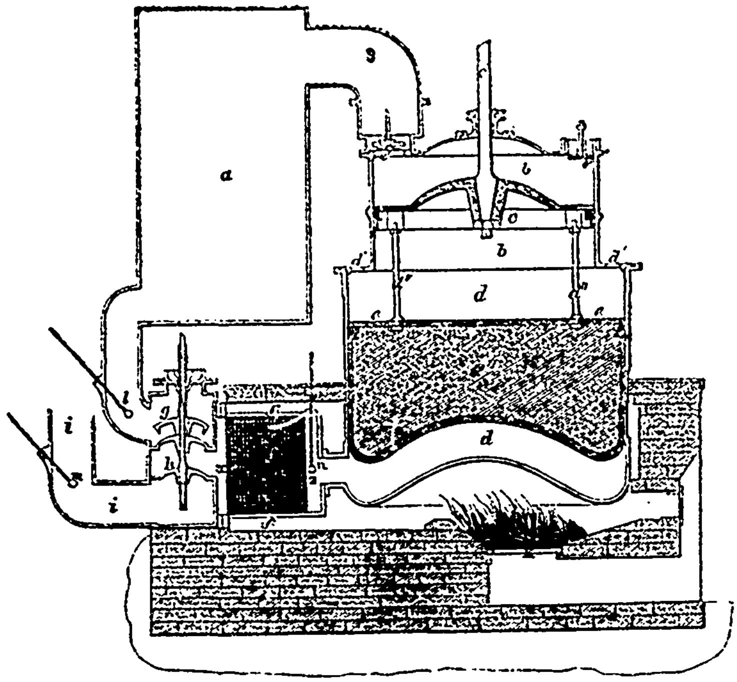
The engines of the Caloric Ship Ericsson consist of four large double cylinders, "standing in a fore-and-aft line; two before and two abaft the shaft of the paddle wheels, and working in pairs upon it." Each cylinder is double, the two cylinders being placed one above the other. The lower one, which is the larger of the two, is called the working cylinder, and the other the supply cylinder. The working cylinder is entirely open at the top, and the supply cylinder at the bottom. The pistons which play in the two cylinders are connected by eight strong iron columns, and move up and down together; the length of the stroke is therefore, of necessity, the same for each, viz: 6 feet. For the sake of distinction, the piston in the working cylinder is called the working piston, and the piston in the supply cylinder the supply piston. Underneath each working cylinder is a furnace, which heats the air in this cylinder beneath the piston, and by thus increasing its expansive force, furnishes the motive power of the engine. The expansive force of this heated air drives the working piston up, and with it the supply piston. During the ascent the air above the supply piston which is compressed before it passes through a communicating pipe into the working cylinder, and receiving an accession of heat keeps up the ascensional force. When the pistons have reached their highest point, a valve is opened by the machine, which establishes a free communication between the compressed and heated air under the working piston and the external air; it flows out, and the two connected pistons descend by their own weight. It is to be observed, however, that the mechanical effect of this descending weight is but a compensation for the diminution of mechanical effect produced by the same weight in the ascent, and that the weight of the pistons therefore forms no part of the real motive power of the engine.

*Sill. Jour.

Confining our attention to the pair of double cylinders posited on either side of the main shaft, in the vacant space between the working and supply cylinders is placed a horizontal working beam, turning upon a shaft lying between the two double cylinders. One of the supply pistons is connected with one end of this working beam and the other with the other end; by means of links and connecting rods: and so, by the alternate action of the two working pistons, a reciprocating movement is communicated to the working beam. It will be seen therefore, that *one double cylinder*, with the necessary appurtenances, *constitutes a single acting engine*, and that *each contiguous pair of double cylinders*, standing on either side of the main shaft, by the connection of their pistons with the opposite ends of a working beam, *form a double acting engine;* that they accomplish the same end as one double acting steam engine.

The shaft of the paddle wheels of the Ericsson is, accordingly driven by two double acting engines; one before and the other abaft the shaft. Each of these engines has its separate working beam. The power is transferred from each of these working beams to the shaft, (which, it is to be observed, is considerably elevated,) by means of a connecting rod passing from the nearer end to the crank of the paddle-shaft. The two connecting rods are attached to the same crank-pin; and the relative position of the shaft and working beams is such that each of the connecting rods has a mean deviation of about 45° from the vertical position, and when one rod is passing the dead centre the other is acting upon the shaft with the maximum leverage.

From what has been stated, it will be seen that in studying the essential theory of the new engine, we may confine our attention to one of the double cylinders with its accompanying mechanical arrangements, which taken together form one single acting engine. The essential parts of this engine are shown in the annexed diagram, which is a copy of Ericsson's representation of the stationary engine. These are, respectively, the double cylinder, with the pistons and piston rods; the furnace, a large vessel communicating by pipes with the top of the supply cylinder and the bottom of the working cylinder, called the *Receiver*; and a piece of apparatus placed in the lowermost of these pipes, called the *Regenerator*. The working piston in the engines of the Ericsson, has a diameter of 14 feet, and the supply piston a diameter of 11 feet 5 inches. The ratio of the areas of these pistons, and therefore also the ratio of the volumes of the two cylinders is as 3 to 2. The working piston is six feet deep, and concave underneath to fit the cylinder-bottom. The top and bottom, as well as the sides, are of iron, but the space between them is filled with gypsum and charcoal, non-conductors of heat. The packing of the piston is at the top. The working cylinder is of necessity prolonged six feet below the position of the top of the piston when at its lowest point, thus forming a large vessel called the heater, or heating chamber, into which the air passes from the receiver. By this arrangement the packing at the top of the piston never comes into contact with any portion of the cylinder that is touched by the hot air. The grate of the furnace is five feet below the apex of the dome-shaped cylinder-bottom. Anthracite coal is used, and acts by radiant heat alone. The supply cylinder is merely a great condensing air-pump, which forces fresh air into the receiver, to be thence transmitted to the heating chamber under the working piston. The supply piston is furnished with thirty-six self-acting valves, which open upwards and through which the air is admitted into the cylinder, in the descending stroke of the piston. During the ascending stroke these valves remain closed, and the compressed air opens another set of valves at the top of the cylinder, and flows along the connecting pipe into the receiver. These two set of valves may be called respectively, the *outlet* and the *inlet* vales. The valve arrangement represented in the diagram is a little different: both



the outlet and inlet valves are at the top of the cylinder. *e′* is an inlet, and *e″* an outlet valve. The air receivers of the four double cylinders communicate with each other by connecting pipes, and thus form, in connection with the several communicating pipes, one common receiver, of so large a size, that as it is asserted, the the elastic force of the compressed air remains very nearly the same in the working of the engine. The receiver is provided with a guage. The communications between the receiver and the heater, and between the heater and the external air are closed by two puppet-valves. These valves are shown in the diagram at *g* and *h*. The one I will call the *upper* and the other the *lower* valve. The thermometers at *l*, *m*, *n*, serve to indicate the temperature of the entering and escaping air. When the working piston reaches its lowest point, that is, is nearly in contact with the cylinder bottom, the upper valve is opened by the machine, the compressed air rushes from the receiver through the regenerator into the space underneath the working piston, and the piston is forced up. At two-thirds of the stroke this valve is closed and the heated air acts expansively to the end of the stroke. The lower valve is now opened, and the same body of air escapes through it into the vertical pipe *i*, which communicates with the external air; passing again through the regenerator on its exit.

The Regenerator is an admirable contrivance of Captain Ericsson's for abstracting the heat, or the greater portion of it, from the escaping air, and restoring it again to an equal body of air entering the cylinder, to repeat the work performed by the air which has just escaped; that is, for employing the same amount of heat over and over again. The regenerator consists of a large number of disks of wire-netting, placed side by side and in a vertical position, in a marginal frame by which they are held very nearly in contact with each other, (see the diagram) Each disk is six feet high and four feet broad, the wire of which it is made is [illegible]th of an inch in diamter, and there are tens of thousands of minute meshes in the whole extent of the disk. The number of meshes in all the disks, added to the equal number of interstitial spaces between the disks, make up, it stated, over 20 millions of minute cells through which the air passes and repasses, on its way to and from the working cylinder. In this way it is brought into contact with several thousand square feet of metallic surface, and parts with or imbibes heat almost instantaneously. It is stated that Captain Ericsson estimates the time occupied by a particular particle of air in traversing the regenerator at about $\frac{1}{30}$th of a second, and that this small interval of time suffices for the transfer of some 400° of heat from the escaping air to the wire, or from the wire to the entering cold air. The clear opening for the passage of the air through the regenerator is about twelve square feet.

We are told that the escape or waste air deposits all its heat, with the exception of about 30°, in the regenerator, the thermometer at *m* never standing more than 30° higher than that at *l*. Ericsson estimates that in the case of the stationary engine the amount of fuel wasted in process of transfer, was only *two ounces* of coal per hour per horse-power, while the amount wasted by the radiation of the heated parts was about nine ounces per hour per horse-power, and the entire consumption about 11 ounces. But it should be observed that his calculation involves the supposition that the estimated horse-power (60) was realized in the actual working of the engine. We shall be better able to judge of the probability of this, after we have considered the details of the performance of the engines of the Ericsson.

After the engine has got into full operation, and the regenerator has reached its normal condition, there is a great difference between the temperatures of the inner and outer surfaces of the regenerator. We are told that in the case of the regenerator of the stationary engines this difference was never less than 350°. The explanation is found in the fact that the heated air on its escape through the regenerator, must undergo a continual diminution of temperature, as it parts with its heat to the successive wire-netting, and on the other hand the entering cold air, on passing through the successive disks, which are of a higher and higher temperature, will tend to lower the temperature of each one of these disks, and at the same time to increase the difference of the temperature between the outer and inner surfaces of the regenerator, and thus to compensate for the tendency to equilibrium of temperature produced by the flow of heat from the inner towards the cooler outer surface. For, while it will reduce the temperature of the outer surface, if the regenerator has sufficient thickness, nearly to an equality with the temperature of the external air, the inner surface being exposed towards a highly heated enclosure will be less affected. It is to be observed that the temperature of the external surface of the regenerator cannot at any time be greater than that of the air escaping through the pipe *i*, and that the temperature of the internal surface can never be less than that of the air issuing from this surface, on its passage into the working cylinder, or rather, heating chamber.

The preparation necessary for starting the engine consists in "keeping up a slow fire in the furnaces, for about two hours, until the various parts contained within the brick work shall have become moderately heated, and then charging the receiver with air by means of a hand-pump," until the gauge shows a pressure of about 8 pounds above that of the external air. The upper valve, *g*, is then opened by a starting bar, and the compressed air flows into the working cylinder, and begins the work of raising the piston.

We are now prepared to enquire into the

THEORY OF THE MOTIVE POWER OF THE ENGINE.

I will first state a few principals which it is important should be kept in view.

1. The expansive force of the heated air under the working piston must be somewhat less than that of the compressed air in the receiver; otherwise the air in the receiver would have no tendency to flow from it into the heating chamber. The difference may not amount to more than a few ounces; it depends upon the obstructions to the free flow of the air and the relative size of the aperture of communication and heating chamber.

When the air is flowing from the supply cylinder into the receiver, its elastic force must exceed that of the air in the receiver; for the additional reason, beside that just stated, that the vales in the supply piston would close if no such difference of pressure existed.

In seeking to determine the power of the engine, I shall however disregard the inequality of pressure and suppose the expansive force of the air to be the same in the working and supply cylinders as in the receiver, so long as the communications between them are open.

3. Since the two connected pistons are of unequal size, and the elastic force of the air pressing upon them the same or nearly the same, the entire upward pressure exceeds the downward pressure, and the two pistons are urged up with a force equal to the difference of these pressures. This statement is here made with respect to the actual pressures subsisting when the communications are open. We shall see hereafter that it might also be made in regard to the mean effective pressures throughout the stroke.

4. In the engines of the Ericsson the cut off is introduced at the $\frac{5}{8}$ stroke, and therefore the space underneath the working piston into which the air is admitted from the receiver, before the cut off valve is closed, is equal in volume to the interior of the supply cylinder. It will soon be seen that this is in accordance with a general principle, the adoption of which is essential to the most efficient operation of the present form of engine.

5. When the engine has reached its permanent working state, the quantity of air admitted into the working cylinder, each upward stroke of the piston, cannot exceed the quantity forced into the receiver, from the supply cylinder, during the same interval. In fact it must be less, by reason of the waste from *leakage* and *clearance*.

Now it will be perceived that if this quantity of air, after being admitted into the working cylinder, as just supposed, retained the same temperature, its elastic force would be the same as that of the external air (15 lbs. say, per square inch) since the same quantity originally filled the supply cylinder, at this pressure. But if we suppose the temperature to be elevated 480°, or thereabouts, by the heat derived from the regenerator and the heating chamber, its elastic force would be doubled, or amount to 30 lbs., per square inch. To realize this supposition the compressed air in the receiver must therefore have an expansive force of over 30 lbs., or 15 lbs., above the atmospheric pressure. If the working temperature in the lower cylinder were 384° above the temperature of the external air instead of 480°, then the pressure in that cylinder, and of necessity therefore in the receiver, would be 12 lbs., above the atmospheric pressure, (i. e. $\frac{384}{480}$ths of 15 lbs.) It will be seen then that the working pressure in the receiver and the working temperature in the principal cylinder are necessarily connected together—that the one determines the other.

It is here supposed that there is no leakage or clearance, but the fact is otherwise; and therefore the quantity of air admitted into the working cylinder, each ascending stroke, is less than that which is expelled from the supply cylinder into the receiver. If we suppose the pressure in the receiver to be 8 lbs., above the atmospheric pressure, and that the leakage and clearance, at this pressure amounts to $\frac{1}{4}$, then $\frac{3}{4}$ of the air furnished by the supply cylinder will enter the working cylinder, and its elastic force, for the $\frac{5}{8}$ stroke would be reduced to $11\frac{1}{4}$lbs. ($\frac{3}{4}$ of 15 lbs,) by the expansion, if the temperature remained unchanged, but the 480° of additional heat will augment this to $22\frac{1}{2}$ lbs., or 15lbs., + $7\frac{1}{2}$ lbs. Now 8 lbs. above the atmospheric, is the actual working pressure of the engines, we may conclude therefore, that if the working temperature is 480° above the atmospheric temperature or a little less, the waste from leakage and clearance, during the double stroke, must amount to nearly $\frac{1}{4}$. The actual working temperature is undoubtedly less than this, but how much I have not been able to ascertain with certainty. The actual leakage is therefore less than $\frac{1}{4}$, but its exact amount cannot at present be determined. According to the newspaper accounts the working temperature, on the trial trip, was about 450°, or 418° above the temperature of the air (taken at 32°.) This would make the waste, from leakage and clearance, about $\frac{1}{5}$. It undoubtedly lies between $\frac{1}{4}$ and $\frac{1}{5}$.

Working at a given temperature, and with a given cut off, the leakage will determine the working pressure. To show this suppose the elevation of temperature to be 480°, and the leakage $\frac{1}{4}$ at a pressure of 8 lbs., shown by the receiver-guage; then at 12 lbs. pressure the leakage, if we disregard the clearance which is comparatively small, would be $\frac{3}{8}$ths, and the elastic force of the air in the working cylinder would be reduced from $7\frac{1}{2}$ lbs. to $3\frac{3}{4}$ lbs. If the communications remained the same, so great a difference of pressure between the receiver and the cylinder could not be realized; an additional quantity of air would flow out of the receiver, and this would go on for each successive stroke until the pressure in the receiver was reduced to 8 lbs. or thereabouts, when the pressure in the cylinder would be $7\frac{1}{2}$ lbs., and the engine would be nearly in its permanent working condition.

From this cause, (viz., the leakage,) mainly, as it would seem, the expected pressure of 12 lbs. has not been obtained in the working of the engines of the Ericsson. This is in fact the reason assigned by the builders of the engines, for the fact that no higher pressure than 8 lbs. has yet been realized.

There is another mode of presenting the theory of the motive power of the caloric engine. Suppose that the constant pressure in the receiver is 15 lbs. + 15 lbs. On this supposition air will begin to pass from the supply cylinder into the receiver, at the end of the $\frac{1}{2}$ stroke, or thereabouts, and will continue to flow to the end of the stroke, at a pressure a little above this. At the end of the $\frac{1}{2}$ stroke of the supply piston the body of air which originally filled the supply cylinder at 15 lbs. pressure, will occupy one-half the space at 30 lbs. pressure. Now, while the communication between the receiver and the working cylinder continues open, that is during the $\frac{2}{3}$ stroke, if we disregard the leakage, &c., the same quantity of air, at the same pressure of 30 lbs. will flow from the former to the latter. It is capable of filling a space equal to one-half of the supply cylinder, or what amounts to the same, one-third of the working cylinder, at the same temperature, without any change of pressure: therefore in expanding to fill two-thirds of the working cylinder, its expansive force will be reduced to 15 lbs. To compensate for this it is only necessary that its temperature, as fast as it flows in, should be elevated 480°, *when its expansive force will be retained at* 30 lbs.

A similar explanation may be given for any other supposed pressure and temperature, and the question of the leakage may be considered from this point of view.

It has been stated that the cut off, whatever may be the relative size of the two working cylinders, should be so adjusted that the portion of the working cylinder into which the air is admitted while the valves remain open, will be equal in volume to the whole supply cylinder. To show this, we will at first leave the leakage out of view, and denote the fractional part of the stroke answering to the cut off supposed, (in the present engines $\frac{2}{3}$) by a, and a larger fraction of the stroke, answering to a different cut off, by b. *Let b be n times greater than a. Now, if we conceive* the fractional cut-off stroke to less than a, the actual working pressure remaining the same, the mean effective pressure for the whole stroke, will be less than when a is used. If, on the other hand, it be made greater, (as $b=na$.) the body of the air which originally filled, the supply cylinder at 15 lbs. pressure and 32° emperature, on entering the working cylinder will expand n times, and its working force will be $\frac{15}{n}\times 2$ (supposing working temperature to be 480°+32°;) whereas, for to cut off a the force will be 15×2, and in the subsequent expansion from a to b, the mean force throughout the fractional stoke b will be greater than $\frac{15\times 2}{n}$, since this will be the actual force after the expansion to b.

The same will be true if we take the leakage into account; for suppose the leakage to reduce the pressure of the air that fills a, before it is heated, to $\frac{15}{m}$, then when heated 480° the pressure becomes $\frac{15}{m}\times 2$, which we will put equal to k. Now, if we suppose, as before, the cut off to be increased from a to b. the force k will be reduced to $\frac{k}{n}$; but the mean effective pressure for the same fractional stroke b, when the cut off a is used, will be greater than this, and the actual pressure after the expansion to b. will be $\frac{k}{n}$. So that the constant pressure for the b cut off is equal to the pressure for the a cut off reduced by the expansion to b.

It may be well to inquire, in this connection, into the proper relative size to be given to the supply and working cylinders to obtain the greatest amount of motive power from the engine. Let A=area of supply piston, and x=ratio of working to supply piston; then, by what we have seen, the portion of the stroke during which the air is flowing into the working cylinder, and acting with its full constant pressure is equal to $\frac{1}{x}$. Calling this pressure per square inch, P, the following proportion gives us the mean effective pressure (p) on working piston for the whole stroke, viz., x : hyp. log. $x+1$: : P : $p=\frac{\text{P log. } x+\text{P}}{x}$. The mean effective upward pressure upon the whole piston will therefore be expressed by $\frac{\text{P log. } x+\text{P}}{x}\times \text{A}x$, or P.A log. x+P.A. The downward pressure on the working piston=15lbs.$\times$Ax, and hence the resulting effective pressure=P.A log. x+P.A—15Ax. With the aid of the differential calculus, we find this expression to be a maximum when $x=\frac{\text{P}}{15}$ $\left(\text{more accurately } \frac{\text{P}}{14.7}\right)$; from which it appears that the engines will have the greatest possible power, at any given working pressure, when the cut off, taken inversely, and the ratio of the volumes of the two cylinders, are each equal to the working pressure per square inch, divided by the atmospheric pressure (15 lbs). Accordingly the ratio of the bulks of the cylinders ought to vary with the working pressure used. When this pressure is 8 lbs. above the pressure of the atmosphere the cubical content of the supply cylinder ought to be $\frac{648}{1000}$ of *that of the working cylinder, and the portion of the stroke from* the commencement at which the air is cut off, the same. The actual ratio of the cubical contents of the cylinders of the engines of the Ericsson is $\frac{665}{1000}$, ($\frac{65}{100}$ nearly), and the fraction of the stroke at which the air is cut off is said to be about $\frac{63}{100}$.

If a pressure of 12 lbs. instead of 8 lbs. were used, the same ratio ought to be $\frac{55}{100}$. This would make the radius of the working piston 15·4 feet. It was Ericsson's original design that it should be 16 feet.

Let us see now how the *power of the engines* of the caloric ship is to be determined. The actual pressures upon the two pistons are the same, or nearly the same, while the communications are open; the pressure on the top of the supply piston begins *at 15 lbs., becomes 8 lbs. + 15 lbs. at the $\frac{2}{3}$ stroke from the end* (more accurately $\frac{65}{100}$), and continues the same to the end of the stroke. The air is shut off from the working cylinder at the same fractional part of the stroke, and acts expansively to the end of the stroke. The mean effective pressure per square inch, for the whole stroke, is then the same upon both pistons. It may be found in the usual manner, by the use of hyperbolic logarithms. Multiply this, diminished by 15 lbs., into the difference between the areas of the two pistons, expressed in square inches, and again into the velocity of the piston per minute, and divide the product by 33,000, and the result will be the *horse-power* of one of the engines.

But it is to be observed that the result thus obtained will be somewhat too large, for the following reasons. 1. The actual *pressure in the supply cylinder is greater than the pressure in the* receiver (8 lbs.), and the actual pressure in the working cylinder is less than this. 2. During the $\frac{1}{3}$ stroke from the commencement, the outlet valves at the top of the supply cylinder remain closed, and consequently the expansive force of the air in the receiver must be somewhat reduced by the flow of air from it into the working cylinder. 3. After the cut off valve is closed, the elastic pressure of the air in the working cylinder during the remaining $\frac{1}{3}$ stroke, must be diminished somewhat by leakage. The effect of this leakage has not hitherto been taken into account.

To be Continued.

The Dublin Great Industrial Exhibition.

The Inauguration of Ireland's first Great Exhibition of the productions of her own and other nations, took place at the appointed time,—and passed off with brilliant success. The weather was most propitious, and the assemblage brilliant. The central hall—upwards of 400 feet long, as we have said—was left clear for the company, which filled from end to end. There must have been at least 15,000 people present; including the Lord Lieutenant, the representatives of the Church, the Bench, the Bar, the University, the Army, and the Corporations and Guilds of Ireland,—besides a large number of visitors from England, Scotland, and other countries. The hall was hung with upwards of 150 heraldic banners:—which added much to the picturesque appearance of the whole.

The music was in itself a great triumph. It was of a high character and performed with marvellous accuracy; and the effect of the 800 performers, vocal and instrumental, aided by the great organ, was sufficiently powerful to fill the building, without being marred by that superabundance of noise which often spoils the effect of the finest compositions and execution.

The exhibition itself, it must be confessed, was somewhat hidden by the ceremony which was to usher it to the world—the means overlaid the end. The object of the exhibition is, the practical and useful:—that of the inauguration was, the introduction to high society, with a view to give it that stamp which recommends both men and things so forcibly to the public. It is to be hoped that some day the Useful and Beautiful may walk hand in hand, independantly, through the world,—that an order of merit will rank side by side with orders of nobility:—but those who have the management of Industrial Exhibitions or of any other great public displays must take the world as they find it at present, and use the means which are common to all.

The main body of the Exhibition was far from complete on the opening day,—but the managers had wisely prepared a great treat for their visitors in the Picture Gallery. The collection is perhaps the finest that has ever been seen of the works of modern and especially of living artists. The room is 325 feet long by 40 broad, and already contains nearly 600 pictures. Many more have yet to be hung; and an additional gallery, about a quarter the size of the present, is in preparation for the remainder. The Belgian and English shcools are most fully represented; next to these, the German; then, the Dutch; and lastly the French. The foreign collections were made by Mr. Roney, the Secretary, with the assistance of the Emperor of the French, the King of Prussia, and Dr. Waagen, the King of the Belgians, and the Dutch Government. The English pictures have been contributed by private individuals,—including Her Majesty and Prince Albert; and several of the finest productions of the English school have thus been brought before the public for the first time for many years, amongst which may be mentioned Hogarth's 'Gates of Calais' and 'Last Stake'—Landseer's 'Bolton Abbey' —Wilkie's 'Rent Day'—Borker's 'Woodman'—Danby's 'Deluge' Mulready's 'Wolf and Lamb'—Etty's 'Rape of Proserpine.' A late number of water colour drawings and prints are placed on screens in this gallery,—and the centre is occupied by sculpture. The most remarkable of this last, perhaps, is the 'Boy and Dolphin' attributed to Raffaelle, The sculptors of Ireland make an excellent show. This division of the Exhibition must alone draw a very large number of visitors, for such a collection of works of Art is not likely soon again to be brought together.

One end of the Fine-Art Gallery is devoted to mediæval exhibition; which is in process of being arranged by Mr. Hardman of Birmingham, and will include painted glass, iron, brass, and silver work, ecclesiastical fittings and vestments, wood carving, ornamented tiles, &c. The ceiling is covered with ecclesiastical emblems. The department is considerably larger than that in Hyde Park, and will be much more complete in design and arrangement. The contents of this department, whatever may be its faults and peculiarities, may teach the people of Ireland an important lesson upon Ornamental Art. The value of the articles is very considerable; but that value resides not in the costliness of the materials, but in the artistic labour which has been expended on them. The Irish have a fertile fancy and great aptitude; and this portion of the Exhibition may dispose them to produce articles of ornament, as the Art workmen of the middle ages did, by the application of taste and skill to materials of comparatively little worth,—and to avoid imitating our heavy, costly, and often inelegant, pieces of plate.

A glass case in the Picture Gallery containts a collection of memorials of Edmund Kean:—including a sword and box presented to the Tragedian by Lord Byron, and another sword given to him by the people of Edinburgh, with the play-bills of his first and last performance in London,—the characters and dates being, Shylock in 1814, and Othello in 1833. In addition to these, there are, a dagger which belonged to Henry the Eighth and the hat of Cardinal Wolsey, from the Strawberry Hill collection.

There will be a fine collection of East Indian and Chinese articles—contributed by Her Majesty, the East India Company, the United States Service Museum, the Royal Asiatic Society, the Society of Arts, and several private individuals. The standards taken in China and the guns captured at Sabraon and Goojerat by Lord Gough, attract much attention.

The most important sections of the collection to Ireland, however, are those which are self-derived, and which represent her natural resources or the industry of her people. One of these is, a collection of Irish Marbles—not merely cabinet specimens, but good practical examples—exhibited by the Royal Dublin Society, in whose grounds the Exhibition building, as our readers will remember, stands. The Exhibition, in fact, although entirely independent of the Society, has taken the place of the triennial exhibition which that body had held regularly since 1821. Its last exhibition, that of 1850, was indeed thrown open to all the world; but no trouble was taken to obtain contributions from abroad; and the space would not have permitted many foreign articles to have been introduced. On the 24th of June last, Mr. Dargan made the liberal offer to put down £20,000 for a grand Exhibition on condition that the Society would permit the building to be erected on their lawn. This was readily agreed to. Mr. Dargan's expenditure has grown to nearly £100,000; and the building has increased in the same ratio, until it has covered not only the lawn and gardens, but also the court in front of the Society's house, which it completely surrounds. The Marbles exhibited by the Royal Society form part of a much larger collection which it is now making, and for which a new museum is to be erected. For this purpose the Society have set aside upwards of £2,000,—subscriptions have been made to the extent of £800,—and Government has promised a grant of £5,000. The object in view is very important to Ireland. At present, for want of the necessary stimulus, the working and conveyance of the native marbles are both costly,—but there is no intrinsic cause why they should remain so. The Society intend to furnish their entrance hall with architectural fittings worked in Irish marbles. A door-case in fine red marble, two large tables in green Connemara, and a fount in black marble, are included in the collection now shown. There can be no doubt of the value of such efforts as these. The native marbles of Ireland are very beautiful,—some of them quite unique; and if the Exhibition draws attention to them, and leads to improvements and greater economy in working them; it will render a very important service.

The Royal Irish Academy of Science will show a very interesting collection of Irish Antiquities comprised in its Museum,—along with contributions for the purpose from the Board of Works, and from several private individuals. The collection of the Academy is very curious and important: including many rare ecclesiological antiquities, and a large number of implements, tools, and arms, illustrative of the early Art of the country. The Banner of the O'Donnell family—the Psalms of St. Columb—and some other specimens—are very celebrated in Irish history. The Museum of the Society is liberally opened to all applicants, and the specimens are admirably arranged. To the present time, however, the institution has been without a Catalogue,—which will now be supplied by the Great Exhibition, and which will doubtless, soon give rise to a great extension of the Museum. Included in the Academy's Museum is a collection of Danish and Norwegian antiquities, presented by the King of Denmark and the Directors of the Museum of Copenhagen.

The Irish Fisheries Commissioners contribute a large collection of apparatus and tackle used in the fisheries; including not only those at present employed, but also specimens of those which have been superseded or improved,—together with models of what are called River fixtures, and other means of capturing the finny tribe.

In one of the galleries is a collection of 257 specimens of the Birds of Ireland, indigenous and immigratory, together with their eggs. These belong to a private gentleman of Dublin, named Waters, and are very well arranged in scientific order.

There is a very curious collection of work, principally of the coarser descriptions, exhibited by the guardians of the twenty-seven Poor Law Unions.

The general departments of the exhibition in which Ireland makes the greatest show are:—linen manufactures—poplins, including a loom for making a new brocaded variety, which will as we have said, be woven in the building—Balbriggan hosiery,—saddlery and leather work—church bells, of which there are some large and fine specimens—carriages—engineering and architectural designs—musical instruments—lace, embroidery and needle-work of every description, and most of it in good taste—clothing—furniture—agricultural machines and implements—and food, which, after the example of Hyde Park Exhibition, includes tobacco and snuff, in wholesale quantities. There are also several samples of beet-root sugar—bacon and hams in endless profusion—and no small supply of whisky. In this latter case the committee have not followed the lead of London;—nor have they done so in the refreshment-rooms, where malt liquors of all sorts are freely dispensed, and where probably whisky is not a stranger.

Since the opening day the work of arrangement has proceeded with rapidity,—and the effect produced has been marvellous. There were some indications of flagging previous to the inauguration; but it seems to have disappeared under the influence of the excitement of that day,—and to have been replaced by confidence and natural feeling of satisfaction at which has been already achieved, and what promises to be accomplished.

In another week the greater part of the Exhibition will be complete. It will, indeed, it already does, reflect the highest honour upon the Irish people. In the history of our country there is not recorded a more important or more praiseworthy act than the raising of this temple of industry; and the effort which has been made under so many difficulties, *must* yield a substantial and enduring reward.—*Athenæum.*

INCORPORATED BY ROYAL CHARTER.

Canadian Institute.

Council Meeting, June 11th, 1853.

DONATIONS.

1. The Corresponding Secretary announced the presentation to the Institute by Mr. Bohn, the eminent London Publisher, of six volumes of Bohn's Scientific Library.

2. The presentation was also announced of two pair of Stags-horns of very extraordinary dimensions, by Mr. Maurice S. Baldwin, Junior Member of the Institute.

The names of the following Candidates for Membership were laid before the Council on the evening of June 4th:—

S. W. Hallum, Junior Member	Toronto.
T. C. Gregory,	Windsor, C. W.
Rev. R. Whitwell,	Phillipsburgh.
J. E. Pell,	Toronto.
Rev. B. Cronyn,	London.
C. McGregor, Junior Member	Toronto.
E. M. Crombie, Junior Member,	"

It was ordered that the Secretary should be directed to communicate to the above named gentlemen that the formalities of their election could not be completed until the first General Meeting in December, but that on payment of the Subscription for the current year they will be entitled to a copy of the Journal from January last, and to the use of the Reading-room.

Provincial Observatory; Toronto.

In the February number of the Canadian Journal we published the Memorial of the Institute to the three branches of the Legislature to continue the Royal Magnetic Observatory, under Provincial management. The reply of the Provincial Secretary on the part of His Excellency the Governor General, contained the following passage:—"I am directed by his Excellency to acquaint you, (Capt. Lefroy) and through you the members of the Canadian Institute, that the subject referred to in their memorial has, for some time past, engaged his Excellency's most anxious consideration, and that his Excellency has already taken the necessary measures to prevent, if possible, the proposed dismantling of the Observatory, by the Imperial authorities, at the end of next month." [See March No. Can. Jour.]

It is now our pleasing duty to announce that the very liberal sum of two thousands pounds has been voted by the Provincial Parliament for the reorganization and temporary maintenance of the Scientific Observatory at Toronto.

The prominent part taken by his Excellency the Governor General in securing the maintenance of an Observatory, which has already won for itself an American and European fame under the admirable management of its late accomplished Director, will secure a grateful acknowledgment from all interested in the progress of scientific enquiries in this Province. We shall return to this subject in the next number of the Journal.

Gold in Canada.

The extraordinary discoveries of Gold in California and Australia during the last four years, have so absorbed the attention of the public, that announcements, however important and advantageous, of the existence of other less dazzling but perhaps far more useful Mineral Deposits, have hitherto failed to excite that amount of public and private enterprize which, during other less Golden periods, would have stimulated to active exertion.

We shall not, probably, greatly err, if we venture to express the opinion that traces of a healthy reaction are now distinctly discernable in the Golden Fever of the day, lately so prevalent among classes in the enjoyment of permanent and remunerative industry.

The excessive toil and continued privation required on the part of the Gold Digger,—not always with adequate results,—coupled with the well-ascertained fact, that those who continue to occupy themselves in the regular routine of established industry, more generally accumulate a sufficiency for independence and comfort, are happily arresting that unquiet spirit of adventure which has been so greatly aroused during late years.

We have elsewhere drawn attention to the admirable letter of Mr. Millett, on the Mineral Wealth of Nova Scotia. Coal, Iron, Copper, Barytes, and exquisite Marbles, constitute a noble Gold Field for our sister Province; and such treasures, with the exception of Coal, exist, too, in Canada East and West, independently of the more dazzling Metal to which we shall now call attention. Let us, however, suppose for a moment that a widely distributed auriferous soil, rivalling in richness the famed fields of Australia, were to be brought to light, and without due preparation and precaution on the part of the Provincial Government, thrown open to the cupidity of those uneducated masses now crowding into the country. What effect would such a discovery have upon the construction of the vast system of Railways in progress or in contemplation throughout the Province? What difficulties would soon arise with our Gold worshipping and not over scrupulous or tractable neighbours! What a sudden and destructive check would the agricultural industry of the country receive, and all other branches dependant upon that expanding source of our present unexampled prosperity! What a flood of vice and crime would rush in to disturb, with its unhallowed and demoralizing influences, the quiet pursuit of intellectual and moral wealth, which now begins to display itself so vigorously amongst us! Here and there, throughout Western Canada, we find a painful solution of the question, in the case of a few misguiding or misguided individuals. Digging for Gold is a positive fact in various parts of Canada West. Delving sixty feet deep through the rich and teeming clays of the Valley of the Thames, and in the black bituminous shales below the veritable Golden Field (of Grain), the discovery of a few glittering lumps of Iron Pyrites is enough, in these days of Golden Fever, to turn men from remunerating Industry to waste their means in the hopeless search for Gold where no Gold exists. If digging for Gold under such unfavourable conditions be sufficient to secure the present ruin of a few, and to produce much local excitement, what might one expect if a rich auriferous soil in a thinly settled district were suddenly revealed to the eager and unfettered grasp of the uneducated labour of the country?

But does Gold really exist in Canada? Is it found in quantity likely to prove remunerative? To both of these questions we think we may answer in the affirmative with certainty. We may also hint to our Western friends, who are anxiously searching their own and their neighbours farms for the precious Metal, that the region which may truly be called Golden lies some hundred miles to the East and North-East of Western Canada. There appears no longer to exist any doubt that Gold is distributed over very considerable areas in Canada East, and in sufficient abundance to cause it to become a source of some anxiety to many interested in the progress of our Public Works and the general Industry of the Provinces.

We write, however, in the firm belief that precautionary measures are in progress, under the sanction of the Provincial Government, which will convert what would otherwise be a lamentable discovery, into a source of real advantage and profit to the country at large.

We have for some time past been aware of the existence of one powerful Association,—embracing some of the most distinguished individuals in the Provinces,—framed for the purpose of working a portion of the recently discovered Gold Fields on the Wage system, abjuring the Leasing system: a system at once ruinous to the labourer and destructive to order and morality.

We entertain and venture to express the opinion that whatever may be the extent of the Gold deposits in Eastern Canada, it is of the utmost importance that all Mining operations should be conducted systematically,—should be under Government supervision,—and that labour should not be dependent upon the success of individual exertions, but be in strict subordination to the Wage system.

REVIEWS.

1. *Report of the Board of Directors of the Ontario, Simcoe, and Huron Railroad Union Company—June 6.*

2. *Report of Alfred Brunnel, Chief Assistant Engineer, Ontario, Simcoe, and Huron Railroad.*

The Report of the Directors of the Ontario, Simcoe and Huron Railroad Union Company read by the Secretary at the annual general meeting of the Shareholders, at the office of the Company on June 6, is without doubt, one of the most feeble and melancholy effusions of the kind which it has ever been our misfortune to peruse. It commences by assigning three singularly unimportant reasons why the Directors "*felt*" it due to themselves and the shareholders that they should report upon the general position of the Company; and with this "*view*" they begin, continue and close their report with a doleful relation of disappointments, misunderstandings, defeats, faint hopes, and indefinite anticipations.

The *first* important difficulty appears to have originated with the Corporation of Toronto, and considering the very grave results due to the resolutions of that body (not explained in the Report) such as placing the Company in a false position—delaying the construction of the road—injuring its financial credit—we are bound to say that the report speaks of the Corporation in a very mild and courteous manner.

"The payments to the contractors have been made from time to time in pursuance with the original and supplemental contracts, so far as the Board have been enabled to carry the same into effect; but they regret that the difficulties which arose in regard to the resolutions of the Corporation of Toronto, granting aid to the Company; and the subsequent requirement for and a surrender of the loan; as also of the gratuity of £25,000, originally voted by the City Corporation, materially impeded the Directors in carrying out their contract with Messrs. M. C. Story & Co., and placed the Company for some time in a false position, delayed the construction of the road, and injured its financial credit. Subsequently, however, these difficulties were surmounted, and the construction of the road has progressed in accordance with the terms of the contracts."

The *second* misunderstanding is also with the Corporation of the City of Toronto, and is thus alluded to in the Report:

"The Company have been unfortunate in regard to their original understanding with the City of Toronto Corporation to construct a terminus on the market block, inasmuch as subsequent experience has shown that the location is not a good one, and that both the City and the Company would be injured by the construction of a city depot there. Acting upon this conviction, and fortified by the advice of their engineers, your Board determined on locating the city terminus on the Bay Shore, between Yonge and Bay Streets, and took the requisite steps under their act of incorporation to ensure the getting of the land and water frontage for that purpose."

The *third* misunderstanding is of a more important character, and is also laid at the door of the unfeeling Corporation of Toronto. It is referred to with affecting simplicity in the following pathetic paragraphs:

"The Directors regret to state, that after expending a considerable sum of money upon works at the last mentioned location, the Corporation of Toronto instituted proceedings in Chancery against the Company, and succeeded,—in consequence of the time limited by the charter to acquire lands having expired,—in *quashing* the orders they had obtained; and the Company are still under an obligation to erect the depot on the objectionable site, and the requisite excavations have been commenced for that purpose. Your Board have always been willing and offered to make an exchange of this site for other lands of the Corporation suitable for depot purposes; but as yet that body have not consented to the proposal made to them. The position of the Company with the Corporation remains, consequently, in an unsatisfactory state."

The style in which the wicked success of the Corporation is introduced deserves a nobler field for the display of its vigour than that offered by a mere railway report. The conclusion arrived at by the very gentle authors of the gem before us we think we may endorse without further enquiry. "The position, says the Report—the *position* of the Company with the Corporation remains consequently in an unsatisfactory state."

The selection of a harbour for the Northern Terminus is next adverted to, and much to our chagrin we find that here as in the other cases we have noticed affairs remain in an unsettled and distracted condition. After all that has been stated, written, published and *sworn* in favor of the Hen and Chickens, after the *positive* evidence frequently brought forward of the fitness and adaptation of the Harbour for all the purposes of the Company, the Northern Terminus of the Railway has been virtually "*quashed*" by the Board of Railway Commissioners just as the Southern Terminus was "*quashed*" by the Corporation of Toronto.

"The selection of a harbour for the Northern Terminus, has been a subject to which your Board have given their particular attention. The Chief Engineer, in his last printed report, reviewed the advantages and disadvantages of the various Harbours, and the line leading to the same, and, keeping in view the desirability of extending your line to the westward, reported in favour of Collingwood.

"The Directors, after mature and anxious consideration, adopted Collingwood Harbour, subject to the approval of the Board of Railway Commissioners; and the matter having subsequently been brought under the notice of the Commissioners, they communicated their opinion and views, in a letter addressed by them, on the 27th of April last, to the President of your Board. The following extract from that letter will explain better than any comment, the result of their consideration upon the question referred to.

"The Board of Railway Commissioners have given their best attention to the subject of the selection of a Northern Terminus, for the line of the Ontario, Simcoe and Huron Railroad.

"So far as the Commissioners have been able to ascertain, four sites have been up to this time proposed for such Terminus, all in the Georgian Bay, which seems to have been originally selected by the Company as the Northern Water Terminus for their Road. Two of these sites are in Gloucester Bay, viz:—Penetanguishene and Victoria Bay. The Commissioners entirely concur with the Engineer in deciding against either of those Termini, being fully convinced that the interests of the public will be best served by giving the Road a Westerly Direction. The other sites which have been brought under their consideration are Nottawasaga and Collingwood, both in Nottawasaga Bay. The Commissioners are of opinion that the objections to Nottawasaga River as a Terminus are insurmountable. The only other site treated of by the Engineer is Collingwood; and although the Commissioners if compelled to decide in favour of some one of the sites brought under their notice, would have no hesitation in giving the preference to Collingwood, yet such strong objections have been made to that place by persons whose opinions are entitled to respect, that they have felt it their duty to consider whether some Terminus less open to objections cannot be found, either within or outside of the Georgian Bay.

"They are of opinion, that if a good Harbour could be obtained outside of that Bay, on Lake Huron, it would be a most desirable change. It seems doubtful whether, under their present charter the Company can extend their line to Lake Huron, if they touch Georgian Bay at Collingwood. However, their financial arrangements have been made with a view to an expenditure much more limited than would be required if the road were carried to Owen's Sound, Saugeen, or Fishing Islands; and the Commissioners could not sanction any new proposition, unless with the distinct understanding that the guarantee of the same is not to be increased. The Company is now endeavouring to obtain permission from the Legislature to extend its Line Westward; and the Board trust that they may be successful. Meantime the Railway Commissioners, in view of the facts that is important to the Company to complete their present contract, and to fix on some terminus on Nottawasaga Bay which may afterwards be used as a way station, are of opinion that further exploration of the Georgian Bay west of Collingwood should be immediately made, with the view of ascertaining whether any other site more desirable than Collingwood can be found, and they recommend that the Directors obtain the assistance of some person of nautical experience in the survey. And with a view of obviating further delay, the Board of Commissioners are prepared to give their assent to the proposition of the Directors, regarding Collingwood, in case no better site can be found after a new exploration, In that case however, they recommend that the expenditure at Collingwood should be on a limited scale for the present, as they are not convinced that such a harbour can be obtained as the public interests require."

"Your Board *considered that the suggestions of the Railway Commissioners* *demanded attention*, and have accordingly taken the necessary action to carry their recommendations into effect.

As doubts existed as to the power of the Company to touch at more than one point on Lake Huron, or to extend the Line further Westward than Collingwood; and, as the litigation with the Corporation of Toronto above referred to, resulted in a judgment of the Court of Chancery, materially impairing, and, in some cases, destroying, the powers which had previously been exercised by the Company, it became necessary to apply without delay to Parliament, for the revival of those powers, and to obtain a Legislative authority to touch at more than one point on Lake Huron, and to extend the Railroad to the Eastern Shore of that Lake. A Bill has passed both Houses of the Legislature and now awaits the Royal assent, giving the Company the necessary powers, with the right to increase their capital to carry out the extension of your Line. With the view to such an extension, an exploration is now proceeding under the order of your Board.

The report tapers off with an allusion to the financial condition of the Company, and 'hopes,' 'anticipates,' that as the accounts of the Company have hitherto presented a statement of "continuous outgoings," they will next year present a "fair amount of incomings." During the penning of the last half dozen lines, the framers of the report evidently revived a little and found strength and courage to 'hope' and 'anticipate' that the "Proprietors, Directors, Government, and Contractors, may each discover that the spirit which initiated, and the perseverance and energy which is carrying to completion this link of communication and connexion with the Northern Lakes, have not been without beneficial results to the public, the Company, and the advancement and progress of Upper Canada."

It occurs to us that if "Proprietors, Directors, Government and *Contractors!!!*" have yet to "discover" the beneficial results of the Northern Railroad they must seek for better guides than lamenting and languid reports, whose feeble repinings will do more to weaken a great and noble work, than all the hard fighting, legal, battle fields through which it has been successfully carried to completion for one half of its length, and in spite of which, it will shortly arrive at the fullness of the measure of its growth.

2. *Report of Alfred Brunel, Chief Assistant Engineer, Ontario, Simcoe and Huron Railroad.*

This is a sensible document, and contrasts strikingly with the wishy-washy 'report' we have just noticed. We give the most interesting portions of Mr. Brunel's communication below. The portions omitted refer to topics already discussed.

To the President and Directors of the Ontario, Simcoe and Huron Railroad Union Company.

Owing to the continued illness and consequent absence of the Chief Engineer, I have the honor to submit the following Report of the progress of the work on your Road, as called for by resolution of the Board, under date 20th ultimo:—

Since the Report made by the Chief Engineer in February last, the works generally have progressed in a satisfactory manner. The first section of the Road to the Township of Whitchurch, a distance of thirty miles, was opened on the 16th of May last, and the amount of business done, during the short period which has intervened, indicates the most satisfactory results.

The second section, from Whitchurch to Bradford, should, by the terms of the original contract, have been ready for opening on the 15th of May, 1853, but in consequence of the changes made in the location to improve the alignment of the Road, requiring the formation of heavy embankments, it was agreed in a supplementary contract, that the time for completing this division should be extended so much as the Chief Engineer might decide to be reasonable. Such an extension of time would not have been necessary, but for the very unfavorable weather during the spring, and the unusually heavy fall of rain, which has caused a greater amount of subsidence in these new embankments than was anticipated. The iron is now laid on this division of the Road to within about two miles of the Holland River, and will, without doubt, be laid to that point, and be put in order for running over, on or before the fifteenth day of June, instant.

From Holland River to Barrie, with the exception of those sections where changes in the original location were made, the bridging and grading is very nearly completed, and the whole of this division, which, by the terms of the original contract, should be completed by the first of December next, will, I have every reason to believe, be ready for opening at least two months previous to that time.

In order to facilitate and to avoid interruption to the regular business of the Road, the arrangement ordered by the Board, has been made with the contractors for taking the Roads off their hands as far as Barrie, without ballasting, for the consideration agreed upon. The ballasting will now be done by the Company at such times as the business of the Road may best admit or require. With a similar purpose, two of the minor changes, in the original location, required by the supplementary contract, have been postponed, and the contractors having placed their estimated cost at the credit of the Company, the track has been laid on the original location, which was graded, and the improvements will be made at a more convenient season.

From Barrie to Collingwood Harbour, on the Georgian Bay, a distance of thirty-one miles, the location has been completed, and the works are in satisfactory progress on this division, with a fair prospect of being completed by the time stipulated in the contract, viz., the 1st day of June, 1854. On this portion of the Road, the alignment and grades have been greatly improved over those indicated by the preliminary survey, and the country through which it passes, is generally favorable to the construction of such a permanent way, as will be economically maintained, and requiring the construction of but 452 feet of bridging on the entire division.

* * * * * * * *

It is not contemplated to proceed at present with the construction of any very extensive work at Collingwood Harbour. No greater outlay this year will be incurred at that terminus than will be necessary to afford a good steamboat landing, and sufficient storage for goods. This course has been deemed advisable, inasmuch as the bill recently passed through both branches of the Legislature, authorizes the extension of your Road to the eastern shores of Lake Huron; and the advantages offered by such an extension may at an early date be a sufficient inducement to extend your Road to some point near the "*Saugeen*" or "*Fishing Islands.*"

* * * * * * * *

The rolling stock at present on the Road consists of four engines and fifty nine cars of the several classes, besides which, thirty-six other cars are in a forward state in the contractor's shops, and will be on the Road within the present month. Contracts have been made with Messrs. McLean, Wright & Co. for two hundred and eighteen cars; and as they have their shop and machinery in full operation, no difficulty is likely to occur in fully equipping the Road. Four other locomotives have also been ordered, three of which will be in service before the expiration of this month, and the fourth early in July.

The recent report of the Chief Engineer fully detailed the expenditure required for completing the road to Collingwood, nothing has since occurred calculated to disturb that estimate. The expenditure as exhibited by the books of this office to the present time, is as under:

For Grading, Bridging, and permanent way, including Engineering expenses, and Rolling Stock under original contract, and iron for eighty-two miles of road, with sidings,	417,542
For Rolling Stock under supplementary contract, ...	4,070
For Harbour and Depot service, under supplementary contract, being for permanent and temporary work in Toronto, and for Way Stations,..............................	2,254
	£423,866

All which is respectfully submitted,

ALFRED BRUNEL,
Chief Assistant Engineer.

ENGINEER'S OFFICE,
Toronto, June 4th, 1853.

Great Western Railway.

At the annual general meeting of the Stockholders of the Great Western Railroad, held in Hamilton, a few days ago, reports were adopted, of which we present the following extracts:

The Directors, in submitting the usual financial statement, made up to the 30th April last, will, in explaining their proceedings during the past year, endeavor to place before the Stockholders the exact and real position of every matter connected with the Road.

The amount expended up to the date of the last Report, in June, 1852, was........ ... ...£ 383,039 8 5

From the accounts this day submitted, it will be seen

that the total expenditure, to the 30th of April, 1853, was.... .. .. £1,322,758 2 10
There has consequently been expended during the past twelve months............ ....£ 939,718 14 5

It will thus be seen that a very large amount of work has been performed since the last annual meeting, and the progress made up to this time has been such as to admit of the works being pressed forward during the present season with the greatest possible rapidity. All the large and important structures are advancing rapidly towards completion—the grading of a considerable portion of the line is in a forward state—so much so that the superstructure has been commenced at several points, and arrangements are in a forward state for vigorously carrying on this work along the whole line. By far the largest portion of the rails, which are of a very excellent description, and were purchased at a low price, before the late extraordinary advance in the price of iron, is delivered at various points on the line, and the balance is now on its way from England via Quebec.

The Directors therefore feel themselves justified in expressing a strong and confident belief, that by the adoption of the most energetic measures to press on the work, they will, if no unforeseen contingencies arise, be in a position to open the line from Niagara to the Detroit River by the 1st of January next.

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ENGINEER'S REPORT.

To the President and Directors of the Great Western Railway Company

Gentlemen,—* * * * The late period in 1852 in which I assumed the duties of Chief Engineer, left but little time hitherto except during those seasons of the year unfavorable to operations of this kind, to press forward the work on the line with as much energy and expedition as was desirable.

Some difficulties have existed during the past fall and winter with some of the Contractors on the Western Division of Road, but these have been adjusted, and the work is in full progress on that portion of the line—its completion may be reasonably anticipated at the period hereinafter named.

The line of your road cannot be opened for use by the time indicated in the last annual report from this office, nor has there ever been a period within the last twelve months when any such opinion ought reasonably to have been entertained. Even the grading on the one hundred miles from the Detroit river east, has not yet been completed, and probably will not be before the first of September next.

The report and estimate made by my predecessor on the 30th of September last, gives an estimated increase in the cost of the road of $1,129,173,01 exceeding any sum before deemed necessary to complete the enterprise. The amount of work required to be done under this increased outlay, no doubt satisfied every friend of the road familiar with works of this kind, that the opening of the whole line by the close of the year 1853, would be exceedingly problematical and dependant upon contingencies that might defeat all the applications of science skill and labour that could well be devoted to the accomplishment of an object so anxiously desired, and so important to the interest of the company. This being perceived, every precautionary measure deemed essential and within my power, has been adopted to expedite the progress and completion of the work, that a strict regard to economy in expenditure and the permanence of the road combined has seemed to be required.

As the periodical subsidence of the waters of the western lakes had not occurred in 1852, and it probably will not, according to all former experience, during the present year, a plan was adopted by my predecessor, for piling about 14 miles of the line over the wet praries west of Chatham on the Western Division.

The slow progress made in the work, and its probable insecurity and want of permanence for the purposes of operating the road with desirable security, safety, and expedition, induced me to recommend a change in the plan of construction, and the whole distance through the prairies, with the exception of a mile and a half, will be graded in a permanent manner, either by taking materials to form the embankment from the prairies adjacent to the line of road, by means of coffer dams and pumping, and with dredging machines, or by hauling beach sand from the shore of the Lake. This change will increase the cost of constructing on the part of the line considerably above the sum estimated by my predecessor for a pile road; that being only one dollar per lineal foot, but the cost I think will not exceed what would eventually be required to render a pile track safe for the rapid transmission of trains.

The one is permanent for all time to come, the other temporary, and will require filling in within a few years.

* * * * * * * *

The completion of the City Section on the Central Division, in connection with the opening of the new channel of the Desjardines Canal, through Burlington Heights, and the draw bridge connected therewith have continued to excite my most lively solicitude. Under favorable auspices and with the application of proper means and an adequate force, this work can be got ready for laying down the superstructure in time to connect with other portions of the line westward, by the 1st day of January, 1854. In order to avoid obstructions and embarrassments, as well as to guard against a large expenditure of money, consequent on the heavy slides on sections three and four, near Dundas slight alterations have been made in the line of the road, with the view at some future period, after the surface water shall have a proper drainage, and the moving mass has become settled and compact, of placing the track upon the original lines, if deemed necessary.

Sections five and six, Central Divisions, embracing the Copetown work, which has heretofore attracted some attention, have thus fa. presented objects serious in their character and difficult to overcome.

The increased quantity of material required to be excavated and removed, occasioned by the large and continued slides of earth in the deep cutting, and the piling necessary to protect the foot of the slopes and maintain the required width of the road way, will enhance very much the cost of the work beyond all former estimates.

This work, however, is in such a state of forwardness as to justify the expectation that no serious delay in opening the line on this Division will be occasioned by the obstacles there to be encountered and overcome.

The sinking of the embankment on section 11 Central division, into a deep morass or subterranean lake, has heretofore shown unmistakeable evidences of serious difficulties. A new plan for carrying forward the work has been recently adopted which promises fair, not only to expedite it, but very much reduce the expense. This has been done by constructing an extensive platform of evergreen trees and brush, so interwoven its roots with earth as to prevent the loss of material by displacement, which was occasioned by the nature of the materia used and the superabundant weight put upon the basis of the em bankment beyond its capacity to sustain.

Present indications show the entire success of the plan; and w hope to complete the grading at that place by the first of Septembe next.

The work on the Western Division is of such a character, and i such a state of progress, with the exception of the deep and difficul excavations on sections two and three, near London, as to present n serious apprehensions that this portion of the line will be in conditio to be operated upon by the close of the present year And as to thos points, new arrangements have been made with the contractors, to fa cilitate the progress of the work; and if need be, further attainab means may be resorted to by the application of a night force, so th the opening of the line West of London may be simultaneous wit that between Hamilton and London.

On the whole, then, if the financial arrangements of the Compa shall be such as to allow the work on this part of the line to be push to the extent required, and no other casualties or obstruction shall in tervene or occur than such as may be reasonably anticipated an guarded against, I see no just cause to doubt you can be gratified wit the opening of the whole line, from Windsor to Hamilton, by the clos of the present year.

* * * § * * * *

I submit therewith a detailed account of the cost of the entire lin between the Niagara and Detroit rivers, two hundred and twenty-eigh miles, and the Galt branch twelve miles. This estimate is intende to cover all items of expenditure requisite to put the line in complet operation, with buildings and equipments complete, including th docking and filling in depot grounds at Hamilton and Windsor, an the extension of the line down the Detroit river to a point opposite th Michigan and Central Railroad station.

The right of way, land and land damages, and the incidental an contingent expenses of the Company are not included in the estimate.

According to this estimate the cost of two hundred and forty miles of single track road, with an allowance of 17 miles of superstructure for side tracks, &c., will amount to the sum of $7,791,075.14 which is composed of the following items:—

Grading, Masonry and Bridging	$1,477,138 49
Superstructure	1,795,186 65
Fencing and Gates	153,600
Station Buildings, Engine and Freight Houses, Machine Shop, Car Factory, &c.	375,000
Stationery Engines, Machinery, Tools and Turn Tables,	48,000
Rolling Stock,	662,159
Engineering Expenses and pay of Inspectors of Work,	280,000
	$7,791,075 14

The increase of Mr. Benedict's estimate of the 30th Sept. last, is as follows:

On Grading, Masonry and Bridging	$653,799 83
On Superstructure	320,717 65
On Fencing,	20,413
On Buildings,	115,000
On Rolling stock,	195,250
On Engineering Expenses,	40,000
	$1,315,180 48

In submitting this report, I have felt compelled to speak plainly and explicitly on all topics discussed; in my judgment this was a duty alike due to the Board of Directors, the Shareholders and myself. All my exertions must be directed to the promotion of the permanent interests of those who furnish the means to carry forward to completion the great work in which you are engaged. Notwithstanding the increased outlay, according to the estimates now submitted, will reach a sum considerably larger than had ever been anticipated by the friends of the enterprise, we may indulge in the well grounded hopes that with the application of reasonable economy in our future operations and with an energetic and cordial co-operation among all the official departments of the company, the whole line of road will be open for traffic at an early day, and this noble enterprise may be made to yield a fair increase on the capital invested.

Respectfully submitted.

(Signed) JOHN T. CLARK,
Chief Engineer.

Engineer's Office, G. W. R.,
Hamilton, 4th June, 1853.

Toronto and Guelph Railway.

Report of the Directors of the Guelph Railway Company—June 6.

This is truly an exulting and abounding river of words. It is far, very far removed from the subdued goodness, not to say *softness* of the Report of the Northern Railway Board. It speaks in a tone of undisguised, and even affectionate triumph of the wonderful sagacity of the BALANCE—to which it appears the favourable solution of all the vital questions affecting the very existence of the Guelph line are gratefully due.

We begin at the end of the Report, struck as we were with the late singular exigencies of the Guelph line, so distinctly delineated in the closing paragraph, which we subjoin:—"When it is felt, as your Board feel, that all these vital questions have been decided in our favor, by the mere wavering, as it were, of a BALANCE, which a moment's delay or a brief indiscretion might have turned against us, &c., &c., &c."

The principle is evidently borrowed from the Bank of England Sovereign Weighing Machine, a short description of which we give in the present number of the Journal. The Report says nothing about the ingenious inventor, but with quiet humour, tinged with exultation, thinks that the Balance was '*discreet.*'

It may be so, but the aspect of coming times is not so undisturbed to our mental vision as it appears to the Directors of the Guelph Railway Company. Something we fear 'looms in the future,' and may not the Great Western Railway form a part of that shadowy veil which we believe is destined to suppress with "cold obstructions apathy" many of the aspirations of the *Canadian* Shareholders, and especially those interested in that particular portion of the line which is *destined* (?) to run from Stratford to Sarnia.

The Board thus speak for themselves:—

"The Board of Directors, in laying before the Shareholders of the Toronto and Guelph Railway Company, a statement of their transactions for the past year, do so with no ordinary feelings of pride and gratification, at the commanding position and future importance which, in the brief period of their term of office, this infant enterprise has secured. When twelve months ago, the Directors assumed their onerous trust, it was generally understood, that the construction of a railroad from Toronto to Guelph would be a task attended with much difficulty and discouragement, in consequence of the scarcity of capital, the limited powers granted by Parliament, and the powerful union of opposing interests. Confident however, in the intrinsic merits of the undertaking, and the vast benefits to be derived from it by the citizens of Toronto, and the inhabitants of every town and township interested, the Board set themselves steadily to work to surmount the obstacles that lay thick in their path, and the result has been, that at this moment, not only is the railroad visible as an actual fact, in a more or less advanced state, in almost every part of the line between Toronto and Guelph, not only have surveys been completed to Goderich and Stratford; and partially so from Stratford to Sarnia; and full powers obtained from the Legislature, despite of all opposition, to extend our line to the last named point: not only has this been accomplished, but important as these must be considered, they are only a portion of what the Toronto and Guelph Railway Company has achieved."

After some explanatory remarks the Report tells us that "under the able agency of Alex. Gillespie and A. T. Galt, Esquires, deputed by your Board, the arrangements have been all completed, the legal documents signed and delivered, subject to the sanction of the shareholders, by which the Toronto and Guelph Railway Company has become a component part of a great congeries of Railroads, extending from the Atlantic coast on the east to Port Sarnia on the west, a distance of 809 miles, with branches to Quebec, and thence to Trois Pistoles, 253 miles, and to Peterborough 50 miles, being 1,112 miles in all, independent of the large number of tributary lines which must pour in their streams of travel, from Hamilton, from Goderich, Port Hope, Cobourg, Rawdon, &c., besides the connecting links which will unite our line with the Railroads of Nova Scotia, New Brunswick, Maine, New Hampshire, Vermont, Massachusetts, New York, Pennsylvania, Ohio, Michigan, and Wisconsin, all situated within reach of one or other of its various tributaries.

* * * * * * * *

On the 4th of May, letters were received, announcing the effective accomplishment of the contemplated arrangements, by the completion of an agreement, subject to ratification of the Stockholders of this Company, by which the entire interests of this Company became merged in those of the Grand Trunk Railway of Canada, and the Municipalities have been enabled to exercise their free choice in retaining or resigning their stock. Those letters your Board have appended to this Report, with the view of affording every proprietor of shares the fullest insight into the nature of the changes involved. By them, all the previous contracts with Messrs. Gzowski & Co., together with all the financial arrangements contingent thereupon, have been set aside, and a new contract substituted, establishing a mileage rate, for the construction of the Railway from Toronto to Sarnia, of £8000 sterling per mile, including all expenditure for the erection of stations, purchase of lands, cost of tubular iron bridges for double track, and other works, upon the scale adopted for the Grand Trunk Railway; besides a sufficient sum to provide for the payment of interest on the entire stock until the line is opened throughout, and an amount not exceeding £15,000 sterling for the current expenditure of the Company, or the payment of salaries, rent, stationery, and all other incidental outlay."

Then follows an account of matters of detail, which are not of interest to the general reader. The report closes with a song of triumph and rejoicing, which we trust future events will show to be suitable, seasonable and sincere.

"Perhaps no circumstance connected with the history of your Company for the last year, is more significant than the fact, that whereas a few months since, it was with difficulty that even wealthy individuals could be induced to invest their capital in railroad stock at all, and the sole motive which induced the citizens to consent to give municipal aid, was, the indirect benefits to be obtained from Railroads; we now find many of the same individuals then most opposed to holding stock now unwilling to dispose of it at par with interest. When so striking a change is kept in view: when too the formidable obstacles which have been surmounted, in the selfish opposition of powerful and extensive rival combinations, are remembered—when the commanding position of the City of Toronto, as a central station of the Grand Trunk Railway of Canada, as contrasted with what it must have been, if reduced to a rank subordinate to a neighboring city, is considered—when it is felt, as your Board feel, that all these vital questions have been decided in our favor, by the mere wavering, as it were, of a balance, which a moment's delay or a brief indiscretion might have turned against us, then truly every shareholder of this Company, every inhabitant of each town and city on the line, ought to rejoice at the result.

Your Board feel that they have done their duty, and they yield up their charge in the full confidence, that their acts will meet with the entire approbation of the stockholders, and their fellow citizens generally."

All which is respectfully submitted.

By order,

S. THOMPSON,
Secretary.

Toronto, June 6, 1853.

Hamilton and Toronto Railway Company.

REPORT OF THE BOARD OF DIRECTORS.

The Directors place before the Shareholders a statement of the accounts made up to the 31st May, by which it will appear that only preliminary expenses have yet been incurred. The contract with an eminent English contractor has been approved of and adopted by the Directors; and arrangements are in progress for vigorously prosecuting the work. The Directors have to report that they have arranged to lease the Line when finished to the Great Western Railway Company, at a rent of 6 per cent. on the guaranteed cost of the road, and an equal participation in any dividend beyond 6 per cent. that the Great Western Railway may pay to its shareholders, and which lease they strongly recommend for the adoption of the annual meeting of Shareholders. The Directors have to congratulate the shareholders on the contemplated arrangements between the Great Western Railway Company and the Grand Trunk Company, by which rivalry, injurious alike to the public and to the shareholders, will be avoided, and the stability of Railway property in Canada secured.

All of which is respectfully submitted.

ROBERT W. HARRIS,
President.

CORRESPONDENCE.

"Rara Avis."

To the Editor of the Canadian Journal:

SIR,—I was highly interested in the account of the Land Birds wintering in the neighborhood of Toronto, read by G. W. Allan, Esq., Feb. 28th, 1853. Though aware that some of the birds enumerated might winter with us in the dense forests of cedar and hemlock in Canada east, yet, I had no idea that so great a variety, as twenty, could be found near Toronto, although nearly two degrees more to the south.

The perusal of Mr. Allan's paper brought to my mind an ornithological curiosity which characterized the winter of 1851-52, and which, being so very rare and uncommon, if not without a parallel, is certainly worthy of being recorded. It is nothing more nor less than the fact of a Robin red-breast remaining with us about the Rectory, and enduring the rigours of the whole winter—by no means a mild one. At first sight of the bird I could scarcely believe my bodily vision; yet was soon convinced of what I imagined it to be, namely, what Thomson so graphically portrays in his "Winter," the season, in England, when this general favorite seeks a more intimate acquaintance with the human family:

"The red-breast, sacred to the household gods,
Wisely regardful of th' embroiling sky,
In joyless fields, and thorny thickets, leaves
His shivering mates, and pays to trusted man
His annual visit. Half afraid, he first
Against the window beats; then brisk alights
On the warm hearth; then hopping o'er the floor,
Eyes all the smiling family askance,
And pecks, and starts, and wonders where he is:
'Till more familiar grown, the table-crumbs
Attract his slender feet."

I was anxious to ascertain what had become of the other robins, and after the lapse of a day or two, the melancholy conclusion was forced upon me, that, sure enough, this careless child of nature had lost the main chance, and suffered his parents, relations, and neighbours, to migrate to their annual resort for the winter, and that my poor friend was truly the *last Robin of Summer*, or rather Autumn, left shivering alone. I called the attention of my family to the affecting fact, when general sympathy was felt for the solitary bird, and fear expressed that the intensity of the cold would number him with the dead.

Fortunately, the berries of the mountain ash in front of the house, afforded an ample supply of food to Bob through the winter, till the cedar-birds came to feed on them, as they generally do towards the end of the season. Several times a day he enjoyed his meal, with apparent relish and gratitude, always returning to his roost, which was generally the lowest branch of a plum or cherry tree, in the rocky part of the flower garden.

On intensely frigid days, with a piercing cold wind, or when the mercury was down to ten or twenty degrees below zero, the effect on poor Bob was truly affecting to witness. Once or twice especially, while perched on the cherry tree, the frigidity of the atmosphere had so thickened his blood and benumbed his frame, that he could not maintain his proper roosting position; but with feathers ruffled, and head dropping gradually lower and lower—just like a person nodding while dozing, but raising up his head less and less high, as sleeps gets the mastery—gave sad intimation that the last fatal sleep of death was upon him! when, lo! he would rouse himself as if by a desperate effort, and, recovering his vivacity and strength, have recourse to his favorite and only remaining food, without which he certainly must have perished.

His nocturnal repose, I have reason to believe, was in a neighboring barn or stable, distant some twenty rods, since his flight about dusk was in that direction, and from thence back again at twilight, a.m.

Thus like a brave pilot, he weathered the storms and bitter cold of winter, unscathed by their severity. When Spring came, with the return of his wiser and more favored kindred, we lost sight of our feathered hero, who had given ample proof how much hardness he could endure.

It would have afforded us much pleasure could we have related the warm congratulations of his brethren, on again recognizing this long lost member of their fraternity—*the last Robin of Summer.*

RICHARD WHITWELL.

Philipsburgh, 22nd April, 1853.

Installation of the Chancellor of Trinity College.

Owing to the non arrival of the Steamer, in due time on Thursday, by which the Chancellor elect was a passenger, the installation of the Hon. J. Beverly Robinson, Chief Justice of Upper Canada, as the first Chancellor of this University did not take place until Friday last.

At Ten o'clock, the Lord Bishop, the Chief Justice, the Provost and heads of the University, the Students and company having assembled in the College Chapel, the Liturgy was there said, after which the Bishop, Clergy and Students having adjourned to the Hall where a large company was assembled, his Lordship took the Chair. Shortly after the Chancellor entered in his splendid robe of office, the gift to the College of various liberal friends. Immediately upon his entrance, the Lord Bishop vacated the chair and the Chancellor being led thereto, took his seat, with the Lord Bishop and the Archdeacon of Kingston on his right, the Vice Chancellor and Archdeacon of York on his left.

* * * * * * * *

The Chancellor then proceeded to confer degrees when Messrs. Badgley, Bethune, Hallowell, Hodder, and Beazley, Medical Professors of the University were severally introduced by Dr. Bovell, and having taken the oaths and declarations, severally received their degrees of M.D., in this University, *ad eundem*, and also Dr. Bovell who was presented by Dr. Badgley.

Professor Hind then received the degree of M.A., and Mr. J. M. Strathy that of Musical Bachelor.

The following gentlemen also received the degree of B.A., Rev. Messrs. Merritt, Ingles, Geddes, McKenzie, and Messrs. Helliwell, C. Robinson and Preston. The following being of sufficient standing in the College also received the degrees of M.A., Rev. Messrs. Merritt, Geddes, McKenzie, Messrs. Helliwell and C. Robinson.

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We cannot close our report of the proceedings of this day without making mention that it having been recollected that this was the fiftieth year of the ministration of the Lord Bishop in Canada, it was proposed to commemorate the event by founding in Trinity College a Scholarship to be denominated "The Bishop Strachan Jubilee Scholarship," value £30 a year for which purpose the sum of £500 was proposed to be raised by subscription. A subscription list was immediately opened, and the amount was subscribed in the room.

At the meeting of the friends of the College which was held after the installation, it was decided to raise at once by voluntary subscription the further sum of £5,000 in aid of the funds of Trinity College, and the sum of two thousand pounds was subscribed before evening. Since then we understand the subscription list is fast filling up.—*British Canadian.*

University College, Toronto.

The following appointments have been made by His Excellency the Governor General, in University College, Toronto:—

"J. Bradford Cherriman, Esq., M. A., Fellow of St. John's College, Cambridge, to be Professor of Natural Philosophy in University College, Toronto.

"Daniel Wilson, Esq., L. L. D., Honorary Secretary of the Society of Antiquaries in Scotland, to be Professor of History and English Literature in University College, Toronto.

"The Rev. William Hincks, F. L. S., Professor of Natural History in Queen's College, Cork, to be Professor of Natural History in University College, Toronto.

"Edward J. Chapman, Esq., Professor of Mineralogy in University College, London, to be Professor of Geology and Mineralogy in University College, Toronto.

"James Forneri Esq., L. L. D., to be Professor of Modern Languages in University College, Toronto.

Government aid to various Institutions for the advancement of knowledge in Canada East and West, 1853.

Aid to the	Literary and Historical Society at Quebec,	50
do	Natural History Society, Montreal,	50
do	Mechanics' Institute at Quebec,	50
do	same at Montreal,	50
do	same at Kingston,	50
do	same at Toronto,	50
do	same at London, Canada West,	50
do	same at Niagra,	50
do	same at Hamilton,	50
do	same at Belleville,	50
do	same at Brockville,	50
do	same at Bytown,	50
do	same at Cobourg	50
do	same at Perth,	50
do	same at Picton,	50
do	same at Guelph,	50
do	same at St. Thomas	50
do	same at Brantford,	50
do	same at Catherines,	50
do	same at Goderich,	50
do	same at Whitby,	50
do	same at Three Rivers,	50
do	same at Simcoe,	50
do	same at Woodstock,	50
do	same in the County of Peel,	50
do	same at Port Sarnia,	50
do	same at Chatham,	50
do	same in the County of Halton,	50
do	same in the County of Ontario,	50
do	same at Port Hope,	50
do	Athenæum at Toronto,	100
do	Huron Library Association and Mechanics' Institute	50
do	Teachers' Association at Quebec, for their Library,	50
do	Canadian Institute at Toronto,	250
do	Canadian Institute Quebec,	50
do	Canadian Institute, to their Library,	100
do	Academie Industrielle de St. Laurent, for the years 1852 and 1853, at £150 per annum	300
do	Academie Industrielle, towards their building	150
For the re-organization and temporary maintenance of the Scientific Observatory at Toronto		2000
To reimburse Captain Lefroy, in charge of the Magnetical Observatory, the value of certain additions made by him to the building of the Observatory at Toronto, as a residence for the officer in charge,		219
To the Literary and Historical Society at Quebec, as an aid for the removal of their Library and Museum,		150
To the Natural History Society at Montreal, towards their building		150
Towards to the establishment of an Experimental Farm at Toronto,		£500
		£6319

Gold in England.—At a late meeting of the Poltimore Copper and Gold Mining Company, the result of the reduction of 50 tons of auriferous gossan, from the mine, was produced to the meeting in the shape of a piece of pure gold weighing 26½ ounces. The following is the postscript to the report of Messrs. Rawlins & Watson, at whose works the auriferous gossan was reduced :—

P.S.—In order that the company may have additional data for forming an opinion respecting the value of the gossan, we add that we are willing to undertake the reduction of the red ore, containing the same proportion of gold as the lot we have reduced, and return to the company 1 oz. of gold per ton of dry ore, free of all smelting charges ; or we should be willing to give at the rate of £4 4s. per ton of dry ore. Now, assuming that the cost of the rasing and carriage of the ore would amount to about £1 per ton, this would cause a nett profit of £930 per week, or upwards of £16,000 per annum, and this from auriferous ore alone, irrespective of any copper or other lodes.

As a proof of our confidence in the undertaking, we now take the 500 shares in the company which were placed at our disposal.—R.&W.

The Fine Arts in Finland.—At Helsingfors, say the foreign journals, has just been opened an Exhibition of the Fine Arts—the first that ever took place in Finland. Of fifty-two pictures which compose it, forty are by native artists :—a fact sufficiently noticeable in a country where but a few years ago so little was known of Art that the very street sign-boards were imported from abroad. It is also noticeable, that of these forty about two-thirds are the works of fourteen young ladies, nearly all of the old nobility of Finland.

Coloured Snow, Rain, and Hail.—In the *New York Journal of Commerce*, of the 2nd ult., an extract is given from the *Boston Journal* in which it is mentioned that a fall of black snow occurred at Walpole N. H., on the 30th March. The account forwarded to Boston was written with a solution of the snow as it fell, and had the appearance of having been written with pale black ink. It is also mentioned in the *Journal of Commerce* of the above date, that after the prevalence of a rain storm in Cincinnati, in the latter part of March, the pavements throughout the entire city were found to be strewn with a yellow substance resembling sublimate of sulphur, but which was ascertained on examination, to consist of pollen of flowers, wafted by the winds from a tropical region to the north. Many earth worms were likewise deposited on the pavements by the same rain. This yellow rain extended also to Louisville, Kentucky.

Mock Suns.—The following accounts of this rare phenomenon, observed on two successive days, February 14th and 15th, at two place in England, are taken from letters addressed to the *Times* by the respective observers, Mr. Emeric S. Berkeley, of King's Cliffe, Wandsford, Northamptonshire ; and Mr. John Thornton, of Kimbolton, Hunts. The latter says :—

"About a quarter past 12 P. M., this day, (Feb. 14), my attention was called to a beautiful appearance of four parhelia, situated at different points, of a great circle of bright light, parallel with the horizon, and passing through the sun. Around the sun was a vertical arch of white light, in breadth about one-third the diameter of the sun, and at the intersection of this circle with the horizontal one the two most southerly parhelia were situated : these were very brilliant, of a fawn colour towards the sun, and of a violet white on the remote side ; the two more northerly parhelia were much fainter. There was at the same time in the zenith a beautiful circular ring, not very distinct towards the North, but shewing brilliant prismatic colours towards the South. The diameter of this ring, which was horizontal, was apparently the same as that of the vertical circle in which the two most southerly parhelia were situated. From further observations, taken at 2.45, P.M., the angle between the parhelia was 48°20′. At the same time the angle between the sun and the nearest point of the prismatic ring in the zenith, was 47°. The air was very keen during the day, and at 10 A. M., the thermometer stood at 28 F., in the house."

The other account says :—

"At 12 o'clock this morning I perceived on either side of the sun two parhelia or mock suns; these were in their usual places in two intersections of the halo; in each parhelion the colours were prismatic. Higher in the heavens, touching the halo, was an arch of an inverted rainbow; and still higher, with the prismatic colours much more vivid, was another inverted arch. These two inverted arcs were as distinct in colours as the common rainbow, but not of the same breadth. There were various other circles not well defined. Verging towards the North was a third parhelion, not consisting of prismatic colours, and in which we could not trace the intersecting circles distinctly. The clouds in the North were at the same time tinged with red. The parhelia lasted more than an hour."

Extraordinary Length of Wire from one Piece of Metal.—A remarkable specimen of the ductility of copper was manufactured last week at Mr. Walker's mills, Fazeley-street. The metal referred to weighed about 123 lbs., which was drawn out to a length of upwards of four miles, and is to be laid down as a line of telegraph without link or weld.

A method has lately been introduced in Prussia of printing books on linen prepared for the purpose. It is the invention of an apothecary named Sänger, of Berlin, and is found very admirable in large schools for the poor. The appearance of the book is by no means injured, and the price is the same as if printed on paper.

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

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

Magnet	Day	Barom. at tem. of 32 deg. 6 A.M.	2 P.M.	10 P.M.	MEAN	Temperature of the air 6A.M.	2P.M.	10P.M.	M'N.	Tension of Vapour 6A.M.	2P.M.	10P.M.	M'N	Humidity of Air. 6A.M.	2P.M.	10P.M.	M'N.	Wind. 6 A.M.	2 P.M.	10 P.M.	Rain in Inch	S'nw in Inch.
						°	°	°	°													
b	1	30.074	30.071			37 0	43 8			0 191	0 193			87	69			NE b N	E S E		- -	- -
bd	2	29 963	29 877	29 761	29.851	39 1	46 9	44.5	43 90	0 179	0.170	0 174	0.17	76	55	60	62	E b N	E b N	E b N	0 005	- -
e	3	685	.662	.701	.682	46 3	50 3	48 4	48.72	.235	.284	278	.277	75	80	83	82	Calm.	Calm	Calm	- -	- -
c	4	748	.718	.624	.693	48.5	61 4	49.9	53 43	.236	353	279	.289	70	66	79	71	Calm	S b E	Calm	0 055	- -
b	5	651	471	.559	.534	49 6	50.6	47 5	49 33	.327	.349	289	.31	94	96	96	92	N	N E b E	N N E	0.400	- -
c	6	.5‹3	.636	.695	.643	44 2	54 9	43.8	48 22	218	271	.213	2‹.	76	64	86	76	N b E	SE b E	Calm.	- -	- -
b	7	.688	503	.285	.474	4‹.5	52·5	44.2	48.53	.233	.290	.272	.276	69	75	94	82	N E	N E b E	E N E	0.160	- -
b	8	233	.213			47.4	56 0			294	388			91	88			E b S	W S W	—	Im p	- -
b	9	390	.351	.373	.371	42·0	49.8	46 3	47 08	238	.278	.293	.283	90	79	94	90	Calm	E b S	S	0 065	- -
b	10	.462	.489	.597	.522	47 8	51 6	44 5	48 15	303	.256	243	.279	93	77	84	84	S S W	S W	N N W	0 200	Inap.
b	11	.706	.710	.635	.681	38.9	51 7	45 0	46 40	219	272	.220	.242	93	72	75	74	N b W	S b E	E b S	0.345	- -
a	12	.455	575	.742	.609	42 1	47 4	39.2	42 80	.243	.285	.188	23	92	88	79	84	N E b E	N	Calm.	0 045	- -
b	13	.851	.817	.848	.837	40.8	53.4	42 0	46 55	.193	.237	.213	.234	76	59	81	74	Calm.	S b E	Calm.	- -	- -
b	14	.880	837	.764	.819	43 5	62 0	47 2	51.72	.198	302	.241	271	72	56	76	72	Calm.	S S W	Calm.	- -	- -
d	15	.706	551			47 0	50.6			.275	.345			87	95			Calm.	Calm	—	0 135	- -
d	16	493	.418	.572	.500	55 4	69 9	57.4	62.02	.365	.467	.357	.410	85	66	77	75	S S W	S S W	Calm	- -	- -
e	17	.689	.617	689	.670	52 8	59.6	50 3	55 10	.347	.466	.341	.357	88	93	95	90	Calm	S E	N	0 225	- -
b	18	.794	.633	361	.5‹1	41 2	43 7	44 5	43 88	.257	.262	.270	.26	90	93	93	92	N b E	E b N	E b N	0 975	- -
c	19	.311	369	.660	.469	45.0	42 4	35 5	41 23	.273	.252	.181	.24	92	94	87	93	S b E	N W	N WbW	0 130	- -
c	20	.544	.518	.488	.510	39.1	56 0	44 8	47.60	.196	.261	.232	.239	83	60	79	71	N W b W	W b N	Calm.	- -	- -
b	21	.413	261	.240	.297	48 2	65.4	56.4	56 70	.269	.404	.362	.347	80	67	81	77	W	S W b S	S W	0.095	- -
b	22	.283	.285			53 4	56 2			.377	.409			94	93			Calm	E b N	—	1.400	- -
d	23	.262	.469	.585	.455	51.7	57.1	46 7	52 22	345	.305	.235	.307	91	67	74	80	Calm	W b S	W b N	- -	- -
de	24	.672	.711	.766	.717	44 5	51.3	47 1	47 75	243	.280	.268	.267	84	75	84	82	W b N	S S W	N W	- -	- -
c	25	.746	.664	.604	.666	48.1	57 7	54.8	53.43	.275	.377	374	.335	83	81	90	83	N	N W	N	0 005	- -
a	26	.493	.403	.461	.448	52.4	58 9	53.1	55.97	356	.399	.377	.347	92	82	96	91	N N W,	N NW	W	0.170	- -
b	27	.548	.579	.609	.582	55.5	69.3	59 2	62·12	368	.452	.380	.410	85	63	77	76	N b W	N W b N	S W	- -	- -
d	28	.618	.591	.570	.594	60.7	71 4	59.2	65.07	.453	.501	.377	.456	87	67	77	76	S W	S S E	Calm.	- -	- -
b	29	.599	.539			ˑ5.4	71 1			365	.448			85	60			Calm	S b E	—	- -	- -
d	30	.263	.414	.726	.490	ˑ0.5	63 2	48 8	56.00	.441	343	·229	.317	86	60	68	70	Calm	N W	N W b N	0.010	- -
c	31	864	876	.814	.852	15.1	54.9	43.4	48.80	211	.309	·215	248	72	73	77	73	N W b N	E b S	E N E	- -	- -
	M	29 603	29 583	29.605	29.598	47 48	55 88	47.83	50.87	0 278	0.325	0.274	0 297	84	73	82	80	Ml's 3.62	Ml's 8 12	Ml's 2.85	4 420	Inap

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

North.	West.	South.	East.
1489.22	1331.98	840.17	1101.65

Mean velocity of the wind - - 5.14 miles per hour.
Maximum velocity - - - - - - 21 0 mil's per h'r, from 2 to 3 p.m. on 30th.
Most windy day - - - - - 19th: Mean velocity, 10.77 miles per hour.
Least windy day - - - - - 3rd: Mean velocity, 0 33 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 - - 30.074, at 6 A. M., on 1st. } Monthly range:
Lowest Barometer - - 29.213, at 2 P.M., on 8th. } 0 861 inches.
Highest observed Temp.- 78.4, at 12½ P.M., on 28th } Monthly range.
Lowest regist'd Temp. - 32.2, at A.M., on 13th } 46.2
Mean Highest observed Temperature - - 56.74 } Mean daily range:
Mean Thermometer Minimum - - - - - 42 55 } 14.19
Greatest daily range - - - - -28.4 from noon of 28th, to A.M. of 29th.

Warmest day - - 28th - - - Mean Temperature - 65 07 } Difference:
Coldest day - - - 19th - - - Mean Temperature - 41 23 } 23.84
The "Means" are derived from six observations daily, viz., at 6 and 8 A. M., and 2, 4, 10 and 12, P. M.
Aurora observed on 3 nights. Possible to see Aurora on 19 nights.
Halo round the sun at 5 30 P.M., on the 11th
Perfect Double Rainbow at 7.25 P.M., on the 26th. Brilliant colours.
The depth of rain for this month is much above the average, and has been exceeded only in two years, 1844-49; but the number of rainy days is the greatest that has been known throughout the whole series of years, being only equalled in August, 1844.

Comparative Table for May.

Ye'r	Temperature. Mean.	Max.	Min.	Range.	Rain. D'ys	Inches.	Snow. Dy's	Inch.	Wind. Mean Velocity
	°	°	°	°					Miles.
1840	53.78	74.5	30.8	43 7	9	4.150	0	--	--
1841	60.77	70·2	26.6	49 6	11	2 350	1	Inap.	--
1842	49 44	74 3	30.0	44 3	7	1 275	0	--	--
1843	49.28	79.6	28.9	50 7	5	1.570	0	--	--
1844	53.80	77.7	29.0	48·7	14	5 670	0	--	--
1845	50.13	76.6	29 4	47.2	8	2.300	0	--	--
1846	55.37	78 1	34.3	43.8	9	4 375	0	--	--
1847	54.92	72.5	27.8	44.7	12	2.040	0	--	--
1848	54.12	78 5	31 9	46.6	13	2.520	0	--	4 93
1849	48.63	72 5	32 7	39 8	16	5.115	0	--	5 33
1850	48 61	76 3	31 1	45 2	7	0 545	1	Inap.	6 32
1851	52 48	73.2	28 7	44.5	12	2 950	1	0.5	6 34
1852	51.67	73.3	34 5	38 8	7	1.125	1	Inap.	4.00
1853	50.87	78 4	38 4	40.0	17	4.420	1	Inap.	5.14
M'n	51.69	75.84	31.01	44.83	10.5	2.886	0.4		5.34

Monthly Meteorological Register, St. Martin, at Isle Jesus, Canada East, May, 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.	10 P. M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.	6 A. M.	2 P. M.	10 P. M.		6 A. M.	2 P. M.	10 P. M.	
1	30.103	30.020	30.019	30.0	46.0	35.0	.177	.303	.222	.95	.93	1.00	N W	N W	N W	10.57	10.54	10.74		Clear.	Clear.	Cl. ft. A. L.	
2	.072	29.910	29.882	38.0	60.0	45.0	.2 0	.467	.315	.96	.89	1.00	N N W	SW b W	SW b W	0.86	0.80	0.90		Clear.	Clear.	do. Bril. A.	
3	29.912	.743	.777	47.0	51.0	42.0	.291	.337	.283	.86	.87	.98	N E	N E b E	N E b E	0.30	3.12	3.56	0.100	Str. 10.	R. 1 45 p.m.	Slight R'n	
4	.812	.806	.807	45.0	52.6	46.5	.292	.328	.330	.93	.78	.96	N E b E	W N W	S W	2.8	Calm.	1.00		C.Str 10.	C.C. St. 9.	Cl. Au. B.	
5	.804	.729	.703	46.0	55.0	45.5	.319	.413	.320	.97	.93	.93	N E b E	N E b E	E	0.64	10.10	1.08	Inap.	Str. 4.	Str. Rain.	Str. 4.	
6	.702	.669	.732	45.0	60.0	46.1	.300	.393	.282	.96	.75	.86	N E b E	N E b E	N b W	8.67	7.13	2.82		Clear.	Cum. 4.	Clear.	
7	.799	.713	.602	47.3	67.5	53.0	.291	.445	.316	.86	.67	.77	N E	S S E	S S E	Calm.	0.87	1.13		Clear.	Cir. C. 2.	Str. 6.	
8	.452	.396	.406	45.5	55.8	47.0	.298	.364	.321	.93	.80	.96	S S E	S S E	S S E	6.25	7.64	11.2.	0.103	Shower.	Cum. Str. 2.	Cum Str.4.	
9	.442	.504	.524	52.6	66.2	50.2	.352	.464	.332	.85	.71	.89	SW b W	W b N	S W b S	0.65	2.88	1.65		Cirr. 2.	Cum. Str. 7.	Clear.	
10	.564	.596	.599	50.0	69.0	55.0	.352	.486	.394	.95	.69	.88	SW b S	SW b W	SW b W	5.62	5.45	4.00	0.086	Shower.	Cir. Cum. 4.	Str. 10,	
11	.644	.657	.738	51.0	57.2	44.1	.315	.376	.241	.81	.79	.79	W	W	N N W	5.00	8.95	9.19		Clear.	Cum. Str. 4.	Clear.	
12	.773	.504	.653	41.0	44.3	40.1	.241	.282	.250	.90	.92	.98	N E	N E	N W	5.51	2.14	12.22	0.509	R. 6 40 a.m.	Cum. Str. 2.	Overcast.	
13	.820	.806	.809	36.0	57.0	49.2	.220	.376	.312	.96	.79	.86	N W	W N W	W S W	7.61	9.80	7.39		Clear.	Str. 10.	Clear.	
14	.832	.783	.774	51.7	64.0	54.2	.337	.460	.373	.87	.77	.87	W	W N W	S S E	3.45	11.82	5.80		Overcast.	Cum. Str. 2.	Cum. 2.	
15	.823	.652	.505	53.0	80.0	57.0	.361	.753	.450	.87	.75	.96	S S E	S S E	S W b W	0.26	3.06	4.62	0.319	Cir. C. 4.	Cirr. 2.	Cl.S. 6 p.m.	Thunder at 6 p.m.
16	.476	.364	.380	70.2	83.0	67.0	.659	.681	.534	.90	.61	.81	W S W	W S W	W S W	5.79	18.86	21.42		Clear.	Cir. Cum. 4.	Overcast.	Do. do. 7 15 p.m
17	.706	.716	.798	57.1	73.0	42.9	.376	.572	.272	.79	.72	.92	N W b W	S W b W	N E	10.81	8.5	10.83	0.180	Str 4.	Cir. Str. 8.	R 5 10 p.m	
18	.899	.74	.719	39.4	57.9	50.0	.234	.327	.291	.91	.66	.80	N E	N E	N E b E	4.00	8.55	0.21	0.143	Strat. 9.	Cir. Str. 4.	Overcast.	
19	.397	.415	.463	40.0	43.0	39.7	.282	.260	.250	.98	.96	.96	N E b W	N N E	N b E	13.96	18.08	8.78	1.459	Rain.	Rain.	Rain.	
20	.472	.457	.505	41.1	54.4	46.0	.253	.326	.282	.92	.76	.86	N W b W	N W b W	W b N	16.45	11.95	11.35	1.060	Str. 10.	Cum. 4.	Cirr. 4.	L'nr Halo dia. 63°
21	.391	.302	.314	48.4	55.5	53.2	.302	.394	.368	.86	.88	.89	SW b W	S W b S	N E	5.84	5.00	5.26	0.730	Clear.	R. 1 15 p.m.	Str Cum. 8	
22	.318	.414	.402	52.2	67.0	56.0	.351	.506	.432	.88	.76	.94	N E	W	S b W	1.35	0.22	0.85	.200	C.C. St. 5.	Cum. 4.	Overcast.	
23	.410	.423	.554	54.6	70.0	67.1	.442	.600	.318	.98	.83	.48	N E b E	W S W	W S W	0.79	5.26	5.83	.447	Rain.	Cirr. Str. 5.	Str. 4.	
24	.715	.742	.786	54.4	62.6	51.3	.304	.351	.315	.70	.63	.81	W S W	W b S	W S W	8.51	2.50	6.50		Clear.	Cirr. Str. 2.	Str. 4.	
25	.825	.769	.712	53.5	59.0	55.1	.315	.361	.4 8	.76	.73	.94	N E	N E b E	N E b E	1.14	9.12	5.24	Inap.	Str. 2.	Hazy.	Sl'gt Rain.	
26	.556	.421	.447	60.2	62.5	58.8	.416	.522	.460	.79	.91	.92	N E	N E b E	N E b E	6.73	13.26	14.00	0.630	Str. 4.	Rain.	Rain.	
27	.507	.538	.570	61.0	83.3	67.0	.440	.827	.520	.81	.75	.77	N W b W	N W b W	N W b W	1.97	2.14	0.64		Clear.	Clear.	Clear.	
28	.632	.56	.580	63.2	81.0	70.0	.443	.863	.551	.76	.83	.76	W b S	W b N	W b S	0.17	1.43	2.87		Clear.	Clear.	Clear.	
29	.604	.512	.528	62.2	87.8	68.8	.421	.578	.470	.75	.46	.69	W	S W	S W b W	1.14	3.73	8.86		Clear.	Clear.	Clear.	
30	.445	.302	.668	70.0	66.5	46.6	.465	.580	.246	.64	.90	.78	S W	W S W	N W b W	1.60	15.00	16.28	0.433	Rain.	Cum. 2.	Clear.	White Frost.
31	.978	.932	.927	43.6	62.0	48.5	.177	.333	.281	.58	.59	.81	N E	S S W	S	5.10	2.72	3.75		Clear.	Clear.	Cl. ft. A.A.	

Barometer.
- Highest, the 1st day - - - - - - 30. 03
- Lowest, the 21st day - - - - - - 29.302
- Monthly Mean - - - - - - 29.644
- " Range - - - - - - 0.801

Thermometer
- Highest, the 29th day - - - - - 87.°9
- Lowest, the 1st day - - - - - 30.0
- Monthly Mean - - - - - - 56.34
- " Range - - - - - - 57.9

Mean of Humidity—.895.

Greatest Intensity of the Sun's Rays—111.°3.

Amount of Evaporation—2.51 inches.

Most Prevalent wind—N.E. b E.

Least do. do. E.

Most Windy Day—the 16th day, mean—15.35 miles per hour

Least Windy Day—7th mean—1.00 miles per hour.

Rain fell on 16 days—amounting to 6.399 inches, and was accompanied by thunder and lightning on two days.

Aurora Borealis visible on 4 nights.

Lunar Halos on one night.

The electrical state of the atmosphere has been marked during the month *generally* by high intensity of positive electricity, and on the 15th, 16th, 28th and 30th days indicated changes from positive to negative of a very high tension.

Galvanic Electricity.—An interesting lecture on Voltaic Electricity, was recently delivered to a numerous audience, at the Islington Literary and Scientific Institution, by Henry M. Noad, Esq., the eminent electrician and chemist. The lecturer commenced by alluding to the absurd anecdotes, which were found in every English and French writer on physics, respecting the discovery of this species of electricity—that a pupil of Galvani, while operating on the electric machine, accidentally brought a scalpel in contact with the nerve of a frog's thigh, which he noticed was immediately thrown into violent convulsions, and that the master followed up the experiment, fancying he had discovered some new principle in connection with animal vitality. This was attributing to Galvani an ignorance which he certainly did not deserve; Matteucci had practised on animal electricity long before, and Galvani, who had been studying the subject for 10 or 12 years previous to this period, was well acquainted with its principles, and all his discoveries were the result of practice, close observation, and inductive philosophy. Volta, an Italian chemist, followed up the experiments, and made many valuable discoveries. It was then shown that the development of a current of electricity could be effected without metals, a voltaic pile of flesh might be constructed which would engender a current, although certainly a weak one. There was, the lecturer believed, not an electrician in this country who did not attribute the effects of the battery to chemical action, while the German philosophy was that it was only a natural result, arising from the contact of two dissimilar metals. Mr. Noad then proceeded to describe the several batteries of Smee, Daniells and Grove, the first of which was called the chemico-mechanical battery; Daniell's was the most constant, while that of Prof. Grove gave the largest amount of power, and was decidedly economical, from there being no electrical action except when the circuit was complete. A variety of experiments followed, showing the heating, chemical and magnetic powers; which were performed with a Grove battery of 24 pairs, the decomposition of water, iodide of potassium, chloride of sodium, and sulphate of soda; the combustion of gold, silver, copper and iron; the electric light, and the usual apparatus for showing the extraordinary magnetic powers of a current of galvanic electricity, was exhibited. A pretty experiment was shown with a handful of nails, which being placed on a tray of card board, on the upper surface of the soft iron bars, surrounded by wire, on making the circuit could be moulded about in any direction, and an arch was formed of them, which on breaking contact, immediately fell to pieces. Mr. Noad also explained that in the most trivial actions of every day life, enormous currents of electricity were evolved; no cook could perform an operation in the culinary department, nor a joint of meat be cut, but this result took place. This was illustrated by a saucepan of milk being heated by a spirit lamp, and a wire from one pole of a galvanometer fastened to the handle; the wire from the other pole was attached to a silver spoon, and the moment the milk was stirred in the slightest degree, the needle was instantaneously and powerfully deflected. The entire lecture was a very lucid explanation of the principal details of what is at present known in this interesting science, and appeared evidently to be well appreciated by an attentive audience.

Conductability of Minerals for Voltaic Electricity.—From some researches into the conductability of minerals by M. Elie Wartmann, Professor of Natural Philosophy in the Academy of Geneva, some curious facts present themselves, and on an examination of 319 species which were submitted to direct examination by the author, the comparison of the results with those of previous experimenters shows in general a satisfactory coincidence. Where divergencies present themselves, they are to be referred to the variety of structure resulting from difference of locality, and to the fact of having employed voltaic instead of frictional electricity. The purity of the mineral operated on, exercises a great influence on its conductability and the author, therefore, always employed well-defined crystals; the conducting powers of sulphuret of antimony, native and artificial, have been confirmed by the experiments of MM. Riess, Karsten, Munck, and Professor Faraday. The author found native crystals of realgar good conductors, while M. Hausmann estimates them as semi-conductors, and Pelletier among the insulators. Sulphuret of zinc is a conductor or an insulator, as it is prepared in the dry or humid manner: black sulphuret of mercury conducts well, while red cinnabar is a perfect insulator. The other sulphurets exhibit the same peculiarities. In conducting these experiments, numerous difficulties presented themselves, and curious variations occurred in examining the same mineral; he found some crystals perfect conductors, and others, of the same appearance, which arrested the most intense currents, until, by the continuous friction, the surface was abraded. Some beautiful crystals of oxide of tin proved conductors along their edges, and in places on their facets, but everywhere else insulators; while the variable adherence of the surfaces of cleavage sometimes modifies the conducting power in the most capricious manner. The deductions arrived at from these experiments are,—that the conducting minerals belong to five primitive crystalline types; that minerals present all intermediate degrees between perfect conductability and perfect insulating power; that all native metals and their alloys are conductors; that among metallic oxides much difference exists, those opake and lustrous generally better conductors than others; metallic sulphurets the same; the chlorides partly conductors and partly insulators; salts the same, the majority being insulators; that the molecular state determines the character; diamond insulates, graphite conducts well; that among minerals of vegetable origin, the more perfect the carbonization the better the conducting power; and that among the conducting minerals which do not crystallize regularly, some present differences of conductability, when the direction of the current through the mass is varied.

Deep Sea Soundings.—The Royal Society was lately entertained by Cap. Denham, R.N. of H.B.M. ship Herald, with an account of his experiences in deep sea soundings. The expedition under Capt. D. was particularly directed to observe soundings, and it was very successful. The deepest was attained on a calm day, Oct. 30, 1852, in the passage from Rio Janeiro to the Cape of Good Hope. The sounding-line, one-tenth of an inch in diameter, was furnished by Commodore McKeever, U.S. N., commanding the frigate Congress. The plummet weighed nine pounds, and was eleven inches long by one-seventh of an inch diameter. When the depth of 7,706 fathoms was reached, the plummet touched bottom. Captain Denham states that Lieutenant Hutcheson and himself drew up the plummet fifty fathoms, but it indicated the same depth after each experiment. The velocity of the line was as follows:—

	Hours.	Minute.	Seconds.
The first 1,000 fathoms in........	0	27	15
1,000 to 2,000 "	0	39	40
2,000 to 3,000 "	0	48	10
3,000 to 4,000 "	1	13	39
4,000 to 5,000 "	1	26	06
5,000 to 6,000 "	1	45	25
6,000 to 7,000 "	1	49	15
7,000 to 7,706 "	1	14	15
Total...............	9	24	45

The whole time taken by the plummet in descending to this amazing depth of 7,906 fathoms, or 7.7 geographical miles of 60 to a degree, was 9 hours 24 minutes and 45 seconds. The highest summits of the Himalaya are little more than 28,000 feet, or 4.7 geographical miles above the sea.

Gold weighed in the Bank of England by Machinery.—One of the most interesting and astonishing departments within the whole compass of the Bank of England is the weighing department, in which, with the rapidity of thought, and a precision approaching to the hundredth part of a grain, the weight of the gold coin is determined. There are six weighing machines, and three weighers to attend to them. Large rolls of sovereigns, or half sovereigns, are placed in grooves, and are shaken one at a time by the motion of the machine, into the scale. If they are of standard weight, they are thrown by the same mechanical intelligence into a box at the right hand side of the person who watches the operation, if they have lost the hundredth part of a grain, they are cast into a box on the left. Those which stand the test, are put into bags of 1000 each, and those below par are cut by a machine, and sent back to the mint.

New Compound of Caoutchouc.—Mr. Goodyear, of New York, has just patented a new compound of caoutchouc, which is produced by combining therewith a product of coal-tar and sulphur, alone or in combination with metals and other substances used in manufacturing compounds of caoutchouc. The product referred to is obtained by heating coal-tar in an open boiler until it acquires a consistency about equal to that of resin, and it is mixed with the caoutchouc in proportions which may vary according to the character of the material to be produced. The sulphur, or compound thereof, is used for the purpose of vulcanizing the material, which operation is performed by the application of heat in the ordinary manner.

Notice to Correspondents.

We have given the description of a New Astronomical Instrument by R. S. of Aylmer, Canada East, our best attention. We cannot recommend the construction of the Instrument for reasons advanced by R. S. himself, and which are contained in the subjoined extract from his communication:—"I am fully convinced in my own mind that this instrument will answer every purpose that I have mentioned; whether upon trial it will be *useful* or otherwise, of course remains a *mystery*."