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THE PROVINCIAL EXHIBITION.

Already the details of this splendid exposition of the progress of Upper Canada, not only in material wealth, but in industry and art, have been scattered broadcast throughout the land by the daily and weekly press. Elaborate and excellent descriptions of the numerous improvements in manufactures, machines, and agricultural implements have been read, no doubt, by the greater portion of the reading public. There remains but for this journal, which as yet only ventures upon a monthly issue, to record the facts which have been made patent to all, and which by the time these pages meet the eye of our readers, will have become matters of history, so rapid is the progress of events with us.

Among the tens of thousands who visited the Provincial Exhibition last week, there were some who were able to go back in mental review to the time when a dense forest covered Upper Canada from the Ottawa to the St. Clair; when the Province which has so recently displayed such a magnificent collection of grain and fruits, of domesticated animals and home manufactures, was an almost uninhabited and pathless wilderness. If the recollections of those now living can carry them to the dawn of the history of Upper Canada, how bold may be the aspirations and predictions of those who in the full vigour of manhood contributed towards the seventeenth Exhibition of Upper Canadian industry, enterprise, and skill. Each succeeding year has attested in a remarkable manner the rapid progress of the country, but on no former occasion did the resources of Upper Canada exhibit themselves to such advantage as during the last week of September in the present year. Many fortunate circumstances assisted in giving effect to the display—the presence of illustrious visitors, the continuance of most favourable weather, a bountiful harvest, and a happy revival of general prosperity—all contributed to make the exhibition held at Toronto, not merely far superior to its predecessors, but a striking and truthful representation of the progressive civilization of the western half of the Province.

Well might Lord Mulgrave express his astonishment at what he witnessed when he contrasted the scene before him, with all its evidences of industry, energy, activity, with the wilderness from which the accumulated wealth was won. Reflecting men will endeavor to trace the probable future of a people who during the present century have increased from a few thousands to more than a million and a quarter; who came to a wide waste of dense woods and gloomy swamps, and within the memory of thousands now living have converted it, by dint of the labor of their hands and the energy of their will, into a land of rich farms, producing thirty million bushels of wheat; fruits surpassing in every point, the skilled productions of the father land; cattle and horses equal in many respects to the best; and as a people preserving, notwithstanding 3000 intervening miles, a singular attachment of loyalty to the institutions and throne of the country under whose protection they maintain inviolable the greatest freedom and the utmost respect for the law.

It was generally supposed that the late Exhibition would surpass all its predecessors chiefly on account of its being held at the capital of Upper Canada. In this respect most anticipations were fully realized. There was, nevertheless, some want of arrangement in the so-called Crystal Palace, which might have been remedied if more time had been bestowed upon the distribution of the articles exhibited, and if opportunity had been offered for completing arrangements before the public were admitted. In some instances, the judges found great difficulty in discovering the articles of which they were in search. Such disorder is by no means a necessary accompaniment of the sudden assemblage of a large number of contributions of every conceivable variety. The printed classified catalogue, always ready weeks beforehand, serves as an excellent basis on which a regular plan of arrangement might have been adopted. It seems absurd to place articles belonging to the same class in different parts of the building, although it may happen, as was the case in this present instance, that the manner in which different articles are presented for exhibition precludes their being placed side by side. In one or two instances great carelessness was apparent, though with whom the fault lies does not appear. A case of fish, for instance, was exposed to public view, just as if it had come from a long journey, with its contents jumbled together. The admission of the public before the judges have completed their rounds is always objectionable, and must materially interfere with that quiet discussion respecting the worth of different articles, so needful in awarding positions of merit. The inconvenience arising from dust was much felt in the

interior of the building. Apart from these imperfections, which, while they greatly mar the general impression produced upon the public at large, and which are by no means unavoidable, the appearance of the "Crystal Palace" was attractive and encouraging. The number of agricultural implements of every description on the Exhibition grounds was very considerable and indicated the change which is rapidly and completely taking place in the details of farm work.

Among a vast number of articles worthy of special notice, we may mention the woollen cloths of Canadian manufacture exhibited by the Port Dover Woollen Factory. The Ontario Woollen Mills of Cobourg produced some excellent specimens of goods manufactured at that establishment. Brockville, Grafton and Georgetown also distinguished themselves by sending capital broad-cloths, blankets, woollen carpets, &c. The names of the proprietors of these different establishments are as follows:

1. Port Dover Woollen Factory, built by a Joint Stock Company, and rented to J. N. Pitts.
2. Ontario Woollen Mills of Cobourg, Messrs. Fraser & Co.
3. Georgetown, W. Barber & Brothers.
4. Brockville, Ezekiel Snyder.
5. Grafton, Platt Hipman.
6. St. Catharines, Disher & Haight.
7. Victoria Woollen Mills, Almonte, Messrs. B. & W. Rosamond.

The different samples displayed were of excellent material and very creditable manufacture. There can be no longer any question that Canadian broad-cloths, woollens and carpets will rapidly gain favour in public estimation if the markets are supplied with articles equaling those exhibited at the Provincial Exhibition.

Mr. Sheppard's fuel-saving fire place, of which a full description is given in another place, altho' involving no new principle, is an ingenious artifice for saving much of the heat which is usually allowed to find its way, with hot air and smoke, up the chimney.

The presence of three portable steam engines from different firms, (Beckett & Co., of Toronto, Zealand of Port Hope, and Ganson, Watrous & Co. of Dundas,) show how the attention of the farming community is directed to steam as a farm adjunct, in a country where horse-power machines are scattered broadcast over the land. The collection of Reapers, Mowers, Cutters, Ploughs, and indeed every variety of agricultural implement, was very large, and indicated more general progress in the adoption of labour-saving machines of an expensive character, that any one disposed to view Canada as a "new country" could regard without admiration and surprise.

The receipts of the seventeenth exhibition exceeded those of last year by about $3,800. The total amount taken being about $16,000. The financial part of this great annual gathering being as satisfactory as was the exhibition itself, whether viewed in the light of an orderly assemblage of a vast number of individuals met together for the purposes of enjoyment, instruction or competition, or as an exposition of the progress of the country in those industries which constitute the material wealth of a state.

THE PROVINCIAL EXHIBITION.

Why was there not an Address?

It has been the custom at the close of our annual exhibitions for the President of the Association to deliver an address, which was supposed to embody remarks on the progress of the country in agricultural and manufacturing industry, and to glance at the improvement it is making in civilization. This year the address has been omitted. We cannot agree with the opinion expressed by Col. Thompson at the meeting held at the close of the exhibition, that "Mr. Stone deserved credit for the moral courage he had displayed in bringing to an end the practice which had hitherto prevailed of an address being annually delivered by the retiring president." We think that it is rather to be deplored that Mr. Stone should have permitted so favourable an opportunity of recording the progress of the country in material things to slip by. The addresses of the Presidents of our Agricultural Association do, or ought to embody a vast amount of information, which would be eagerly read by people at home and abroad, and coming with all the authority of the highest representative of the agricultural and manufacturing industries of the country, they would carry weight with them which other emanations might very probably not possess. It is an opportunity for the spread of information respecting the resources and climate of the country, the industry and activity of its people, the increase of their wealth, the progress of their education, their submission to order and law, and their rise in the scale of civilization, which nothing is more calculated to establish than the fruits of their skill, so abundantly displayed at our annual exhibitions; forming a theme which every patriot should rejoice to enlarge on. If there were no signs of activity and progress visible, no improvement to note or advance to record during the retrospect of the year, then might the annual address be dispensed with without regret, as it would

only serve to show degeneracy or apathy. But where success and improvement are so manifest, where mind to conceive and skill to execute are so striking, where no retrograde movement is visible, but all is securely advancing, it is for the interests of the country that this forward movement should be published under the best authority the agriculturists and manufacturers of the country are supposed to possess. It is urged that the demands upon the time of the President—who is very properly selected from the practical farmers of the country—or a want of familiarity with literary efforts, are cogent reasons why the address should be abandoned; but if this reasoning were to hold good elsewhere as in Canada, the addresses of Presidents would be few and far between, and many of those luminous and delightful retrospects of progress in different branches of art and science from which we derive our knowledge of what has been done during the year that is past, would have never seen the light. It is not necessary that every president should himself collect all the facts and discuss the merits of the events of the year, or even write any portion of his own address. In many instances this would be a difficult effort, or a task which few could accomplish with credit; it is sufficient if the sentiments which are uttered, or the statements which are made, are endorsed by the President, in order to secure the weight which always attaches to such an authority. No one supposes that the annual address of the President of the Royal Geographical Society, except in some few instances, is written by himself, a considerable part of it may be, but much is prepared for him by those whose business of life it is to make themselves familiar with the progress of geographical discovery. So also it should be with the Presidents of our Agricultural Associations. If they do not feel themselves competent to present to the public a retrospect of the progress made in the country during the past year, there can be no difficulty in procuring the assistance of friends who would furnish the desired information, and if necessary put it into shape.

Mr. Mayor Bowes also "thought that the retiring President had acted judiciously in departing from the custom of delivering a written address;" but he gave an excellent reason for their being continued. "I am sorry," said Mr. Bowes, "that I am not a practical farmer myself, that I might share with them the glory of the testimony which was borne by the noblemen from England and Ireland, to the excellence of their cattle, the magnificence of their horses, and the superiority of the products of the mechanical genius of the country now exhibited on these grounds." It is the very excellence of which Mr. Bowes speaks that should be noticed and described in the annual address of the President of the Association. The admirable and eulogistic speeches of Lord Monck and Lord Mulgrave will be read with delight and enthusiasm by the farmers throughout the country, but we want a calm and collected retrospect of the years that are past, and of our progress in all things pertaining to agricultural and manufacturing improvement, which should come from the lips of the President of the Association. These are necessary reviews of our onward march in material wealth, deriving as we do great external aid from emigration, and the introduction from abroad of so much which tends to improve our condition. We hope that the Agricultural Association and the Board of Agriculture, rather than lending their influence towards the discontinuance of the annual address, will give such counsel and assistance, when required, as may make the address of the President of the Association a document of general and substantial value, fitted to command respect both in Canada and across the seas. It ought to embody a synopsis of what we have done, so as to lead the stranger who criticises us to form some conception of what we may be expected to do.

THE FISHERIES OF THE GULF.

The Lower Provinces are attracting considerable attention at the present moment in consequence of the projected Intercolonial Railway. The great fisheries they command in the Gulf of St. Lawrence, and on the Atlantic coast constitute the most important source of their wealth, as well of the Eastern Townships in Canada. As this subject is one not generally appreciated in the Upper Province, we shall devote a short space to the consideration of our Fisheries.

The commercial and political importance of the North American Fisheries has been recognised for more than three hundred years. They have attracted the earnest attention, at different periods, of the Spanish, Portugese, French and English Governments, and have been made the subject of special treaties after the termination of protracted, expensive and sanguinary wars. The navy of France was sustained during the first half of the eighteenth century by the Fisheries of North America. Without this admirable nursery for seamen France would not have been able to man the tithe of her fleets at that period. We have only to glance at Louisberg, and the treasure lavished on that once splendid harbor and magnificent fortress, on the island of Cape Breton, to feel sensible of the vast importance with which the

North American Fisheries were invested by France at an early period, and to the grasping policy of Louis Napoleon during the last four or five years, with respect to fishing rights on the coast of Newfoundland, for a proof of the anxiety with which he wished to retain and improve them as a nursery for seamen. The fortifications of Louisberg cost thirty million livres, and when taken by the British forces from New England, under Sir William Peperall, for the first time, in 1745, the annual value of the fisheries to the French, which built up Louisberg, were nearly one million sterling, independently of their being the best nursery for seamen the world ever saw.

The city was built to a great extent of bricks brought from France. The walls were defended by more than two hundred pieces of artillery. During the seige 9,000 cannon balls and 600 bombs were discharged by the assailants, and the city was taken on the forty-ninth day after investment. The conquest of the city was regarded by Smollet as the most important achievement of the war of 1744; and the First Lord of the Admiralty at the time declared, that "if France was master of Portsmouth he would hang the men who would give Cape Breton in exchange." Louisberg was restored to the French at the peace of Aix la Chapelle, in 1748; but in the succeeding war it was again invested, in 1759, and the force then employed consisted of twenty-nine ships of the line, eighteen frigates, a large fleet of smaller vessels, and an army of fourteen thousand men, and within three years of a century preceding the fall of Sebastopol, the churches throughout the British empire were thronged with thankful worshipers in gratitude to the Almighty for the success of the British arms, and the second fall of Louisberg.

Louisberg may yet rise again. The site of this ancient fortress and capacious harbor is two hundred miles nearer to Europe than Halifax, and the island of Cape Breton is separated from the mainland by the Gut of Canso, not more than 900 yards broad at its narrowest part. Across this narrow strait a steam railway ferry could always keep up communication with the mainland, and yet leave free this valuable entrance to the gulf. (1)

(1) The Gut of Canso, separating Breton Island from Nova Scotia, is frequented by a great number of vessels, amounting to some thousands annually, who pass through it from the Atlantic to the Gulf of St. Lawrence. Admiral Bayfield considers it by far the most preferable route for homebound vessels trading between the southern ports of the gulf and Great Britain, as it affords a safe anchorage until an opportunity for sailing with the first fair wind. The length of the passage of the Gut is 14½ miles, and its least breadth 900 yards. The depth of water is seldom less than fifteen fathoms. Cape Porcupine, on the western shore, rises 640 feet above the sea, and is a very remarkable object. The rocks on each side belong to the Lower Carboniferous Series.

The political importance of the North American Fisheries to France and the United States, have been the cause of the extraordinary efforts made on all occasions of the renewal of treaties by these powers, not only to maintain the position formerly won by their diplomacy, but to take every conceivable advantage of this great nursery for their seamen. The Government of the United States have paid not less than $12,944,998 for bounties to vessels engaged in the fisheries since the commencement of the Republic (1), and the average amount now paid annually by the Government is very nearly $340,000. So great is the impetus which the system of bounties has given to the American fisherman that while in 1795 only 37,000 tons of shipping were employed in the Cod fishery, at present there are upwards of 110,000 tons engaged in this lucrative business.

The convention between Her Majesty and the Emperor of the French, relative to the rights of fishery on the Gulf coast of Newfoundland, in the Straits of Belle Isle, and the neighboring coasts, signed at London, January 14th, 1858, created alarm in Newfoundland, and much excitement and anxiety in other British Provinces interested in the fisheries. In 1857, the Speaker of the House of Assembly, Newfoundland, addressed an urgent letter to the Speaker of the House of Assembly, Canada, relative to this convention expressing the opinion that "the ultimate effect of the operation of this measure will, it is confidently believed, be the depopulation of the colony of its British inhabitants, and the consequent possession of Newfoundland by a foreign power." A Select Committee of the House of Assembly of Newfoundland reported on the 26th of February, 1857, and submitted resolutions most strongly condemnatory of the convention, as ruinous to British American interests. An address to the Secretary for the Colonies was framed and adopted, and all constitutional steps taken to arrest the calamity with which the convention threatened them.

The "taking of bait," which consists of herring, capelin and launce, on the coast of the gulf, is perhaps the most material and important question with regard to the fisheries; for without bait the cod fisheries on the Banks and elsewhere, in deep water, would be comparatively valueless. The French were most anxious to obtain the right to purchase and fish for herring and capelin to be

(1) The bounty, according to the laws of 1855, is as follows:—
A vessel between 5 and 30 tons, receives . . $3 50 per ton.
" more than " " . . 4 00 "
The small State of Massachusetts has received since the Declaration of Independence bounties to the amount of $7,926,273, and Maine, contiguous to New Brunswick and Canada, the sum o $4,175,050.

used as bait on the south coast of Newfoundland—the traffic in bait being expressly forbidden by law. The value of bait sold in 1856 to the French was estimated by competent authority at not less than £58,000. (1) The price which the French give for bait operates as a very seductive temptation towards illicit traffic. In 1856 an average of 26s. to 27s. sterling a barrel was paid by them for herring sold for bait, while the actual legitimate value of herring for exportation was at the same time only 6s. 1d. sterling. Hence the premium on the illicit traffic amounted to one pound sterling per barrel of 200lbs. A reduced supply of bait to the French fishermen is equivalent not merely to a corresponding diminution in their catch of fish, but to a much larger supply of cod on the British American coast, which, after feeding for a certain period on the great banks, resort to the coasts in pursuit of the herring, capelin and launce. If the French have an abundant supply of bait, the fish linger on the banks as a feeding ground. The tonnage fitted out yearly for the French bank fishery slightly exceeds 18,000 tons.(2) The right to dry and cure on shore is of the greatest importance, as not only are fish so cured of much superior quality, and consequently command a market where indifferent samples are unsaleable, but facilities for doubling or trebling the ordinary catch are greatly augmented.

The bounties paid by France during the nine years from 1841 to 1850, inclusive, for the Cod fishery only, had amounted to the annual average of 3,900,000 francs. The number of men employed annually in the fishery amounting to 11,500, the bounties would therefore be at the rate of 338 francs per annum, per man. France thus trains up hardy and able seamen for her navy.

This notice, already, perhaps, too much prolonged, of the importance of the Cod fisheries of Newfoundland, the Great Banks, and the Gulf of St. Lawrence, may be appropriately brought to a close by a quotation from a French official document of great interest and weight.

"Nevertheless, the loss of her magnificent colonies has occasioned irreparable injury to her commercial marine, which is an essential element of naval power. Treaties, which became inevitable in the course of time, have successively robbed her of the most valuable objects of freight. Cotton belongs to the Americans, coal to the English; and at the present moment, the shipment of sugars, our last resource for distant navigation, seems to be daily growing less and less.

"The GREAT FISHERIES STILL REMAIN to US; and in order to preserve them we must continue the encouragement they have received, even at periods when a commercial and colonial prosperity, infinitely superior to that now existing, multiplied our shipping, and created abundance of seamen. In fact, the fisheries give employment to a great number of men, whom a laborious navigation, under climates of extreme rigor, speedily forms to the profession of the sea.

"*No other school can compare* with this in preparing them so well, and in numbers so important, for the service of the navy." (1)

M. Coste, of the Institute of France, submitted a report to the Emperor, during the present year, whose title shows the interest taken in this prolific subject. "On the organization of Fisheries as regards the increase of the Naval Force of France."

The total value of the fisheries of the Gulf, exclusive of the Banks of Newfoundland, amounts to upwards of fourteen million dollars per annum. The Gulf of St. Lawrence is not only an inland sea of inestimable value for its great fisheries, but is a most splendid nursery for seamen, and will one day be regarded by the British American Provinces as their noblest inheritance.

THE BENDING OF WOOD.

The applicability of bent wood for an increasing variety of purposes is both surprising and instructive. Here in this great lumber country, and in many others, it is used in all departments of business and pursuits of life wherever man and his products are known. It is as ancient as history, and is found among the artifices employed in the rudest state of barbarism. Little is known of the most ancient devices for bending wood, but the oldest patented in England has now been practised for nearly a century, and is yet used there for some purposes. In 1813, at Woolwich Navy Yard, England, floor timbers, sixteen inches square, for a man-of-war, were bent over an arc of a circle with a radius of four feet. All these devices, as well as almost all others subsequently used, restrained, in some degree, that tendency found in wood to elongate its outer curve when

(1) Governor Darling.

(2) The anxiety with which the assent of the Government of Newfoundland to the "Convention with France" was viewed by the British Government may be inferred form the following extract from the despatch addressed by the Secretary of the Colonies to Governor Darling, in 1857:—Such are the outlines of the Treaty, which I now transmit to you. Deeply anxious as they are to effect the settlement of questions so complicated and so pregnant with possible mischief to both countries, Her Majesty's Government have, nevertheless, not thought themselves justified in departing from that rule of Colonial government which is now so firmly established in British North America." * * *

(1) Report rendered in the name of the Commission for the enquiry into the projected law relating to the Great Sea Fisheries, by M. Ancet, 1851.

under the operation of bending, the same as is now claimed to be done in apparatus brought as near the state of perfection as the nature of wood and the change of position the particles undergo will admit. The organic structure of all woods of the endogenous or internal growths, and the exogenous or external growths, are similar, and possess the qualities of cohesiveness and compressibility more or less, differing most in the degree or quantity of these two qualities, which make and determine the amount or degree of flexibility or elasticity in any wood. These qualities, with a structure that will admit any fluid agency to thoroughly penetrate and soften its tissue, indicate a wood that may be made to assume any curvilinear shape required for practical use. Then only ordinary skill and judgment would be required to operate on good wood—bending successfully, without any loss occurring from breakage of the wood under the operation of bending, but where the wood has not been seasoned or partially seasoned, a trifling loss will occur from breakage caused by the shrinkage that all woods are subject to in the process of seasoning. And in the case of unseasoned bent wood, this shrinkage acts upon the fibre of the outer curve, which is always at the point of tension, if not in an actual state of severe tension, for the reason that in deflecting any substance, but particularly wood, either with or without partial restraint, to oppose tension, the wood is acted upon by two forces, the one a crushing force that foreshortens and contracts the lesser or inner curve, with a tendency to rupture it laterally, the other a tensile force that stretches and elongates the greater or outer curve, with a tendency to fracture it transversely and lift the fibre, which is the most hurtful, and of the more frequent occurrence. These two forces are divided by a neutral line, more or less removed from either curve. When nearest the inner curve the best result is obtained, because all tension, however little, is injurious to the structure of the wood, arising from separating and drawing out the fibre, which can never be made to unite again, as in ductile and malleable substances, and because the crushing or compressing force improves the wood by forcing the fibre into the interstices or cells, and by interlacing and interlocking the fibre, the product is obtained nearly resembling the knot or knurl, which is difficult to split or cut, even when rupture is indicated.

In order to get the best result from bent wood, it is recommended that the crushing force alone be used. And this can be, if the fibre of the wood be left free to move into a new position in more than one direction from the point of bending, by beginning the curve in the middle of it when the wood is made to assume a long curve first, before taking the shorter curve of the mold, which long curvature starts the fibres throughout, and makes more, if not every particle of the wood, accessible to the influence of the softening agent already in it, and consequently more yielding to the action of the crushing force. This force should be produced and governed by fixed and immovable restraint that should not compress the wood while in its straight form. It should also prevent end expansion and preserve the exact length on the outer curve. This would give a product uniform in density and rigidity throughout its whole length, with the fibre undisturbed on the outer curve, to resist any tendency to change the shape produced. The long curve gradually adapting itself to the curve of the mold, would amount to double on successive manipulation, if unrestrained; wood has been compressed into one-third of its primary bulk, with every quality improved to resist decay and wear in use. Nothing can be reasonably urged in support of the popular belief of the necessity to produce or permit tension and elongation in successful wood bending. Tension and elongation are required or permitted only in consequence of the uses of imperfect apparatus—elongation is positively indispensable in machines that bend from one end, or in one direction from the point of bending, and that press the wood against the mold with such power as to prevent all movements of the fibre, producing in advance of the point of bending, a wave-like movement among the fibres of the wood, held rigidly confined and straight, until suddenly made to take the curve of the mold. The movement in advance of the bending gradually accumulates a power that resists compression thus attempted, and before the completion of the process, and in order to save the machine or the product, relaxation of restraint is required, and is followed by elongation of the wood, however small it may be. Tension acts upon the fibre, giving a product uneven throughout its whole length, and more liable to change the artificial shape. It is obvious that any augmentation of restraint during the process, must give just such results, and that the machinery in use for the bending of wood is far from having reached perfection. There can and will be machinery constructed to bend large timbers for marine and other structures, over any arc or curve that will not require a reduction of its bulk, by the compression of the inner curve, to less than one-half its lateral size. Past experience has shown that wood-bending machinery is most profitably employed in the production of smaller articles, for which there is an unlimited demand that will con-

tinue because of the suitableness and superiority of bent wood for these purposes.

Iron or jointed structures are generally used on a large scale; but there can be no doubt that timber of the most imposing dimensions can be bent into many convenient forms, with considerable increase to its strength and the appearance of the structure in which it is employed. The subject is well worthy of the attention of inventive mechanics. Steaming wood, previously to submitting it to a bending force, is now employed.

THE PRICE OF CANADIAN PETROLEUM.

The *Oil Springs Chronicle* of Sep. 24th contains an article on the Oil Association and its advantages. After enumerating some beneficial results which at once arose from the united action of the Oil-men of Enniskillen, the *Chronicle* says:—Oil is now one dollar per barrel, and as the season approaches, orders begin to increase in quantity and value. No one thinks of disposing of a barrel of oil short of one dollar. It will never again sell below that price, but will constantly appreciate until the proper standard is reached.

"These results have been brought about by the Oil Association. This no one will attempt to deny. And it is a matter of satisfaction to reflect that whilst we have associated ourselves together for promotion of our own interests, and for the protection of ourselves, we have worked no injury to any one else. We have determined to receive a fair and uniform price for our oil. That price is still very far below its acknowledged intrinsic value; and until it is raised above that, no one has a right to complain."

We are quite sure that no one would for a moment grudge a fair and remunerative compensation to the well-owners for the time and capital they have expended, the anxieties they have suffered and the risks they have run, in developing the oil resources of Enniskillen. But there is danger in any attempt to raise the price of an article beyond its legitimate commercial value by any and every kind of monopoly. There are always two parties to a transaction, the buyer and the seller. If the Oil Association raise the price of their oil beyond a certain margin, which is well defined at one dollar a barrel, buyers will seek more liberal markets. The object of the Association should be to attract the attention of Commercial men in Europe to their oil on account of its abundance and cheapness. Raise the price of the oil and another market will be sought. We believe that oil will be found over a large area in the United States on the rivers or near the boundaries of the great coal fields, which indicate pretty accurately the geological position of the Devonian rocks in which the oil has accumulated. These rocks have an immense spread in the United States, and indications of accumulations of oil are now known to exist over a very broad area. There is every reason why the supply of oil should be equal to the demand, and it is perfectly well known among commercial men that when a trade has once taken a certain direction, it is most difficult to divert it. The American oils are now well known in Europe, the Canadian oils are only beginning to be known. It is of the utmost importance that European importers should be made aware of the facts, namely, the permanency of the supply, the accessibility of the material, and the absence of any monopoly to keep up the price. Monopoly of a natural product stinks in the nostrils of the commercial men of the present day; the Oil Association of Canada can make no more fatal mistake, than that of raising the price of the oil beyond a fair source of remuneration to themselves; and if by this means the trade should be directed to the United States and the foreign buyer seek for his supply in the cheapest market, where no monopoly to keep up prices exists, the Oil Association of Canada can neither expect sympathy nor encouragement. One dollar a barrel affords, we are informed, a handsome profit to the well-owners. If the Oil Association goes beyond this mark, they will certainly entail ruin on the trade, or be compelled to reduce their price below the proper margin. Already American petroleum commands a higher price in Europe than Canadian, because it contains more of those lighter oils which are valuable there for different purposes in the Arts. We do not expect to see Canadian oil higher than one dollar a barrel, we should not be surprised if the Oil Association found it to their advantage to reduce the price rather than to raise it. The laws which govern the relations of buyer and seller are unalterable in the long run, and, in these days of commercial freedom, far removed from the influence of monopolies.

WHERE A LARGE PORTION OF OUR SURPLUS PRODUCE GOES.

People not conversant with the mysteries of distillation and brewing will be surprised to learn that nearly all our farm crops are made to contribute more or less to the supply of that bane of this country, and indeed of this continent—Spirituous Liquors. Wheat, barley, rye, Indian corn, peas, buck-wheat, mill-feed, oats and potatoes, are all enlisted in the service of the distiller and the

brewer. Last year (1861) upwards of one million, three hundred thousand bushels of grain, and four hundred and fifty-five thousand bushels of malt were consumed in manufacturing spirituous and malt liquors. The number of distilleries in Canada West, in 1861, was *seventy;* in Canada East, *four.* The quantities of the different kinds of grain consumed in this way form a curious table, shewing the various sources from which the poisoned cup is filled to overflowing, and how steadily the production is increasing year by year.

The following table shows the quantities and kind of grain used for distillation in Canada, during the years 1859, 1860 and 1861. No doubt much that goes to the distiller is of inferior quality and scarcely fitted for any other purpose; and if the product obtained by distillation were only used in manufacturing processes, there would be no one to regret its final disposition; but when there is no doubt whatever that a large proportion is employed in the manufacture of intoxicating liquors of the worst description, there arises a subject on which the philanthropist may amplify to the benefit of thousands of his fellow-countrymen, and the relief of society at large.

USED FOR DISTILLATION.

	1859. Bushels.	1860. Bushels.	1861. Bushels.
Malt	114,651	108,347	100,603
Wheat	22,231	21,022	22,490
Barley	47,647	42,112	27,256
Rye	154,286	179,627	233,554
Indian Corn	511,846	409,795	542,989
Peas	1,880	4,816	2,851
Buck Wheat	1,532	2,812	2,494
Mill Feed	63,457	88,622	92,637
Oats	291,355	416,744	323,955
Potatoes	25	1,391	54
Molasses or other substances	37,766	20,794	.....

The total quantity of grain used for distillation in the same years was as follows:—

	1859. Bushels.	1860. Bushels.	1861. Bushels.
Total of Grain...	1,208,909	1,275,288	1,348,883
	Gallons.	Gallons.	Gallons.
Proof Spirit dis..	3,239,870	3,327,819	3,817,660

USED FOR BREWING.

	1859.	1860.	1861.
No. of Breweries in Canada W.	128	122	138
" " " E.	22	21	22
Total	150	148	160

	Gallons.	Gallons.	Gallons.
Quantity of Malt Liquor produced	3,488,271	4,249,934	4,898,995
	Bushels.	Bushels.	Bushels.
Quantity of Malt consumed	326,834	386,624	455,001

The total quantity of grain and malt employed by the distillers and brewers of Canada in the three years before named is as follows:—

	1859. Bushels.	1860. Bushels.	1860. Bushels.
Total quantity of Grain and Malt consumed	1,535,743	1,661,912	1,803,884
	Gallons.	Gallons.	Gallons.
Total quantity of Spirits and Malt Liquors manufactured	6,728,141	7,577,753	8,716,655

The excise duty last year on spirits, at 6 cents a gallon, amounted to $229,059, and on malt liquors, at one cent a gallon, $48,989.

We export a mere trifle of spirits and malt liquors; hence we may assume that the produce of this country is consumed at home; and, therefore, the actual average quantity of beer and spirits drank by each individual in the province amounts to nearly seven gallons per annum. But the returns are for proof spirits, or about 50 per cent. alcohol and 50 per cent. water. Whiskey—the common form in which spirituous liquors are consumed—contains rarely more than from 25 to 30 per cent. of alcohol; consequently, although a very considerable margin is allowed for the employment of spirits in manufactures, yet it appears that the average amount consumed by every man, woman and child in Canada exceeds nine gallons per annum.

It is certainly one sign of progress—but not of the kind which would be selected by preference—that as a people we have grown to such an extent in little more than one generation, that we are able to consume in the shape of alcoholic liquors, manufactured by ourselves, more human food than our forefathers could raise throughout the length and breadth of Upper Canada. We have made vast progress in creating material wealth, but it also apparent that we have made equally great progress in intemperance. In a former article on the Cultivation of Wheat in Canada, the gradual disappearance of that cereal in Lower Canada was adverted to. It will not fail to strike the reader who may glance at this page that no increase has taken place in the number of breweries in Canada East since 1859. In that year there were five distilleries in the eastern half of the province, now there

are only four.* It does not appear from the data at hand whether any considerable importation of Upper Canadian spirits and malt liquors takes place. It is probable that such is the case; but under any circumstances, where the raw material and the process is so cheap, it is astonishing that so small an amount of capital is employed in brewing and distilling in Lower Canada. It only proves that the character which the French Canadians have long enjoyed for docility, temperance and contentment is, with respect to temperance, borne out by statistical facts. There are many who would be inclined to regard a passive and quiet journey through life, with sobriety and contentment, as far surpassing the feverish rush for, and attainment of, wealth or position, with those concurrent evils of intemperance and its vicious train, which too often, but not necessarily, go hand in hand, where the chief object of men's lives appears to be the acquisition of riches and power.

SHEPPARD'S FUEL SAVING FIRE-PLACE.

This improved fire-place, which was shown at our Provincial Exhibition, is an adaption of hot air flues communicating with the external air, and an arrangement for the combustion of smoke, to the ordinary American grate.

The grate is fixed upon the stone or marble facings of the chimney-piece, in the usual way; but instead of being backed up solidly with brickwork, a flue is constructed at the back, sides and over the top of the fire. This flue is supplied with air from the outside of the building by a duct, which passes under and through the hearth into it. The vacancy between the arch over the grate and the shelf of the mantel-piece forms the upper part of the flue. The air within the flue, being heated by the fire, ascends and is admitted into the room by perforations in the shelf which are concealed by bottomless vases. In an experiment made with an ordinary fire, a rapid current of air was emitted from a perforation two inches in diameter, at a temperature of 162°. It was speedily diffused, and gave a good supply of fresh warm air to replace what was carried up the throat of the chimney; thus establishing an efficient ventilation without cold draughts from the crevices of doors and windows; and economising the heat of the back and sides of the fire. An intervention of soap-stone between the iron plates of the flue and the fire, prevents the, what is popularly called, "burning" of the air.

The smoke is consumed by being brought, in its most heated state, into contact with a current of air passing towards the throat of the chimney, by means of a plate projecting over the fire; and also by a current of hot air introduced through orifices in the back plate of the fire-place.

The air for the support of combustion in the grate, is supplied by a duct from the outside of the building, to avoid the cold draughts which would be produced by drawing the supply from the room.

The advantages of this arrangement are twofold: First, it serves to economise heat, by utilizing a large portion of that which is allowed to escape up the chimney in fire-places constructed in the ordinary way. Secondly, it very effectually provides for ventilation, and while introducing an abundant supply of fresh air into the room, it adds to the warmth and comfort of the inmates by securing a genial temperature. The supply of air can always be controlled by means of valves in the air ducts, or at the orifices of the shelf of the mantel-piece. Mr. Sheppard has some of these improved fire-places ready for inspection at his establishment on Queen Street.

* Tables of the Trade and Navigation for 1861.

Board of Arts and Manufactures

FOR UPPER CANADA.

AGRICULTURAL ASSOCIATION OF UPPER CANADA.

The Annual Meeting of the Association was held in the Central Committee Room, Exhibition Grounds, on Friday September 26th, at 10 A. M. the President, F. W. Stone, Esq., in the Chair.

Fifteen Members of the Board of Agriculture, and the Board of Arts and Manufactures; and about ninety Delegates from the various Agricultural and Horticultural Societies, were present. The President said the first business to be entered into was the election of officers, and that the election of a President for the ensuing year stood first in order.

Moved by John Barwick, Esq., seconded by Hon. H. Ruttan,—"That Asa A. Burnham, Esq., of Cobourg, the first Vice-President of the Association, be the President for the ensuing year."—Carried unanimously.

Moved by Dr. Beatty, seconded by the Hon. John Carling—"That James Johnson, Esq., of London, the second Vice-President of the Association, be the first Vice-President for the ensuing year."—Carried unanimously.

Moved by W. Ferguson, Esq., seconded by the Hon. D. Christie,—"That J. C. Rykert, Esq., M. P. P. for Lincoln, be the second Vice-President of the Association for the ensuing year."

Moved by Aaron Choates, Esq., seconded by D. Wilson, Esq.,—"That Thos. Stock, Esq., of East Flamboro', be second Vice-President for the ensuing year."

Moved by Tho. A. Milne, Esq., seconded by R. A. Hartley, Esq.,—"That John P. Wheeler, Esq., of Scarborough, be the second Vice-President for the ensuing year."

A show of hands being taken, the President declared the vote to be in favour of J. C. Rykert, Esq., as second Vice-President of the Association for the ensuing year.

Moved by J. Young, Esq., seconded by J. C. Rykert, Esq., — "That Col. R. L. Denison be Treasurer of the Association for the ensuing year." —Carried unanimously.

The several gentlemen elected duly acknowledged the honor done them in appointing them to fill such responsible positions in the Association.

Mr. Denison having asked permission to read the financial statements and audit of accounts of the Association, for the past year, the meeting determined to go on with the regular business instead.

Moved by J. C. Rykert, Esq., seconded by the Hon. John Carling—"That the next annual Exhibition be held in the City of Kingston."

The Treasurer said it was necessary, before the motion was put, that the delegates from Kingston should come forward and say what offer of money they would make, and what guarantee they would offer as to buildings for the proper accomodation of the stock.

Mr. Ferguson said the Association ought to have sufficient confidence in the honour of Kingston, without getting the pledge demanded by Col. Denison. Kingston was the first to put up a permanent building. It was the first to erect a Crystal Palace, and Toronto followed suit, and then Hamilton, and then London; and he was quite satisfied that next year Kingston would have better buildings than Toronto had now.

Dr. Beatty said that the Treasurer, in requiring a pledge, was only carrying out the law agreed upon by the Association.

Col. Denison said he did not think the Association could vote upon this motion until it had a pledge from Kingston in writing.

Mr. Flannigan, Warden of Frontenac, Lennox, and Addington, said the City of Kingston and the county of Frontenac were acting quite unanimously and would do everything in their power to make the grounds all they should be, and to put up every necessary building. The Association need not be afraid, but everything necessary would be done. They would find in Kingston better accomodation than they had ever had anywhere else.

Mr. Gildersleeve, Mayor of Kingston, said he held in his hand authority under the seal of the city of Kingston, authorizing him and the members of the Corporation who accompanied him to give a pledge to any reasonable extent the Association might demand.

This paper was handed in, and in the course of the discussion a resolution passed in 1858 was read, affirming, "That it is not in the power of this board to fix the location of the Exhibition in the year 1860, or any year beyond next year, but that in the opinion of the Directors the Exhibition should not in future be held at any place where there are not permanent buildings erected, or assurances given that permanent buildings will be erected, and also that ample accommodation will be afforded." The motion that the Exhibition next year should be held in Kingston was then put to the meeting, and unanimously adopted.

Hon. H. Ruttan gave notice that at the annual meeting next year, he would move that the resolution which had just been read be rescinded.

THE LATE HON. ADAM FERGUSSON.

Col. Thompson said that since they had assembled in Toronto, they had heard announced the death of an old friend of this institution, and he was sure some such resolution as that he was now about to propose would receive the cordial approval of the meeting:—

"That the Association have learned with deep regret that, since the meeting of the Association on this occasion, one of the first and most indefatigable friends of the institution has been called from the scene of his earthly labours, and they desire to record their high estimation of the value of the services of the Hon. Adam Fergusson, of Wood Hill, and the esteem in which he was held by the Board of Agriculture, of which he had been a member since its formation, and also by the farmers of Canada at large."

He said that having had so long and intimate an acquaintance with Mr. Fergusson, he could not submit this resolution without making one or two remarks. Mr. Fergusson was one of the first who were consulted when the getting up of the Association was first spoken of. He thought it was a difficult undertaking, but consented to give his assistance, and he did assist most efficiently. He [Colonel Thompson] was the first President of the Association, and requested Mr. Fergusson to prepare an address. He did so, and it appeared on their transactions as the first of the annual addresses delivered before the Association. And from that day to the present time, Mr. Fergusson had always been ready to give the Association his earnest assistance in everything which tended to advance the prosperity of the agricultural interests of Canada. [Hear, hear.] It was owing to the indefatigable exertions of Mr. Fergusson and a few

others that the Association had attained its present position of prosperity and usefulness.

Hon. D. Christie said—I have a melancholy satisfaction in seconding the resolution which has just been moved. I have had the honour and advantage of knowing Mr. Fergusson almost from childhood. He was my father's friend, as well as my own, and I was taught to look up to him as an honest man, and I believe I may say a Christian man. He was long associated, as many of you know, with the advancement of Agriculture in the mother country, being one of those who had the honour of originating the Highland Society of Scotland. [Hear.] When he came to Canada he was not backward to engage in a similar work, and he has lived to see the interests of Agriculture most successfully advanced in this country. While he was amongst us, he was always foremost in every good work. I have had the honour of being associated with him as a member of the Board of Agriculture since its formation, and I can cheerfully and heartily bear testimony to the truth of what has been said by our friend, Col. Thompson, that on every occasion when it was in his power to be present, he has used his utmost endeavours to promote the success of the Agricultural Association. But I know that no words of mine are necessary to endorse his many virtues. His works follow him. [Hear, hear.]

The resolution passed in solemn silence.

Col. Thomson submitted to the meeting a printed draft of a new code of Rules and Regulations, prepared by a committee of the Council of the Association, appointed for the purpose.

After some conversation, it was agreed, on the motion of Mr. Grey, of Woodstock, to defer the consideration of these rules till the next annual meeting of the Association, and that the draft be printed in the *Agriculturist* and the *Journal of the Board of Arts and Manufactures*, for the information of members.

On motion of Asa A. Burnham, Esq., seconded by James Johnston Esq., a vote of thanks was passed to the retiring President, F. W. Stone, for his able and valuable services during the year.

On motion of Mr. Grey seconded by Mr. M. Stover, the thanks of the Association were voted to the Local Committee for the present year, for their valuable services in contributing to the success of the Exhibition.

On motion of Mr. Ferguson, the appointment of the Local Committee for the next Exhibition was referred to the Council of the Association.

The meeting then separated.

Draft of Rules and Regulations

Of the Agricultural Association of Upper Canada, under authority of the Statute 20 Vic. cap. 32, sec. 33, and adopted at the Annual Meeting, at Toronto, 20th September, 1862.

Whereas by the Act of the Legislature of Canada, 20 Vic. cap. 32, sec. 33, it is enacted, that "The Directors of the Agricultural Association shall hold a meeting during the week of the Exhibition, and may make Rules and Regulations for the management of said Exhibition;" and whereas, by sec. 34 of the said Act, a Corporation is established entitled "The Council of the Association," with full power to act for and on behalf of the Association between the Annual Meetings thereof; and as it is expedient that Rules and Regulations for the management of the affairs of the Association be adopted; Be it therefore enacted:

1. The Council of the Association, of whom for this purpose three shall form a quorum, shall, during the Exhibition, hold daily meetings, and in the absence of the President and Vice-Presidents a Chairman *pro tem.* may be appointed, and all questions of importance requiring immediate adjudication shall be decided by said Council, and such decision shall be final.

2. The Council of the Association shall attend at an early period in each summer, and at successive times, as may be necessary, with the Secretaries and Treasurer of the Association, at the place appointed for the next Exhibition, and may appoint a Local Committee (if such appointment has not been previously made), and shall make all such preliminary arrangements as may be deemed requisite for the ensuing Exhibition; determining when necessary the plans, dimensions and capacity of the buildings, offices and fixtures, suitable for the proper accommodation of the Exhibition, and everything relating thereto. And in case of anything occurring to prevent the Exhibition being held at the place appointed by the Annual Meeting, such as the failure of the local authorities to provide the necessary buildings, or such like cause, then the Council shall have full power to determine where the Exhibition shall be held for that year, and shall give the earliest possible notice of such change.

3. All contracts, and all lawful proceedings, by, with or concerning the Association, shall be made and had with the Council of the same, and no other contracts, agreements, actions or proceedings shall bind or affect the Association.

4. The Secretaries of the Association shall keep proper records of all transactions and proceedings at the Annual Meeting and Exhibition, and also of the Council of the Association from time to time; and shall, under the direction of the Council, prepare and publish in due time, a Premium List for the Annual Exhibition, with such regulations and information for the guidance of the public as may from time to time be adopted. All entries in the Departments of Agriculture and Horticulture shall be made with the Secretary of the Board of Agriculture; and all entries in the Department of Arts and Manufactures shall be made with the Secretary of the Board of Arts and Manufactures; and

they shall prepare suitable books, and insert therein all articles entered for exhibition in their respective Departments, and under their appropriate classes; and shall make whatever other arrangements may be necessary to secure the fair and impartial exhibition of every article; and, if deemed expedient by the Council, shall prepare and publish, previous to the Exhibition, a Catalogue of all articles entered.

5. The Council shall use great care and adopt such measures as may seem best calculated to obtain the services of competent and disinterested Judges; and to secure these essential ends shall have full power at any period of the Exhibition to change or annul any appointment made.

6. The Judges shall, in the execution of their duties, be careful to act with the most rigid impartiality; shall make their entries in a clear and conspicuous manner, in all cases of doubt or difficulty referring freely to the Secretary, to any member of the Council, or to the Superintendent; and when they have completed their reports, shall sign and deliver their Books to the Secretary of the Department to which they belong, who shall cause the awards made by the Judges, to be transferred to Ledgers prepared for the purpose; giving parties entitled to the premiums orders upon the Treasurer for the payment thereof.

7. At the Annual Meeting, which shall be held at 10 A.M. on Friday of the week of Exhibition, the Directors shall decide the place of holding the next Exhibition; such decision, however, shall be in accordance with the provision of the Rule adopted at the Annual Meeting of the Fair, 1858.

8. The Treasurer shall take charge of and duly account for all moneys advanced by the Government for the benefit of Agriculture, all subscriptions and donations made to the Association by Counties, Townships, Cities, Towns or Societies; all funds arising from the sale of Member's Badges or Tickets, and for entrance at the gates, and otherwise, entering the same under their respective heads in his general account; shall pay all accounts and expenses under instructions of the Council. The payment of premiums, and of all authorized contingent expenses of the Exhibition, shall be made so far as practicable on the spot where the same is held.

9th. The Treasurer and Secretaries, under approval of the Council, shall employ a proper number of experienced assistants in their several offices, so as to secure the most prompt and perfect despatch of business; and, with due regard to economy, there shall be employed such a number of constables and ticket receivers as shall be necessary for the best accommodation of the public, and for keeping order and protecting the articles in every department of the Exhibition.

10. The Treasurer shall make up and close the accounts of the Association, upon the 31st December of each year, attaching thereto a list of all claims unpaid; and the Council shall direct the same to be audited and published. All balances of cash and all other monies received on behalf of the Association, shall be placed to the credit of the same in such Bank as the Council may from time to time direct.

11. All stores and properties, of whatever kind, belonging to the Association and used for exhibition purposes, shall be in charge of the Treasurer; and he shall have the same properly protected and cared for from year to year, and shall have such as may be required conveyed to the place where the Exhibition shall be held.

12. The Local Committee may appoint a Chairman, and such Sub-Committees as may be deemed necessary, and shall assist the Council of the Association in every thing concerning which their assistance may be necessary in relation to the Annual Exhibition.

13. The Council of the Association may appoint General Superintendents of the several Departments, and also, so far as necessary, competent persons may be placed in charge of each class, who shall see that every possible facility is afforded to the Judges in the examination of the same.

14. A sufficient number of Refreshment Booths may be leased under direction of the Council, within the exhibition grounds, and shall be so constructed as to afford suitable accommodation to the public, and so as to secure the due maintenance of sobriety and good order; and any infringement of this regulation shall subject the offender to a forfeiture of his lease and the consideration paid therefor, and the Booth may be immediately closed by order of the President of the Association.

15. The Members of the Agricultural and Horticultural Societies of the cities, towns and townships, and the Members of the Electoral Division Societies within the Electoral Division in which the Exhibition may be held, or immediately contiguous thereto, shall be Members of the Association and shall have free entrance to the Exhibition for that year; provided that the said Societies shall each devote their whole funds for the year, including the government grant, in aid of the Association; provided also that the sum paid shall be not less than one dollar for each Member of the said Societies.

16. Upon the discovery of any fraud, deception, or dishonest practice, either in the preparation, ownership, or of any representation concerning any article exhibited, which may have affected, or have been intended to affect, the decision of the Judges, the Council shall have power to withhold the payment of any prize awarded, and may prohibit any such party or parties from exhibiting in any class for one or more years, and may also publish the names of such, or not, as may be deemed most expedient.

17. No Member of the Council or of the Local Committee shall be concerned in any contract or work of profit, directly or indirectly, ordered to be performed for the use of the Association, either as principal or surety.

18. These Rules may be altered or amended at any annual meeting of the Association; notice of the intended alteration or amendment being published in the *Agriculturist* and in the *Journal of the Board of Arts and Manufactures*, for three months prior to the day of the annual meeting, when the same shall be decided by a vote of two-thirds of the Directors present.

Toronto, 22nd September, 1862.

THE PROVINCIAL EXHIBITION.

THE PRIZE LIST.

In the next issue of the Journal we shall give the corrected Prize List for the Arts and Manufactures departments, with some comments of the judges contained in their reports on the various articles submitted to their decision. It is probable that the reasons which may then be assigned for the awards in particular instances will be appreciated by competitors and the public.

COPIES OF THE JANUARY No. WANTED.

A few numbers of the Journal for the month of January, of the present year, were sent to parties who were not then subscribers, but who subsequently became so, and then received a full set from the commencement of the volume—any such person having duplicate copies of the January No. preserved, would confer a favor by returning one copy to the Secretary of the Board.

BOOKS ADDED TO THE FREE LIBRARY OF REFERENCE DURING THE MONTH.

SHELF NO.		
J. 26.....	Annual Retrospect of Engineering and Architecture; a Record of progress in the Science of Civil, Military and Naval construction. 12 mo., vol. I, 1862	*G. R. Burnell.*
E. 32 & 33.	English Cyclopœdia of Art and Sciences. 4to., vols. 7 & 8, 1861—being completion of the work	*Chas. Knight.*
L. 20.....	Ure's Philosophy of Manufactures; an Exposition of the Scientific, Moral and Commercial Economy of the Factory System of Great Britain. 12 mo., 1861	*P. L. Simmonds.*
I. 49.....	Proceedings of the Literary and Philosophical Society of Manchester. 8vo., 1860-61 and 1861-62	
H. 45.....	Memoirs of the Literary and Philosophical Society of Manchester. 8vo., vol. I, 3rd series, 1862	
	The "Exchange:" a Home and Colonial Monthly Review of Commerce, Manufactures and Ghneral Politics	

N.B.—In future numbers of this Journal each new book enumerated as being added to the Library will have placed before it a number indicating its position in the Library for the convenience of reference.

BRITISH PUBLICATIONS FOR AUGUST.

Albert the Good; a Nation's Tribute of affection to his memory, 4to	0	18	0	*J. F. Shaw.*
Alevs (James de) Buddhism: its Origin, History, and Doctrines	0	6	0	*Williams and N.*
Ansted (Prof. D. T.) Short Trip in Hungary and Transylv. in the Spring of 1862, p. 8vo	0	8	6	*W. H. Allen.*
Arnold (Rev. Frederick) Public Life of Lord Macaulay, 8vo	0	14	0	*Tinsley.*
Brown (Wm.) Natural History of the Salmon, fcap. 8vo	0	2	6	*A. Hall.*
Davy (John) On some important Diseases of the Army	0	15	0	*Williams and N.*
De Quincy (Thos.) Works, new edit., Vol. 8, Leaders in Literature, &c., p. 8vo	0	4	6	*Black.*
De Witt (C.) Jefferson and the American Democracy, trans. by R. S. H. Church, 8vo	0	14	0	*Longman.*
Edmonds (Rich.) Land's End District; its Antiquities, Natural History &c. 8vo	0	7	6	*J. R. Smith.*
Francatelli (C. Elmè) Royal English and Foreign Confectioner, illust. p. 8vo	0	12	0	*Chapman and H.*
Gawthrop's Elocutionary and Rhetorical Class-Book, 2nd edit., by Davenport 12 mo	0	2	0	*Reste*
Gile's Keys to the Classics. Sallust's War of Cataline, 18 mo	0	1	6	*Cornish.*
Gosch (Charles A.) Denmark and Germany since 1815, 8vo	0	10	6	*Murray.*
Johnson (C. P.) Useful Plants of Great Britain, illust. by J. E. Sowerby, roy. 8vo	1	16	0	*Kent.*
Kirkaldy (David) Inquiry into the Tensile Strength of Wrought-Iron and Steel 8vo	0	18	0	*Simpkin.*
Little Book (A) for Every Man who Keeps a Horse, by L.L.D., fcap. 8vo	0	1	0	*Simpkin.*
My Country: the History of the British Isles, by E. S. A., 2 vols. 18mo	0	6	6	*Wertheim.*
Owen (Prof.) On the Extent and Aims of a National Museum of Natural History, 8vo	0	6	0	*Saunders & O.*
Ponting (T, Cadby) Photographic Difficulties; how to Surmount Them, &c., cr. 8vo	0	2	6	*Bland and Co.*
Rattray (A.) Vancouver Island and British Columbia, where and what they are, &c., p. 8vo	0	5	0	*Smith and Elder.*
Sandby (Wm.) History of the Royal Academy of Arts, 2 vols 8vo	1	10	0	*Longman.*
Simple Questions and Sanitary Facts, for the Use of the Poor, fcap. 8vo	0	2	0	*Tweedie.*
Thompson (Wm.) Practical Treatise on the Cultivation of the Grape Vine, 8vo	0	5	0	*Blackwoods.*
Tourrier (J.) Ten Thousand Useful French Words, Classed in Chapters, 12mo	0	3	0	*Nutt.*

Notices of Books.

THE ANNUAL RETROSPECT OF ENGINEERING AND ARCHITECTURE, A RECORD OF PROGRESS IN THE SCIENCE OF CIVIL, MILITARY, AND NAVAL CONSTRUCTION. *Vol. I., January to December*, 1861. *Edited by George R. Burnell, C. E., F. G. S.. London : Lockwood & Co.*, 1862, *pp.* 359, 8*vo.*

This publication contains notices of the improvements which have taken place in many departments of mechanical science during the past year. It also embraces some valuable articles on different engineering works now in progress or recently completed. The contents of the first volume are devoted to Railways and Roads; Harbours, Docks and Canals; Gas, Water Supply and Sewerage; Agricultural Engineering, Mechanical Engineering, &c., &c.; Architecture, Styles and Design and Practical Architecture. There is also a division devoted to Military and Naval Engineering, Steam Engines, Propellers, &c. As an interesting record, this retrospect will become valuable. The absence of a general index at the close of the volume is a great omission.

Proceedings of Societies.

VISIT OF HIS EXCELLENCY THE GOVERNOR GENERAL TO THE TORONTO MECHANICS' INSTITUTE.

On Wednesday of the Provincial Exhibition week, Lord Monck made a very interesting visit to the Mechanics' Institute of this city.

His Excellency arrived at the Institute a little after six o'clock in the evening, and was met at the door by Mr. W. Edwards, 1st Vice-President, and Mr. Walter S. Lee, 2nd Vice President, to whom he was introduced by his Worship the Mayor, and was by them conducted to the Music Hall, where he was enthusiastically received by a large company of ladies and gentlemen who had assembled for the occasion. Upon the platform, besides His Excellency and suite, and His Worship the Mayor, were the Directors of the Institute. Mr. Edwards informed His Excellency that in the absence of the President, Mr. Rice Lewis, it devolved upon him to read the following

Address

To His Excellency the Right Hon Charles Stanley Viscount Monck, Governor General, &c., &c.

"MAY IT PLEASE YOUR EXCELLENCY,

"We the Board of Directors of the Toronto Mechanics' Institute, on behalf of the members, anxious to do homage upon all proper occasions to our beloved Sovereign the Queen, desire to embrace this the first opportunity of doing so through Your Excellency as Her Representative in this important part of the Empire.

"We hail with pleasure Your Excellency's visit to this our city, offering as it does to all classes of Her Majesty's subjects an opportunity of expressing their loyalty and fidelity to theirgracious Queen, more particularly as Your Excellency has been so recently appointed to represent Her crown and person in this Province.

"The Toronto Mechanics' Institute cannot fail to perceive in Your Excellency the patron of Literature, the Arts and Sciences, and are confident that Your Excellency feels so great an interest in all that tends to elevate the mechanic and working man as to look upon this and all similar Institutions with encouragement.

"We are satisfied that Your Excellency will be pleased to learn that from an humble beginning made by a few progressive citizens in the year 1830, the Institute has gone on increasing and prospering until it has become possessed of this building, [in which we have now the honour of receiving you] together with a library numbering over 5,000 volumes, a Reading Room which is the resort of our citizens generally, and other advantages open to the enjoyment of about one thousand members.

"While supplying reading matter to a large number of our citizens at a nominal charge, the Institute also affords means of instruction in the various branches of knowledge, which, while informing the mind and expanding the intellect, tends to the development of that mental and moral vigor so conducive to the greatness and happiness of a nation.

"In conclusion, we ardently express our hope that your Excellency's administration may be as prosperous and happy as its advent has been acceptable, and that both yourself and Lady Monck may recur to it in after life with that satisfaction which can only be derived from the remembrance of a well fulfilled mission."

His Excellency replied as follows;—

"*To the Board of Directors of the Toronto Mechanics' Institute:*

"GENTLEMEN,—The expressions which I have just heard of loyalty to the Queen, and of courteous welcome to myself personally, demand my warm acknowledgments.

"I am, indeed, most anxious to do every thing which lies in my power to promote those praiseworthy objects that you have in view.

"The labouring classes in this country have every inducement to profit by the facilities of improvement that you offer them. They have but to look around and they can see many persons who began life with nothing to trust to but their own abilities, now holding distinguished positions in society, honoured and respected by all. Self culture is almost indispensable to the attainment of such a position, and therefore those who offer the means of it to persons desiring to profit by them, are engaged in a most useful work.

"I shall always have great pleasure in hearing that the Mechanics' Institute of Toronto is in a flourishing and satisfactory condition."

The following Directors of the Institute were then introduced to His Excellency by Mr. Edwards

who shook each heartily by the hand: Mr. John Paterson, (Treasurer) Messrs C. W. Bunting, J. J. Withrow, John Cowan, H. E. Clarke, W. H. Sheppard, Wm. Hamilton, jun., Wm. Halley, R. J. Griffith, D. G. Carnegie and H. Langley. Three cheers were then proposed by Mr. Edwards for the Queen, three for Lord Monck, and three for Lady Monck and family, all of which were heartily given.

His Excellency was then conducted through the Reading Room, the Library, and the Lecture Room with which he expressed himself much pleased, and regretted that time would not allow him to visit the other portions of their Noble Building. He then left amid renewed cheering.

ADDRESS FROM THE HAMILTON MECHANICS' INSTITUTE TO THE GOVERNOR GENERAL.

On the day of His Excellency's visit to the City of Hamilton, on the 18th ultimo, the following address from the Mechanic's Institute of that City was presented to him, in the large Hall of the Institute :—

To His Excellency the Right Hon. Charles Stanley, Viscount Monck, Governor General, &c, &c, &c.

MAY IT PLEASE YOUR EXCELLENCY:

We, the President and Directors of the Hamilton and Gore Mechanic's Institute, as well for ourselves as in the name of our constituents, beg to welcome your Excellency on this the occasion of your first visit to this city, for apart from the eminent qualities which you possess and which have rendered you worthy of the excellent position which you occupy, we recognize in you the representative of our beloved Queen, who is illustrious among the sovereigns of the civilized nations as a promoter of the arts and sciences, and an encourager of all that tends intellectually or morally to the good of her subjects. While thus tendering a respectful and a sincere welcome to your Excellency, we feel that we have great reason to congratulate ourselves, for we, whose duties are to encourage intellectual pursuits, to diffuse useful knowledge, and so to endeavour to refine the tastes of our fellow men, are confident that your Excellency will acknowledge the propriety of countenancing our efforts, and of giving to us and to similar institutions in the Province all the encouragement in your power.

Permit us to express the hope that your administration of the Government of the Province may be prosperous, and that you may experience much happiness in Canada, so that should your Excellency at some future time revert to your residence amongst us, your recollection of Canadians may not be tinged with regret.

FREDERICK JAMES RASTRICK, *President.*
THOS. M. SIMMONS, *Secretary.*

Hamilton, 16th. Sept., 1862.

[REPLY.]

To the President and Directors of the Hamilton and Gore Mechanic's Institute.

GENTLEMEN:—It affords me much pleasure to receive an address from a body associated together for such a praiseworthy object as is yours, and I thank you heartily for the kind greeting you offer me on my arrival in this city.

An institution whose aim is to refine and elevate the tastes of the people, and which endeavours to show them that the human mind has wants and aspirations which require something more to satisfy them than mere material prosperity, while it also supplies the needs it indicates, is deserving everywhere of the countenance of thoughtful men. And more especially is such a society useful and deserving of all encouragement in a country of comparatively recent settlement, where men are necessarily more universally engrossed with pecuniary cares and the needful provision for their families, than in a state of society where a larger leisured class exists, which has more time, means and opportunity to devote to intellectual cultivation, and to the promotion of science and art, than as yet is possible amongst any considerable portion of the population here.

Your exertions, gentlemen, will tend to keep moral and intellectual progress on a par with that material progress of which I see so many evidences, and so I bid you God speed, and wish you every success in your labours.

THE TORONTO MECHANICS' INSTITUTE, AND EVENING CLASSES.

The Board of Directors of this Institution have determined to establish during the ensuing season classes for instruction in English, French, German, Mathematics, Mechanical Drawing, Music, and Book-keeping with Penmanship. We are informed by the Secretary that the Institute has been very successful in getting good teachers; we may therefore look forward to much being done this winter in the way of middle class education. We hope the members will fully appreciate the advantages they enjoy, and that each class will be well supported. The terms are as follows:—

		Members.	Non-Mem.
English	Class.....	$2 00	$3 00
French.....	"	3 00	5 00
German	"	3 00	5 00
Mathematical...	"	2 00	3 00
Mechl. Drawing	"	2 00	3 00
Music	"	2 00	3 00
Book-keeping and Penmanship		2 00	3 00

Each class will be continued for a term of twenty weeks, two lessons each week, from 8 to 10 P.M.

Patent Laws and Inventions.

ABRIDGED SPECIFICATIONS OF ENGLISH PATENTS.

243. G. and G. PHILLIPS. *Improvements in the distillation and rectification of alcohols or spirits.* Dated Jan. 30, 1862.

This consists in the filtration of the vapour of alcohol or spirit by passing it through wire gauze, perforated sheets of metal shavings, filings, or pellets of metal, fibres of silk, cotton, wool, &c., arranged so as to have fine openings or passages

through which the vapour of alcohol can pass, but not its impurities.

354. W. Macnab. *Improvements in steam engines.* Dated Feb. 11, 1862.

The patentee claims: 1. The causing of the fresh steam in combined high and low pressure engines to give up a portion of its heat to the partly-used steam, substantially as described. 2. The combining together of two pairs of high and low pressure cylinders, with the individuals of each pair acting at right angles, as described.

384. T. Davison. *Improved means for preventing the corroding of steam boilers.* Feb. 13, 1862.

This consists in introducing into the water a salt or salts, such as the carbonate of soda, potash, or lime, capable of neutralising the corrosive action of the injurious agent present in the water.

435. C. T. Marzetti and J. Watson. *Machinery or apparatus for raising, lowering, and otherwise moving or disposing casks and other heavy bodies.* Dated Feb. 19, 1862.

This consists in using a tangent wheel and screw, or worm and worm-wheel movement, in combination with a winding barrel or shaft, upon which is wound the chain or rope, to the one end of which the cask or other body, or the object to be raised, is attached by a sling and hook or other means, whereby a considerable economy both of labour and space is effected.

460. R. H. Skellern. *An improved self-inking hand-stamp or press.* Dated Feb. 21, 1862.

This invention comprises various improvements (the details of which we cannot here give space to) in that class of hand-stamp or press consisting of two side frames mounted together at or near the top yb a cross piece, through which slides vertically a hollow plunger, which is raised by a spiral spring in the interior.

461. H. Ward. *An improvement or improvements in ladies' saddles.* Dated Eeb. 21, 1862.

The patentee claims making the third or leaping crutch of ladies' saddles movable, without detaching it from the saddle, so that it may be adjusted and fixed to suit the convenience of the rider.

471. W. H. Ross. *Improvements in the manufacture of sugar.* (A communication.) Feb. 22, 1862.

This consists principally in using, in the manufacturing or refining of sugar, the phosphates of ammonia in conjunction with sulphurous acid, either gas or liquid, or with any of the sulphates or bisulphates.

472. J. Kirkwood. *Improvements in looms for weaving.* Dated Feb. 22, 1862.

This comprises various improvements in looms, the object being to admit of the application of steam or other mechanical power, and in one modification of loom embodying them are combined with jacquard pattern mechanism of the single lift class.

473. A. Bornemann. *Improvements in the mode of constructing fountains.* Dated Eeb. 22, 1862.

This relates to fountains adapted not only for pleasure grounds, but for drawing-rooms conservatories, &c., and consists in constructing such fountains so as to work by atmospheric pressure, without the aid of clockwork or other mechanism for producing and maintaining the requisite pressure.

Canadian Items.

PETROLEUM GAS—STEVENSON HOUSE.

The Toronto *Globe* of October 3rd, contains the following card from Mr. E. W. Stevenson, the proprietor of the Stevenson House, St. Catharines: —

Thomson's Patent Petroleum Gas Works.

Stevenson House, St. Catharines, C.W.,
Sept. 26th, 1862.

I have much pleasure in giving public testimony to the excellence, cheapness, and freedom from all kinds of annoyance from smoke or smell of the Petroleum Gas, made at my establishment, in the Patented Works erected by Mr. James E. Thomson. The works have now been in operation for six weeks, and have given uniform satisfaction in every respect. They supply my establishment, the Stevenson House, St. Catharines, C. W., with 180 burners, at a cost of 86 cents a night.

I most cordially recommend Thomson's Petroleum Gas to the general public.

(Signed,) E. W. Stevenson.

To James E. Thomson, Toronto and Buffalo.

This is a most satisfactory testimonial respecting the extraordinary cheapness, purity, and excellence of Petroleum gas. The importance of the new process for gas illumination will soon be appreciated, when such establishments as the Stevenson House find it economical and agreeable. It seems almost incredible that one hundred and eighty burners can be fed for the trifling sum of eighty-six cents a night. Under the old system of burning coal gas, one hundred and eighty burners lighted on an average four hours per diem, and burning three feet an hour, would consume 2,160 feet of gas, which, at $2 50 a thousand, would cost $5 40 per night. The difference in favour of Petroleum gas, according to Mr. Stevenson's statement, is four dollars fifty-four cents, or upwards of $1,600 a year. Where four feet burners were formerly used with coal gas, instead of the one foot burner with Petroleum gas, and assuming that the average time of the gas being lighted at 5 hours a day, the saving is proportionately greater. When the works at the Rossin House are completed, which will be at the close of this month, the citizens of Toronto will have an opportunity of daily witnessing this beautiful light, and satisfying themselves by personal inspection of its extraordinary cheapness, brilliancy and purity.

"THE OIL SPRINGS CHRONICLE"—OIL SPRINGS.

This is the title of a paper which is published by Messrs. Edwin T. Solis and Hudson, at the new village of Oil Springs, in the county of Lambton, C. W. A couple of years ago, the township of

Enniskillen was a forest wild. It now contains several villages, among which is "Oil Springs," already a thriving little town, not two years old. The Oil Springs *Chronicle* looks as if it has seen at least a dozen years, and enjoyed a wide-spread and well-earned reputation. It has already reached, not its twenty-fifth year, or month, but its twenty-fifth week. Two pages and a half are filled with advertisements chiefly from Oil Springs, a village of yesterday, and Wyoming, the station on the Great Western Railroad, which is situated about a dozen miles from Oil Springs. We find advertisements of hotels, livery stables, houses, stores, goods, &c., just as if the site of Oil Springs was that of an old settled and well established city, and did not recollect being nothing but a forest two or three years ago, where one might find the track of a deer, or come across a wild turkey in a morning's stroll. The *Oil Springs Chronicle* will be invaluable to all who are interested in Petroleum, and it will likewise be of much service to those who have lands or other property in the Western District. We should be glad to see a list of wells dug in the Oil regions, an authentic enumeration of the natural springs which have been discovered, and an enumeration of the flowing wells with their history. No doubt there are many parties at Oil Springs who could furnish this information, it would be acceptable and valuable in many ways.

THE APHIS AVENÆ.

The *Canadian Naturalist and Geologist* for August contains a very useful paper from the pen of Dr. George Lawson, of Kingston, on the Aphis, which has been a source of such wide-spread alarm among the farmers of Upper Canada during the present and preceding year.

Dr. Lawson states that the Aphis Avenæ had not been recognized as belonging to the insect depredations already described as affecting grain crops in America until 1861. Notices of the insect will be found under the following synonyms: *Aphis Granaria*, Kirby; and Fitch, in the Country Gentleman, Albany, N.Y., Aug. 16, 1861; *Aphis Hordei*; *Aphis Cerealis*. This American species of Aphis is identical with the European species as determined by Mr. Walker of the British Museum, to whom Dr. Lawson sent some specimens; and also by Dr. Asa Fitch of Salem, Mass., who is satisfied that our Canadian Aphis is of the same species as the well known *Aphis Avenæ* of Europe. We give Dr. Lawson's description of this insect in his own words:

The insect is individually minute, like all the Aphides, but presents a formidable appearance on account of the vastness of its numbers. In some fields, a few days after its first appearance, the ears of grain became covered with it; in fact the wheat was commonly spoken as "dark with it." The fly presented itself chiefly in the wingless form, the individuals clustering in great numbers in the upper parts of the culms and panicles of wheat, rye, oats and barley, and this season they have been observed on indian corn and various other grasses. Most of them are stationary, but some are usually moving about with rather an awkward motion, resembling that of mites under a magnifying glass. On each panicle or head of grain they are found to be of various sizes, according to age, some scarcely large enough to be visible to the naked eye, others as large as the capital letters on this printed page. They vary in colour; some are pale apple-green, some of a brownish yellow colour and many, especially the older and larger ones are of a rather deep brick-red colour, when they become very conspicuous. In some cases where the whole ears were covered with the insects, the total destruction of the crops seemed to some of the farmers to be inevitable. They looked upon the "new bug plague" (for anything that looks like an insect is called a bug) as the greatest calamity that had ever befallen our fields. It was deemed advisable therefore to publish in the Kingston newspapers an account of the habits of the insect with the view of allaying unnecessary fears. Attention was drawn to the following among other facts;—The aphides do not gnaw the plant's stem and leaves like young caterpillars, nor like the midge, injuriously affect the young grain, but simply suck the juices of the most exposed parts of the plant. The plant necessarily suffers from this injury, its energies are weakened, the leaves and other parts shrivel and blister, and an inroad is formed for other diseases; but, while aphides are highly injurious to thin and succulent leaved plants the compact tissue of wheat and other grains, hardened too by silica, is not so liable to suffer and become deformed, and a vigorous healthy crop of grain will hardly be injured. No doubt the yield is lessened by the presence of the insect in vast numbers, and the quality of the grain perhaps slightly deteriorated, but the injurious effects are by no means so extensive as the formidable appearance of the insect would indicate.

During the present season (1862) the aphis has again made its appearance, and in as great numbers as before. It has naturally attracted less notice, but appears to be widely diffused in all the cultivated parts of central Canada. In August, 1862, I traced it from Kingston, on the scattered farms along the Addington Road, back to the township of Olden, a distance of about 50 miles. When we consider that many of the farms referred to are mere isolated patches of clearing in the woods, widely separated from each other, in some cases by miles of interminable forest and swamp, we see that the distribution of this insect is totally independent of its own limited locomotive powers. In its winged state it is no doubt carried in clouds by

the winds, like the seeds of thistles and other winged plants.

Mr. Walker calls attention to the fact that the aphis has many insect and other enemies in Europe, and in Canada it also has its enemies which during the past two seasons have been busily at work lessening its numbers. These have been so graphically depicted by Dr. Fitch, in the Albany Country Gentlemen, that I cite his description:—"On many of the wheat heads may at present be noticed from from one to half a dozen of these lice, which are very large, plump and swollen, of the colour of brown paper, standing in a posture so perfectly natural you suppose that they are alive. Touch them with a point of a pin, you will find that they are dead. Pick off a part of their brittle skin; you see there is inside a white maggot, doubled together like a ball. Put one of these wheat heads in a vial, closing its mouth with a wad of cotton. In a week's time or less, you find running actively about in the vial, some little black flies like small ants. These you see have come out from the dead lice through a circular opening which has been cut in their backs. Drive one or two of these flies into another vial, and introduce to them a wheat having some fresh lice. See how the fly runs about among them examining them with its antennæ. Having found one adapted to his wants, watch how dexterously it curves its body forward under its breast, bringing the tip before its face, as if to take aim with its sting. There, the aphis gives a shrug, the fly has pricked it with its sting an egg has been lodged under its skin, from which will grow a maggot like that first seen inside of the dead swollen aphis. And thus the little fly runs busily around among the lice on the wheat heads, stinging one after another, till it exhausts its stock of eggs, a hundred probably or more, thus ensuring the death of that number of lice. And of its progeny, fifty we may suppose to be females by which five thousand more will be destroyed. We thus see what effectual agents these parasites are in subduing the insect on which they prey. I find three different species of them now at work in our fields destroying this grain aphis. I have not space here to describe them. A particular account of them will be given in my Report in the forthcoming volume of Transactions of our State Agricultural Society. And aiding these parasites in the work which they have been created to perform, are several other insects to which I can only briefly allude. A lady bug or Coccinella (*C 9-notata*, Herbst) a pretty little beetle, nearly the size and shape of a half pea, of a bright yellow or red colour, with nine small black spots, has all the season been common in our grain field, it and its larvæ feeding on this aphis. Another insect of the same kind, but much smaller and black, with ten yellow dots on its wing covers, (*Brachyacantha* 10-*pustulata*, Melsheimer,) is little less common. The Chrosopa, or Goldeneye flies, are also there, placing their white eggs at the summit of slender threads that their young may feed on these lice. The larvæ of different Syrphus flies, small worms shaped like leeches, may also be seen on the grain heads, reaching about as an elephant does with his trunk, till an aphis is found, which is thereupon immediately seized and pulled from its foothold and devoured."

Photography.

THE USES OF PHOTOGRAPHY.

The *North British Review* contains an excellent *resumé* of the progress of Photography from the pen of Sir David Brewster. The following extract will be interesting to all admirers of this wonderful art; which is even yet in its infancy—

Importance to the Naturalist.

"The importance of photography in enabling the naturalist to represent with accuracy the various forms of animal and vegetable life cannot be too highly appreciated, both in its relations to art and to education. When we consider the vast number of species in zoology the noble forms of animated nature, whether wild or domesticated, and the services which many of them perform as the slaves of man, we can hardly attach too much importance to their accurate delineation. The Landseers, Copes, Andsdells, and Rosa Bonheurs of the present day give us fine delineations of the deer, the cattle, the dogs, the horses, and other animals which are associated with the wants and amusements of man; but even fine art might derive some advantage from their truthful photographs whether in plane perspective or in solid relief. When we look at the pictures with which Buffon has caricatured the world of instinct, we long to possess genuine representations of the giraffe, the lion, the tiger, the elephant, the gorilla, and the other noble animals which we see only in prison and in chains. With a truthful camera and an instantaneous process, the denizens of the jungle and the fields might be taken captive in their finest attitudes and their most restless moods; and binocular photographs thus obtained, and raised into relief, would furnish valuable ideas to the painters and the poets, whose works or whose epics may require an introduction to the brutes that perish.'

"The engraver has endeavoured to copy and perpetuate the finest productions of the pencil and the chisel; and the traveller, in his hurried sketches, has still more imperfectly represented to us the edifices of ancient and modern civilization. But the sun has outstripped them both; and though he has as yet only one colour on his palette, he exhibits on his canvas every visible point and line in his subject, and every variety of light, shadow and lustre, which the hour of the day or the state of the weather may impress upon it."

* * * * * *

Importance to the Sculptor.

"To the sculptor sun-painting is still more valuable. The living subject affords him little choice of material. Swathed in opaque drapery, the human figure mocks his eager eye, and it is only by stolen glances, or during angel visits, that he can see those divine forms which it is his business to perpetuate. He must therefore quit his home, and spend months and years in the museums of foreign art, copying day after day those master triumphs of genius which have been consecrated by the taste of ages. Brought back to his own studio, these copies will be his principal instructors. They will exhibit to him forms more than human, though human still, embodying all that is true and

beautiful in what might be man. These copies, however have a limited value. The light of the sun, even in a cloudless sky, is ever varying, and the breadth and direction of the shadows are changing from hour to hour. The portion of the drawing executed in the morning will not harmonize with what is delineated at noon or in the evening; and hence the most skilful representation of a piece of sculpture cannot possibly exhibit those lights and shadows which can give even an approximate idea of figures in relief. The binocular photographs, on the other hand, when rightly taken, give all the shadows of an instant of time, and when combined in the stereoscope, reproduce the statue in relief in all its aspects, and with all its parts as exhibited under the same beam of light."

Importance to the Engineer.

"To the engineer and the machinist, photography and the stereoscope are of inestimable value. The difficulty of drawing complex machinery is often insurmountable; and even when the drawings are well executed, it is not easy to study from them the construction and mode of operation of the machine; but the union of one or two binocular pictures of it, judiciously taken, will in many cases remove the difficulty both of drawing and understanding it. In the erection of public buildings, hourly and daily photograph have shown to the absent superintendent the progress of his work."

Importance in Microscopical Research.

"Photography has also been applied to the miscroscope, in reducing for special purposes, large objects into such small dimentions that they are invisible to the naked eye, and can be seen only in the microscope. Mr. Shadbolt seems to have been the first (March 1854) who executed these small photographs, by making an achromatic object-glass 1 or 1½ inch focus the lens of a camera, and using a *structureless collodion*. His photographs of single persons varied from the $\frac{1}{20}$th to the $\frac{1}{40}$th of an inch, and could bear a magnifying power of a hundred times. The finest microscopic photographs which we have seen are those of Mr. Dancer of Manchester, consisting of single portraits, monumental inscriptions, and family and other groups.

One of them, a family group, contains *seven* full-length portraits, occupying a space the size of a pin's head, so that ten thousand single portraits could be included in a square inch! In 1857, the writer of this article, who took several of these to Rome, proposed to M. Castellani, the celebrated jeweller there, to have them placed in the centre of a brooch, a locket, or a ring, and magnified by the single or the central jewel, cut into lens sufficient to exhibit the group distinctly when looked into or held up to the light. It was also suggested to a distinguished diplomatist, that copies of dispatches might be transmitted by post, of words placed in spaces not larger than a full stop or a small blot of ink."

"Among the wonderful applications of photography, we cannot avoid mentioning one by M. Crusco, who in May 1859, presented to the Academy of Sciences a photograph of a morbid alteration in the choroid coat of the human eye, as seen in the ophthalmoscope, to which he has the name of *partial* atrophy. The photograph shows that a large portion of the choroid wants both the vessels and the pigment, and the sclerotic coat is seen, through it. M. Cusco has obtained many other photographs of intra-ocular lesions, both in the living and the dead subject."

Defect of Photography.

"The greatest defect of photography, as an art is, that its pictures are more perishable than the material which bears them. Many of them, indeed, have disappeared, and left the paper on which they were drawn in all its original whiteness. This fading of photographs has been ascribed, and we believe justly, to the imperfect removal by hot or cold water of the hyposulphite of soda used in fixing them; and for a long time photographers have endeavoured to get rid of this injurious salt. It is fortunate, however, for the credit of the art, that a method of reviving faded photographs has been discovered, and the following process has been published by MM. Davanne and Girard:—'Place the print in a solution of chloride of gold, and leave it in this bath for three or four hours if shielded from the light, or for a few minutes if under the influence of the solar rays. In other respects follow the ordinary course, pass through hyposulphite of soda, and *the print, however faded*, will be revived.'"

Cartes-de-Visite.

"Among the interesting applications of photography, we must mention one which we believe was first introduced at Nice by M. Ferrier in 1857. The Duke of Parma having had his full length portrait placed upon his visiting cards, some gentlemen imitated his example, which was soon afterwards followed in Paris and in London. In order to produce these *carte-de-visite* portraits quicker, a Parisian artist is said to have fitted up a camera with 24 lenses to take 24 negatives upon the same plate. These pictures will represent the party as seen from 24 different points of view. All *carte-de visite* portraits should be taken with binocular camera, and so as to show different distances, in order that those who chose it might obtain pairs for their stereoscopes. These portraits are, beyond doubt superior to all others, especially if taken, as they should be, at the distance of 20 or 30 feet, in which case they may be enlarged into a life size by the camera of Woodward, or other analogons instruments."

"From the history which we have now given, in this and in a previous article, of photography, and its processes and applications, the reader cannot fail to see that, notwithstanding the beauty of the Daguerrotype, the *Talbotype*, or photograph on paper, or its equivalents, is the true type of the photogenic art. The public have not yet suitably acknowledged the obligations which they owe to Mr. Talbot, who, in order to perfect the processes of his invention, has drawn liberally upon his fortune, and foregone for a while, a reputation of no ordinary kind, which his mathematical, physical, and literary accomplishments could not fail to have secured him. A jury of his country, indeed (the highest arbitrator of scientific contentions, in a court where Mammon presides), have decided that he is the inventor of the Talbotype; and we trust the day is not distant when the nation shall not grudge some honourable recognition of labours which

have given the professional bread to thousands—an elegant pursuit to hundreds of amateurs, male and female—domestic gratification to the occupants of the cottage and the palace—new powers of observation and research to the philosopher—and ever-flowing fountains of knowledge to every class of society but the blind. As James Watt was not the sole inventor of the steam-engine, nor Newton the sole discoverer of the laws of the planetary system, so Mr. Talbot does not claim to be the sole inventor of photography as an art or a science. Wedgwood and Davy were humble pioneers in guiding the pencil of the sun, and Niepce and Archer have added to its power; and if we may name any other individual in England as the great inventor of photogenic instruments and processes, we are sure that every photographer in the empire will not grudge this tribute of praise to Mr. Claudet, who has so long occupied the highest place in the profession."

PHOTOGRAPHIC NOTES.

Photography at the Great Exhibition.

Colonel Sir Henry James, Director of the Ordnance Survey, shows specimens of a very valuable adaptation of the art, by which the Government saves many thousands a year in the operations of his department, in the reduction, enlarging, and printing of maps and plans. It is termed "Photozincography," and the results are extremely beautiful and interesting. Sir Henry shows adaptations of it to the production of fac-similes of ancient MS.; and one of a page of Domesday Book is shown. The photograph by a simple and cheap process, is transferred to a zinc plate, whence any number of copies can be taken off by the ordinary plate printing press.

F. Joubert exhibits a series of very beautiful pictures burnt in on glass, a marvellous adaptation of the photographic art in an absolutely new direction; and here permanency is obtained, at least so long as the glass will last. By a pure photographic process he produces on the glass, in ceramic colours, a picture which by exposure to heat in the furnace becomes burnt in like any other picture on glass or china. By a careful and artistic manipulation he has been able to produce effects in several colours. The process has been perfected, and a cheap and artistic ornamentation of our windows, whether in portraits of our friends, landscapes of familiar scenes, architectural objects, or statuary, is brought within the means of the many.

Preserving Sensitive Paper.

M. Herm. Krone, speaking at the French Society of the Preservation of sensitive paper, states that it is necessary not merely that the paper should be kept dry and free from the action of the light, but that a certain amount of free chlorine should be present in the preservative cases to convert the particles of silver into chloride. For this, recent chloride of calcium alone is not sufficient. He recommends the followine mixture:—

Chloride of Calcium	3 parts,
" Lime	1 part.

The latter, continually exhaling gaseous chlorine, acts chemically; and the former, absorbing all moisture, keeps the paper dry.

Filtering strong Acids or Acid Solutions.

Guncotton is recommended by Bottger for filtering strong acids. He has used it with advantage for nitric acid, fuming sulphuric acid, chromic acid, permanganate of potash, aqua regia, &c.

M. Disderi's Formulæ.

M. Disderi, who is known as the most able and enterprising of Parisian photographers, has recently published a treatise on the art, in which he communicates the formulæ he has found most useful in practice. A quality in the collodion on which he lays great stress is the fact that it will remain humid a considerable time in either winter or summer, thus allowing for re-posing or re-arranging when the plate is in the dark slide, without injuring the film, which will retain its sensitiveness for an hour in winter, and a third of that time in summer. The formulæ are as follows. For winter operation he gives three recipes:—

Alcohol of 820 sp. gr.	400
Ether of 725 sp. gr.	600
Pyroxyline	11
Iodide of ammonium	6
Iodide of cadmium	4
Bromide of ammonium	0·6
Bromide of cadmium	0.4
Iodine	0·5

OR,

Alcohol 820 sp. gr.	400
Ether 725 sp. gr.	600
Pyroxyline	11
Iodide of ammonium	5
Iodide of potassium	5
Bromide of ammonium	1
Bromide of potassium	1
Iodine	0·5

OR,

Alcohol at 820 sp. gr.	400
Ether 725 sp. gr.	600
Pyroxyline	11
Iodide of ammonium	6
Iodide of cadmium	4
Bromide of ammonium	1·5
Bromide of cadmium	0·5

The two first are very vigorous, but are not distinguished by delicacy; the third gives very soft, delicate results. The first is best suited for a strong light, the second for an indifferent light, and the third for a weak light; the whole are intended to be used with a strong bath, as much as 48 grs. to the ounce being recommended. For spring operations he recommends the following formulæ:—

Alcohol of 820 sp. gr.	500
Ether of 725 sp. gr.	500
Pyroxyline	10
Iodide of ammonium	5
Iodide of cadmium	5
Bromide of ammonium	1
Bromide of cadmium	1
Iodine	0·5

OR,

Alcohol of 820 sp. gr.	500
Ether of 725 sp. gr.	500
Pyroxyline	10
Iodide of ammonium	5
Iodide of cadmium	5
Bromide of ammonium	0·5
Bromide of potassium	0·5
Iodine	0·5

A silver bath of from 35 grs. to 40 grs. is recommended for these collodions. For hot summer weather he gives the following:—

Alcohol at 52°	400
Ether at 62°	600
Pyroxyline	8
Iodide of ammonium	5
Iodide of cadmium	3
Bromide of ammonium	0·5
Bromide of cadmium	0·2
Iodine	0·3

With this a 30-grain bath is recommended.

Protosulphate of iron, 20 grains to the ounce, with 20 minims ef acetic acid, or pyrogallic acid 4 grains, and 4 minims of acetic acid, may be used for development. Flat negatives he strengthens with the following solution,—

Water	2 oz.
Bichloride of mercury	3 grs.
Hydrochloric acid	6 "
Chloride of gold	1 "

—*The Photographic Journal.*

Selected Articles.

THE MICHIGAN SALT WORKS.*

The existence of salt springs in the lower peninsula of Michigan has been known from the time of its earliest settlement, and when in 1836 the State was admitted into the Union, the privilege was granted her of selecting 72 sections of salt spring lands. In the following year she organized a geological survey, principally for the purpose of ascertaining the number and distribution of the salt springs in the State. This survey led to erroneous conclusions, and the borings for salt which followed these conclusions were unsuccessful.

In 1859 a second survey was commeneed and this led to the discovery and announcement, for the first time, that below the carboniferous limestone of Michigan occurs a series, 180 feet thick, of argilaceous shales, clays, magnesian limestones, and beds of gypsum; and that here is truly the origin of the brine. The strike of the outcropping edges of these strata describes an irregular circle, inclosing all the central portion of the State. The Michigan salt group of rocks underlies 17,000 square miles, in the form of a vast reservoir, constituting the most magnificent saliferous basin on the continent. The edges are sufficiently elevated to prevent the efflux of water which finds its way into it, and hence the saline particles have never been washed away. Beneath this series of shales is a porous sandstone —the Napoleon sandstone—which, within the circumference of the basin, becomes saturated with brine from above. From the nature of the case, it is evident that the strongest brine must accumulate in the deepest part of the basin.

Under this more intelligent guidance new borings were commenced and a well at East Saginaw reached the solid rock at the depth of 92 feet, and after passing through the coal measures, with their terminal and initial sandstones, pierced the carboniferous limestone, and found the Michigan salt group of strata 169 feet thick and eminently saliferous. In the Napoleon sandstone beneath, 109 feet thick, the reservoir of the brine was struck, and a supply, abundant in quantity, and of 90° strength, was obtained at almost exactly the point which geology had predicted. This well was 669 feet deep, terminating near the middle of the sandstone. Another was subsequently bored, 806 feet deep, extending through the sandstone and penetrating the underlying shales 64 feet.

This decided success was attained early in 1860. By July of that year a "block" had been erected and boiling commenced. Before the close of the year 4,000 barrels of salt had been manufactured, and no less than four other companies had commenced boring at different points along the river.

The following analyses will exhibit the strength and purity of Saginaw brines in comparison with those of other salt-producing regions:—

	Saginaw City.	East Saginaw.	Bay City.	Syracuse N. Y.	Kanawha, Va.
Specific Gravity	1·180	1·170	1·163	1·142	1·073
Chloride of Sodium	19·246	17·912	19·692	17·690	7·309
Chloride of Calcium	2·395	2·142	0·742	0·156	1·526
Chlo'de of Magnesium	1·804	1·522	0·432	0·119	0·374
Sulphate of Lime	0·534	0·116	0·155	0·573	—
Sulphate of Soda	—	—	0.116	—	—
Compounds of Iron	0·064	0·105	—	0·002	—
Other constituents	0·127	0·220	0·013	—	—
Total solid matter in 100 parts	24·170	22·017	21·140	18·540	9·209

As pure saturated brine has a specific gravity of 1·205, and contains 25·7 per cent of saline matter, it appears that the Saginaw brines approximate remarkably near to saturation.

The following table exhibits further comparisons:

Localities.	Weight of one gall. of brine.	Solid matter in one gall.	Pure salt in one gall.	Galls. required for 1 bus salt.
Saginaw City, lbs.	9·858	2·38	1·90	29
East Saginaw	9·775	2 15	1·75	32
Bay City	9·716	1 95	1·82	31
Syracuse	9.541	1·76	1·68	33
Kanawha	9·464	0·94	0·75	75

An intelligent writer in *Hunt's Merchants' Magazine* for September, to whom we are indebted for these interesting facts, states:—

It is now but two years since the first salt was manufactured in Saginaw valley; yet it is estimated that in this time the value of real estate has increased to the extent of three and a half millions of dollars in the counties of Bay and Saginaw. At Carrolton, grounds suitable for salt lots, which, two years ago were bought at $20 an acre, are now held at $300 and $400 per acre. At Saginaw city, salt lands have risen from $30 to $200 and $300 an acre. Wood lands, from one to eight miles west and north of Saginaw city, which, as late as 1861, sold for $15 and $20 per acre, are now selling for $40 and $45 per acre. At Bay city, the increased valuation has been similar. And this is but the first impression of the creation of this new branch of industry in what is generally regarded as a Michigan wilderness.

He also gives the following account of the processes of boring the wells and manufacturing the salt:—

In the boring of the wells of the Saginaw valley, steam power is always used, and the tools and details of the process are similar to those employed in Ohio and Virginia. The boring is generally done by contract. The price per foot two years ago was $3; at the present time it is $2, and I see no reason why the price should not be reduced to $1 50

* *Scientific American.*

per foot for wells not over 900 feet deep, since the engine—the only costly part of a well-borer's outfit—is furnished by the employer. The well is bored of an enlarged diameter, and tubed as far as the "bed rock." Beyond this, a diameter of 3½ to 5 inches is the usual capacity. On the completion of the boring to the requisite depth, the hole is tubed with iron to some point below the place of influx of fresh water. This is generally the carboniferous limestone; and here some sort of packing is introduced around the tube for the purpose of shutting off communication between the inside and outside of the tube. The strong brine rises to within 5 or 10 feet of the surface, and sometimes overflows—in one instance rising in a tube as high as 17 feet. In all cases, however, a pump is introduced into the well for the purpose of securing an adequate supply.

The water is pumped at an expense of about three cents per barrel of salt, into vats or cisterns elevated about five feet, and having generally a capacity of 20×30 feet and 6 feet deep, holding consequently about 26,000 wine gallons each. Two of these vats are requisite for each block. In the cisterns, the water is allowed five or six days to settle—that is for the iron to be precipitated—a process which is generally facilitated by sprinkling in the brine a small quantity of limewater.

The kettles are arranged in two close parallel rows, and supported by walls of brick and stone, forming an arch with a longitudinal partition—or more properly two arches, in the mouths of which the fires are built. A chimney, from 50 to 100 feet high, rises at the back extremity of the arches, and thus the heat is made to pass under each kettle of the double series. The arches are inclosed in a house 120 feet by 40, or thereabouts, with a shed rnnning the whole length of each side, divided into large bins for the reception of the salt. At the Bay city works the bins occupy a separate building, into which the salt is wheeled and emptied. This arrangement permits an opening to run the whole length of the block on each side, for the admission of air to drive the steam from over the kettles.

After settling, the brine is conveyed into the boiling house in logs, which run along the arch above the kettles, resting on the middle wall which separates them; and from these logs supplies are drawn as needed, into the kettles.

It may be of interest to note that kettles are not manufactured at Bay city, but by a firm recently from Chatham, Canada West.

The fuel employed is generally a mixture of hard and soft kinds, for prices varying from $1 31 to $1 50 per cord. Hard wood, consisting of maple, beech, hickory, ironwood and birch, is exclusively employed at the East Saginaw works, and costs, delivered, $1 75 per cord. One block, including the engine, consumes about six cords of hard wood, or six and a half cords mixed woed, in twenty-four hours.

The brine, of course, evaporates much the most rapidly in the front kettles, immediately over the fire. These have to be filled once in three to five hours, and the back ones once in fifteen to twenty-four hours. Settling pans are introduced into kettles just filled, for the purpose of receiving any impurities precipitated by the application of heat. Occasionally milk, blood, or some other animal substance is employed to promote the clearing of the brine. Generally, also, some skimming is needed; and the more when the brine is purified in the manner just mentioned. The contents of the kettles are reduced by boiling to one-fourth or one-fifth the original quantity, when the salt, crystallized and fallen to the bottom, is transferred to baskets supported over the kettles, where it is allowed to drain.

The baskets at first used were of the Syracuse pattern; but these being found too small, a new style, patented by a Michigan man, and of larger size, is now generally employed. These cost forty cents each.

The baskets of salt, when moderately drained, are emptied into the bins, where the salt lies fourteen days to complete the drainage.

In the meantime, the kettles are replenished with brine and the same process is repeated. After a kettle has been boiled down two, three or more times, the accumulation of bitterns needs to be thrown out. Some prefer to do this after every kettle full. The bitterns are thrown into a conduit which runs at a convenient distance, and are thus carried out of the block.

The work is thus prosecuted day and night for the period of two to five weeks—the boilers and firemen succeeding each other in relays every twelve hours. At the end of this time the rapid evaporation and great heat of the front kettles has caused an incrustation to be formed upon the bottom from one or two inches in thickness. This must be removed, or it acts as a false bottom, permitting an interval to form between it and the kettle, thus rendering the bottom of the kettle liable to be melted out. In the Syracuse works this crust contains so much gypsum as not to be readily soluble, and is picked out with iron tools, to the great danger to the kettles. In the Saginaw works the crust is almost pure salt, and is at once loosened and removed by the simple introduction of fresh water, which is obtained from a second set of logs introduced for the purpose. The fires are permitted to go down on Saturday night. During Sunday the arches cool. On Monday any needed repairs are attended to, and on Monday night the fires are rekindled.

The amount of salt produced in twenty-four hours from a block of a given number of kettles, varies with the strength of the brine, the state of the atmosphere, the quality of the fuel, and the attention of the firemen. At Portsmouth, in good summer weather, 40 barrels are made per day from 50 kettles.

The packing of the salt is done for three cents a barrel. The barrels used cost from twenty-four to twenty-six cents—the price varying with the quality. Elm barrels with pine heads are generally employed; but at some of the works pine is used exclusively, These barrels are manufactured in stave and barrel factories opening in the vicinity, and are admitted to be a superior article for salt packing. No objection exists against elm staves, provided they are cut narrow; otherwise they are somewhat liable to warp on exposure to the weather, and might in some cases endanger the package. The tidy appearance of the packages of Saginaw salt has everywhere recommended it to notice.

The solar manufacture is yet in its inception.

The East Saginaw Co. have 20 solar vats in operation; and the prospects of success in this method of manufacture are so great that 500 additional vats and covers have been constructed, making a total outlay in the coarse salt manfacture of $8,500. Five hundred barrels have been produced.

The method of boiling in kettles is evidently too primitive and wasteful of heat to be tolerated by an inventive people. Immense quanties of caloric are transmitted from the arches to the ground and entirely lost. In Chapin's method the heat is conducted in every direction only into the brine. If he could now devise some means to utilize the steam, the economy of caloric would be complete. In the opinion of the writer, steam pipes might be made to replace the two flues in the condensing vat, and fuel employed—but in redoubled amount—only in the graining vat. We wait with interest to learn whether Mr. Chapin's process is destined to turn the old potash kettles on their sides.

In the process of boiling in kettles, two firemen and two boilers are required for each block—the firemen relieving each other at intervals of 12 hours, as also the boilers. At some of the works it is in contemplation to let the boiling—which can be done for ten cents a barrel—the company furnishing the fuel. This method, while it would increase the quantity of salt produced, might somewhat endanger its excellence. Under the present arrangement, boilers are paid $1 75 per day, and firemen $1. The wages of an engineer are $1 50 per day, and of common hands $1.

(This process was illustrated on page 97 of the current value of *Scientific American.*)

The total amount of fine salt manufaclured in the Saginaw Valley up to the first of July of the current year, was nearly one hundred thousand barrels. At the present time, the number of blocks in actual operation is 22, with an aggregate of 1,187 kettles. Several of these blocks have started within a few days. There are besides, four or five new blocks just ready to go into operation, to say nothing of the three blocks nearly completed for evaporation, by the Kanawha and Chapin process. If the 22 blocks now in operation succeed in maintaining the standard of productiveness established by the old ones, they are turning out daily 1,210 barrels, which, making allowance for the check of winter amounts to 396,000 barrels or 1,980,000 bushels annually. This is not a calculation of what the Saginaw works are expected to do; it is what they are doing at this moment; and shows a growth at the end of two years from the production of the first bushel of salt, equal to that attained by the Onondaga salt works in 1834, at the end of 38 years from the time the salt springs passed under the superintendence of the State. But it is not necessary to pause here. Within thirty days, or by September 1st, not less than four additional blocks would come into operation, raising the daily production to 1,300 barrels, and the annual production to 468,000 barrels or 2,340,000 bushels—a result ofily reached by the Onondaga salt works less than twenty-five years ago.

The only question which remains, and one upon which the predicted growth of the manufacture must depend, is that which respects the quality of Saginaw salt. There is no corner on which our predictions rest with greater security. The appearance of a pile of Saginaw salt is that of driven snow glistening in the morning sun. The grain is coarse, clean, and angular; the taste purely saline and unexceptionable, and the weight is 58¾ lbs. to the measured bushel. Letters and documents are in the hands of the manufacturers proving that the acceptance of Saginaw salt is such that the market is literally clamorous for an adequate supply. It would occupy too much space to make many citations. The Mechanics' Institute, of Chicago, the New York State Agricultural Society, (at Elmira), and the Mechanics' Association, of Utica, have severally awarded the salt of the East Srginaw Company their highest testimonials. Harvey Williams, Esq., one of the oldest and most extensive fish packers on the lakes, certifies: "My experience and observation lead me to the opinion that the salt manufactured by your company is purer, stronger, safer, and more economical for fishermen than the Syracuse fine salt." He also names several other parties who have used the salt for fish packing with the same results. In Detroit, this salt is ranked equal to any, and is very often called for in preference to Syracuse salt. The annual statement of the trade and commerce of Toledo, says: "We are led to the conclusion that eventually all the beef, pork, &c., packed west of Lake Erie, will be laid down in Saginaw salt." Dow, Quirk & Co., of Chicago, think Saginaw salt "superior to any that comes to this market." Large quantities of this salt are now sold in London, C. W., whence it is distributed through the province. St. Louis and Cincinnati also take large supplies, and the demand, at all these points, is far greater than can be furnished.

ON FORCE.

(*Concluded from page* 248.)

There is one other consideration connected with the permanence of our present terrestrial conditions, which is well worthy of our attention. Standing upon one of the London bridges, we observe the current of the Thames reversed, and the water poured upward twice a-day. The water thus moved, rubs against the river's bed and sides, and heat is the consequence of this friction. The heat thus generated is in part radiated into space, and then lost, as far as the earth is concerned. What is it that supplies this incessant loss? The earth's rotation. Let us look a little more closely at the matter. Imagine the moon fixed, and the earth turning like a wheel from west to east in its diurnal rotation. Suppose a high mountain on the earth's surface; on approaching the moon's meridian, that mountain is, as it were, laid hold of by the moon, and forms a kind of handle by which the earth is pulled more quickly round. But when the meridian is passed, the pull of the moon on the mountain would be in the opposite direction, it now tends to diminish the velocity of rotation as much as it previously augmented it; and thus the action of all fixed bodies in the earth's surface is neutralized. But suppose the mountain to lie always to the east of the moon's meridian, the pull then would be always exerted against the earth's rotation, the velocity of which would be diminished in a degree corresponding to the strength of the pull. The tidal wave occupies this position—it lies always to the east of the moon's meridian, and

thus the waters of the ocean are in part dragged as a brake along the surface of the earth; and as a brake they must diminish the velocity of the earth's rotation. The diminution though inevitable, is, however, too small to make itself felt within the period over which observations on the subject extend. Supposing, then, that we turn a mill by the action of the tide, and produce heat by the friction of the millstones; that heat has an origin totally different from the heat produced by another mill which is turned by a mountain stream. The former is produced at the expense of the earth's rotation; the latter at the expense of the sun's radiation.

The sun, by the act of vaporisation, lifts mechanically all the moisture out of the air. It condenses and falls in the form of rain,—it freezes and falls as snow. In this solid form it piles upon the Alpine heights, and furnishes materials for the glaciers of the Alps. But the sun again interposes, liberates the solidified liquid, and permits it to roll by gravity to the sea. The mechanical force of every river in the world, as it rolls towards the ocean, is drawn from the heat of the sun. No streamlet glides to a lower level without having been first lifted to the elevation from which it springs, by the mighty power of the sun. The energy of winds is also due entirely to the sun; but there is still another work which he performs, and his connection with which is not so obvious. Trees and vegetable grow upon the earth, and when burned they give rise to heat, and hence to mechanical energy. Whence is this power derived? You see this oxyd of iron, produced by the falling together of the atoms of iron and oxygen; here also is a transparent gas which you cannot now see —carbonic acid gas— which is formed by the falling together of carbon and oxygen. These atoms thus in close union resemble our lead weight while resting on the earth; but I can wind up the weight and prepare it for another fall, and so these atoms can be wound up, separate from each other, and thus enabled to repeat the process of combination. In the building of plants carbonic acid is the material from which the carbon of the plant is derived; and the solar beam is the agent which tears the atoms asunder, setting the oxygen free, and allowing the carbon to aggregate in the woody fibre. Let the solar rays fall upon a surface of sand; the sand is heated, and finally radiates away as much heat as it receives; let the same beams fall upon a forest, the quantity of heat given back is less than the forest receives, for the energy of a portion of the sunbeams is invested in building up the trees, in the manner indicated. Without the sun the reduction of carbonic acid cannot be effected and an amount of sunlight is consumed exactly equivalent to the molecular work done. Thus trees are formed; thus the cotton, on which Mr. Bazely discoursed lately, is formed. I ignite this cotton, and it flames; the oxygen again unites with its beloved carbon; but an amount of heat equal to that which you see produced by its combustion was sacrificed by the sun to form that bit of cotton.

But we cannot stop at vegetable life, for this is the source, mediate or immediate, of all animal life. The sun severs the carbon from its oxygen; the animal consumes the vegetable thus formed, and in its arteries a reunion of the severed elements takes place, and produces animal heat. Thus, strictly speaking, the process of building a vegetable is one of winding up; the process of building an animal is one of running down. The warmth of our bodies, and every mechanical energy which we exert, trace their lineage directly to the sun. The fight of a pair of pugilists, the motion of an army, or the lifting of his own body up mountain slopes by an Alpine climber, are all cases of mechanical energy drawn from the sun. Not, therefore, in the poetical, but in a purely mechanical sense, are we children of the sun. A man weighing 150 lbs. has sixty-four pounds of muscle; but these, when dried, reduce themselves to fifteen pounds. During an ordinary day's work, for eighty days, this mass of muscle would be wholly oxidised. Special organs which do more work would be more quickly oxidised: the heart, for example, if entirely unsustained, would be oxidised in about a week. Take the amount of heat due to the direct oxidation of a given amount of food; a less amount of heat is developed by this food in the working animal frame, and the missing quantity is the exact equivalent of the mechanical work which the body accomplishes.

I might extend these considerations; the work, indeed, is done to my hand—but I am warned that I have kept you already too long. To whom, then, are we indebted for the striking generalisations of this evening's discourse? All that I have laid before you is the work of a man of whom you have scarcely ever heard. All that I have brought before you has been taken from the labors of a German physician, named Mayer. Without external stimulus, and pursuing his profession as town physician in Heilbronn, this man was the first to raise the conception of the interaction of natural forces to clearness in his own mind. And yet he is scarcely ever heard of in scientific lectures, and even to scientific men his merits are but partially known. Led by his own beautiful researches, and quite independent of Mayer, Mr. Joule published his first paper on the "Mechanical Value of Heat," in 1843; but in 1842 Mayer had actually calculated the mechanical equivalent of heat. In 1845 he published his Memoir on "Organic Motion," and applied the mechanical theory of heat in the most fearless and precise manner to vital processes. He also embraced the other natural agents in his chain of conversation. In 1853 Mr. Waterston proposed, independently, the metoric theory of the sun's heat, and in 1854, professor William Thomson applied his admirable mathematical powers to the development of the theory; but six years previously, the subject had been handled in a masterly manner by Mayer, and all that I have said on this subject has been derived from him. When we consider the circumstances of Mayer's life, and the period at which he wrote, we cannot fail to be struck with astonishment at what he has accomplished. Here was a man of genius working in silence, animated solely by a love of his subject, and arriving at the most important results, some time in advance of those whose lives were entirely devoted to Natural Philosophy. It was the accident of bleeding of a feverish patient at Java in 1840, that led Mayer to speculate on these subjects. He noticed that the venous blood in the tropics was of a much brighter red than in colder latitudes, and his reasoning on this fact led him into the labora-

tory of natural forces, where he has worked with such signal ability and success. Well, you will desire to know what has become of this man. His mind gave way; he became insane, and he was sent to a lunatic asylum. In a biographical dictionary of his country it is stated that he died there; but this is incorrect. He recovered; and, I believe, is at this moment a cultivator of vineyards in Heilbronn.

While preparing for publication my last course of lectures on Heat, I wished to make myself acquainted with all that Mayer had done in connection with this subject. I accordingly wrote to two gentlemen who above all others seemed likely to give me the information which I needed. Both of them are Germans, and both particularly distinguished in connection with the Dynamical Theory of Heat. Each of them kindly furnished me with the list of Mayer's publications, and one of them was so friendly as to order them from a bookseller, and to send them to me. This friend, in reply to my first letter regarding Mayer, stated his belief that I should not find anything very important in Mayer's writings; but before forwarding the memoirs to me he read them himself. His letter accompanying the first of these papers, contains the following words:—"I must here retract the statement in my last letter, that you would not find much matter of importance in Mayer's writings: I am astonished at the multitude of beautiful and correct thoughts which they contain;" and he goes on to point out various important subjects, in the treatment of which Mayer had anticipated other eminent writers. My second friend, in whose own publications the name of Mayer repeatedly occurs, and whose papers containing these references were translated some years ago by myself, was, on the 10th of last month, unacquainted with the thoughtful and beautiful essay of Mayer's, entitled "Beitrage zur Dynamik des Himmels;" and in 1854, when Professor William Thomson developed in so striking a manner the meteoric theory of the sun's heat, he was not aware of the existence of that essay, though from a recent number in *Macmillan's Magazine* I infer that he is now aware of it. Mayer's physiological writings have been referred to by physiologists—by Dr. Carpenter, for example—in terms of honourable recognition. We have hitherto, indeed, obtained fragmentary glimpses of the man, partly from physicists and partly from physiologists; but his total merit has never yet been recognised as it assuredly would have been had he chosen a happier mode of publication. I do not think a greater disservice could be done to a man of science, than to overstate his claims; such overstatement is sure to recoil to the disadvantage of him in whose interest it is made. But when Mayer's opportunities, achievements, and fate are taken into account, I do not think that I shall be deeply blamed for attempting to place him in that honourable position which I believe to be his due.

Here, however, are the titles of Mayer's papers, the perusal of which will correct any error of judgment into which I may have fallen regarding their author. "Bemerkungen über die Krâfte der umbelebten Natur," Liebig's Annalen, 1842, vol. 42, p. 231; "Die Organische Bewegung in ihrem Zusammenhange mit dem Stoffwechsel;" Heilbronn, 1845; "Beitrage zur Dynamik des Himmels," Heilbronn, 1848; "Bemerkungen über des Mechanische Equivalent der Warme," Heilbronn, 1851.

INDIA RUBBER MANUFACTURES AT THE INTERNATIONAL EXHIBITION.

(From the "Mechanics Magazine.")

"To commence with our own country, and the Eastern Annexe, to which india-rubber manufactures—like many others, equally worthy of better positions in the main building—have been condemned, we find upwards of twenty exhibitors of various manufactures in this material, to say nothing at present of gutta-percha, and other analogous substances.

"Prominent amongst these stand the original patentees in England, C. Macintosh and Company, of Manchester, who have three cases here, containing specimens as applied to various purposes. The manufactures of this firm are too generally known to need much comment; but we may particularize, as worthy of notice, the beautiful specimens of raw material in their large case, showing the process of manufacture, from the masticated lump to the finished sheet. They also exhibit suction hose, buffers and springs, driving bands, tubing of all colours, and a peculiar make of hose, consisting of leather and india-rubber combined, which, we should think, for some purposes, an improvement on the ordinary kind. They have, also, an application of tubing for the illumination of railway carriages by gas, which, we understand, has been tested on the Lancashire and Yorkshire Railway, and found practicable. This being the case, we sincerely hope that its adoption will be universal in *every class* of railway carriage, as well as on all lines. In educational appliances, an inflated globe for the use of schools merits attention, as a very simple and cheap substitute, and decided improvement on "*the use of the globes.*". The one exhibited is about three yards in circumference, the price being only £3 10s.

"Next in importance are Messrs. Silver and Company, and Messrs. Warne and Company, who stand forward pre-eminently as enterprising producers of the newest improvements in the manufacture and application of the material. Silver and Co., with their ebonite, which is similar in appearance to the old vulcanite of 1851, stand by themselves; no one having hitherto been able to produce the material satisfactorily in this country. They exhibit, as practical applications, tubes or pipes of large dimensions, which are not effected by acids, for the use of vinegar and dye works; bottles and funnels, photographic baths and dishes, (in place of gutta-percha,) coated harness irons, bracelets and chains, for ornamental use in place of jet, as well as numerous other things. In soft vulcanized india-rubber, great credit is due for a very ingenious mat for doors or halls. This is produced by making incisions with a sharp knife at regular intervals and spaces in a sheet of the *un*vulcanized material, so that when stretched out small diamond squares are formed, and being kept open by mechanical means during vulcanization, a mat is produced, firm to the foot, and excellently adapted for the purposes required. They also exhibit washers, valves, steam packing, hose, &c., all of which show a great advance

in finish and quality. We have recently noticed the india-rubber insulated wire of this firm, as well as their ebonite pole-insulators, which will be found with other telegraph appliances, in Class 13.

"Messrs. Warne and Co. exhibit several very novel and useful appliances of the material. Their "junction rubber" for piston rings, pump buckets, &c., made of soft and hard rubber combined, is a very ingenions and valuable application, as also their "patent screw shaft " water-stop for ocean steamers, which prevents the necessity of stoppage for repacking when at sea. This is effected by the inflation of two rings so arranged as to answer the end required, whilst the stuffing-box is being repacked. They also show an elastic bath towel, having a rubber warp alternate with cotton; "red mineralised rubber;" "ferruginous " cement packing;" a very ingenious flesh brush, and their "aromatic bands," which are all worthy of notice as improved appliances of the material, as also an "Archimedean screw rifle cleaner." Messrs. Warne and Co. were the first to introduce the use of india-rubber for door-mats, samples of which they exhibit. These are formed of sections of tubes cemented together. They are well adapted to the purpose, and are extensively used. The whole contents of this case are well worthy the attention of our readers and the commercial public.

"On the opposite side, in the centre passage, will be noticed a very handsome case devoted to the exhibition of overshoes, hose, belting, &c., manufactured by the North British Rubber Company of Edinburg. This firm, which, we believe, consists chiefly of Americans, possesses the advantage of the superior knowledge attained in that country, where the india-rubber trade has been so much more extensively developed than in England, and, consequently, their goods at once strike the eye as superior to what we have seen elsewhere. This is shown particularly in their overshoes, which, indeed, is a branch of the trade that has hitherto only been carried on in France and America. The shoes exhibited here, however, very far exceed in beauty of make and finish those of either of the other makers. This is not only apparent in shoes, but in the other three articles to which their manufacture is confined—valves, hose, and belting. In front of their case, let into the floor, is the largest valve which has every been made, being 6 feet 4 inches in diameter, and 1½ inches thick, made of pure rubber, in the manufacture of which no solvent has been used. In their hose there is a clearness of finish which must place it in favourable contrast with other makers.

"India-rubber hose must eventually supersede leather, as being more durable and cleanly, and for fire-engines certainly possesses advantages from its smoothness of bore, and consequent non-resistance to the passage of the water. The same advantages are possessed by india-rubber belting for machinery, which is daily superseding the use of other kinds.

"The belting shown by the North British Company is of remarkable strength, and yet possesses a requisite amount of elasticity. Numbers of the machines in the Western Annexe are driven by these bands, as well as the pumps of the large French fountains in the Horticultural Gardens. In the same case are shown combs manufactured by another branch of the firm—the Scottish Vulcanite Company—which are very good specimens of the variety of patterns and shapes which may be produced in the material.

"Coming down the Annexe we find a cluster of smaller cases, each containing specimens of india-rubber manufactures. Chief amongst these we remark that of Messrs. P. B. Cow and Co., of Cheapside, which contains a most elegant collection and arrangement of useful appliances. Their waterproofed cloths, of every shade of colour and substance, are superior articles. Great care is evidently given to this branch of their trade, and their specimens deserve attention. Among other things they show a knapsack and haversack combined, which from its lightness, compactness, and general finish, would be invaluable to the tourist; also a ladies' yachting jacket, of fine but strong material, which must become an essential in the outfit, not only of yachting ladies, but all those who take long voyages. The floor of this case is covered with an inlaid pavement of hard rubber in various colours, which we should like to see tried practically in some position where its merits or defects could be ascertained. The effect is pleasing, and we should think, if not too expensive, the application is a good one.

"Mr. J. L. Hancock exhibits an ingenious "portable air-bed chair," for invalids which can be packed in a very small compass for travelling; Messrs. Tuck, their elastic steam packing; Mr. Wansbrough, his patent flocked cloth; Mr. Foster, of Streatham, various articles made from waste vulcanized rubber; Mr. Hodges, his excellent accumulators or springs; and Mr. Horsey, of Lambeth, a variety of small but useful articles for personal use.

"Mr. Hooper, of Pall Mall, and Messrs. Hall and Wells, exhibit specimens of their manufactures; the first in vulcanized sheet rubber, &c., and the latter in elastic braids and fabrics. Both these firms also exhibit, in Class 13, the application of india-rubber to the coating of telegraph wires for submarine and aerial purposes, as named in our recent article on telegraph apparatus. The india-rubber covered wires of Messrs. Hall and Wells exhibit excellent material and superior workmanship.

"Messrs. Spill and Co. have a large assortment of waterproof goods, as well as specimens of their vegetable leather made up in various forms. There are also several exhibitors of kamptulicon floor cloth, which is a compound of india-rubber and cork.

"Before leaving the Eastern Annexe there is one case to which we would draw the attention of those interested in the subject, and that is the one containing samples of "campticon, or india-rubber substitute," exhibited by Messrs. F. Walton and Co., of Chiswick. The high price which india-rubber has reached, and the greatly increased consumption, render the question of an economical substitute a great desideratum. The paper which was recently read before the Society of Arts by Mr. F. Walton, and which was published in the journal of that Society, very clearly describes the nature of the new material. It is made from oxidised oil, so treated as to remove all unctuous matter, and is formed into a semielastic resin, which for many purposes, such as steam packing, driving bands, and hose, is

said to answer equally as well as india-rubber at a considerable less cost. It can be supplied in either dough or solution, and as a hard compound vulcanizes as readily as india-rubber, without the use of sulphur. We shall hope to hear more of this invention, as we believe it will prove an important addition to the known elastic and waterproofing gums.

"The Gutta-Percha Company have a very good display of their general manufactures in this annexe, their insulated wires being with the other telegraphic apparatus within a short distance of their case. Mr. C. Hancock exhibits a large and extremely elegant sideboard, enriched with very beautiful mouldings in gutta-percha, which well deserves the attention of every visitor, showing, as it does, the adaptability of the material to such purposes. On the top is a well-executed model of a dog reclining on a roughly-shaped block of gutta-percha, the effect of which is extremely good. Passing into the main building, we find in the French Court several exhibitors of tubing and vulcanised rubber goods generally, and from Hanover three or four, two of which deserve more extended notice. These will be found in the south-western transept.

"Messrs. Cohen and Co., of Harburg, make the most extensive display of any one in the building, consisting of india-rubber goods generally—overshoes, clothing, tubing, toys, and a very elegant and useful mat or carpet for doors, stairs, railway carriages, &c. By the side of this case are shown specimens of india-rubber combs in great variety, made by the Gummi-Kamm Company, of Harburg. Close by these, in the centre of the transept, are three exhibitors from Prussia—Messrs. Blanke, of Magdeburg; Bolle and Co., Berlin; and Fanrobert and Reimann, also of Berlin; they do not, however, show anything specially worthy of notice, the general appearance of their goods having nothing to attract the eye, and being badly displayed, prevents the possibility of judging as to their quality.

"There is but one other stand to which we would draw attention, and that is the exhibition of the Russian India-Rubber Company, of St. Petersburg, which is placed in the north-west gallery, and we mention this only to draw attention to the fact we have before named, of the superiority of the manufacture when directed by American skill, the manager of this company being a gentleman who has had long experience in that country. They display overshoes, hose, and belting of very superior quality. Many of the boots are specially adapted to Russian wants, and we should think they must be thoroughly appreciated in their severe winters.

"The india-rubber trade is yet in its infancy; and the advances that have been made during the past ten years will, we feel assured, be far exceeded in the decennial period before our next international display. Ingenious and enterprising manufacturers will spring up,, who will improve and invent, adding to the many valuable appliances of the material which are daily made. We should not go so far as the late enterprising Charles Goodyear, who proposed to erect a house of hard india-rubber, but we see many things to which it may be applied with success, creating new and profitable industries, for our teeming population to replace those which in the course of time either die out or change their localities. And it is to these periodical exhibitions that we must look for the advance of thought and interchange of idea, which will tend eventually to bind all nations together in a firmer bond of brotherhood.

LAKE NYASSA.—CENTRAL AFRICA. *

River Shire, Jan. 6, 1862.

Having lately returned from the exploration of about 200 miles of Lake Nyassa, a few notes respecting this part of the Lake region of intertropical Africa may not be unacceptable to my fellow-members of the American Geographical and Statistical Society.

We carried a boat past the Murchison† cataracts of this river, in August last, a distance of 35 or 40 miles. In that place we have five considerable cataracts of 100 to 150 feet each; but the intermediate spaces are very rapid, too, as may be inferred by the total descent being 1,200 feet. When we launched the boat on the Upper Shire we were virtually on the lake, though 60 miles distant, for that part of the river partakes much of the character of a lake. It spreads out in one spot to a lakelet, 10 or 12 miles long, and 5 or 6 broad

On the 2nd of September we sailed into lake Nyassa, and found it to be very deep. Our means of sounding were very imperfect, we had brought a lead line of thirty-fathoms; failing to reach the bottom at a mile from the shore we employed a fishing line and found bottom in a bay at one hundred fathoms, or six hundred feet; but a mile outside of the bay we felt none with one hundred and sixteen fathoms, or six hundred and ninety-six feet. The water is cool in consequence of its large volume, and alligators (which, well fed on fish, seldom molest men) allowed us to bathe in its waters whenever we chose. This great luxury can be enjoyed in but few African rivers, and palisades are often made by the natives to protect women in drawing water against these dangerous reptiles. The shape of the lake is, with the help perhaps of a little imagination, somewhat like Italy on the map. The ankle of the boot is in the narrowest part about eighteen or twenty miles; that is if we exclude the arms of its southern end. One of these, 30 miles long and 10 or 12 broad, is prolonged into the Shire. The other, about the same breadth, is 18 miles long, and if we reject the boot shape, we may say that the southern end has a forked appearance. It expands up toward the north to fifty or sixty miles; the length is over two hundred miles, probably two hundred and twenty-five, but we failed to reach above the two hundred. It begins in latitude fourteen degrees twenty-five minutes south, and extends into the Southern borders of the tenth degree of South latitude. It lies between the 35th and 36th degrees east longitude, and is very nearly straight. We sailed along the western shore and found it to be a succession of bays all open to the east. We were there during the prevalence of equinoctial gales, and found that furious storms came down with great suddenness from the mountains and high lands with which Lake Nyassa is

* Communicated to the American Geographical and Statistical Society.

† So named after Sir Roderick Murchison, President of the Royal Geographical Society of London.

surrounded. Heavy seas in which no open boat could live often get up in fifteen or twenty minutes. There are several small rounded rocky islands covered with forests, which are uninhabited. These would afford no shelter to a ship, for many rocks put out from deep water near them; an anchorage is to be found only near the shore. Five rivers of fifteen to thirty yards flow into it from the west; possibly another of larger size flows in from the north, but that we did not see. The lake rises and falls about three feet between the wet and dry seasons; the water is fresh but somewhat earthy tasted and hard. The population on its shores is prodigiously large; all engage in catching fish by nets, hooks, creels, torches or poison. Slavery is the only trade they know. An Arab vessel called a dnow had lately been built on the lake to carry slaves across, and we daily expect a steamer (in parts) out from England to be carried past the cataracts, and launched on its waters for a very different purpose. The natives had never seen Europeans before, and we had to be stared at to any amount. They were upon the whole civil; no fines were levied or dues demanded. We were, however, robbed in the sphere of the slaves' operations; the first time we had suffered loss by thieves in Africa. The people are much less honest where slaving goes on than elsewhere, and there they place but little value on human life. We went up to show a mission (sent out by the Oxford and Cambridge Universities) a healthy locality on the islands south of Mount Zomba, and in trying to induce a tribe called Ajawa to desist from slave-hunting, were attacked with poisoned arrows and guns, and but for recourse to fire-arms in self-defence would soon have been made food for the vultures; they were the first who have attacked us in Africa, and seemed maddened by continued success in clever forays against their fellow country-men.

Africa is a continent of the future. It is impossible to recite its capabilities. It is preëminently a cotton country, for here the plant is perennial, and requires little of that heart breaking toil necessary where it is an exotic; no frosts endanger the crops, and the best qualities yield largely. Slave-hunting is the greatest drawback known—it depopulates the country so much that labor becomes dead in proportion to its prevalence. The Portuguese possessions on the Zambezi are valueless, because all the labor is departed to Bourbon, the subjects of his Most Faithful Majesty at Lisbon having performed the part of the boy of the Goose with the Golden Egg.

In addition to the missions of the English Universities two other missions in this region are contemplated. Healthy localities can be secured on the highlands, which arise on our east to a height of some 6,000 or 8,000 feet above the sea.

I am, &c.,

DAVID LIVINGSTONE.

INUNDATION OF THE MARSHLAND FENS.

Where the Wash penetrates between the counties of Lincoln and Norfolk, and threatens even to advance into the great Levels of Cambridgeshire and Huntingdonshire, and even to the home county of the Duke of Bedford, great fortifications have been raised in far distant times, and are continued down to the present The works of the old monks are still to be seen, and our Sovereign Lord King Henry VIII., after he had driven these dammers out, by his Statute of Sewers, formally declared war against "the outrageous flowing surges and course of the sea in and upon marsh grounds and other low places." The Bedford Level was in itself an usurpation of half a million of acres, which were at least of an amphibious character. The traveller who knows these Fens, who has ridden along the straight roads, and experienced how often he has to go along three sides of a square to arrive at his destination, need not be told that Holland is not the only country of dams, and that the Dutch are not the only people who must hunt a rat in a dyke lest it should flood a province.

It is in this district, where he has met with such continuous defeat, that the watchful enemy has at length found a weak place. Freshes of flood water from the distant uplands have a natural tendency to linger and soak in these peaty levels; high spring tides have an inclination to flow over and not return. There are 700,000 acres of the most productive land in the kingdom which lie below the high-water level of the Wash and depend for their existence as land upon great embankments and self-acting sluice-gates. Four miles south of King's Lynn there is a sluice-gate through which the waters of one of the huge drains empty themselves at low water into the river Ouse, thus passing out to sea with the receding tide, the gates closing of their own accord to the pressure of the rising tide. These works were, unfortunately, allowed to fall into disrepair. Small symptoms of decay, eloquent to the initiated, were disregarded. The natural consequence followed. The German Ocean, with a high spring tide, came up the river and toppled down the defences. The waters have been ever since pouring through that gap. Every tide necessarily increases the breach. The letting out of waters is proverbially a folly difficult to be repaired. Day by day the floods creep on, covering farm after farm and homestead after homestead; swallowing up flocks and herds, and driving back yeoman families, who retreat from their relentless enemy, and retreat as paupers. With a few great exceptions this is a county of small proprietors:—"Cottagers have been driven at short notice from their homes, some moving their down-stairs furniture into the chambers, others being able to carry off most part of their moveables in carts, and house after house is to be seen with waves lapping at the brick walls and wetting the doorhandles, while hedge tops denote the site of the garden and its submerged vegetables. Where the flood is deepest the rows of pollard, willow, or thorn bushes, and the top bars of gates indicate where enclosures of cropping lie; and on the outskirts of the bright sheet of water you see fine wheat crops with their rank green flags, forward peas and beans, ridges where the potatoes were but lately planted, fallows half prepared for mangold and turnip-sowing—over all of which the water is stealthily creeping and killing all with its deep irrigation of brine." All efforts to arrest this steadily advancing enemy appear to have been hitherto vain. The "Middle Level Commissioners" have held consultations, but their collected wisdom has not frightened the invader; barges laden with clay bags have been

sunk in the current of the tide, but the tide has toppled them over, emptied them, and passed on. There is now, we are told, hardly any obstacle to prevent a steamboat going several miles up the cut and through the breach, and paddling about the Fens. The condition of the inhabitants, not only of the inundated territory, but also of the threatened districts, is terrible. To them the age of Deucalion and Pyrrha is come back again, and the portents of the Roman poets are realities. Competent authorities, so far from being able to give any consolation, declare that the district flooded at present is nothing like so great as the area which will in all probability suffer for the next year, or even more. Such is the present state of this vast and increasing irruption.—*Times.*

Since the above was written the progress of the sea has been arrested, and there is every probability that the submerged land will soon be re-claimed.

Miscellaneous.

VALUABLE RECEIPTS.

Black Japanning.—Black grounds for japans may be made by mixing ivory black with shellac varnish, or for coarse work, lamp black and the top coating of common seedlac varnish. A common black japan may be made by painting a piece of work with drying oil and putting said work into an oven not too hot, then gradually raising the heat and keeping it up for a long time, so as not to burn the oil and make it blister.

Tortoise Shell Japan.—This varnish is prepared by taking of good linseed oil one gallon and of umber half a pound, and boiling them together until the oil becomes very brown and thick, when they are strained through a cloth and boiled again until the composition is about the consistence of pitch, when it is fit for use. Having prepared this varnish, clean well the vessel that is to be varnished (japanned) and then lay vermillion mixed with shellac varnish, or with drying oil diluted with good turpentine, very thinly on the places intended to imitate the clear parts of the tortoise shell. When the vermillion is dry brush over the whole with the above umber varnish diluted to a due consistency with turpentine, and when it is set and firm, it must be put into an oven and undergo a strong heat for a long time. This is the ground for those beautiful tea-boards which are so much admired. The work is all the better to be finished in annealing oven.

Painting Japan Work.—The colours to be painted are tempered generally in oil, which should have at least one-fourth of its weight of Gum sanderac or mastic dissolved in it, and it should be well diluted with turpentine, that the colours may be laid on thin and evenly. In some instances it does well to put on water colors or grounds of gold, which a skillful hand can do and manage so as to make the work appear as if it were embossed. These water colors are best prepared by means of isinglass size mixed with honey or sugar candy. These colors when laid on must receive a number of upper coats of the varnish above described.

Cements for Joints of Petroleum Stills.—Take 6 lbs. graphite (black lead), 3lbs. of dry slacked lime, 8lbs. of the sulphate of barytes and 3lbs. of boiled linseed oil, and mix them thoroughly together. The solid materials must be reduced to fine powder before being stirred among the linseed oil. If the above quantity of oil is not sufficient for making the cement sufficiently thin add more until the proper consistency is obtained.

Linseed meal cake reduced to powder and mixed with water so as to make it into a paste makes a good lute for stills which are not subjected to a temperature above 260° Fah.

Cement for Leaky House Roofs.—Take 4 pounds of Rosin, one pint of linseed oil, two ounces of red lead, and stir in pulverized sand until the proper consistency is secured, and apply it warm. This cement becomes hard and yet possesses considerable elasticity and it is durable and water proof.

Clear Gutta Percha Solution.—Cut gutta percha into thin strips and put it in a glass bottle, and add as much chloroform as makes a thick paste. This paste is then placed in very hot water and kneaded with the fingers. After considerable manipulation the gutta percha loses much of its color, and if this process is repeated, becomes very nearly colorless, having only a pale straw tint. A chloroform solution may then be made of any strength, which is useful for many purposes—when thin, as a substitute for court plaster, and when thick, as a stoping for decayed teeth.

To Remove Resin Spots from Silk.—Many silk dresses receive stains from turpentine being spilt upon them. These stains are due to the resin which is held in solution by the turpentine, and which remains in the silk after the volatile or spirituous portion has evaporated. Alcohol applied to the stains with a clean sponge will remove the spots because alcohol dissolves the resin. The silk stains should be moistened with the alcohol first, and allowed to remain soaked for a few minutes. Fresh alcohol is then applied with the sponge, and with a slight rubbing motion. It is then wiped as dry as possible and afterwards permitted to dry perfectly in the open air. Alcohol also removes grease and oil spots from silk and woollen dresses, but oil generally leaves a yellow stain behind. A mixture of alcohol and the refined light petroleum, called benzone, is excellent for cleaning light kid gloves, ribbons and silks. It is applied with a clean sponge. Persons who apply these liquids and mixtures to cleaning silks, gloves &c., must be careful to do so in an apartment where there is neither fire nor lamp burning, under the penalty of an explosion.—*Scientific American.*

Parchment Paper.

Ordinary water-leaf paper, as it is called, that is common white blotting-paper—says Dr. Lyon Playfair, F. R. S., Professor of Chemistry in Edinburgh :—for you know it better by that name,—is simply dipped into diluted sulphuric acid ; but the dilution must be exact. If you err on either side, even within very small limits of error, you get a waste product and not parchment paper. If your acid be too weak, you convert the paper into a gum ; and if the acid be too strong you corrode the paper, and do not get what you desire. In or-

der to produce this beautiful parchment-paper, you must take exactly two measures of strong oil of vitriol—sulphuric acid—and one measure of water, and mix them together. They first become heated, and you allow them to cool; and after they have cooled to the ordinary temperature they are ready for use. Nothing is more simple. The best paper for this purpose is that which has been well pulped, or well disintegrated in the making. The conversion of it into parchment paper is an exceedingly simple operation. I now place it in ammonia, which takes away the acid, and there is the parchment paper completed, so that you see nothing is more easy. What have I done? Although I have effected such a transformation in the paper that it is now much stronger than it was before, yet we have added actually nothing to it. The acid has not entered into its composition. It is the same weight after it has dried as it was before. It is simply a molecular change which has occurred in the character of the paper, the pores of the water-leaf having become closed, and it is now repellant of water. It is a semi-transparent body with great elasticity. You can bend it backward and forward without cracking, and the strength of it is much increased. It is repellant of water, but it allows some fluids to pass by a process of diffusion; and when it is stretched upon a sort of drum, or a sieve frame, or wooden circle, it forms an instrument, which, in the hands of the Master of the Mint, has produced that elegant process of separation, of diffusive analysis, which he has called "Dialysis." The strength of the paper is so much increased by this operation of simply subjecting it to the action of the acid, that a strip of paper which requires sixteen pounds weight to break it when it is in the state of the water-leaf, requires seventy-five pounds to break it after it is passed into the other state. This property of sulphuric acid with regard to paper was discovered in 1854 by Mr. Gaine; but it was not until some years afterwards that Mr. De la Rue, by extensive experiments was enabled to form parchment paper as a commercial article, and it is now used for a great many purposes. There are some deeds written upon it. And it is now extensively used by ladies for covering preserve-jars, and is used for a great many other useful purposes.

Bank-Note Splitting.

Mr. Thomas Millard, a native of Bath, now one of the Queen's book-binders, under the librarian at Windsor Castle, has discovered a method of splitting bank notes or any other sheets of paper. By the courtesy of Mr. Gregory, of Bath Street, with whom Millard served his time as an apprentice, specimens of the young man's ingenuity, consisting of a 5*l.* Bank of England note, a sheet of the *Times*, of the *Illustrated London News*, of the *Bath Journal*, and of the *Daily Telegraph* each of which has been split cleanly and cleverly into two parts, without any rent or tear, have been exhibited to many of our fellow-citizens during the past week. There can be no mistake about the matter, as we have now before us a copy of a leaf of our own *Journal* completely split in two. The separate parts could well be printed on at the back, but the separation of the flimsy paper of the *Telegraph* seems equally complete. The engravings in the illustrated journal are brought out more clearly by the process, and when mounted on cardboard present a strikingly improved appearance. The discovery is applied by Mr. Millard to practical use in print-mounting, and in repairing torn leaves of books, which he can so skillfully manage that the junction of the new and old can with difficulty be distinguished. The mounting of old prints upon paper is also so complete, that the specimens we have seen seem impressed upon the original paper. Unscrupulous people would certainly turn this plan of bank-note splitting to profitable account, if they could find it out, inasmuch as the halves could be made as stiff as the whole, the blank parts could be printed in imitation of the original, and the water-mark would of course be perfect. A cotemporary says that "Mr. Millard has devised a method of manufacturing paper that cannot be split, and bankers will probably soon be compelled to make use of his invention?" but this we understand is a mistake. Mr, Millard, to prevent the difficulty which might arise to the bank of England for having their water mark left on blank pieces of paper, upon which might be printed *fac similes* of their notes, suggest a plan for the prevention of the fraud. We are glad to hear that Her Majesty, in consideration of the talent displayed by Mr. Millard in this discovery, has already been pleased to order that he should have an increased salary. We hope his discovery may further lead to his pecuniary advantage.—*Keene's Bath Journal.*

Porous Water-Proof Cloth.

This quality is given to cloth by simply passing it through a hot solution of weak glue and alum. This is what is done by paper makers to make writing paper, the very thing which constitutes the difference between it and blotting paper, only on cloth the nap like the fur of a beaver, will preserve the cloth from being wet through as the rain will not adhere but trickle off as soon as it falls, and moisture will not adhere at all.

To apply it to the cloth, make up a weak solution of glue and while it is hot add a piece of alum, about an ounce to two quarts, and then brush it over the surface of the cloth while it is hot, and it is afterwards dried. Cloth in pieces may be run through this solution and then wrung out of it and dried. By adding a few pieces of soap to the glue the cloth will feel much softer. Goods in pieces may be run through a tubful of weak glue, soap and alum, and squeezed between rollers. This would be a cheap and expeditious mode of preparing them. Woollen goods are prepared by brushing them with the above mixture, first in the inside, then with the grain or nap of the cloth, after which it is dried. It is best to dry this first in the air and then in a stove room at a low heat, but allow the cloth to remain for a considerable time to expel the moisture completely. This kind of cloth, while it is sufficiently waterproof to keep out moisture and rain—being quite impervious to water—is pervious to the air. Many fishermen know that by boiling their pants, jackets, nets and sails in a pot with oak bark and fish skins, and afterward drying them, they become waterproof. The composition mentioned above is of nearly the same nature as the fish glue and oak bark, and consequently the same effects are produced. The composition is stated to be improved by adding

about one-fourth the quantity of the sulphate of copper to the alum. Cloth made waterproof in this manner will resist the effects of water even if it is somewhat warm, but it loses its waterproof properties if boiled. Persons who are exposed to the inclemency of the weather, will find it to their advantage, as a means of perserving health to prepare their clothes in the way we have described. Several corps in the French army are provided with porous water-proof cloth tunics prepared in a similar manner. They have been found very beneficial when the troops are in active service.—*Sci. Amer.*

Subterranean Railway.

The Metropolitan (Subterranean Railway) Works were inspected in August by a party of the directors and other gentlemen interested in the undertaking, who passed through the entire length of the line from the junction at Paddington to within a few yards of the temporary station at Farringdon Street. The inspection commenced at the terminal station at Paddington, the construction of which is a difficult piece of work, arising from the confined and awkward nature of the ground on which the station has to be fitted on either side of the up and down lines of the metropolitan branch. At this point an artificial roadway is carried on girders to give room for a standing, and for an approach for cabs and omnibuses. The engine used on Monday was especially designed for the line by Mr. Fowler, the engineer of the company. It consumes its own smoke and condenses its own steam, and gives off neither smoke nor vapour when it once enters the tunnel. The carriages are lighted with gas on a simple and efficacious plan. In an india-rubber bag, on the roof of each carriage, the gas is inclosed, and feeds two lamps for two or three hours. This arrangement has been at work for some time on many of our northern lines and on the continent and has always worked with safety. When empty the bags are replenished in a few moments from an ordinary gas-stand pipe. The train proceeded at the rate of about twelve miles an hour — a speed that was seldom exceeded, from the constant stoppages to visit all the stations. The tunnel was perfectly clear, free from close air, dry, and well lit. The directors were perfectly satisfied with the result of their inspection. The line it is reported, will be open for traffic on the 1st of October.—*Mechanics Magazine.*

Mechanical Power of the Tides.

Let us suppose that by the action of the tides the difference of level of the surface of the ocean at a certain spot is 21 feet between high and low water; omitting for the present all consideration of the power of the subjacent liquid, what is the mechanical value of a space of 100 yards square of this water? 100 yards square by 21 feet deep equals 70,000 cubic yards of water, which is lifted to a height of 21 feet, or to 1,470,000 cubic yards lifted to a height of 1 foot. Now, since one cubic yard of water weighs about 1,683 lbs., 1,470,000 cubic yards weigh 2,474,010,000 lbs., which is lifted in six hours. This is equivalent to lifting a weight of 412,335,000 foot lbs. in one hour; and since one horse-power is considered equivalent in raising 1, 800,000 foot lbs. per hour, we have, locked up in every 100 yards square of sea surface, a power equal to a 230 horse-power steam-engine, acting, be it remembered, day and night to the end of time, requiring no supervision, and costing nothing after the first outlay but the wear and tear of machinery.

Different Glazes used for Cooking Utensils.

The wrought and cast iron vessels which are to be placed on the fire are often covered with enamel, which protects the liquid from metalic contact with the sides.

Two compositions are generally employed for this purpose, one having for its base silicate of lead and the other boro-silicate of soda. These enamels are applied to the scoured surface of the metal in the form of a powder, which is fixed by heating it to a sufficiently high temperature to fuse it; it then spreads over and covers the metal with a vitreous varnish.

The boro-silicate of soda enamel possesses great superiority over that of silicate of lead, for it is unattacked by vinegar, marine salt, the greater number of acid or saline solutions, even when concentrated, and resists the action of the agents employed in cooking or chemical operations.

The silicate of lead enamel is whiter and more homogenious, which explains the preference given to it by the public; but it gives up oxide of lead to vinegar or to common salt; it acts upon a great number of colouring matters, and it is attacked by nitric acid, which immediately communicates a dull appearance to it. On evaporation the liquid leaves a white crystalline residue of nitrate of lead. This enamel is instantly darkened by dissolved sulphides, and also by cooking food containing sulpher, such as cabbage, fish, and stale eggs.

It is very easy to distinguish these two enamels by means of a solution of sulphide of potassium, sodium, or ammonium. On allowing a drop of one of these reagents to fall on the vessel to be tested, the lead enamel darkens in a few moments, whilst the boro-silicate of soda enamel retains its white colour.—*Journal d'Anvers.*

Silvering Solution.

If one drop of solution of acetate or sulphate of morphia (1 per cent. strength) be mixed with ten or fifteen drops of a solution of nitrate of silver (four grs. to the drachm), and agitated for a minute or so, a fine white crystalline precipitate of frosted silver shortly takes place, the liquor acquiring a slight yellow colour from the reaction of the liberated nitric acid upon the morphia, and on decantation or filtration and the addition of strong nitric acid the usual orange-red colour of morphia is developed. If a white porcelain dish, containing the nitrate of silver solution, be slightly warmed previons to adding the morphia, the reduction is almost instantaneous, and the vessel coated with a film of silver.

Aurora Borealis.

M. De la Rive has recently communicated to the *Philosophical Magazine* some researches on this phenomenon. The fundamental points established are:

1st. The coincidence of the occurrence of aurora in the northern and southern hemispheres, particularly at Christiania and Hobart Town.

2nd. That the phenomenon is an atmospheric one.

Alex. S. Macrae's Circular for September.

PETROLEUM, OR ROCK AND WELL OIL.—In my last circular it was intimated that owing to the high prices of rosin, the refiners of that article had turned their attention to the above oil. One very important feature has developed itself within the last few weeks, namely, the relative value of American and Canadian Crude.

It was generally predicated, before the eupion or benzine was utilized, that the American, possessing so much more of it than the Canadian would be of less value, although the latter *nauseated* consumers with its very offensive smell, but other results have accrued. Owing to spirits of turpentine having advanced to four times their average value, varnish and paint manufacturers have seriously studied the applicability of spirits of petroleum as a substitute, and I may safely say with the most perfect success in a majority of instances. The American Crude, therefore, as stated, being so much more replete with this than the Canadian, and being again so much more agreeable in smell has become first in favour, and, as I write, rules £2 per tun above the oil of our own colony. So long, therefore, as the American is plentiful, Canadian will be neglected; but should the former (as seems likely to be the case) become scarce and dear, a disparity in prices may reconcile the consumer to the latter. This detrimental prospect, however, does not apply to the distilled. Let the Canadians send the deoderised safe refined; the quality of some that has been sent over being superior or equal to anything yet manufactured.

I would remind the refiner, that the Government Bill, which becomes law on the 1*st proximo, permits the unlimited sale of an oil that is safe at* 100° *Fahrenheit and upwards, while it places the most rigid restrictions on qualities that are permanently ignitable under that range.*

The Petroleum Trade.

The last steamer from New York brought a circular of the American Petroleum or Rock Oil Company, which has been organized with a nominal capital of £100,000. The company offer to deliver it in any quantities free on board at New York, and they state that the Excise duty, equal to 7d sterling per gallon, recently imposed upon refined oil under the new system of Federal taxation, does not apply to exported oil, and that in that case there is no duty on the crude article. In addition to the qualities of this oil as an illuminator, giving a much whiter light than gas, as well as for purposes of lubrication, and for the manufacture of dyes, it is now found to yield a substitute for turpentine, which, so far as it has been tested as a vehicle for painting, is considered to work much more freely than turpentine, and to combine the properties of that spirit with some other peculiarity, which gives it fluency and softness. The consumption of rock oil in the world is vaguely estimated to have been 15 millions of gallons in 1860, and 20 millions in 1861, while for 1862 the quantity, it is thought, may range from 30 to 50 millions.—*London Times, Sept.* 19.

The New Main Sewers of London.

The aggregate length of the present sewers in the City of London is 2,000 miles. These are to be tapped on each side of the Thames by means of six immense tunnels 9 feet 6 inches in diameter, which will carry the sewage 26 miles from London before it is allowed to fall into the Thames. The cost of this gigantic enterprise is estimated at £4,000,000 sterling. The works will be large enough to carry off the sewage water of a city twice the size of London, or one containing six millions of people. Attempts will be made to apply the sewage as manure. The number of yards of concrete consumed on the south side of the river will be 800,000, of brick 300,000,000, and 4,000,000 cubic yards of earth work. The sewage will be pumped into reservoirs by eight pumps seven feet in diameter, and capable of raising 25,000,000 cubic feet in a day.

Green Colour which may be Employed in Confectionery.

The finest green colour is formed, as is known, from preparations of copper and arsenic; that of which the formula is here given is devoid of danger, and may replace it. To obtain it, infuse for twenty-four hours 0·32 grammes of saffron in 7 grammes of distilled water. Then take 0·26 grammes of carmine of indigo, and infuse it in the same manner in 15·6 grammes of distilled water. Then mix the two liquids together, and a very beautiful green colour is obtained, which may be employed for colouring an immense quantity of sweetmeats (10 parts of this solution will colour 1000 parts of sugar of a very beautiful green). This colour may be preserved for a long time, either by evaporating the liquid to dryness or by converting it into a syrup.—*Journal de Pharmacie et de Chemie,* xli. 286.

Phosphorescent Pork.

M. Hankel, in the *Annalen der Physik,* gives an account of the phenomenon of phosphorescence appearing on pork. The phosphorescence was silvery white, and enlightened the neighbouring objects. It was superficial; for, on cutting the flesh with a knife, the under part was obscured till after a certain time, when doubtless the oxygen of the air had had time to act. The phosphorescent matter was of an unctious character, and M. Hankel could not perceive in it any traces of organised beings. The light was annihilated by the application of ether, alcohol, a solution of caustic potash, cold, hot water, and a temperature of 104° F.; but in the last two cases the light reappeared when the flesh was restored to the ordinary temperature. The light also disappeared when placed in a vacuum, or in an atmosphere of carbonic acid; but returned when a little oxygen was permitted to enter. Sulphuric acid annihilated it for ever. Ozonised oxygen does not sensibly affect this phosphorescence. Fatty oils lessen its duration (this is the case also with distilled water); but none of these liquids become phosphorescent by contact with this animal matter. This phenomenon has been previously observed in sea-fish, at the time when they were on the verge of putrefaction, and has been called the "glow-worm fire." The same appearance is sometimes offered by rotting wood. It is not certain that in any of these cases the appearance is due to the oxidation of phosphorus. It would be important to learn whether the pork described by M. Hankel, is poisonous when "phosphorescent."—*Brit. Med. Jour.*