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FOR UPPER CANADA.

APRIL, 1863.

CANADA A FIELD FOR CAPITAL AND MANUFACTURING ENTERPRIZE.

In order to form a correct idea of the amazing amount of capital in England seeking investment, it is only necessary to glance at some of the leading commercial transactions of the past year.

The Extension of Banking alone during the last few months of 1862, covers a sum exceeding twenty-one millions sterling. Joint Stock Banks have found extraordinary favour with the British public. The abundance of money, the large amounts of idle capital, have induced large speculations in these institutions. The New Banks of 1862 include eight which may be termed home institutions, with a capital of £12,000,000. No less than five Colonial Banks, with a capital of £3,750,000; two Indian with £2,000,000 capital, and four Foreign with £4,000,000 at their disposal, making the aggregate upwards of £21,000,000 sterling, subscribed for banking purposes in a few months. But if new banks show an abundance of capital seeking investment, surely foreign loans are equally conclusive of the existence of this plethora. The transactions in foreign loans in 1862 reached the enormous figure of £23,746,240, and were distributed as follows:

Egypt	£2,908,040
Italy	1,782,000
Morocco	501,200
Peru	5,500,000
Portugal	1,700,000
Russia	4,670,000
Switzerland	285,000
Turkey	5,400,000
Venezuala	1,000,000
Total	£23,746,240

All of these loans were, it will be seen, made to foreign countries. But this is not all; the joint stock enterprises of greater and lesser character and importance involved an additional investment of capital, which may reach twelve or fifteen millions sterling. Among these the following are the most important:

Home Mining Companies	£770,000
Colonial " "	710,000
Foreign " "	356,000
Home Land Companies	625,000
Colonial " "	1,650,000
Foreign " "	4,300,000
Sundry Joint Stock Companies	3,450,000
Total	£11,861,000

Here we have an aggregate sum of not less than fifty-five millions sterling, seeking investment during the last year in Banks, Loans, Money, Land, and other speculations.*

Of the loans, no doubt a considerable amount will be ultimately lost, and perhaps many of the mining, land, and other companies, may come to nothing; but the capital was subscribed, and it would no doubt be obtained if necessary. Why may we not look for the employment of some of this superabundant wealth in Canada? Have we not better securities to offer than those which are eagerly accepted from foreigners, or from doubtful enterprises?

No one doubts that there is a large field open in Canada for enterprise in woollen manufactures. In 1861, we imported woollens to the value of upwards of four million dollars. All kinds of woollen fabrics will be in demand owing to the price of cotton. In 1861, English wool was 66 per cent. dearer than middling Orleans cotton, now it is 11 per cent. cheaper; ordinary yellow East Indian wool was 33 per cent. cheaper; at the present time it is nearly 60 per cent. cheaper. It is estimated that not less than 25,000,000 lbs. more of wool were worked up in 1862 than in 1861.† British North America imported last year 65,000 pieces of cloth more than in 1861. But Canada, of worsted stuffs, took 94,000 pieces less in 1862 than in 1861. Considerable increase has taken place in the woollen manufactures of Canada during the past year or two, but far from being adequate to supply the country even with the coarse kinds of cloth so largely imported.

The annual review of the commerce of Toronto tells us that "American carpets have advanced to a rate which altogether shuts them out of this market. The tax on manufacturing, the high price for exchange, and the depreciation in currency, and the necessity for payment of duties in gold on all the imported materials, has run rates up to some seventy per cent. beyond the usual figures. In this, as in nearly all other branches of trade, has our commerce with the United States ceased."

Canada ought to be fearless of competition in numerous articles of clothing suitable to the climate; for we can not only make woollen cloth of ordinary grades as good as imported, but, in consequence of the general introduction of the sewing machine, can make them up at as low a price as is desirable. In other woollen goods, such as flannels, blankets and hosiery, all we want is capital, skill and machinery. The raw material

* See the Exchange, for an article on British Trade and Finance in 1862.

† *Ibid.*—Commerce and Manufactures of Great Britain in 1862.

would soon become abundant, and the demand is constantly increasing. The impetus given to the flax and linen trades by the high price of cotton has been relatively greater than that given to wool. While the increase at home in the imports of wool in 1862, as compared with the increase of 1861, amounted to 14 per cent., the arrivals of flax have risen to 35 per cent. So also with exports of linen, which have amounted to 24 per cent. increase during the same period. We imported $332,433 worth in 1861. Some attention has recently been devoted to the cultivation of flax, and the introduction of machines for rendering the raw product marketable has been attended with promising results. In 1851, Upper Canada raised 59,680 lbs. of flax and hemp; in 1861, 1,225,934 lbs. The quantity of linen manufactured in 1851 was only 14,711 yards, in 1861 it rose to 37,055 yards, an increase still quite out of proportion to the amount of raw material brought into the market, although it is impossible to state the difference, as the census returns do not distinguish between flax and hemp. The increase in the amount of the wool crop during the same period was about 1,000,000 lbs. The quantity of flannel manufactured in 1851, was 1,157,221 yards, against 1,595,514 yards in 1861; and, strange to say, the number of yards of fulled cloth manufactured in 1851, was greater than in 1861. The great fact, however, is patent to all, that if we import woollen, linen and cotton fabrics to the amount of nearly ten millions of dollars per annum, and export a quarter of a million dollars' worth of wool, and possess the capability of greatly increasing the yearly amount of the raw product raised, that a wide field is now open for competitive industry in the Province, if capital and skilled labour were to be abundant in our midst. In former numbers of this journal we have spoken of the vast field which is open for the manufacture of salt in the Gulf the St. Lawrence. The absence of coal renders the immense quantity of iron ore of first quality as yet unavailable; but there is an enormous distribution of coal in the Eastern Provinces, in Nova Scotia, New Brunswick and Newfoundland. The aggregate area of Cape Breton, New Brunswick, Nova Scotia and Newfoundland, is 81,113 square miles; and of this extent, not less than 15,000 to 18,000 square miles are true coal lands, belonging to the carboniferous series. When we compare this area with that of the English coal fields, their importance becomes apparent. Great Britain, with an area of 120,290 square miles, has only about 12,000 square miles of coal lands, or one-tenth of the whole island. The Eastern Provinces have one-sixth of their area coal land. At Pictou, Nova Scotia, one of the coal beds has the extraordinary thickness of 37½ feet, and a second 27½ feet, while the "Mammoth vein" in Pennsylvania is 29½ feet thick. On the island of Newfoundland, usually but erroneously considered so destitute of mineral and other resources, bituminous coal is found only seven miles from the coast, on the Great Codroy River, near Cape Ray; so also on the north-east of Grand Pond, there is bituminous and cannel coal. At St. George's Bay the bituminous coal crops out in a layer three feet in thickness. From Pictou, on the Gulf, coal might be obtained in any quantity, if any unforeseen events should limit the supply at present derived from the United States; and on an emergency, if the Intercolonial Railway were constructed, there can be little doubt that the coal of New Brunswick or Nova Scotia would not only find a market in Canada, but greatly assist in developing our mineral wealth, and lead to home manufactures in iron and copper. It is satisfactory to note, that so great has been the improvement which has taken place in agricultural implements and machinery, that we are now to a great extent independent of the United States, and no doubt that very soon the demand will be altogether supplied by home-manufactured articles. A population now numbering not far from three millions, rapidly increasing, cut off by the civil war in the States from a large import trade, and possessing abundance of water power, raw material and growing home markets, cannot fail to furnish a splendid field for manufacturing enterprize. At no period of our history have the conditions been so favourable for the introduction of that capital which is so lavishly bestowed upon the foreigner, and the skilled labour which is pining in almost hopeless poverty at home.

CANADIAN INLAND NAVIGATION.

The General Report of the Commissioner of Public Works, for 1862, contains some excellent observations on the extent and importance of our Inland Navigation. Few people have any true conception of the magnitude of the river St. Lawrence, and the great lakes of which it is the outlet. The waters of this river drain an extent of country larger than France. The great inland lakes alone exceed in extent the area of Great Britain, and comprehend more than half the fresh water on the surface of the globe. The coast line of the river St. Lawrence and the great lakes measures 5,600 miles, one half of which is American, the other half Canadian. The cost to Canada of making this vast extent of coast accessible to vessels of 400 tons burden, has been $14,000,000.

In the early settlement of the Province, and, indeed, until the opening of the Erie Canal, in

1825, the trade of the country bordering upon the river and the upper lakes found its way to the sea by Montreal and Quebec. But upon the opening of that canal the products of the West were at once diverted to the other side of the boundary line, and taken to New York; and notwithstanding the noble efforts which have since been made by Canada to regain a fair share of this trade, by the construction of canals of more than double the tonnage capacity of the Erie Canal, and by the formation of a more direct and cheaper channel of inland navigation, still, such has been the commanding influence of that great commercial metropolis in drawing trade to itself, and in keeping down the price of ocean transport, that these efforts, though not fruitless, have not been so successful as at first anticipated.

A vast stream of traffic has been diverted from the St. Lawrence, and continues to flow through the Erie Canal with augmented volume, notwithstanding the railway competition it had to encounter in later years. In 1861, the bulk of property transported both ways upon it amounted to upwards to four and a half millions of tons, of the value of one hundred and thirty millions of dollars, and yielding to the State, in tolls, a revenue of nearly four millions of dollars.

The St. Lawrence route, on the other hand, was not fully opened until 1847, and the returns during a series of years show that, with considerable fluctuations and reactions, the traffic has gradually increased, though not in so marked a degree as might reasonably have been expected. The bulk of property transported both ways through these canals amounted, in 1861, to 1,020,483 tons through the Welland, and 886,908 tons through the St. Lawrence; and the revenues which would have that year been derived from the traffic, had the usual tolls of former years been imposed, would have amounted to $392,289: scarcely more than a tithe of that collected the same year upon the Erie Canal.

The Timber Slides on the Great Lumber Rivers of Canada.

In 1862, the enormous number of 326,781 pieces of square timber, and 90,000 saw logs passed the Chaudière slides. From the Gatineau river 9,251 pieces of square timber, and 154,918 saw logs have been brought down. On the Saugenay the following timber passed through the slides :—

43,289 white pine logs.
7,000 spruce logs.
715 pieces ship timber.

The Notre Dame Mountains.

The range of the Notre Dame or Shick-Shock Mountains, which begins at the Matane and runs nearly east and west magnetically, is about 2,000 feet in height, and two miles in breadth at its western termination. At the Chatte it increases to 3,500 feet in height and to six miles in breadth. At the St. Anne, where it seems to split—one portion running towards the south-east, and the other a little to the north of east—one of the most elevated summits, called Mount Albert, attains an elevation of 3,778 feet. From the latter stream, the northern portion of the range, which reaches the height of 4,000 feet near the head of the Marsouin river, continues to the rear of Mont Louis, until it strikes the River Magdalen, with a breadth of about 1½ miles, at about 17 miles from the St. Lawrence; thence from the south side of the Magdalen, with heights rising from 1,500 to 2,000 feet, it is subdivided into a series of parallel ridges cut transversely by the deep gorges of north and south flowing streams, until it reaches Cape Gaspé where it terminates with cliffs 700 feet in height. It occupies the most of the space between the St. Lawrence, on the one side, and the Bay of Gaspé and the Darmouth River, on the other side.

From the Magdalen westward the summits of the peaks are bare rock. West of Mount Albert, on the less elevated portions, but on the highest plains, the principal growth is dwarf spruce, with a small proportion of white birch of diminutive size, growing widely apart; the intervening surface being covered with tall ferns. At a lower elevation the the soil supports a mixed growth of larger size, consisting of a very open bush of spruce, white and black birch, cedar, and some white pine. East of Mount Albert, which is a vast bare rock, the range toward the Magdalen is generally destitute of vegetation; the rocks of a pale green colour, are generally hard, close textured and silicious, on the summits of the highest peaks, near the Chatte Mount Albert. Barn shaped and conical mountains, are composed of igneous rock or trap; Table topped mountain, another of the most elevated peaks, and belonging to the same range, is composed of intrusive rock, and occupies an area of 72 square miles, the greater part of which is bare rock.

Coast of Gaspe.

From Cap de Chatte to Tourelle, the banks of the St. Lawrence vary from 12 to 50 feet in height.

Between Tourelle and Great Fox River, the coast is flanked by an almost continuous series of cliffs towering from 100 to 400 feet in height, interrupted at intervals of from three to six miles by numerous streams descending from the south. These are walled in on either side by mountain ridges which increase in height as they recede from the shore or from 800 to 2,000 feet or more, at distances varying from 8 to 15 miles, where, on the portion west and north of the Magdalen, a somewhat level tract of land, at their base is found, forming what is commonly called the Grand Savanne; this depression or valley, which has been examined, extends from the Ste. Anne eastward to the Magdalen.

Long stretches of the beach, along the shore, are composed of shaly rock, sand and gravel; or are scattered over with fragments of rock from the cliffs, and are only partly covered during high water, whilst others remain submerged during low water, but for short distances. This is the route followed by the mail carrier, for the weekly transmission of the mails to and from Cape Rosier and Gaspé Basin. Such points as are covered by water constantly or only occasionally, when the tide is high, are generally avoided by passing across the spurs of the headlands or summits of the cliffs, or by waiting until the tide is partly low.

No continuous line of road, therefore, is practicable along the beach.

Coast Rocks.

Between the Chatte and Tourelle, the coast consists of bands of conglomerate limestone, black bituminous shales, and thin calcareous sandstones.

From Tourelle downwards the cliffs, in many places, are nearly perpendicular, and sometimes overhanging and threatening destruction to the foot traveller at their base. West of the Magdalen they consist chiefly of frequently disturbed strata of coarse and fine grained calcareous sandstone, in beds of various thicknesses, interstratified with black graptolitic or indurated and bituminous shales, and thin arenaceous limestones; east of the Magdalen the rocks possess a very uniform lithological character; they consist of black bituminous argillaceous shales, interstratified with thin, grey calcareous sandstones, and thin, grey yellowish weathering limestone. Graptolites are found on some of the limestones and in the shales.

Bands of black dolomites, capable of yielding good hydraulic cement, and limestone fit for burning are occasionally found among the strata, together with an abundance of building and flag stones.

Soil and Timber on Highlands.

The mountains—of which these cliffs form the base—present upon their slopes and summits long stretches of land fit for cultivation and settlement; the most elevated portions are generally covered with a growth of white birch, spruce and balsam fir, from 6 to 12 inches in diameter, 40 to 60 feet in height, on a good description of light, sandy loam; on the less elevated portions and upon the slopes, the same description of timber, but of a larger size, prevails, being frequently intermixed with black birch, cedar, maple and poplar, from 9 to 18 inches in diameter, by 40 to 50 feet or more in length, and the soil improves in quality in proportion to the size of the timber and the quantity of earth and vegetable matter, which increase with the decrease of surface elevation above the sea. As far as could be judged in the winter season, from the description and size of the timber and the soil on the roots of overblown trees, the land along the western division of the line is superior to that along the eastern division, where the soil is apparently more stony and gravelly, and of a lighter and drier nature. On the whole it appears more favorable for cultivation than the lands along the Témiscouata and Saguenay routes, which were examined and reported upon in 1860.

The Board of Arts and Manufactures for Upper Canada.

PROVINCIAL EXHIBITION.

PRIZE LIST—ARTS AND MANUFACTURES DEPARTMENT.

The following is the Prize List of the Arts and Manufactures Department of the Agricultural Association's Exhibition, to be held in the City of KINGSTON, on September 22nd, 23rd, 24th and 25th, 1863. The Rules and Regulations will be published in the next issue.

CLASSIFICATION OF PRIZE LIST.

ARTS, MANUFACTURES, LADIES' WORK, &c., &c.

Class 38—Cabinet Ware and other Wood Manufactures.
" 39—Carriages and Sleighs, and parts thereof.
" 40—Chemical Manufactures and Preparations.
" 41—Decorative and Useful Arts; Drawings and Designs.
" 42—Fine Arts.
" 43—Groceries and Provisions.
" 44—Ladies' Work.
" 45—Machinery, Castings, and Tools.
" 46—Metal Work (Miscellaneous) including Stoves.
Class 47—Miscellaneous, including Pottery, and Indian Work.
" 48—Musical Instruments.
" 49—Natural History.
" 50—Paper, Printing, and Bookbinding.
" 51—Saddle, Engine Hose, and Trunkmaker's Work; and Leather.
" 52—Shoe and Bootmakers' Work, and Leather.
" 53—Woollen, Flax, and Cotton Goods; and Furs, and Wearing Apparel.
" 54—Foreign Manufactures.

Class 38—Cabinet Ware, and other Wood Manufactures.

Cabinet Ware.

Sect.		1st Prize.	2nd Prize.
1	Bed Room Furniture, set of	$10 00	$6 00
2	Centre Table	7 00	4 00
3	Drawing Room Sofa	7 00	4 00
4	Drawing Room Chairs, set of	7 00	4 00
5	Dining Room Furniture, set of	8 00	4 00
6	Side Board	6 00	3 00
7	Wardrobe	5 00	3 00

Class 38—*Continued.*

Miscellaneous.

Sect.		1st Prize	2nd Prize.
8	Cooper's Work	$4 00	$3 00
9	Corn Brooms, 1 doz.	2 00	1 00
10	Curled Hair, 10 lbs	8 00	2 00
11	Handles for Tools for Carpenters, Blacksmiths, Gunsmiths, Watchmakers, &c., &c., collection of	8 00	4 00
12	Joiner's Work, assortment of	8 00	4 00
13	Machine-wrought Moulding, and Flooring, 100 feet of each	6 00	4 00
14	Shingles, two bundles of split	2 00	1 00
15	Turning in Wood, collection of specimens	6 00	4 00
16	Turned Hollow Wooden Ware, assortment of	4 00	3 00
17	Veneers from Canadian Woods, undressed	8 00	4 00
18	Veneers from Canadian Woods, dressed and polished	8 00	4 00
19	Wash Tubs and Pails, three of each, Factory made	4 00	2 00
20	Willow Ware, six specimens	4 00	2 00
21	Extra entries		

Class 39—Carriages and Sleighs, and Parts thereof.

Sect.		1st Prize.	2nd Prize.
1	Axe, wrought iron	$3 00	$2 00
2	Bent Shafts, half a dozen	3 00	2 00
3	Bows, for carriage tops, two sets	3 00	2 00
4	Buggy, double seated	8 00	4 00
5	Buggy, single seated	7 00	4 00
6	Buggy, trotting	6 00	4 00
7	Carriage, two-horse, pleasure	12 00	7 00
8	Carriage, one-horse pleasure	8 00	4 00
9	Child's Carriage	4 00	3 00
10	Dog Cart, single horse	6 00	4 00
11	Express Waggon	6 00	4 00
12	Hubs, two pairs carriage	3 00	2 00
13	Rims or Felloes, two pairs carriage	3 00	2 00
14	Spokes, 1 dozen machine made carriage	3 00	2 00
15	Sleigh, two-horse pleasure	10 00	6 00
16	Sleigh, one-horse pleasure	8 00	4 00
17	Springs, one set steel carriage	4 00	3 00
18	Sulky, trotting	5 00	3 00
19	Wheels, one pair of carriage, unpainted	3 00	2 00
20	Extra entries		

Class 40—Chemical Manufactures and Preparations.*

Sect.		1st Prize.	2nd Prize.
1	Essential Oils, assortment of	$6 00	$4 00
2	Glue, 14 lbs	3 00	2 00
3	Isinglass, 1 lb	3 00	2 00
4	Medical Herbs, Roots and Plants, native growth	12 00	7 00
5	Oils, Linseed and Rape, and other expressed kinds	6 00	4 00
6	Oil—Coal, Shale, or Rock	6 00	4 00
7	Oil, Neat's foot, half gallon	2 00	1 00
8	Printing Inks, an assortment	3 00	2 00
9	Varnishes, assortment of	6 00	4 00
10	Extra entries		

Class 41—Decorative and Useful Arts, Drawings and Designs.

Sect.		1st Prize.	2nd Prize.
1	Architectural Design, with complete detail Drawings	$10 00	$6 00
2	Carving in Wood	6 00	4 00
3	Drawing of Machinery, in perspective	5 00	3 00
4	Decorative House Painting	5 00	3 00
5	Decorative Sign Writing, on Glass	4 00	2 00
6	Engraving on Wood, with proof	5 00	3 00
7	Engraving on Copper, with proof	5 00	3 00
8	Goldsmith's Work	5 00	3 00
9	Geometrical Drawing of Engine or Mill work, coloured	5 00	3 00
10	Lithographic Drawing	5 00	3 00
11	Lithographic Drawing, coloured	6 00	4 00
12	Mantlepiece in Marble	10 00	6 00
13	Map of Canada, Lithographed	6 00	4 00
14	Mathematical, Philosophical and Surveyor's Instruments, collection of	15 00	10 00
15	Modelling in Plaster	5 00	3 00
16	Monumental Headstone	5 00	3 00

* All parties exhibiting in competition for prizes in this class, must deliver their goods to the Secretary of the Board of Arts and Manufactures, Toronto, by the 1st of September, with a view to having a proper analysis made prior to the Exhibition.

Class 41—*Continued.*

Sect.		1st Prize.	2nd Prize.
17	Picture Frame, ornamented gilt	$5 00	$3 00
18	Penmanship, business hand	4 00	2 00
19	Penmanship, ornamental	4 00	2 00
20	Seal Engraving, collection of impressions	5 00	3 00
21	Sign Writing	4 00	2 00
22	Silversmith's Work	5 00	3 00
23	Stained Glass, collection of specimen	10 00	6 00
24	Extra entries		

Class 42—Fine Arts.

Professional List—Oil.

Sect.		1st Prize.	2nd Prize.
1	Animals, grouped or single	$12 00	$7 00
2	Historical Painting	12 00	7 00
3	Landscape, Canadian subject	12 00	7 00
4	Landscape or Marine Painting, not Canadian subject	10 00	6 00
5	Marine Painting, Canadian subject	12 00	7 00
6	Portrait	10 00	6 00
	In Water Colours.		
7	Animals, grouped or single	7 00	5 00
8	Flowers, grouped or single	7 00	5 00
9	Landscape, Canadian subject	7 00	5 00
10	Landscape or Marine Painting, not Canadian subject	7 00	5 00
11	Marine View, Canadian subject	7 00	5 00
12	Portrait	6 00	4 00
	Pencil, Crayon, &c.		
13	Crayon, coloured	6 00	4 00
14	Crayon, plain	6 00	4 00
15	Crayon or Pencil Portrait	6 00	4 00
16	Pencil Drawing	6 00	4 00
17	Pen and Ink Sketch	6 00	4 00
	Amateur List—Oil.		
18	Animals, grouped or single	8 00	5 00
19	Historical Painting	8 00	5 00
20	Landscape, Canadian subject	8 00	5 00
21	Landscape or Marine Painting, not Canadian subject	8 00	5 00
22	Marine Painting, Canadian subject	8 00	5 00
23	Portrait	7 00	5 00
	In Water Colours.		
24	Animals, grouped or single	7 00	5 00
25	Flowers, grouped or single	5 00	3 00
26	Landscape, Canadian subject	7 00	5 00
27	Landscape, or Marine Painting, not Canadian subject	7 00	5 00
28	Marine view, Canadian subject	7 00	5 00
29	Portrait	6 00	4 00
	Pencil, Crayon, &c.		
30	Crayon, coloured	5 00	3 00
31	Crayon, plain	5 00	3 00
32	Crayon or Pencil Portrait	5 00	3 00
33	Pencil Drawing	5 00	3 00
34	Pen and Ink Sketch	5 00	3 00
	Photography.		
35	Ambrotypes, collection of	6 00	4 00
36	Potograph Portraits, collection of, in duplicate, one set coloured	10 00	6 00
37	Potograph Portraits, collection of, plain	8 00	5 00
38	Photograph Landscapes and Views, collection of	8 00	5 00
39	Photograph Portrait in Oil	8 00	5 00
40	Extras		

Class 43—Groceries and Provisions.

Sect.		1st Prize.	2nd Prize.
1	Barley, Pearl	$3 00	$2 00
2	Barley, Pot	3 00	2 00
3	Biscuits, an assortment of	6 00	4 00
4	Bottled Fruits, an assortment, manufactured for sale	6 00	4 00
5	Bottled Pickles, an assortment, manufactured for sale	6 00	4 00

Sect.	Class 43—*Continued.*	1st Prize.	2nd Prize.
6	Buckwheat Flour	$3 00	$2 00
7	Cayenne Pepper, from Capsicums grown in the Province	2 00	1 00
8	Chickory, 20 lbs. of	3 00	2 00
9	Indian Corn Meal	3 00	2 00
10	Mustard, one jar	2 00	1 00
11	Oatmeal	3 00	2 00
12	Sauces for Table use, an assortment, manufactured for sale	6 00	4 00
13	Soap, one box of common	4 00	3 00
14	Soaps, collection of assorted fancy	6 00	4 00
15	Spices, ground, an assortment of	2 00	1 00
16	Starch, 12 lbs. of Corn	2 00	1 00
17	Starch, 12 lbs. of Flour	2 00	1 00
18	Starch, 12 lbs. of Potatoe	2 00	1 00
19	Sugar, 20 lbs. of Beet Root	3 00	2 00
20	Sugar, 20 lbs. of Sorghum	3 00	2 00
21	Sugar, one loaf of Refined	5 00	3 00
22	Tobacco, 14 lbs. Canadian manufactured	4 00	3 00
23	Wheat Flour	5 00	3 00
24	Extra entries		

Sect.	Class 44—Ladies' Work.	1st Prize.	2nd Prize.	3rd Prize.
1	Bead Work	$3 00	$2 00	$1 00
2	Braiding	3 00	2 00	1 00
3	Crochet Work	3 00	2 00	1 00
4	Embroidery in Muslin	3 00	2 00	1 00
5	Embroidery in Silk	3 00	2 00	1 00
6	Embroidery in Worsted	3 00	2 00	1 00
7	Gloves, three pairs	2 00	1 00	0 50
8	Guipure Work	3 00	2 00	1 00
9	Hair Work	3 00	2 00	1 00
10	Knitting	3 00	2 00	1 00
11	Lace Work	3 00	2 00	1 00
12	Mittens, three pairs of Woollen	2 00	1 00	0 50
13	Needle Work, ornamental	3 00	2 00	1 00
14	Netting, fancy	3 00	2 00	1 00
15	Plait for Bonnets or Hats, of Canadian Straw	3 00	2 00	1 00
16	Shirt, gentleman's	3 00	2 00	1 00
17	Socks, three pairs of Woollen	2 00	1 00	0 50
18	Stockings, three pairs of Woollen	2 00	1 00	0 50
19	Tatting	3 00	2 00	1 00
20	Wax Fruit	6 00	4 00	2 00
21	Wax Flowers	6 00	4 00	2 00
22	Wax Shells, a collection of	6 00	4 00	2 00
23	Worsted Work	3 00	2 00	1 00
24	Worsted Work (fancy) for framing	3 00	2 00	1 00
24	Worsted Work (raised)	3 00	2 00	1 00
25	Extra entries			

Sect.	Class 45.—Machinery, Castings, and Tools.	1st Prize.	2nd Prize.
1	Blacksmith's Bellows	$4 00	$3 00
2	Castings for General Machinery	10 00	6 00
3	Cast Wheel, spur or bevel, not less than 50 lbs. weight	8 00	5 00
4	Castings for Railways, Railroad Cars and Locomotives, assortment of	12 00	7 00
5	Hand Power Weaving Loom	6 00	4 00
6	Edge Tools, an assortment	15 00	10 00
7	Engine, Steam, stationary, of one to four horse power, in operation	15 00	10 00
8	Engine, Steam, stationary, five horse power and upwards, in operation	25 10	15 00
9	Engine, Hot Air, one to four horse power, in operation on the ground	15 00	10 00
10	Pump, in metal	5 00	3 00
11	Refrigerator	6 00	4 00
12	Saws, an assortment	8 00	5 00
13	Saw Mill, in Model or otherwise	6 00	4 00
14	Sewing Machine, manufacturing	8 00	5 00
15	Sewing Machine, family	8 00	5 00
16	Scales, platform	5 00	3 00
17	Scales, counter	3 00	2 00
18	Shingle Splitting Machine	6 00	4 00
19	Skates, an assortment of	6 00	4 00
20	Smoke Consuming Furnace, in operation on the ground	12 00	7 00
21	Tools for Working in Metals, assortment of	12 00	7 00
22	Turning Lathe	5 00	3 00
23	Valves and Gearing for working steam expansively, either in model or otherwise, principle of working to be the point of competition	12 00	7 00
24	Extra entries		

Class 46.—Metal Work (Miscellaneous) including Stoves.

Miscellaneous.

Sect.		1st Prize.	2nd Prize
1	Coal Oil Lamps, an assortment	$8 00	$5 00
2	Coppersmith's Work, an assortment	7 00	4 00
3	Engineer's Brass Work, an assortment	6 00	4 00
4	Fire Arms, an assortment	7 00	5 00
5	Files, collection of cast steel	8 00	2 00
6	Fire Proof Office Safe	8 00	5 00
7	Gas Fittings, an assortment	7 00	5 00
8	Iron Fencing and Gate, ornamental	7 00	5 00
9	Iron Work from the hammer, ornamental	6 00	4 00
10	Iron Work, ornamental cast	6 00	4 00
11	Locksmith's Work, an assortment	7 00	5 00
12	Malleable Hardware Manufactures, an assortment	7 00	5 00
13	Nails, 20 lbs. of pressed	6 00	4 00
14	Nails, 20 lbs. of cut	6 00	4 00
15	Plumber's Work, an assortment	6 00	4 00
16	Screws and bolts, an assortment	6 00	4 00
17	Sheet Brass Work, an assortment	7 00	5 00
18	Tinsmith's Work, an assortment	6 00	4 00
19	Tinsmith's Lacquered Work, an assortment of	6 00	4 00
20	Wire Work, an assortment	6 00	4 00
	Stoves.		
21	Cooking Stove, for wood	6 00	4 00
22	Cooking Stove, for coal	6 00	4 00
23	Furniture for Cooking Stove, one set	4 00	3 00
24	Hall Stove, for wood	5 00	3 00
25	Hall Stove, for coal	5 00	3 00
26	Parlour Stove, for wood	5 00	3 00
27	Parlour Stove, for coal	5 00	3 00
28	Parlour Grate	5 00	3 00
29	Parlour Fire Place complete, including setting of grate so as to economise fuel; and arrangement for ventilating room	6 00	4 00
30	Extra entries		

Class 47.—Miscellaneous, including Pottery and Indian Work.

Miscellaneous.

Sect.		1st Prize.	2nd Prize.
1	Artificial Leg	6 00	0 00
2	Artificial Arm	6 00	0 00
3	Brushes, an assortment	6 00	4 00
4	Model of a Steam Vessel	6 00	4 00
5	Model of a Sailing Vessel	6 00	4 00
	Pottery.		
6	Filterer for water	3 00	2 00
7	Pottery, an assortment	8 00	5 00
8	Sewerage Pipes, stoneware, assortment of sizes	10 00	6 00
9	Stoneware, an assortment	10 00	6 00
10	Slates for roofing	8 00	5 00
	Indian Work.		
11	Buckskin Mittens, one pair	2 00	1 00
12	Clothes Basket	2 00	1 00
13	Fruit Basket	2 00	1 00
14	Hand Basket	2 00	1 00
15	Moccasins, one pair of plain	2 00	1 00
16	Moccasins, worked with beads or porcupine quills, one pair	3 00	2 00
17	Extra entries		

Class 48.—Musical Instruments.

Sects.		1st Prize.	2nd Prize.
1	Harmonium	$10 00	$6 00
2	Melodeon	6 00	4 00
3	Organ, Church	20 00	12 00
4	Piano, Square	15 00	10 00
5	Piano, Grand	15 00	10 00
6	Piano, Cottage	10 00	6 00
7	Violin	3 00	2 00
8	Violin, double bass	3 00	2 00
9	Extra entries		

Class 49.—Natural History.

Sect.		1st Prize.	2nd Prize.
1	BIRDS—Collection of Stuffed Birds of Canada, classified, and common and technical names attached	$8 00	$5 00
2	FISHES—Collection of Native Fishes, stuffed or preserved in spirits, and common and technical names attached	8 00	5 00
3	INSECTS—Collection of Native Insects, classified, and common and technical names attached	8 00	5 00
4	MAMMALIA AND REPTILES of Canada, stuffed or preserved in spirits, classified, and common and technical names attached, a collection	8 00	5 00
5	MINERALS—Collection of Minerals of Canada, named and classified	8 00	5 00
6	PLANTS—Collection of Native Plants, arranged in their natural families, and named	8 00	5 00
7	STUFFED BIRDS AND ANIMALS of any country, collection of	8 00	5 00
8	WOODS—Collection of the Woods of Canada, in boards two feet long, one side polished; also, a portion of the tree cut in sections, showing the bark	8 00	5 00
9	Extra entries		

Class 50.—Paper, Printing, Bookbinding, and Type.

Sect.		1st Prize.	2nd Prize.
1	Bookbinding (blank-book), assortment of	$5 00	$3 00
2	Bookbinding (letter-press), assortment of	5 00	3 00
3	Letter-press Printing, plain	5 00	3 00
4	Letter-press Printing, ornamental	5 00	3 00
5	Paper Hangings (Canadian paper), one dozen rolls, assorted	6 00	4 00
6	Papers—Printing, Writing, and Wrapping, one ream of each	6 00	4 00
7	Papers—Blotting and Coloured, one ream of each	6 00	4 00
8	Pocket Books, Wallets, &c., an assortment	6 00	4 00
9	Printing Type, an assortment	6 00	4 00
10	Extra entries		

Class 51.—Saddle, Engine Hose, and Trunk Makers' Work, and Leather.

Saddlery, &c.

Sect.		1st Prize.	2nd Prize.
1	Engine Hose and Joints, 2½ inches diameter, 50 feet of copper rivetted	$6 00	$4 00
2	Harness, set of double carriage	8 00	5 00
3	Harness, set of single carriage	6 00	4 00
4	Harness, set of team	5 00	3 00
5	Harness, set of Express	5 00	3 00
6	Horse Collars, an assortment	3 00	2 00
7	Hames, four pairs of iron carriage or gig	3 00	2 00
8	Hames, three pairs of iron cased team or cart	3 00	2 00
9	Hames, six pairs of wooden team	3 00	2 00
10	India Rubber Belting, Engine-Hose, &c., an assortment	6 00	4 00
11	Leather Leggings for Volunteers	3 00	2 00
12	Saddle, Ladies' full quilted	8 00	5 00
13	Saddle, Ladies' quilted safe	6 00	4 00
14	Saddle, Gentlemen's full quilted	7 00	4 00
15	Saddle, Gentlemen's plain shaftoe	5 00	3 00
16	Trunks, an assortment	8 00	5 00
17	Valises and Travelling Bags, an assortment	5 00	3 00
18	Whips and Thongs, an assortment	6 00	4 00
	Leather.		
19	Belt Leather, 30 lbs	3 00	2 00
20	Brown Strap and Bridle, one side of each	3 00	2 00
21	Carriage Cover, two skins	3 00	2 00
22	Deer Skins, dressed	2 00	1 00
23	Harness Leather, two sides	3 00	2 00
24	Hog Skins, for saddles, three	4 00	3 00
25	Patent Leather, for carriage or harness work, 20 feet	6 00	4 00
26	Skirting for saddles, two sides	4 00	3 00
27	Extra entries		

Class 52.—Shoe and Boot Makers' Work, Leather, &c.

Boots, &c.

Sect.		1st Prize.	2nd Prize.
1	Boots, Ladies', an assortment	$7 00	$4 00
2	Boots, Gentlemen's sewed, an assortment	7 00	4 00
3	Boots, pegged, an assortment	5 00	3 08
4	Boot and Shoemakers' Tools, an assortment	8 00	5 00
5	Boot and Shoemakers' Lasts and Trees, an assortment	8 00	5 00
6	Shoemakers' Pegs, an assortment	4 00	3 00
7	Shoes, India Rubber, an assortment	6 00	4 00

Leather.

Sect.		1st Prize.	2nd Prize.
8	Calf Skins	$3 00	$2 00
9	Calf Skins, grained	3 00	2 00
10	Calfskins, two morocco	3 00	2 00
11	Cordovan, two skins of	3 00	2 00
12	Dog Skins, two dressed	3 00	2 00
13	Kip Skins, two sides	3 00	2 00
14	Kip Skins, grained	3 00	2 00
15	Linings, six skins	3 00	2 00
16	Patent Leather for bootmakers, 20 feet	6 00	4 00
17	Sheep Skins, six coloured	3 00	2 00
18	Sole Leather, two sides	3 00	2 00
19	Upper Leather, two sides	3 00	2 00
20	Upper Leather, grained, two sides	3 00	2 00
21	Extra entries		

Class 53.—Woollen, Flax, and Cotton Goods; and Furs and Wearing Apparel.

Sect.		1st Prize.	2nd Prize.
1	Bags, from flax or hemp, the growth of Canada, one dozen	$5 00	$4 00
2	Bags, one dozen cotton	4 00	3 00
3	Blankets, woollen, one pair	6 00	4 00
4	Calico, unbleached, one piece	5 00	3 00
5	Carpet, woollen, one piece	8 00	5 00
6	Carpet, woollen stair, one piece	6 00	4 00
7	Cassimere cloth, from Merino wool, one piece	6 00	4 00
8	Cloth, fulled, one piece	6 00	4 00
9	Cloth, broad, one piece	6 00	4 00
10	Counterpanes, two	5 00	3 00
11	Cordage and Twines, from Canadian flax or hemp, assortment of	10 00	6 00
12	Check for horse collars, one piece	4 00	3 00
13	Drawers, factory made, woollen, one pair	4 00	3 00
14	Flannel, factory made, one piece	5 00	3 00
15	Flannel, not factory made, one piece	5 00	3 00
16	Flannel, Scarlet, one piece	5 00	3 00
17	Fur Cap and Gloves	4 00	3 00
18	Fur Sleigh Robes, Buffalo, Wolf and Racooon (an assortment)	5 00	3 00
19	Gloves and Mits of any leather, an assortment	4 00	3 00
20	Horse Blankets, two pairs	5 00	3 00
21	Kersey for horse clothing, one piece	5 00	3 00
22	Linen Goods, one piece	5 00	3 00
23	Oxford Grey Cloth, one piece	5 00	3 00
24	Overcoat of Canadian cloth	4 00	3 00
25	Satinet, black, one piece	6 00	4 00
26	Satinet, mixed, one piece	5 00	3 00
27	Sheep Skin Mats, dressed and coloured, an assortment	6 00	4 00
28	Shirts, factory made, three each, woollen and Angola	5 00	3 00
29	Silk and Felt Hats	5 00	3 00
30	Stockings and Socks, factory made, woollen, three pairs of each	4 00	2 00
31	Stockings and Socks, factory made, mixed woollen and cotton, three pairs of each	4 00	2 00
32	Suit of Clothes of Canadian Cloth	8 00	5 00
33	Tweed, Winter, one piece	6 00	4 00
34	Tweed, Summer, one piece	6 00	4 00
35	Twine, linen and cotton, an assortment	3 00	2 00
36	Winsey, checked, one piece	5 00	3 00
37	Woollen Cloths, Tweeds, &c., an assortment	10 00	6 00
38	Woollen Shawls, Stockings, Drawers, Shirts, and Mits, an assortment	10 00	6 00
39	Yarn, white and dyed, one pound of each	2 00	1 00
40	Yarn, fleecy woollen for knitting, one pound	2 00	1 00
41	Yarn, cotton, two pounds	2 00	1 00
42	Extra entries		

Class 54.—Foreign Manufactures.

Foreign Articles will be admitted for exhibition only; but Certificates will be awarded to any article of worth or peculiar merit.

BOOKS ADDED TO THE FREE LIBRARY OF REFERENCE.

Shelf No.		
F. 26 to 41—	The American Cyclopedia: a popular Dictionary of General Knowledge, edited by George Ripley and Charles A. Dana; 16 vols. 8vo. 1863......	*Appleton & Co.*
L. 31—	Guide to Pictorial Perspective; Landscape Drawing; Oil Painting; Flower Painting in water colours; and Hints for Sketching Trees from Nature, in water colours. Bound pamphlets, 12mo..........	*Rowney & Co.*
L. 32—	Hand Book of Light and Shade; and Guide to Figure Drawing; Pictorial Art; Miniature Painting, and Colouring Photographs; and Painting on Glass. Bound pamphlets, 12mo..........	*Rowney & Co.*

Official Illustrated Catalogue of International Exhibition of 1862, Parts VII to XIII.:—

Part VII. Class XIII.—Philosophical Instruments and Processes.
" XIV.—Photographic apparatus and Photography.
" XV.—Horological Instruments.
" XVI.—Musical Instruments.
" XVII.—Surgical Instruments and Appliances.
Part VIII. Class XVIII.—Cotton.
" XIX.—Flax and Hemp.
" XX.—Silk and Velvet.
" XXI.—Woollen and Worsted, &c.
" XXII.—Carpets.
" XXIII.—Woven, Spun, Felted, and Laid Fabrics.
" XXIV.—Tapestry, Lace, and Embroidery.
Part IX. Class XXV.—Skins, Fur, Feathers, and Hair.
" XXVI.—Leather, including Saddlery and Harness.
" XXVII.—Articles of Clothing.
Part X. Class XXVIII.—Paper, Stationery, Printing, and Book-binding.
" XXIX.—Educational Works and Appliances.
Part XI. Class XXX.—Furniture & Upholstery, including Paper Hangings & Papier Maché.
" XXXVI.—Dressing Cases, Travelling Cases, &c.
Part XII. Class XXXI.—Iron and General Hardware.
" XXXII.—Steel and Cutlery.
Part XIII. Class XXXIII.—Works in Precious Metals, and Jewellery.
" XXXIV.—Glass.
" XXXV.—Pottery.

The usual Mechanical and Scientific periodicals, Parliamentary Reports and other documents.

BRITISH PUBLICATIONS FOR FEBRUARY.

Anderson (Wm.) Practical Mercantile Correspondence, 12th edit., fcap. 8vo........	0	5	0	*Trübner.*
Boutell (Chas.) Manual of Heraldry, Historical and Popular, 8vo....	0	10	6	*Winsor & N.*
Byrne (Oliver) Dual Arithmetic, a New Art, 8vo..........	0	10	6	*Bell & Daldy.*
Chambers (R.) Book of Days: a Miscel. of Popular Antiquities (2 v.), V.1, s.-roy 8vo	0	10	6	*Chambers.*
Code of Signals, with the British Vocabulary and Marine Navy List, 1863, 8vo.....	0	10	0	*Mitchell.*
Dick (A. M.) Compendium of Mathematical Geography, post 8vo..........	0	5	0	*Longman.*
Dickson (Nich.) The Books of Lindsay & Son: an Illustration of Bookkeeping, 12mo	0	2	6	*Longman.*
Dircks (Hy.) Contribution towards a History of Electro-Metallurgy, post 8vo..	0	4	0	*Spon.*
Dod (R. P.) Peerage, Baronetage, &c., of Great Britain and Ireland, 1863, post 8vo	0	10	6	*Whittaker.*
Folkard (H. C.) The Sailing Boat: a Treatise on Boats, 3rd edit., post 8vo..........	0	12	6	*Longman.*
Heimann (A.) Introduction to the Study of German Authors: a Reading-Book, 12mo	0	4	6	*Nutt.*
Hopkinson (J.) Working of the Steam Eng. Exp. by use of the Indicator, 4th ed. 8vo..	0	12	6	*Weale.*
Hunt (J.) Stammering and Stuttering: their Nature and Treatment, 5th ed., cr. 8vo	0	2	6	*Longman.*
Huxley (Thos. H.) Evidence as to Man's Place in Nature, 8vo..........	0	6	0	*Williams & N.*
Lloyd (W. W.) On the General Theory of Proportion in Architectural Design, 4to..	0	6	0	*Weale.*
London Catalogue (The) of Periodicals, Newspapers, &c., 1863, roy. 8vo...	0	1	0	*Longman.*
Lyell (Sir Chas.) Geological Evidences of the Antiquity of Man, 8vo..........	0	14	0	*Murray.*
Pim (Commander Bedford) The Gate of the Pacific, 8vo..........	0	18	0	*L. Reeve & Co.*
Scratchley (Art.) Practical Treatise on Savings' Bank, new edit., 8vo..........	0	14	0	*Longman.*
Sutton (Francis) Systematic Handbook of Volumetric Analysis, cr. 8vo..........	0	7	6	*Churchill.*
Thom's British Directory, 1863, 8vo..........	0	12	6	*Simpkin.*
Timbs (John) Year-Book of Facts in Science and Art, 1863, fcap. 8vo	0	5	0	*Lockwood.*

AMERICAN PUBLICATIONS FOR MARCH.

Halliwell (J. O., F.R.S.) Historical Sketch of the Provincial Dialects of England, 4to	$1	50	*J. Munsell.*
Hittell (J. S.) The Resources of California, 8vo..........	1	50	*W. J. Middleton.*
Mason (S. W.) Manual of Gymnastic Exercises for School and Family, 16mo..........	0	25	*Crosby & Nichols.*
Mitchell (O. M., LL.D.) The Astronomy of the Bible..........	1	50	*Blakeman & Mason*
New (The) American Cyclopedia; Vol. XVI. 8vo..........	3	50	*Appleton & Co.*
Three Years in Chili, 12mo	0	75	*Follet, Foster & Co.*

Proceedings of Societies.

HAMILTON AND GORE MECHANICS' INSTITUTE.

The annual meeting of the members of this Institute was held in the reading room on Friday, the 27th February, 1863.

F. J. Rastrick, Esq., the President, occupied the chair.

The Secretary, Mr. Simons, read the Annual Report of the Directors, and the report of the Auditors, from which we give the following extracts :—

Number of Members.

The number of members on the 1st of February, 1862, was	475
Members have been elected during the year, numbering	189
Total	664
The number of those who have retired during the same period has been	84
Total	580
From which deduct those over six months in arrear	68
And there remain in good standing and on the books	512

The Receipts and Expenditure for the past year are as follows:

Receipts.

To Balance from last year	$142 53
" Subscriptions to 1st Feb., 1862	1,248 18
" Hall Rent " "	1,601 92
" Donations, principally in books	183 43
" Sundries	114 21
" Calalogues	1 86½
" Paper Sales	91 62
" Concert Fund	226 95
" Show Cards	8 00
" Pamphlet Fund	93 30
	$3,712 00½

Expenditure.

By Cash paid for Magazines	$57 92
" " Newspapers	320 96½
" " Building Account	473 18
" " Insurance	86 80
" " Gas Account	462 40
" " Outstanding Debts	290 49
" " Salaries	613 02
" " Incidental Expenses	79 96
" " Concert Expenses	76 45
" " Interest Account	596 84
" " Wood Account	85 14
" " Postage Account	82 16
" " Printing Account	38 24½
" " Book Account	303 78
" in hand	144 65½
	$3,712 00½

Final Balance.

Dr.	
Cash on Hand 1st February, 1863	$144 65
Library	2,650 00
Furniture	2,612 00
Building Account	19,584 33
	$24,990 98
Cr.	
Mortgages	$11,897 44
Interest due on same	360 00
Outstanding Debts	613 69
Original Contributions	12,119 85
	$24,990 98

Library.

"The number of volumes added to the Library during the year has been		305
Of which, 103 were purchased and 202 were donations		2,702
Total		3,007
From which however must be deducted those sold at Auction, being either duplicates or incomplete	177	
And other duplicates which have been exchanged for works of equal value	91	
		268
The number of volumes in the Library on the 1st inst. was therefore		2,737

"The number of volumes issued during the year has been 6,380; daily issue over 20 volumes.

"Although the Library does not exhibit a large increase in numbers of volumes, the exchanges and additions which have been made have improved the standard of the books which partially fill its shelves.

"The Superintendent, Mr. Rutherford, continues to discharge the duties of his office to the entire satisfaction of the Board; indeed, not a little of the success now connected with the working of the Institute is attributable to his exertions, courtesy, and business habits.

"From the following tabular statement of the progressive increase of the revenue of the Institute for the last five years, it will be seen that the revenue from Subcriptions alone is more than double of what it was in 1859.

	Hall Rent.	Subscriptions.	
Year ending Feb. 1, 1859,	$903 00	$617 00	=$1520.
" " 1860,	907 00	755 90	= 1662.
" " 1861,	1149 00	939 00	= 2088.
" " 1862,	1288 00	1087 00	= 2375.
" " 1863,	1601 00	1248 00	= 2849.

"The Directors congratulate the members of the Institute upon the more prosperous state of its affairs, as evinced by its increased number of subscribers, its better Library, and its revenue, which, notwithstanding the fact that the annual grant from the Great Western Railway has not yet been received, shows a considerable increase over that of the previous year. These gratifying circumstances lead the Directors to hope that their successors may have a still better report to give at the expiration of their term in office."

The report also gives a list of names of 46 gentlemen who have donated books to the Library during the year, to the value of $178 90; a list of 44 newspapers and magazines supplied to the Reading Room, gratuitously, by the publishers; and of 54 such publications subscribed for by the Institute.

The report of the Directors was adopted, when the following gentlemen were elected office-bearers for the ensuing year: *President*, F. J. Rastrick, *Vice-President*, A. Macallum, *Directors*, Dr. W. Craigie, Alex. Stuart, H. M. Melville, Thos. Simons, S. Sharp, C. W. Meakins, T. B. Harris, T. McIlwraith and Wm. Michael.

Votes of thanks were unanimously passed to the President, Vice-President, Directors and Superintendent for their valuable services rendered to the Institute during the year; and also to the several publishers and others for the various donations made to the Library and Reading Room.

Dr. Craigie spoke of the action taken at a meeting of the Toronto Mechanics' Institute, which had resolved to petition the Legislature to transfer the funds, now granted to the Electoral Division Societies in cities, to Mechanics' Institutes and Horticultural Societies, so that suitable education might be imparted at small cost to those who desire it, and he hoped that similar action would be taken by this meeting. He also laid on the table petitions to the different branches of the Legislature on the subject.

Mr. Macallum briefly alluded to the importance of establishing evening classes for education in Science and Art, but regretted that the Institute did not afford the requisite accommodation. The alley-way at the side of the building, which was now an intolerable nuisance, could easily be turned into class-rooms, if the municipal authorities would allow of its being made use of by the Institute, and he hoped that steps would immediately be taken to bring about such a result.

The meeting then adjourned.

New Barometer.

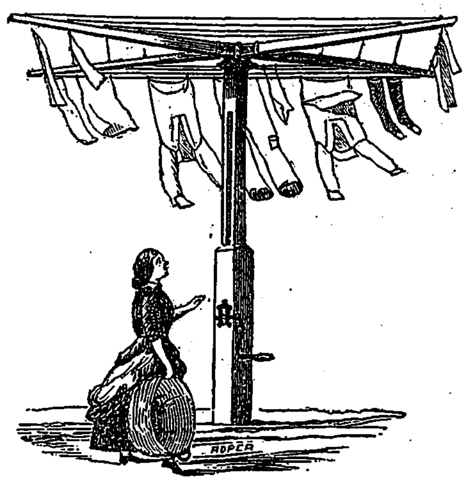
At a recent meeting of the Manchester Literary and Philosophical Society, Dr. Joule described a barometer for measuring small atmospheric disturbances. It consists of a large carboy connected by a glass tube, with a miniature gasometer formed by inverting a small platinum crucible over a small vessel of water. The crucible is attached to the short end of a finely suspended lever, multiplying its motion six times. When the apparatus was raised two feet, the index moved through one inch; hence he was able, in serene weather, to observe the effect corresponding to the elevation of less than one inch. The barometer is placed in a building, the slated roof of which affords, without perceptible draught, free communication with the external atmosphere. In this situation it was found that the slightest wind caused the index to oscillate, a gale occasioning oscillations of two inches, an increase of pressure being generally observed when the gusts took place.

Patent Laws and Inventions.

RECENT CANADIAN INVENTIONS.

We place before our readers two views of a new Clothes Dryer, invented by Mr. R. H. Oates of this city, and patented the 12th day of January of this year. The first view represents the dryer closed down receiving the clothes; the other view shows

the dryer when elevated with the clothes to dry.



Description of Machine.

A box post made of one and a-half inch plank, eight feet long, and seven inches square, leaving a three and a-half inch square hole in the centre. This box post is placed three feet in the ground, leaving five clear feet above. An inside post three and a-half inches square, eight feet long, fills up the square hole in the box post. On the top of this inside post revolve four wooden arms with three or four lines stretched round the arms to hold the clothes. On one side of the inside post is a cast iron rack made fast. On the box post is a cast iron shaft and pinion wheel working into the said cast iron rack. A cast iron crank with handle is made fast on the pinion wheel shaft to raise up and down the clothes. Nine turns of the crank elevates the clothes eleven feet and a-half feet from the ground.

Advantages of this Machine.

Ease in putting on and taking off the clothes; likewise the ease of elevating high, causing the clothes to dry quick, and keeping them clear of any thing moving through the yard.

VENTILATING A CELLAR.

A correspondent of the *Scientific American*, says:—

"In my sitting-room, immediately over the cellar, I have a small cast iron air-tight, wood-burning stove, with 3½ feet of 6-inch pipe connected through a thimble with the chimney-flue at about 1 foot from the stove. I have made a T-connection with the stove pipe with pipe of the same size, passing through the floor, and reaching to within 1 foot of the cellar floor. At the top of this pipe, close to the connection with the stove pipe, there is a valve which regulates the draft of cool air taken from the cellar. The opening in the floor is ½ inch larger than the pipe.* The vacuum produced in the cellar by the draught in the chimney-flue draws air down from the chambers through the space around the pipe in the floor. My cellar, which was before damp, is now as dry and pleasant as any room in my house. Formerly, articles placed in my cellar soon became mouldy, and were spoiled for want of ventilation."

ABRIDGED SPECIFICATIONS OF ENGLISH PATENTS.

2096. A. Vignon. *Improvements in the means and apparatus for extinguishing fire, either on land or water.* (A communication.) Dated July 23, 1862.

The patentee claims,—1. The employment of a solution of carbonic acid gas, in water, either at a high or low pressure, for extinguishing fires on land or on board vessels. 2. The construction and employment of apparatus, either portable or fixed, for extinguishing fires, in which a solution of carbonic acid gas in water is prepared and stored up, and whence such solution is ejected with sufficient force without the aid of pumps.

2099. R. Bell. *Improvements in the manufacture of bricks.* (A communication.) Dated July 23, 1862.

This invention consists in certain improvements in the manufacture of bricks, by means of which they are enabled to register with each other in the process of building, and to bind the work together in such a manner that it shall form a mass incapable of being riven asunder or cracked. The bricks are to be formed with projections or tongues across or along one surface, and with grooves or recesses of corresponding size on the opposite side whereby they may be laid down on the other with the aid of a small quantity of mortar or Portland cement, in such order as to fit or bind together the upper layer with the lower layer, and to tie each other longitudinally and crosswise, so as to prevent any lateral or transverse deviation or fissure occurring in the work. With regard to bricks for arches, a similar system of construction is adopted, by means of which it is evident that centres will not be required n the construction of arches and vaults, for as soon as one single layer of bricks has been thrown across the arch the series may be continued by inserting the second layer into the first, into which it will register and be self-supporting, and so on with the entire length of arch, or tunnel, or vault.

2176. W. E. Newton. *Improvements in lubricating compounds.* (A communication.) Dated July 31, 1862.

This consists in the production of a lubricating compound or fluid composed of coal oil obtained in a natural state, or simply by artificial distillation combined with caoutchouc, and with or without the addition of water.

2197. J. Higgin. *An improved substitute for cow-dung used in printing and dyeing textile fabrics or yarns.* Dated August 5, 1862.

The patentee has discovered that certain alkaline salts, namely, the tungstates and molybdates, may be used for neutralizing acid phosphates and arseniates without any insoluble compound being precipitated, and, consequently without any loss or waste of phosphoric or arsenic acid. The compound salts thus produced forms a convenient substitute for cow-dung in the dunging process, without the disadvantages found inseparable from the old phosphate of lime and soda.

Selected Articles.

ON RADIATION THROUGH THE EARTH'S ATMOSPHERE.

BY JOHN TYNDALL, Esq., F.R.S.

Nobody ever obtained the idea of a line from Euclid's definition that it is length without breadth. The idea is obtained from a real physical line drawn by a pen or pencil, and, therefore, possessing width; the idea being afterwards brought, by a process of abstraction, more nearly into accordance with the conditions of the definition. So also with regard to physical phenomena; we must help ourselves to a conception of the invisible by means of proper images derived from the visible, afterwards purifying our conceptions to the needful extent. Definiteness of conceptions, even though at some expense to delicacy, is of the greatest utility in dealing with physical phenomena. Indeed, it may be questioned whether a mind trained in physical research can at all enjoy peace, without having made clear to itself some possible way of conceiving of those operations which lie beyond the boundaries of sense, and in which sensible phenomena originate.

When we speak of radiation through the atmosphere, we ought to be able to affix definite physical ideas, both to the term "atmosphere," and the term "radiation." It is well known that our atmosphere is mainly composed of the two elements, oxygen and nitrogen. These elementary atoms may be figured as small spheres scattered thickly in the space which immediately surrounds the earth. They constitute about 99½ per cent. of the atmosphere. Mixed with these atoms we have others of a totally different character; we have the molecules, or atomic groups, of carbonic acid, of ammonia, and of aqueous vapour. In these substances diverse atoms have coalesced to form little systems of atoms. The molecule of aqueous vapour for example, consists of two atoms of hydrogen united to one of oxygen; and they mingle as little triads among the monads of oxygen and nitrogen, which constitute the great mass of the atmosphere.

These atoms and molecules are separate; but in what sense? They are separate from each other in the sense in which the individual fishes of a shoal are separate. The shoal of fish is embraced by a common medium, which connects the different members of the shoal, and renders intercommunication between them possible. A medium also embraces our atoms; within our atmosphere exists a second, and a finer atmosphere, in which the atoms of oxygen and nitrogen hang like suspended grains. This finer atmosphere unites, not only atom with atom, but star with star; and the light of all suns, and of all stars, is, in reality, a kind of music propagated through this interstellar air. This image must be clearly seized, and then we have to advance a step. We must not only figure our atoms suspended in this medium, but we must figure them vibrating in it. In this motion of the atoms consists what we call their heat. "What is heat in us," as Locke has perfectly expressed it, "is in the body heated nothing but motion." Well, we must figure this motion communicated to the medium in which the atoms swing, and sent in ripples through it with inconceivable velocity to the bounds of space. Motion in this form unconnected with ordinary matter, but speeding through the interstellar medium, receives the name of "Radiant Heat;" and, if competent to excite the nerves of vision, we call it "Light."

Aqueous vapour was defined to be an invisible gas. Vapour was permitted to issue horizontally with considerable force from a tube connected with a small boiler. The track of the cloud of condensed steam was vividly illuminated by the electric light. What was seen, however, was not vapour, but vapour condensed to water. Beyond the visible end of the jet the cloud resolved itself into true vapour. A lamp was placed under the jet at various points; the cloud was cut sharply off at that point, and when the flame was placed near the efflux orifice the cloud entirely disappeared. The heat of the lamp completely prevented precipitation. This same vapour was condensed and congealed on the surface of a vessel containing a freezing mixture, from which it was scraped in quantities sufficient to form a small snowball. The beam of the electric lamp, moreover, was sent through a large receiver placed on an air-pump. A single stroke of the pump caused the precipitation of the aqueous vapour within, which became beautifully illuminated by the beam; while, upon a screen behind, a richly-coloured halo, due to diffraction by the little cloud within the receiver, flashed forth.

The waves of heat speed from our earth through our atmosphere towards space. These waves dash, in their passage, against the atoms of oxygen and nitrogen, and against the molecules of aqueous vapour. Thinly scattered as these latter are, we might naturally think meanly of them as barriers to the waves of heat. We might imagine that the wide spaces between the vapour molecules would be an open door for the passage of the undulations; and that, if those waves were at all intercepted, it would be by the substances which form 99½ per cent. of the whole atmosphere. Three or four years ago, however, it was found by the speaker that this small modicum of aqueous vapour intercepted fifteen times the quantity of heat stopped by the whole of the air in which it was diffused. It was afterwards found that the dry air then experimented with was not perfectly pure, and that the purer the air became, the more it approached the character of vacuum, and the greater, by comparison, became the action of the aqueous vapour. The vapour was found to act with 30, 40, 50, 60, 70 times the energy of the air in which it was diffused; and no doubt was entertained that the aqueous vapour of the air which filled the Royal Institution theatre, during the delivery of the discourse, absorbed 90 or 100 times the quantity of radiant heat which was absorbed by the main body of the air of the room.

Looking at the single atoms, for every 200 of oxygen and nitrogen there is about 1 of aqueous vapour. This 1, then, is 80 times more powerful than the 200; and hence, comparing a single atom of oxygen or nitrogen with a single atom of aqueous vapour, we may infer that the action of the latter is 16,000 times that of the former. This was a very astonishing result, and it naturally excited opposition, based on the philosophical reluctance to accept a result so grave in consequences before testing it to the uttermost. From such opposition, a discovery, if it be worth the name, emerges with its fibre strengthened,—as the human character gathers force from the healthy antagonisms of active life. It was urged that the result was, on the face of it, improbable; that there were, moreover, many ways of accounting for it, without ascribing so enormous a comparative action to aqueous vapour. For example, the cylinder, which contained the air in which these experiments were made, was stopped at its ends by plates of rock-salt, on account of their transparency to radiant heat. Rock-salt is hygroscopic; it attracts the moisture of the atmosphere. Thus, a layer of brine readily forms on the surface of a plate of rock-salt; and it is well known that brine is very impervious to the rays of heat. Illuminating a polished plate of salt by the electric lamp, and casting, by means of a lens, a magnified image of the plate upon a screen, the speaker breathed through a tube for a moment on the salt; brilliant colours of thin plates (soap-bubble colours) flashed forth immediately upon the screen, these being caused by the film of moisture which overspread the salt. Such a film, it was contended, is formed when undried air is sent into the cylinder; it was, therefore, the absorption of a layer of brine which was measured, instead of the absorption of aqueous vapour.

This objection was met in two ways. Firstly, by showing that the plates of salt, when subjected to the strictest examination, show no trace of a film of moisture. Secondly, by abolishing the plates of salt altogether, and obtaining the same results in a cylinder open at both ends.

It was next surmised that the effect was due to the impurity of the London air, and the suspended carbon particles were pointed to as the cause of the opacity to radiant heat. This objection was met by bringing air from Hyde Park, Hampstead Heath, Primrose Hill, Epsom Downs, a field near Newport, in the Isle of Wight, St. Catharine's Down, and the sea-beach near Black Gang Chine.

The aqueous vapour of the air from these localities intercepted at least seventy times the amount of radiant heat absorbed by the air in which the vapour was diffused. Experiments made with smoky air proved that the suspended smoke of the atmosphere of West London, even when an east wind pours over it the smoke of the city, exerts only a fraction of the destructive powers exercised by the transparent and impalpable aqueous vapour diffused in the air.

The cylinder which contained the air through which the calorific rays passed was polished within, and the rays which struck the interior surface were reflected from it to the thermo-electric pile which measured the radiation. The following objection was raised:—You permit moist air to enter your cylinder; a portion of this moisture is condensed as a liquid film upon the interior surface of your tube; its reflective power is thereby diminished; less heat, therefore, reaches the pile, and you incorrectly ascribe to the absorption of aqueous vapour an effect which is really due to diminished reflection of the interior surface of your cylinder.

But why should the aqueous vapour so condense? The tube within is warmer than the air without, and against its inner surface the rays of heat are impinging. There can be no tendency to condensation under such circumstances. Further, let five inches of undried air be sent into the tube—that is, one-sixth of the amount which it can contain. These five inches produce their proportionate absorption. The driest day, on the driest portion of the earth's surface, would make no approach to the dryness of our cylinder when it contains only five inches of air. Make it 10, 15, 20, 25, 30 inches; you obtain an absorption exactly proportional to the quantity of vapour present. It is next to a physical impossibility that this could be the case if the effect were due to condensation. But lest a doubt should linger in the mind, not only were the plates of rock-salt abolished, but the cylinder itself was dispensed with. Humid air was displaced by dry, and dry air by humid in the free atmosphere; the absorption of the aqueous vapour was here manifest, as in all the other cases.

No doubt, therefore, can exist of the extraordinary opacity of this substance to the rays of obscure heat; and particularly such rays as are emitted by the earth after it has been warmed by the sun. It is perfectly certain that more than ten per cent. of the terrestrial radiation from the soil of England is stopped within ten feet of the surface of the soil. This one fact is sufficient to show the immense influence which this newly-discovered property of aqueous vapours must exert on the phenomena of meteorology.

This aqueous vapour is a blanket more necessary to the vegetable life of England than clothing is to man. Remove for a single summer-night the aqueous vapour from the air which overspreads this country, and you would assuredly destroy every plant capable of being destroyed by a freezing temperature. The warmth of our fields and gardens would pour itself unrequited into space, and the sun would rise upon an island held fast in the iron grip of frost. The aqueous vapour constitutes a local dam, by which the temperature at the earth's surface is deepened; the dam, however, finally overflows, and we give to space all that we receive from the sun.

The sun raises the vapours of the equatorial ocean; they rise, but for a time a vapour screen spreads above and around them. But the higher they rise, the more they come into the presence of pure space, and when, by their levity, they have penetrated the vapour screen, which lies close to the earth's surface, what must occur?

It has been said that, compared atom for atom, the absorption of an atom of aqueous vapour is 16,000 times that of air. Now, the power to absorb and the power to radiate are perfectly reciprocal and proportional. The atom of aqueous vapour will, therefore, radiate with 16,000 times the energy of an atom of air. Imagine, then, this powerful radiant in the presence of space, and with no screen above it to check its radiation. Into space it pours its heat, chills itself, condenses, and the tropical torrents are the consequence. The expansion of the air, no doubt, also refrigerates it; but, in accounting for those deluges, the chilling of the vapour by its own radiation must play a most important part. The rain quits the ocean as vapour; it returns to it as water. How are the vast stores of heat set free by the change from the vaporous to the liquid condition disposed of? Doubtless in great part they are wasted by radiation into space. Similar remarks apply to the cumuli of our latitudes. The warmed air, charged with vapour, rises in columns, so as to penetrate the vapour screen which hugs the earth; in the presence of space, the head of each pillar wastes its heat by radiation, condenses to a cumulus, which constitutes the visible capital of an invisible column of saturated air.

Numberless other meteorological phenomena receive their solution, by reference to the radiant and absorbent properties of aqueous vapour. It is the absence of this screen, and the consequent copious waste of heat, that causes mountains to be so much chilled when the sun is withdrawn. Its absence in Central Asia renders the winter there almost unendurable; in Sahara the dryness of the air is sometimes such, that though during the day "the soil is fire and the wind is flame," the chill at night is painful to bear. In Australia, also, the thermometric range is enormous, on account of the absence of this qualifying agent. A clear day, and a dry day, moreover, are very different things. The atmosphere may possess great visual clearness, while it is charged with aqueous vapour, and on such occasions great chilling cannot occur by terrestrial radiation. Sir John Leslie and others have been perplexed by the varying indications of their instruments on days equally bright—but all these anomalies are completely accounted for by reference to this newly-discovered property of transparent aqueous vapour. Its presence would check the earth's loss; its absence, without sensibly altering the transparency of the air, would open wide a door for the escape of the earth's heat into infinitude.

SUBMARINE TELEGRAPH.*

A continuous wire was joined up from London to the island of Corfu, a distance of nearly 2,000 miles, but as the wire had necessarily to be suspended from hundreds of poles, extending over such a great distance, and where, perhaps, at every

*Abstract of a paper read before the Society of Arts by Mr. T. A. Meesey.

connection a small amount of electric fluid would escape, the charge would not last out to reach its destination without some additional assistance on the road. It, therefore, becomes necessary in such operations to refresh and invigorate the lightning, as in the old slow time a man would water his horses on the road, or as the Brighton "Age" would, in its then wonderful journeys, "change horses in half a minute."

To provide this assistance, instruments called "relays" were placed at different intervals along the line, the object of which was to receive the nearly exhausted current of electricity, revive it instantaneously with additional strength, and send it on to the next relay, and so on till it arrived at its destination.

In order to fully realise this wonderful achievement, we will trace the progress of a message along the route from London to Corfu.

The transmitting instrument in connection with the battery generating the electricity is set in motion. A flash of electricity is liberated, and wings its way along an insulated wire, under the busy streets of London, and under the now quiet turnpike roads to Dover, then under the surging waves, through the submarine cable, peacefully lying at the bottom of the Channel, to Calais, where it mounts up to land again, traverses the intermediate country to Paris, picks up a relay of electricity charged from a local battery in waiting to revive its now languishing strength, and re-invigorated, pursues its silent and instantaneous flight through cities and towns without stopping, but every now and then receiving assistance and new life, till it arrives at Turin; thence on to Genoa, from whence with increased power it dashes through the submarine cable, 100 miles in length, to Corsica, rushes over this island in the quickness of a thought, descends again into the sea, across the Straits of Bonifacio to Sardinia, up on land again, through villages and over the Gallura Mountains, where the deadly malaria lurks that killed so many men in its construction, to the easternmost point of this island; then again taking a header through another submarine cable lying at the bottom of the deepest part of the Mediterranean to Malta, over its rocky ridges to the other side, from whence it finally flashes through another submarine cable under the sea to its destination, Corfu, doing the whole distance of 2,000 miles in two seconds and-a-half, and passing over, in its transit, some of the highest mountains in Europe, as well as five times descending more than a mile's depth into the ocean.

But the coming back of this mysterious agent is still more wonderful than its guided transit along the wire; for there it has an operator philosopher, guide and friend to direct its course, but now it returns home again, not along a conductor supplied by man's ingenuity, but alone through the earth. "The world is all before it where to choose," for after it has reached its destination, and recorded its symbolic mission, it is transmitted down a wire, sunk in the earth for that purpose, to find its mysterious way back to the spot from whence it started, and passes up another wire similarly placed in the ground, again into the presence and power of the operator; for, until it has arrived at home, the electric circuit is not completed, and no signal is given.

Wave after wave of electricity was transmitted, until the whole message of some twenty words had been communicated to the island of Corfu, the transit of the whole occupying three minutes; then a brief interval, and click, click, the serpentine length of paper unwinds itself, containing the reply, which came back in even less time than the message sent.

Having now briefly reviewed the subject of submarine telegraphs generally, and the Atlantic in particular, with some, I trust, pardonable digressions, I shall proceed to sum up my conclusions in as few words as possible.

1. First, then, with respect to the original cable, I cordially acquiesce in the resolutions arrived at by the committee appointed by the Board of Trade, that, "the failure of the enterprise was to be attributed to the original design of the cable having been faulty, owing to the absence of experimental data; to the manufacture having been conducted without supervision; and to the cable not having been handled, after manufacture, with sufficient care.

2. That intercommunication between the old and the new world, by means of an Atlantic telegraph, is not more desirable than feasible.

3. That the accidents which befel the first cable arose from causes which there is every reason to believe will not occur again.

4. That the improvements in the process of manufacture of the cable itself, as well as of the insulating medium, have greatly enhanced the value of both, and in the latter case to an extent of 10 to 1, as compared with the insulating medium of 1857.

5. That we are no longer exposed to the mercy of the elements in the matter of laying and paying out the cable, as on the previous occasion, the "Great Eastern" having obviated the serious danger and difficulties hitherto experienced from the pitching of vessels employed in these operations, and by which, through the strain upon the cable, success was rendered highly problematical.

6. That the above conclusions are borne out by the liberal proposals of those eminent and successful cable manufacturers, Messrs. Glass, Elliott and Co., to which I have before alluded.

7. That recent experiments fully demonstrate the possibility of working a one-wire cable commercially; but that it will be cheaper in the end for the Atlantic company to lay a cable consisting of at least, two if not three wires, because there will be such an influx of messages both ways, that, if a one-wire cable only is laid, telegrams will have to wait two or three days before they can be sent. The chances of success would also be greatly enhanced by having more than one wire.

8. That of all the various routes contemplated, that between Ireland and Newfoundland presents advantages superior to any other.

9. That considering the issues at stake, the present state of the science of telegraphy, and the fact that it has already interfered to point out the causes of the former failure, and the remedies to be adopted in any subsequent undertaking, Government might reasonably be called upon for another grant, at all events, to perfect the experiments necessary in a second and successful attempt to lay down the Atlantic telegraph.

10. That the time has fully come when that attempt should be prosecuted in the interests, not only of science, commerce, and social economy, but also from a regard to the still higher interests of civilization and humanity.

In conclusion, I indulge a fervent hope that those who have sacrificed so much already, and who, nevertheless, are prepared to risk still more to carry out this great work, may in the end reap the full reward of all their noble enterprise. Should, however, that pecuniary reward be wanting, of this I am well assured, that the consciousness of being pioneers on the high road to peace and amity among the nations of the earth, and above all, between the different families of the great Anglo-Saxon race, will be to them a source of satisfaction alike deep and permanent. I shall only add the expression of a wish, in which I am certain all here will join, that our kindred across the Atlantic diverted from scenes of fratricidal strife and bloodshed, may ere long turn their thoughts back again to such subjects as I have been discussing this evening.

THE RELATIONS OF DEATH TO LIFE IN NATURE.*

1. The creation of a plant, with "seed in itself," as Moses states in his concise description, was the simultaneous institution of life and death. It was the establishment of an in-coming and out-going stream, to be in constant flow as long as the kingdoms of life should last—an incessant renewal of youth, and rejection of age.

All life is a system of progressing changes in cycles—the germ first, then the embryo, the young, the adult, and last, the seed or germ again, to continue the rounds; the adult sooner or later disappearing from the field of progress, and then from the sphere of existence. Death is implied in the the very inception of the scheme.

2. Death is also in every step of the process of life. For the living being is throwing off effete matter during all its growth; the change is constant, so that with each year a large part of the material in our bodies has passed away and been replaced by new. Moreover, the force which had been expended in making a cell, or particle of tissue, goes to form a new cell or particle when the former dies, and was needed for the new formation going on. Force is not lost or wasted, but used again. There is unceasing flow, and in this flow is life; its cessation is death.

3. The kingdom of plants was instituted to turn mineral matter into organic, that the higher kingdom of animals might thereby have the means of sustenance; for no animal can live on mineral matter. Now this living of animals on plants implies the death of plants.

Again the rocks of the globe are, to a great extent, made of the remains of dead animals.

5. The chemistry of life, also, requires death. Life in the plant or animal, if sustained by means of nutriment, and continued consuming, with no compensating system, would evidently end in an exhaustion of any finite supply. A perfect adjustment was therefore necessary, by which nutriment should sustain life, and life contribute to nutriment. Now, the plant takes up carbonic acid from the atmosphere, appropriates the carbon, and gives back the oxygen. Yet there is no tendency to an exhaustion of the atmospheric carbonic acid, or an over supply of the oxygen; for death strikes an exact balance.

The death of the plant ends in a change of all its carbon into carbonic acid again. Thus the plant as it grows, decomposes carbonic acid to get carbon, and then ends in making, by its decay, as much carbonic acid, and restoring it to the atmosphere. Thus, through death, the compensation is perfect. The atmosphere loses only what it receives. Again, as just now observed, the plant, in growing, gives oxygen to the atmosphere; but in the decay of the plant, the carbonic acid formed is made by taking up the same amount of oxygen. The same carbon that lost oxygen when becoming a part of the plant, takes it again at the decay. The system is hence complete. The parts play into one another in perpetual interchange. Take death and decay out of the system, and it would not work.*

Animal life as above stated, was made to subsist on plants. But the scheme is so well managed as not to disturb the balance made by the vegetable kingdom alone. For all the carbon of animals comes from plants. The plants which feed an animal, and which, on decay, would have turned into carbonic acid, become changed into carbonic acid in the course of the growth of the animal, so that the whole amount of carbonic acid which the animal makes, is only what the plants would have made if left to natural decay. Thus the higher kingdom of life is introduced and sustained, and yet the balance remains undisturbed. The system is perfect.

5. Again, one part of the animal kingdom, though every class, is made to eat up the other, part, or at least to live on it. The flesh eaters are of all grades, low and high, from the infusorium and maggot, to the lion and man. Some take what is already dead, or decomposing; others kill and eat. On this subject we observe:—

(1.) Death is the system of nature—death from earthquake, lightning and all moving forces, as well as by natural decay; and the creation of carnivorous animals was hence in harmony with the system.

(2.) Various noxious animals are held in check by the carnivorous species.

(3.) By means of flesh-eaters, the diversity of animal species subsisting on a given amount of vegetation is vastly increased, and a wider expansion is given to the animal kingdom.

(4.) Putrefaction of the dead is prevented by a multitude of scavengers, who, at the same time, turn the flesh into food for the vegetable kingdom; and

* By J. D. Dana.

* In early geological history, as is generally believed among geologists, there was an excess of carbonic acid in the atmosphere; and this excess was removed to a great extent by the growth of plants during the carboniferous era. Vegetable material decaying under water does not undergo complete decomposition, and thus part of the carbon is left behind; and so far as there is carbon left, there is an actual abstraction of carbonic acid from the atmosphere by the process of growth. The coal era was a period of great marshes; and by this means the needed purification of the atmosphere was effected, preparing it for land life. The amount abstracted now by the same means is very small, and may be balanced by the carbonic acid from mineral sources and volcanoes.

thus plants feed animals, and animals feed plants —one of Nature's circles again.

The last two principles mentioned are of profound importance. The vegetable kingdom is a provision for the storing away or magazining of force for the animal kingdom. This force is acquired through the sun's influence on forces acting on the plant, and so promoting growth; mineral matter is thereby carried up to a higher grade of composition, that of starch, vegetable fibre and sugar, and this is a state of concentrated or accumulated force. To this stored force animals go, in order to carry forward their development; and, moreover, the grade of composition thus rises still higher, to muscle and nerve (which contains nitrogen in addition to the constituents of the plant), and this is a magazining of force in a still more concentrated or condensed state. There are thus five states of stored force in nature—three in the *inorganic*, the solid, liquid, and gaseous; and two in the *organic*, the vegetable and animal.

Now what is the provision to meet this last and highest condition? Is this magazined force left to go wholly to waste by the death and decomposition of the plant-eaters? Just the contrary: an extensive system of flesh-eaters was instituted which should live upon it, and continue it in action in sustaining animal life among successive tribes. The flow is taken at its height, and the power is employed again and again, and made gradually to ebb. What is left as the refuse is inorganic matter —the excremented carbonic acid, water, and excrements, with bones or any stony secretions present. Thus the flow starts at the inorganic kingdom, and returns again to the inorganic. Moreover in the class of quadrupeds (mammals), the flesh of the herbivores (cattle) is among the means by which the animal type is borne to the higher grade of the carnivores. The true carnivores, besides, take the best of meat. Whales may live on the inferior animals of the sea; but the large forest flesh-eaters take beef and the like.

There is another admirable point in this scheme. The death and decomposition of plant-eaters would have rendered the waters and air locally destructive to life. It is well known that it is necessary in an equarium to have flesh-eaters along with the plant eaters and plants. And when in this way the living species are well balanced, the water will remain pure, and the animals live on indefinitely. If not so balanced, if an animal is left to decay, the waters become foul, and often everything dies. Putrefaction and noxious chemical combinations follow death, because, in life, the constituents, carbon, hydrogen, nitrogen, and oxygen, are in a constrained state, at the fartherest remove from what chemical forces alone can produce; and hence when the restraint is taken off at death, the elements fly into new conditions, according to their affinities. Now animals, dying yearly by myriads, are met at death by an arrangement which makes the dead contribute anew to animal life as its aliment, and in this very process the flesh ultimately comes out innocious, and is at least so far changed to the inorganic condition as to be the best of fertilizers for plants. Part of the process of getting rid of the great fleshy carcases consist in their minute subdivision by the feeding of larvæ of insects, and, further, an infinitesimal division of the insect as the food of the infusoria,—which again may become the nutriment of larger animals, to go the rounds once more. But the final result is, as stated, *plant-food*—largely through the processes of digestion and excretion, but part through the decomposition of animals that are two small and readly dried up to prove offensive.

Thus the carnivorous tribes were necessary to make the system perfect.

One word respecting the necessity of a check on the excessive multiplication of individuals. Nature as just now observed, is a system of constantly varying conditions—of changing seasons, winds, clouds: of inconstancy, under law, in all forces and circumstances. At the same time, the growth of a species requires the nicest adjustment of special conditions in each case. On this account the reproductive powers in species is, in many cases, excessively large, so that the various accidents to which the eggs or young would be exposed, might not cause their extermination. This provision opened the way for occasional excessive multiplication, and requiring a check from carnivorous races.

6. Finally, could death be prevented in a system of living beings in nature without a constant miracle? How should the earth be managed to secure it against death? It would be necesssary to still the waves, for they are throwing animals and plants on the shores to die; to still the winds for they are ever destroying in some parts of their course: to still even the streams and rains. With winds and waves, not only helpless animals and plants, but men's houses, ships, and boats, would now and then be destroyed, in spite of prudent precaution and holy living. But if we still the waves, the winds, and the streams, the earth would rot in the stagnation, and here again is death.

We thus learn, that in life the fundamental idea of reproduction implies death; the processes of life are the processes simultaneously of death; the stability of the system of life requires death; the vegetable kingdom is made to feed animals, and the animal kingdom, while containing plant-eaters, demands flesh-eaters for its own balance, for the removal of the dead, and to make out of dead flesh the proper food for plants, thus to pay its debt to the vegetable kingdom. Hence death pervades the whole system of life in its essence and physical laws; and it could not be prevented in a world of active forces except by a constant miracle; and this would be an annihilation of nature, that is, a system of law.—*Siliman's Journal of Science and Arts.*

THE MANUFACTURE OF WAX CANDLES AT CLICHY.

By J. TURGAN, of the *Moniteur Universal.*

The manufacture of stearine* is essentially French—from the first works of MM. Chevreul and Gay-Lussac in 1824, and the industrial realisation of MM. de Milly and Motard in 1835, down to the

* Stearine (from *stear*, suet) that part of oils and fats which is solid at common temperatures. The nature of these substances was first made known by Chevreul, in 1823, who showed that they were compounds of peculiar acids, with a base termed glycerine; of hese compounds the chief are stearine, margarine and oleine (from *elaion*, oil).

recent idea of decorating the wax candle, and making it an ornament which completes the luxury of candelabra. The numerous inconveniences of the candle, its nauseous odor, its insufficient consistency, its smoky wick requiring snuffers, added to the high price of wax, stimulated the inventors in their researches. As in a great number of industrial operations, the spirit of fraud guided the wax chandlers. They commenced by making tallow candles coated with a layer of wax; but the fraud was discovered quickly enough by the fœtid emanations arising therefrom. They mixed with the wax different kinds of flour—beans and horse chesnuts. They also tried to fabricate tallow candles which appeared to be wax; but this did not appear to give very satisfactory results. The wick was always smoking, the snuffers necessary, and the candle disguised under divers names, continued to soil the hands, to stain the clothes and furniture. It was reserved for MM. Chevreul and Gay-Lussac to discover, in 1825, the principles by the aid of which MM. de Milly and Motard, assisted by the researches of M. Cambacéres, should, in 1835, lay the foundation of an entire industry, one of the most flourishing of the present day—the fabrication of the stearine wax candles. The trials of experience had been fruitless; it was the methodical researches of chemistry which triumphed with *éclat*. They had a portion of tallow analysed, which they found composed of three acids—stearic, margaric and oleic, with a base termed glycerine, the first acid fusible at 60°, the second at 47°, and the third liquid at 0. They analysed the three acids, and they discovered that they were formed of carbon and hydrogen, together with a certain quantity of oxygen, which was the most favourable composition to produce by combustion a brilliant light. In fact, they contained hydrogen, the most inflammable of gases; oxygen, without which all combustion is impossible; and, finally, carbon, the disengagement of which puts in suspension in the flame of the hydrogen little corpuscles which, passing to a reddish-white, give brilliancy to the flame. Of the three acids, two were, by their physical properties, that is to say, by their consistence and whiteness, in the best condition possible for making the wax candles. The third, on the contrary, by its extreme fluidity, was an obstacle that it was necessary to surmount. Its reddish color, the volatile matters that it contained, the smoke that is disengaged by an excess of carbon, rendered it unadapted for luxurious lighting. These principles once laid down, we perceive the means they used to obtain, in their purity, the stearic and margaric acids; they mixed the melted tallow with a base of soda or potash, and they thus got rid of the glycerine, which could be of no use. By adding a certain quantity of sulphuric acid, which has an extreme affinity for bases, they formed a sulphate of soda, and the three fat acids were set at liberty in a state of paste; the solid crystals of the stearic and margaric acids containing in their network the fluid oleic acid. An energetic pressure disengaged it mechanically, and the two acids remained pure in a state of white matter like alabaster, solid enough, and fusible at about 55 deg. Towards 1835, the application commenced on a great scale at the *Usine de l'Etoile*, extended into Germany, where the Austrians distinguished themselves notably in the manufacture, which established itself in England, where the powerful firm of Price & Co. produce immense quantities of fat acids, and now all nations make large quantities of the stearine wax candle, more or less handsome, particularly since the economical method of distillation has allowed a decrease in the price by making use of matters of less value, such as palm oil, and all kinds of inferior fats.

The manufactory at Clichy, the description of which will give us an opportunity of furnishing a detailed account of the making of wax candles, is the last established. The company has studied rather to introduce processes for the purpose of bringing the manufacture to perfection, than in the erection of one of those immense buildings that swallow up the bulk of the capital, leaving little or no residue for the carrying on of the business. The tallow factory, however, is necessarily a vast edifice, and its chimney is one of the highest. The only object of the company has been the manufacture of irreproachable products, and to raise the title of its manufacturing mark. Let us see what series of operations resulted from this. The first is the melting of tallow. No industrial manipulation is more infectious or more nauseous—none more repulsive for the neighbours. The factories where it is carried on are built as far as possible from the centre of habitation. The authority for establishing them is a sort of privilege. The use of the tallow candle, which scarcely extended to the south, where oil was abundant and very cheap, was extended, and became perfected in the north of Europe—in particular, in France. The butchers themselves melted their fat and made candles of it. Towards 1016, a corporation of chandlers was established by Philip I., re-arranged towards 1470, and kept its privileges to the end of the last century. Moreover, without being as much shackled and as well regulated as formerly, it is, however, practised under a very active superintendence of the police prefecture and of the supervision of the butchers of Paris. The tallow arrives at the manufactory *en branche*, that is to say, as it comes from the offal-houses and butcheries. The sooner it is brought the better, especially in summer; in fact, the fat-matter is enveloped in fibrous cells, eminently liable to putrefaction, which decomposes rapidly at their contact. In order to disengage these fat-matters from the membranes which envelop them, two means are employed: the most ancient consists in melting the tallow in copper pans, then to extract, by strong pressure, all the liquid part, and having for remainder *des cretons* (the residue of tallow) in little loaves. The procedure employed at Clichy consists in reducing the fusion of the tallow into a liquid with an addition of sulphuric acid, which destroys completely all the membranes, and brings with it a certain quantity of glycerine, when they pour the mixture into large vats, capable of containing four or five thousand kilogrammes; they barrel up the tallow, after having previously added a little water and sulphuric acid; they introduce then a current of vapour at 133° by means of a serpentine pipe, perforated with little holes; ebullition commences, the cells open, the membranes are destroyed. At the end of four hours, it is poured into crystallising copper vessels and left to cool; they then rack and leave it to settle in forms of wood named *jalots*. The tallow then takes the form of cone-shaped loaves. By this process they withdraw about 88 to 100 per cent. of useful matter, already white, purified from all organic bodies not belonging to it, leaving a little glycerine, which it is necessary to get rid of altogether. This object they obtain by saponification, that is to say, by the combination of the fat acids of the tallow with a basis. The tallow coming out of the melting-house in a state of stearine, the margarate and oleate of glycerine are collected in gigantic vats, capable of containing 10,000 kilogrammes of matter, and are put in fusion by means of an injection of vapour, admitted by a serpentine pipe at the bottom of the vat. They add lime, dissolved in water, which soon seizes on the acids, forms stearate, margarate, and oleate of lime. All the glycerine is racked and poured into the Seine, for they have not yet learned how to utilise it economically. The soap obtained by this operation is of a greyish white, and of great hardness. In order to separate the fat acids from it, they pound it, and throw it into great vats, lined with lead, where is already to be found the quantity of sulphuric acid necessary to neutralise the lime; a pipe heats this medley by an injection of vapour, and soon a sulphate of lime is formed, drawn by its weight to the bottom of the vat, whilst the stearic, margaric, and oleic acids remain on the surface, presenting the appearance of a pretty thick liquid, of a reddish colour, and of a disagreeable smell. A series of canals, of a calculated inclination, conduct into little flat reservoirs, made of iron plates and disposed on props, one beyond the other. The liquid fills the superior reservoir, that which flows falls into the immediately inferior scale, then into the third, and so on in continuation. In cooling, the matter coagulates, and, drawn from the mould, forms a large square of four centimètres in thickness, by fifty-eight in length and thirty-five in breadth. From these squares it is now necessary to withdraw the oleic acid that they contain. Chemistry is not competent to perform this task; mechanism can succeed, thanks to the hydraulic press. But it is not one simple pressure which can obtain this result; two, three, and even four, are necessary. The first is a cold pressure. The tablets, placed horizontally, enveloped in coarse woollen stuff, horse hair, or even ordinary hair, called *malfils*, and separated by plates of iron, are piled up under on ordinary hydraulic press, and compressed as much as possible. A great part of the oleic acid contained between the crystals of the two other acids passes off in a reddish-brown liquid, and descends to the cellars, where we shall find it by-and-by. The cakes, now flattened, still contain a large quantity of the proscribed liquid, as one can judge by the large red spots which mottle them. They then submit them to a final pressure, which should entirely purify them. This pressure, which is accompanied by heat, is effected by means of ingenious machinery, brought to perfection by M. Galabrun. The tablets are placed vertically between horse-hair *étreindelle* covered with a printer's blanket, separated from each other by one of plated iron, composed of two plates supported by props, leaving between them sufficient space for an injection of vapour, which maintains them at about 80°. The hydraulic pressure is made horizontally, and, thanks to the clever invention of M. Galabrun, the vapour continues to penetrate between the plates by pipes, made of caoutchouc.

The oleic acid squeezed out runs into the inferior part of the preparation, and goes to find that which has deposited itself there in escaping from the cold presses. There they make it pass through felt filters, in which it still leaves a good part of the stearic and margaric acids, which again undergo pressure. The oleic acid, disembarrassed of the useful matters which it contained, is casked, given up to commerce, or employed in the manufacture of soft soap; for the Clichy manufactory, like almost all others, possesses an important soap-making department. The tablets of stearic and margaric acids, freed by the hot pressure of the greater part of the oleic acid, are afterwards employed in making wax candles. The first kinds for commerce are made thus. At Clichy the loaves undergo a second hot pressure, and they then obtain the stearic acid almost pure, of a beautiful white, translucent, and deprived of odour, of a pretty good resistance to fusion, presenting, in fact, all the qualities which in commerce have given it the name of *extra-double*. In coming out of the presses, the stearic acid is purified by several washings in water, at first acidulated, to purge from all foreign matter, and particularly from the oxide of iron by oxalic acid, to take away every trace of lime, then clarified *à l'albumine*. Thus purified, it crystallises with an excessive rapidity, which would present a great difficulty in the making of the wax candle if it were not remedied. Formerly, they added in the coppers a small quantity of arsenic acid, which prevented, it is true, the crystallisation, but was decidedly injurious to the consumer. In a great many stearine manufactories they employ the old candle-moulds, slightly warmed, before pouring in the liquid stearic acid. At Clichy they make use of apparatus by means of which they can easily make 40,000 wax candles per day. These apparatus have the advantage of being heated and cooled at will, of being made use of by women and children, and owe their rapidity of execution to the clever mechanism which supplies them with a series of wicks without end. In coming out of the mould, the wax candles are exposed to the air on frames of lattice-work; there they undergo the discolouring influence of light, and become of an absolute whiteness. After forty-eight or sixty hours of exposure, according to the season, they bring them to the cutting-machines. An endless chain, composed of parallel staffs, receives each wax candle at the moment in which, escaping from the notches of the cylinder, it is cut by a circular saw, warmed by friction against two corks, which press it lightly. During their passage on the endless chain, a brush, animated by a to-and-fro movement, washes and rubs the candles, on which fall some drops of water charged with carbonate of soda; from thence they pass over the polisher, a machine in which the brushes are replaced by plugs of flannel, which gently polish the cylindrical surface, and give it an agreeable brightness. The wax candles are then finished; but their fate varies according to their degree of perfection. Those which contain any defect whatever are broken and again melted down; those which satisfy in every way the experienced eye of the persons charged with the examination of them, are recognised by the house and judged worthy of bearing its mark. By means of a little apparatus in silver, maintained at a heat of about 212° F., they impress the word "Clichy," and the wax candle goes to the packing room with its fellows, or, if it present an unusual degree of perfection, it is judged worthy of being decorated. The idea of decorating the wax candle, in ornamenting it with paintings, escutcheons and figures, is an elegant and graceful invention, that the proprietor of the manufactory, M. Casinberche, has developed with the same certainty of purpose which distinguishes all his enterprises. Nothing in the world is more unseemly than to see in rich candelabra with costly carvings, or even in small delicate porcelain candlesticks, finely painted, thick ugly candles, very unjustly called wax candles, yellowish and dropping grease, with a shrivelled-up wick, emitting with an unpleasant smoke an insipid and repulsive odour.

Exaggerating the contrary idea, the manufactory of Clichy has had the foolish prodigality to paint on the wax candles some *chefs d'œuvre*, signed by the best names of the manufactory of Sèvres: the ever-to-be-regretted Mme. Laurent, and other artists of talent, have executed charming subjects on stearine. But we must not forget that the ornamental painting has its laws. Execute on the wax candle ornaments of every kind—flowers, birds, chimeras, but do not trace portraits thereon. Nothing could be more tasteful—nothing more simple and more natural than to have on the wax candle of which you make use your armorial bearings, if you have inherited them from your ancestors —your figure when you can draw one, or, at least, choose it well. This kind of ornamenting is still expensive, but researches actively and cleverly conducted will soon lead to a reduction in the cost, which will generalise the custom in every house priding itself on elegance.

We cannot leave the Clichy manufactory without complimenting its young director, M. Léon Droux, who has organised an establishment so important, so industriously carried on, without false luxury, without any falsely-speculated expense; economising on the constructions, and laying out money for the machines and apparatus. We shall encourage him to persist in this undertaking, and, above all, to maintain, unspotted, the rising reputation of the distinguishing mark of his house.

PAPER.

Any fibrous vegetable or animal substance may be manufactured into paper. Cotton and linen rags are now chiefly employed for this purpose, because they are more easily and cheaply converted into pulp, and furnish a better article when finished than other fibrous materials. But the comparatively high price of rags, and the enormous and constantly increasing demand for cheap paper, have lately compelled manufacturers to turn their attention to other sources of supply. At present, it may be useful and interesting to review the efforts which have been made from time to time, during the last century and a half, to manufacture paper from the fibres of different species of vegetable substances.

Down to the beginning of the eighteenth century, cotton, flax, and hemp were the only materials, except rags, used in this manufacture. In 1719, Réaumûr published an essay, in which he desired some one to make the experiment of producing paper from wood. The idea was suggested to his mind by his observing that the fabric of wasps' nests was procured from wood. The same idea was revived in 1734, by Seba, a Flemish writer on natural history, who directed attention especially to seaweed, Muscovy mats, and similar substances. It was not, however, until A.D. 1751 that any experiments were made to find a substitute for cotton and linen rags. In that year, M. Guettard, in France, published the results of his experiments upon the bark, leaves, wood, &c., of different plants, shrubs, and trees. Five years later (1756), on account of the scarcity of rags, the German papermakers attempted to use straw, and a treatise was published upon the method of reducing vegetables into pulp, and bleaching it. In A.D. 1765, Jacob Christian Schaffers, of Ratisbon, published a work, in octavo, containing specimens of different sorts of paper made without the use of rags, among which were the *cotton du peuplier*, hornets' nests, sawdust, moss, beech, willow, aspen, mulberry, clematite, and pine; hop-vines, the peelings of grapevines, hemp, the leaves of aloes, lily of the valley, arroche, moth-wort, *masse d'eau*, barley straw, cabbage stumps, thistle stalks, burdock, conferva, wheat straw, broom corn, and Bavarian peat. Seven years later (in 1772), the same inventor published a book containing upwards of sixty specimens of paper, made of different materials, the result of his own experiments. A copy of this remarkable book is in the Smithsonian Institution Library, at Washington, U. S. The success of Schaffers, and the scarcity of rags, probably led other inventors to make experiments; for we find that, in 1776, a volume was printed in France upon white paper made from the bark of the linden or basswood, and at the end of it there were about twenty specimens, made from as many different kinds of vegetables. Shortly after this time, experiments were made at the manufactory of M. Leorier, at Bruges, Belgium, upon many vegetables, but without finding any substance that could be converted into good paper as cheaply as rags. The results of these experiments were given to the world in the works of the Marquis de Villette, printed in London A.D.1786, on paper made of marsh-mallow, and at the end are specimens, in single leaves, of paper made of the nettle, hops, moss, reed, couch grass, three species of conferva, spindle trees, wayfaring tree, elm, lime, two kinds of willow, poplar, oak, burdock, coltsfoot, and thistle. In 1788, Mr. Greaves, of Warrington, made paper from the bark and leaves of willow twigs; and in the same year a French manufacturer obtained a silver medal from the Society of Arts for paper made from the bark of the sallow tree. He used about 600 lbs. of bark for the production of 44 quires. In 1790, Samuel Hooper, of London, made paper from leather cuttings and refuse paper. In 1800, the first useful paper made entirely from straw was used in a book printed by Burton, of London, and containing an historical account of the different materials used, from the earliest times to the invention of paper, for conveying ideas and perpetuating the remembrance of events. A copy of this work was presented by the Marquis of Salisbury to King

George III. In 1801, M. Seguin patented in France, a method of manufacturing paper from straw, hemp, and other vegetables, but his intention was not put in practice. In the same year (1801), Matthias Koops succeeded in making 'the most perfect paper from straw, wood, and other vegetables, without the addition of any other known paper stuff.' He printed a book on these fabrics. He asserted that paper could be made from any vegetable substance. He patented a method of manufacturing paper from straw, hemp, thistles, waste and refuse of hemp and flax, and different kinds of wood and bark. A patent for making paper from the husks of Indian corn was granted, in 1802, to Burgess Allison and John Hawkins; and in the same year M. Lozanna offered to the Society of Agriculture at Turin a number of specimens of paper made of the *papas* of the *seratula ervensis*, the *carduus nutans*, and of the bark of the erigerone of Canada. On the other side of the Atlantic, so anxious were the American Company of Booksellers for the introduction of new materials into the trade, that they offered a gold medal worth £10 for the greatest quantity of paper, fit for printing, not less than fifty reams, of other materials than linen, woollen, or cotton rags; and a silver medal worth £4 for the greatest quantity of wrapping paper, not less than forty reams, made of other materials than those then used for that purpose.

Paper was made from straw in 1812, at Caen, in France, by Gabriel Desetable. In 1818, the *Prince of Wales Island Gazette* was printed upon paper made from rice straw. In 1820, M. Huygeron, of France, patented a method of manufacturing paper from pure straw, and produced a white and durable paper. In the same year the Government of Denmark granted a patent for five years to the inventor of a mode of making paper from seaweed. In 1821, M. Janbeaurt, of Marseilles, obtained a patent in France for the production of paper from beaten hemp and liquorice wood. In 1823, a paper-mill was erected in England for manufacturing wrapping paper from old sacks, ropes, &c. A method of making paper of beaten hemp, macerated in water was patented in France by M. Laferet in 1824; and in the same year W. Van Houten, a Hollander, patented in France a mode of manufacturing paper and felt from moss. Also in England, in the same year, J. M'Guaran patented a mode of producing wrapping paper from hop-vines; and A. Nesbit patented a mode of producing paper from moss. About this time, brown wrapping and bleached and unbleached paper was made in England, from pine shavings, by Mr. Sharp, in Hampshire. In 1827, Louis Pierre Poisson, of Paris, obtained a patent in France for a process of making paper of liquorice root and pasteboard scraps, mixed together and macerated. In the same year, Pierre Balilliat, of Macon, in France, patented a chemical substance as a substitute for linen rags; and Benjamin Deraux, of Paris, obtained a patent for a mode of making paper and pasteboard from hemp. Also in 1827, in England, a patent was granted to Count de la Garde, for a method of making paper from the bullen or ligneous parts of textile plants. In 1828, William Magaw manufactured at Chambersburg, Pa., U. S., paper from straw and blue grass. In the same year, Elisha Hayden Collier patented, in America, a mode of making paper from a marine production, called *alva marina*. In the same year a patent was granted in France to Cyprian Prosper Brard, of Fréjus, for a mode of making paper from decayed wood; also a patent was taken out by Bernadotte and others for a mode of producing paper from animal substances, called aporentype. Cobbett, in his 'Treatise on Corn,' written in 1828, says, 'This 21st November, I have not only received a parcel of paper made of the husks of my corn, but have sent it to have printed on it the title-page of this very book.' In the following year a process of making paper from leather cuttings mixed with refuse paper, similar to that used in 1790 by Samuel Hooper, of London, was patented in France by Rondeaux & Henn. In 1829, two patents were granted in the United States for modes of using new materials—one to Messrs. Sprague, of Fredonia, New York, for a mode of making paper from the husks of Indian corn; and another to Louis Bomeisler, of Philadelphia, for making paper from straw. In France, in the same year, we find also two patents granted for modes of using new materials—one to M. Jullien, for a method of making paper from hay; and a second M. Quirini, for a mode of producing paper from straw and refuse pasteboard. In 1829, paper was made in Mexico from the magney, said to be equal to that made of rags, and Congress passed a law prohibiting the Government from using any other paper. In the same year, the paper-makers of Turin produced paper from willow twigs, poplar, &c., which was extensively used. At the same time excellent packing paper was manufactured by Magaw's process at Chambersburg, Pa, U. S., at less than 9s. per ream, imperial size, and was machine made. In the following year, M. Brard, a French officer, produced coarse paper from the pine tree. Also, in 1830, Wooster & Holmes, of Meadville, Pa. U. S., patented an improvement in the mode of making paper from wood; and in the same year the *Crawford Messenger* was on one occasion printed upon paper manufactured of the lime and aspen, by Joseph E. Holmes & Lewis Wooster, of Ohio.

Since 1830, the number of patents granted in this country and abroad for new materials for paper, or new methods of manufacturing other materials than cotton, linen, and woollen rags, is so great, that even the titles, dates, &c., of them would cover several columns of a daily newspaper. Only the more important or curious facts can be noticed in this sketch. In 1835, paper of an inferior quality was made in Ireland from peat. At the French Exhibition in 1839, there were specimens of paper made of the leaves of the banana tree; and about the same time powerful works were established at Havana, in Cuba, by M. Rocques, to wash and convert those leaves into pulp for the European market. The absolute necessity of strong bleaching with this pulp caused, however, a waste of more than one-third of the original weight, and consequently rendered the article too expensive. In 1845, a patent was obtained in this country for producing paper from gutta percha and an intermixture of other substanees. In 1850, specimens of paper were made in Algiers from the dwarf palm. The stalks and roots of the waterbroom (spartam) were converted into a pulp for the manufacture of paper by Jean A. Farina, of Paris, in 1852. In 1853, Messrs. B. A. Lavender & Henry Lowe, of Baltimore, Md., U. S., produced samples of paper from southern canes and white pine shavings, and stated that they could make by their process, from reeds or wood, as the main staple, paper worth from 6*d.* to 8*d.* per lb., at a cost not exceeding 3*d.* per lb. In 1854, patents were granted in Great Britain for modes of making paper from the stalks of the hop-plant, from Brazilian grass, and from twitch or couch grass. Also, in 1854, specimens of paper made of straw were exhibited at the World's Fair in New York, which for whiteness, strength, and beauty of finish, appeared to be nearly equal to rag paper. Its patentees and manufacturers, Messrs. Cooper & Mellier, stated that they had succeeded in making a better article from straw than any of the 150 inventors who had patented, previously, similar processes in England and France alone. In the same year an inferior quality of straw paper, costing about 4½*d.* per lb., was used in printing a Philadelphia daily paper, the *Ledger*, which had then a circulation of from 20,000 to 30,000 a day. In 1854, George W. Beardslee, of Albany, U. S., produced a strong, soft, and beautiful paper from basswood. In the same year, Alexander Brown patented in this country a mode of making paper from the bracken, or fern plants of Scotland. Also, about the same time, Mr. C. Hill manufactured paper in England from the stems and roots of horseradish, the rush and flag, and the vegetable remains of manures. In 1854, Herr von Parmewitz, inventor of a process of making wool from pine trees, presented to the King of Prussia specimens of paper made of the same material. Both of M. Parmewitz's inventions are in successful operation at the present time. Paper was also made at this time from the red pine, at Giersdorf, which was said to be so white and good as to be fit for writing and drawing, and needed no sizing because of its resinous quality. In 1856, extraordinary efforts were made to procure new materials for paper, and to effect their conversion into a pulp which could compete with pulp from rags. The *Times* in that year offered a reward of £1,000 for the discovery of a new and readily available material. Mr. Watts patented a mode of producing paper from wood shavings and bran, which he expected would take this premium, but was not successful. About the same time, Messrs. Watt & Burgess, of London, made elaborate experiments for the conversion of woody fibre into pulp, and it was asserted that paper made of this material would cost only £24 a ton, which if made of rags would cost £40. In the same year, very clean and firm paper was manufactured from the common garden hollyhock by J. N. Nevin, of Scotland; and from undressed flax by James N. Kellogg, of Louisville, Kentucky, U. S. In 1855, a mill was erected by Geo. W. Beardslee, at Little Falls, N.Y., for the purpose of making paper from basswood and other ligneous substances. Another mill was erected in the same year at Waterville, Maine, U.S., by Charles H. Hall, for manufacturing paper from the barks of trees, and good wrapping paper was produced at a moderate cost. In 1856, paper made by Henry Lowe, of Baltimore County, Maryland, U. S., was used in printing the *Baltimore County Advocate*. Mr. Low's mill was employed exclusively in the manufacture of wrapping paper. Also, in 1856, Edward Grantless, a marble cutter, of Glasgow obtained a patent for a mode of making paper of *stone*. In the same year, wrapping paper was made at a mill near Hagarstown, Maryland, U. S., from the refuse leather scrapings of curriers shops. About the same time, paper was made from similar materials by Lasare Ochs, of Belgium. In this year also, the *Overland Mail*, published at Hong Kong, was printed on stout and heavy paper, of fine texture, made from the shavings of bamboo. In the same year, pasteboard was produced from beetroots, by an English manufacturer. Also, at the same time, a beautiful white paper was made by Dr. Terry, of Detroit, U. S., from a species of moss very common on Isle Royal and other localities in the region of Lake Superior.

In this review of the attempts made to obtain paper from other materials than rags, we have mentioned only a few of the most important facts. Many thousands of inventors and manufacturers, many years of incesant labour, and millions of pounds sterling, have been expended in experiments upon wood, straw, and similar substances; but the problem of obtaining good paper, at a moderate cost, from raw vegetable fibre, is yet only partially solved. Neither straw, nor wood, nor any similar material, has superseded linen and cotton rags. The raw fibre papyrus was used for thirteen centuries; the reign of rags has now lasted twelve and a half centuries; and it appears probable that the time for returning again to some cheap vegetable fibre is fast approaching. Whoever shall first succeed in solving the problem, by introducing into common use, among paper manufacturers, the raw fibre of any vegetable, will deserve a large reward, and a high rank among the benefactors of mankind.—*Technologist.*

ARTIFICIAL ILLUMINATION.

Dr. Frankland recently delivered a lecture on "*Artificial Illumination,*" at the Royal Institution of Great Britain. He commenced by stating that it was ten years since he delivered a lecture on the same subject at the Royal Institution. In the interval very little improvement had taken place in the means of producing artificial light; but recently a new illuminating agent had been introduced, and the magneto-electric light had received an important application. The lecturer exhibited and described the electric light; and went on to speak of Dr. Faraday's discovery of the magneto-electric spark, and its application to lighthouse illumination. Professor Holmes' machine, he said, had been in operation at the South Foreland lighthouse for twelve months without breaking or failure. The electric light, however, was of no use for domestic purposes; its cost was too great, and it was only available where light of the greatest intensity was required. Some improvements, in the form of mechanical contrivances for keeping the carbon poles at proper distances, have been introduced, as instanced in the clock-work arrangement in Dubosc's lamp; and the electric light had received a modification in the substitution by Mr. Way of mercury for the carbon poles. The light emitted from the mercury poles Dr. Frankland showed to be far inferior to that emitted from the carbon points. He stated that it only amounted to one twentieth; but the battery used was not the best adapted to procure a good light, as it required quantity rather than intensity.

In gas manufacture very little improvement had been made in these ten years. Sulphur was still found in it in considerable and, perhaps undiminished quantity. It was present in the form of bisulphide of carbon, which was irremovable by the ordinary modes of purification. A method, however, had been devised by the Rev. Bowditch, the Vicar of Wakefield, by which almost all could be easily got rid of. It consisted in passing the gas over hydrate of lime heated to 400°: by this means the sulphur of the bisulphide of carbon was brought into the form of sulphuretted hydrogen, which was removed by the ordinary oxide of iron purifier. On the small scale, this process was found to take away nearly all the sulphur, and it might, perhaps, answer as well on the large. The lecturer stated that he had never found more than nine or ten grains of sulphur in 100 cubic feet of gas, but he was aware that others had found as much as 40 or 50, and he believed the quantity commonly present was about 20 grains in the hundred cubic feet. Recently, a new illuminating constitutent, acetylene, had been discovered in coal gas, and the discovery may, perhaps, entirely revolutionise the manufacture. At present a comparatively low temperature is employed in the manufacture of gas; but an intense heat is favourable to the production of acetylene. It is produced when carbonic oxide and carburetted hydrogen are stongly heated together. It would be necessary, the lecturer said, to investigate how this body could be produced on a large scale to increase the illuminating power of gas; but the subject was still *in embryo*. Acetylene may be obtained from gas by passing it through a solution of subchloride of copper, by which means, what might be called an acetylide of copper was produced, in the form of a brick-red precipitate. The lecturer showed that this acetylide of copper was decomposed on the addition of dilute hydrochloric acid, and that the acetylene envolved burnt with a brilliant flame. The acetylide of copper is an explosive compound, which has been the cause of several accidents where gas has been passed continuously through copper tubes. It is exploded by friction, percussion, and by heat.

The use of animal and vegetable oils for illuminating purposes had received no new development in the past ten years; but a new source of light of the greatest importance has been discovered in the oils obtained by the distillation of coals and shales at low temperatures. This oil, however, has recently found a formidable rival in the oil distilled by nature herself. The native oil of the United States and Canada is obtained in immense quantities: from the latter country alone as much as 20,000,000 of gallons have been procured, which, it has been calculated, would give as much light at 180,000,000 lbs. of sperm candles. The importance of these oils could not be overrated. Some accidents had resulted from their use, apparently from careless manufacture, it being necessary to remove the lighter constituent oils before they could be used with perfect safety. The lecturer explained that it was necessary to burn these oils, as well as Young's paraffin oil, in lamps made of some badly-conducting material like glass, so that the oil in the reservoir might not become heated; and he showed the explosiveness of some oils and non-explosiveness of others when heated to 120°.

The following diagram exhibits the illuminating equivalents of various materials, showing the quantities of other substances required to give the same amount of light as would be obtained from one gallon of Young's paraffin oil:—

Young's paraffin oil.........	1·00	gallon.
American rock oil (1)......	1·26	"
" " (2)......	1·30	"
Paraffin candles...............	18·6	pounds.
Sperm "	22·9	"
Wax "	26·4	"
Stearic "	27·6	"
Composite "	29·5	"
Tallow "	39·0	"

The comparative cost of light was shown in a diagram exhibiting the comparative cost of the light of twenty sperm candles, each burning ten hours, at the rate of 120 grains per hour:—

	s.	d.
Wax	7	2½
Spermacceti	6	8
Tallow	2	8
Sperm oil...........................	1	10
Coal gas............................	0	4¼
Cannel gas..........................	0	3
Paraffin candles....................	3	10
" oil..........................	0	6
Rock oil	0	7⅝

It was thus shown that paraffin and rock oils are the best sources of light for domestic purposes, inasmuch as they give the largest amount of light with the least development of heat.

Amount of carbonic acid generated, and heat evelved, per hour, in obtaining a light equal to twenty Sperm candles, each burning 120 grains an hour:—

	Carbonic acid in cubic feet.	Units of heat.
Tallow	10·1	100
Wax.................. / Spermaceti..........	8·3	82
Paraffin	6·7	66
Coal gas................	5·0	47
Cannel gas..............	4·0	32
Paraffin oil .... / Rock "	3·0	29

The lecturer then entered upon the chemical and physical principles concerned in the production of light, explaining that it was produced by the incandescence of certain solids or vapours. The incandescence of liquids is never used, and in one case only—the mercurial light—is a vapour employed. In all other cases it is the incandescence of solid carbon. He explained, too, how the light was affected by the pressure of the atmosphere and temperature; a greater pressure of the atmosphere brought more solid particles to incandescence, and a fall of one inch in the barometer involved a reduction in illuminating power of 5 per cent. When the air supplied to the burner, or the gas itself is heated, an increased illumination is obtained with the same consumption of gas amounting to 62 per cent.; or, for an equal amount of light, the saving of gas would amount to 33 per cent.

Dr. Frankland then explained the conditions of a good light, and showed that it was necessary that light for ordinary purposes should contain all the colours of the spectrum, as the light obtained in all common modes does. He showed the effects of the monochromatic light of sodium on colours. Solar light, he stated, was defective in showing colour, as it was incapable of showing tints brought out by sodium, and that, consequently, a pigment containing these tints would be invisible by daylight. Sunlight passed through a variety of vapours, of which sodium was one, and the lecturer showed how the sodium band in the spectrum was obscured when the light passed through the incandescent vapour of sodium. Solar light, however, had one great advantage over that from all other sources, inasmuch as it was attended with less heat, and, consequently, ordinary daylight produced less discomfort in the eye than any artificial light.

The disadvantage of having heat associated with light was, that the greater part of it was absorbed by the humours of the eye, there causing pain and discomfort. The behaviour of the eye towards the heat of a moderator lamp had been examined, and the following diagram represented the amount reflected and absorbed by the various media:—

	Eye of ox.	Eye of sheep.	Eye of pig.
Rays reflect'd at surface of cornea	4	4	4
Rays absorbed by cornea.........	59·8	56·9	57·5
" " aqueous humour.	19·2	—	20·6
" " crystalline lens...	6·8	30·7	7·2
" " vitreous lens......	2·5	—	1·6
Rays which penetrate to retina .	7·7	8·4	9·1
	100·0	100·0	100·0

In conclusion, Dr. Frankland alluded very briefly to the difficulties in the way of applying the discoveries of science to every-day purposes. It was thirty years ago that Reichenbach first made paraffin and paraffin oil in the laboratory, and twenty years elapsed before any practical use was made of them. It was thirty years since Dr. Faraday showed the magneto-electric spark. How long shall we have to wait for any development of thermo-electricity, or the direct transformation of heat into light by electricity? In the magneto-electric machine the transformation was accomplished by the intermediate transformation of heat into mechanial force, by which there was experienced a loss of nine-tenths of the heat force. The man of science was rewarded by the truths which he discovered: it was not his function to apply these truths to useful purposes. That required quite different powers of mind.

NOTES ON INDIAN CORN.

Indian corn or maize may be said to be the staple and peculiar crop of North America. The export of this grain is fast becoming the *hydra* of famine throughout the world. Whenever Europe is short of food, America stands ready to supply the deficiency with the excess of her corn crop. No plant is more beautiful, and none so well suited to the varieties of the climate; for anywhere between the 43rd degree of north latitude and a corresponding parallel south, it may be grown in the greatest perfection. Its ease of hybridation has produced innumerable varieties, suited to every kind of soil and every degree of temperature, from the time-enduring hard corn of Canada, to the Stowell's evergreen for boiling in the unripe state. We have it suited to summers, varying from three to six months; thus we find it in the North requiring but half the time for its growth that is requisite in the South, and still in each locality are kinds appropriated to the different lengths of summers. We may say of the Indian corn crop of America what Mr. Webster said of the turnip crop of England, that "its failure for three successive years would nearly bankrupt the nation." Fortunately, however, by the recent improvements in agriculture they are enabled, in the growth of this crop, almost to defy drought, and to render every variety of soil suitable for the production of maximum quantities. It is the food of both man and animals; and even its stalks, by proper treatment, have been rendered equal in value to the whole labour and expense of raising the crop. To it America is indebted for her fine beef, her plentiful supply of pork, and also as an article of human food. It is the plant of the country: and the olive branch might with propriety be taken from the claw of the national emblem, and the Indian corn plant substituted in its place.

In proof of the American origin of this plant, it may be stated that it is still found growing in a wild state from the Rocky mountains to the humid forests of Paraguay, where, instead of having each grain naked, as is always the case after long cultivation, it is completely covered with glumes or husks. Columbus found the natives of Hispaniola cultivating it in extensive fields, and those of other places first visited by him were also in possession of it. The first Englishmen by whom it was cultivated were they who settled in Virginia in 1760.

In England all cereals used as food for man are called "corn;" but those who first landed in America from that country found a new cereal, also used as food by the aborigines. They added it to their catalogue of corn with the prefix of Indian. As it had been for ages the main dependence of the Indians, so it has since become the staff of life to thirty millions who now occupy their places, while it is gradually making its way to favour among other millions in Europe. The pioneers give no account of the Indians having many varieties of corn. They seem to have been content with what they had. The higher civilization of the whites quickly seized on the new cereal, recognised its value as food for man and beast, improved its culture, multiplied its varieties, made its increase a hundred-fold, and, by the invention of machines for shelling it rapidly and grinding it cheaply, raised it to the position of a staple so important, that if the whole wheat crop of America were suddenly annihilated, the crop alone would supply the people plenteously with food. It already equals the wheat crop of the whole. The latter can be profitably cultivated only in certain latitudes, but corn grows luxuriantly in all. The border states of the tropics refuse to yield wheat. Louisiana and Florida produce but 1,500 bushels annually, but nearly 14,000,000 bushels of corn.

The annual average wheat crop of the world is 900,000,000 bushels, of which nearly 200,000,000 may be credited to the United States. In 1850 her corn crop was over 590,000,000 bushels, and in 1860 it was fully 900,000,000, thus equalling the wheat crop of the whole earth. The varieties of corn are numerous, and are continually increasing by improvement, and the introduction of seed from one section to another. The plant hybridises with great facility. Some choice varieties have been originated in this way. It would be almost impossible to enumerate the many varieties now cultivated, or to give the reasons why one is preferred above the others.

Visitors at the recent Royal Horticultural Society's collection, had an opportunity of inspecting the greatest variety of Indian corn, perhaps, ever before exhibited here, in the collections of Mr. P. L. Simmonds, Messrs. Barr and Sugden (both of which received prize medals), and the New York State Agricultural Society. The varieties of size, colour and shape were remarkable.

With proper cultivation, in an ordinary season, the crop should not be less than 60 bushels to the acre; 100 bushels is not an uncommon yield. The New York State Agricultural Society require a yield of 80 bushels to the acre, to be entitled to a premium.

It is a remarkable fact, in connection with this subject, that, although the experience of the people of the entire American continent bears uniform testimony in favour of the palatableness, the healthfulness, and the economy of Indian corn, it is but little known to the people of those portions of Europe to whom cheap food is the great desideratum. The famine of 1847 brought it prominently into notice here, and once having tasted it, even after imperfect cooking, it has secured a perfect foothold. European chemists have discovered that corn contains 77 per cent. of nutritive matter, while wheat contains but 65. When a bushel of wheat is worth 95c., one of corn is worth 77c., nutriment alone considered; yet when corn has stood at $1 per bushel, wheat has stood at $2 50; thus, in buying wheat, we obtain, for any given amount of money, a little less than half the nutriment we obtain when buying corn. Why this disparity in price? It must be mainly sought for in supply and demand. Wheat is relished by a greater portion of the human family; it may be kept sweet more readily in any of its stages of manufacture, whether stationary or during transportation by sea or land; hence its superior commercial value. Then, all the world is familiar with it as an article of food, while not a tenth of its population ever heard of Indian corn. Wheat needs no introduction among any people, while corn has required thorough, judicious and persistent effort by European governments to induce even famishing communities to consume it.

It is well known that residents in American cities are small consumers of Indian corn, in comparison with those who live in rural districts. This is because the former do not so well understand the art of cooking it in the numerous forms of which it is susceptible. No wonder that European nations, to whom the grain and meal are novelties, should be more ignorant of their value, and should therefore refuse to consume them. But since 1855 the Prussian Government has left no means untried to ascertain the best mode of preparing corn bread. As corn meal, even when the dough is nicely risen, always falls when placed in the oven, producing an unsatisfactory bread, a multitude of experiments were tried with mixtures of potato flour, wheat, rye, and other substances. Rye flour was found to be the best. But most of these experiments were unfortunately made with meal which had soured before reaching Berlin. Finding it to be coarsely ground, the operators caused it to be ground very fine, not knowing that no kind of grain is spoiled by fine grinding except Indian corn. In spite of these discouragements, Germany is annually consuming larger quantities, as her people become better acquainted with the article. In England and Ireland it has become permanently domesticated. Its introduction has been slow, but nothing seems more certain than that a few years hence will witness an enormous European demand, not the result of famine, but of popular appreciation of this cheap and wholesome staple.

Common preference, as well as chemical analysis, proves that the round northern yellow variety contains the most nutriment, and is in all respects best adapted for the consumption of people living in the high latitudes. The white variety, by its resemblance to wheaten flour when manufactured, meets with a ready sale where the difference is not known, or where the appearance is alone consulted.

There are a great number of varieties of corn in cultivation, and these varieties have become considerably intermingled. The principal varieties, which may be distinguished by the number of rows or grains on the cob, and the colour, shape or size of the kernels, may be classified and described as follows:

1. Yellow Corn. Golden Sioux, or Northern Flint corn, having a large cob, with twelve rows of moderate sized grains; very oily. This is regarded as one of the best varieties for fattening animals, or for human food. By skilful tillage, 130 bushels have been raised to the acre, weighing 9,216 lbs. in the ear; when dry, 75 lbs. of ear gave a bushel when shelled.

2. King Philip, or the eight-rowed yellow corn. Its ears, which contain only eight rows, are longer than those of the Golden Sioux, and it will yield about the same quantity of oil. It is a hardy plant, which belongs to a high latitude; grows to about nine feet in height; stalks small; ears from 10 to 14 inches in length.

3. Canada Corn, or eighteen-rowed yellow corn, which is smaller, earlier, and more solid than any of the preceding, contains more oil than any other variety except the rice corn and the pop corn. It is exceedingly valuable for fattening poultry, swine, &c., and is grown by many in gardens for early boiling.

4. Dutton Corn. The cob sometimes grows to a length of fourteen or fifteen inches, but the grain is so compact on it, that two bushels of small ears have yielded five pecks of shelled corn, weighing 62 lbs. to the bushel. With proper management, an acre of ground will yield 100 to 120 bushels. As it is very oily, gives a good yield, and ripens early, it has always been a favourite variety for culture in the North.

5. Southern Big Yellow Corn. The cob of this corn is thick and long, the grain much wider than it is deep, and the rows unite with each other. The grain contains less oil and more starch than the Northern Flint kinds; yet its outward texture is somewhat flinty, solid and firm. It comes to maturity rather later, affords an abundant yield, and is much used for fattening animals.

6. Southern Small Yellow Corn. The ears of this variety are more slender as well as shorter than the last named; the grains are smaller, though of the same form, of a deep yellow, more firm and flinty, and contains an abundance of oil, which renders it more valuable for the purpose of shipping, or for feeding poultry or swine.

7. Rhode Island White Flint Corn. The grains of this variety are about the size and shape of those of the Tuscarora corn, but differs from them in containing an abundance of a transparent colourless oil, which may be easily seen through their clear pellucid huls. The farinaceous parts of the grains are white, and as the quantity of oil which they contain is large, the flour or meal is more substantial as an article of food, and less liable to ferment and become sour.

8. Southern Little White Flint Corn. The kernels of this variety are smaller than those of the preceding, and much resemble them in shape, but they are more firm and solid, contain more oil, and consequently are of more value for feeding poultry and swine, and for human food.

9. Dutton White Flint Corn. A variety not differing materially from the Yellow Dutton corn, except in the colour of the oil.

10. Early Canadian White Flint Corn. Cultivated principally for early boiling and roasting, while green.

11. Tuscarora Corn. The ears contain from twelve to sixteen rows of grain, which are nearly as deep as they are broad, of a dead whitish colour on the extreme end, are entirely composed within of pure white dextrine, except the germs. As it contains neither gluten nor oil, it may be profitably employed in the manufacture of starch. It is much softer and better food for horses than the flinty kind; and if used before it becomes sour, it may be converted into excellent bread. It is also an excellent variety for boiling when green, or in the milky state.

12. Fine White Flint Corn. The ears of this variety contain twelve rows of rather white, roundish, thick grains, which are filled with a snowy-white flour, composed principally of starch, but contains neither gluten nor oil. It is much used. As it possesses similar properties with the preceding variety, it may be profitably used for the same purpose. It is also an excellent variety for boiling, when green.

13. Virginia White Seed Corn. The ears of this corn, which are not very long (nor is the cob so long as those of the Big White or Yellow Flint) contain from twenty-four to thirty-six rows of very long narrow grains. These grains, at their extreme ends, are almost flat, and grow so closely together from the cob to the surface, that they produce a greater yield than any other variety in proportion to the size of the ears. They contain more starch, and less gluten and oil, than those of the Flint kinds, and from their softness they serve as better food for horses, but are less nourishing to poultry and swine. This variety ripens later, though it is more productive, than any other kind.

14. Early Sweet Corn. There are two kinds of this corn; one with the cob red, and the other white. The ears are short, and usually contain eight rows, the grains of which, when mature, are of a higher colour, and become shrivelled, appearing as if they were unripe. It contains a very large proportion of the phosphates, and a considerable quantity of sugar and gum, though but little starch. It is extensively cultivated for culinary purposes, and is delicious food when boiled green.

15. Rice Corn. A small variety, with small conical ears, the kernel terminating in sharp points, which give them the appearance of burrs; the kernels in size and shape something like rice. It contains more oil and less starch than any other kind, and when ground its meal cannot be made into bread alone, but is dry like sand. From its oily nature and peculiar size this corn is well adapted for feeding poultry.

16. Pearl Corn, commonly called pop-corn, from the fact of its being used for popping or parboiling. The ears of this variety are small, the grains are sound, of various shades of colour (8), the white of a pearly appearance; and contains with the rice corn, more oil and less starch than any other variety.

17. Chinese Tree Corn. It is a pure white variety, a very handsome ear, about ten inches long, has ten rows, grain very closely set, long and wedge-shaped, well filled out to the end of the cob, some of the grains slightly indented. One peculiarity of this corn is, the ears grow on the buds of the branches, hence its name "tree corn." It is said to yield from one-third to one-fourth more than the common varieties; when ground into meal it is handsomer and better flavoured than the common varieties of white corn. There are generally two ears on a stalk, and often three.

The foregoing embrace those species thought worthy of cultivation.—*Technologist.*

NOTES ON THE INTRODUCTION OF STEAM NAVIGATION.

Mr. Dyer stated, at a recent meeting of the Institution of Civil Engineers, that this subject, being of great importance, had engaged many able pens in tracing the origin of the several inventions and experiments that preceded the final triumph of steam power over that of wind for navigating ships; each writer claiming the honour of priority for his own country. It may be useful to state the order in which and the parties by whom the principal attempts were made to realise that object. Several letters lately appeared in the *Times*, and were thence transferred to the pages of the *Engineer*, giving a graphic account of the "first steamer in English waters," the *Margery*, built at Dumbarton, by the late William Denny, for William Anderson, of Glasgow, and passed through the canal to the Forth and thence to the Thames, where she arrived on the 23rd January, 1815." On the authority of Mr. Anderson, then, this date is fixed when the first steamboat was seen on English waters. The first steamboat, the *Claremont*, was started as a regular packet on the Hudson River, in the spring of 1807; so that the first steamer seen on the American waters was fifty-five years ago, a lapse of time that should now insure a calm view of the steps that led to this first actual success in steam navigation. It will be shown that, by a long course of persevering labours, the honour of that success must be conceded to Robert Fulton, by whom it was achieved. Whilst admitting the merits of other ingenious men long engaged in the same pursuit, it is clearly proved that, either from good fortune, or by the exercise of superior judgment and skill, the race was won by eight years' priority of steam navigation, by Fulton, on the Hudson River. In 1793, Mr. Fulton sent his plan for a steamboat to Lord Stanhope, who approved of, and thanked him for the communication. Shortly after Fulton went to Paris, and made experiments, on the French waters, with the chain floats, the duck's foot paddles, the screw or smoke-jack propellers, and with the paddle wheels, to which latter he gave the preference, and constructed a boat with them in 1803, which was the model adopted in building the *Claremont* in 1806. Mr. Dyer has sailed in the *Claremont*, and remembers the sensation created by her appearance, and the high admiration bestowed on the author of so great an enterprise. That sensation in 1807 was precisely the same as the *Margery* created among the vessels on the Thames in 1815. All attempts at steam navigation were fruitless before the invention of Mr Watt's steam-engine, his engine being the first that could be usefully applied to rotative machines on land, and, therefore, for propelling ships. The principal claims put forth by other inventors of steamboats are the following:—In France, the Marquis de Jauffroy constructed a steamboat at Lyons, in 1782, "with paddle wheels," but that this boat did not succeed is obvious, because she was not heard of until 1816, when the first Fulton boat was started to run on the Seine. In 1783, Daniel Bernoulli proposed a plan which consisted of forcing water through a tube, out at the stern of the boat. This scheme has been tried many times since, but fails on account of the defective principle of applying the force. Endless chains, with float propellers, have been many times tried, and have failed on the same ground. In 1795, Lord Stanhope made experiments with a boat on the Thames, using the reciprocating or duck's foot paddles, which also failed, from the loss of time and power by the return stroke. In 1785, James Rumsey, of Virginia, tried a boat on the Potomac, and afterwards in London, both without success; and about the same time Mr. Fitch, of Philadelphia, tried one, with paddle wheels, on the Delaware, but this boat also did not succeed, and was given up as a failure. J. C. Stevens, of New York, made experiments in 1804, with a "boat twenty-five feet long and five feet wide," which of course did no good, and was stopped as a failure, though again brought to notice as preceding Mr. Fulton's. In 1788, and 1789, William Symington, in conjunction with Patrick Millar and James Taylor, made experiments with their patents for navigating by steam, and in 1802 commenced running a boat on the canal at Glasgow, which made three miles an hour; but after many changes of her propellers and trials, the scheme was given up, and no more was heard of the steamboat of Mr. Symington until long after those of Fulton were widely spread over the American waters. In 1816, the Marquis de Jauffroy complained that the Fulton steamboat on the Seine had taken the "paddle wheels" invented by him, and used at Lyons thirty-four years before, but also abandoned by him. To this charge Mons. Royou replied in the *Journal des Debats* thus:—"It is not concerning an invention, but the means of applying a power already known. Fulton never pretended to be an inventor in regard to steamboats in any other sense. The application of steam to navigation had been thought of by all artists, but the means of applying it were wanting, and Fulton furnished them." The first ocean steamer was the *Fulton*, of 327 tons, built in 1813, and the first steamer for harbour defence was built under Fulton's direction, 2,470 tons, launched in 1814. This became the model-ship for the iron-clad batteries and rams since constructed with many changes. It will be seen by the drawings of Fulton's plans, that he had tried the several other kinds of propellers—the chain float, duck's foot, and the screw fan—before adopting the paddle wheel; for, though the screw was good in principle, it was many years before it could be constructed to act efficiently. The *James Watt* was the first boat with the screw running between London and Havre, about ten years after the advent of the *Margery*. In 1811, I endeavoured to introduce steam navigation into England, but I found a strong conviction that it would not answer in this country, our most eminent engineers saying, "We don't doubt the success of steamboats in the wide rivers and harbours of America, but in our comparatively small rivers and crowded harbours they will never answer." Even such scientific engineers as the late John Rennie, sen., and Peter Ewart, a Vice-President of this Society, both advised me to relinquish the attempt to introduce steamboats, as sure to prove a waste of time and money to no-purpose. However, when conviction came over the public mind that steam navigation would answer here—but not until after more than 5,000 tons of steamboats had been launched on the Hudson in 1816, did it so come—then began the spread of steam navigation, since extended with such marvellous rapidity and perfection as to atone for the sluggish beginning. Since nations are indebted to the genius of Watt for success in using steam power, to that of Fulton for its successful application to navigation, to Stephenson for the like success on railways, the meed of praise due to each of their names should be cheerfully awarded by all who are so largely benefited by the result of their labours. In doing this we should bear in mind, that inventions do not spring into existence perfect from their birth, like Pallas from the brain of Jupiter, but they come from the prior labours of many brains, and he is the true inventor who first collects the essence of, and gives the stamp of vitality to, those labours. In this sense the invention of steam navigation will for ever illustrate the name of Robert Fulton.—*Chemical News.*

Miscellaneous.

FLAX AND FLAX-COTTON.

At the last annual meeting of the New York State Agricultural Society, Dr. Gould, from the committee appointed to examine flax-machinery, made an interesting report. He said:

"The best soil for flax is that which is best for barley, and the best manure, phosphates, and the land should be well drained and carefully and deeply plowed, and the best for the purpose is the Michigan plow. After a few days, go over with a cultivator each way, and sow and roll the ground very smooth, and then the crop may be cut with the reaping machine. The length of straw depends upon the length of the root, and no crop is more injured by weeds. The crop is ready to pull when the bolls are filled and the lower half of the stalk turned yellow.

"It is very important to get off all the seed, else it stains the lint; and it is equally important, to make the business of flax-growing profitable, that the grower and manufacturer should be located near each other, so that the grower can sell the straw without attempting to clean it. If he rots it, he must take great care not to carry the process too far. It is now settled that mechanical and chemical operations must be combined to successfully prepare flax. A solvent is wanted, which has not yet been discovered, to dissolve the gum that holds the fibres together.

"At Lockport, N. Y., there is a chartered company in operation which pays $10 per tun for flax-straw, and makes 300 pounds of flax-cotton at a cost of $27. It goes through a great number of process, mechanical and chemical. It is first broken by fluted rollers, then hackled and worked again with rollers, then combed, steeped, boiled, washed, bleached, dried, picked, carded, roped and spun. For the coarse portions there is a great demand for upholstering purposes.

"There is also a large demand for paper stock. Indeed, there is no lack of demand, and no doubt of flax culture being profitable so long as the seed and straws can be sold near where produced at the present prices, and there will be a very large area in this State sown the coming spring."

Mr. Gould also described the Pen Yan flax machine, which puts the straw through a crushing process about fifteen minutes, and then it is beaten to shake out shives and then passed through fluted rollers, where it is combed by a toothed band. The product of a crop of nine acres of flax in Renselaer county was given at 4,237 lbs of lint.—*Genesee Farmer.*

SOLDERING

Soldering is the art of uniting surfaces of metals together by partial fusion, and the insertion of an alloy between the edges, which is called solder, it being more fusible than the metal which it unites. Solders are distinguished as hard and soft, according to their difficulty of fusion. Hard solders usually melt only at a red heat, but soft solders fuse at lower temperature. In applying solder it is of the utmost importance that the edges to be united should be chemically clean—free from oxide—and they should be protected from the air by some flux. The common fluxes used in soldering are borax, sal ammoniac, and rosin. Hard silver solder is composed of four parts of fine silver and one of copper, made into an alloy and rolled into sheets. It is quite difficult of fusion. Soft silver solder is composed of two parts of silver, one part of brass, and a little arsenic, which is added at the last moment in melting them. It will be understood that these alloys are commonly run into convenient bars or strips for use. Silver solders are used for soldering silver work, gold, steel, and gun-metal. A neater seam is produced with it than with soft solder. It is commonly fused with the blow-pipe. A strip of thin silver solder is laid on the joint to be closed, the blow-pipe is brought to bear upon it, when it melts and runs into the joint, filling it up completely. Button solder is employed to solder white metals, such as mixtures of copper and tin. It is composed of tin ten parts, copper six, brass four. The copper and brass are first melted, then the tin is added. When the whole is melted the mixture is stirred, then poured into cold water and granulated, then dried and pulverised in a mortar for use. This is called granulated solder. If two parts of zinc are added to this alloy it makes a more fusible solder. Fine gold cut into shreds is employed as a solder for joining the parts, of chemical apparatus made of platinum. Copper cut into shreds is used as a solder for iron. Hard silver solders are frequently reduced to powder, and used in that condition. Soft solder consists of two parts of tin and one of lead. An excellent solder is made of equal parts of Banca tin and pure lead; it is used for soldering tin plate, and, if well made, it never fails. The following is a useful table of solders with their fusing points:—

No.	Parts of Tin.	Lead.		Melting deg. F
1	1	25		558
2	1	10		541
3	1	5		511
4	1	3		482
5	1	2		441
6	1	1		370
7	1½	1		334
8	2	1		340
9	3	1		356
10	4	1		365
11	5	1		378
12	6	1		381
13	4	4	1 Bismuth	320
14	3	3	1 "	310
15	2	2	1 "	292
16	1	1	1 "	254
17	1	2	2 "	236
18	5	3	3 "	202

The alloy No. 8 is used sometimes for soldering cast iron and steel; the flux used for this purpose is sal ammoniac, but common resin may be employed. Gold and silver are sometimes soldered with pure tin and a flux of resin. Copper, brass, and gun-metal are soldered with No. 8 and a flux of resin or sal amoniac. The chloride of zinc is used for soldering sheet and plate iron as a flux with the same solder. Lead and tin pipes are soldered by plumbers with Nos. 6, 7, and 8, and a flux of resin and sweet oil. In soldering with soft brass, the ends of the article to be soldered are secured together by a wire, and granulated solder and powdered borax are mixed in a cup with a small quantity of water, and spread along the joint with a spoon. The article is then placed in a clear fire, and the solder melts at a bright red heat, when the article is then removed from the fire. In soldering small articles with the blow-pipe, they are supported on a piece of charcoal, or, better, pumice-stone, and the flame is ejected upon the solder. In soldering lead pipes, the parts to which the solder is not to be attached are usually covered with a mixture of lamp black and size. In soldering any articles care must be exercised to have the edges of the plates or articles perfectly clean, or the solder will not adhere. A flux is employed for the purpose of preventing oxidation. Resin and sal ammoniac, powdered and mixed together, make a good flux for copper and sheet iron soldering. In other cases, a strong solution of sal ammoniac is used to moisten the edges of the joint. Then the resin is sprinkled upon it, and the solder applied. The chloride of zinc is made by dissolving pieces of zinc in muriatic acid. It is well adapted for soldering zinc plates and pipes, and is applyed with a brush to moisten the edge of the article to be soldered. The solder is then applied in the usual way with a tool. Zinc is a very difficult metal to solder, because it is so easily coated with oxide and it also volatilises with heat.—*Mechanics Magazine.*

CAN WORK BE DONE WITHOUT BEER OR SPIRITUOUS LIQUORS.

A correspondent of the *Mining Journal* says:—Paul Bartlett is employed as a labourer at Tudhall Iron Works, Durham, and has been a teetotaller fourteen years. His employment consists in wheeling iron to the furnaces. He works nine hours per day, and five days per week. He wheels 24 tons of iron each day, 4 cwt. at a time. The distance traversed is nearly nine miles per day. He thus walks 45 miles per week of five days, wheeling in the same time 120 tons of iron. During the fourteen years Paul has driven his barrow, with its 4 cwt. of iron, not less than 630 miles, and has wheeled in the same time 87,360 tons. He can on a "pinch" place a ton weight on his barrow and wheel it several yards.

The G. W. R. R., N. R. R., G. T. Railways and the Grain Trade.

The following will show the comparative amount of produce moved by these three railways during the past and previous years:—

	Flour, Bls.	Grain, Bush.
1862	1,053,951	4,353,616
1861	829,051	4,673,796

Reducing the flour to wheat at the rate of five bushels to the barrel, the entire movement amounts to 9,623, 371 bushels, against 8,816,051 in 1861.

Copper Shoe-tips.

The *Scientific American* says, "The copper shoe-tips, now so estensively used for children's shoes, are manufactured at Lewiston, Maine. Three million pair of tips are turned out annually at the factory."

A large quantity of these articles are imported into Canada. Could they not—with our present protection tariff—be manufactured here at a fair profit?

Zinc Wash for Rooms.

Mix oxide of zinc with common size and apply it with a brush, like lime whitewash to the ceiling of a room. After this apply a wash in the same manner of the chloride of zinc, which will combine with the oxide and form a smooth cement with a shining surface.—*Artizan.*

Pittsburgh and Petroleum.

Not a barrel of petroleum had been landed at Pittsburgh three years ago. Within that space of time two millions of barrels have been delivered on the wharves of that city. The value of this quantity unrefined, amounted to $8,000,000; when refined, $17,000,000; two-thirds of the quantity were refined in Pittsburg and the vicinity. There are 60 oil refineries in that city, in which 600 persons are employed, and which in buildings and apparatus, represent a capital of $1,000,000. In these refineries 1,200,000 bushels of coal are consumed annually. From nothing this petroleum business has arisen in three years to be second only in importance to the iron trade of Pittsburgh, simply because it is the centre of the oil-producing region of the United States and possesses superior facilities for importation, exportation and refining.

Ventilation of Apartments.

The Academy of Sciences, Paris, has received an interesting paper by General Morin, on the ventilation produced in apartments by fire-places. The room of the director of the Conservatoire des Arts et Metiers was chosen by him for his experiments. This room may be heated at pleasure, either by a fire in the fire-place, or by a mouth of the calorifere of the establishment. Experiments were first instituted to ascertain the volume of air evacuated by the fire-place by the mere action of the difference of temperature of the outer and inner atmosphere. This natural ventilation was found to be on an average 400 cubic metres of air per hour, when the outer temperature was between 1·8 and 10 deg. centigrade (35·3 and 1·50 Fahr.), and the inner temperature was between 18 and 22 deg. centigrade (64·4 and 71·6 Fahr). Hence this room is sufficiently ventilated by the mere aspiration of the chimney, even when, instead of one person, it contains, as it sometimes happens, ten or twelve. Direct experiments afterwards showed that the mouth of the calorifere introduced 150 cubic metres of air at 20 deg. centrigrade per hour (68 Fahr.), when the temperature of the calorifere was between 70 and 100 deg. centigrade (158 and 212 Fahr.); but when the temperature of the calorifere was 45 deg., it only furnished 123 cubic metres. The quantity of air thus introduced through the interstices of two windows and two doors was found to be 246 cubic metres per hour. The fire-place drew from 1,200 to 1,300 cubic metres of air per hour, the amount of wood consumed being 8.26 kilogrammes per hour. The same quantity of air was drawn when the fire consisted of coal, the quantity burnt being 4 kilogrammes per hour. From these experiments it appears that nearly the whole of the warmth produced by combustibles in an apartment is carried off through the chimney, and the only useful part of it is obtained by radiation.

The Gold Miner's Implements.

The first miner's implement was a large dish of tin plate, or simply of wood. This dish was filled with earth, and shaken up in water, so that the sand was thrown off, while the heavier gold remained at the bottom of the plate. The miner, with this dish, could wash at the most 400 kilogrammes of earth (about 7½ cwt.) per day. In those times, however, he found the river diggings to yield 400 or 500 francs worth of gold per cubic metre. The gold digger could thus earn 125 to 130 francs per diem. After the dish there came the "*rocker.*" The "rocker" is a small oblong box without a cover, and open at one of the smaller ends. The bottom of the rocker is covered with a piece of coarse cloth. The box is placed on a slope towards the open end, and it can be made to rock to and fro like a child's cradle. A grating is placed on the open top of the box. The earth containing gold dust is shovelled on to the grating. While the apparatus is being rocked to and fro, it is supplied with a stream of water. The heavier gravel remains on the grating, and the earthy matters and the sand pass through, fall down and roll out, while the gold is kept back by the coarse cloth at the bottom. A miner could wash 1,500 killograms (23½ cwt.) of sand per day with the rocker. This produced four times as much as with the dish, but the soil had become about six times poorer, and the gold-digger only earned 85 francs per day. The "*long-tom*" was then invented, with which the miner, by using a quick current of water, could wash 6,000 kilogrammes (114 cwt.) of sand per day. This was a great advance on the dish; but the progress of invention did not stop here, and the "*sluice*" method of washing was invented. The invention of the "*sluice*" marks a complete revolution in the working of gold.

The *sluice* is a canal formed of three planks, one for the bottom and two for the sides. This canal is narrow, being about 0·30 metres (about one foot) broad, but it is very long, as its length must be not less then 100 metres (328 ft.), and it sometimes measures more than 1,000 metres (3,280 ft).

The bottom is paved with rough, knotty wood. It is set on an incline, varying with the nature of the soils to be washed, and it is traversed by a plentiful and violent current of water. Five or six diggers ceaselessly shovel in the auriferous soil. The water carries away the sand and stone; but the gold, separating itself from the muddy current gains the bottom, where it adheres, being seized upon by the mercury there present. The gold is taken out of the sluice once every week.

The invention of the sluice was of itself a fortune for the miners. Instead of only washing 400 kilogrammes (about 7½ cwt.), as with the dish, they could wash 18,000 kilogrammes (342 cwt.); and they could therefore work with profit soils 45 times poorer.

Tanning Skins with the Wool or Hair on.

First wash the skin in strong soap-suds, to remove the grease and dirt from the wool, then rinse in clean cold water, The skin should now be tacked upon a board (with the flesh side out) and stretched, its edges trimmed, and the whole fleshy part scraped off with a blunt knife. It is now rubbed over hard with as much chalk as it will absorb, or until the chalk falls down in powder. Now take the skin down, fill it with finely ground alum, wrap it closely together, and keep it in a dry place for two or three days; at the end of that time unfold it, shake out the alum, and it will be ready for use, after being again stretched and dried in the air. This method is for white sheep-skins for door-mats. Another mode of treating them consists in applying a strong solution of alum, moderately warm, with a sponge, to the flesh side of the skin, when it is stretched, then allowing it to dry before the chalk is rubbed in. It must always be dried in the open air, or it will turn very hard. Another mode of tanning skins with the hair on, after they are stretched on the frame and scraped, is to employ a warm decoction of sumac, prepared by boiling one pound of sumac in a gallon of water for about five minutes. The sumac liquor is applied with a sponge to the whole fleshy surface, then the skin is dried in the open air. Three applications of the sumac are given, and when the skin is dried it is laid upon a smooth board or table, and rubbed down with pumice stone. Both alum and sumac combine with the gelatine of the skin, and form leather.—*Scientific American.*

British Navy and Army Estimates.

The sum voted for navy estimates this year by the British Parliament is £10,736,000—about fifty-three and a half million of dollars. This is a reduction of five millions of dollars from the estimates of last year. The total number of steam and sailing ships in the British navy on February 1, 1863, was 669. The number of screw steamers now afloat is 414 paddle steamers 108. Thirteen screw and two paddle steamships are building. The construction of 29 others is suspended. The effective sailing ships afloat are 103. There is also a light reduction in "British establishment of the regular forces," of about 4,000 men, and of about 2,000 on the Indian. The effective force of the former is about 148,000 men, and of the latter about 80,000. There is also in Great Britain a volunteer force, well disciplined and equipped, of about 120,000 men.

The New Copper Paint.

J. Nickles, the Paris correspondent of *Siliman's Journal*, states that M. Audry, who has been so successful in electro-plating with copper the cast-iron monumental fountains in the *Place de la Concorde*, makes his new copper paint from the porous copper deposited by the galvanic battery, mixed with a varnish. The solvent of his varnish is the light and refined petroleum, or what we call benzine. The copper is very pure and easily pulverized, then it is mixed with the benzine varnish and applied either to iron, brass, plaster, or wood. When this copper is mixed with oils, it acquires a green antique hue.

Product of Gold and Quicksilver in California.

The total value of the treasure obtained from all the California mines in 1862 was 42,539,799 dols., of which 4,989,921 dols. were coined in San Francisco. In 1861 the total value was 41,689 077 dols.: in 1860, 45,211,693 dols. The quicksilver product of California mines is prodigious. Last year it amounted to 3,025,875 lbs.; most of this was exported.

Patent Albuminized Paper.

Mr. Sutton has recently patented a method of albuminizing paper, which is stated to give very superior results. It consist in first immersing the paper in a solution of india rubber: this has the effect of keeping the albumen on the surface, instead of sinking into the paper at all, and adds much to the brilliancy of the print.

Height of Obelisks.

Two obelisks erected by Sesostris in Heliopolis, 180 feet high. Obelisk mentioned by Diodorus Siculus; 130 feet high, 25 feet square at base. Lateran; 105 feet, 440 tons weight. Obelisk at St. Peters'; 132 feet, including pedestal. Obelisk of Luxor, Paris, 76 ft. Cleopatra's Needle, 63 ft.