THE JOURNAL
OF THE
Board of Arts and Manufactures
FOR UPPER CANADA.

SEPTEMBER, 1862.

ON THE CULTIVATION OF WHEAT IN CANADA, AND ON THE SEASON OF 1862.

In the July and August numbers of this Journal we noticed the "Home Manufactures of Canada," and the "Use we make of our Mineral Resources," we now propose to devote a few pages to the Industry of the Soil, and the Manufactures which are dependent upon a constant and cheap supply of grain. In collecting material for this subject, the extraordinary fluctuations in the production of wheat in Lower Canada came so prominently into view, when contrasted with the rapid and steady increase in Upper Canada, that we were led to devote more space to this important subject than would appear to belong to the pages of this Journal, and our notice of "the Cultivation of Wheat in Canada and of the season of 1862," has swelled to a far greater extent than was anticipated, when a mere introduction to the condition of different manufactures in the Province, dependent upon a supply of rye, barley, wheat, and Indian corn was in contemplation.

There are many important questions which require solution, with respect to the cultivation of Wheat in Canada.

Two facts are patent to all from the results of the last census. These are:—

First; The cultivation of wheat is rapidly diminishing in Lower Canada, and the quantity raised does not amount to one half what is required to feed her population, assuming that each man, woman and child consumes five bushels only per annum.

Second; The cultivation of spring wheat is rapidly increasing in Upper Canada, and more than twice the quantity of land is devoted to spring wheat than to fall wheat.

With regard to the first statement—namely, the diminution in the cultivation of wheat in Lower Canada—we find that section of the Province formerly exported a very considerable quantity of wheat, the produce of her own soil. The following tables show the exports of wheat from Quebec between 1793 and 1802, inclusive:

Year.	Wheat, bus.	Flour.	Biscuit, cwt.
1793	478,900	10,900	9,800
1794	414,000	13,700	15,000
1795	395,000	18,000	20,000
1796*	3,106	4,300	3,800
1797	31,000	14,000	8,000
1798	92,000	9,500	12,000
1799	129,000	14,400	21,500
1800	217,000	20,000	25,000
1801	473,000	38,000	32,300
1802	1,010,033	28,300	22,051

In 1802 the population of Upper Canada did not exceed 60,000 souls, and there is no reason to suppose that that part of the Province contributed much wheat for export previous to 1802. The frontier States of the Union did, no doubt, contribute flour and wheat "in casks." We will therefore strike out from the above table all the exports of flour and biscuit, and credit them to the frontier States and Upper Canada, amounting to 855,500 bushels wheat, and 169,451 cwt. biscuit, from 1793 to 1802, a period of ten years.

With these deductions, the total quantity of wheat of Lower Canada growth exported between 1793 and 1802, amounted to 3,251,139 bushels, or at the rate of three hundred and twenty-five thousand bushels per annum.

The quantity of wheat raised in Lower Canada in 1827, '31, '44, '51 and '60 was as follows, showing no increase, but, in proportion to the population, an extraordinary and indeed alarming decrease:

Year.	No. of bushels.
1827	2,931,240 (1)
1831	3,404,756
1844	942,835
1851	3,045,600 (2)
1860	2,563,114 (3)

The quantity required to feed the population of Lower Canada, at five bushels per head, the usual allowance, is 5,553,320 bushels. Hence the people of Lower Canada, if they consumed wheat after the manner of their forefathers, would require an importation of not less than 2,990,206, or nearly three million bushels.

Nor is this decrease compensated by the production of other kinds of grain in due proportion. The total amount of barley, rye, peas, oats, buckwheat and Indian corn, raised in 1851, amounted to 12,147,000 bushels, and in 1860 to 23,534,903 bushels; † an increase of 11,387,633 bushels—not in fact even doubling in ten years, while during the same time the population increased from 890,261 to 1,110,664 souls.

*The exportation of wheat was prohibited this year, in consequence of the bad crops of 1795.

(1) Bouchette. (2) Census 1851-'2. (3) Mr. Galt's Budget Speech.

† Mr. Galt's Speech.

The comparison between Upper and Lower Canada stands thus in relation to population and the production of the following articles:

	Upper Canada.	Lower Canada.
Population, 1851	952,004	890,261
" 1861	1,396,091	1,110,664
Wheat crop of 1860, bus.,..	24,620,425	2,563,114
Indian corn, rye, oats, barley, buckwheat and peas........................	36,122,340	23,534,903
Total bus. grain in 1860....	60,742,765	26,098,017

Proportion of grain produced in Upper Canada to each inhabitant, 43 bushels.

Proportion of grain produced in Lower Canada to each inhabitant, 23 bushels.

The change is astonishing which has taken place in Lower Canadian husbandry during the last half-century, and is certainly worthy of special study, and even of the attention of the Government. When a province which once was a large exporter of wheat becomes incapable, under her present system of husbandry, of raising one-half the quantity of a staple product of human food necessary for home consumption, questions of much moment arise. Does it result from a change in climate, from insects destructive to wheat crops, exhaustion of the soil, or bad farming practice? No doubt, more or less, from all of these causes united; but we must chiefly look to the manner in which the soil is cultivated, and the practice prevailing in Lower Canada, for the solution of this problem.

Turning now to Upper Canada, we find the following encouraging statistics:

Year.	Wheat produced, in bushels.
1842................................	3,221,991
1848................................	7,558,773
1851................................	12,674,503
1860................................	24,620,425

In some counties in Upper Canada the cultivation of wheat is progressing with extraordinary rapidity (too rapidly, we fear, for good husbandry), as the following comparative table, showing the produce of the United Counties of York, Ontario and Peel for the years 1848, 1850, 1851 and 1860, will tend to show:

Produce.	1848.	1850.	1851.	1860.
Wheat...	1,451,384	2,038,677	2,362,932	3,469,002

The United Counties, of York, Ontario and Peel produced in 1860, as much wheat as Lower Canada in 1831, and nearly one million more bushels than Lower Canada in 1860.

We would remind those among our readers who are inclined to the view that the Wheat Midge and the Hessian fly are preëminently destructive in Lower Canada, that by the use of early-ripening seed, draining, and improvement in farming practice, the "fly" has been overcome in many parts of Upper Canada, and there is no fear that with the adoption of well known artifices the ravages of these destructive insects will be held in check. And why, we ask, might not the same artifices have been employed in Lower Canada, which have proved so successful with us? Probably an answer will suggest itself when we compare the number and circulation of the newspapers published in the French language, with the number and circulation of the same means of diffusing information in the English tongue in Upper Canada. It is a question, we submit, which might reasonably engage the attention of the Minister of Agriculture, whether an enquiry should not be set on foot to obtain information respecting the cultivation of wheat in Lower Canada, and the best means of circulating a knowledge of the most successful remedies against the ravages of the Midge and Hessian fly, which are so generally instanced, and, we think, most erroneously, as the ineffacable destroyers of the wheat crops in Lower Canada, whose wide-spread devastations it would be vain to attempt to arrest.

The present year has been remarkable for the infinite number of insect-pests which have infested the wheat crops, but fortunately without, as far as we can learn, occasioning any wide-spread damage.

The insect which created the greatest alarm at one time was an Aphis, a very common and most prolific creature, whose powers of multiplying itself almost surpass belief, and furnish us with one of the most astonishing marvels of insect life, out of the vast number by which we are daily surrounded. If the reader has noticed the extremities of the shoots of currant bushes during the latter part of August and the beginning of September of the present year he will have observed, no doubt, a a vast number of green and brown insects feeding on the leaves, causing them to curl up, and often assume a dark or a bright colour according to the stage of insect growth. The green and brown insects are Aphids, similar to those which were found in such infinite numbers upon the succulent parts of the wheat and many other plants where they are not commonly observed during the early part of the summer.

The Aphis, or Plant Louse, is a name given to a very extensive genus of insects, whose destructive habits and wonderful productiveness make the study of their history especially interesting to farmers and gardeners. Certain species of Aphids affect different plants. Dr. Fitch describes twenty-eight species, which feed upon the juices of Indian corn, the pear, apple, cherry, and a number of other trees. In the collection of the British Museum no less than 326 species of this insect are described, and it is worthy of notice that almost every species of plant has its own peculiar Aphis. The Hop-fly and Bean-dolphin have occasioned immense destruction in Britain. In 1802 the hop duty fell from £100,000 to £14,000 on account of the great increase of the Aphis. When the Aphis has been absent the duty has risen to £500,000. This insect is well named the APHIS or EXHAUSTER. They are so prolific that one individual may become the projenitor of one qunitillion in the 10th generation. As many of our readers may not be quite familiar with the vast number represented by the word 'quintillion,' some details may be useful. Professor Owen shows in his lectures on 'Comparative Anatomy,' that the *Aphis lanigera* produces each year ten viviparous broods, and one which is oviparous, and each generation averages 100 individuals:—

1st Generation	....	1 Aphis produces
2nd "	....	100. One hundred
3rd "	....	10,000. Ten thousand
4th "	....	1,000,000. One million.
5th "	....	100,000,000. One hundred millions
* *	*	* * * * *
10th "	....	1,000,000,000,000,000,000 one quintillion.

The Aphids which appear in Spring are exclusively females, no males being found till the Autumn. It is not necessary for the young females produced during the Summer to pair with a male; yet these females go on producing each 25 a day of living young ones, all of which become in a short time as fertile as their parent.

It does not come within the province of this Journal to describe more in detail the habits of these insects, but to those of our readers who are interested in this curious subject we may refer them to the following accessible works, in which they will find much valuable information:—

1. First and Second Report on the Noxious, Beneficial, and other Insects of the State of New York. By Asa Fitch, M.D.
2. Harris on Insects. New Edition.
3. The Farmers' Encyclopedia. By Cuthbert Johnson.
4. The English Cyclopedia.
5. Stephens' Farmers' Guide.

The question naturally arises, why were these insects so numerous during the present year? The cause is to be traced, very probably, to the extraordinary dryness of the spring months of 1862.

The Aphis multiplies much faster in a dry season than in one which is humid; like the red spider, and many other destructive insects, it is fond of a warm and dry atmosphere. The month of May was extremely dry, and the quantity of rain recorded at the Toronto Observatory was only one third of the average which has fallen in that month for twenty-two years.

The month of June was also remarkably dry, the amount of rain which fell reaching only one third of the average of twenty-two years, and it was the dryest June which has occurred during the entire period in which observations have been made at Toronto. Fortunately for the wheat and other crops July was extremely wet, having nearly double the average fall of rain, so that not only were the crops pushed forward by the unusual moisture of this month, but an innumerable host of insects were washed off the leaves of the growing crops by the heavy and continuous fall of rain. By the most unusual and providential fall of rain in that month the multiplication of the Aphis was arrested and the crops of the country saved. It will be noticed throughout Canada, that in general the fall wheat has been harvested at an average time of the year—the spring crops are later than is common with us. The fall wheat was sustained during the long drought by the great amount of moisture in the soil at the advent of spring, from the excess of snow and rain which fell in February and March. In March we had one inch more rain and nearly ten inches more snow than the average of twenty-two years.

The retardation in the growth of the spring crops arising from the dryness of May and June has probably been of immense value to the country in destroying the Midge. That this insect was very abundant in many parts of Canada during the present year there is no reason to doubt; observations made in many different quarters have recorded its presence in infinite numbers, but the fly appeared before the wheat *was ready to receive it*, and its eggs were deposited where there was not suitable food for the young worms when hatched; myriads would consequently die for want of food, and therefore we may look upon the unusually dry spring of 1862 as having been a blessing of incalculable value to the Canadian Farmer by destroying one of the worst and most widely distributed enemies of his wheat crops. The maggots of the Midge were also seen in vast numbers in the fall wheat, but generally it was too far advanced for them to injure it to any considerable extent. The fall wheat was suddenly pushed forward by the July rains (which at the same destroyed the Aphis) and the Midge could not penetrate the chaff or sheath to deposit its eggs, or if it succeeded in penetrating the germ the young worms were hatched after the grain had been formed. Although this year has been one of most exceptional character in relation to the distribution of snow and rain, yet when viewed in the proper light it will afford a striking illustration of that wise and merciful benificence which disposes and adjusts all things for some excellent purposes, which do not appear to our eyes until the object for which the disposition was made is attained, and sometimes not even then.

The following table from the records of the Provincial Observatory has been kindly furnished by Professor Kingston—an examination of its contents will show the extraordinary character of May, June and July of the present year.

	May,	June.	July.
Mean Temp'rature 1862.......	52.17	60.52	66.70
Average for 22 years........	51.39	61.36	66.85
Difference from average......	+0.78	—0.84	—0.15
	Inches.	Inches.	Inches.
Depth of Rain, 1862.	1.427	1.007	5.344
Average of 22 years..........	3 241	3.100	3.490
Difference form average......	—1.814	—2.093	+1.854
	Days.	Days.	Days.
No. of Rainy days, 1862.....	8.0	10.0	15.0
Average of 22 years.	11.3	11.9	10 0
Difference from average......	—3 3	—1.9	+5.0

May, 1862, was mild, and extremely dry, but it was thrice surpassed in that respect: it only records one-third of the average depth of rain.

Jnne, 1862, was comparatively cold and extremely dry, the depth of rain recorded only reached one-third of the average; it was absolutely the driest June during the last 23 years.

July, 1862, was comparatively cold and extremely wet, shewing nearly double the average depth of rain, it was only once surpassed, viz. in 1841 when the depth received amounted to 8.150 inches.

A comparison of the foregoing with the corresponding months of the several years may be made by referring to the comparative tables that accompany the monthly reports for May, June, and July, 1861, published in the *Canadian Journal.*

A glance at the following table will show how dependent the prosperity of the country is upon a good harvest. It will be seen that the difference between the agricultural exports of 1856 and 1857 amounted to more than six millions of dollars, and that our exports last year exceeded those of 1857 by ten millions of dollars.

Table of the absolute value of all Agricultural products exported, exclusively of Canadian growth, for the years 1863 *to* 1861, *inclusive.*

Year.	Value of Ag. Exports.	Year.	Value of Ag. Exports.
1853	$8,032,535	1858	7,904,400
1854	7,316,160	1859	7,339,798
1855	13,130,399	1860	14,259,225
1856	14,972,276	1861	18,244,631
1857	8,882,825		

In our next issue we shall endeavour to exhibit the use we make of a considerable portion of our rapidly increasing grain crops, and show how closely dependant many important manufactures in Canada are upon a good harvest.

FACTS FROM THE CENSUS FOR UPPER CANADA.

The quantity of butter made in 1861 amounted to 26,828,264 lbs., and of cheese to 2,687,172 lbs.

In 1851 there were 16,064,532 lbs. of butter, and 2,292,600 lbs. of cheese made, or

1861...	26,828,264 lbs.	butter.
1851..................	16,064,532	"
Increase in 1861...	10,763,732 lbs.	butter.
1861..................	2,688,172 lbs.	cheese.
1851..................	2,292,600	"
Incr. in 1861.......	394,572 lbs.	cheese.

Beef in barrels:

1851	113,445	
1861	67,508	
Decrease in 1861......	45,937	bbls. beef.

Pork in barrels:

1861	336,744	
1851	317,010	
Increase in 1861......	19,734	bbls. pork.

The increase in barrelled beef and pork, and consequently in the export of these articles, is very small in ten years, and shows that in this branch of the provision trade Upper Canada has not made much progress by comparison with the years 1851 and 1861.

The exports from the Province of beef, pork, butter, and cheese, for the years 1859, 1860, and 1861, were as follows:

	1859.	1860.	1861.
Beef...	3,235 cwt.	1,846 cwt.	1,598 cwt.
Pork..	36,984 "	63,109 "	81,032 "
Butter	3,750,296 lbs.	5,512,500 lbs.	7,275,426 lbs.
Cheese	323 cwt.	1,100 cwt.	2,628 cwt.

The Fisheries of the Upper Province do not show that increase which might be expected from the valuable resources of the great Lakes.

In 1851 there were 11,886 barrels of fish cured; in 1861, 10,013 barrels; 2517 quintals, and 175,744 lbs. of fresh fish sold.

In Michigan, which is the largest inland fish producing state, the value of white fish returned in 1860, amounted to $250,467. There is yet a vast field open for remunerative enterprise in the fisheries of Lakes Huron and Superior. The whole of the north shore of Lake Huron with its million islands will yet yield great wealth to the country from its clear and cold waters. The art of the preservation of fish is as yet unknown in Canada, or rather it is not practised. In Germany, France, and Britain, Pisciculture is now an acknowledged department of national importance. It would be a wise economy on the part of the Government to examine into the working of fishing regulations and Pisciculture now in operation in Europe. A few skilled emigrants from France, Germany, or Britain, would soon enable Canadians to rejoice in the possession of the finest fresh-water fisheries in the world.

NECESSITY FOR A GOVERNMENT PETROLEUM INSPECTOR.

Two thousand barrels of Canadian oil were lately ordered by a German house, and dispatched from Enniskillen to Montreal to be shipped for Bremen. When the oil was examined accidentally at Montreal it was found to be *adulterated with water*. On enquiry at Enniskillen it was ascertained that the party furnishing the oil had pumped it from Black Creek, and sent only surface oil mixed with water. Fortunately this was found out in time, or else this miserable specimen of Canadian oil would have been shipped to Germany, and a bad name given at the outset to a most important and rising branch of Canadian trade. Many enquiries are now being made for Canadian Petroleum, and there is every prospect of a large trade with Continental Europe springing up. But if we wish to retain the trade it is essentially necessary that the dealings of oil-shippers should be honest and upright or else the trade will rapidly acquire a bad name. In order to prevent such wretched frauds as we understand have recently been attempted, all exported oil should be subjected, we submit, to the inspection of an officer appointed by the Government, and each barrel branded according to its character, its specific gravity being determined, as well as freedom from admixture with water. The system adopted for branding fish barrels, &c., would be of vast advantage to the oil-dealer as well as to the country.

The extraordinary importance of the Petroleum trade may be inferred from the fact, that the exports of Petroleum, crude and refined, from the United States for the first half year of 1862, amounted to 4,379,669 gallons, equal to 109,492 barrels, valued $1,413,390.

It is now sent to every quarter of the globe. At Philadelphia the price has varied from 23 cents on January 4th, to 9 cents a gallons for crude oil on May 10th. It is now, August 10th, 12 to 14 cents a gallon for crude, and 25 to 32 for refined. The largest exportations have been sent to Liverpool, the quantity in the first half year of 1862 being 2,291,344 gallons, this is exclusive of Enniskillen oil. Liverpool takes nearly as much as all the rest of the world together, Enniskillen oil men should note this, and keep a sharp look-out on any one who attempts by dishonest dealing to make a few dollars for himself at the risk of ruining a most valuable trade.

WHY DO WE NOT CULTIVATE GINSENG?

The value of this plant as an article of trade is now very little known in Canada. Among the Chinese the Ginseng (*Panax quinquefolium*) is all important as a constituent of their most expensive medicines.

It grows wild in Canada and the Northern parts of the United States. From 1803 to 1807 the annual value of the Ginseng exported was $123,000, from 1823 to 1830, $157,000. In 1841, 640,967 lbs. valued at $437,265 was exported from the United States.

The Ginseng was discovered in Canada by the Jesuit Lafitu in 1716. A pound weight of this root, once worth two francs at Quebec, sold for 25 francs in Canton; its price subsequently rose to 80 francs the pound. One year the Canadian export of Ginseng, during the occupation of the country by the French, exceeded one hundred thousand dollars. The root resembles a small carrot about three or four inches in length.

The price of Ginseng in the Chinese seaports varies from 75 to 130 dollars for 133 lbs. for the crude, and from 130 to 200 dollars for the cured, or at the rate of six shillings sterling a pound. In Canada this plant grows wild in abundance, and the sample is of the best quality. Two hundred thousand pounds weight of Ginseng were exported from St. Paul last year. In former times the exportation from Canada was very great, but the trade declined in consequence of a "bad name" having been given to Canadian Ginseng on account of the practice of gathering the plant at a wrong season of the year, when it was considered by the Chinese, who are its chief consumers, wholly unfit for medicinal preparations. The collection of the Ginseng root, if not its cultivation, is well worthy of attention in Canada.

In the preceding article we have referred to the gross fraud which has been attempted at Enniskillen—to send waste petroleum, pumped from the surface of Black Creek, to a German house. A century ago, Canada had a rich trade in Ginseng, which she subsequently lost, through the cupidity of the dealers at that period knowingly collecting ginseng at all times of the year, and exporting it as the prime article. They lost the trade by this fraudulent proceeding, and have left their posterity an example which it is to be earnestly hoped the Canadian Oil Association will know how to improve, and take steps to prevent its occurrence in our time.

INTERNATIONAL EXHIBITION.

AWARD OF MEDALS, &c., TO BRITISH AMERICANS.

Medalists.

The Comissioners for Canada, for the display of woollen goods and hand-yarns manufactured in the colony.

The Government of Prince Edward's Island, for a very interesting and varied collection of woollens, mixed fabrics, &c., homespun and made, illustrative of the domestic industry of the colony.

Government of Newfoundland, for a very fine collection of skins of silver cross, and red fox, and otter.

W. Coleman, Nova Scotia, for a very choice collection of skins, fine specimens of silver, red, and cross-fox, otter and mink.

McEwen and Ried, Nova Scotia—sofas, chair, and cabinet of native wood—for excellence of workmanship.

— Snell, of Canada, for good machine-made nails.

— Scrymgeour, New Brunswick, for well-made horse-shoes.

Captain R. Gaskin, Kingston, Canada, for a collection of agricultural hand instruments.

Tongue & Co., Canada, for an assortment of edge tools highly finished.

Hon. P. J. O. Chauveau, for the merit of his collection of educational journals and reports.

The New Brunswick Committee for the Exhibition, for their collections of woods illustrating the study of botany.

—Downes, of Nova Scotia, for his collection of animals.

Professor Howe, Nova Scotia, for the excellence of his mineralogical collection.

J. M. Jones, Nova Scotia, for his collection of fish.

J. Mosher, Nova Scotia, for good manufacture of blocks on the Bothway principle.

W. Notman, Montreal, for excellence in an extensive series of photographs.

Captain P. Gaskin, Kingston, Canada, for a collection of agricultural tools.

J. Jeffrey, Canada, for iron plough.

J. McSherry, Canada, for iron plough.

J. Morley, Canada, for iron plough.

J. Patterson, Canada, for iron plough.

Whiting & Co., Canada, for collection of agricultural tools.

New Brunswick Commissioners, for a horse-rake.

J. Brown, Canada, for the excellence of manufacture of hydraulic cement.

G. R. Stephenson, as the representative of his cousin, the late R. Stephenson, M. P., F. R. S., for the extraordinary boldness of conception and the great ingenuity of the construction of the Victoria Bridge, Canada.

Larue & Co., Canada, cast iron hollow wheels, for excellence of workmanship and proved durability.

The Executive Committee of Vancouver's Island, for spar of Douglas pine, 220 feet.

Edward Stamp, Vancouver's Island, for a section of Pinus Douglassii, six feet diameter, with roof shingles and other timber specimens.

Blaikie & Alexander, Toronto, for dressed flax.

Andrew Bridge, Canada, for a tub on a new principle of construction, exhibiting much taste and ingenuity.

E. B. Eddy, Ottawa, for machine-made wooden pails and tubs, at exceedingly low prices.

C. L. Ingersoll, Canada, for a cask constructed on a new and ingenious principle, for five liquids.

James Lawrie, Canada, for planks and logs, and 21 named specimens of logs from the Ontario district.

Hugh McKee, Canada, for scientifically-named collection of 98 of the woods of the colony, accompanied with leaves, &c.

T. Moore, Canada, for a large collection of excellent handles for tools and implements in hickory and other woods.

Nelson & Wood, Canada, for whisks and brooms of Sorghum straw, at very low prices, from 1s. 6d. to 6s. per dozen.

Duncan, Porter & Co., Canada, for 19 very fine square logs of timber.

The Abbè Provancher, Canada, for a very extensive, accurately named and extremely well illustrated collection of the woods of the colony, accompanied with dried specimens, useful information, &c.

Samuel Sharp, G. W. R. R., Hamilton, for a magnificent collection of planks, polished slabs, veneers, and a named collection of 26 specimens, from Western districts.

James Skead, Canada, for a magnificent collection of planks, logs, and a scientifically named collection of 27 woods, all from the Ottawa districts.

D. R. VanAllen, Canada, for planks and logs, all magnificent specimens from the Thames district, and 21 scientifically named specimens.

A. L. Trimbinski, Canada, for magnificent logs of white oak, rock elm, and hickory,

Miss E. Begg, Nova Scotia, for application of native grass to plaiting and bonnet-making.

Miss E. Begg, Nova Scotia, for very fine samples of flax prepared by dew rotting.

Miss Hodges, Nova Scotia, for baskets decorated with pine cones and other hard fruits.

Miss Lawson, Nova Scotia, for a collection of forest leaves of the colony, so prepared as to preserve the autumn tint.

— Pryor, Nova Scotia, for a preparation of the fibre of *Melilotus leucantha major*.

Local Committee of Prince Edward's Island—for a collection of wicker work, &c., including excellent flax, well dressed.

Miss E. Jardine, New Brunswick—for ornamental work of native seeds.

D. Munroe, New Brunswick—for an excellent scientifically named collection of 21 woods, veneers, &c., accompanied with specimens, and a volume of valuable notes and observations.

E. Potter, New Brunswick—for fine carving in a wooden box.

Mrs. D. B. Stevens, New Brunswick—for ornamental work in native seeds.

Campbell and McLean, Nova Scotia, cavendish tobacco. Quality of Tobacco used, and quality of article produced.

— Barber, Nova Scotia—salmon and lobster; excellence of quality.

J. Cairns, Prince Edward's Island—salmon and lobster; excellence of quality.

D. Brown, Canada—maple sugar; excellence of quality.

New Brunswick commissioners—spiced salmon; excellence of quality.

S. Knight, Newfoundland—preserved salmon and lobster; excellence of quality.

W. Boa, Canada—for all his samples of substances used for food.

R. L. Denison, Toronto—Indian corn stalks; for extraordinary growth.

W. Evans, Canada—for collections of grains and seeds, excellent and interesting.

J. Fleming, Toronto—for seeds and grains, as excellent and interesting.

B. Johnstone, Canada—for samples of Soule's winter wheat, of excellent quality.

J. Logan, Canada—for spring wheat of excellent quality.

County of Peel Agricultural Society, U. C.—(medal to John Lynch, Sec.) for barley, peas, and two kinds of spring wheat, all of excellent quality.

A. Shaw, Canada—for rye of excellent quality.

County of Beauharnois Ag'l Soc'y L.C., (two medals awarded to growers), for flax seed, grown by C. Burguin, for grass seed grown by C. Tait.

J. Wilson, Canada—for oatmeal of excellent quality.

The New Brunswick Commissioners, for the excellence of their collection of substances used for food.

The Commissioners of Newfoundland, for a fine collection of seeds.

R. G. Fraser, of Nova Scotia, for excellent grain, of garden and field seeds.

Local Committee of Prince Edward's Island—for interesting collection of agricultural produce.

Agricultural Board of Upper Canada—for samples of wheat from various counties of excellent quality.

Agricultural Society of Huntingdon, L. C., (one medal to grower), for peas 40 bushels per acre grown by John Penis.

Agricultural Society of Wellington, U.C., for wheat of excellent quality.

Agricultural Society of Wentworth and Hamilton, U. C., (three medals to growers), for blue stem wheat grown by I. H. Anderson, for red chaff wheat grown by John Smith, for potato oats grown by A. Gorie, very superior in quality.

Spurr D. Wolfe, New Brunswick, for products obtained by the distillation of coal.

Executive Committee of Vancouver's Island, for collection of Agricultural seeds.

Benson and Aspden, Canada, samples of Indian corn starch. For the excellent quality of samples.

Canadian Oil Works, Hamilton, for an extensive exhibition of the derivatives of petroleum.

E. A. McNaughton, Canada, flour and potato starch. For the excellent quality of samples.

Parson Bros., Toronto, Canada, for an extensive exhibition of the derivatives of petroleum.

E. Billings, of the Geological Survey, Canada, for his published decades on Canadian fossils, and his valuable general contributions to palæontology.

English and Canadian Mining Co., for the skill and perseverence with which they have opened their ground, and the discovery of composits conformable with the stratification.

Foley & Co., Canada, for plans of mines, ores and lead, smelted in the colony.

J. Sterry Hunt, of the Geological Survey, Canada, for the instructively described series of the crystaline rocks of Canada, and his various published contributions to geological chemistry.

Larue & Co., Canada, for excellent cast iron railway wheels made from bog iron ore, which have run 150,000 miles.

Montreal Mining Co., for interesting series of copper ores, accompanied by sections of the workings.

A. Taylor, Canada, for good specimens of crude and prepared gypsum, with plans and sections of the gypsum mines.

The officers of the Geological Survey of Canada, for an admirably prepared selection of specimens, illustrating the mineral resources of the Province.

B. Walton, Canada, for the discovery of good roofing slates.

West Canada Mining Co., for specimens and plans, illustrations of well-worked copper mine.

—Williams, (Enniskillen,) for introducing an important industry, by sinking artesian wells in the Devonian strata for petroleum.

New Brunswick Companies, for general collection of the works and minerals of the colony.

The Government of Newfoundland for a general collection of the rocks and minerals of the Island.

Rev. Mr. Honeyman, Nova Scotia, for a large collection of specimens illustrating the geology of the colony.

Prof. Howe, Nova Scotia, for collection arranged by him, illustrative of the rocks and minerals of the Province.

Government of Nova Scotia, for the large and instructive collection, illustrating the occurrence of gold.

J. Scott, Nova Scotia, for column of coal, showing the entire height of the seam, 34 feet; one of the thickest known beds in the world.

Honourably Mentioned.

The following is a list of those who are honourably mentioned:

E. L. Betts, Canada, J. Hodges, Canada, and Sir S. M. Peto, Bart., M. P., a collective honourable mention for the successful execution of the Victoria Bridge, and for the ingenuity displayed by Mr. Hodges in constructing the coffer dams for the same.

New Brunswick Commissioners, models of bridges. For the utility of the works represented by the models.

Prof. Howe, Nova Scotia, for goodness of quality of specimen building stones.

T. Scarfe, Nova Scotia, good quality of common and pressed brick, and drain tiles.

Palmer & Sheppard, Canada, for the excellence of his white bricks and drain tiles.

Missisquoi Drain Tile Company, Canada, for drain tiles of good quality.

F. Claudet for a series of views in New Westminster, British Columbia.

Bowren & Cox, New Brunswick, for photographic views, being the earliest taken in that colony.

W. H. Adams, of New Brunswick, for railway springs.

— Spiller, New Brunswick, for collection of edge tools.

G. Connell, Nova Scotia, for axes.

Mrs. W. Black, for her models of fruits.

Gordon & Keith, Nova Scotia, for the excellent workmanship of their furniture.

James Thomson, Canada, for his collection of birds.

E. O. Richards, Canada, for model of water wheel.

Fleming & Humbert, New Brunswick, for oscillating steam engine.

W. G. Simpson, Nova Scotia, for model of gold washer.

Government of Prince Edward's Island, for good specimens of tanned lambskin rugs.

L. D. Sovereign, Canada, for his combined cultivator and drill.

H. Collard, Canada, for his cultivator.

S. H. Gilbert, New Brunswick, for his model of stone picker.

S. Sharp, Canada, Great Western Railway, model of sleeping and freight cars.

A. Bronson, Canada, for magnificent sections of strobus and white oak.

— Burrows, Canada, for fine sections of "laurus sassafras."

Jacob Choate, Canada, for fine cherry wood and soft maple planks.

— Coutlee, Canada, for named collection of 72 woods of the colony.

O. Gingras, Canada, for fine planks of timber.

Miss Crooks, Canada, for collection of 490 native plants.

F. X. Prieux, Canada, for a named collection of 74 woods of the colony.

E. H. Rose, Canada, for a box of very fine walnut veneers.

— Truman, New Brunswick, for veneers of good quality, and a book formed of inlaid slabs, barks, &c., illustrating the woods of the colony.

N. Norman, Newfoundland, preserved wurcle, goodness of quality.

Nova Scotia Commissioners, salted salmon, goodness of quality.

Rev. F. L. D'Heureux, maple sugar, illustrative.

The Agricultural Society of Huntingdon, L. C., for barley, grown by Mr. McNaughton.

The Agricultural Society of Wentworth, U. C., for collection of wheat, goodness of quality.

T. Badham, Canada, for oats of good quality.

J. Logan, Canada, for barley, goodness of quality.

A. Shaw, Canada, for Indian corn and marrowfat peas, excellent quality.

C. Wilkins, Canada, Indian corn, goodness of quality.

Miss Bossoult, Nova Scotia, for water colour paintings of native flowers, as instructive.

Dr. Howe, Nova Scotia, medicinal and other plants.

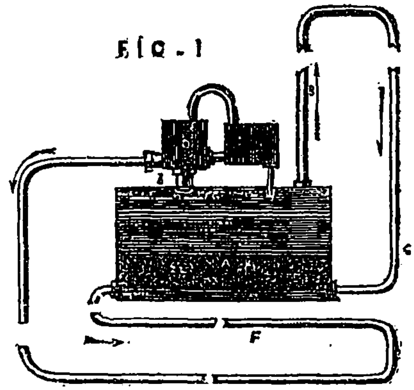
W. H. A. Davis, Canada, for interesting and instructive specimens from a remarkable deposit.

H. T. McCaw, Canada, for fine instructive specimens of ores running with the stratification, and illustrating the structure of the country.

S. Sweet & Co., Canada, for fine and instructive specimens of ores, running with the stratification, and illustrating the structure of the country.

HOT WATER CIRCULATING APPARATUS FOR WARMING PURPOSES.

BY MR. PURNELL.*



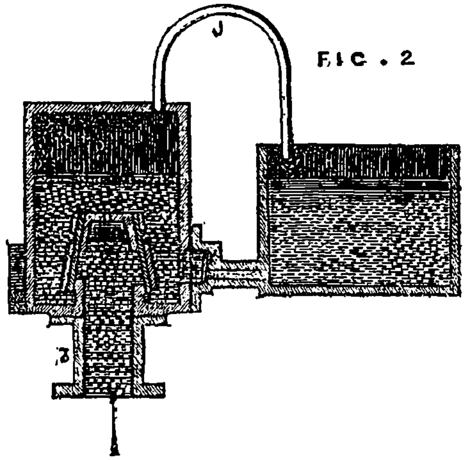


Fig. 1 is a diagram, and fig. 2 is an enlarged section of the principal part of the apparatus.

Ordinarily, hot water is made to circulate through pipes by placing the boiler A, fig. 1, at the lower end of a range of pipes, B and C. The water in the boiler, and in the pipe B, from the top of the boiler, becomes heated, and slightly lighter than that in the return pipe C, which communicates with the bottom of the boiler. The cooler and heavier water tends continually to displace the warmer and lighter, and a circulating current in the direction of the arrows is thereby induced and kept up. In this arrangement the pipes are entirely, or for the most part, above the level of the boiler; but if the pipes were for the most part below that level, the circulation would not (with ordinary arrangements) take place, as the warm lighter water in the descending branch could not force up the cold heavier water in the ascending return branch.

It is often extremely inconvenient to find a proper place for the boiler sufficiently below the general level of the pipes; and some simple means to cause circulation to take place in pipes on or below the level of the boiler has been a great desideratum.

In Mr. Purnell's arrangement, a pipe *b*, from the top of the boiler, A, communicates with a valve-box, D, from which there proceeds the descending or out-

* Paper read, and a working model shown in operation, at the Institution of Engineers in Scotland.

going branch, E, the ascending return branch, F, communicating with the bottom of the boiler. In the box, D, there is a pair of simple, freely-working clack-valves, G, which the water has to lift in passing from the boiler to the branch E. To keep up the supply of water, there is a cistern, H, communicating through a clack-valve with the box, D; and this cistern may itself be kept full by an ordinary float-cock on a service pipe. The box, D, is open to the atmosphere by the pipe, J, which is bent over to the cistern merely to catch any dripping from condensed steam.

The working model was contrived so that it could be arranged with either the old or the new arrangement, and it was shown that with the old arrangement no circulation took place in the pipes, whilst with the new plan a regular continous circulation was at once established, the pipes being below the level of the boiler in both cases.

After trying a great many different plans, the the present one was at length arrived at by Mr. Purnell; but it is not easy to explain how the action takes place. In the working model the box, D, was formed with glass sides, through which it could be seen that the valves did not remain steady, but were in a continual tremor. Indeed, without an intermittent action it is difficult to conceive how the result obtained could be produced. The opening of the valve indicated a temporary increase of internal pressure, which would give the water a tendency to leave the boiler by both branches, E and F. If the water were previously quiescent, the exit would actually be freer by the return branch, F, the valves obviously offering some slight resistance the other way. If the water were already in motion in the pipes, the tendency would take effect in slightly retarding the entrance of the water into the boiler by the return branch F. The next step of the action is the closing of the valves, which must be due to a diminution of the internal pressure, and the water must tend to return into the boiler, but being prevented from returning by the valves of the branch, *b*, must do so entirely by the branch F, and so the circulating current is gradually established. The intermittent variation in the internal pressure has yet to be explained; but it appears that, however regular the fire is, the intermittent or pulsating action exists. The model boiler was heated by a gas jet, the heat from which is perhaps as regular as can be obtained.

In reply to enquiries, Mr. Purnell further explained the details of his apparatus, and stated that he had it in operation on a large scale in different warehouses in Glasgow, and also in garden hothouses. A very convenient application of it was where it was wanted to heat a single flat of a building. Formerly the boiler had to be placed in the flat below, which might be occupied by a different tenant; but with his arrangement the boiler might be placed on the same flat with the pipes below it near the floor, and even beneath the floor, where required.

Board of Arts and Manufactures

FOR UPPER CANADA.

MEETING OF THE SUB-COMMITTEE.

At the Monthly Meeting of the Sub-committee of the Board, held on Thursday, the 4th instant, present: the President, (Dr. Beatty), the Vice-President, (Dr. Craigie), Professor Hincks, Professor Hind, and W. H. Sheppard, T. Sheldrick and R. Bull, Esquires, a Special Committee was appointed to draft a Memorial to the Government relating to the Statute for the encouragement of Agriculture and Manufactures; and to report such draft to the Sub-committee at its next meeting.

The Free Library of Reference, and Model Rooms, will be open to the public on the evenings of *Monday, Tuesday, Wednesday, Thursday and Friday*, of the Exhibition Week, in addition to the usual hours each day.

BOOKS ADDED TO THE FREE LIBRARY OF REFERENCE.

CLASS VII.

Cyclopœdia of Useful Arts and Manufactures, parts I to IX, 1862 .... *C. Tomlinson.*

CLASS X.

Discourses on Painting and the Fine Arts—delivered at the Royal Academy, 4to, 1856 .... *Sir J. Reynolds.*

CLASS XI.

Topographical and Statistical Description of Lower and Upper Canada, and the other British North American Provinces; 2 vols. 4to 1832 .... *Jos. Bouchette.*
Topographical Dictionary of Lower Canada, 4to., 1862 .... "

CLASS XIII.

A Treatise on some of the Insects injurious to Vegetation, 8vo., 1862 .... *T. W. Harris, M.D.*

CLASS XV.

Popular Lectures on Food, delivered at the South Kensington Museum by the Superintendent of the Animal Products and Food Collections, 12mo., 1861 .... *E. Lankaster, M. D.*
———— On the Uses of Animals in Relation to the Uses of Man, delivered at the South Kensington Museum, 12mo .... "
Book of Legal Forms and Law Manual, 12mo, 1854 .... *W. H. Richmond.*

CLASS XVIII.

Specifications of Inventions, Letterpress, 26 vols., 8vo., 1860 .... *British.*
" " Plates, 36 vols., folio, 1860 .... "

ALPHABETICAL LIST OF THE PRINCIPAL ENGLISH PUBLICATIONS FOR THE MONTH ENDING JULY 31.

Ancient Empires: their Origin, Succession, and results, 8vo	0	6	0	*Rel. Tract Soc.*
Annual Register (The) 1861. Vol. 103, 8vo	0	18	0	*Rivingtons.*
Annual Retrospect of Engineering and Archi. Vol. 1, 1861, ed. by G. R. Burnell, post 8vo	0	7	6	*Lockwood.*
Arrivabene (Count C.) Italy under Victor Emmanuel. A Personal Narrative, 2 vols. 8vo	1	10	0	*Hurst & Black.*
Austin (J. G.) On Preparation, &c., of Calcareous and Hydraulic Limes and Cements, 12mo	0	5	0	*Trübner.*
Cabinet Lawyer (The) a Popular Digest of the Laws of England, 19th edit., fcap. 8vo	0	10	6	*Longman.*
Chamber's Journal of Popular Literature. Vol. 17, sup. roy. 8vo	0	4	6	*Chambers.*
Coleridge (Herbert) Dictionary of the First or Oldest Words in the Eng. Lang. roy. 8vo	0	2	6	*Hotten.*
Du Breuil (M.) Sci. & Prac. of Grafting, Pruning & Training Fruit Trees, cr. 8vo.	0	6	0	*Kent.*
Every Boy's Book; a Complete Enclyopœdia of Sports, new edit., sm. cr. 8vo	0	8	6	*Routledge.*
Fletcher (G.) Parliamentary Portraits of the Present Period, 3rd series, post 8vo	0	7	6	*Ridgway.*
Gamgee (John) Our Domestic Animals in Health and Disease, 2nd division, cr. 8vo.	0	6	0	*Hamilton.*
Grant (James) Memorials of the Castle of Edinburgh, 2nd edit. fcap. 8vo	0	3	6	*Blackwoods.*
Gronow (Capt.) Reminiscences of, being Anec. of the Camp, Court, & Clubs, cr. 8vo	0	9	0	*Smith & Elder.*
Guizot (M.) Embassy to the Court of St. James in 1840, 2nd edit., 8vo	0	14	0	*Bentley.*
Irving (Washington) Life & Letters of, by his Nephew, P. E. Irving. Vol. 1, post 8vo	0	2	0	*Bohn.*
Jay (Wm.) Autobiography; edit. by G. Redford and J. A. James, cr. 8vo, red to	0	5	0	*Hamilton.*
Johns (Rev. C. A.) British Birds in their Haunts Illustrated, cr. 8vo	0	12	0	*Soc. Pr. Ch. Kn.*
Johnston (A. K.) Dictionary of Geography, Descriptive, Physical, &c., n. ed., rev. 8vo	1	10	0	*Longman.*
Keane (Wm.) Young Gardener's Educator, 8vo	0	5	6	*Groombridge.*
Kearley (Geo.) Links in the Chain; Chap. on the Curiosities of Animal Life, fp. 8vo	0	3	6	*Hogg.*
Laurie (W. F. B.) Northern Europe (Denmark, Sweden, Russia) in 1861, 8vo	0	12	0	*Saunders & O.*
Linton (Wm.) Colossal Vestiges of the Older Nations, post 8vo	0	6	0	*Longman.*
Lloyd (Julius) Life of Sir Phillip Sydney, sq. cr. 8vo	0	7	6	*Longman.*
Macdonald (Duncan G. F.) British Columbia and Vancouver's Island, 8vo	0	12	0	*Longman.*
M'Ghee (Rev. R. J. L.) How we got to Pekin, a Nar. of Chinese Campaign, 1860, 8vo	0	14	0	*Bentley.*
Mining and Smelting Magazine (The) Vol 1, Jan. to June, 1862, 8vo	0	7	0	*Office.*
Moore (Thomas) Field Botanist's Companion, with Coloured Illustrations, 8vo	1	1	0	*L. Reeve.*
My Country; The History of the British Isles. By E. S. A. Part 5, 18mo	0	1	6	*Werlheim.*
Observational Astronomy, and Guide to the use of the Telescope. Edited by J. T. Slugg, p. 8vo	0	4	0	*Simpkin.*
Pratt (H. F. A.) On Eccentric and Centric Force, a new Theory of Projection, 8vo	0	10	0	*Churchill.*
Reid (Hugo) Hand-Book of the History of the United States, fcap. 8vo	0	2	6	*Griffith & Far.*
Rickmam (T.) Styles of Architect in Eng., 6th ed., with addns. by J. H. Parker, 8vo	1	1	0	*J. H. & J. Parker*
Ritchie (Robert) Treatise on Ventilation, Natural and Artificial, 8vo	0	8	6	*Lockwood.*
Ronalds (Alfred) Fly-Fisher's Entomology, with coloured illustr., 6th edit., 8vo	0	14	0	*Longman.*
Simmonds (P. L.) Waste Products and Undeveloped Substances, fcap. 8vo	0	6	0	*Harkwicke.*
Smee (Alfred) General Debility and Defective Nutrition, 2nd edit., fcap. 8vo	0	3	6	*Churchill.*
Templeton (W.) Engineer's Millwright's and Machinist's Prac. Assist., 2d ed., 18mo	0	2	6	*Lockwood.*
Tuckett, (P. D.) Prize Designs for Covered Homesteads for Farms of 200 and 500 Acres, 8vo	0	5	0	*Weale.*
Waterston (W.) Manual of Commerce, new edit., revised, fcap. 8vo	0	3	6	*Simpkin.*

AMERICAN PUBLICATIONS FOR AUGUST.

Bernhard (Wm.) Book of One Hundred Beverages for Family Use, 16mo	$0 25	*James Millar.*
Hittell (J. S.) Mining in the Pacific States of North America, 16mo	0 70	*John Wiley.*
Lewis (Dio, M.D.) The New Gymnastics for Men, Women, and Children, with three Hundred Illustrations, 12mo	1 00	*Ticknor & Fields.*
Rankin (W. H., M.D.) Half-Yearly Abstract of the Medical Science. Vol. 35, Jan. to June, 1862, 8vo	$1 00	*Lindsay & Blackiston*

Proceedings of Societies.

TORONTO MECHANICS INSTITUTE.

A quarterly meeting of the members of the Mechanics Institute was held last evening Aug. 11th in the Lecture Room, Mr. William Edwards, 1st Vice-President, occupying the chair.

The Secretary read the minutes of the annual meeting, after which it was moved, by Mr. D. Carnegie, in accordance with a notice previously given, that the subscription of members be increased from $2 to $2 50 per annum. The motion was seconded by Mr. W. S. Lee. After a spirited discussion, in which part was taken by Messrs. Carnegie, Lee, Halley, Withrow, Sheppard and others, the motion was carried.

It was moved by Mr. W. S. Lee. seconded by Mr. W. Halley, that in accordance with the recommendation of the Board of Directors in their annual report, that the subscription of life members be reduced from $40 to $20, and that the money derived from this source be invested in a sinking fund for the liquidation or reduction of the debt of the building. The motion was unanimously adopted.

Mr Carnegie moved, seconded by Mr. Withrow, that steps be taken for permanently establishing classes in mathematics, drawing and English grammar.—Carried.

Moved by Mr. Richard Davis, seconded by Mr. W. Halley, and

Resolved,—That a series of meetings be instituted for the purpose of giving members an opportunity to converse on subjects of general interest, for dissocussion, essays, readings, &c.

After which the meeting adjourned.

FORTNIGHTLY MEETINGS AT THE TORONTO MECHANICS' INSTITUTE.

In the July number of this Journal, we called attention to a meeting of Members of the Toronto Mechanics' Institute, for the purpose of initiating a series of meetings for the discussion of matters of practical interest to Mechanics. On Friday, July 25th, the first of these very useful reunions was held, and a paper on the "*Heating and Ventilation of Buildings*" read by Mr. W. H. Sheppard. After reviewing at some length the effects produced upon the air of a room by the breathing of a large number of persons, and the inefficient methods of ventilation commonly adopted, Mr. Sheppard said:

"But within four walls the ventilation may be so managed that every individual may receive his quota of air directly from without, uncontaminated by the exhalations of others, warmed, if necessary, and even perfumed, if desirable.

"The arrangement necessary for this is that there may be, with a ready outlet for the foul air above, a provision made for admitting the air through numerous small apertures, distributed equally over the whole surface of the floor, it having been, if necessary, warmed, cooled or otherwise prepared in a chamber below.

"This system was adopted by Dr. Reid, in the ventilation of the temporary House of Commons, about 1835, and a similar plan was proposed by Mr. Sylvester for the new Houses of Parliament. The details of these methods are given in Tomlinson's Treatise on Warming and Ventilating, p. 214 & 238. The only defect in Dr. Reid's experiment was that the air in ascending carried with it some of the dust, &c., which was left in the carpet which it came through. This may be avoided in a seated room, by having for the lower back rails of the seats pipes of iron communicating with the space below, through the feet of the seats, and perforated every inch of their length, so that every one's share comes up directly to himself.

"This principle may be applied to an apartment of a dwelling house, where, to avoid the carpet, the air may be admitted by the base, in which a Torus moulding may be introduced, composed of a perforated iron pipe. Such rooms not being very large, or apt to be crowded, there is not the same necessity for having the perforations all over the floor. A hole at the top of the room, directly into the chimney, or, better still, a tube connecting the top of the room with the flue from the kitchen, where the fire is more constant, will give the necessary outlet.

"Any objection that may be made to an efficient system of ventilation, on the ground of its wasting the heat of an apartment, must be met by the consideration of its importance. The amount of human life that is lost by bad ventilation is worth far more than the extra expenditure of fuel which would have saved it."

* * * * *

On Friday, August 8th, Mr. W. Edwards read a paper on "*The Warming of Buildings.*" The first part of Mr. Edwards' paper was devoted to a general outline of the different methods of heating or warming buildings pursued in this country, viz.: the open fire place, the close box stove, the hot air furnace, the steam heated pipes, the hot water pipes, and the steam heated chamber. The following interesting facts in relation to the consumption of fuel in several large buildings in the City of Toronto were introduced. With respect to heating by steam, the mode adopted in the Toronto Mechanics' Institute, Mr. Edwards states:

"This plan of heating is, undoubtedly, as safe, more economical, and a healthier mode than any we have yet considered, as adapted to large buildings. It is safe, because, but only one fire is required in the entire building, therefore, under easy control, and being placed in a fire proof vault in the basement, no danger from fire can arise; and if the boiler and apparatus be of the low pressure kind—an advantage this Institute has secured, the pressure of steam generally varying from 2½ to 10 lbs. on the inch—no danger of explosion or casualty of that nature need be apprehended. That this system is economical, is proved by our own experience, this building having been heated up to from 65° to 75° the entire winter, and the fire kept up continually, night and day, Sabbath and week days, with a consumption of about 35 tons of coal.

"It is healthier, because warmth is produced by radiation of heat from the steam pipes that pass through the rooms, and therefore does not burn or injure the atmosphere, as is done where the air is radiated from red-hot iron plates.

"This system, however, requires thorough ventilation of the room, and the introduction of fresh air in the vicinity of the pipes, or the same atmosphere will be simply re-heated and made to circulate through the room, the same as with the box stove.

"It is unnecessary for me to explain the working or construction of this apparatus, as it is in the building for any one to see; I would merely add, that it is easily managed by our housekeeper, and that the temperature is regulated with very little trouble, by means of valves in the different rooms of the building.

The Steam Heating Apparatus in this building, (the Toronto Mechanics' Institute and Music Hall) was supplied and arranged by Mr. Jas. E. Thompson of this city.

Hot Air Furnaces.—For extensive buildings this is probably the system most commonly in use for heating purposes. It is, however, open to one of the worst objections to the close stove, inasmuch as it is more liable to overheat *or burn* the air before introducing it into the room; and is also more expensive, both as regards the first cost of the apparatus and the subsequent keeping of it in repair, and also in the consumption of fuel.

"In two of the churches of this City, respectively of about the same capacity as our Music Hall, and in one of which the temperature is generally very low in the coldest weather, each consumed about fourteen tons of coal during the past winter. In one of them four Challenge Heaters are used, and in the other two McGregor Furnaces.

"I am informed that in heating the St. James' Cathedral for the past winter, with, I believe, "The Chilton Furnaces," sixty tons of coal were used. These Churches were only heated up for the Sabbath days, except to a very limited extent.

"In the Normal and Model Schools, heated by means of *Tiffany's* Furnaces, the consumption of wood is about 200 cords per annum; and the Model Grammar School, heated by coal furnaces, consumes about sixty tons of coal during the winter. These furnaces are all kept in operation for five and six days in each week."

"The cold air is introduced by conducting tubes from the outside of the building, generally from near the surface of the earth, into the air boxes of these furnaces; when to obtain a sufficient degree of heat it is often brought into contact with red hot iron plates or plates heated to such a degree as to destroy the vitality of the air, and cause headaches and other unpleasant sensations to the occupants of the room heated.

"These objections are, to some extent, obviated by placing a vessel of water, with a large amount of surface, for evaporation, in such a position that the heated air, before passing through the supply pipes into the rooms, must pass over it, taking up a certain amount of moisture with it in its passage."

"The last mode of Heating which I propose to notice is that of *Steam-heated Air Chambers*, placed in the lower portion or *basement* of the building. I am not aware of any buildings in Toronto being warmed on this principle, nor have I been able to find a description of such a system of warming in the works I have had the opportunity of consulting. It is, however, I have no hesitation in saying, the most complete and healthiest method of warming buildings of any yet brought under our notice, possessing all the advantages of hot air furnaces, and steam and hot water systems of heating without any of their disadvantages.

"The great advantage of this system is, that the air is always pure, if introduced into the building from a high elevation, as it invariably should be for all systems of heating, being thus comparatively free from the obnoxious gases and animal impurities resting near the surface of the earth, especially during the night.

"I have no doubt but a greater amount of fuel will have to be consumed by this system to produce the same amount of heat that is obtained by a smaller consumption of fuel in connection with the other systems of heating, except that of the open fire-place; but admitting such to be the case, there is no doubt of its being less injurious to health than any of the other modes, a consideration of the greatest importance to all who value their own or their neighbours' well-being."

Patent Laws and Inventions.

ABRIDGED SPECIFICATIONS OF ENGLISH PATENTS.

13. W. B. Pattrick. *Improvements in the manufacture of sugar, and in the apparatus employed therein.* Dated Jan. 1, 1862.

Here the patentee makes use of a closed vessel or vacuum-pan, and he heats the saccharine syrups or solutions therein to a low temperature, considerable below the boiling point, or 212° Fahr., by hot water, air, or vapour, caused to circulate in pipes in or around such vessel, or in the jacket or outer case thereof combined with the use of air heated to about the same temperature forced through openings in a pipe or pipes, applied so that the air may be distributed amongst, and pass through, the syrup or solution, and thereby aid in driving off the aqueous particles contained therein in the form of vapour, which are then drawn off by the air-pump or other means. By these means improved colour and increased amount of crystals will be obtained with less molasses or treacle.

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55. J. Stenhouse. *Improvements in rendering certain substances less pervious to air and liquids.* Dated Jan. 8, 1862.

This consists in the use of paraffine for rendering leather, thread, cord, ropes, and textile fabrics composed of cotton, linen, or wool, &c., less pervious to air and liquids.

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99. J. G. Marshall. *Improvements in the preparation of flax and other fibres previous to being spun.* Dated Jan. 13, 1862.

This invention consists in preparing the fibres of flax, hemp, and other analogous plants, by passing them in a wet state between a series of drawing rollers, to which an increasing draught is imparted, previous to being spun, and where all the fibres are reduced to one uniform length and degree of fineness.

139. T. ROBERTS and J DALE. *Improvements in the manufacture of gunpowder.* Dated Jan. 18, 1862.

This consists in a method of making gunpowder, whereby the patentees are enabled to use nitrate of soda instead of or in combination with nitrate of potash. This they effect by adding thereto a substance which will effloresce, so as to correct the tendency of the other material or materials to become moist. Of these substances they name, for example, the anhydrous sulphate of soda and magnesia.

147. E. C. NICHOLSON. *Improvements in the preparation of colours suitable for dyeing and printing.* Dated Jan. 18, 1862.

Here the patentee takes red dye, such as is made from aniline or its homologue, and without the admixture of either aniline or its homologue, heats it carefully to a temperature, by preference, between 390° and 420° Fahr. The substance quickly assumes the appearance of a dark semi-solid mass, the red dye being transformed into a dark substance with evolution of ammonia. The mass he prefers afterwards to extract with acetic acid, using a quantity of acid about equal in weight to the amount of red dye treated, and this acid he dilutes with enough alcohol to make a dye of convenient commercial strength. The solution obtained is of a deep violet or purple colour, and may be used directly for dyeing purposes.

156. C. T. BOUSFIELD. *Improvements in machinery for making nails and spikes.* (A communication.) Dated Jan. 21, 1862.

This relates to a novel arrangement of parts, constituting an improved nail-making machine, in which two pairs of compressing rollers are used for tapering the ends of the metal rods fed into the machine to a suitable shape for forming nails or spikes, in combination with a cutter for severing such tapered ends from the rods, and a heading die for striking up the heads of the nails or spikes while the same are held firmly between nipping dies, the object being to effect in a rapid and economical manner the conversion of rods or bars of iron or other suitable material into nails or spikes.

157. J. H. RAWLINS. *Improvements in machinery used in the manufacture of paper.* (A communication.) Dated Jan. 21, 1862.

This consists in applying to a paper-making machine, wherein an endless web or woven wire is used, an apparatus consisting of a roller and a travelling blanket or felt to remove the wet web of pulp from the endless web of wire of such machine. By these means the web of wet pulp is caused to adhere to the travelling blanket or felt, and the two together are pressed between pressing rollers, and then the web of pressed pulp or paper is separate from the blanket and passes away to be dried, while the travelling blanket returns to the paper-making machine.

158. A. J. MARTIN. *Improvements in the treatment of fusil oil, and for various applications of the same to useful purposes.* Dated Jan. 21, 1862.

The patentee claims, 1. The combination and treatment or preparation of fusil oil with pitch or other hydro-carbons as described, for the manufacture of an oil or fluid to be used for illuminating purposes. 2. Treating fusil oil by subjecting it to the action of heated iron and steam as and for the purposes described.

202. J. BROWN and J. DAVENPORT. *An improved lubricator for pistons.* Dated Jan. 25, 1862.

This consists of a lubricator having two thoroughfares open to the steam, with a direct communication through the tap or plug, which tap or plug may be placed in a horizontal direction.

PATENTS OF INVENTION.

BUREAU OF AGRICULTURE AND STATISTICS, *Quebec, 16th August*, 1862.

HIS EXCELLENCY THE GONERNOR GENERAL has been pleased to grant Letters Patent of Invention for a period of FOURTEEN YEARS, from the dates thereof, to the following persons, viz:

DAVID TODD, of the Town of Windsor, in the County of Essex, for "A Railway Break of Guage Frustrator."—(Dated 27th May, 1862.)

Reverend JOHN HARVY ROMBOUGH, of the Township of Osnabruck, in the County of Stormont, Minister of the Methodist Episcopal Church, for "A Self-feeding Trashing Machine, improved Separator and Fanning Mill."—(Dated 27th May, 1862.)

THOMAS ROBSON, of the Township of Brantford, in the County of Brant, Miller, for "An Improved Feed Mill," a machine for reducing to a fine state Bark, Indian Corn in the ear and other substances, and for cracking for feed coarse grains."—(Dated 27th May, 1862.)

JAMES E. MITCHELL, Machinist, and WILLIAM DEPEW, Tin-Smith, both of the Town of Paris, in the County of Brant, for "Improved Balance Gate." —(Dated 3rd June, 1862.)

JOEL SYLVESTER WARNER, of Cornwall, in the County of Stormont, Watchmaker, for a Churn called "The Peoples' Self-acting Churn."—(Dated 3rd June, 1862.)

ROBERT METCALFE, of the Village of Carleton Place, in the County of Lanark, Carpenter, for "Certain improvements in the construction of Churns." —(Dated 3rd June, 1862.)

AARON HAWLEY SCOTT, of the Village of Tilsonburg, in the County of Oxford, Cabinet Maker, for "A new mode of applying power to Machinery, by means of rotary motion with a slide lever."—(Dated 3rd June, 1862.)

GEORGE MARTIN, of the Village of Oshawa, in the County of Ontario, Joiner, for a new Fanning Mill or Wheat Separator, called "Martin's Improved Wheat Separator." (Dated 3rd June, 1862.)

CHARLES H. WATEROUS, of the Township of Brantford, in the County of Brant, Machinist, for "A Centripetal Churn and Centripetal Agitator for refining and fitting for use Rock Oil or Petroleum and Coal Oil."—(Dated 6th June, 1862.)

H. C. Drew, of the Township of Whitby, in the County of Ontario, Mechanic, for "An Improved Waggon and Carriage."—(Dated 9th June, 1862.)

Albert Bigelow, of the City of Hamilton, in the County of Wentworth, for "A new and improved compression Cock."—(Dated 9th June, 1862.)

Thomas Northey, of the city of Hamilton, in the county of Wentworth, Machinist, for "An improved expansion steam engine."—(Dated 9th June, 1862.)

Samuel Weaver, of the township of Humberstone, in rhe county of Welland, Artist, for a new process for taking photographs, called "Weaver's Process."—(Dated 9th June, 1862.)

Joseph Marks and Richard Eaton, both of the city of Hamilton, in the County of Wentworth, Mechanical engineers, for "An improved smoke stack and spark arrester for locomotive and other steam engines."—(Dated 9th June, 1862.)

Robert White, of the city of Kingston, druggist, for "An adjustable concave cleaner."—(Dated 9th June, 1862.)

H. B. Morgan, of the township of Tilsonburg, in the county of Oxford, Machinist, for "A Bee-Hive and miller destroyer."—(Dated 9th June, 1862.)

James Bowtell Burbank, of the village of Danville, in the county of Richmond, joiner, for "A new and improved washing and wringing machine."—Dated 18th June, 1862.)

Lorenzo Graves, carpenter and joiner, and Hollis Clark, wheelwright, both of the township of Barnston, in the county of Stanstead, for "A new sawing machine."—(Dated 18th June, 1862.)

Benjamin Thrasaer Morrill, of the township of Stanstead, in the county of Stanstead, farmer, for "An improved thrashing machine."—(Dated 18th June, 1862.)

Richard Lewis, of Melbourne, in the county of Richmond, carpenter, for "A new and improved churn."—(Dated 18th June, 1862.)

Richard Rogers, of the town of Whitby, in the county of Ontario, carpenter and joiner, "for A double attached clothes wringer."—(Dated 29th June, 1862.)

Hiram Joseph Livergood, of the township of Brantford, in the county of Brant, carpenter, for an improved Bee-hive, styled "Livergood's Bee-hive."—(Dated 7th July, 1862.)

John Battersby McNeail, of the Township of Westminter, in the County of Middlesex, butcher, for "A new and useful improvement in the manufacture of refrigerators."—Dated 7th July, 1862.)

William Holt, of York Mills, in the county of York, for "A ploughing, ridging, drilling, sowing and rolling machine."—(Dated 7th July, 1862.)

Thomas Gregory, of the township of King, in the county of York, yeoman, for "An improved Straw Cutting Machine."—(Dated 7th Jnly, 1862.)

James Phillips, of the city of Toronto, in the county of York, Mariner, for "An improved self-heating smoothing Iron."—(Dated 7th July, 1862.)

John Abner Burton Hannum, of the town of Cornwall, in the county of Stormont, Cabinet Maker, for "A Double Dasher Churn Power."—(Dated 8th July, 1862.)

Nelson Simmons, of the township of Sophiasburgh, in the county of Prince Edward, Farmer, for "A Revolving Float Churn."—(Dated 8th July, 1862.)

John Bennett, of the township of Madoc, in the county of Hastings, Machinist, for "A combination Sieve."—(Dated 8th July, 1862.)

Leon M. Clench, of the village of St. Mary's, in the county of Perth, for a Hydropult to be called the "Pneumatic Repeating Hydropult."—(Dated 8th July, 1862.)

Daniel C. Ward, of Streetsville, in the county of Peel, Hotel Keeper, for "A new method of constructing Washing Machines with Wringer attached thereto."—(Dated 8th July, 1862.)

Thomas M. Bottomley, of the city of Toronto, in the county of York, Machinist, for "A Metallic Carriage and Waggon Hobb."—(Dated 8th July, 1862.)

Charles H. Waterous, of Brantford, in the county of Brant, Machinist, for "An improved machine for manufacturing the shoes of horses and other animals."—(Dated 8th July, 1862.)

Canadian Items.

THE CANADIAN OIL ASSOCIATION.

The owners of oil wells in Enniskillen have formed an Association for the sale of their oil. All the oil produced at the different wells becomes in effect the property of the Association, and when sold the proceeds are distributed amongst the various owners in proportion to the amount each contributes to the general stock, or in other words, to the yield of their wells. The Association recently despatched a committee of inquiry to the oil region of Pennsylvania, whose report from the *Oil Spring Chronicle* is subjoined.

"At a meeting of the Association last Friday evening, Mr. Richardson, of the committee sent to the oil region of Pennsylvania for the purpose of making observations and gathering information in regard to the oil business and its prospects there, made, substantially the following verbal report:—

Members of the Canada Oil Association; Gentlemen:—

I, as one of your committee, appointed by you to visit the Pennsylvania Oil Springs, will, in the absence of my associate, Mr. Sanborn, make only a verbal report. We visited the springs in Oil Creek only believing that we there obtained all the information in regard to the oil trade which could be of any particular advantage to you who are engaged in the trade here. We found upon arriving at Titusville, that all the oil wells in that vicinity are dry, or in other words had ceased to flow as they once had and that the nearest well to that point now flowing, was six or seven miles down the creek. This first well is called the Sherman well, and is one of the best which we visited. It is claimed to flow 500 barrels per day, and I think not over estimated. The territory which is at present producing oil to any considerable extent, does not extend more than some four miles down the creek from the Sherman well. Below that to the mouth of the creek, the wells have principally ceased to flow, as about Titusville. We found but few wells claimed to flow equal to the Sherman well. Some few claimed to flow 200, and a number claimed to flow from 10 to 50 barrels per day. From our best observation, and the most reliable information we could obtain, we came to the conclusion that the present yield of oil on Oil Creek, and indeed of all the Pennsylvania springs, is not over one fourth of what it was last winter, that is for each 24 hours. The fact of this great falling off of the supply is not attempted to be concealed by the oil men there. Refineries, both large and small, are being erected, a branch railroad constructed to the springs, and various improvements being made, which convinced us that all interested in the oil trade have a deep abiding faith in a large supply to be drawn by pumping after the veins cease to flow by the pressure of the gas. Whether such will be the case is hard to tell. We asked the opinion of many, and were generally answered, "the wells have not been tested, but we think they will pay fair quantities by pumping." There is more uncertainty in obtaining a flowing vein there than here, and the cost much heavier. The veins there are not generally less than 500 feet in the rock. The oil is accompanied by much more gas in the flow than ours, consequently it is lighter and of less value, provided it costs no more to deodorize ours than theirs. We found the market price at the wells from 50c. to 60c. per barrel, but the stock was light and buyers plenty. We found a large quantity stowed in tanks covered in the earth, which is not in the market at these low prices. Pennsylvania oil producers once realized large prices, and they confidently expect those prices to return, and that ere a great while. They reason in this way. The demand is much larger than one year ago, and the supply much diminished, hence, the price must go up. This reasoning to my mind is logical, and I have no doubt that they will realize their most sanguine anticipations within the next two years at farthest.

The practice with us of shutting off flowing veins, is not followed in Pennsylvania, consequently they are subjected to heavy expenses in storing, or are compelled to sell at low prices, or let their oil waste. Again, transportation to shipping points costs them from twice to six times what it does us, hence we have nothing to fear from competition with them in the markets of the world; while our price is not more than double theirs at the springs. I will now make a few suggestions upon the probability of the early exhaustion of our great reservoir of oil in Canada, not as legitimately a part of my report. If the theory is a correct one, that petroleum is a product of coal, and our supply was produced from the Pennsylvania coal beds, the strong probability is, that our reservoir reaches to a great depth, and that we have as yet only drawn a little from the surface. Or again, if it is not the product of coal, but produced by agencies now at work, we may never be able to fully exhaust our supply. But insomuch as these are all uncertainties, I would advise that we proceed just as though we knew we had tapped the only body we will ever find, and that it will exhaust within five years at most."

THE CANADIAN NATIVE OIL COMPANY.

The cause of the decline in the yield of the Pennsylvania wells is very probably due to the exhaustion of the gas which forced up the oil to the surface. We do not agree with the "uncertainties" spoken of by the Committee of the Canadian Oil Association which precedes this notice. Petroleum is neither derived from coal, nor is it of recent origin. It was formed long before the coal, and is the result of the decomposition, under pressure, of an infinite number of oil-yielding animals which swarmed in the seas of the Devonian period, long anterior to the coal. The decomposition of marine plants may have given some oil to the rocks of Canada and the United States, which are saturated with this curious substance. The shale beds of Collingwood furnish an answer to those who object to the infinite number of animals it would require to produce the oil locked up in the earth. Those shale beds are composed almost altogether of the remains of Trilobites—they extend from Lake Huron to Lake Ontario, and far west and east of those lakes. The oil-bearing rocks of Canada were once a vast coral reef, extending from the Gulf of Mexico to Lake Superior. There is the best ground for belief that the supply of oil will last for a long period, and that new discoveries will be made in different localities. But as soon as the motive power which forces the oil to the surface is exhausted by finding free access to the air, recourse must be had to pumping, and the sinking of the necessary deep wells, will soon throw out all those owners of wells who are not possessed of capital. Deep shafts will eventually have to be sunk, and the oil will continue for a very long period to flow into the wells, but the cost of pumping will be so small that the price of oil may not rise much beyond its present market value. That value will be of course determined by the cheapness of other illuminators, and as the supply will doubtless be ample, we do not anticipate any considerable rise in price. The London Company have made purchases of land, we understand, in different parts of the peninsula, but it does not appear that these purchases have been made with a knowledge of the geological formation of the country or of the distribution of the *accumulations* of oil. The area of oil or petroleum yielding rock is very great in Western Canada, extending over the whole region occupied by the Corniferous limestone, but the fissures in which the oil has accumulated, are probably found only in the main and subordinate anticlinal axes which run through the western peninsula. If the land purchasers for the company have not had this remarkable geological peculiarity prominently and constantly before them, in vain are their purchases of "oil lands," they may have secured good farm lots as the country settles up, but when they come to bore for oil, the returns for their labour may be chiefly couched in the words *non est inventus.*

The following is from the Prospectus of the Canadian Native Oil Company, (limited). Incorporated under the Joint Stock Companies Acts 19 and 20 Vic., Cap. 47, by which the liability of each Shareholder is strictly limited to the amount of his Shares. Capital £100,000, in 20,000 Shares of £5 each, 10s. on Application, and 10s. on Allotment. No Call to exceed £1 per Share, and an interval of not less than Three Months between each Call.

Directors.—John Arthur Roebuck, Esq. M.P., Chairman, Ashley Place, Westminster; Adolf Ellisen, Esq., Firm of Ellisen & Co., 21 Moorgate Street, Director of the Metropolitan and Provincial Bank; The Hon. Mr. Justice Haliburton, M.P., Gordon House, Isleworth, Chairman of the Canada Agency Association; John Henry Lance, Esq., Director of the London and South African Bank; F. John Law, Esq., The Holmwood, Dorking, Chairman of the London General Omnibus Company; Lt.-Colonel G. H. Money, N.E.L.R., 2 Bedford Square, and 9 Berkeley Street, Berkeley Square; with power to add to their number.

Bankers.—The City Bank. *Brokers .*—Sir Robert Carden and Son, 2 Royal Exchange Buildings. *Auditors.*—Henry Kingscote, Esq., Samuel Burgess Gunnell, Esq. *Solicitor.*—J. F. Elmslie, Esq., 10 Lombard Street. *Consulting Engineers.*—Messrs. Phillips and Darlington Moorgate Street Chambers. *Secretary.*—Mr. David Nisbett, Jun. *Temporary Offices.*—27 Gesham Street.

The directors state in their prospectus, that in order to show the comparative advantage of this Petroleum or Rock Oil over all other burning Oils, the following statement, the result of careful experiment and calculation is submitted:—

Description of Oil.	Price per Gallon.		Intensity of Light by the Photometer.	Amount of Light from equal quantity.	Cost of an equal quantity of Light in decimals.
	s.	d.			
Petroleum or Rock Oil	2	0	13·70	2·60	2·00
Sperm	7	6	2·00	·95	20·00
Camphine	5	0	5.00	1·30	10·00
Rape or Colza	4	0	2·10	1·50	6·50
Lard	4	0	1·50	.70	14·50
Whale	2	9	2·40	·85	8.25

PETROLEUM GAS.

The Stevenson House, St. Catharines, is now lighted with Petroleum gas. The light is very white and brilliant; and although one foot burners only are used, the illuminating power is fully equal to that of a four foot burner supplied with the coal gas in ordinary use. There is no smoke or smell perceptible during the burning; and as the works are situated some short distance from the hotel, the odor of Petroleum is not apparent. The works are constructed according to Messrs. Thompson & Hind's patented process. The success which has attended the lighting of the Stevenson House, has already induced other parties to adopt Petroleum gas. Among several others, we notice a large factory at Dundas, a factory at Hespeler, the Rossin House at Toronto. The introduction of Petroleum gas into the Rossin House will be a great saving to the proprietors. They consumed last year 578,000 cubic feet of gas, which cost $1,734 @ $3 a thousand feet. This year the Toronto Gas Company propose to let them have the gas at $2 50 a thousand, which, for a consumption of 600,000 feet per annum, amounts to $1,500. Mr. Thompson's works will cost them about $1,500, and they will cover, by the use of the Petroleum gas, the entire expense in less than two years. Including every outlay, interest on capital, &c., the cost of the gas will be only $1 70 a thousand feet, assuming that 10 gallons of oil are used for making that quantity of gas, although, if good oil is available, 7 gallons are abundantly sufficient in the process employed. One foot burners are used instead of three or four foot burners, hence the quantity of gas consumed is less than one-third. So that the actual cost per thousand, compared with coal gas, is about 60 cents against $2 50 a thousand feet.

FLOWING WELLS AT ENNISKILLEN.

On Wednesday, the 13th August, Mr. John W. Sitton was rewarded for his labour by striking a large vein of oil at the depth of 153 feet in the rock. The oil immediately rose to the surface, filling the surface well (51 feet), and commenced flowing. The yield is variously estimated at from 1,000 to 1,500 barrels in 24 hours. We are glad to be able to record this, as Mr. Sifton well deserves his prize.

ANOTHER.—We learn that on Tuesday last, Mr. Wm. Webster tapped a large vein of oil at the depth of 153 feet in the rock. The flow of this well, although not as large as the one mentioned above, is amply sufficient for all practical purposes, and is as great as can be taken care of. It is estimated at about 800 barrels in 24 hours.

ANOTHER—On Wednesday morning (Aug. 20), still another flowing well was struck. The fortunate ones this time are Messrs. J. H. Fairbanks and J. H. Eakins. The depth was but 116 feet in the rock—the shallowest one yet struck in the diggings. The yield is said to be about 500 barrels in 54 hours.

The Oil Springs *Chronicle* of Aug. 28th contains the announcement of another flowing well struck by Mr. E. T. Soles the Editor of the Chronicle.

SALE OF 2,500 BARRELS OF OIL.—The Canada Oil Association sold last week 2,500 barrels of crude oil to one firm in Montreal. We understand that they have received orders for another 2,500 barrels for the same market. This is encouraging.—*Oil Springs Chronicle.*

CENSUS OF CANADA.

ACCORDING TO ORIGIN.

Natives of Canada not of French origin.	1,037,170
" French origin	880,607
" Ireland	241,423
" England and Wales	127,429
" Scotland	111,952
" United States	64,399
" Prussia, German States and Holland	23,855
Indians	12,717
Natives of Nova Scotia and Prince Edward's Island	5,360
" New Brunswick	4,066
" France	3,061
" Guernsey, Jersey, and other British Islands	1,157
" Newfoundland	719
" Switzerland	698
" West Indies	669
" Sweden and Norway	590
" East Indies	252
" Russia and Poland	227
" Italy and Greece	218
" Spain and Portugal	151
" All other places	669
Born at sea	384
" at places not known	1,809
	2,506,755
Coloured persons included in the above.	11,413

CENSUS ACCORDING TO RELIGION.

Belonging to the Church of Rome	1,200,865
" " England	374,987
Wesleyan Methodists	244,246
Free Church of Scotland	157,813
Established do.	132,649
Episcopal Methodists	79,152
Baptists	69,310
United Presbyterians	56,527
New Connexion Methodists	29,492
Lutherans	25,156
Other Methodists than the above	24,204
Men of no religion	18,850
Creeds not classed	14,962
Congregationalists	14,384
No creed given	13,849
Protestants	10,098
Menonists and Tunkers	8,965
Bible Christians	8,085
Quakers	7,504
Christians	5,316
Universalists	4,523
Disciples	4,152
Second Adventists	3,355
Unitarians	1,284
Jews	1,241
Mormons	77
	2,506,755

The population of the principal cities is as follows:—

Upper Canada.		Lower Canada.	
Toronto	44,821	Montreal	90,323
Hamilton	19,096	Quebec	51,109
Kingston	13,743	Three Rivers	6,058
Ottawa	14,696	Sherbrooke	5,899
London	11,555		

PERSONAL CENSUS OF THE BRITISH NORTH AMERICAN PROVINCES.

Canada	2,506,755
New Brunswick (over)	250,000
Nova Scotia	330,000
Prince Edward's Island	80,857
Newfoundland	122,638
Total	3,290,250

MANUFACTURES IN MONTREAL.

The manufacture of boots and shoes in Montreal has risen to great prominence, and many persons engaged in the business have rapidly acquired wealth. The wholesale trade is in the hands of some six or seven houses. The amount of capital invested in all the works is about $750,000, and the number of boots and shoes of all kinds manufactured averages 1,000,000 pairs. This branch of trade gives constant employment to about 1100 persons, many of whom, of course, are women and children. There are besides the following manufactures in operation:—India rubber shoes, &c., foundries, threshing machine factories, steam sawmills, &c. The sugar refinery of Mr. Redpath is the largest factory in Montreal, and deserves special mention. Its large pile and tall chimney are visible a long way off from the city. The principal building is of stone and brick, seven stories high, the whole of the floors comprising an area of 11,766 square yards. Besides this there are two brick warehouses attached, affording storage for 8,000 barrels of refined sugar and 2,500 hhds. of raw sugar. There is also attached a range of brick buildings, 236 feet in length and two stories high, containing the gas house, the bone house, blacksmith's, carpenter's, machinist's and cooper's shop, and stable; cost £45,000. The machinery is propelled by a steam-engine of 50-horse power, the boilers being equal to 150-horse power. 150 to 170 men are employed upon the premises, but a good deal of work is done elsewhere. The wages amount to £11,000 per annum, the total expenses of the establishment being £33,000 per annum. The present product is about 3,000 bbls. of refined sugar per month, and the production could easily be doubled if the demand required it. It is all sold in Canada. This factory is the first and as yet the only one of the kind in the Province.

To show that we also support to some extent articles of luxury, says the correspondent of the *Canadian News*, I may mention that there are in this city five piano manufactories, which annually turn out about 185 instruments. This year there has been a slight decrease in the number produced in comparison with the preceding one. The amount of capital invested in this branch of business is about $40,000 to $50,000, and the number of hands employed is about 60 men, who earn from $6 to $15 per week each, according to ability.

GROWING TRADE WITH CONTINENTAL EUROPE.

In the present year nine ships have already sailed for German ports—Stettin, Hamburg, and Bremen—with cargoes of Timber and Rock Oil.

Stettin	1 ship,	Oak.
Hamburg......	3 ships,	Oak and Pine.
Bremen........	4 ships,	Red and White Pines, Walnut, &c., from Chatham.
"	1 ship,	with Rock Oil.
Total..........	9 ships.	

LOSSES ARISING FROM BAD FLOUR BARRELS.

The following remarks on Flour Barrels, from the *Montreal Witness*, are well worthy of the attentive perusal of millers and exporters of flour:—

"We wish to draw the attention of millers to the important subject of flour barrels, as many of the difficulties and losses in flour transactions grow in one way or another out of imperfect barrels. If barrels be made too slight, they cannot be transported in good order, and sometimes they get into such a state that no sea captain will sign a bill of lading for them. Such barrels get loose, the flour dusts through the staves, the heads of some fall out, and the flour turns out short weight, entailing the expense of filling up, which involves a loss of from 15 to 20 cents a barrel, besides the disgrace of being published for short-weights.

"Barrels that are heavy enough may be made of wood only partially seasoned, in which case also they become loose, and the above results occur as well as one to which we wish to draw attention. A barrel made in winter, of wood only partially seasoned, will lose 1½ lbs. by this time. Suppose it weighed 21 lbs. when made and branded, and 196 lbs. of flour was put in, the gross weight would be 217 lbs.; but the barrel itself loses perhaps 1½ lbs. in weight, so that the gross will be only 215½ lbs., from which we deduct the marked tare of 21 lbs., and only 194½ lbs. remain as the net. The Inspector will reject this flour as short weight when all the time there are 196 lbs. in the barrel. This strikes us as being a mistake either in the law or the Inspector; because, no flour can be called short-weight if there be 196 lbs in the barrel. It is however to be observed, that no barrel should be scribed until seasoned; and, we may add, no barrel should be less than 20 lbs. weight, but rather a little more:—for 20 lbs. is always deducted in Liverpool as Tare, and Canada loses an average of three or four pounds of flour per barrel, on a great proportion of her shipments."

CENSUS IN NEW BRUNSWICK.

The population of New Brunswick has increased 30 per cent. during the last ten years, and the number of inhabitants exceeds 252,000. Of these 128,593 are white males and 120,661 white females, 625 Indians, and 587 females, making a total of 129,948 males and 122,099 females. The per centage exceeds that of Nova Scotia by 10 per cent., and Lower Canada by 6; it nearly equals the whole of Canada, whilst it has made great advances over several states in the adjoining Republic.

The Roman Catholics are the largest body of Christians in the Province, numbering 85,258, a third part of our whole population. The Baptists united have 57,730; Episcopalians, 42,776; Presbyterians, 86,072; Methodists,25,637.

Of manufactures, there are 80 steam saw mills, 609 water saw mills, 6 steam grist mills, 273 water grist mills, 21 water oat mills, 22 steam tanneries, 10 water and 94 manual do., 21 steam foundries, 79 weaving and carding water mills, 5,134 hand looms, 9 breweries that produce 322,040 gallons, &c. Since 1851 a great increase is observable in mineral wealth, especially in coal, as last year there were 18,244 tons raised, while in 1851 there produced only 2,842.

Photography.

MR. DE LA RUE'S PHOTOGRAPHS OF THE SUN.

Arago, in his elegant and popular work on Astronmy, translated by two eminent fellows of our Society, states that MM. Fizeau and Foucault, in 1845, obtained a photographic image of the sun, and two spots on its disk, delineated with much accuracy; but, however this may be, it is certain that no uniformly successful method of taking images of the Sun has been devised until Mr De la Rue took up the problem for investigation.

Yet great as have been the difficulties in obtaining a really accurate and available picture of the Moon they sink into significance when compared with those which had to be overcome in the photography of the Sun, for to obtain any automatic pictures of the Sun's photosphere available for practical purposes, it was found necessary to institute a series of preliminary experiments before actual operations could be successfully commenced. At first nothing but burnt-up and polarized pictures could be obtained by any method that had hitherto been devised, or with any the least sensitive of the media that could be procured. Now, with the help of the Kew photoheliograph, as devised by him, and described in vol. xv. of the 'Monthly Notices,' *heliography* is the easiest and simplest kind of astronomical photography. The method devised by Mr De la Rue will enable any photographer of common average skill to take excellent heliographs. Professor Selwyn, of Cambridge, succeeds in getting pictures of the Sun with the apparatus made for him by Mr Dalmeyer, after the pattern of the Kew photoheliograph.

Mr De la Lue announced at the last Meeting of the Society, that by applying the stereoscope to the examination of the Sun's disk, as he had done in the case of the Moon, he had discovered, that faculæ on the surface of the sun are to be found in the outer or or highter regions of the solar photosphere.

I ought not to conclude without alluding to Mr. De la Rue's observations on the solar eclipse in 1851; and of the solar eclipse in 1860 *four* small pictures were taken dnring the totality by Professor Monserrat, under the direction of MM. Aguilar and Secchi, at Desierto de las Palmas, in Spain.

Mr. De la Rue, during the progress of the same eclipse, took many large and exquisitely defined pictures, and secured two during the totality. I have no need to enter into details, as he has already described at several meetings of this Society the numerical results that follow from the discussion, and the comparisons of the photograghs which he took on that occasion. A paper, giving the result of his labours during the expedition to Riva Bellosa has been presented to the Royal Society.

Mr De la Rue has invented an ingenious micrometer, lately exhibited at one of our meetings, by means of which he fully confirms the hypothesis that the coloured protuberances belong to the Sun, and renders it almost certain that the commonly received diameters both of the Sun and Moon require a correction.

More recently still, photographic pictures of the Sun have been obtained by Mr De la Rue, not only exhibiting its well known mottled appearance, but showing traces of Mr Nasmyth's "willow leaves" and by the aid of stereoscopic pictures rendering it certain that the faculæ are elevations in the Sun's photosphere.

I need not enlarge on the wonderful discoveries which have been made and the astonishing results that have been obtained by Newton and his successors in this, the most fertile and exact of all the applied mathematical sciences. Neither would it be-become me, an humble but zealous worshipper of science, to hazard conjectures as to thr *future progress* of *astronomy*. And yet I cannot refrain from expressing my belief that the success already achieved by our friend warrants us in entertaining the hope that before long he will be able, with the aid of stereoscopic pictures, to exhibit to us the rose coloured prominances depicted on the sensitive plates as plainly as the faculæ have already been photographed.

The depths and the successive strata of those strange interlacing outliers within the solar spots may be brought into tangible view. The different plains of *Saturn's* rings will also come into relief, the belts of *Jupiter* may be manifested as portions of his dark body, and ere long the mountains and elevated continents of *Mars* will rise up into solidity before our delighted gaze.

I may also, perhaps, be permitted to remark, that while our great national and public Observatories—indeed I ought to say, those of the civilized world as well—are day by day adding to that enduring record of the transient phenomena of the heavens, which will enable future ages to reach the final finish and last perfection in the calculation of the tables of the motions of the moon and the planets, to eliminate any element of error, however minute, and to detect any latent disturbing force however feeble its effect, yet it is to *private Observatories* and to observations made in the remoter regions of starry space that we are chiefly to look for new discoveries. It augurs well for the future that there is no lack in our own day of such establishments, or of accomplished observers to use them. It is almost, if not altogether, needless to bring before you the names of Admiral Smyth, or Lord Rosse, or Mr. Lassel, or Lord Wrottesley, or Mr. Dawes, or Mr. Carrington, and a host of others familiar to many of you. The elliptic motions of binary stars round their common centre of gravity, the colours of others, the discovery of new planets, the calculation of cometary orbits, the laws of change in the *variable* stars, the sudden burst upon the sight of some stars, and the gradual evanescence of others, will afford for many generations suitable and exhaustless subjects of sustained astromonical research. The instant splendour and gradual decay of certain stars is one of the most wonderful facts recorded in the history of astromony. In 1572 Cornelius Gemma observed a star in the chair of *Cassiopeia*, transcending *Venus* in brightness. It was Hipparchus who first, I believe noticed the sudden appearance of a star of singular briliancy before unknown. By this strange discovery he was urged to construct a Catalogue of Stars visible to the naked eye, "that posterity might know whether time had altered the face of the heavens."

The art of photography is of the very highest importance in the promotion of exact science. It stereotypes, so to speak, for the use of all time to come, the present aspect of the heavens.

As astronomical observations ranged in tables record the present positions of the heavenly bodies, so photography registers their present aspect, It may be that the pictures of the Sun now taken will enable future ages to test the prediction of the poet—

> "The Stars shall fade away, the Sun himself
> Grow dim with age, and Nature sink in years." *

Selected Articles.

FISH CULTURE.

The remarkable facilities which nature has afforded Canada for Fish culture, may make it become the most extensive fish-producing country in the world. Besides the unequalled system of rivers which flow into the St. Lawrence and its great tributary, the Ottawa, we have the vast extent of lake coast which reaches from Kingston to Fort William. We enjoy the grandest series of fresh water reservoirs in the world, and so situated that they may, on our north shores, become most productive in fish, and eventually yield not only large revenues to the Government, but also give employment to a very useful and hardy class of population. In another part of this number we have referred to this subject. It is sufficiently important to engage the serious attention of all who

* Abbreviated from President's address, Photographic Journal.

are anxious to develope the material resources of the country. The present notice refers to the Salmon; in subsequent numbers we shall introduce the result of successful experiment with several species of fresh water fish suitable to our lakes and rivers.

The following extracts are from a very instructive book entitled—"The Natural History of the Salmon," by William Brown.

"In the spring of the year 1854, Mr. Buist, the conservator of the Tay, obtained some ova, nearly ready for hatching, from a ford on the river, and placed a dozen of the grubs of the May-fly (*ephemera*), taken from the same bed, along with them in a vessel, which was supplied with water by a syphon of thread. In a few days the grubs had devoured one of the eggs, and in a few days more the whole were devoured; but, previous to that time, two or three of the grubs left their covering, and came forth as the May-fly. We watched them carefully while in the act of feeding, and found five or six of the grubs firmly fixed to an ovum, which they never left until totally eaten up. These animals are not the scavengers of the river, for, in this instance the ova were alive. Again, in a small but complete artificial rearing apparatus, which we have had in operation for many years, and which is supplied with filtered water, we deposited in two boxes, on the 26th of November, 1859, a quantity of salmon ova, fecundated by the milt of a male salmon, and on the 30th of the same month a small quantity of sea-trout ova, fecundated by the milt of a male salmon also. The progress made by both was very satisfactory; the temperature of the water was 40° when the ova were deposited—never falling below 36°, and by the 1st of March, the eye and round form of the fish could easily be detected in both kinds, by the naked eye, and an ovum, when put in the hollow of the hand, would turn itself round. Peter Marshall, the keeper at the Stormontfield pond, who was in the habit of examining them regularly, stated that they were about a fortnight earlier than the ova at that place, which had been deposited at the same date. But about this time, on account of a deficient supply of filtered water a quantity of unfiltered water was allowed to enter the pipe; this water contained a large amount of the larvæ and grubs of insects, particularly of a small black water beetle and by the end of April all the ova were devoured. Their method of procedure was as follows: the grub fastened on a live ovum, and pierced a hole in the shell, the colour instantly changing from a salmon colour to opaque white: the egg was devoured at leisure afterwards.

"The fish lies in the shell, coiled round in the form of a bow, and the greatest strain being at the back, it is the first part that is freed; and, after a few struggles, the shell is entirely thrown off with a jerk. The appearance of the fish at this stage of its being is very interesting; what is to be the future fish is a mere line, the head and eyes large, the latter very prominent. Along the belly of the fish, from the gills, is suspended a bag—of large dimensions in proportion to the size of the fish. This bag contains a yolk which nourishes the fish, for six weeks after which they must be fed. For a few days after hatching, the two dorsal fins are apparently joined, and the two pectoral are very large in proportion to the rest of the animal. The little creature, not requiring to seek its food, moves very little, and, when it does, swims mostly on its side, owing to the large size of the bag; this gradually becomes absorbed, and in a short time the fins get separated, and the fry assumes the general aspect of a fish. In its first stage it is translucent, but in a short period it takes on the parr colour, and the transverse bars can be easily seen, and the tail begins to get much forked. At the bag stage of their existence they are very easily injured; a displaced stone in the gravel amongst which they are lying coming against them destroys them; and although they are no longer the pray of insects, all kinds of fish and fowl are their enemies, and great must be their destruction in rivers where there enemies are numerous. As we have previously stated, in about six weeks the bag is absorbed, and the fish is fingerling or parr, from one inch and a half to two inches long.

At the end of a year the fry had become parr, and in May, 1855, smoults. At the beginning of this month the sluices were withdrawn, and the fish allowed to depart; but scarcely any showed an inclination to pass into the river until the 24th of that month, when the exodus began, and a shoal came down to the marking-box. Here 1,300 fish were marked by cutting off the second dorsal fin; but a much larger number escaped unmarked. On the 7th of July, the first marked fish, in the form of a grilse, weighing 3lb., was captured; and this was soon followed by several others caught during this month, weighing from 5 lb. to 9½ lb. Making allowance for grilse taken with marks, and not reported, it is calculated that at least 4,000 were added to the stock in the river from the breeding ponds. Thus the first experiment proved entirely successful; and although some of the seasons since 1853 have been very unfavourable to pisciculture, yet the general results are higlhy satisfactory.

"We also learn that the ova of salmon, at least, are not fecundated until they leave the fish, and that the male parr is as fit to continue its species as the adult male salmon, but no female parr has yet been discovered with roe developed. The experiment has also established the fact that there is no difference in the length of time taken to hatch, or the appearance of the fry after hatching, up to the smoult state, between the fry of salmon, grilse-salmon and grilse, salmon and parr, or grilse and parr. It has also been ascertained that the fry of the first year that assumes the migratory dress, are composed of both sexes in nearly equal proportions, and it makes no difference whether the fry be reared from salmon or grilse, or salmon and grilse, or salmon and parr, or grilse and parr. Why those that remain behind for another year do so, and a few no doubt of each hatching for a year more, we cannot tell, but such is the fact; and the best reason we can venture to give is, that by this means the river has always fish in it, that will migrate at least a month sooner in the spring than the fry of the first year, and also that male parrs will always be at hand in the river during the spawning months in a fit condition to supply the want of male salmon, when that occurs, which is a wise provision in nature, as many females in small and distant tributaries might be left without a mate, if there were no parrs, male parrs having been proved to be in a breeding state at that time. The question of salmon spawning in the sea has also been settled—no salmon will spawn in the sea if it can help it—as salt water destroys the ova. The experiment has demonstrated the practicability of rearing salmon artificially, fit for the market, within twenty months from the deposition of the ova—and the great value of artificial production—as it is ascertained that not above ten per cent. of the ova deposited in the boxes is lost, and not above twenty per cent. additional, but arrives at the smoult state and is sent into the river—(the keeper's report is much under this);—whereas it is generally supposed that not above 1 in 1000 of those naturally deposited in the river ever arrive at the smoult state, being the prey of fowl, fish, insects, and many other enemies. It has been also been noticed that not a few of the ova deposited in the natural way miss the fecundating milt, and are lost; and when we take into account the great quantity that is deposited during floods on places that are left dry when the river falls in, and also the numbers of redds that are sanded up by large spates, we need not wonder that if only 1 in 1,000 should ever become marketable. The keeper this season—January 1862—has been employed for many days carrying the spawn which has been deposited in places of the river which have been left nearly dry, by the river falling, and spawn sanded up by the spates, and placing it in the boxes to be artificially reared. Hence the obvious advantage of artificial breeding to rivers that have been overfished, or to those that have been destroyed by poaching and obstructions on the river to the ascent of the spawning fish, etc."

A COURSE OF SIX LECTURES

On some of the Chemical Arts, with Reference to their progress between the Two Great Exhibitions of 1851 *and* 1862, *by Dr.* LYON PLAYFAIR, *C. B., F. R. S., Professor of Chemistry in the University of Edinburgh.*

LECTURE II.

DISTILLATION OF COAL.—SHOWING HOW THE FORMER WASTE PRODUCTS IN THE MANUFACTURE OF GAS HAVE BEEN ECONOMISED. SALTS OF AMMONIA, BENZOL, TAR COLOURS, &c.

(*Continued from page* 243.)

But I must go faster with my subject. I now pass to coal-tar.

Now, coal-tar is a very complex body. It contains a large number of substances, some of which are volatile, others more difficultly volatile, and others not at all volatile in the ordinary sense of the word.

I have here a retort filled with tar, and I am now going to pass through that a current of steam; and you will see that after a little when it passes through freely it will distil over along with the water, and that this water will contain, swimming on its top, a certain quantity of naphtha. The steam which passes through the tar will take away the more volatile portions of the tar and condense it upon the top under the name of naphtha. What remains behind is a mixture of what is called dead oil and pitch. This dead oil is afterwards distilled off, and what remains behind in the retort is finally pitch.

In distilling it in this way we obtain from 100 parts of coal-tar, of naphtha 9 parts, of dead oil 60 parts, and of pitch 31 parts, so that there are various substances obtained. I have only time, however, to deal with the naphtha. Now, naphtha itself, or the substance which we get over by distilling the tar with steam, is a general word also. I have placed on this diagram the products of the tar. Crude naphtha contains all these substances which are written down there; but I will refer you at present to the upper division. The crude naphtha contains, first, basic oils, or oils acting as bases; secondly, acid oils, or oils acting as acids; and thirdly, neutral hydro-carbons. You will notice in the diagram, as in all the diagrams which we shall use, that whenever we have a body acting as a base, we colour it blue to show that it is a base, like this soda which coloured red water blue; when it is an acid, we colour it red; and when it is neutral we colour it green; so that when you find a body written red, it is an acid body; and when it is green it is a neutral hydrocarbon.

This naphtha is now taken and purified and clarified. There is added to it sulphuric acid. The sulphuric acid takes up the basic oils which are at the top, and unites with them and forms salts—sulphate of these bases. (We will complete our distillation of the tar afterwards. It is making too much noise for me to have my lecture accompanied by it. We will finish it after the lecture, and you shall see the products in the next lecture.) The sulphuric acid unites with the basic oils and produces this "sludge," as it is termed by manufacturers—the bases united with the acid.

Now, these are extremely valuable, and it is from them that these coal-tar colours, which I am going to speak of presently, are obtained; but they are entirely lost by the manufacturer. They will probably be saved afterwards, but at present they are thrown away as a sort of tar. The first things that we obtain of any advantage are the acid oil and the naphtha. The naphtha itself—the crude naphtha of which there is a specimen there, is employed at once, without any purification, for the purpose of making india-rubber waterproof coats and similar articles. But it is purified for various very important purposes. When the most volatile portions are collected, what comes over are the acid oils. Now these acid oils consist of two acids—carbolic acid and cressylic acid. Carbolic acid has the formula $C_{12}H_6O_2$; and the cressylic acid is what is called a homologue of the other, or contains C_2H_2 more. It consists of $C_{14}H_8O_2$. Common creosote is a mixture of these two acids. This carbolic acid which forms common creosote, is, after purification, and when perfectly dry, a solid; and it is this beautiful acid which I have present here. I see the manufacturer of this very specimen in the room, and I wish he was lecturing here to tell you more about it than I can. Before he sent me this beautiful specimen, I had never seen it in commerce solid; it is generally liquid. This carbolic acid when united with lime forms one of the most powerful disinfectants we have, which I will show you in my last lecture, when we come to the subject of sanitary chemistry. When this acid is treated with nitric acid it loses part of its hydrogen, and that hydrogen becomes replaced by peroxide of nitrogen, a lower oxide of nitrogen than nitric acid. When it is treated with nitrogen three of these go away, and the hydrogen is replaced by what is termed a compound radicle—a body which plays the part of hydrogen, and which forms this yellow substance called carbazotic acid. Carbazotic acid is carbolic acid, three of whose equivalents of hydrogen, have been substituted by three equivalents of an oxide of nitrogen.

Now, this carbazotic acid can be prepared in large quantity from creosote by the action of nitric acid, and can be employed at once for dyeing. If I take a skein of silk and agitate it for a little in this carbazotic acid, it will take on the dye without any previous preparation, and it is dyed a beautiful yellow colour. You see how it has already taken on the colour, and in this way you can dye silks of a beautiful colour with this substance obtained from the former waste product of coal-tar. This material has also been lately employed, as almost everything is employed, for various other useful purposes. It is an excellent antiperiodic, like quinine, only when employed, it dyes the skin of the patients yellow, and they, therefore, have a sort of artificial jaundice. But it has also been suggested for another purpose. It may be mixed with arsenic and other poisons for the purpose of rendering them more ready of detection. It imparts to the arsenic a bitter taste, and it also turns the person to whom it is administered yellow, and in a case of slow poisoning this yellow appearance would be an indication that there was something wrong.

Cressylic acid, another of the compounds of crude coal oil, is not much employed in its separate state.

I now pass to the neutral hydrocarbons. The neutral hydrocarbons are also various. They are called benzol, toluol, xylol, cumol, cymol, and a great many other names with which I will not trouble you. They are compounds of hydrogen and carbon, and possess many degrees of volatility. For instance, benzol boils at 177°. This is one of the most useful of the substances. It is made from crude naphtha by a simple operation, taking advantage of its low temperature of ebullition. Here is a benzol still. The crude naphtha is placed in this still. It is a double still, into which steam is sent from this steam-boiler in order to heat the crude naphtha. The top of the still, you will observe, passes through a cistern of water. That cistern of water is kept at the boiling point of benzol, 177°, and the vapour of the naphtha passes through the heated vessel, which is heated to 177°. Benzol distils over at 177°; but toluol, cumol, cymol, and the others boil at a much higher temperature. Therefore they are condensed at that temperature, and fall back into the still. The separation is, therefore, effected simply by means of keeping the benzol at its own boiling temperature, and cooling the others below theirs. It is a very volatile substance. It, no doubt, adds much to the illumination of our coal gas. We will show you this. I have here the means of showing you the gas, first, not passed through benzol, and then passed through benzol. I first take the gas not passed through benzol, and if I light it you see that there is little illumination. You can scarcely see it at all at a distance. Now, I will pass some gas through this benzol. It is now passing through, and you see how the gas has licked up this volatile body, and given us a stronger illumination. Benzol is, no doubt, one of the illuminating vapours which exist in common coal gas.

Now, this body, when acted upon by nitric acid, produces what you will find in that big bottle—nitro-benzol. I must call your attention to nitro-benzol a little scientifically. Benzol has the forula $C_{12}H_6$,—that is, it contains twelve equivalents of carbon and six of hydrogen. In nitro-benzol one of these equivalents of hydrogen goes out, and one equivalent of oxide of nitrogen, NO_4, goes in and substitutes it, and then forms nitro-benzol, a substance which by itself possesses some peculiar characters. It smells strongly of bitter almonds, and it is employed now instead of bitter almonds, which is poisonous, for making common almond soap. That common almond soap which we buy is now perfumed with this nitro-benzol. It is also employed in confectionery as a substitute for bitter almonds. It is much better for that purpose, because the bitter almonds contain prussic acid, and by the use of too large a quantity by our cooks, we may poison our friends. There is no chance of that taking place when nitro-benzol is used. It is the basis from which we derive our tar colours, and the mode in which it is used for this purpose will require a little close attention to a chemical formula; but it is very interesting.

If nitro-benzol is acted upon by water and by iron, of which I have put down the symbols here—nitro-benzol+water+iron $= C_{12}H_5(NO_4) + 2HO + 4Fe$—the iron takes away all the oxygen from the water, and the oxygen from the oxide of nitrogen. There are six equivalents of oxygen, which the iron takes to itself and forms iron rust with it. This rust remains, and the two of hydrogen of the water now joins itself to the $C_{12}H_5N$, and produces this body here, $C_{12}H_7N$, aniline. That is to say, the iron takes away the oxygen and leaves oxide of iron and aniline as the result.

Now, this aniline is a most important body. It was first investigated by Dr. Hofmann, who has made with regard to it, a series of the most brilliant researches, out of which have arisen these coal-tar colours with which we are now acquainted. Aniline is an ammonia. It is a body exactly resembling the base ammonia, but it is what is termed a compound ammonia. Here is the constitution of ammonia:—

$$N\begin{cases}H\\H\\H\end{cases}$$

I put down the three atoms of hydrogen separately. Now, if I take away one of these atoms of hydrogen, and substitute it by one of something else which plays the part of hydrogen, I form a compound ammonia. I will do so in this case.

$$N\begin{cases}C_{12}H_5\\H\\H\end{cases}$$

I have replaced one atom of hydrogen with a compound radicle which chemists call phenyle, and I obtain what is termed aniline. This aniline is therefore a compound ammonia in which the radicle phenyle replaces one of hydrogen.

When Hofman began his researches upon this subject, aniline was made by a laborious process by distilling indigo with potash; and the possession of a pound of aniline in any chemical laboratory would have been looked upon as a wonder. Now you see that out of coal-tar we can present to you upon the lecture-table whole gallons of aniline, and it is now sold for a few shillings a pound. I have here a series of the substances formed in the production of Magenta. I am indebted for them to the discoverer of Rosaniline. Here is a block of coal weighing 100 lbs. This block of coal produces this amount of tar when distilled. Here is the amount of aniline which, with the most economical manufacture, can be extracted from that block of coal; but still, although it appears to you only a small quantity, it is, in fact, a most economical quantity compared with the processes which were formerly employed. It is out of this aniline that the peculiar dyes are obtained, and this is the quantity of the Magenta dye which can be obtained from that large quantity of coal. If you will examine these products after the lecture, you will find this a very instructive proportional series.

Now, it is out of this aniline that we produce mauve, Magenta, roseine, azuline, bleu de Paris, and the various colors which have received arbitrary names. It was known for a long time that the products of distillation of coal had a strong tinctorial power. Here, for instance, I have one of them—a body called pyrrole. I have here a piece of pine-wood, which I see Mr. McIvor has made, for a theatrical purpose, in the shape of a dagger. I will now moisten this with muriatic acid, and then place in a deep vessel which contains a few drops of pyrrole. You see that it suddenly gets as it were covered with blood. This muriatic acid is mixing with it, and the dagger comes out in a sanguineous state. You observe the strong tinctorial power which this substance has by the deep colour which it produces. Now this tinctorial power has been known, in fact, for a long time, but the mode of manufacturing the substance readily and economically was not known. Here I have a small quantity of aniline, and I agitate it with water; and now, if I add to that a solution of bleaching powder, you will see the effect it produces. It was long known that this aniline gave a purple colour with bleaching powder. The colour comes after a little while; it does not come immediately, but you see, as I add it, that the aniline produces a mauve or a purple colour; and this was known for many years, before persons knew how to make it for commercial purposes. This is now a colour used in the arts. The first person who introduced this, and to whom the greatest credit is due for its production, was Mr. Perkin, a pupil of Dr. Hofman. Mr. Perkin had seen and admired the tinctorial power of aniline, and he had an ambition to render this fugitive colour permanent, and to introduce it into the arts as a dye, and he succeeded admirably. The mode is this: this aniline is a base, and unites with sulphuric acid as ammonia does, and it forms sulphate of aniline. He takes equivalent quantities of aniline and bichromate of potash, and mixes them together, and in a little while, after standing together, they form this very unpromising-looking black powder. You see this black powder here; it looks extremely unlike a dye. Now, when this colour is washed with coal naphtha, this nasty-looking brown resinous substance is dissolved out of it by the coal naphtha, and then there remains a still unpromising substance, but which is rather purple in colour. When you treat with alcohol this brown powder, which has been washed with naphtha and had the resin taken out of it, it forms with the spirit a strong solution of mauve. This beautiful purple colour is obtained in this way,—by dissolving out of the brown powder the purple colour by means of alcohol; and it is this purple colour which is used largely in dyeing. It is readily soluble in alcohol. If I take a washing-bottle of alcohol, and throw a little of it upon the substance, you see that the beautiful purple colour of this substance is readily manifested. (The substance had been previously spread on a white paper screen, and there remained unapparent; but upon the projection of the stream of alcohol upon the screen, the purple colour was produced where the alcohol came in contact.) It is a substance which you can easily detect and find out whether you are dealing with this colour, or dealing with some colours derived from lichens, which have a similar character. I have here aniline purple, and I now add to it a little sulphuric acid, and I will show you that it is very easy to detect which colour you are dealing with. The sulphuric acid turns it first to a dirty green. If now I add to this a little water, this dirty green becomes a beautiful blue. The light has become bad. The day is not a good one for showing you these colours. I am afraid this day-light, or want of day-light, will render it necessary for you take what I say on trust. The addition of water makes it a beautiful blue. This is a second test for it; but if now I add a little more water to it, it is restored again to its purple state. You see on pouring it into this large jar that it resumes its beautiful purple, and in this way you can easily detect its presence. The sulphuric acid turns it a green, a little water turns it a deep blue, and a large quantity of water brings it back to its original purple condition.

It is easy to dye with this aniline purple; in fact, ladies can dye with it perfectly themselves. It is only necessary to use for this purpose hot water—water so hot that you cannot bear it with your hand, but not boiling. The best temperature is about 150°. If you take this hot water and add to it a little tartaric acid and a little of this aniline purple, and then place the silk or woollen in it, it becomes dyed. It is easy to attach the colour to animal fibre, but not to cotton. In the next lecture I have to explain to you its application with regard to cotton. I have here the colouring matter, and now I will add to it a solution of tartaric acid, which is necessary to produce the colour. After that all I require is to place my silk in this solution, and to rinse it for a little time in it, and you see that it quickly takes up the colour and produces that beautiful mauve which is now so familiarly known. It is, therefore, a substance which is extremely easily applied—almost as easily as the carbazotic acid.

Although I am within a minute of the hour, I must ask your attention for five minutes more. The next dye to which I have to direct your attention is Magenta; or, as it is more properly called by Dr. Hofman when it is in the state of purity, rosaniline. I should like also to prepare this before you, and show you the method. Any weak oxidising agent less strong than bichromate of potash, produces this substance. I will take here bichloride of tin for my purpose. I add to this anhydrous bichloride of tin an excess of aniline. It must be done cautiously, for the action is energetic. As soon as the action subsides we will add a little more, and finally heat it until I drive off all the aniline. I must have an excess of aniline and then drive it off, after which the Magenta will be seen to appear. This will take a little time to perform. Mr. McIvor will now heat this gently, passing it slowly over the flame at first, as the action is violent, and will continue the heat until our Magenta begins to appear. After a little time we shall have a very good imitation of Magenta, but not nearly so good as is produced by the manufacturers, who now produce it on the most magnificent scale; I allude to Messrs. Simpson, Maule and Nicholson. to whom I am indebted for a number of the illustrations that are exhibited here, and for this crown, which is made of the substance in the ordinary condition in which it is sold—acetate of rosaniline. You see what a magnificent crown it is. The formula of rosaniline I have written here.

$$N_3C_{40}H_9$$

It is what is called a triamine, or it is three atoms of ammonia which have coalesced into one; and this rosaniline forms, with acetic acid and other acids, deeply-coloured salts, of which this ordinary Magenta is one. You will see a crown in the Exhibition, which I think is one of the most remarkable of the scientific exhibits which we possess, The crown is composed of the acetate of rosaniline. You see the difference between this rosaniline and mauve. It is of a much redder colour than mauve, and is more definite in its character. Mauve is a neutral body, not possessing either basic or acid properties; while, on the other hand, rosaniline is a true ammonia—a true base.

Now we have formed our Magenta by this experiment. I think I can show you the colour better if I pour it into water and add an acid. You will then also see its tinctorial power. After a little time it will dissolve and form a solution of this substance. It is a powerful tinctorial body. There (referring to a bale on the lecture table) is the quantity of woollen which is dyed from the amount of Magenta produced from 100lbs. of coal. There is the 100lbs. of coal which produces this small quantity of Magenta and that bulk of wool is dyed from it, so that you see its tinctorial power is great.

As I have only given you an introduction to the subject, and you will afterwards have the application of this to calico printing I will only say one word as to the blue colour which is obtained, and in the next lecture, and the lecture afterwards, we shall have an abundant opportunity of following up this subject. Not only have reds and purples been obtained in this way, but a yellow has recently been procured by Mr. Nicholson, to whom we are so much indebted; so that yellow, red and blue, the three primitive colours, are now to be obtained from the coal-tar. Here is one called *bleu de Paris*, or *bleu de Lyons*, or azuline. It is obtained sometimes from aniline by the action of oxidising agents, such as bichloride of tin, at a high temperature under pressure—a temperature of 350°. But most of these blue colours are made from carbolic acid, and not from aniline. I think I can show you here the blue colour. I have put some of this blue upon this paper. There is one which is obtained from carbolic acid or from creosote. The process, however, is not known; it is still kept a secret in the arts, but you see what a beautiful colour it is; and what a power we have in possessing the three primitive colours, by the mixture of which we can obtain so many others.

As a new art, the manufacture of these colours is of great importance. Hitherto, England has been dependent upon foreign countries for its dyes. We have imported madder from Holland, from Turkey, and from France, and blue colours from India, in order to produce our calico prints; but you see now that we are likely to reverse this. We find in this waste product, coal-tar, the three primitive colours out of the mixture of which we can produce almost any shade we desire; and without taking upon myself the character of a prophet, I think I may easily predict that, in a few years, England will be a colour-exporting instead of an importing country. In this country, even now, coal-tar, notwithstanding all these applications of it, is worth only from a penny to three halfpence a gallon. These discoveries will probably alter the whole character of calico printing, and make this country an export market of colours.

As this is a highly important industry, I have solicited your attention to two other lectures on it.

Miscellaneous.

THE CAPE RACE TELEGRAPH.

The general form of Newfoundland is that of an irregular triangle, having the south coast at its base. At the south-eastern extremity is Cape Race (from the Portuguese, Cap El Raz, the "Captain's Cape"), which all the steamers running from England to New York, Boston, or Portland endeavour to make, as it lies directly in their route, or rather in their way,—as a detour has to be made from the direct line in order to clear it. The coast at Cape Race is bold and rocky; the cliffs rise in precipices out of the water and their strata are tossed and torn asunder, as if by some great convulsion of nature.

On the top of the cliffs, a very short distance from the edge, stands a well built lighthouse, painted red with white vertical stripes. A little further inland is the telegraph station, a small, neat building, from which the wires can be seen stretching away on tall poles, standing out clearly on the moors and barrens which are the great features of Newfoundland.

Two whale boats, of very best description, are employed to board the steamers which pass. Both these boats were built at New York; one is a "Whitehall" boat, and the other, said to be the best of the two, was built in Brooklyn. These boats are kept in recesses of the rocks, one on each side of the Cape, so as to take advantage of that side which may be at the moment the most favourable for launching or landing—both operations being attended with considerable danger. The crew consists of four oarsmen, natives of Newfoundland,

and magnificent men they are, equal to any and every emergency, The fifth man is their steersman—Mr. Murphy, the news agent. He is said to be a native of Sydney, Cape Breton, and certainly the way in which he manages a boat in all weathers and makes his way on board vessels at times when the most daring would tremble, is something quite wonderful and scarcely to be credited. To see him standing up with a foot on each gunwale, swaying with the motion of the boat in the most awful sea, and steadying himself with the tiller ropes, ready for his spring, in boarding, is enough to make the blood run cold while watching him.

In the night, or in unusually stormy weather, when the boat cannot overtake or get near the steamer, a tin cannister is thrown over, containing the latest newspapers and despatches. These canisters are cylindrical, about 18 inches in length and six in diameter; they are carefully soldered up, and have a piece of lead at one end to make them float upright in the water, while straps at the side carry a slight pine staff, about three feet long, bearing a tiny flag, which serves to mark the position of the canister, and render it more easily seen and picked up. Having obtained the news the men pull for the shore with long and. powerful stroke and the boat goes dancing over the waves in right gallant style. Murphy springs ashore at any available point; he is next seen scrambling up the clifts and rushing along to the station house with the speed of a reindeer, for he is active on land as on sea. From thence the news is sent off without an instant's delay by wires which stretch from that point 400 miles westwardly to Port au Basque, over one of the wildest countries in the world—mountains, moors, ravines, roaring torrents, and mad precipices following each other in quick succession.

Port au Basque is at the south-western extremity of Newfoundland, near Cape Ray—a name also derived from the Portuguese—*Cap el Rey*, the "King's Cape." From this point a cable is submerged across the main entrance to the Gulf of St. Lawrence, here 57 miles wide, to Aspy Bay, at the north-eastern extremity of Cape Breton, between North Cape and Smoky Cape, both remarkable headlands rising directly from the sea to the height of 1,300 feet and 950 respectively.

From Aspy Bay, the line is brought through the broken but most picturesque country which forms the interior of Cape Breton, to the northward of a magnificent sea-lake known as the Great Bras d'Or, and passes on to its western extremity at the peninsula of St Peter's. Thence it follows the post road to Plaister Cove, in the Strait of Canso, where communication is maintained with the shore of Nova Scotia (the mainland of America) by means of a submarine cable not much more than half-a-mile in length. This is landed in a cove a little to the northward of Cape Porcupine, which cape is nearly a thousand feet in height.

Thence the cape Race line follows the eastern coast of Nova Scotia, by Antigonish, to Merigomishe (around the head of Pictou Basin) on to Port Wallace and Pugwash, whence it strikes off to Amherst, and there intersects the main telegraph with the whole western world, terminating only in the Pacific.

BRUNEL'S MISHAPS.

Although Brunel died at the comparatively early age of fifty-three, it is even matter of surprise that he lived so long, He had more perilous escapes from violent death than fall to the lot of most men. We have seen that at the outset of his career when acting as assistant-engineer to his father in the Thames Tunnel, he had two narrow escapes from drowning by the river suddeuly bursting in upon the works. Some time after when inspecting the shafts of the railway tunnel under Box Hill, he was one day riding a shaggy pony at a rapid pace down the hill, when the animal stumbled and fell, pitching the engineer upon his head with great violence: he was taken up for dead but eventually recovered. When the Great Western line was finished and at work he used frequently to ride upon the engine with the driver, and occasionlly he drove it himself. One day, when passing through the Box Tunnel upon the engine at considerable speed, Brunel thought he discerned between him and the light some object standing on the same line of road along which his engine was travelling. He instantly turned on the full steam and dashed at the object, which was driven into a thousand pieces. It afterwards turned out to be a contracter's truck which had broken loose from a ballast-train on its way through the tunnel. Another narrow escape which he had was on board the Great Western steam-ship, where he fell down a hatchway into the hold, and was nearly killed. But the most extraordinary accident which befel him was that which occurred while one day playing with his children. Like his father Sir. Marc, he was fond of astonishing them with sleight-of-hand tricks, in which he displayed considerable dexterity; and the feat which he proposed to them on this occasion was the passing of a half-sovereign through his mouth out of his ear. Unfortunately he swallowed the coin which dropped into his windpipe. The accident occurred on the 3rd of April 1843, and it was followed by frequent fits of coughing, and occasional uneasiness ln the right side of the chest; but so slight was the disturbance of breathing that it was for some time doubted whether the coin had really fallen into the windpipe. After the lapse of fifteen days, Sir B Brodie met Mr. Key in consultation, and they concurred in the opinion that most probably the half sovereign was lodged at the bottom of the right bronchus. The day after, Mr. Brunel placed himself in a prone position on his face upon some chairs, and bending his head and neck downwards, he distinctly felt the coin drop towards the glottis. A violent cough ensued and on resuming the erect posture he felt as if the object again moved downward into the chest. Here was an engineering difficulty, the like of which Mr. Brunel had never before encountered. The mischief was purely mechanical; a foreign body had gone into his breathing apparatus, and must be removed, if at all, by some mechanical expedient. Mr. Brunel was, however, equal to the occasion. He had an apparatus constructed, consisting of a platform which moved upon a hinge in the centre. Upon this he had himself strapped, and his body was then inverted in order that the coin might drop downwards by its own weight, and so be expelled. At the first experiment the coin again slipped towards the glottis, but it caused such an alarming fit of convulsive coughing and appearance of choking that danger was apprehended, and the experiment was discontinued. Two days after, on the 25th, the operation of tracheotomy was performed by Sir Benjamin Brodie, assisted by Mr. Key, with the intention of extracting the coin by the forceps, if possible. Two attemps to do so were made without success. The introduction of the forceps into the windpipe on the second occasion was attended with so excessive a degree of irritation, that it was felt the experiment could not be continued without imminent danger to life. The incision in the windpipe was, however, kept open, by means of a quil or tube, until May 13, by which time Mr. Brunel's strength had sufficiently recovered to enable the original experiment to be repeated. He was again strapped to his apparatus; his back was struck gently; and he distinctly felt the coin quit its place on the right side of his chest. The opening in his windpipe allowed him to breathe while the throat was stopped by the coin, and it thus had the effect of preventing the spasmodic action of the glottis. After a few coughs the coin dropped into his mouth. Mr Brunel used afterwards to say that the moment when he heard the gold piece strike against his upper front teeth, was, perhaps, the most exquisite in his whole life. The half-sovereign had been in his windpipe for not less than six weeks!—"*The Brunels,*" *in the Quarterly Review.*

SIR W. E. LOGAN AND CANADIAN MINERALS AT THE EXHIBITION.

Canada is most worthily represented in Class I., thanks to the director of the Canadian Geological Survey, Sir William Logan. Justice compels us to deviate from the course which we have hitherto pursued, and bestow more than a passing notice on this indefatigable geologist. Unaided he commenced in 1831, a geological survey of part of the great South Welsh coalfield, extending from Owm Avon to Carmarthen Bay, and completed it in seven years, at no small pecuniary sacrifice. Such was the estimate of the accuracy and value of this survey by the director of the Geological Survey of Great Britain, Sir Henry De La Beche, that, with Sir William Logan's consent, it was adopted as a part of the national work. In 1842, Sir William went to Canada, where he has ever since resided, devoting his life with a singleness and earnestness of purpose truly remarkable to the exploration of the structure and the mineral resources of that vast territory. Not having the advantage of an accurate map of the country, such as has been supplied to our home geologists by the Ordinance Survey, he has been obliged to make a topographical survey *pari passu* with a geological one. Few persons can imagine the arduous nature of this work. Our indomitable geologist is often compelled to penetrate the trackless primeval forest, to force his way across the tangled cedar swamp, and brave the dangers of Canadian rapids in a frail canoe; and to these difficulties we may add that his passage is obstructed at every step by the most relentless and invincible foes with which man in these regions has to contend—countless hosts of mosquitoes and black flies. Very different is the comparatively light and gentlemanlike occupation of our home geologists, who have no such hardships to encounter, and, after the pleasant ramble of the day, never fail to enjoy the luxury of an English cottage. Sir William Logan has neither sought wealth nor honors, but has quietly and honestly pursued the one great object of his life with a devotion as rare as it is praiseworthy. Let it not be supposed that this eulogium is prompted by any feeling of personal regard. It is a just tribute, and no more, to a man who has striven during many years to develope the vast mineral resources of Canada, not with a view to his own advancement, but from pure love of his work. We are glad to know that the Canadian Government fully appreciate the value of the labours of this self-denying and faithful public servant. The Canadian territory comprises about 300,000 square miles, and about 100,000 have already been surveyed by Sir William and his small staff of assistants.—*London Times.*

PETROLEUM—EXPERIMENT TO DETERMINE ITS COMPARATIVE ILLUMINATING POWER WITH GAS AND CANDLES.

It is not the difference in price per gallon between two burning fluids, or other agents employed in artificial illumination, that determines their respective cost for use. One burning fluid, such as a mixture of alcohol and turpentine, that costs only sixty cents per gallon, may be more expensive than sperm oil costing one dollar and a quarter; because the latter possesses three times the illuminating power of the former. It is well known that refined petroleum has lately driven all other burning fluids out of use, and one reason for this is its very low price. But as we have already stated this cannot determine its economy—its comparative illuminating power must also be known to form a just estimate of its cost. Heretofore this has been unknown, but now we have a most valuable contribution to science in the record of a series of experiments conducted by Professor James C. Booth and Mr. T. H. Garrett, of Philadelphia, and published in a late number of the Journal of the Franklin Institute. Their experiments were chiefly instituted to test the comparative illuminating power of petroleum and the common coal gas used in Philadelphia. The gas was measured by a water meter, and the jet used was a fishtail burner attached to the top of the meter, and fixed at the uniform distance of six feet from the photometer. The lamp for burning the fluid and giving equal light to the gas jet, was measured on the opposite side of the photometer. Messrs. Booth and Garrett first determined by experiment the relative economy of several coal and mineral oils, and common burning fluid (alcohol and turpentine). Of four kinds of mineral oils, or refined petroleum there was but little difference in their illuminating power. It was found that 2.599 gallons gave a light equal to 1,000 cubic feet of gas, and it required no less than 11.699 gallons of burning fluid to produce an equal amount of light; thus proving that one gallon of petroleum is equal to four of burning fluid for giving light. Various experiments were also made with flames of different shape in the petroleum lamp, to determine which form gave the most intense light with the least quantity of oil. It was found that a clear, straight cut of the wick gave the best results. The most common way of trimming such lamp wicks is with an arched cut, to produce a flame shaped like a bow. With a flame from a wick cut straight across, 2.576 gallons of oil gave a light equal to 1,000 cubic feet of gas, while with an arched flame, 2.846 gallons of oil were required. Very great care must be observed in trimming the wicks of oil lamps, so as not to leave them ragged at the edges. A loss varying from four to twenty per cent. was observed with different trimmed wicks. Messrs. Booth and Garrett say on this head, "The best method of obtaining the fullest amount of light, is to trim the wick straight across, and test the shape of the flame until it presents as even a top as practicable."

Experiments were also made to determine the relative illuminating power of gas and paraffine, and spermaceti and adamantine candles. It was found that it required 35.53 pounds of paraffine candles to produce a light equal to 1,000 cubic feet of gas; 41.16 pounds of spermaceti, and 47.18 of adamantine. A very great loss of light results from permitting beads of smoke to accumulate on the ends of candle wicks. The relative cost to produce an equal amount of light, is also given in the paper of Messrs Booth and Garrett. For 1,000 cubic feet of gas, the price in Philadelphia is \$2 10; for 2⅝ gallons of refined petroleum (at 45 cents per gallon) \$1 07; for spermaceti candles, \$18 50; for paraffine candles, \$11 68; for adamantine candles \$11 72. There can be no question, therefore, judging from these experiments and statistics, that petroleum is the cheapest known agent of artificial light. Against its common use, however, it may be said that it is dangerous, being liable to explode. It is not, indeed, so dangerous as alcoholic burning fluids; still it is dangerous when by improper distillation, or the cupidity of the manufacturer, the light, volatile fluid called benzine is permitted to remain in the oil. All petroleum lamps should be filled during day, and the oil should be kept in a cool place. The following advice is given to gas companies:—

"We leave it to gas companies to resolve this question, or its alternative—whether the extraordinary comparative cheapness of mineral oil illumination will not stimulate invention to contrive ways of burning the oil, or of making gas from it in a small way, so as to obviate every objection to its use and so supersede the use of company made (coal) gas."—*Scientific American.*

MR. GLADSTONE ON ENGINEERS.

At the inauguration of the statue to Sir Hugh Myddelton, Mr. Gladstone concluded an eloquent address with the following observations upon engineers:—"It is a thing somewhat new in the history of mankind to erect in public places the statues of engineers. If we go back to the very first roots and beginnings of philosophy, we shall find that whatever related to mechanics and to physical force was associated with strictly and purely mental inquiries; but they soon came to be divorced one from another, and thousands of years elapsed before the engineer, as such, came to be recognised as a person having a high title to public distinction. It does not appear that the people of this country in very early times had developed much of the talent for which they are now so remarkable, and thus we see, in reviewing the history of the nation to which we belong, that at the later period of its career it has exhibited aptitudes of which there was no trace at an earlier period. Let me say, in passing, that that is a useful lesson, not for nations only but for individuals, for it may teach an individual that there are many things at present wholly beyond his power, and for which he cannot even recognise in himself materials and fitness, and yet to which he may thoroughly and conspicuously attain by assiduous and resolute cultivation of the faculties which God has given him. No doubt the engineers who, under the name of architects, erected the cathedrals of this country, must have been persons considerable in their profession; but for much of their education we are indebted to foreign countries. It was rather in the main an imported than an indigenous quality; but in these later times we have seen a great change, and the engineers of this country have taken their place as one of the most important and most distinguished classes of the community. They have fairly taken their place amongst the great men of England; and I do not know whether any commemoration has yet been given to any of them so conspicious as the erection of this statue of Sir Hugh Myddelton in one of the greatest thoroughfares of this vast metropolis. It is a fact full of meaning; it is an indication of the movements of the times, and the development of those faculties by which man is fitting himself more and more by the efforts of each generation in succession to contend with those difficulties of outward nature amidst which Providence has placed him for the purpose of evoking his energies, and to make the gifts and bounties of Providence available for his comfort and his happiness. This is the opening almost of a new chapter in the condition of man. I do not mean that it is the beginning of such efforts, but it is the beginning of them on a new scale, with a new system, with new appliances, and with new means for the intercommunication and interchange of knowledge; and it marks the fact that in the list of elements that belong to human civilisation these great operations of art and science, applied to the external world, must henceforward be included, and hold a conspicuous place; and it will be our own fault if the addition of that new chapter fail to be a great blessing. There it no reason why it should displace anything; and therefore let us not see in the distinctions bestowed upon the engineers anything that need fill us with fear or apprehension; and do not let us see in it the displacement of whatever has been done by man with respect to religion, art, or ancient learning. All these things ought to continue to grow and thrive, and that which we introduce we ought to add to what we have enjoyed before, and not substitute for what we have been enjoying. it is an immense blessing—it is a work of which we may confidently say that it is acceptable to God as well as to man—when water is brought from a distant spot to supply the population of this great city. It is all very well for most of us who are assembled here to make light of these great appliances of modern engineering, and to think that it does not signify whether we are carried fifty miles an hour or five—whether our houses are well drained or not, and whether the water of the country is brought to feed London. It is all very well for us to assume a high and sanctimonious tone and say, 'Do not let us overwhelm these temporal goods and comforts.' It is wise that the poor should be remembered; and I have no doubt that the ministers of religion will take care to remind them that they are not to suffer their minds to be absorbed and dried up with the continual contemplation of temporal and physical necessities, but ever to lift their eyes up to the God that is in heaven; but language such as that need not be held amongst the wealthy. Let us freely and gratefully acknowledge that those who, like Sir Hugh Myddelton in former days, devote themselves with energy, forethought, care, and skill to the multiplication of appliances which conduce to the comfort of man, and to conquering the forces of nature and making them subservient to human happiness, are doing a great and good work before the face of Heaven as well as before the face of man, and deserve to be held in grateful honour as real and genuine benefactors of mankind."

Electric Clock.

This is an invention by Mr. C. G. Gumpel, M. E. By this plan the oscillations of the pendulum are independent and free of any influence from the motive power (whether electricity or gravity). The pendulum is compensated. The rod, good white deal, is baked, and soaked in a mixture of beeswax, oil of turpentine and linseed oil, and then French polished to prevent absorbtion of moisture. The compensation consists of a zinc tube (sheet zinc) resting on the adjusting nut at the bottom of the wing rod; on the top of the zinc tube rests the cast iron bob by means of a plate screwed on the latter. The proportions are the following:—

Co-efficient of Expansion.

White deal	23
Cast iron	66
Zinc	170

Length in inches.

Cast iron bob and also zinc tube................ 7·17

Wood rod........................ $39{\cdot}14+\frac{7{\cdot}17}{2}=42{\cdot}72$

Expansion Upwards.

Of zinc tube.................. $7{\cdot}17 + 170 = 1218{\cdot}90$

Expansion Downwards.

$$\left.\begin{array}{ll}\text{Of wood rod} \ldots\ldots & 23 + 42{\cdot}72 \\ \text{Of cast iron} \ldots\ldots & 66 + \frac{7.17}{2}\end{array}\right\} = 1218.84$$

The pendulum is suspended by means of an agate (with the grove inverted) on a cast steel edge (slightly rounded). By this arrangement the dust cannot accumulate to destroy the surface, while the rounded edge produces a rolling motion, preventing the sharp edge of the steel wearing into the stone. (The pendulum by itself oscillated 1¼ degree at a quarter to eleven o'clock one evening, which had subsided about seven the following morning morning [after eight hours] to one fourth degree.) The weight of the pendulum bob, with zinc tube, is about twenty-one pounds. The pendulum in this clock has nothing to do but to disengage the slight arms, from which it receives the required impulse. These arms descend only about one fiftieth part of an inch more than they are uplifted, and yet maintain an oscillation of the pendulum of 2½ degrees. The acting weight suspended from the curved lever, for the purpose of uplifting the impulse arms, is 2½ drachms, exerting a pulling pressure (longitudinally) of about 1½ drachms at the point, where the arms hold the curved lever, so that the actual force required to disengage the arms is a high fraction of a drachm (the hooks of the curved lever and the pin in the impulse arms being hardened and polished cast steel.) Hence the pendulum insures a correct time keeper, equal (by even inferior workmanship) to the best astronomical clock. In the best known electric clock, the pendulum makes a contact at each oscillation by bending a spring, which, in itself, as the temperature varies, will influence the rate of the clock. Besides the manner in which the impulse is imparted to the pendulum in that clock is not free from friction, and tends to produce "wobbling," as the impulse, although parallel, is not in the same plane as that in which the pendulum oscillates. The contact makers are formed of iron cups, containing mercury, into which dip pieces of copper with iron ends. The one enters the mercury before the other leaves, so that no spark from the direct current can oxide the surfaces of the contact makers, as both transmit the same current alternately; the left one to the magnet of the pendulum, the right one to the clock. In the clock a separate contact is made every minute, which will keep any number of filial clocks going, all showing the same (that is, correct) time. The minute wheel shows (in the clock exhibited) a method of moving the hands of large clocks by means of two pins (placed diametrically) gearing into an ordinary wheel. It is impossible to shift the hand; and if held it will always, within the minute, place itself right. The clock is intended for large mansions, palaces, hotels, club-houses, warehouses, hospitals, &c. The pendulum in an airtight case being fixed on the basement floor on a good foundation, while the battery is placed at any convenient spot easily accessable. The inventor claims the application of the same escapement to clocks moved by gravity, in which it is stated it will, undoubtedly, show its superiority over other escapements for the purpose for which a clock is intended—correct time keeping.—*Artizan.*

Illuminating Oil from Coal.

Appears to have been made as early as 1846 by Dr. Gesner, of Nova Scotia, and in 1854 the Kerosene Oil Company, on Long Island, commenced the first manufacture of carbo-hydrogen oil under patents secured by Dr. Gesner, using cannel oil from England, New York, and other parts of the United States. The Breckinridge coal oil works on the Ohio, at Cloversport, Kentucky, were commenced in 1856, and were soon followed by others, to the number of twenty-five in operation in 1860 in Ohio alone with a working capacity of three hundred gallons of light oil each, per diem. There were then about fifty-six factories in the United States, exclusive of some fifteen engaged altogether on petroleum, and several small private coal oil works. The capital expended in coal oil works and cannel coal mines was estimated at nearly four million dollars. The manufacture of coal-oil lamps, resulting from the use of the oil, formed the principal business of sixteen companies, who employed 2,150 men and 400 women and boys, and work for 125 looms in making the lamp wick.

The Production of Petroleum in the United States.

Its existence in any vast amount appears to have been unknown until 1845, when a spring was "struck," while boring for salt, near Tarentum, thirty-five miles above Pittsburgh, on the Allegheny. Experiments having proved its constituents to be nearly the same as those of the artificial carbon oil, a company was organized in New York to attempt its purification by the same process applied to the latter. But little was effected, however, and in 1857 Messrs. Bowditch & Drake, of New Haven, commenced operations at Titusville on Oil Creek, where traces of early explorations were found, and in August, 1859, a fountain was reached by boring, at a depth of seventy-one feet, which yielded four hundred gallons daily. Before the close of the year 1860, the number of wells and borings was estimated to be about two thousand, of which seventy-four of the larger ones were producing daily, by the aid of pumps, an aggregate of eleven hundred and sixty-five barrels of crude oil, worth, at twenty cents a gallon, about ten thousand dollars. Wells were soon after sunk to the depth of five or six hundred feet, and the flow of petroleum became so profuse that no less than three thousand barrels were obtained in a day from a single well, the less productive ones yielding from fifteen to twenty barrels per diem. In several instances extraordinary means were found necessary to check and control the flow, which is now regulated in such wells, according to the state of the market, by strong tubing and stop cocks. The quantity sent to market by the Sunbury and Erie Railroad from the Pennsylvania oil region, which has thus far been the principal source, increased from 325 barrels in 1859 to 134,927 barrels in 1861. The whole quantity shipped in the last-mentioned year was nearly 500,000 barrels. Since August, 1861, the product has rapidly increased. The present capacity of the wells is estimated at 250,000, to 300,000 barrels per week. So important, however, have the operations in this article become, that a railroad, we understand, has been chartered in Pennsylvania exclusively for the transportation of the oil to market. From a recent number of the *Registrar*, a newspaper published in Titusville, Pennsylvania, we copy the following statement respecting the production of petroleum in that vicinity;—"We learn that the number of wells now flowing is seventy-five; the number of wells that formerly pumped and flowed is sixty-two; the number of wells sunk and commenced is 358; total, 495. The amount of oil shipped is set down at 1,000,000 barrels; amount on hand to date 94,450 barrels; present amount of daily flow, 5,717 barrels. The average value of the oil at $1 per barrel, is $1,092,000; average cost of wells, at $1,000 each, is $495,000; machinery, building, &c., from $500 to $700 each, $500,000. The total number of refiners is twenty-five. The detailed report of the condition of the wells shows that production is on the increase. Holders are firm at fifty cents per barrel at the wells, and don't seem to care about selling any great amount at that price." With increased facilities for getting it to the seaboard at a cheap rate for transportation, the operations will doubtless become much more extended than at present. The quantity exported from the cities of Philadelphia, New York, Boston, Baltimore and San Francisco, from the 1st of January to the 1st of April, 1862, amounted to 2,342,042 gallons, valued at $633,949. The receipts at Cincinnati, during the same period, of carbon and petroleum oils, were 519,960 gallons, or 13,000 barrels, nearly one-half of which was petroleum oil. The exports from the three cities first mentioned, from the 1st of January to the 16th of May of the present year, were 3,651,130 gallons, worth $889,886, and the shipments in the last week of that period from the same places were 255,600 gallons, valued at $42,160.

A large reduction has taken place in the price since the commencement of the trade, and particularly during the last few months. The price of crude petroleum in Philadelphia on the 4th of January, 1862, was from 22½ to 23 cents a gallon, and of refined oil 37½ to 45 cents. On the 29th of March the prices has declined at the same place to 10 and 12 cents for crude, and 25 to 32 cents for refined oil, while the most recent price current lists place it at 9 and 19 cents. Although the capacity of the existing wells already exceeds a profitable demand, there appears to be no assignable limit to the flow, or to the localities which may be found to yield it, whenever an augmented demand shall warrant farther search or increased production.

Coal Tar made Picturesque.

If coal be regarded as the product of ancient sun-force, then the "light of other days," which has not faded, may be reproduced in colour of every shade and hue. Every one knows that when coal is distilled gas is produced, is carried away and collected, and that among the refuse products of the process is coal tar, which was formerly sold at a very low price. Coal tar is a very complicated body, and, when carefully distilled, it yields certain volatile fluids, smelling more or less of tar, among which is a naptha called "benzole." Small bottles of benzole are sold for removing grease stains under the name of *benzine collas*. Benzole is next acted on by nitric acid, and by that means changed into nitro-benzole—a liquid having so exactly the smell of the essential oil of bitter almonds that it is substituted for it in the manufacture of almond soaps and of cheap perfumery. When iron filings and acetic acid act upon the nitric benzole it is changed into aniline, and this aniline when acted on by arsenic acid, bichromate of potassia, permanganic acid, stannic chloride, &c., yields a great variety of very beautiful colours. These coal-tar dyes are a characteristic feature of this Exhibition. In Perkin's case the visitor will see a cylinder of solid aniline purple, which could easily be carried under the arm. It is worth at least £800, and required for its production the tar obtained from 2,000 tons of coal. It is in tinctorial potentiality equal to 100 miles of calico. Thus are we reminded that death in nature is but new life. Force is, indeed, indestructible; form alone it is which changes. The actual elements caught up from the air millions of years ago, and then quickened into vegetable life by the sun that shone on earlier scenes than Eden, are now delighting the eye and gratifying the taste. The elements of the decayed forests of a pre-Adamite earth, are quickened in 1862, and re-assembling, show that "a thing of beauty is a joy for ever."

Mineral Resources of New Brunswick.

In the interesting pamphlet distributed in the New Brunswick department we find some valuable information with relation to the mineral resources of the province. The carboniferous system of rocks covers an area equal to more than one-third of the entire province. In such an extensive formation of this nature coal must abound; but until within the last few years very little of it was raised in New Brunswick; and, indeed, it was questioned by many whether it existed in sufficient quantities to pay for its working. A seam had been opened for several years at Grand Lake, one of the feeders of the St. John River, and about 900 tons of coal were taken from it in 1851; but this of course, was little better than nothing. Within a few years the discovery of a new species of coal, or mineral substance resembling coal, in Albert county, has directed much attention to that county, and one or two other seams of coal have been discovered. The coal of Albert is principally bituminous and cannel, and is of a superior description for the manufacture of coal oil, gas, &c. In 1859, 15,000 tons of the first-mentioned coal were taken out, and it sold at the mine for $15, or 3*l.* sterling, per ton. During the past year a vein of pure Cannel coal, 10 ft. wide, has been discovered in the same county, and preparations are being made to work it on an extensive scale. In the vicinity oil works have been erected for the manufacture of oil. The discoveries in Albert have been a source of much gratification to the people of the province, as evidencing that abundant supplies of coal do exist, and that the coal measures are not so barren as some have supposed. Indeed, it is likely that more critical examinations of other sections of the country will prove that localities where coal is now only supposed to exist in small quantities are rich in their deposits of this precious mineral. The value of the coal exported in 1858 was 13,743*l.*; in 1859 the exports were nearly three times as valuable. Iron ore abounds in New Brunswick. It has been found in considerable quantities near Woodstook (of the hematite species), and smelting-works on an extensive scale were at one time in operation there, very fine iron being produced. The bed of iron found near Woodstock is in three separate strata of respectively 28, 15, and 27 ft. Iron ore has also been found in considerable quantities on the Nerepis road, some distance below Fredericton. Its thickness is described as varying from 20 to 60 yards. One great reason why the iron of New Brunswick is not worked more extensively is accounted for by the fact that as coal has not yet been found in the vicinity of the ore, and the cost of its conveyance thither so increases the price of the melted iron as to prevent its finding a ready sale. This is an obstacle, however, that time will overcome. Gypsum, copper, lead, potter's clay, fire-clay, &c., are also found in large quantities.

Brilliant Whitewash.

Many have heard of the brilliant stucco whitewash on the east end of the President's house, at Washington. The following is a receipt for making it, as gleaned from the *National Intelligencer*, with some additional improvements learned by experiment:—

Take half a bushel of nice unslacked lime, slack it with boiling water, cover it during the process to keep in the steam, and add to it a peck of clean salt, previously well dissolved in warm water; three pounds of ground rice, boiled to a thin paste, and stirred in boiling hot; half a pound of clean glue, which has been previously dissolved by first soaking it well, and then hanging it over a slow fire in a small kettle with a large one filled with water. Add five gallons of hot water to the whole mixture; stir it well and let it stand a few days covered from the dirt. It should be put on right hot; for this purpose it can be kept in a kettle on a portable furnace. It is said that about one pint of this mixture will cover a square yard upon the outside of a house, if properly applied. Brushes more or less small may be used, according to the neatness of the job required. It answers as well as oil paint for wood, brick or stone, and is cheaper. It retains its brilliancy for many years. There is nothing of the kind that will compare with it, either for inside or outside walls. Coloring matter may be put in and made of any shade you like. Spanish brown stirred in will make red or pink more or less deep according to the quantity. A delicate tinge of this is very pretty for inside walls. Finely pulverized common clay, well mixed with Spanish brown before it is stirred into the mixture makes a lilac colour. Lampblack in moderate quantities makes a slate color, very suitable for the outside of buildings. Lampblack and Spanish brown mixed produce a reddish stone color. Yellow ochre stirred in makes a yellow wash—but chrome goes farther, and makes a colour generally esteemed prettier. In all these cases the darkness of the shade will of course be determined by the quantity of coloring used. It is difficult to make a rule, because tastes are very different; it would be best to try experiments on a shingle and let it dry. It is said that green must not be mixed with lime. The lime destroys the color, and the color has an effect on the whitewash which makes it crack and peel. When walls have been badly smoked, and you wish to have them a clean white, it is well to squeeze indigo plentifully through a bag into the water you use, before it is stirred into the whole mixture. If a larger quantity than five gallons is wanted, the same proportions should be observed.—*Scientific American.*

Preservation of Meats.

At a recent meeting of the Society for the Encouragement of National Industry, M. Peligot read the following note of M. Martin de Lignac on his new patented process for the preservation of meats:

"In the usual way of salting, the meat is placed first in salt, and afterwards in the pickle. The salt absorbs the liquids in proportion as they separate from the flesh, then the pickle penetrates by endosmose, and preserves them from any subsequent alteration by its antiseptic properties But in this case, the salt acts on the surface a long time before it penetrates to the centre, whence results an excess of salt at the surface, whilst the centre is not sufficiently salted, and still contains the principles of fermentation. To avoid this, the habit is to cut up the meat; but this, while it increases the chances of its preservation, greatly alters its quality. In fact, the salt in contact with large surfaces absorbs too largely the liquids contained in the flesh, and extracts from them the aroma and a portion of their nutritive juices. Pork, the tissue of which is dense and protected by fat, bears this preparation better than beef, the flesh of which, after long standing in the salt, presents only a fibrous tissue without flavour, and with but a low nutritive power.

"It results from these facts; first, that meat preserved by the usual process contains necessarily too much salt, and that its prolonged use is injurious to health; secondly, that it loses a part —sometimes a notable part—of its nutritive value.

"The method of avoiding these inconveniences is to salt uniformly and not sub-divide too far the meat, thus preserving its aroma and its juices; I think that I have found the solution of this problem, and the following are the means that I employ:

"If it is a ham which I wish to salt, I introduce, by means of a trocar, between the bone and the muscle at the small end, a sound which I attach to a stop-cock which communicates by a tube with a reservoir of water saturated with salt, to which are added various aromatics and condiments. The reservoir is from 25 to 35 feet high. When the stop-cock is opened, the liquid by its pressure rapidly separates the muscle, and the two or three ounces of pickle which are necessary for the preparation of one pound of meat, are easily lodged in the cellular tissue which surrounds the bone. Thence it forms a kind of reservoir, the liquid spreads penetrating all the fibres by infiltration, distributing regularly and homogeneously the conservative agent, and producing its first effect upon the parts most susceptible of alteration, that which surrounds the bone. The hams thus prepared are put for some days in a pickle-bath. The object of this bath is to prevent by its pressure the issue of the liquid injected; besides which it completes the preparation by saturating the surface. When they leave the bath the meat has lost nothing of the weight which it had at its entrance. I then expose them to a current of air at a moderate temperature. When by evaporation they have lost the infiltrated liquid and 5 per cent. of their normal weight, I expose them to the action of smoke for a time which varies with their weight This latter operation is not necessary for their preservation, but it gives them a taste which is generally sought for, and effects a reduction of weight. On leaving the smoke-house they have lost from 12 to 15 per cent. of their weight; before entering they had already lost about 5 per cent., so that their whole loss is from 18 to 20 per cent."—*Cosmos.*

Potabilisation of Sea-water by the Electric Current.

In *Macmillan's Magazine* for last month is an interesting paper by Dr. Phipson, entitled, "Electricity at work," in which the author passes in review the useful applications of this wonderful agency. He concludes his paper as follows:—"Reflecting upon the powerful decomposing chemical force with which we are furnished by the electric current it occurred to me that I might be able to render sea-water potable by decomposing and extracting its salt, by means of a moderately powerful battery. The experiments were made at Ostend a few years ago. My apparatus consisted of three vessels containing sea water to be operated upon, the two others communicated with the two poles of the battery. The three vessels were connected by two bent U-tubes filled with sea-water. As the only battery I could procure in Ostend was rather weak, I passed the current through the water for about fourteen hours, after which one of the outside vessels had become acid and the other alkaline. The sea water was then filtered through charcoal, and was nearly drinkable. It would have been, I doubt not, quite potable had the battery employed been more powerful, as it was I found it difficult to extract the last particles of salt; and the water after subsequent trials, still presented a slightly brackish taste. I have not had an opportunity of repeating this experiment since but from the results obtained, I think it probable that sea-water may be rendered potable by means of the electric current."

Michigan Coal Field—The Woodville Company.

In 1858 this company commenced operations, and though, at present, no active work is being carried on, it is hoped that its cessation is but temporary, and that a short season of repose will be followed by one of active and vigorous exploitation. A perpendicular double shaft has been sunk to the depth of 97 ft., including the depth of the pump; this would make, therefore, the vertical distance from the surface to the floor of the coal to be about 90 ft. at this point. The following section taken in the shaft will show the succession of rocks cut through:—

Superficial materials	12 feet.
Woodville sandstone	40 "
Black shale, highly bituminous	12 "
Fire clay	
Iron ore, varying from 3 to 18 in. (say)	1 "
Black shale	16·5 "
Coal	3·5=90 feet

The "Woodville sandstone" is a light coloured rock with a peculiar tint at this point, not unlike that of the celebrated "Pictou sandstone;" it is soft, friable, and weathers rapidly. The fire-clay is a good article, apparently, and ought soon to find some economical application.

Though called but one, the vein appears to us to be two distinct seams, separated by a thin band of highly bituminous shale, and marking two distinct and widely different qualities of coal. The upper seam is of some 15in. thickness, and the coal is much freer from pyrites than that occurring in the lower one. The presence of this mineral in a very appreciable quantity in the coal of Michigan has been a source of much annoyance and considerable trouble to those who have used it to any extent, and accounts in a measure for the comparative ill success of most of the explorations throughout the coal basin of that State.—*West. R. R. Gazette.*

New Kind of Gunpowder.

Apart from the ancient discovery of Berthold Schwarz, and the more novel invention of gun-cotton by Prof. Schönbein, the feat has just been repeated in another way by two officers in the Prussian and Austrian service. Of these, Hauptmann Schmidt, a captain of artillery at Berlin, is the original discoverer, whose idea was subsequently imitated and improved by Colonel von Uchatius. The latest explosive material consists of the flour of starch, which, boiled in a peculiar way with nitric acid, possesses a far greater projective force than the gunpowder in ordinary use. It has also the great advantage of not fouling the piece to any appreciable extent, and, from the nature of the materials used, is produced at a far cheaper rate. Another point in its composition which recommends it especially for fortresses and magazines is the facility with which the ingredients are mixed together, thus rendering it possible to keep them separate until wanted for actual use. In this state the powder is non-explosive. The experiments now in course of progress in Vienna and Berlin are said to leave little doubt as to its general adoption in the Austrian and Prussian armies.

Heat Evolved by the Combustion of Carbon in Siemens' Gas Furnaces.

Carbon burnt perfectly into carbonic acid in a gas producer would evolve about 4000° of heat; but, if burnt into carbonic oxide, it would evolve only 1200°. The carbonic oxide, in its fuel form, carries on with it the 2800° in chemical force, which it evolves when burning in the real furnace with a sufficient supply of air. The remaining 1200° are employed in the gas producer in distilling hydrocarbons, decomposing water, &c. The whole mixed gaseous fuel can evolve about 4000° in the furnace, to which the regenerator can return about 3000° more.—*Faraday.*

Method of Colouring Pickles green without the use of Copper.

Into the preparation of pickled vegetables, remarkable for the intensity of their green colour, a preparation of copper, often in large proportions, almost always enters either directly or indirectly. This practice having been very justly condemned, attempts have been made to obtain the same colour with innocuous agents. Nothing succeeds better than boiling the vegetables in water made slightly alkaline sometimes either with a small quantity of bicarbonate of soda, sometimes with lime-water, and sometimes with saccharate of lime or with water containing a quarter of an ounce of liquid ammonia to the quart.

Coinage of the British Mint.

Seven million & a half of sovereigns and over a million of half-sovereigns were coined last year. Since 1852, sixteen millions of florins, twenty-four millions of shillings and twenty millions of sixpences have passed through the Mint. During the same period forty-seven thousand silver two-penny pieces, eighty thousand silver pence, and a large quantity of silver three-half-penny pieces were issued, the latter for circulation in Ceylon. The coinage of half-farthings ceased in 1856, when 913,000 were struck; The total value of all the pieces coined since 1852 to the beginning of the present year is about £64,000,000.—*Athenæum.*

Photography Appreciated.

The municipality of Ghent so highly appreciate the value of Photography that they have established gratuitous lectures on the subject, of an instructive character.

Captain Coles' Shield Vessel.

Captain Coles's plans were submitted to the Admiralty in 1859, long prior to the construction of Ericsson's battery. These shields and the *Monitor's* are much alike in principle; but Captain Coles's vessel is a far better sea boat than the *Monitor,* and carries twelve guns instead of one, as in that vessel. Coles's shield has a conical roof, and carries one or two Armstrong 100-pounders fixed in slides, which are parts of the interior of the shield, that moves round on a central pivot, and the men working the guns are turned round in it entirely under cover. The construction of the shield ship designed by the Admiralty is altogether better than the *Monitor's.* The speaker does not wish, however to see our war ships replaced by vessels of this class, but by those worthy of ourselves—a fleet of *Warriors.—T. Scott Russell.*

Production of Salt in the United States.

The making and refining of salt in the United States in 1850 employed 340 establishments, and the value of their production was $2,177,945. The four States of New York, Virginia, Ohio and Pennsylvania, which, in the order named, are the principal salt-producing States, made according to the eighth census, nearly twelve million bushels, the cost of which was $2,200,000, an average of about 18½ cents per bushel. Texas, Kentucky, Massachusetts and California are also self-producing States. About sixty per cent of the whole was made in New York, at an average cost of 17 cents per bushel.—*U. S. Census for* 1860.—*Scient. Amer.*

The Three Hundred Pounder Armstrong Gun.

The 300-pounder Armstrong gun, which, since its proof with 90 lbs. of power, has been in a dangerous state, was on the 7th ult. again used at Shoeburyness against iron plates at a range of 200 yards. The target represented a portion of the side of the new class of steam frigates to which the *Minotaur* belongs. In these frigates the armour is 5½ in. thick instead of 4½ in., as in the *Warrior;* but the thickness of the teak backing is reduced from 18 in. to 9 in. The inner skin and iron framing are the same as in the *Warrior.* For the first three trials the shot was of cast iron, and the charge was 50lb., as usual. No. 1 struck and pierced the centre plate, damaging but not passing through the inner skin and framing. No. 2 struck the upper plate, and went completely through armour, timber, and skin. No. 3 was directed against the lower plate, and, like No. 2, passed right through the target. The fourth shot was of wrought iron, and the charge the same as before. At this round, however, the gun gave way, the breech being blown backwards to a considerable distance. The gun, however, did not break into fragments, and no one was hurt.

The Atlantic Telegraph.

The Atlantic Telegraph Company are to be once more assisted by Government. The Admiralty have undertaken to make a new survey of the bed of the ocean between Ireland and America, and will lend vessels for laying the cable. Should the line be laid successfully, Government will further pay the company £16,000 a-year as long as the cable is in working order.