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FLAX: A STUDY FOR THE POLITICAL ECONOMIST.

(Continued from page 116.)

The history of flax is traced throughout the writings of the Old and New Testaments, linen and flax being there often mentioned. "Fine linen" appears to have been one of the marks of distinction of priests and princes. In the days of king Solomon it was an article of commerce, brought to him from Egypt. The Tyrians were skilled in it, for Hiram king of Tyre sent to Solomon "a cunning man," "skilled to work in fine linen." "The spindle," "the distaff," "the shuttle," and "the weaver's beam," are all mentioned in Scripture; and notwithstanding the simplicity of these primitive instruments of manufacture, they wove "garments without seam," and produced linen cloth which has survived to the present time, enwrapping the mummies of Egypt, some of which have been brought to England, and specimens of linen cloth taken from them may be seen in the British Museum in London. Some of these specimens are of exceeding fineness, 270 threads to an inch warp and 110 weft or woof—whilst the finest production woven in India by the Deccan loom have only 100 threads to the inch of warp and 84 in the woof or weft. The cultivation of flax, and the manufacture of linen, kept company with civilization as it marched westward and northward, through Europe, over Greece, Italy, Spain and France, and was brought to England by the Romans; but it is believed that they only brought the productions of flax, and that the cultivation of it was not introduced into that country for some centuries after; for as a modern author writes, "At the time of the Norman conquest flax was not enumerated amongst the titheable articles at that time." And he adds, "had it been discovered by the clergy, there is little doubt but that they would have had it in their tithe list."

It is thought that linen was introduced into Ireland by the Tyrian or Phœnician traders long before the Romans visited Britain. Be that as it may, it has been stated upon what is believed to be reliable authority, that flax was used A.D. 500, and that at that time the Irish wrapped in linen the bodies of deceased persons of eminent rank. The linen "Cota" was an article of dress used by them three or four centuries after that, but it is thought that up to the eleventh century the flax used in Ireland was for the most part imported, and there are even some who do not date the introduction of the manufacture of linen into that country so far back. About the close of the fourteenth century "breeches of linen cloth" were worn by the kings. Through the fifteenth century linen was found amongst the productions of Ireland, and from the beginning of the sixteenth century, the Irish had "plenty of linen."

It seems the Clergy in England did at last discover flax, for the Council of Westminster, in 1175, included it among the titheable productions of the land. (Macpherson's Annals of Commerce.) "Fine linen" was made in England, and "linen shirts" came into use, in 1223. The Flemings introduced the weaving of fine linen into that kingdom in 1253, and a company of linen weavers existed in London in 1388. But for some reason not known, the cultivation of flax received especial attention at the hands of the English government early in the 16th century. In 1531-2-3, laws were passed enacting that for every sixty acres of tillage land, one rood should be sown in each year with flax or hemp. (See Macpherson's Annals of Commerce.) This quantity was increased to an acre in 1662. (Elizabeth's reign.) In 1664, Abraham Hill registered a patent for a machine in England "for breaking and dressing flax." In 1677, a Mr. Andrew Yarranton published a book called "England's Improvement by Sea and Land, to outdo the Dutch without fighting; to pay the debts without money; and to set at work all the Poor of England with the growth of the land." The entire burthen of his song was "flax;" and were an author of the present day to substitute the names of "Canada" for England, and "United States" for Dutch, he would have a suitable title for an elaborate and useful work on the same subject at the present time.

In the reign of Henry VIII. in addition to the English acts of 1531-2-3 to compel the sowing of flax in England, an act was passed in Ireland, in 1542, forbidding merchants from "forestalling" linen and linen yarn; and in the 11th year of Queen Elizabeth's reign, 1569, that act was revived and a law made against watering flax or hemp in rivers, &c.; and in 1571, another act was passed prohibiting all persons "from exporting linen yarn, excepting merchants residing in cities and boroughs." In the same year, a further act was passed "for the employing the inhabitants and encouraging the manufacturing of linen, by fixing penalties on all flax or linen exported."

Fynes Moryson, Secretary of Lord Mountjoy, the Lord Deputy of Ireland under Queen Elizabeth, in his History of Ireland, states, "Ireland yields much flax, which the inhabitants work into yarn, and export the same in great quantities; and of old they had such plenty of linen cloth as the natives used to wear 30 or 40 ells in a shirt, all gathered and wrinkled and washed in saffron, because they never put them off until worn out."

Sir Thomas Wentworth, afterwards created Earl of Strafford, was Lord Deputy of Ireland from 1633 until 1639, under Charles I. He may be said to have been the first to establish the growth of flax extensively in Ireland. In 1640, articles of impeachment were preferred against him, in which it was charged "That flax, being one of the principal and native commodities of Ireland, the said Earl having got great quantities thereof into his hands, and growing on his own lands, did issue out several proclamations prescribing and enjoining the working of flax into yarn and thread, and the ordering of the same in such ways wherein the natives of that kingdom were impracticed and unskillful; and the flax wrought or ordered in other manner than as said proclamation prescribed was seized or employed to the use of him and his agents, and thereby the said Earl did gain in effect the sole sale of that native commodity." To this the Earl replied "that he imported flax seed from the Low Countries, and sold it at first cost to such as desired it, that the linens were not made above a foot broad and the linen yarn wound from many bottoms together; that the flax of the kingdom was not above a foot long, whereas the flax produced from his seed became a yard in length, on the soil fit to bear it; and the people loved such easy works, he set up many looms, made much cloth, and sold it to the loss of some thousands of pounds; but when the state saw the natives would not change their old customs for new and better, the Proclamation was declined; what he did was for the public good, &c." After an investigation, a bill of attainder was passed against the Earl, and he was executed in 1641. Be his crime what it may, there is no doubt but it is to him that Ireland is indebted for introducing the cultivation of flax into that country upon a proper system. The civil wars which soon after broke out checked its progress, however, for a time.

An act was passed in the year 1661, in the reign of Charles II, for granting a subsidy of tonnage upon merchandise imported and exported into or out of Ireland; and by the book of rates settled for payment of the duties, in the same year, linen yarn was valued at £20 the pack of 400, at six score to the 100, or 10d. per lb.

In 1662, an act was passed "for encouraging Protestant strangers to inhabit and plant in Ireland for the improvement of manufacture." Flax and linen yarn were now considered amongst the materials and principal commodities of the Kingdom.

In 1667, James Butler, Duke of Ormond, obtained from Charles the Second, a prohibition of the importation of linen, &c., from Scotland, and successfully executed his plans of national improvement; and by constant attention, the weight of his own influence, and princely munificence bestowed in aid of the linen manufacture of Ireland, he revived it; he induced people from the Low Countries—France and the Netherlands—who understood the cultivation and manufacture of flax, to come over to Ireland in 1668, and from that time great encouragement was given to manufacture; and such an interest was taken in the matter, that in 1681, spinning linen yarn was fashionable amongst the high classes of farmers in Ireland.

Great numbers of Protestant refugees left France in 1685; some of them went to England and many to Ireland, bringing with them a knowledge of manufacture. In 1696, hemp, flax, linen, thread, and yarn, from Ireland, were admitted duty free into England, and this infused life and spirit into the trade of Ireland, which was found to be of such advantage to the country, that by an order of the Irish House of Commons, in 1697, (in the reign of King William III.) steps were taken to form a society of persons qualified to superintend the linen manufacture and flax business; and they finding the necessity for further information and instruction, "induced other French Protestants to settle in Ireland, to instruct the inhabitants in the manufacture of hemp and linen." The King granted to one of those Colonies of French Protestants, who came to Ireland with Cromellin, in 1700, a patent in which, amongst other regulations, it was directed that £380 should be paid yearly as salaries to several of the Colonists, and £800 as bounty money for linen to be made by them, making a total of £1180 yearly. They improved and encouraged the linen trade of Ireland; they had manufactures and machinery for damasks and figured goods, and many persons were employed by them; by their improvements the Irish soon came to compete with the French and Flemish manufacturers.

To the trustees of the Irish Linen Board, which had been formed under an order of the Irish House of Commons, large sums of money were voted by the Irish Parliament from time to time, for the promotion of the cultivation and the manufacture of flax. A second patent was granted by Queen Anne, continuing the patent of 1700 for ten years, and also continuing the allowance of £1180 per annum. In this reign several laws were passed for the benefit of linen manufacture, regulating its width and length, granting freedom to weavers, exempting them from toll, and admitting duty free, flax seed from Holland, Russia and Muscovy; and further to encourage the importation of such seed, a bounty of 5s. per hogshead of all imported from those countries was granted. From 1704 to 1708 there was paid under Queen Anne's patent "£2,457 12s. 11½d; to the French colony at Lisburn, £451 6s. 7½d; to William Cromellin, the principal of the French Colonists, towards a linen manufacture, £2,225; to Louis Cromellin, and other flax dressers, £55 4s. 9d; for printing Cromellin's books," and for various other charges, amounting in the whole to £7,283 12s. 0½d; besides "a pension of £600 a year for three years, and £120 a year for two years to the French Minister. In 1705 an essay was published by "L. Cromellin, overseer of the Royal linen manufacture of Ireland," for the purpose of improving the hempen and flaxen manufactures of Ireland: in it he at this early period dwelt upon the value of "Russian seed imported from Riga or Narva." The instructions given by him for cultivation of the land, and growing of the crop, differ little from what was written by Pliny the Roman naturalist and historian, 1800 years ago, and by the host of modern theoretical essayists whose papers are to be met with everywhere. About the year 1710 Mr. Joseph Beaumont compiled tables calculating the proportions to be observed in making linen, called "sleaing tables," which were much approved of by manufacturers, and were thought of such merit that the Irish House of Commons voted to him a reward for same.

The Irish Linen Board was constituted under an act of Parliament; and was to consist of 72 trustees—18 to be nominated by each of the four Provinces. Spinning schools were established in every county, 32 workshops were opened; £20 a year was allowed for each of the 32 masters, and £10 each to 32 mistresses, to instruct in the preparation and spinning of flax. In 1711 a further grant of £1619 was made by a vote of Parliament, "for the encouragement of the linen and flaxen manufacture;" and an act was passed to encourage "the sowing and dressing of flax." In 1713, special committees of the House of Commons were appointed to inspect the management and state of the linen manufacture, and to make reports. Foreign flax seed was imported by the Board to remedy the evils arising from frauds committed by dealers in seed, who fraudulently imposed bad home saved seed, representing it to be good foreign seed. The Board disposed of part of the imported seed gratis, and part at half cost. "This encouraged the sowing of larger quantities than usual, and the produce let people see the goodness of the foreign seed in preference to their own."

Itinerant "flax men" were appointed in each Province, to instruct all persons in the best methods of sowing and preparing their seed and managing their flax; and the committee of the House of Commons reported that these men were of "great use." The trustees published and disposed of several books of instructions, encouragement was given by the trustees to parties setting up manufactures of linen and bleach yards, and rewards were offered for sowing flax seed. At the instance of the Linen Board, Mr. Turner, who was employed for the purpose of improving flax and flax seed, and bleaching cloth, published several papers giving new methods of improving flax and flax seed. In these he gave directions as to the mode of cultivation. Some of his instructions are about as unsuitable as many in the present day, calculated only to mislead and mystify the flax growers. Amongst the oddities of his teaching he suggests "to steep the flax seed about two days in new milk, in order to prepare it for sowing."

The trustees of the Board contracted for eight spinning schools, to instruct 160 girls, at £1 16s. per annum for each girl, amounting to £288 per annum; and for 470 boys and girls to spin hemp, at the like allowance, amounting to £846; being a total of £1134 yearly for these spinning schools. The annual expense of the board at this time amounted to £1729. The Committee of Enquiry reported, "that the importing and sowing of foreign flax seed *was absolutely necessary* for the improvement of flaxen manufactures; that the appointment of proper persons for the instructing of the common people in the best methods for sowing, managing, and dressing flax and hemp, the continuance of the spinning schools and the setting up of flax and hemp manufactures in the several provinces of the kingdom, is highly advantageous to promote the trade of the kingdom."

A sum of £1,000 a year was voted to the trustees of the Board, for two years, to aid the cause; and, in 1719, a further sum of £2000 was paid to the trustees. In 1721, another Committee of Enquiry was appointed by the House, and they reported, amongst other things, "that they had employed an understanding person to go into foreign parts, to make himself master of the methods used for improving the several branches of the flaxen and hempen manufactures." In 1722-3 £3000 was allowed by Government towards building a linen hall in Dublin, and £4000 to buy imported flax seed. In 1725, another Committee was appointed by the Irish House of Commons, and it reported "that the effect of the laws (in favour of flax and linen manufactures) had been that Ulster had universally run into the manufacture of linen and yarn, by which their rent is in a great measure paid, and the land improved in value and their poor maintained." "That the £4000 given by Parliament last session, to import flax seed, had promoted flax growing so as to raise sufficient for home manufacture."

From 1710 up to 1725, the Board had received and expended no less a sum than £49,134 10s. 2d. sterling, in their efforts to encourage the growth of flax and manufacture of linen; yet the Irish Legislature did not show any regret for the expenditure, but granted £2000 a year for two years further; and another Committee of the House of Commons, in 1827, investigated the proceedings of the Board, and reported thereon. The £2000 a year was continued to the Board from 1725, for 30 years, up to 1755, amounting to £60,000; and another grant of a further £2000 a year, made in 1733, was continued up to 1758, 25 years, amounting to £50,000. Prohibitive duties on imported calicos were imposed for the purpose of giving a preference to the linen trade; and these duties, levied from 1725 to 1758, amounting to £358,433 4s. 10½d. were paid over to the trustees to be applied in various ways to encourage this trade in Ireland; and to these sums may be added £540 bestowed by the King's letter in 1731, to purchase a site for a flax market; and £4,000 voted in 1755 for the purpose of being divided equally in each county, to encourage the raising of flax; making the almost incredible sum of £528,107 15s. 0½d., stg., paid out of the public treasury of "Poor Ireland," between 1725 and 1758, to encourage this branch of business.

In 1723, a Committee appointed to inspect the state of manufactures in Ireland, made its report, and amongst other matters stated, "that there never had been sufficient quantities of flax raised in the Kingdom to employ their looms and the poor, and to carry on an extensive manufacture; that in 1722 there was imported 107 tons 18 cwt. 1 qr. 5 lbs. of flax, to remedy which for the future, the Committee hoped that the House of Commons would find proper methods to increase the growth of their own flax, so as it might fully answer the demands of their manufacturers and spinners;" and in 1723 an Act of Parliament was passed to benefit the trade, by regulations to protect manufacturers. The importance in which the linen trade at this time was viewed, may be learned from this fact, that this act made "the stealing of linen or cloth out of bleach yards, of the value of 5s. or upwards, "*Felony without benefit of Clergy;*" and it is said that an offender against this law suffered death on the gallows for the crime. In 1737, an act was passed empowering the Grand Juries of Counties to raise money to build public warehouses for sale of yarn, flax, hemp and flaxseed; by which means large sums were expended in the erections of extensive public buildings, called "Linen Halls," in many of the towns of Ireland.

In 1737, the Dublin Society's weekly transactions contained a series of letters and articles, treating of the different methods of proceedings by the Dutch and Flemish flax farmers, who even at this time were held up as examples to be followed in this business. The quantity of seed recommended at this time to be sown per acre, is just what is now sown in Holland and in Ireland.

The following appeared in the 27th number of the Dublin Society's transactions of 1837, shewing the importance then attached to the subject of linen manufacture:—"As the linen manufacture "is and must be the main support of trade, and "the chief inlet of riches in this kingdom, it must "give the Society a more lively satisfaction to be "useful there than in any other point. Improve"ments in any branch of business will indeed "adorn the kingdom, but this maintains it; "whatever affects that, affects our very vitals, "and to correct an error, or introduce an advan"tageous practice, is therefore eminently bene"ficial. Upon this account the Society will always "bestow upon it more than ordinary attention."

An act was passed in the 17th of George II, granting bounties of a half-penny to three halfpence per yard of linen manufactured in Great Britain and Ireland, exported to Africa, America, Spain, Portugal, Gibralter, Minorca and the East Indies, for the space of fifteen years from that time.

The mode adopted by the trustees in the distribution of the £4,000 granted to encourage the raising of flax was, by apportioning £125 to each County, to be divided into two classes of premiums, viz., 25 at £2 each, and 75 at £1 each; no person to be entitled to a premium of either class who sows any quantity of ground with flax more than one acre plantation measure; the largest quantities of merchantable flax worth £1 15s. per cwt. to compete in the first class, and those worth £1 per cwt. in the second class.

A member of the Irish Linen Board, in 1745, published remarks on the state of the linen manufacture; and also some further articles in 1753, by which it is stated that 17,889 barrels of flax seed were delivered into the stores of the Linen Board in 1745, besides so much rejected as would have made 220,000 barrels. This he computed to be the produce of 8,000 acres, which he estimates would produce 1,600 tons of flax (about 500 lbs. per acre), and he observes "that this quantity would afford employment for a year to 48,000 people." "In Munster and Leinster they had only made the flax seed the object of their concern, and had but too generally neglected the flax, that contractors had over-stocked the kingdom with bad seed, unfit for sowing, and only fit for *Oyl*," of which a considerable loss had ensued," which he computes at £10,000. Of the North of Ireland, he writes: "The North part of the kingdom, for which this seed is intended, would not use it on account of its bad quality."

Another essay to encourage and extend the linen manufacture in Ireland, was published in 1749, by a Mr. Prior. The means he advocated were premiums. He says—"There can be no increase of linen manufacture without an increase of yarn, nor of yarn without an increase of spinners, nor of spinners without an increase of flax." "There are as many women and children within the kingdom that do not spin flax, as those that do; and many of those who are now unemployed would work if they could get the materials." "*We find a general disposition and readiness in all our poor women to get a livelihood by spinning, if they could get flax and wheels to work with.*" How like Canada at the present time.

This author computed that rough flax, worth 40s. per cwt., when manufactured into linen of a medium quality would be worth £16. He computed each acre, on an average, would produce 4 cwt. (448 lbs.) of flax; that 125,000 hands could be employed in manufacturing 15,625 acres, producing about 3,125 tons of flax, and working it up so that when manufactured it would be worth one million pounds sterling. He argued "that it was 700 per cent. advantage to the nation to raise flax from seed imported, rather than to import the flax, and he therefore suggested payment of premiums to merchants importing Baltic flax seed."

In a letter from Sir Richard Cox to Robert Price, Esq., published in 1749, he writes: "There are extraordinary demands for flax mills, &c." "There are at this time 166 spinning schools." The expenditure of the Linen Board he states at £14,887 yearly. The members or trustees of the Linen Board were for the most part gentlemen not conversant with business, though anxious for the success of it; they did not attend to its affairs, and left them in the hands of paid officials, without any check, in consequence of which it became necessary to wind up the affairs and reconstruct the Board. A Mr. Stephenson was appointed by the trustees to travel through the country, and to investigate the state of matters; he made a long and elaborate report, published about 1759, in which he reviews the linen trade up to that time in Ireland, and gives us particulars of the plans adopted by the Commissioners appointed for improving and encouraging the linen trade in Scotland. They had young men instructed in raising and dressing flax: they paid premiums to flax growers; salaries to flax dressers for instructing farmers; allowances to Spinning Schools—premiums to spinners; and they purchased wheels and reels, and bought flax seed. He informs us of the increase in amount of linen cloth and yarn exported out of Ireland, and shows how under the careful attention bestowed on it, that linen exports which were in 1710 only £22,250, had increased in 1757 to £1,033,913; linen yarn had also increased from £27,041 to £186,473, during the same period.

In 1757,	16,500,000	yds. of linen were made in Scotland.
	12,500,000	" in Ireland for home consumption.
	5,000,000	" " export to England.
	21,000,000	" made in England.
Total,	55,000,000	yards.

The cottonizing of flax, claimed to be a modern discovery, was practised in 1775 by Lady Moira, who converted considerable quantities of refuse flax and hemp into "flax cotton." "The fibre was boiled in an alkali lye, or a solution of kelp, containing carbonate of soda."

The following table shows the foreign linen imported into England, as taken from a return made to the House of Commons in 1856—

Year.	Total number of yards.	Total Value.	Average price per yard.	Duty paid on importation.
1730	32,050,912	£2,087,110	15¼d.	£192,859
1735	38,363,507	2,313,802	14	223,458
1740	31,637,459	2,040,558	14	184,794
1748	29,759,448	1,764,138	14	200,759
1751	31,242,681	1,658,532	12¾	182,358
1752	24,132,717	1,347,026	13	182,287
1753	34,857,130	1,908,596	13	211,212
1754	25,959,399	1,433,098	13	194,577

The farmers of England long enjoyed the advantage of high protective duties on grain, which made the cultivation of grain crops (which could be produced with less trouble than flax), more to be grown by them; but in 1783 some bounties were paid to farmers to grow flax, a demand having sprung up for flax and hemp, of which 17,695 tons were in 1785 imported from Russia.

Hargreaves's spinning jenny was invented in 1769, and Arkwright's improvements in 1790-2, from which time may be dated the rise of cotton and the fall of flax in England. In 1791 a spinning mill was built at Holbrook, near to Leeds, and in 1793 there were 900 spindles at work there.

Scotland, like Ireland, had begun the cultivation of flax at an early period, the first we find worthy of notice in the Scottish trade, is that in 1660, it had sent linen yarn to England to be woven; and though we have no circumstantial account of her progress, it must have been very considerable, for we find in 1727 the old method of breaking and scutching flax had yielded to a water mill invented in Scotland about this time; and it is remarkable that this mill is that most generally used up to the present time in Ireland, and it was introduced into Canada a few years ago by the "Canada Company." By a work published in 1794, entiled a General View of East Lothian, by G. B. Hepburn, Esq., of Smeaton, it is stated; "In the year 1727, the Board for the encouragement of manufactures and fisheries was instituted, and as the culture of flax was altogether unknown at that period, the Board had a certain number of surveyors instructed in the culture of flax to whom they assigned a district of the country, and by bounties they invited the husbandmen in each district to cultivate the plant, under the directions of these surveyors, who superintend the work from the time of sowing the seed until the flax was watered and prepared for scutching. Mr. Spalding who had charge of one of the Counties, invented the water machine now (1794) used for the scutching of flax, and under his directions the Board erected the first machine of the kind ever known in Great Britain, at Gifford mill, on the Tweedale Estate, in East Lothian." In an essay written on flax, by Mr. Walter Reid, of East Lothian, he states that "in 1746 flax received great attention from the then Society for the Improvement of Agriculture, and bounties were given by the Board of trustees till within the last twenty years; but notwithstanding this encouragement, its cultivation gradually decreased. The high price of grain at the beginning of the present century contributed much to this result."

Hand-loom weaving and hand spinning were in practice in Scotland until a few years ago; and even yet such means of manufacturing, by domestic work, are to be found in many remote districts of the country.

Spinning and power-loom factories are numerous in Scotland, and Dundee is the great mart for Russian and foreign imported flax. By the "Dundee flax trade" is understood a coarse description of flax—the supply of this is obtained principally from Russia, and much of the inferior Irish flax is purchased for it. Canadian flax, such as has hitherto been produced, is only fit for the "Dundee market;" but it is hoped that by the proper means by which it is possible to improve it, a better class of flax, such as is used by the Belfast spinners, may be produced in Canada ere long.

At Montrose there are spinning factories consuming large quantities of flax, besides a great number of power-looms weaving medium fabrics, and broad looms weaving coarse floor cloths, and wide sheetings of fine quality. In Fifeshire there are factories for the preparation of flax by retting, breaking and scutching; and also many extensive spinning and power-loom factories. In 1833, the Dundee linen trade exceeded that of all Ireland.

In 1830, was imported into England, Scotland and Ireland, hemp to the value of £427,758; flax and tow, £1,942,231; linen yarn, £124,182; linen under £20,000. In the same year there was exported 61,919,963 yards, valued at £2,017,775 11s. 10d.; upon 55,613,308 yards of this there was paid a bounty of £153,110. In 1831 the total exports of linen amounted to £2,461,704. The exports in 1836 were 82,088,760 yards of linen, valued at £3,238,031; thread, tape, &c., £64,020; linen yarn, £479,307; amounting in all to £3,781,358.

Bounties were withdrawn when the trade was found equal to support itself.

The Linen Board ceased, and a great want was found to exist; but its place was filled even more efficiently, and, no doubt, with greater economy, by the "Royal Flax Society," formed in 1842, at Belfast. Aided by private contributions and grants from Government, it developed and improved the trade which the Linen Board had established, and by its exertions in procuring all available information from other countries, and disseminating it by teachers amongst the Irish farmers, it raised the character and value of Irish flax so as to enable it to compete with the best qualities of that material which can be produced by any other country. Had not this Society thus improved the quality of the Irish flax, keeping pace with the improvement of the times, Ireland could not have competed with Belgium and other European countries.

Until last year, when the extent of the flax crops had increased to double what it had been in 1862; the product of flax crops in Ireland was estimated at 30,000 tons per annum, and 20,000 tons for the south of Scotland, Yorkshire, and Somersetshire, making a total of 50,000 tons annually produced in the United Kingdom. The consumption was estimated at about double that quantity. The consumption has increased not only in Ireland, but in England; upwards of 1500 power looms formerly weaving cotton having been applied to the weaving of linen.

Mr. William Charly, in his "Handbook" on flax and linen manufacture, estimated the export of linen from the United Kingdom, ten years ago, to be about £4,500,000 sterling, and the home trade probably equal. To this he adds nearly £2,000,000 sterling as the yearly value of the yarns exported, making in all a total of £11,000,000. About two-thirds of this he allowed to be the Irish share of the trade: the other third to be from Yorkshire and Scotland.

Since that estimate, however, Ireland has engrossed a greater proportion of the trade, and Belfast is indisputably the Flax and Linen Metropolis of the world. The Irish Legislature in the eighteenth century, as we have seen, expended what may appear to have been extravagant amounts of money in establishing, in that country, a trade it has held and is likely long to hold. Fluctuations and depressions have taken place throughout all countries in this branch of trade, at various times, owing to various causes. Flax is grown less, of course, when the price of grain continuing high for a few years in succession tempts the farmer to adopt the cultivation of cereal crops; low prices of which again causes him to fall back upon flax; but throughout all fluctuations and changes it will be found that Ireland has retained her position relatively as a linen producing country, and this may be traced to the education she received through the "Linen Board," and Royal Flax Improvement Society; the cost of which was no doubt great, but has been repaid manifold, directly and indirectly. Mr. Charly estimated Ireland's share of the linen trade as worth two thirds of eleven millions sterling, but even if it were not worth more than five millions of pounds sterling, annually, for the last sixty years, would give us three hundred million of pounds sterling, out of which surely there has been sufficient profit to have recompensed the country for some millions of pounds sterling, which probably was expended from time to time out of the public funds to establish this trade.

In England the cultivation of flax had been almost abandoned from the end of the last century, except in Yorkshire; but here for several years past a considerable breadth of land has been under cultivation in flax, which is prepared in factories on Schenck's system. Flax seed of excellent quality, pure and good for sowing, saved in Yorkshire and sown in Ireland has produced good fibre; it can be purchased at about two thirds the price of Riga or Dutch seed.

In the official report of the Great International Exhibition of 1851 it is stated—"Bridgeport may be considered the especial seat of flax and hemp manufactures (in England); so early was it celebrated for it, that in an act, 21 Henry VIII., it was set forth that "the inhabitants had time out of mind used to make within the town the most part of all the great cables, ropes, and other tackling for the Royal Navy,' and the most part of the ships within the realm." Upwards of 1,250,000 cwts. of flax and tow were imported into England in 1841, at a duty of 1d. per cwt., yielding consequently to the revenue £5,500.

To go further into the details of the advantages which have been derived in Ireland, by the cultivation and manufacture of a material which was, by great exertions, introduced into that country, and established as an institution, is here unnecessary, as it is also to examine further the means so energetically pursued for upwards of two centuries to secure it. We have seen something of what has been done in Ireland; in our next paper we will look into the history of flax in Canada, and what has here been done, and has not been done, to promote its cultivation and manufacture.

THE MONTREAL "TRADE REVIEW" AND OUR INDUSTRIAL INTERESTS.

This ably conducted Journal, in its weekly discussion of our commercial and industrial interests, takes a most correct view of the causes of the general depression now existing. It does not, as is the case with most of our *political* newspapers, point to the large imports of the wholesale merchants as evidences of the country's prosperity, but warns the people that if we continue to import so largely in excess of our exports, as we have been doing for many years past, it will inevitably lead to national insolvency; and, instead of depreciating the efforts of those who desire to make this a manufacturing as well as an agricultural country, as is the wont of many of our public writers, shows that it is utterly impossible for us to be prosperous unless we manufacture much more largely than we now do, and thus employ our surplus and unproductive labour, and keep capital in the country; and also, as the basis of the whole, improve our systems of agriculture, and largely increase the quantity and value of our agricultural productions.

The following extract from a recent number, gives, in a few words, the pith of the whole argument:—

"During the last ten or twelve years the consumption of the Province has outridden the production by many million dollars; indeed we have been running into debt at the rate of some eight or nine million dollars a year, as will be seen by reference to the provincial import and export account. To conceive that such a course can be forever pursued without producing national insolvency, would be to condemn as unsound the principles established by all the great writers on political economy. A colony—and especially a new and not wealthy colony—cannot afford, any more than an individual, to spend a dollar and only earn seventy-five cents, without ultimately coming to grief. No doubt a large portion of the specie and commodities imported to Canada during the last twelve or fourteen years, has been spent in works of a permanent and useful character, but that these works, however essential to the development of the country, have not produced the marvellous results which were confidently predicted for them, is but too plainly apparent. The cause is simply this, that, up to the present, our entire capabilities, or nearly so, have been expended in creating facilities for the interchange of commodities, and that without due regard to the production of those commodities which we hoped to exchange. The pleasing but delusive theory that Canada only wanted an outlet for the product of her vast agricultural regions to make her rich and happy, is well nigh exploded, and even our most enthusiastic railway and canal builders are beginning to acknowledge that something more is required to secure permanent prosperity. The same principle that applies to Ireland holds good in Canada. As soon as Ireland lost her manufactures, her prosperity faded, she could not support her population and exist as a solely agricultural country, even with an inexhaustible market for her cereals at her elbow, which Canada has not. So it is with us; we cannot secure more than transient prosperity unless we curtail our imports, and permanently increase our agricultural productions; and we cannot do this without manufacturing to our utmost capacity, and thus attracting to the Province a population of skilled laborers to create a home consumption for our root crops."

Correspondence.

ON THE MOST ECONOMICAL USE OF STEAM.

[Having afforded space for the very severe criticism of "Z.," in the article "Brantford Engine Works," in a former number of the Journal, we cannot in fairness refuse space for the following communication, and thus leave the matter for the judgment of our engineering and mechanical readers. In publishing the criticism we could not but anticipate a reply; and we did so in the belief that by such a discussion attention would, to a certain extent, be drawn to our home manufactured engines, and result in benefit to both the producers and the Province. If we do construct first-class engines at home, why go abroad for such as we require? and if we do not produce them, the sooner we know it the better, so that we may set about to improve in both their design and manufacture.—ED. JOURNAL.]

To the Editor of the Board of Arts Journal.

SIR,—A communication over the signature of "Z." appeared in the March number of your Journal, the object of which seemed to be not an impartial criticism on the notice you gave of the Brantford Engine Works, in a previous number of the *Arts Journal*, but a labored attempt to disparage the merits of the steam engines manufactured by our firm.

Had "Z." made his remarks in a spirit of fairness and candor, we should not have deemed any reply from us necessary, as we earnestly solicit honest and legitimate criticism upon the machinery we manufacture; believing that it must always result in advantage to ourselves, as well as to those, the exigencies of whose business require the best machinery and steam engines that advancing art and science can produce.

Without entering into a long discussion, it will be sufficient to notice a few only of the numerous errors into which "Z." has fallen in his hasty zeal to condemn our steam engines, about which he seems to know little or nothing.

In the first place he states that "some American millwrights build water-wheels which (they say) give 146 per cent. of the water," and adds, "it appears from these statements of the proprietors of the Brantford Engine Works, that they have made fully as startling improvements in the steam engine." What these statements are which are ascribed to us, we are unable to discover; but to show that, after all, "Z." believes in the truth of all the statements we have put forth with reference to what our steam engines *can* acccomplish, we have only to draw attention to the closing remark of his communication. He says: "In conclusion, we may add, that there are very few mechanics who could not do all that the Brantford firm *say* they can do."

If this be true, why does your correspondent impugn the correctness of our statements; or why does he class them with the absurd statement which he ascribes to the American millwrights, who he says claim for their water-wheels "146 per cent. of water?" Either the first or the last paragraph quoted above from the communication of "Z." is manifestly untrue, for the one is wholly incompatible with the other.

But even this story of the American millwrights claiming for their water-wheels "146 per cent. of water" is disingenuous. In a foot note to "Z.'s" communication, it appears, that all that was really claimed by the American millwrights for their turbine water-wheel was 80 per cent., while the overshot water-wheel gave only 66 per cent. Through the blunder, however, of a Canadian agent, who probably knew nothing of the law of forces as applied to water, the 80 per cent. given by the turbine water-wheel was added to that of the overshot-wheel, thus making up the "146 per cent.," an absurdity so palpable that it could not possibly lead any mill-owner astray.

"Z.," however, seems to have become enamoured of the story, and introduces it again by way of illustration, and to give point to his remarks, by saying "In trying to prove that steam power is cheaper than water, they (the Brantford firm) will have some difficulty in convincing the mill-owners, and greater difficulty still in convincing their own countrymen, who manufacture the '146 per cent. water-wheels." This sentence contains two groundless insinuations—the one referring to the "146 per cent. water-wheels," which we have already disposed of; and the other an allusion to the supposed nationality of the "Brantford firm," an insinuation too sneeringly repeated several times in "Z.'s" communication. We may here state, for his information, and that without the least reflection on American Manufacturers, that there is but one gentleman connected with the Brantford Engine Works of American birth, all the others being Canadians or old countrymen: hence our firm cannot be, in any proper sense, called an American firm. But even were every man connected with the establishment an American by birth, we cannot see how that could possibly affect the merits of the engines we manufacture, as there are just as good steam engines of all kinds manufactured in the United States as in any other country in the world.

The statement that in mills supplied with both water and steam power, when only one of them is required, the former is invariably preferred, is doubtless correct, but the reason is so obvious that it needs no explanation. It does not affect the question as to which, under ordinary circumstances, is the cheaper power—water or steam. Under certain conditions steam is doubtless the cheaper power, while under others, water must receive the preference in point of economy.

With reference to the statement ascribed to us —that there is not one engine in Canada capable of grinding one hundred barrels of flour with six cords of wood, we have only to say, that it was taken from a circular issued by us a number of years ago, and though it may not be true in every particular at the present time, it was when the circular was issued.

"Z." next proceeds to say that "high pressure steam and a high velocity of piston explains all the improvements adopted by this (the Brantford) firm, and this by making a much more dangerous machine than we care to have beside us in Canada." In reply to this we beg to state that all the steam engines used in Canada for milling purposes, with, perhaps, one or two exceptions, are constructed on the high pressure principle; and further, that no engine made by the "Brantford firm" has ever been known to explode or to suffer any injury in consequence either of the "high pressure steam," or "a high velocity of piston."

"The wear and tear" resulting from "high velocity of piston" is made another objection to our engines, but it seems to us to be an exceedingly puerile one. The more rapidly any kind of machinery is driven, whether by steam or other power, and the more work it is made to perform in a given time, the greater will be "the wear and tear," other things being equal. A saw which should make a thousand revolutions in a minute, would certainly wear out in a shorter time than one making only ten revolutions in the same time, yet who on that account would prefer, in practical work, the latter to the former rate of velocity.

The more perfect, however, the machinery in all its parts, and the more exact its adjustment, the less will be "the wear and tear" in accomplishing a given amount of work, and in this respect we claim for our engines special superiority over many others now in use. If they will perform more work in a given time, with less expenditure of fuel, than other engines, and at the same time prove as durable and safe, our claim of superiority must be admitted to be well founded. The decision of this question we leave, however, to those who have used our engines, and who can therefore speak from experience.

We will quote another paragraph or two from the communication of "Z.," and then give the testimonials of competent gentlemen to answer them. Your correspondent says towards the close of his communication: "In regard to the 'vital steam' used by the firm, it is only another cause of wear." And again: "In building steam engines it says a great deal for our Canadian builders, that they make it a primary condition to turn out a safe machine, and one that will not require 'a horse at the gallop' all the time between the Brantford Engine Works and the mill with broken pieces of engine."

In these last two paragraphs your anonymous critic displays either his utter ignorance of the subject on which he writes, or else a wilful disregard for truth.

It would, indeed, be exceedingly strange if in the manufacture of engines and machinery to the value of more than half a million of dollars, during a period of sixteen years, that no one should be found to complain of the quality of our work, and yet we are proud to say that we know of *not even one* of all our customers, who would be willing to endorse the statements made by your correspondent "Z."

We submit, as the best answer that can, perhaps, be given to what "Z." has urged with regard to "the wear and tear" caused by "high pressure steam and a high velocity of piston," "attrition" produced by the use of "vital steam;" and also, as evidence of the strength, durability, and safety of our engines, and of the small amount of fuel required for the production of steam necessary to drive them, the following testimonials from gentlemen competent from long experience to form a correct opinion on the subject, and whose integrity and veracity no man can impeach.

We may remark that in these testimonials reference is made only to our second class engines, which are not recommended where economy in the use of fuel is especially desirable.

H. Laycock, Esq., of Clear Creek, County of Norfolk, writes as follows, under date of April, 1865: "In January, 1856, I purchased one of your steam engines to drive a saw mill, and ran it steadily till 1860, since which time it has run portions of each year, cutting during the whole period over ten millions of feet of lumber. The engine and boiler have not required repairs to the amount of five dollars since the mill was first put in operation, neither have the brasses been renewed nor the valves been repaired. A better or more efficient engine I could not desire, and I consider it to be almost, if not quite, as efficient now as when it it was first put up. I remark as evidence of this, that a short time since, I sold it, and the purchaser took it down in order to remove it to another locality; that upon examination it was found to be in such a complete condition as to require no repairs before putting it in operation again."

N. Brown, Esq., of Springford, County of Oxford, under date of March 29, 1865, says: "I have delayed expressing any opinion with regard to the merits of the steam engine I purchased from you until I had thoroughly tested it. Justice requires me to say that I do not think it can well *be beat.* We can run our chop mill and shingle machine, and not use half the refuse made by the shingle machine. We can run our grist mill twelve hours, and grind 100 bushels of wheat with only three quarters of a cord of wood. I am perfectly satisfied with the power, economy in the use of fuel, safety and efficiency of the engine you have furnished us."

William Lentz, Esq., an experienced mill-owner of Boston, County of Norfolk, writes, March 21, 1865: "I have used one of the Brantford engines for twelve years, and cut during that time over nine millions of feet of lumber. The engine is still running well, and doing efficient work, although the only repairs it has required during the whole of that long period has been the renewal of some portion of the brasses, and the boring of the cylinder once. I have seen a large number of steam engines in operation, of various manufacture, but none equal, in my opinion, to those made at the Brantford Engine Works."

Messrs. McIntosh & Helmer, of Shakspeare, write, March 21st, 1865: "We had one of your 35 horse power engines in use for two years and a half, in a steam mill, and during that time it did not cost us a dollar for repairs; and, to all appearances, it would have run many years longer, had not the mill been destroyed by fire. Our engine required only 2½ cords of wood to grind 100 barrels of flour. In excellence of workmanship, durability, and economy in the use of fuel, your engines, in our opinion, have no superiors, and few, if any, equals. So complete are they in all their parts, and so durable, that a 'break-down' rarely occurs."

In addition to the above testimonials, we could furnish very many others of the same tenor, but as they would occupy to much of your valuable space, we will submit instead the names of a few parties who have used our manufacture of engines, with the dates of purchase, and who have furnished similar testimony with regard to the merits of the Brantford engines, with that supplied in the foregoing certificates.

Sharp & Armstrong, Paris............	July, 1857.
Joseph Whitehead, Clinton..........	Jan., 1857.
James Wilson, Oakland..............	Jan., 1857.
William Scringer, Stratford..........	Feb., 1857.
Henry Rats, Stratford..................	April, 1858.
Duncan McKercher......................	March, 1860.
William Small, Mitchell...............	Nov., 1860.
George Rock, jun., Mitchell..........	Nov., 1860.
Henry Yates, Superintendent of Way, Grand Trunk Railway......	Jan. 1861.
Wm. Merrill, Norwichville...........	March, 1861.

We might extend this list, almost *ad infinitum;* but we think enough evidence has been adduced to convince every unprejudiced mind, even that of your correspondent "Z.," that his remarks upon the Brantford steam engines are purely gratuitous and without any foundation in fact, and that his insinuation that it requires 'a horse at a gallop' all the time between the Brantford Engine Works and the mill with broken pieces of engine, is utterly destitute of truth.

C. H. Waterous & Co.

Brantford, April 22, 1865.

We have also received a letter from Mr. B. Vansickle, going over much the same ground as the above communication, and corroborating many of its statements; and in which he refers to his very satisfactory experience in the use of the "Brantford Engines" from the year 1854 to 1863, both as to economy of fuel, trifling cost of repairs, and safety in working.

Mr. Vansickle says:—

"I use for driving my grist mill alone about ¾ of a cord of slabs to grind a hundred bushels of wheat. The grate surface is 18 square feet. I can drive the circular saw and one run of stones with the sawdust alone that the saw makes. With reference to the relative merits of water and steam, I can only say that I would prefer such a steam mill as mine for *flouring* to most of the water mills with which I am acquainted, on our ordinary streams, for several reasons—1st. It is always ready to run, and is not subject to drouth, floods, or frost. 2nd. The cost of keeping up dam, flumes, water wheels extra, is saved; 3rd. Locality of mill, being in close proximity to point of shipment, thus saving the cost for teaming of flour, lumber, &c. As to the assertion of your correspondent that he has always found that with both steam and water power, he never saw the steam engine running and the water wheel shut down when there was water enough to run it, it is surely unworthy of notice, for no man of common sense would incur the expense of furnishing and keeping up the dam, flumes, head and tail races, water wheels and other fixtures necessary to mills driven by water without using them when he could, because it would indicate an utter ignorance of the commonest principles of economy not to use those costly appliances in preference to consuming fuel, when there existed no necessity for it, and when to do so would be to allow the capital expended in supplying the water power and its accompanying and necessary machinery to remain dead and inactive."

The water that has no taste is purest; the air that has no odor is freshest; and of all the modifications of manner, the one most generally pleasing is simplicity.

VENTILATION: "THE EXHAUSTIVE PRINCIPLE."

To the Editor of the Journal of Arts.

SIR:—I have a few words to say on what your correspondent, Mr. Ruttan, calls his "exhaustive principle" of ventilation, and on the mode of heating advocated by him.

1. Why a new term is coined for a very old principle, is not apparent. Notwithstanding the very amusing notions propounded in Mr. Ruttan's book, it must not be received as an axiom that air rarified and lightened by heat will ascend, and that as speedily and vertically as it is permitted. Cold air is admitted at the warmer, and being warmed would go straight up the shaft if allowed. It may be forced to descend an outlet at the floor of an adjoining apartment, if such outlet opens into a sufficiently high shaft, which also forms the easiest road to the zenith. Give this warm air a fair chance, provide an ample opening at the ceiling, and another at the floor, and see how much of it would "naturally fall downwards," (vide Mr. Ruttan's book, p. 12). If his *warmer* were placed at the top of the foul air shaft, and a draught so induced, it might then be called "exhaustive ventilation.

2. Mr. Ruttan confounds the ventilation of buildings with mere heating; or at least he provides only for the two in combination. His is winter ventilation only, better than none certainly, but the least necessary in our climate in my view of it.

3. This mode of heating and ventilating is not of Canadian origin, as may be seen by referring to the plans of Sir John Robson's house in Edinburgh, as given in Loudon's "Villa Architecture."

4. As applied to dwelling houses, I give some objections to the mode of heating which make it unacceptable to the majority of people. (1.) It destroys privacy; one might almost as well have "one apartment," as have communications of some two or three square feet constantly open all over the house. (2.) It does not heat by radiation; we all like to see the fire, or at least to go up to something fitted to warm our hands and feet. (3.) When the fire gets low from carelessness, or during the night, the house air is speedily reduced to the temperature of that outside, not by any means comfortable if the latter be at 20° (4.) It is wasteful; Heat is kept up by expelling the cooled air at a temperature of say 60°, and replacing it with warmed air at a temperature of say 75°. If it be as above, 20° in the open air, air has to be brought in at that temperature and warmed up to 75° to replace air which is being expelled at 60°. All of this expelled air not needed for breathing or other purposes is thus wasted. This and the previous objections may not apply in mild climates, where fuel is cheap; here with wood at $8 a cord, it is serious.

(5.) Mr. Ruttan's notions of the gross ignorance of physics prevailing among professional men are, in my judgment, unfounded.

Yours, obediently, Δ

P. S. Touching fuel, you could not do better service to your readers than publish reliable estimates of the economical value, for household purposes, of the different kinds of fuel used and sold in the Province. The suffering caused by dear fuel has been unusually severe during the past winter, in this city.

Transactions of Societies.

TORONTO MECHANICS' INSTITUTE.

Annual Meeting.

The annual meeting of this Institute was held on the 8th of May, the chair being occupied by the retiring President, F. W. Coate, Esq. The Secretary, Mr. Geo. Longman, read the annual report, in which the directors express their satisfaction that although great depression has been experienced in almost every branch of business, the prosperity of the Institute has not been affected, nor its usefulness impaired. The membership, however, experienced a slight decrease, the total being 969, while at last report it was 1002. At the date of last report the floating liabilities over available assets amounted to $1116 31, which balance has now been reduced to $314. The net receipts from all sources except discounts, or balance from previous year, amounted to $6, 627, 94; The expenditure, not including payment on liabilities of former year, or present balance in hand, $5 771.60. During the year 704 volumes of books have been added to the Library, and a large number of the old ones have been rebound, at an expenditure altogether of $522.60; the total number of volumes now on the shelves is 6,554.

The report says, "the following summary of the number and character of the books taken out during the year, is important and interesting:

Volumes Issued.

Biography	1,246
History	914
Miscellaneous	1,045
Novels and Tales	20,383
Periodical Literature	2,667
Poetry and the Drama	660
Science and Art	772
Religious Literature	283
Voyages and Travels	1,010
	28,980

It will be seen that a very large proportion of these books are works of fiction. It would have been more gratifying to have reported a more extensive reading of works of a higher order, but it is satisfactory to know that the utmost care is taken to exclude all works of a doubtful or improper tendency; and although the balance of reading is largely in favour of works of fiction, it will be seen that the aggregate number of all *other* works of a more solid character is very high.

We cannot but express our regret, that nearly 5-7ths of all works taken out during the year should have been of the character of novels and tales, having very grave doubts as to the benefit to be derived from such a mass of light reading. We think it devolves upon directors of these Institutions to direct, as far as possible, the reading of the youthful members to works that will improve and inform the mind, and not to pander to their vitiated tastes.

The Reading Room is still maintaining its efficient character, the cost of newspapers and magazines supplied for the year being $208 96, a large portion of the latter are eventually bound up and find a place on the shelves of the Library.

The evening classes are amongst the most interesting and beneficial operations mentioned in the report. During the past season there were seven classes organized, numbering 104 pupils. The total receipts were, including $100 from the Northern Railway Company, $400.94; the expenses, including Teachers salaries, prizes, fuel and gas, printing, &c., $500.95; showing the cost to the Institute, including a loss of some $37 on the Soiree, to have been $100.01.

The report shows that the reunions and Vandenhoff readings afforded a net income to the Institute of $524.45, and furnished a source of interesting amusement and instruction to the members. The Exhibition of works of Art, specimens of curiosities, Natural History, &c., &c., which was kept open for ten days, passed off very satisfactorily; it was visited by upwards of 6,000 persons, and realized a net profit of $195 50.

The Auditors reported. "That they have carefully examined the books and the vouchers, and compared them with the Treasurer's report, which they find correct.

The Auditors find the Secretary's books continue to be kept with the same care and accuracy that have heretofore elicited the approbation of former auditors.

The report was unanimously adopted.

Election of Officers.

The election of officers for the ensuing year was then proceeded with, and resulted in the choice of the following:—President, Mr. F. W. Cumberland; 1st Vice-President, Mr. Daniel Spry; 2nd Vice-President, Mr. J. J. Withrow; Treasurer, Mr. W. Edwards; Directors, Messrs. W. C. Connon, LL. D., Richard Lewis, J. H. Richey, W. P. Marston, George Carroll, H. E. Clarke, F. W. Coate, W. Hamilton, jr., Robt. Hay, Benj. Langley, Henry Langley, Jeremiah Carty.

Committees of the Board.

Mr. W. Edwards then moved, seconded by Mr. J. J. Withrow, "That By-Law No. 3, sec. 4, sub-sec. 7, be amended to read as follows:—" They (the Directors) shall, at the first meeting after their election, appoint from their number the following committees, namely:—A finance committee, which shall also attend to the repairs of building and the renting of rooms; a library and reading room committee, which shall also attend to the organization and superintendence of classes; and a lecture committee, which shall also attend to the management of reunions, and all similar entertainments."—Carried.

Mr. W. Edwards moved, seconded by Dr. Connon: "That the Directors be requested so to amend the regulations for the reading room that it be closed on Christmas day and good Friday in each year."

Several amendments were moved, but the original motion was almost unanimously carried.

Votes of thanks were unanimously passed to the Auditors, to the Scrutineers, and to the retiring President; and strong expression of approval given as to the efficient manner in which the Secretary and other paid officers of the Institute have performed their duties, when this very interesting meeting broke up.

TORONTO MECHANICS' INSTITUTE.

Evening Classes.

The annual Soiree and Meeting for the distribution of prizes, was held in this Institute on the 11th of April. After partaking of refreshments, the Chairman of the Class Committee, Dr. Connon, opened the proceedings by giving a synopsis of the studies, and number of pupils and teachers, of the respective classes; and strongly urged upon the youth of both sexes the advantages to be derived from attending these classes.

The Rev. Dr. Ryerson, Chief Superintendent of Education, had been invited to distribute the prizes to the successful pupils—before doing so he delivered a very interesting and appropriate speech, eulogising the Directors of the Institute for the efforts put forth by them to afford instruction to the adult and juvenile industrial classes, whom the educational institutions of the country cannot possibly reach.

The Rev. Dr. then presented the following prizes:—

Book-Keeping.

1st prize, Richard Woodsworth; 2nd do., W. Wesbroom. *Teacher*, Mr. W. R. Orr.

Penmanship.

1st prize, S. Bartlett; 2nd do., F. Macdonald. *Teacher*, Mr. W. R. Orr.

French.

1st prize, William Beattie; 2nd do., Miss Smith. *Special prize* to head pupil in this class, excluded from competing as *past* prize-man, Robert Palin. *Teacher*, Mons. E. Pernet.

Ornamental Drawing.

1st prize, Geo. R. Hume; 2nd do., Miss E. Bartlett. *Teacher*, Mr. R. Baigent.

Mechanical Drawing.

1st prize, Henry Crowe; 2nd do., Geo. R. Baker. *Teacher*, Mr. John Tully.

Arithmetic.

1st prize, Miss Thompson; 2nd do., Geo. Richey; 3rd do., J. D. Nasmith; and a special prize to *past* prize-man Wm. Graham, as head pupil in Mathematics. *Teacher*, Mr. Henry Browne.

Mr. W. Edwards then presented to the Chairman a cheque for one hundred dollars, just handed in by F. W. Cumberland, Esq., Managing Director of the Northern Railway Company, being the third sum of the same amount presented annually by the Directors of that Company, to assist the Institute in conducting the classes.

A vote of thanks was unanimously voted to the Directors of the Northern Railway Company, for their very handsome present.

Mr. Cumberland responded in a very appropriate speech; referring to his past connection with the Institute, in assisting to bring it to its present proud position, and of the pleasure felt by himself and Co-Directors in assisting an Institution which labours so earnestly to benefit the mechanics and working classes; and hoped the directors of the Institute would see the propriety of commencing a class in which to teach ladies the art of telegraphing. He felt confident the Company would render all the assistance in their power, and that females, when proficient, would meet with remunerative employment.

The French class presented their teacher, Mons. Pernet, with an address, and two pieces of plate.

The Band of H. M. 16th Regt. was present, and enlivened the meeting with occasional performances.

MONTREAL MECHANICS' INSTITUTE.

Free Evening Classes.

On the evening of the 11th of April, a public examination of the pupils of the evening classes was held in the Hall of the Institute, the chair being occupied by J. C. Beckett Esq.; the Episcopal Bishop of Montreal, the Hon. T. D. McGee, the Hon. P. J. O. Chauveau, Superintendent of Education for Lower Canada, and other gentlemen taking part in the proceedings.

The chairman opened the proceedings by stating the importance, and the aims and object of the Institution, and the interest that should be felt by all classes, without distinction, to foster and encourage it and other similar associations. From the chairman's remarks we learn that the memberships number 641, namely: Life members (fee $20) 257; 1st class members (fee $3) 80; 2nd classs do (fee $2) 100; 3rd class do (fee $1) 204. The number of pupils has been in the English class 70; Architectural drawing class 27; Mechanical drawing class 9; total 106.

The classes were then publicly examined by their respective Teachers, Mr. Muir, in the English class, and Mr. Hutchison in drawing.

Bishop Fulford delivered an appropriate address, and gave out the following prizes:

Architectural Class.

1st prize, John Rutherford, a set of compasses from Dr. Bernard; 2nd do., George Scott, a set of planes, from H. Evans; 3rd do., Thomas Ford, a set of squares, from C. Snowden; 4th do., Rufus Dorman, a set of instruments.

Mechanical Class.

1st prize, H. Ward, set of instruments; 2nd do., H. B. Warren, a spirit level, from J. Walker & Co.

The Hon. T. D. McGee then addressed the meeting, and made a strong appeal to the master mechanics to support the Institution, on the ground that by so doing they would be laying the foundation for the attainment of a leading industrial position; and closed by distributing the following prizes:—

English Class.

For general proficiency, Geo. Hyde, a silver medal from Class Committee.

Penmanship.

1st prize, H. W. Becket, "Life of General Wolfe;" 2nd do., James Clelland, "Chemistry of Common Life"

Dictation.

1st prize, E. O'Connor, "Speke's Journal;" 2nd do., George Ballery, "Archai."

Arithmetic.

1st prize, J. H. Jackson, "Arctic Researches;" 2nd do., John Mearns, "The Peasant Boy Philosopher."

Attendance and Diligence.

1st prize, Wm. Salter, "Life of Franklin;" 2nd do., Wm. Clelland, "Self Help."

The drawing class presented their Teacher with the "Imperial Gazetteer," in two volumes.

The Hon. Superintendant of Education referred briefly to the importance of evening classes, as meeting the wants of a large class of the community, especially of those who have to spend the day in earning their daily bread; and that the fact of young men attending evening classes was one of the best certificates they could have.

Dr. Taylor confined his remarks to a brief expression of the importance and value of the Mechanics' Institute, and said he would leave that meeting with a deeper sense of its claims for support.

BOARD OF AGRICULTURE FOR UPPER CANADA AND DEATH OF ITS PRESIDENT, COL. E. H. THOMSON.

The Board met in Toronto on the 11th of May, the Vice-President, the Hon. David Christie, in the chair. Since the previous meeting of the Board the President, Col. E. W. Thomson, had been removed by death. While proceeding on foot from his residence to attend a meeting of a sub-committee of the Council of the Agricultural Association, on the morning of the 20th of April, when about three miles from the place of meeting, he was seen to fall, and expired in a few minutes.*

The first business of this meeting was to pass a resolution expressive of grief at the loss sustained by the Board, and the public, and of condolence with the family on their sudden and sad bereavment; and secondly, to appoint the Hon. David Christie President of the Board, and W. Ferguson, Esq., of Kingston, Vice President; and also to recommend to the Goverment the name of J. Cowan Esq, M. P. P., as a fit and proper person to fill the vacancy occasioned by the death of Col. Thomson.†

After transaction of some other business, and subsequent adjournment of the Board, the council of the Agricultural Association met and adopted the revised prize list and rules for the Provincial Exhibition, to be held in London, C. W., in September next. Mr. J. E. Pell, of Montreal, formerly of Toronto, was re-appointed Superintendent of the Arts and Manufactures Department.

Some few changes have been made in the Prize List, and several important changes in the Rules, which will be noticed in our next.

* A carefully written obituary notice of Col. Thomson was published in the *Canada Farmer* of May 1st.

† The *Canada Gazette* of the 13th May contains a notice of the appointment of F. W. Stone, Esq., to the vacancy on the Board.

RECENT BRITISH PUBLICATIONS.

Ansted, D. T., Applications of Geology to the Arts, fcap. 8vo	£0	4	0	*Hardwicke.*
Bourne, John, Handbook of the Steam Engine, fcap. 8vo.	0	9	0	*Longman.*
Carver, The, and Gilder's Design Book, roy. fol.	1	10	0	*Houston.*
Davy, Edmund W., On Flax and its Cultivation in Ireland, 8vo.	0	0	6	*Simpkin.*
English Catalogue of Books, The, for 1864, roy. 8vo.	0	3	6	*Low.*
Fairbairn's, William, Iron, its history, properties, &c., new edit.	0	9	0	*Black.*
Goodeve, T. M., Elements of Mechanism, 2nd edition, enlarged, post 8vo.	0	6	6	*Longman.*
Hannett, John, Bibliopegia; or Bookbinding. 6th edition, fcap. 8vo.	0	6	0	*Simpkin.*
Hawking's, J., Tradesman's Guide to Superficial Measurement, new ed. fc. 8vo.	0	3	6	*Lockwood.*
Humber, W., Record of the Progress of Modern Engineering in 1864, imp. 4to	3	3	0	*Lockwood.*
Jones, Owen, Grammar of Ornament, new ed. fol.	5	5	0	*Day & Son.*
Medd, Chas. S., Value of Numismatics in Study of Ancient History, 8vo.	0	2	6	*Macmillan.*
Molesworth, G. L., Pocket Book of Useful Formulæ, 8th ed., demy, 32mo.	0	4	6	*Spon.*
Nystrom's Pocket Book of Mechanism, &c., 18mo.	0	18	0	*Trübner.*
Original Designs for Decorative Furniture, roy. fol.	2	2	0	*Houlston.*
Paley, F. A., Manual of Gothic Mouldings, 3rd edition	0	7	6	*Van Voorst.*
Sayer, A., Science of Education Familiarly Explained	0	2	0	*Aylott.*
Sowerby, George B., Aquarium, with colored illus, new ed., sup. roy. 16mo.	0	5	0	*Routledge.*
Timbs, John, Year Book of Facts in Science & Art, 1864, 8vo.	0	5	0	*Lockwood.*
Watts, Henry, Dictionary of Chemistry, vol. 3, 8vo	1	11	6	*Longman.*

RECENT AMERICAN PUBLICATIONS.

Buckmaster, J. C., Elements of Mechanical Physics, 12 mo.	$2 00	*H. C. Baird.*
Burgh, N. P., Rules for Proportions of Steam Engines and Boilers, 12mo.	2 00	*H. C. Baird.*
Bone, J. H. A., Petroleum and Petroleum Wells, complete guide-book, 16mo.	0 50	*American News Co.*
Branston, T. F., Pharmaceutist and Druggist's Practical Receipt Book, 12mo.	1 50	*Lindsay & Blackiston.*
Bidwell, Geo. H., Imposition of Forms, with Rules for laying the pages, turning and folding sheets, &c.; Diagrams, &c., useful to compositors, pressmen, publishers, &c., 16mo	0 75	*Raymond & Canlon.*
Davies, T., Preparation and Mounting of Microscopic Objects, 12mo.	1 50	*W. Wood & Co.*
Hartshorne, H., On Glycerin and its Uses, 12mo	0 63	*Lippincott & Co.*
Munsell, J., Chronology of Paper and Paper Making, 8vo.	2 50	*J. Munsell.*
Winslow, C. F., The Cooling Globe; or, The Mechanics of Geology, 8vo.	0 75	*Walker, Wise & Co.*

Selected Articles.

INCRUSTATION OF STEAM BOILERS.

We have recently noticed corrosion as one of the ills to which the boiler is heir, and we will now consider another of a less insidious but not less dangerous nature, viz., incrustation. This evil is too frequently regarded merely as a matter of inconvenience, or, at the most, as a nuisance of which the owners of boilers would be very glad to be relieved. But this is a false light in which to view it, for it is a source of positive danger, and not unfrequently the cause of steam boiler explosions. Witness the facts of a recent colliery boiler explosion. Here was a plain cylindrical egg-end boiler 40 ft. long by 5 ft. 3 in. diameter, made of 3-8th in. plates, and working at a pressure of 30 lbs. per square inch. It was fitted with two sufficient safety valves, and two floats, one of them having a low-water alarm whistle. The plates over the furnace became overheated, and the boiler was rent in four pieces. There was no evidence of a deficiency of water, but the cause of the overheating was attributable simply to the sedimentary character of the water. The number of boilers which suffer from incrustation is very large; indeed, to find one that does not is quite exceptional. It impedes the satisfactory examination of a boiler, inasmuch as it renders it difficult to ascertain the precise condition of the plates. It sometimes deludes by awaking groundless suspicions of corrosion; more frequently, however, it conceals defects, for it is often found that corrosion is stealthily going on under the deposit which is causing it. A great waste of fuel is one of the evils resulting from incrustation; in addition to this, and apart from overheating, there must be a considerable increase in the wear and tear of boilers. In internally double-flued boilers, the undue longitudinal expansion given to the furnace crowns increases the tendency to groove at the front end plate. In these boilers this action is always present to a greater or less extent. In localities where good water is not to be had, incrustation renders the adoption of tubular boilers impracticable, thus excluding this economical class of boiler from more general use. But the injurious effects of water which will cause incrustation are not always limited to the boiler. The steam carries over a considerable quantity of earthy matter into the engines, and so necessitates an increased amount of grease for the piston and slides. As an illustration of this fact it may be noticed that, where the feed-water of boilers is taken from brooks subject to torrents which stir up the mud, the enginemen find the pistons and slides clog if they neglect the precautionary measure of extra lubrication.

The causes of incrustation do not lie very deeply hidden; it is therefore, but a simple matter to determine them, existing as they do in the water with which the boiler is supplied. Carbonate and sulphate of lime form the principal constituents of water. The carbonate in precipitating forms a loose powder, but the sulphate a hard crust. Both together will also form a solid incrustation, more or less hard in proportion as the one or the other of the salts predominates. This deposit, when allowed to accumulate, forms a hard scale which adheres very tenaciously to the iron and is troublesome to remove. There is, no doubt, much difficulty experienced by the owners of boilers in judging of the quality of the water they have to use, but it is always open to them to have a chemical analysis made; and this is often essential when there are two or more sources of supply in the same locality, as the water, although apparently obtained from the same primary source, may differ very greatly in its composition at two different points. There is an instance of this in a well which produced almost pure water, containing an alkali, but no lime. From this well a boiler was supplied for many years without any incrustation having been formed, the boiler being cleaned by simply brushing out. Within half a mile of this well another was sunk, but which yielded water containing so large a proportion of lime that in a few weeks a thick incrustation was formed within the boiler fed with it. Both wells were sunk through the London clay into the chalk. It is a fallacy to attempt to estimate water from its appearance; transparency does not always mean purity. A specimen of water of perfect apparent purity taken from a London pump, gave, on testing, 140 grains of different kinds of salts per gallon of water, whilst a sample taken from the Thames —considered bad enough—yielded at the most 20 grains of salts per gallon tested.

Of the preventions and remedies which have been proposed from time to time, it may be said their name is legion; they form the subject of a goodly number of patents. Among the preventives are various methods of filtration and purification by chemical processes, whilst the remedies consist chiefly of a variety of compounds best known as "boiler compositions." Both these find supporters and objectors, and this arises from the fact that there are instances in which, either from accident or a judicious choice, selection is made of a remedy which proves suitable to the disease, whilst, on the other hand, an improper antidote is very often applied, it being frequently supposed that one description of boiler fluid, or other scale preventer, is applicable in all cases. Where water is found to form a rapid incrustation, it should be submitted to chemical analysis, the result of which would indicate the proper remedy. Apart from the doctoring processes, are several simple and inexpensive remedies which have proved very effective in preventing incrustation. One of these consists in placing small logs of oak, with the bark on, in the boiler, which has the effect of reducing the carbonate of lime to a kind of sludge, which falls to the bottom and thus preserves the boiler perfectly clean. This plan has been pursued by one of the London water companies for many years with perfect success. Mahogany sawdust has been employed with advantage for the same purpose as the oak logs. It acts in two ways: first, mechanically, by offering so many small points on which the carbonate and sulphate of lime may be deposited, and secondly, by a peculiar action of the extractive matter in the wood. This applies more particularly to oak, especially when green, in which state it should be used. In North Wales the water used in boilers is often perfectly green, and oak sawdust is administered in considerable quantities. Chloride of ammonium will convert the lime salts into soluble compounds, viz., sulphate and carbonate of ammonia, and chloride of calcium; but in practice its use has not been very successful, owing to the sal ammoniac and ammoniacal salt acting on the brass-work. Where the action of a cure is only partial, as is the case with some boiler fluids, the remedy is worse than the disease. For instance, in some boilers at Woolwich supplied with Thames water, a certain composition was used in the hope of preventing incrustation. It was found that the composition only acted upon the lighter portion of the sediment, leaving untouched the heavier and harder portion, which, though forming a much thinner deposit, was nevertheless impenetrable to the water, whilst, on leaving the lighter and the heavier ingredients undisturbed, they were found to form a porous substance through which the water could reach the plates.

There can of course be no legitimate objection to the adoption of a remedy when a disease has been contracted, provided the remedy be appropriate. When the human system becomes deranged, recourse is had to medical aid. But a man of regular habit with an originally good constitution rarely requires the doctor. So with steam boilers; a well-constructed boiler, with attention, need never be troubled with incrustation, except in rare instances. Prevention is at all times better than cure, and under ordinary circumstances, where the construction of the boiler does not insure immunity, the most practical plan for the prevention of incrustation is the adoption of an efficient mode of blowing out. A more complete remedy, however, exists in the adoption of what is termed dry, or surface condensation. But the benefits to be derived from judicious blowing-out are not generally realised, or there would not be the irregularity there is in the use of the blow-out apparatus. To be effectual in its operation it should be used at regular intervals during the day, the best time being whenever the engine is not at work and the water therefore at rest. Under these conditions the sediment has an opportunity of settling, whereas at other times it will be held in suspension by the rising bubbles of steam, when blowing-out will be comparatively useless. But, however regularly the operation may be performed, it cannot be effectual if confined to one point only in the boiler, when there is a heavy sediment. But the action may be distributed throughout the whole length of the boiler by having a perforated pipe carried from end to end. There are other ways in which the same result may be attained, but this arrangement has been found to answer the purpose exceedingly well. It sometimes happens that the lighter sediment will elude this apparatus, and will settle on the plates of the flues and shell. In such cases, by the use of scum pipes, it may be blown out whilst floating on the top of the water as scum, before it has time to adhere. The adoption of these pipes is the common practice in marine boilers, and might be judiciously applied to land boilers. It is a noticeable fact, although one not generally recognised, that overheating often occurs where no actual cake of deposit is formed. In many cases this may be due to the presence of thickening matter held in suspension in the water. When circulation is imperfect, or where there is no agitation, such as in a locomotive when running, the impediment presented by the sedimentary matter to the free escape of steam doubtless lifts the water off the plates and so causes overheating. Instances are constantly occuring where overheating takes place with an ample supply of water, and where no incrustation is formed, such cases being chiefly confined to externally-fired boilers.

A singular case of grease-incrustation resulting in an explosion is given by Mr. Longridge, the engineer of the Steam Boiler Assurance Company, in his last report. The case is worth noticing because it proves beyond dispute that explosions do occur from a cause which is but little believed in. The boiler referred to was cylindrical, with hemispherical ends, made of 3-8th in. plates, in 1850, and had two $2\frac{1}{2}$ in. safety valves, weighted to blow off at 40lb. One day in last October, about noon, a loud report was heard, and the fireman was thrown down, steam and water issuing from the fire-door at the same instant. On examination it was found that about eight feet beyond the bridge there was a hole in one end of the plates of an irregular triangular form about seven inches in length and four inches in width at the base. Around the hole in the inside was an accumulation of deposit extending over an area of about $2\frac{1}{2}$ square feet, from 1 in. to $1\frac{1}{4}$ in. thick in the centre, and gradually reduced in thickness towards the outside. In other parts the boiler was almost free from deposit, but the surface of the plates had a greasy appearance, and at the back end there was a small patch of deposit of the same kind as that just mentioned. The deposit was found to be composed of grease and earthy matters, and on applying a light it ignited like a piece of wood. The formation of this deposit is due to the introduction of grease either by the attendant or in the feed-water, which, it appears, at times conveyed greasy matter from some adjacent soap-works. The feed-pipe delivered the water about fifteen inches from the centre of the hole in the plate on the side nearest the fire, and ten inches from the bottom of the boiler; the feed had been turned on about ten minutes previous to the accident, and the plate showed evidence of its cooling effect on that side. The conclusion is that, after the plate had become red hot, in consequence of the deposit, the latter had become loosened, and fracture taking place, water had intervened between the deposit and plate, producing a sudden generation of steam sufficient to cause rupture. It is a common practice to throw into boilers old greasy cotton waste under the impression that it facilitates the removal of scale. But it is open to objection, inasmuch as the oil combines with impurities in the water and forms a greasy substance, which, when precipitated on the plates, prevents contact of the water and is thus the cause of overheating. It has, however, been found greatly to facilitate the cleaning of boilers if the plates were greased after every cleaning. For this purpose, in the royal gun factories at Woolwich, the refuse oil from the drip cans of the shafting is collected, and, after the boilers are cleaned, it is laid on inside them with a brush. Although this does not stop the incrustation it causes it to come off the plates much more rapidly, and is found to effect a great saving in time and expense in cleaning the boilers.

A simple method of depriving water of its earthy carbonates was successfully adopted in a small high pressure boiler. This was done by admitting a very small jet of cold water into the exhaust pipe of the engine, where, mingling with the waste steam, it condensed a portion of it. The steam, by raising the water to boiling heat, drove off the free carbonic acid, and the natural carbonates were thrown down on the sides of the pipe, which was made large enough to allow it to accumulate. The water then ran down into a tank, whence it was pumped into the boiler at a temperature of about 200 deg. In addition to this, the partial condensation of the waste steam reduced the back pressure on the piston, and the result was a saving of half the fuel, the boiler remaining quite free from scale. But better than all these is the plan of using boilers properly constructed in the first instance, by which incrustation is reduced to a minimum, if not entirely prevented. By a properly constructed boiler is meant one so arranged that a proper circulation of the water is affected. In boilers thus designed such a thing as scaling is of very rare occurrence. Some eight-and-twenty years ago a small circular boiler with water tubes was made by Mr. Hugh Greaves—we believe, the first of its kind in this country. Between the fire box and the outer case was placed a piece of sheet iron around the fire box and the tubes, by which means the circulation was completely established. After being in use twelve years the boiler was taken to pieces, the fire box was scarcely coated, and the slight incrustation was clearly of very recent formation. In the Benson boiler, when worked with salt water at high pressures, no incrustation takes place, owing to the rapid circulation of the water. The Field boiler, described in our number for February 17th, is another in which the principle of rapid circulation is fully developed and incrustation consequently prevented. In the Harrison or multispherical boiler this latter condition is secured by twofold means, a double action being at work to hinder the formation of scale; first, the perfect circulation, and if that be insufficient, second, the alternate action of expansion and contraction. Scale being deposited whilst the spheres were heated, would, on their cooling and consequent contraction, be broken up and thrown down. In marine boilers incrustation was at one time a perplexing matter to deal with, as it was supposed to be impossible to prevent the boilers of a steamer from becoming salted up in some seas. But it has been ascertained that the saltness of different seas varies but little, and, however salt the water may be, the boiler can be preserved from any injurious amount of incrustation by blowing out as already noticed. This operation, to be effectual, should be performed very frequently, or a portion of the super-salted water may occasionally be allowed to escape. But, by proper blowing out, a very slight scale, at the most, will ever be found. There is no excuse for the engineer who allows his boiler to become damaged from incrustation.

They have on exhibition at a Working Man's Association in London, an alarm clock, which, on striking the hour appointed, lights a lamp and boils a pot of coffee or tea while the workman is dressing.

CANADA AS A FIELD FOR CHEMICAL MANUFACTURES.

(From the Montreal Gazette.)

The fifth of the Somerville course of lectures in connection with the Natural History Society was delivered by Professor Bell, of Queen's University, on the evening of Thursday the 23d inst.—Principal Dawson in the chair. The subject was, "Certain chemical manufactures which may be advantageously established in Canada. The lecturer stated in the first place that he purposed to confine his remarks to those substances which might be derived from the natural productions of the country, although it could be shown that certain materials imported from abroad might be advantageously worked up in this Province. From their very profitable nature it was surprising that chemical works were not already established in Canada. The reason of their absence in this country might be attributed to various causes, the most probable of which would be the higher price of labor here as compared with other countries, where such manufactures are carried on, or perhaps the want of a sufficient market. In regard to the price of labor the difficulty was shown to be much less than is generally supposed. The want of a sufficient market could scarcely form a good reason for the non-existance of such manufactures in our own country, for the Trade Returns show that already the home demand for certain chemical products is sufficient to sustain works of this kind in our midst, while it could be proved that it would be found profitable to produce in Canada various chemical substances for exportation." The lecturer thought that the want of skill and knowledge had something to do with retarding enterprises of this kind.

Before proceeding to speak of what are commonly known as chemical manufactures, certain processes involving chemical treatment would be briefly noticed. The first of these had reference to

Copper.—Copper ores are generally reduced by the agency of heat, but of late years certain processes had been perfected for the profitable extraction of copper in the wet way from ores, which were too poor to pay to work on the old plan. Such processes are carried on with success in various parts of England and Wales and on the continent of Europe. An instance was mentioned of a clear profit of 50 per cent. being realized in this way. Several of these processes were described, and the lecturer thought that one of them would probably be found suited to the extraction of copper from a certain class of ores which are abundant in the Eastern Townships. In regard to

Iron, it was contended that circumstances were now more favourable than at any former time for working the rich and unlimited stores of iron ore in our own province. The difficulties of iron mining abroad, the small quantity of ore obtained in proportion to the labor expended, and the low percentage on that ore, were strongly contrasted with the facilities for mining and the richness of the ores in Canada. Considering the improvements which have lately been made in the modes of reducing iron ores and other circumstances, the lecturer said he could not help thinking that the time had come when we should try to work our iron mines. He next proceeded to describe the mode of occurrence of

Common Salt, and the circumstances which tend to regulate its price in any locality, as well as the various modes in which it is prepared for commerce. The quantities consumed in the States and Canada were mentioned; and it was argued that owing to various facilities existing in some parts of the Gulf of St. Lawrence, the establishment there of salt-works of a paying character was feasible enough.

Iodine was next referred to. The price of this substance, which is derived from sea-weeds, was said to have risen enormously within the last year or two. The sea-weeds which yield it in largest quantity are very abundant in the Gulf. It is worth from $3 to $4 per pound, the demand is unlimited, and there seems to be no reason why its manufacture could not be profitably carried on in the Gulf.

Magnesia, in its natural compounds, was mentioned as existing in great quantities in Canada, some of the deposits being of unusual richness and extent. It appeared, however, from the lecturer's statement that the manufacture of its salts would in the meantime be of doubtful advantage. But magnesium, the valuable metallic base of these salts, was now attracting much attention, a company having been formed in Manchester for its extraction; and our "magnesium ores" might some day prove of unexpected value.

Sal ammoniæ, or chloride of ammonia, for various reasons which were mentioned, was thought capable of being profitably made from the ammoniacal liquors of the gasworks in our cities, in the manner which is now practised in Europe, and found to be highly remunerative.

Turpentine and Rosin were spoken of at considerable length. The processes of making these from the balsam of coniferous trees and from the distillation of resinous wood were fully described. It appears that a commencement has been already made in the manufacture of these substances, in Canada and New England, with the most satisfactory results; and the lecturer advocates the extension of this branch of industry. From authentic returns it was shown that in 1863 the amount of turpentine imported into Great Britain had fallen off to one-tenth of what it was in 1859, but that in the same time the price of the article has risen 232 per cent. The imports of turpentine and rosin into Canada are so large that it would probably be some time before we could do more than supply the home demand.

Aniline, which constitutes the basis of the so-called "coal-tar colors, such as *mauve* and *magenta*, and which are now displacing many other dye-stuffs, was shown to be capable of profitable manufacture in this country.

Acetic acid was said to be now made, on a large scale, almost entirely from the distillation of wood. Two of the most approved processes for that purpose were dwelt upon by the lecturer. From the fact that the wood best suited for this purpose is very much cheaper in this country than in Britain, and for other reasons it was claimed that we had the advantage of the old country for the prosecution of this branch of industry. *Chloroform*, it was said, is made by distilling alcohol with bleaching powder, quick-lime and water. One gallon of commercial alcohol produces nearly three pounds of chloroform, and the cost of all the materials for this quantity would, probably, be less than $3 60, while the chloroform produced would be worth $4 95 at the present wholesale price in Montreal, thus leaving a margin of $1 35 for every gallon of alcohol consumed. The labor required to make chloroform is very slight. The New York price is greatly below that of London, and considering the cheapness of alcohol in this country, as compared with either Britain or the United States, it is reasonable to suppose that the profit of making chloroform in Canada would be very large.

Pot ash is exported from Canada, as yet, only in the form of the carbonate, but it was shewn that various other compounds of this substance might be advantageously prepared for exportation abroad.

Sulphuric acid, was by far the most important of the chemical manufactures which the lecturer thought could be profitably carried on in Canada, since it forms, as it were, the ground work of many other chemical processes. Among them were mentioned the making of carbonate of soda (so essential in glass-making, &c.,) together with hydrochloric acid from common salt; also, the superphosphate of lime from bones, or from the mineral *apatite*, which is abundant in Canada, for the refining of rock oil, and for use in other processes which were mentioned.

The English method of making sulphuric acid from iron pyrites, was described, and numerous places in Canada were referred to where this process could be carried out, and an abundant supply of pyrites obtained. In 1863 acids, mostly sulphuric, were imported into Canada to the value of $80,000, and were some of the chemical works which the lecturer had enumerated, established in our midst, the quantity consumed would be vastly increased. There are various causes which render the price of imported sulphuric acid much greater than that for which it could be easily produced in our own country. A very large profit was, therefore, to be looked for by any one who had the enterprise to engage in this operation.

The lecturer then made some observations on the probable future of Canada in regard to what we might expect from agriculture, lumbering and the fisheries, and the increased prosperity to be derived from a greater variety of pursuits, and the establishment of more manufactories, among which some of the foregoing should be included. A judicious revision of the tariff, in regard to the importation of chemical substances, might assist in accomplishing this object. These works would not only be a source of gain to their proprietors, but would also afford employment to our increasing population.

In conclusion, the lecturer said, although this might not be a very interesting subject for a popular lecture, still if he had succeeded in directing the attention of others to an object of such practical importance, he should feel that this effort had not been in vain, and resumed his seat amidst loud applause.

CANADA.*

The great basin of the St. Lawrence, in which the province of Canada is situated, has an area of about 530,000 square miles. Of this, including the gulf of St. Lawrence, the river, and the great lakes, to Lake Superior inclusive, about 130,000 square miles are covered with water, leaving for the dry land of this basin an area of 400,000 square miles, of which about 70,000 belong to the United States. The remaining 330,000 square miles constitute the province of Canada. With the exception of about 50,000 square miles belonging to Lower Canada, and extending from the line of New York to Gaspé, the whole of this territory lies on the north side of the St. Lawrence and the great lakes.

On either side of the valley of the lower St. Lawrence is a range of mountainous country. These ranges keep close to the shores for a considerable distance up the river; but about 100 miles below Quebec, where the river is fifteen miles wide, the southern range begins to leave the margin, and opposite to Quebec is thirty miles distant. From this point it runs in a more southwestern direction than the river valley, and opposite Montreal is met with about fifty miles to the southeast, where it enters Vermont, and is there known as the Green Mountain range, which forms the eastern limit of the valley of Lake Champlain. In Canada, this range, stretching from the parallel of 45° north latitude to the Gulf, is known as the Notre-Dame Mountains, but to its northeastern portion, the name of the Shichshock Mountains is often given.

The flank of the northern hills, known as the Laurentides, forms the north shore of the river and gulf, until within twenty miles of Quebec. It then recedes, and at the latter city is already about twenty miles distant from the St. Lawrence. At Montreal the base of the hills is thirty miles in the rear, and to the westward of this it stretches along the north side of the Ottawa River for about 100 miles, and then runs southward across both the Ottawa and the St. Lawrence, crossing the latter river a little below Kingston, at the Thousand Islands, and entering New York. Here the Laurentides spread out into an area of about 10,000 square miles of high lands, known as the Adirondack country, and lying between the Lakes Champlain and Ontario. The narrow belt of hill-country which connects the Adirondacks with the Laurentides north of the Ottawa, divides the valley of the St. Lawrence proper from that of the great lakes, which is still bounded on the north by a continuation of the Laurentides. The base of these from near Kingston runs in a western direction, at some distance in the rear of Lake Ontario, until it reaches the southwest extremity of Georgian Bay on Lake Huron; after which it skirts this lake, and Lake Superior, and runs northwestward into the Hudson Bay Territory. This great northern hill-region consists of the oldest known rock-formation of the globe, to which the name of the Laurentian system has been given, and occupies, with some small exceptions, the whole of the province northward of the limits just assigned. We shall designate it as the LAURENTIAN REGION. Over a small portion of this area, along Lakes Huron and Superior, and farther eastward on Lake Temiscaming is another series of rocks, to which the name of the Huronian system is given. But as the country occupied by these rocks is geographically similar to the Laurentian, it is for convenience here included with it.

To the south of this region the whole of Canada, west of Montreal, with the exception of the narrow belt of Laurentian country described as running southward across the Ottawa and St. Lawrence Rivers, is very level. The same is true to the eastward of Montreal until we reach the Notre-Dame range of hills, already described as passing southward into Vermont, and in its north-eastern extension as bounding the lower St. Lawrence valley to the south. This valley may be regarded geographically as an extension of the great plains of Western Canada and central New York, with which it is connected through the valley of Lake Champlain. This level country to the south of the Laurentides in the two parts of the province is occupied by similar rock formations, and constitutes the CHAMPAIGN REGION of Canada, the surface of which is scarcely broken, except by a few isolated hills in the vicinity of Montreal, and by occasional escarpments, ravines, and gravel ridges farther westward.

The next area to be distinguished consists of the Notre-Dame range on the south side of the St. Lawrence, which forms the belt whose course has just been described, with an average breadth of from thirty to forty miles. To the south and east of this, is a district of undulating land, which extends to the boundaries of the province in that direction. These two districts may for convenience in farther description be classed together, and they embrace the region which is generally known as the EASTERN TOWNSHIPS. By this term they are distinguished from the SEIGNIORIES, which bound them to the north and west. To the north-east, however, along the Chaudiere River, some few seigniories are found within the geographical limits of this third region.

The whole of the province is well watered with numerous large and small rivers, and in the mountainous districts there are great numbers of small lakes, more than 1,000 of which are represented on the maps.

We have in the preceding descriptions divided the country into three distinct regions, and have next to consider the geological structure of these as related to the soil and to agricultural capabilities.

I.—The Laurentian Region.

The great tract of country occupied by the Laurentian rocks has for its southern boundary the limits already assigned, and stretches northward to the boundary of the province, which is the height of land dividing the waters of the St. Lawrence basin from those of Hudson Bay. Its area is about 200,000 square miles, or six tenths of the whole land of the province. This region is composed exclusively of crystalline rocks, for the most part silicious, or granite like in character, consisting of quartzite, syenite, gneiss and other related rocks. These are broken up into ridges and mountain peaks, generally rounded in outline and covered with vegetation. The summits in the neighbourhood of Quebec are some of them from

* From sketch by J. Sterry Hunt.

2,000 to 2,500 feet in height, and in other parts attain 4,000 feet or more; but the general level of this region may be taken at about 1,500 feet above the sea, although it is much less in the narrow belt which crosses the province east of Kingston. Through the hard rocks of this region run numerous bands of crystalline limestone or marble, which from their softness give rise to valleys, often with a fertile soil. The hill-sides are generally covered with little else than vegetable mould, which sustains a growth of small trees, giving them an aspect of luxuriant vegetation. But when fire has passed over these hills, the soil is in great part destroyed, and the rock is soon laid bare. In the valleys and lower parts of this region, however, there are considerable areas of good land, having a deep soil, and bearing heavy timber. These are the great lumbering districts of the country, from which vast quantities of timber, chiefly pine, are annually exported, and constitute a great source of wealth to the province. These valleys are in most cases along the line of the bands of limestone, whose ruins contribute much to the fertility of the soil. Lines of settled country running many miles into the wilderness are found to follow these belts of soft calcareous rock.

The settlements in this region are along its southern border, and at no great altitude above the sea. In the higher parts, the rigor of the climate scarcely permits the cultivation of cereals. It is probable that no great portion of this immense region will ever be colonized, but that it will remain for ages to come covered with forests. These, if husbanded with due care, will remain a perpetual source of timber for the use of the country, and for exportation; besides affording, with proper facilities for transportation, an abundant supply of fuel to the more thickly settled districts, where the forests have nearly disappeared, and where, from the severity of the long winters, an abundant supply of fuel is of the first necessity. There are other reasons why this great forest-region should be protected. The vegetation, and the soil which now cover the hill-sides, play a most important part in retaining the waters which here fall in the shape of rain or snow. But for this covering of soil, the rivers and mill-streams which here take their rise, would like the streams of southern France, and of the north of Italy, be destructive torrents at certain seasons and almost dried-up channels at others. The effect of this great wooded area in tempering the northern winds, and moderating the extremes of climate, is not to be overlooked in estimating the value of the Laurentian region; which, moreover, as will be shewn farther on, contains inexhaustible mines of rich iron ores, besides copper, lead, marbles, and other mineral substances of economic importance.

II.—The Eastern Townships.

Under this head, as already explained, is included the belt of hill country south of the St. Lawrence, with the region on its southeast side extending to the frontier, and forming a succession of valleys, which may be traced from the head-waters of the Connecticut northeastward to the Bay of Chaleurs. It is true that the Eastern Townships, as now known, do not embrace this northeastern extension; but as it belongs to them both geographically and geologically, it may be conveniently included with them.

The area whose limits are thus defined forms about one-tenth of the province. The hills of the range which traverses it are composed, like those of the Laurentian region, of crystalline rocks; but these are softer than the greater part of the rocks on the north shore, and yield by their wearing-down a more abundant soil. Some of the hills in this range attain an elevation of 4,000 feet above the sea, and the principal lakes in the valley on the southeastern side, Memphremagog, Aylmer, and St. Francis, are from 750 to about 900 feet above the sea level. This region is well wooded, and when cleared is found in most parts to have an abundant soil, generally sandy and loamy in character, and well fitted for grazing and for the cultivation of Indian corn and other grains. Great attention is now paid to the raising of cattle, and the growing of wool, and within the last few years the best breeds of sheep have been successfully introduced from England and from Vermont. Draining and improved methods of farming are in many parts practised, and the agricultural importance of the southern portions of this region is yearly increasing. The Eastern Townships moreover abound in metallic ores, marbles, slates, etc., which will be noticed in their place.

III.—The Champaign Region.

The limits of the great plains of Canada have already been defined in describing those of the two preceding regions. These plains, which may be called the champaign region, occupy about three tenths of the province, and are, as we have seen, divided into two parts by a low and narrow isthmus of Laurentian country, which runs from the Ottawa to the Adirondacks of New York. To the eastward of this division, the present region includes the country between that river and the St. Lawrence, and all between the Laurentides on the north and the Notre-Dame hills on the south-east; while to the westward it embraces the whole of the province south of the Laurentian region, including the great area lying between the Lakes Ontario, Erie and Huron, generally known as the southwestern peninsula of Canada. The whole of this region from east to west is essentially a vast plain, with a sufficient slope to allow of easy drainage. The distance from Quebec to the west end of Lake Superior is about 1,200 miles, yet this lake is only 600 feet above the sea level, while Lake Erie is 565 feet, and Lake Ontario 232 feet above the sea. The land on the banks of the St. Lawrence and its lakes, either near the margin, or not very far removed, generally rises to a height of from fifty to one hundred and fifty feet, and from this level very gradually ascends to the base of the hills which bound the region.

Unlike the two regions already described, these great plains are underlaid by beds of unaltered Silurian and Devonian rocks, consisting of sandstones, limestones, and shales. These are but little disturbed, and are generally nearly horizontal; but over by far the greater part of the region they are overlaid by beds of clay, occasionally interstratified with or overlaid by sand and gravel. These superficial strata, which are in some parts several hundred feet in thickness, are throughout the eastern division, in great part of marine origin, and date from a time when this champaign region was covered by the waters of the ocean; while throughout the western division the clays are more probably of fresh-water origin. It results from the distribution of these superficial post-tertiary strata, that the soil over the greater part of the region consists of strong and heavy clays which in the newly cleared portions are overlaid by a considerable thickness of vegetable mould. In the eastern division, a line drawn from Quebec to Ottawa, and two others from these points, converging at the outlet of Lake Champlain, will enclose a triangular area of about 9,000 square miles, which is very nearly that occupied by the marine clays. These are overlaid, chiefly around the borders of this space, by more sandy deposits, which are well seen near Three Rivers, and about Sorel. They form a warm but light soil, which yields good crops when well manured, but is not of lasting fertility. The greater part of this area however is covered by a tenacious blue clay, often more or less calcareous, and of great depth, which constitutes a strong and rich soil bearing in abundance crops of all kinds, but particularly adapted for wheat, and was in former times noted for its great fertility. These clay lands of Lower Canada have been for a long time under cultivation, and by repeated cropping with wheat, without fallow, rotation, deep plowing, or manure, are now in a great many cases unproductive, and are looked upon as worn out or exhausted. A scientific system of culture which should make use of deep or sub-soil ploughing, a proper rotation of crops, and a judicious application of manures, would however soon restore these lands to their original fertility. The few trials which within the last few years have been made in the vicinity of Montreal, and elsewhere, have sufficed to show that an enlightened system of tillage, with sub-soil draining, is eminently successful in restoring these lands, which offer at their present prices good inducements to skilled farmers. Besides grain and green crops, these soils are well fitted for the culture of tobacco, which is grown to some extent in the vicinity of Montreal. Notwithstanding the length of the winter season in Canada, the great heat and light of the summer, and the clearness of the atmosphere, enable vegetation to make very rapid progress.

The mineral resources of this champaign region of Eastern Canada are chiefly confined to stones for building, paving, lime and cement, stone for glass-making, and peat. Large peat bogs are very numerous in various parts of this region, and may be made to furnish an abundant supply of fuel. This part of the country is also remarkable for the great number and variety of its mineral springs.

To the northeast of Quebec, besides the plains which border the river, there is a considerable area of low-lying clay land, cut off from the great St. Lawrence basin by Laurentian hills, and occupying the valley of Lake St. John and of a portion of the Saguenay. Here is a small outlying basin of Lower Silurian rocks, like those about Montreal, and overlaid in like manner by strong and deep clays, which extend over the adjacent and little elevated portion of the Laurentian rocks, and form a soil as well fitted for cultivation as any part of the Lower St. Lawrence valley. The valley of this lake is probably not more than 300 feet above the sea; and from the sheltered position the climate is not more rigorous than that of Quebec. Several townships have within a few years been laid out in this valley, and have attracted large numbers of French Canadians from the older parishes in the valley of St. Lawrence.

The western part of the champaign region, commencing near Kingston and including all the southern portion of the western province is the most fertile and productive part of Canada. Like the plains further eastward, its soils consist chiefly of strong clays, overlaid here and there by loam, sand, and gravel. In the natural state nearly the whole of this region supported a fine growth of timber, in great part of broad-leaved species, but presented, however, various local peculiarities. Thus, the banks of the Grand River from Galt to Brantford were remarkable for a sparse growth of oaks, free from underwood, and known as oak openings. These are said to have been pasture grounds of the Indians, brought to this condition and kept in it by partial clearing, and by the annual burning of the grass. The object of this was to attract the deer who came to feed upon the herbage. (See on this point, Marsh's *Man and Nature*, page 137.) The soil of these plains is a light sandy loam, very uniform in character, and generally underlaid by coarse gravel. Though fertile, and of an easy tillage, this and similar soils will not support the long continued cropping without manure, which is often practiced on the clay lands of both Upper and Lower Canada.

The valley of the Thames, together with the rich alluvial flats which extend from it northward to the North Branch of Bear Creek, and southward nearly to the shore of Lake Erie, is remarkable for its great fertility, and its luxuriant forest growth. The soil is generally clay, with a covering of rich vegetable mould, and is covered in the natural state with oak, elm, black walnut, and white wood (*Liriodendron tulipifera*) trees of large size, together with fine groves of sugar-maple. Towards the mouth of the Thames, and on the borders of Lake St. Clair, is an area of natural prairie of about 30,000 acres. It lies but little above the level of the lake, and is in large part overflowed in the time of the spring floods. The soil of this prairie is a deep unctuous mould, covered chiefly with grass, with here and there copses of maple, walnut and elm, and with willows dotting the surface of the plain. Numbers of half-wild horses are pastured here, and doubtless help to keep down the forest growth. The characters of the surface are such as to suggest that it had been at no distant period reclaimed from the waters of the adjacent lake.

In no part of the province have skilled labour and capital been so extensively applied to agriculture as in western Canada, and the result is seen in a general high degree of cultivation, and in the great quantity of wheat and other grains which the region annually furnishes for exportation; as well as in the excellent grazing farms, and the quantity and quality of the dairy-produce which the region affords. This western portion of the province, from its more southern latitude, and from the proximity of the great lakes, enjoys a much milder climate than the other parts of Canada. The winters are comparatively short, and in the more southern sections the peach is successfully cultivated, and the chesnut grows spontaneously.

The mineral resources of this region, like those of the eastern portion of the champaign district, are comparatively few. Besides building-stones, lime, and cements, however, may be added gypsum and petroleum both of which will be mentioned in their proper places.

It being the plan of this essay to notice in the first place those points in the natural history of the country which are connected with its agricultural interests, the supplies of artificial manures for the soil, and of peat for fuel, may be here described. The building materials of the country will next be noticed, and finally the various ores and other mineral products which are the subjects of mining and manufacturing industry.

THE HORSE CHESTNUT.*

Of all the waste substances which might be profitably employed in domestic economy, there is none which has given rise to more discussion, or on which so many attempts have made, as the fruit of the horse chesnut, which contains a large quantity of starch. At various periods the utilisation of this product has attracted public attention, and many speculators have essayed to make it an article of commerce.

When first introduced from Constantinople, the fruit of the horse chestnut was considered edible; and Parkinson, writing in 1629, included it among his fruit trees, and described the nut as of "a sweet taste and agreeable to eat when roasted."

Very little use has ever been made of the nuts in this country, though in Turkey they are mixed with horse food, and are considered good for horses which are broken-winded. When ground into flour, they are used in some places to whiten linen cloth, and are said to add to the strength of bookbinder's paste. They contain, moreover, so large a quantity of potash, as to be a useful substitute for soap, and on the latter account they were formerly extensively employed in the process of bleaching. The nuts contain a great deal of starch.

Horse chestnuts are much used on the Continent, especially in the Rhine districts, for fattening cattle and for feeding milch cows. Hermstadt gives the following analysis of a sample dried in the air, and with 21·8 per cent. of the shell removed:

Starch	35·42
Flour fibre	19·78
Albumen	17·19
Bitter extract	11·45
Oil	1·21
Gum	13·54
	98·57

Pabet estimates that 100 lbs. of dried horse chestnuts are equal in nutritive value to 150 lbs. of average hay. Another authority, Petri, makes them equal, weight for weight, to oatmeal.

The starch obtained from the horse chestnut is white, and when thoroughly washed, perfectly free from any bitterness. They yield 29 to 30 per cent., and sometimes nearly 35 per cent., and contain besides a glutinous matter, which, according to Liebig, possesses eminently nutritive properties, but which experience proves very inferior to the gluten of cereals. Adopting the analysis of M. Chevallier and M. Lefrage, 17 per cent. may be taken as the mean yield of starch with operations conducted on a large scale. And therefore in its starch produce the horse chestnut may be taken to be equivalent to the potato, which root contains about 25 per cent. in the solid state, but after deducting the pulp rarely yields more than 18 per cent. of starch.

M. Flandin pointed out in 1849 ("Comptes Rendua," tom. xxvii., p. 349), a method of removing the bitterness from horse chestnut starch, by mixing with 100 kilogrammes of pulp one or two kilogrammes of carbonate of soda; then washing in several waters, and afterwards straining. The product thus obtained was mixed with other farinaceous substances, and constituted, according to M. Fiandin, another food resource. It is probable that the employment of the soda was recommended by Hischermist, because in summer the washing water of the fecula acidifies very quickly, and leads to the formation of a certain quantity of dextrine, which involves a notable loss of starch.

But although the removal of this bitter principle is indispensable when the starch is intended for alimentation, it is quite unnecessary if the starch is to be used for industrial or manufacturing purposes. Parmentier, in proposing to employ horse chestnut starch to supply the place of paste made with food grains, very justly remarks that it has the advantage of not being attacked by insects on account of its bitterness. And bookbinders and makers of pasteboard frequently mix in their paste some aloes, with the object of keeping off insects and mould. It has been suggested by Parmentier and others that the fruit might also be utilised for its potash. The chestnuts are dried and burnt, and the salt obtained by lixiviating the ashes. Or, if preferred, the ashes may be employed direct in bleaching linen. Mercandier, in his "Treatise on Hemp," states that in Switzerland, and some parts of France, they employ the water in which horse chestnuts have been boiled for bleaching hemp, flax, and other fabrics, and it also supplies the place of soap.

For a great number of years M. Klose, of Berlin, has operated on a large scale on the horse chestnut, and obtained the following products:

1. From the burnt pericarp an alkaline ley.
2. From the skin or husk of the peach the episperm, a very fine charcoal, which forms the base of different printing inks.
3. From the amylaceous pulp is extracted the fecula, which can be transformed into dextrine, glucose, alcohol, or vinegar, and which are all adapted to industrial use.
4. The fatty matter extracted serves to make a kind of soap, and to render certain mineral colours more fixed and solid.
5. A yellow colouring matter which serves for different purposes.

* Extracted from the *Grocer*.

The use of the horse chestnut was commenced on a large scale in France in 1855, by M. de Callias, and is still continued. He operated, as we have seen, on more than twenty million kilogrammes annually.

Useful Receipts.

Cement.

Cement to stick india-rubber or leather to metals is made of glue and ammoniacum, melted together, and nitric acid added.—*English patent of J. Allen.*

Liniment.

A cheap and invaluable liniment for sprains or bruises where the skin is not broken. 1 pint of soft soap ; 1 pint of good vinegar ; 2 tablespoonsful of salt ; 1 tablespoonful of saltpetre. First dissolve the salt and saltpetre in the vinegar, then heat the soap hot and add, stir lively, and it is ready for use.

Browning Iron and Steel.

The *Moniteur des Interets Materiels* publishes this receipt for giving a brown color to the surface of polished iron or steel ; Mix four parts of water by weight, one part gallic acid, two parts chloride of iron, two parts chloride of antimony. The chloride of antimony (butter of antimony) should contain the least possible acid in excess. Dip a sponge in the mixture and rub the metal to be colored. By repeating the process the color can be deepened at will. Wash thoroughly with water, and when the surface is dry cover it with a light coating of boiled linseed oil.

A New Use for Petroleum.

Dr. Decasine, of Antwerp, announces that the itch may be cured instantaneously by simply applying (without rubbing) petroleum to the parts affected. The mere emanations of that oil are sufficient to disinfect the patient's clothes, and Dr. Decasine adds that all other parasites of the human body may be destroyed immediately in the same manner.—*Galignani's Messenger.*

Water-Proof glue.

Render glue perfectly soft, but not liquid, in cold water. Then disolve it by a gentle heat in *linseed oil.* It dries almost immediately, and water will not affect it.—*J. L. Hersey.*

Composition for Coating Wood.

A method of coating wood with a varnish as hard as stone has been recently introduced in Germany ; the ingredients are forty parts of chalk, forty of rosin, four of linseed oil, to be melted together in an iron pot. One part of native oxide of copper, and one of sulphuric acid are then to be added, after which the composition is ready for use. It is applied hot to the wood with a brush, in the same way as paint, and, as before observed, becomes exceedingly hard on drying.

To Stain Wood Black.

Take extract of logwood and put water enough with it to dissolve it, and heatboiling hot, and apply to the wood while hot some three or four times, letting each coat dry ; then give it a good coat of acetate of iron, which make by putting vinegar upon iron chips. This produces a perfect jet black.

Solution of Rubber for Overshoes, etc.

A solution of caoutchouc for preparing rubber overshoes and for fastening leather soles upon rubber shoes, is prepared in the following manner:—Cut two pounds of caoutchouc into thin small slices; put them in a vessel of tinned sheet-iron, and pour over twelve to fourteen pounds of sulphide of carbon. For the promotion of solution, place the vessel in another containing water previously heated up to about 86° Fahrenheit. The solution will take place promptly ; but the fluid will soon thicken and thus render the application difficult. In order to prevent this thickening, a solution of caoutchouc and rosin (colophony) in spirits of turpentine must be added to the solution of caoutchouc in sulphide of carbon and in such a quantity that the mixture obtains the consistency of a thin paste. The solution of caoutchouc and rosin in spirits of turpentine should be prepared as follows: —Cut one pound of caoutchouc into thin small slices ; heat them in a suitable vessel over a moderate coal fire until the caoutchouc becomes fluid ; then add one-half pound powdered rosin, and melt both materials at a moderate heat. When these materials are perfectly fluid, then gradually add three to four pounds of spirits of turpentine in small portions, and stir well. By the addition of this last solution, the rapid thickening and hardening of the compound will be prevented, and a mixture obtained fully answering the purpose of gluing together rubber surfaces, etc.—*Am. Druggist's Circular.*

Queen's Metal.

Tin 100 parts, antimony 8 parts, copper 4 parts, bismuth 1 part ; melt under charcoal. Used to make teapots, and other white metal articles. It is a description of pewter.

For Making Architectural Ornaments in Relief.

For making architectural ornaments in relief, a molding composition is formed of chalk, glue, and paper paste. Even statues have been made with it, the paper aiding the cohesion of the mass.

Machinery and Manufactures.

Linoleum Manufacture.

Now that the cultivation of flax is being largely engaged in by our farmers, and linen and oil manufactures are being established, it is well to be made acquainted with any new uses to which flax products can be applied. In noticing *Linoleum* the *Mechanics' Magazine* says :—

"The manufacture of this new and interesting material, which threatens to rival the india-rubber trade in the multiplicity and utility of its applications, is based on the invention of Mr. Frederick Walton, whose patents are now worked by the Linoleum Manufacturing Company, at Staines, and 45 Cannon street West. The word linoleum is derived from *linus*, linseed and *oleum*, oil, from which products the new substance is made. The linseed oil of commerce is solidified or "oxydized" by the absorption of oxygen, by which process it becomes changed into a semi-resinous substance. It is then combined at a strong heat with resinous gums and other ingredients, and the substance thus obtained has all the appearance and many of the properties of india-rubber.

Those who are conversant with the uses of the pliable elastic gums will readily perceive the wide field of usefulness that any material possessing such properties is destined to occupy, more especially as the price of the new substance is much lower than india-rubber or gutta-percha. Linoleum can also be dissolved into a varnish or cement in the same manner as india-rubber, and in this form can be employed in the manufacture of material for water-proof clothing. As a varnish or paint for protecting iron or wood, or for coating ships' bottoms, it is said to be admirably adapted, as it dries rapidly, in fifteen or twenty minutes, and adheres with singular tenacity. As a cement for uniting substances, such as wood with iron, or wood with wood, it is very effective, and has similar properties to the marine glue made from india-rubber and shellac. Singularly enough, linoleum can also be vulcanized or hardened by exposure to heat. By this means it is made hard as the hardest woods, and rendered capable of receiving a high polish without the aid of varnish or any other extraneous substance. In this condition it can be filed, planed, or turned as easily as wood, and employed in many of the various ways for which wood is used. Or it can be molded in heated dies to any desired form, as, for example, flax-spinners, bosses, sheaves for ships' blocks, surgical-instrument handles, picture-frames, moldings, veneers to imitate marble, ivory, ebony, and other woods. Combined with emery it forms a grinding wheel having extraordinary cutting or abrasive power. Very dissimilar are some of the uses to which the new substance can be applied. Carriage aprons, cart-sheeting, sail-covers, reticules, tarpauling, printers' blankets, gas-pipes, telegraph supports, washable felt carpets, table-covers, paints for carriages or for printing floor-cloth, or enamels of any color for enameling papier-mache or metals. These are only some of the many uses to which linoleum may be applied.

The manufacture has, however, hitherto been chiefly confined to the development of the floor-cloth trade, for which the new material has proved itself well adapted. Linoleum floor-cloth is produced by combining the linoleum with ground or powdered cork, which is rolled on to a stout canvas, the back of the canvas being afterwards water-proofed with a cement or varnish made from the solidified or oxydized oil before referred to. The combined fabric so manufactured is then printed by means of blocks in every variety of pattern, in the ordinary way. The floor-cloth thus produced is pliable, and comparatively noiseless to walk upon. It washes well, preserves its color, and can be rolled up like any ordinary carpet. Besides being very durable—the component parts being almost indestructible except by fire—it will not decompose by heat or exposure to the sun or air, as is the case with india-rubber. It is, therefore, better adapted than that substance for hot climates. To the chemist, engineer, and manufacturer, linoleum offers quite a new substance for experiment, and no doubt, as it becomes better known, the various uses to which it may be applied will be more fully developed and appreciated. The patentees, we understand, are prepared to grant licenses for the manufacture of some of its applications, such as varnishes, cements, and the hard compounds above mentioned. Important results may therefore follow the introduction of this new and valuable substance."

Condensation of Steam in Long Pipes.

Some information, exceedingly interesting to engineers, has recently been made public in an account of a subterranean engine erected in the celebrated "Gould and Curry" mine, California. The engine is 50 horse-power, and is 201 ft. below the surface of the ground. Where the Gould and Curry pipe was packed with ashes it lost but five pounds in going 1,100 ft.; whereas in the straw-jacketed pipe, at the New Almaden mines, the steam lost 14 lbs. in going only 1,300 ft. There would seem to be a much greater gain from preventing radiation by packing the ashes loosely around the pipe. Dr. William Charles Wells, in his work on "Dew," states that it is first apparent on wool and similar filamentous substances. From this, says the *Scientific American*, we might argue that the heat from the earth is cut off from them; that they remain cold, and are consequently good non-conductors. The greatest neglect is apparent in carrying steam pipes to a distance. In many cases they are not even covered with canvas, but are exposed to all sorts of atmospheric influences. Such practices are deliberate and wilful extravagances, for which there is no excuse whatever.

The Hydrostatic Girder.

The Hydrostatic Girder is the name applied to a new invention, by the use of which the pressure resulting from any weight which it may be found necessary to place upon a girder, is equally distributed over the whole surface. This distribution of pressure tells best in a large bridge or viaduct, as by its application in such cases the whole of the structure may be made of lighter materials at a consequently greatly reduced cost, without any diminution of safety. The girder consists essentially of two hollow girders, one of which just fits into the other, allowing a small space around it to be filled with water. The weight which the whole girder is required to support, is placed upon the smaller or floating girder. In ordinary girder Bridges the weight of a passing train has to be borne by every inch of the girder in succession; and when the supports are far between, this necessitates an increase in the strength of the structure, with its consequent increase of expenditure. The principle advantages in the Hydrostatic Girder arise from making the floating girder continuous, or without any other support than the water between it and the larger girder throughout its whole length. From well-known hydrostatic laws it is evident that, wherever the weight may be placed upon the floating girder (which weight must, of course, be proportional to the amount of water displaced by the floating girder,) the pressure arising from such weight will be distributed over the whole of the lower girder. Another advantage of the new construction is the absence of that vibration caused by the passage of a heavy train which is so injurious to cast-iron structures. It may be observed that the principal of the Hydrostatic Girder is not limited to bridge building. It is well known that the repairs to the permanent way, which form so large an item in railway expenses, are rendered principally necessary by the transit of those heavy-laden springless Trucks of coal, which operate upon every inequality of the line in their rapid passage, with all the injurious effects of a steam hammer. By simple application of the hydrostatic principle, a cheap and yet efficacious spring might be provided, obviating in a great measure the damage caused to the permanent way. —*Building News.*

Preservation of Steam Boilers.

Engineers will appreciate the following information given in the *Mechanics' Magazine* by an English chemist, Mr. Blockly:—

"I have read with great interest your articles on this and its kindred subject, and feel that I only speak the sentiments of the manufacturing community in saying much gratitude is due for the able manner in which the matter has been treated by you. I trust you will allow me to state that the use of 'muriate of ammonia,' or 'sal ammonia,' or 'chloride of amonium,' is not new. The present state of chemistry is such that every known substance has several names. Seven years ago I found it was in use to prevent incrustations, and only for its expense would have been more largely used then. I found also a gentleman of no mean pretensions as a chemist had used a mixture of sulphate of ammonia and common salt, which answered the purpose admirably, forming in the boiler chloride of ammonium and sulphate of soda; the boilers once incrusted did not appear to be cleaned by its use, but incrustation was effectually prevented, only a sludgy, sandy sediment being formed—easily cleaned by blowing off.

"Some localities are furnished with water of a different character, and for a number of years past the use of alkaline preparations has been adopted. Some of these compositions are made by boiling soda ash and lime together in water until the preparation is stiff. Others separate the lime, and stiffen with farina. I can positively assert that the use of alkaline substances is very old. One firm I know of use caustic soda ash regularly, and find it to answer perfectly, and there is a large dyer in this town whose boiler is always free from solid incrustation—the water is of a peculiar character, and contains a large amount of caustic soda as one of its ingredients. The composition you allude to to-day seems to lay claim to novelty—if so, the novelty cannot be from its possessing an alkali as one of its constituents. I have no connection whatever with any firm using boiler power or selling composition, and I would suggest to all users of steam power to try the use of caustic soda ash, a far cheaper material than most of the compositions, which I happen to know are often sold under the recommendation of the foreman or engineer, who gets a 'per centage,' or some other consideration. If this simple remedy does not succeed, I would suggest an examination of the water, and any chemist would undertake to provide some means as effectual as any composition. No one preparation can be expected to, nor does, answer under all circumstances."

Practical Memoranda.

Quality of different kinds of Wood.

The celebrated experiments of Marcus Bull, of Philadelphia, many years ago, gave the following results, showing the amount required to throw out a given quantity of heat:

Hickory	4	cords.
White oak	4¾	"
Hard maple	6⅔	"
Soft maple	7⅕	"
Pitch pine	9⅐	"
White pine	9⅕	"
Anthracite coal	4	tons.

From this it would appear that there is less difference between hard and soft maple than is generally supposed.

Strength of Materials.

It is a remarkable fact that one of the most abundant materials in nature—iron—is the strongest of all known substances. Made into best steel, a rod one-fourth of an inch in diameter will sustain 9,000 lbs. before breaking; soft steel, 7,000 pounds; iron wire, 6,000; bar-iron, 4,000; inferior bar-iron, 2,000; cast-iron, 1,000 to 3,000 pounds; copper wire, 3,000; silver, 2,000; gold, 2,500; tin, 300; cast zinc, 160; sheet zinc, 1,000; cast lead, 55; milled lead, 200. Of wood, box and locust, the same size, will hold 1,200 pounds; the toughest ash, 1,000; elm, 800; beech, cedar, white oak, pitch pine, 600; chestnut and soft maple, 650; poplar, 400. Wood which will bear a very heavy weight for a minute or two will break with two-thirds the force acting a long time. A rod of iron is about ten times as strong as a hemp cord. A rope an inch in diameter will bear about two and a half tons, but in practice it is not safe to subject it to a strain of more than about one tun. Half an inch in diameter, the strength will be one-quarter as much; a quarter of an inch, one-sixteenth as much, and so on.—*American Artizan.*

Area of Roofing to Supply Tanks of Given Dimensions with Rain Water.

The *Scientific American* says:—"Our rain fall averages 25 inches per annum, being rather more than two cubical feet for every square foot of horizontal surfaces employed in catching it; or, say, 200 cubical feet of water to the square. Each foot contains 6¼ gallons of water. A tank, 15 ft. × 9 ft. × 7½ ft., will hold 6,581 gallons, and about 5¼ squares of horizontal surface would catch enough rain water to fill it in the year at the above rate of rain-fall. In estimating the area of roof, the level area only must be calculated and not the surface area, which is often half as much again. Hence the simple method is to take the area of the ground plan and double the number of feet contained in it, which will give the amount in cubical feet of water that, on the average, may be collected in each year."

Statistical Information.

SUMMARY.

France has 43 Mineral Oil Refineries; 53 Animal Oil Manufacturies; 99 Olive, Nut, and Grain Oil Manufacturies; and 23 general Refineries.—Pittsburg, United States, has 58 Petroleum Refineries, with a total capacity of 26,000 barrels per week.—A *return* of the House of Commons gives for the total Prisons in England on the 1st January 1864, a total of 27,307 prisoners, of whom 5,533 were Roman Catholics.—France contains 12,800-000 acres of natural meadow land, 6,500,000 acres of artificial meadow, and 16,500,000 acres of pasture land.—The length of Telegraph lines in Canada 31st December 1864, was 3,871 miles; number of stations open to the Public 288; number of public messages sent during the year 416,117.—Michigan has now about four and a half millions of sheep. Her wool crop is estimated at twelve million pounds.—The total revenue of the United States for 1864 was $260,632,717; the expenditure $865,234,087; total outstanding debt March 31st 1865, $2,366,954,077.—The yearly product of pianos in the United States has increased from 2,000 to 20,000 in the last fifteen years, the latter number being the estimated manufacture of the present year.—Nearly six million tons of Coal were exported from the United Kingdom from January to August 1864, inclusive.—In one of the processes of steel-pen making done by females at Birmingham, a quick worker will cut out in one day of ten working hours 250 gross, or 36,000 pens, which involves 72,000 distinct motions of the arm, two in every second.—The total quantities of Anthracite and Bituminous Coal sent to market from the various regions of Pennsylvania, for the year 1864, was 136.614.940 tons; and of foreign coal imported 7,713,760 tons.—The population of Great Britain and Ireland in 1861 was 28,980,757; the annual consumption of wheat is estimated at twenty-four million quarters, of which six millions is imported, at an averrage price per quarter for the past 19 years of 53s. sterling.

IMPORTS FOR 1865.

A Great Falling Off.

The total value of dutiable goods received at the Port of Montreal, during the first three months of the present year, viz: up to the 31st ult., amounted to $2,316,884, against $3,984,096 for the same period of 1864, being a decrease this year of $1,667,212. The decrease in the imports of free goods is even greater. The quantity received during this year, up to the 31st ult., was $210,752, against $828,730, for same period last year, being a decrease of $617,978. Of course the duty received at the Custom House shows a corresponding falling off. The amount received this year, up to the 31st ult., was $648,916 68, against $900,128 86 for same period last year; decrease $251,212 18.

Should a corresponding decline have taken place in the imports of the whole province, which we believe is the case, and if it continues during the whole of the year, the provincial import and export account will show a different balance in 1865 from what it presents in 1864, or indeed for a considerable number of years. The imports of 1864 are estimated at $52,000,000, and judging by the last three months, we may deduct at least one-third from this amount for the imports of the present year. The exports of 1864 are estimated at $46,000,000, which we think will be rather enhanced than decreased during the present year. We are of opinion, therefore, that the balance of the provincial import and export account will be on the right side at the end of 1865.—*Trade Review.*

[We trust the anticipations of the *Trade Review* may be realised—it is our only hope for returning prosperity. Let our consumers see to it that Home Manufactured Goods are purchased by them whenever they can be obtained to suit their purposes—especially in the productions of wool, flax, wood and leather.—Ed. Arts Journal.]

THE BRITISH EMPIRE.

An English paper says, "An official return shows that the extent of our entire possessions, colonial and military, or commercial, is 4,346,996 square miles; the population, 152,774,672; revenue, £57,-945,509; expenditure, £58,545,330.

THE BRITISH ARMY AND NAVY.

The British army and navy estimates for the year, 1865-6 have just been announced. The cost of the army is £14,348,447—a reduction of £495,000 from last year; of the navy £10,392,224—a decrease of £316,000 Total estimates for the military and naval establishments for the coming year, £24,740,-671; or, in American currency, $123,703,355.

The officers and seamen in the navy number 38,000. There are also 7,000 boys in the service and 7,000 men in the coastguard service against 7,500 last year, making the total 52,000. The marines number 17,000; namely, 8,000 for service afloat and 9,000 for service on shore, being 1,000 less than in 1864-5. The civilians for the coastguard service are 750 against 950, leaving the total force in the fleet and coastguard service 69,750, against 71,950 last year.

The navy consists of 540 vessels, classified as follows:—

Steamships, 445, of which 357 are screw, and 88 paddle; 26 screw ships are building; 69 effective sailing ships are afloat; making the total of steam and sailing ships 540.

The total enrolled strength of the volunteers of England is 159,000 men of all ranks, of whom 1,300 are cavalry, 23,000 artillery, 2,500 engineers, and 132,000 rifle volunteers.

THE MARITIME PROVINCES.

The following Table is from a "Return to an Address from the Honorable Legislative Assembly, for a Statement of the amount of the Exports and Imports, Revenue and Expenditure, Population, Assets and Liabilities of the Provinces of Nova Scotia, New Brunswick, Newfoundland and Prince Edward Island, for the year 1863.

	Imports.	Exports.	Revenue.	Expenditure.	Population by last Census.	Date of that Census.	Liabilities.
	$	$	$	$			$
Nova Scotia............	10,201,391	8,420,968	1,185,629	1,072,274	330,857	1861	4,838,547
New Brunswick	7,764,824	8,964,784	899,991	884,613	252,074	1861	5,702,991
Newfoundland..........	5,242,720	6,002,212	480,000	479,420	*124,288	1857	946,000
Prince Edward Island...	1,428,028	1,627,540	197,384	171,718	80,857	1861	240,573

* Population in 1861 estimated at 130,000.

It will be observed that the Province of Nova Scotia, only, shows an excess of Imports over Exports, amounting to $1,780,423, for the year 1863. In each of the other Provinces the Exports exceeded the Imports for the same year as follows: New Brunswick, $1,199,960; Newfoundland, $779,492; Prince Edward Island, $199,512; and that in the four Provinces the whole Exports exceeded the Imports by $378,541, while in Canada for the same year the Imports exceeded the Exports by nearly $7,000,000, and for the first half of the year 1864, by about $10,000,000. When will Canada so patronize her own manufactures as to show a more satisfactory result?

NATIONAL DEBT OF GREAT BRITAIN.*

	Principal.	Interest.
Debt at the accession of Queen Anne in 1702 ...	£16,394,702	£1,310,942
Debt at the accession of Geo. I. in 1714..	54,145,363	3,351,358
Debt at the accession of Geo. II. in 1727	52,092,238	2,217,551
Debt in 1763..	138,865,430	4,852,051
Debt at the commencem't of the American War in 1775	128,583,635	4,471,571
Debt at the conclusion of the American War in 1784	249,851,628	9,451,772
Debt at the commencem't of the French War in 1793	239,350,148	9,208,495
Debt 5th January, 1817, when the English and Irish exchequers were consolidated	848,282,477	33,854,466
Debt 5th January, 1854...	757,951,281	27,259,546

The Chancellor of the Exchequer's Budget for 1865 gives the charge for interest on public debt	£26,350,000
On Consolidated Fund..	1,900,000
Total for 1865	£28,250,000

Miscellaneous.

Summary.

Forty tons of rust and scales were a short time since taken out of the Conway and Britannia iron tubular bridges. It is feared that the rapid oxidation of the iron will, eventually, result in the destruction of those world-renowned structures.—An iron company of Tipton, in England, has produced a sheet of iron two feet two inches long by eight and a half inches wide, weighing not quite 178 grains.—An extensive series of experiments in France shows that the Magnesium light is by far the most effective light for light-houses, and, at its present comparatively high price, much cheaper than any other kind of light.—There are upwards of 150 of the "Lenoir Gas Engines," working in Paris, and giving every satisfaction to the users.—A new silk-worm has been reared in great numbers by L. Trouvelat, of Medford, Massachusetts, U.S., which produces a silk superior to all other except the best Chinese; it is a hardy insect, *attacus Polyphemus Linn.*, found throughout the Northern States and Canada, and feed upon the leaves of Oak, Maple, Willow, and other common forest trees,

* Encyclopedia Britannica, 8th ed.

and is easily reared in any part of the country.—The Kola-nut of Western Central Africa, largely used as both food and medicine by the natives, is found to contain about 2 per cent of that valuable active principle of tea and coffee, *theine.*—The National Life-boat Institution has prepared an efficient cork life-belt for the use of seamen and others, at a cost of 4s. sterling.—A $\frac{1}{50}$ inch Objective Microscope manufactured by Messrs Powell & Lealand, has a magnifying power that may be brought up to 15,000 diameters; and the lenses are so small that the workman is obliged to use a microscope in preparing them.—The wages of every employè in the Cossipore Sugar Refinery, Bengal, are calculated according to the profits realized each month, the result being that every one works with a sense of self-interested alacrity.—In the early days of steamboats on the North River, huge shafts of boiler iron were used, 6 feet in diameter, properly stayed and strengthened; no forges or lathes being in use to make or turn wrought or cast-iron shafts.—A writer in the "*Essex Journal*" says that the islands at the head of Lake Erie are admirably adapted for the cultivation of the Grape Vine, both as to soil, and the equalizing of the temperature by the pure air from the Lake; the adjacent American Islands produce immense crops of this delicious fruit, of the finest kinds.—Magnesium wire has just fallen in price, at one drop, from 25s. to 12s. per ounce; and in quantities of 5 ounces, to 10s. per ounce. Coffee swims on water, while chickory sinks, thus affording a ready means of detection.—Some one recommends galvanized iron telegraph wire for clothes lines, and says it never rusts, need never be taken in, never breaks down and lets the wet clothes fall in the dirt.—A Mr. Ferguson pays $9,000 for six months, for the privilege of removing the coal ashes from the Parish of St. Pancras, in London; a short time ago the parish had to pay for their removal. We are at present ignorant of the uses to which coal ashes are put.—A Pneumatic under ground Railway is proposed to run under the Thames, connecting Whitehall and Waterloo Station, near Vine Street. It is to admit a full sized omnibus

Diagrams.

A method of exhibiting diagrams of apparatus, &c., by which lecturers may be saved the expense of the large drawings generally used, has been suggested by M. Thibierge, of Versailles. His plan is to make a small sketch of the apparatus on a plate of glass, and with a large lantern to throw a magnified image on the screen. The lantern he illuminates by an ordinary gas burner with twenty-four holes, and with two silvered reflectors finds the light sufficient even to give a well-defined image of the electrolysis of water.

Choice of Color in Dress.

M. Chevruel, the Government Superintendent of the dyeing department of the great Parisian manufactory of the celebrated Gobelin tapestries, has recently delivered a series of lectures at Paris on complexions and colors, full of valuable hints to ladies. We quote:—"The pink of the complexion is brought out by a green setting in dress or bonnet; and any lady who has a fair complexion that admits of having its rose tint a little hightened, may make effective use of the green color, but it should be a delicate green, since it is of importance to preserve harmony of tone. When there is in the face a tint of orange mixed with brown, a brick red hue will result from the use of green; if any green at all be used in such a case, it should be dark. But for the orange complexion of a brunette, there is no color superior to yellow. This imparts violet to a fair skin, and injures its effect. A skin more yellow than orange has its yellow neutralized by the suggestion of the complement, and a dull white effect imparted. The orange skin, however, has its yellow neutralized, and the red left; so that the freshness of complexion is increased in dark-haired beauties. Blue imparts orange, which enriches white complexions and light flesh tints; it also, of course, improves the yellow hair of blondes. Blue, therefore, is the standard color for a brunette. But the brunette who has already too much orange in her face, must avoid setting in blue. Orange suits nobody; it whitens a brunette, but that is scarcely a desirable effect, and it is ugly. Red, unless when it is so dark as to increase the effect of whiteness by contrast of tone, is rarely suitable in any close neighborhood to a lady's skin. Rose red destroys the freshness of a good complexion; it suggests green."

Improvement in Organs and Harmoniums.

An important invention has just been patented by Mr. Dawes, of Leeds, Engineer. The principle is this: that the highest note of any chord played on the key-board, is made to predominate with greater power than the harmony. Thus the melody always stands out prominently as if produced by another instrument. The effect, it is said, is sometimes marvellous, converting a comparatively dull and tuneless instrument into a brilliant and enjoyable one. It is said to be the one essential improvement which will make harmoniums fit for places of worship as well as for the home circle. The invention is already patented in England, France and Belgium. The patentee has given the name of "Melodie Celeste" to his invention, which is exceedingly simple, and can be applied it is said, to any instrument for about 5s.

Metallic Ceiling.

Mr Little has invented a system for the construction of ceilings, which consists in the application to the joisting of very thin stamped ductile metal, in ornamental embossed panels, of such sizes and shapes as may be required. These stamped panels are fitted for every kind of decoration in colour, and, if inserted as plain surfaces may be used as the ground for every description of cartoon painting, combining with lightness and durability, artistic and ornamental effect, at a comparatively small cost. Besides its applicability to the ceilings of rooms, and all public buildings, churches, &c., the system may be made use of with the same effect in staircases, halls, porticoes, and even on the walls of rooms. It affords the means when coupled with an iron framing, of making theatres fire-proof, thus avoiding those sad contingencies to which these crowded buildings are so exposed.