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FOR UPPER CANADA.

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THE PROVINCIAL EXHIBITION.

The approaching Exhibition, to be held in Kingston, in September next, suggests a brief review of the progress of Canada in these annual displays of the development of her agricultural and manufacturing industry.*

Upper Canada dates its existence as a distinct Province, previously to the Union, from the year 1791. Before that period it formed part of the Province of Quebec; as soon, however, as it had acquired a separate political status, it was divided into four districts, the Eastern, Midland, Home and Western, each of which, in course of time, established agricultural societies. In 1782, or exactly eighty years ago, Upper Canada had barely 10,000 inhabitants. In 1824, the numbers had increased to 152,000, and in 1829 to 225,000; but it was not until the year 1820 that the government of the province took any decisive step to foster the agriculture of the country by "An Act to encourage the establishment of Agricultural Societies in the several Districts of the Province." As early as the year 1825, agricultural societies, it is believed, existed in two or three districts, but no records have been handed down to show the condition of husbandry at that period.

The indirect assistance given by the Imperial Government to Agriculture in Upper Canada, dates from a much earlier period than the encouragement given to Agricultural Societies by the Provincial Government; for we find among the donations of George III. to the U. E. Loyalists the old English plough. It consisted of a small piece of iron fixed to the colter, having the shape of the letter L, the shank of which went through the wooden beam, the foot forming the point, which was sharpened for use. One handle and a plank split from a curved piece of timber, which did the duty of a mould board, completed the rude implement. At that time the traces and leading lines were made of the bark of the elm or bass-wood, which was manufactured by the early settlers into a strong rope. About the year 1808 the "hog-plough" was imported from the United States; and in 1815 a plough with a cast iron share and mould-board, all in one piece, was one of the first implements requiring more than ordinary degree of skill, which was manufactured in the province. The seeds of improvement were then sown, and while in the address of the President at the Frontenac Cattle Show in 1833, we observe attention called to the necessity for further improvement in the ploughs common throughout the country, we witness, in 1855, splendid fruit at the Paris Exhibition. In a notice of the trial of ploughs at Trappes, the *Journal d'Agriculture Practicque* makes the following reference to a Canadian plough: "The ploughing tests were brought to a close by a trial of two ploughs equally remarkable—to wit, the plough of Ranson and Simms, of Suffolk, England, and that of Bingham, of Norwich, Upper Canada." The first is of wood and iron, like all the English ploughs, and the results which it produced seemed most satisfactory, but it appeared to require a little more draught than the Howard plough. Bingham's plough very much resembles the English plough; it is very fine and light in its build; the handles are longer than ordinary, which makes the plough much more easy to manage. The opinion of the French laborers and workmen who were there, appeared on the whole very favorable to this plough.

Before proceeding to describe, in detail, the progress of Agriculture in Upper Canada, it will be advisable to glance at the efforts made by societies and the Government of the Province to elevate the condition of husbandry in all its departments, and to induce the people at large to join hand in hand in the march of improvement.

The first public Act for the encouragement of Agriculture in Canada, which came into operation in 1830, authorizes the governor to pay one hundred pounds to any District Agricultural Society which raised the sum of £50 by subscription, for the purpose of importing valuable live stock, grain, useful implements, &c.

Several acts were passed in subsequent years, being modifications of that of 1830, all of them having for their object the encouragement of Agricultural Societies and Agriculture. In 1847 an additional step was taken, fraught with very important consequences to the interests of husbandry in Canada. An Act for the incorporation of the Provincial Agricultural Associations came into operation; and in 1850, Boards of Agriculture for Upper and Lower Canada were established by law. In 1851, an Act was passed to provide for the better organization of Agricultural Societies, and finally, in 1852, the most important step of all was taken, and "An Act to provide for the

*This article on the Provincial Exhibition forms part of a series on the progress of agriculture in Canada, written by the editor for a work entitled "Eighty Years Progress," just published by S. Stebbins, Toronto.

establishment of a Bureau of Agriculture, and to amend and consolidate the laws relating to Agriculture," came into operation.

The District Societies, which, in 1830, drew their annual pittance from Government, and represented the agricultural interests of the country, have thus grown, in twenty-two years, to a comprehensive and centralized organization, consisting of, 1st, the Bureau; 2d, the Boards of Agriculture for Upper and Lower Canada; 3d, the Agricultural Associations for Upper and Lower Canada; 4th, County Societies; 5th, Township Societies.

In 1857, another change took place, being, also, a step in advance; an Act was passed "to make better provision for the encouragement of Agriculture, and also to provide for the promotion of Mechanical Science." The head of the Bureau of Agriculture received the title of 'Minister of Agriculture,' with very extensive powers for obtaining and distributing information respecting the condition of Husbandry and the Progress of Arts and Manufactures in the Province. By this act Boards of Arts and Manufactures were created, and Horticultural Societies incorporated.

The Boards of Agriculture distribute the annual government grant to the County Societies, upon duly certified statements from the Treasurers of the different Societies. The progress of these excellent adjuncts to agricultural improvements is shown in the following table:

Year.	No. of Societies.	Amount of Subscription.	Amount of Grant.
1852,	22	$13,531.00	$21,557 00
1853,	41	17,109.00	25,930.00
1854,	41	23,409.00	32,792.00
1855,	41	23,119.00	32,574.00
1856,	41	23,654.00	33,614.00
1857,	41	24,957.00	34,075.00
1858,	42	15,675.96	34,275.00
1859,*	61	24,221.00	23,836.00

With the means at the disposal of the County Societies, a valuable impulse has, no doubt, been given to agriculture in all its branches; chiefly by encouraging the introduction of a superior breed of animals, and of improved implements. Several societies have devoted a considerable portion of their funds to the importation of improved breeds of cattle and horses. The awarding of premiums for stock, implements and farm productions generally, has encouraged private enterprise, and awakened a spirit of emulation which has been most successful in promoting progress and improvement, and the rank which Upper Canada now occupies as an agricultural country is mainly due to the excellent organization and energetic spirit which has always distinguished the county societies since their first establishment.*

* This year, in consequence of the financial condition of the country, the legislative grant was limited to a certain amount for the entire Province, and a uniform deduction was made from the amount which each society would have been entitled to under the act. The sum due, according to the act, being $47,950, of which only $32,836 was furnished by the Government.

The Provincial Agricultural Association.

As a necessary result of the successful working of the county and township Agricultural Societies, a growing desire began to be felt, now nearly twenty years ago, for the organization of a Provincial Society which would bring the farmers and manufacturers from all parts of the Province together, and, by friendly rivalry and competition at an annual exhibition, presents, at one view, the best results of the agricultural and mechanical industry of the country. After several ineffectual attempts to obtain general and united action, a meeting of delegates from county societies was held at Hamilton in August, 1846, and an Association formed, entitled the "Provincial Agricultural Association and Board of Agriculture for Canada West."

The first Exhibition of the Association was held at Toronto in October, 1846. The amount of prizes offered in money reached $1,112, besides books, making the total prize list to have a money value of about $1,600. The result of the Exhibition surpassed the most sanguine anticipations of its promoters, and excited the astonishment of many who were not familiar with the progress already made by the County Societies, at the display of stock, implements, grain, fruit, and vegetables. Thorough-bred Durham cattle were exhibited, and eagerly bought up at the close of the show. In the address delivered at the first meeting of the Association, we find the following paragraph, which illustrates the condition of husbandry in relation to stock which prevailed throughout the province: "The rough condition of our farmers, with various concurring circumstances, have in times past precluded any due attention to the important department of live stock. We find everywhere a mongrel mixture of Devons, Herefords, Lancashires, and Normans, frequently, indeed, producing good milkers, and useful cattle for the yoke, but entirely devoid of any established qualities upon which the breeder can rely, or feel any confidence that "like will beget like." We must admit, however, that some improvement has taken place, and that the well-defined breeds of England are beginning to be sought after with some care."

* For an excellent summary of legislative enactments in favor of agriculture in Canada, see the first volume of the Transactions of the Board of Agriculture for Upper Canada.

The Provincial Association commenced its operations without any well-established means of support, trusting to members' fees and contributions from county societies. Its first exhibition was so far successful that a balance of $408.25 remained in the treasurer's hands after all expenses were paid. In 1847 the association was incorporated by act of Parliament, under the title of "The Agricultural Association of Upper Canada." Since that time it has increased in influence and usefulness year by year, as the following brief synopsis of the results of the different exhibitions held under its auspices amply proves:—

Comparative Statement.

Showing the amount of competition at all the Exhibitions held by the Association, between 1846 and 1860, inclusive:

Exhibitions.	Amount of Prizes offered.	Total No. Entries.	Amount of Prizes awarded.
Toronto, 1846,	£400 0 0	1,150	£275 0 0
Hamilton, 1847,	750 0 0	1,600	600 0 0
Cobourg, 1848,	775 0 0	1,500	575 0 0
Kingston, 1849,	1,400 0 0	1,429	700 0 0
Niagara, 1850,	1,276 11 9	1,638	950 0 0
Brockville, 1851,	1,254 9 3	1,466	806 18 9
Toronto, 1852,	1,470 9 9	3,048	1,258 5 0
Hamilton, 1853,	1,601 10 9	2,820	1,323 6 3
London, 1854,	1,794 0 6	2,933	1,356 17 6
Cobourg, 1855,	2,303 1 6	3,077	1,735 8 6
Kingston, 1856,	2,309 12 6	3,791	1,699 17 6
Brantford, 1857,	2,517 10 0	4,337	2,046 10 0
Toronto, 1858,	2,675 2 6	5,572	2,303 15 0
Kingston, 1859,	2,628 5 0	4,830	2,016 15 0
Hamilton, 1860,	3,753 17 6	7,532	3,235 0 0

Permanent buildings are now erected at Toronto, Hamilton, London, and Kingston, respectively, for the express purpose of holding annual exhibitions. In 1862, the annual meeting was held at Toronto, and permanent provision made for stabling 198 horses and 435 head of cattle. The amount of prizes offered exceeded 16,000 dollars.

Such is the progress which has been made during fifteen years, in bringing together the different industries of Upper Canada, and teaching her people those lessons which can only be learned by friendly competition in an arena open to all, without distinction, prejudice, or favor. The cause of this rapid improvement is no doubt in great part due to the immigration of scientific agriculturists, as well as practical farmers, who have learned and studied husbandry in all its branches in the best districts of England and Scotland. Any improvement which takes place, either in stock, implements, or farming practice, either in Europe or the United States, is immediately imported, and, if satisfactory, adopted in Upper Canada. By means of the different agricultural societies, all needful information respecting the results attained are speedily made known, and there is now no lack of enterprising and energetic men who gladly embrace every opportunity of improving their farming practice. The financial condition of the Association and the Board of Agriculture, afford incontestible proof of the deep root which these institutions have taken in Canada. It will be remembered that in 1846 they commenced their operations without funds, relying solely on subscriptions. In 1859, the large sum of $110,908.78 passed through the hands of the treasurer. Out of the surplus funds a handsome and commodious brick building has been erected in Toronto for the purposes of the Board, amply provided with space for museum, library, reading room, large hall for public meetings, and a capacious seed store.

EIGHTEENTH EXHIBITION.

Of the Provincial Agricultural Association, to be held at Kingston on Monday, Tuesday, Wednesday, Thursday, and Friday, September 21, 22, 23, 24, & 25, 1863.

RULES AND REGULATIONS.

Membership.

1. The members of the Agricultural Societies of the several Townships within the County, or Electoral Division, or United Counties wherein the Annual Exhibition may be held, and the members of the County or Electoral Division Society, shall be also members of the Association for that year, and have members tickets accordingly; provided the Agricultural Societies of the said Townships, or the Society of the said County or Electoral Division or United Counties, shall devote their whole funds for the year, including the Government Grant in aid of the Association, and shall pay over the same, accompanied with a list of the members of each such Society, to the Treasurer of the Association two weeks previous to the Exhibition.

2. The members of the Board of Agriculture, and of the Board of Arts and Manufactures, the Presidents and Vice Presidents of all lawfully organized County Agricultural Societies, and of all Horticultural Societies, are members of the Association for Upper Canada *ex-officio*. The payment of $1 and upwards constitutes a person a member of the Association for one year; and $10 for life, when given for that specific object, and not as a contribution to the local funds.

3. Members can enter articles for competition in every department of the Exhibition, at any time previous to the dates below mentioned and all who become members previous to or on the Saturday preceding the show week will be furnished with tickets admitting them to the grounds during the whole time of the show, without additional charge.

ENTRIES.

4. No one but a member shall be allowed to compete for prizes except in class 44, sections 11 to 16 of class 47, and class 54.

5. All entries must be made on printed forms, which may be obtained of the Secretaries of Agricul-

tural Societies, or of Mechanics' Institutes, free of charge. These forms are to be filled up and signed by the exhibitor, enclosing a dollar for membership, and sent to the Secretary of the Association, Board of Agriculture, Toronto, previous to, or on the following named dates:—

6. *Horses, Cattle, Sheep, Swine, Poultry*—Entries in these classes must be made by forwarding the entry form, as above mentioned, filled up, and member's subscription enclosed, on or before Saturday, August 15th, five weeks preceding the show.

7. In the classes of Blood Horses and pure bred cattle, full pedigrees, properly certified, must accompany the entry. No animals will be allowed to compete as pure bred, unless they possess regular stud or Herd Book pedigrees, or satisfactory evidence be produced that they are directly descended from such stock. In the class of Durham cattle particularly, no animal will be entered for competition, unless the pedigree of the same be first inserted in the English or American Herd Book, or in the Upper Canada Stock Register, kept at the office of the Board of Agriculture.

8. *Grain, Field Roots, and other Farm Products, Agricultural implements, Machinery, and Manufactures generally*, must be entered previous to or on Saturday August 29th, three weeks preceeding the show.

9. *Horticultural Products, Ladies' Work, the fine Arts, &c.*, may be entered up to Saturday, September 12th, one clear week preceding the show.

10. EXHIBITORS ARE PARTICULARLY REQUESTED TO TAKE NOTICE THAT IT IS ABSOLUTELY REQUISITE THAT THE ENTRIES BE MADE AT THE DATES ABOVE MENTIONED, IN ORDER TO AFFORD SUFFICIENT TIME TO EXAMINE THE ENTRY PAPERS, AND TO CORRESPOND WITH PARTIES, WHERE NECESSARY, FOR THE CORRECTION OF ERRORS AND OMISSIONS.

11. In the live stock classes, the entry must in every instance be made in the name of the *bona fide* owner; and unless this rule be observed, no premium will be awarded, or if awarded will be withheld.

12. In all other classes, entries must be made in the names of the producers, or manufacturers only.

13. In the Agricultural and Horticultural department the competition is open to exhibitors from any part of the world, with the exception of some classes of fruit.

14. In the Arts and Manufactures department, no article can be entered for competition unless it be the growth, product, or manufacture of Canada; and no money premium will be awarded except in accordance with this rule; articles of foreign manufacture, however, may be entered for exhibition only, and will be reported upon by the judges, according to their merits, or certificates awarded them if deserving. Manufacturers are requested to furnish with their articles exhibited, the quantity they can produce, or supply, and the price, for the information of the Judges; whose decision will be based on the combination of quality, style and price, and the adaptation of the article to the purpose or purposes for which it is intended.

15. No person shall be allowed to enter for exhibition more than one specimen in any section of a class, unless the additional article be of a distinct named variety, or pattern, from the first. This rule not to apply to animals, but to apply to all kinds of grain, vegetable products, fruit, manufactured articles, &c, in which each additional specimen would necessarily be precisely similar to the first.

16. On the entry of each animal or article, a card will be furnished the exhibitor specifying the class, the section, and the number of the entry, which card must remain attached to such animal or article during the exhibition.

Transport of Articles, placing them on Exhibition and charge of them while there.

17. All articles for exhibition, must be on the grounds on Monday, September 21st, except live stock which must be there not later than Tuesday 22nd, at noon. Exhibitors of machinery and other heavy articles, are requested to have them on the grounds as far as possible during the week preceding the show.

18. Exhibitors must provide for the delivery of their articles upon the show ground. The Association cannot, in any case, make provision for their transportation, or be subjected to any expense therefor, either in their delivery at, or return from the grounds; all the expenses connected therewith must be provided for by the exhibitors themselves.

19. Articles not accompanied by their owners may be addressed to the care of the Superintendant of the exhibition, who will receive them on their being delivered at the grounds, but in no case will such articles be brought on the grounds and placed on exhibition, except by and at the expense of the owners or their authorised agents.

20. Exhibitors, on arriving with their articles will apply to the superintendent of the grounds, who will be stationed within the entry gate, and will inform them where the articles are to be placed.

21. Exhibitors will at all times, give the necessary personal attention to whatever they may have on exhibition, and at the close of the show take entire charge of the same.

22. No articles or stock exhibited will be allowed to be removed from the grounds, till the close of the exhibition, upon the delivery of the President's address on Friday afternoon, under the penalty of losing the premiums.

23. While the Directors will take every possible precaution, under the circumstances, to ensure the safety of articles sent to the exhibition, yet they wish it to be distinctly understood that the owners themselves must take the risk of exhibiting them; and that should any article be accidentally injured, lost, or stolen, the Directors will give all the assistance in their power towards the recovery of the same, but will not make any payment for the value thereof.

Steamboats, Railroads, Customs.

24. The Association will make arrangements with Steamboat and Railroad proprietors for carrying articles and passengers at reduced rates.

25. Arrangements will be made with the Customs department for the free entry of articles for competition.

Admission to the Grounds.

26. Tickets from the Secretary's Office will be furnished each person becoming a member previous to or on Saturday, September 19th, which will admit himself only, free to every department of the exhibition during the Show. Life members admitted free throughout the Exhibition.

27. No member's tickets will be issued after the above last mentioned Saturday evening, but those issued up to that time will be good to the close of the show.

28. Necessary attendants upon stock and articles belonging to exhibitors, will be furnished with admission tickets with their names written upon them, which ticket will be good at the *Exhibitor's Gate only*, during the show.

29. The admission fees to non-members on Tuesday and Wednesday, will be half-a-dollar, and on Thursday and Friday, a quarter-dollar, each time of entering through the gates.

30. Tickets of admission to those who are not members, will be issued on and after Tuesday morning, at 25 cents each,—two such tickets to be given up at the gate each time of admission, on Tuesday and Wednesday, and one such ticket on Thursday and Friday, in accordance with the above rates. Children under fourteen years of age, half price. Carriages to pay one dollar each admission; each occupant, except the driver, to be also provided with the usual admission ticket. Horsemen half-a-dollar.

Judges and their Duties.

31. The judges will be appointed by the council of the Association previous to the Exhibition, and will receive a circular informing them of the fact and inviting them to act.

32. The judges are invited to report themselves at the Secretary's office, presenting their circular of appointment, immediately on their arrival at the grounds.

33. The judges will meet, at the committee room on the grounds, on Tuesday, September 22nd at 10 o'clock, A. M., to make arrangements for entering upon their duties, and will then be furnished with the committee books containing the number of the entries in each class.

34. No person shall act as a judge in any class in which he may be an exhibitor.

35. In addition to the stated premiums offered for articles enumerated in the list, the judges will have the power to award discretionary premiums for such articles, not enumerated, as they may consider worthy and the Directors will determine the amount of the premium.

36. In the Fine Arts and Mechanical Department, Diplomas will be awarded—in addition to the money prizes—to any specimen evincing great skill in its production, or deemed otherwise worthy of such distinction, on its being recommended by the judges and approved of by the Committee to whom all such matters shall be referred.

37. *In the absence of competition in any of the Classes, or if the Stock or articles exhibited be of inferior quality the Judges are instructed to award only such premiums as they think the article deserving of.* They will exercise their discretion as to whether they will award the first, second, or *any* premium.

38. Each award must be written in a plain, careful manner, on the blank page opposite the number of the entry; and the reasons for the award should be stated when convenient.

39. No person will be allowed to interfere with the judges while in the discharge of their duties. *Exhibitors so interfering will forfeit their right to any premium to which they might otherwise be entitled.*

Delegates, the Annual Meeting.

40. Delegates and members of the Press are requested and expected to report themselves at the Secretary's office immediately on their arrival.

41. The Annual meeting of the Directors of the Association will take place on the grounds on Friday morning, Sept. 25th, at 10 o'clock.

42. Delegates from the County Societies desirous to obtain a portion of the Canada Company Prize wheat for their Counties, will please apply to the Secretary for it before leaving the exhibition, and take it with them from thence.

The General Superintendent.

43. The General Superintendent will have the entire supervision of the grounds and the arrangements of the exhibition. He will have an office upon the ground, where all persons having inquiries to make in relation to the arrangements will apply.

Paying the Premiums.

44. The Treasurer will be prepared to commence paying the premiums on Saturday, Sept. 26th, at 9 a. m., and parties who shall have prizes awarded them are particularly requested to apply for them before leaving Kingston, or leave a written order with some person to receive them, stating the articles for which prizes are claimed.

45. Persons entitled to cash premiums must apply for them at the Secretary's office, who will give *Orders on the Treasurer* for the amount.

46. These orders must be endorsed, as they will be payable to *order*, not to *bearer*, and on presentation to the Treasurer, properly endorsed, will be paid, either in cash or by a cheque on the Bank.

47. Orders for premiums not applied for on Saturday as above will be given by the Secretary, and the amount forwarded by the Treasurer, on receipt of proper instructions.

Miscellaneous.

48. Provender will be provided by the Association for live stock at cost price. For information Exhibitors will apply to the Superintendent of the grain and fodder department at his office.

49. Auctioneers will be on the ground after the premiums are announced, for the purpose of selling any animal or article which the owner may wish to dispose of, and every facility will be afforded for the transaction of business.

50. In case the Directors shall require any particular information in reference to animals or articles taking first prizes, the owners will be expected to transmit it when requested to do so.

PROGRAMME FOR THE WEEK.

1. MONDAY, Sept. 21st., will be devoted to the final receiving of articles for exhibition, and their proper arrangement. None but officers and members of the Association, judges, exhibitors, and necessary attendants will be admitted.

2. TUESDAY, 22nd. The judges will meet in the Committee Room at 10 A. M.. and will commence their duties as soon as possible afterwards. As soon as they have made their awards, they will report to the Secretary and will then be furnished with the prize tickets which they are requested to place on the proper articles before dispersing. Non-members admitted this day on payment of 50 cents each time.

3. WEDNESDAY, 23rd. The judges of the various classes will complete their awards, and will place all the prize tickets if possible. Admission this day the same as yesterday.

4. THURSDAY, 24th. All the remaining prize tickets not yet distributed by the judges will be placed upon the proper articles this morning, before 9 o'clock, if possible. The public will be admitted this day on payment of 25 cents by each person, each time of entering.

5. FRIDAY, 25th. The annual meeting of the Directors of the Association will take place at 10 A. M., in the Committee Room. The President will deliver the annual Address at 2 P. M., after which the Exhibition will be considered officially closed, and exhibitors may commence to take away their property. Admission to-day the same as yesterday.

6. SATURDAY. 26th. The Treasurer will commence paying the premiums at 9 A. M. Exhibitors will remove all their property from the grounds and building. The gates will be kept closed as long as necessary. and none will be admitted except those who can show that they have business to attend to.

IMMIGRATION.

The subject of Immigration is one of paramount importance to Canada. It was thought at the beginning of 1862, that in consequence of the civil war raging in the United States, an enormous increase of emigrants would arrive in Canada from different parts of the British Isles and Europe. This expectation has not been borne out; the total number of emigrants arrived at Quebec, was 22,176 in 1862 against 19,923 in 1861, being an increase of 2,253, or 11·30 per cent.

With a view to devise means for attracting attention to the resources of this province among intending emigrants, a committee has, for some years, been appointed annually by parliament. The following report for 1863, is deserving of wide spread circulation :—

Report of the Select Committee on Emigration.

Legislative Council Committee Room,
May 6th, 1863.

The Select Committee appointed to take into consideration the subject of Emigration: and especially to report, from time to time, upon the best means of diffusing a knowledge of the great resources of this Province, so as to induce the influx of men of capital and manufacturing enterprise," beg leave respectfully to report,

That they regard the present as a most opportune moment for prosecuting this important enquiry, which ought to command a large share of the attention of the Government and the Legislature. No one can take even the most cursory glance at the past history of the progress of the United States or the Australian Colonies without perceiving the extraordinary extent to which the material growth of such countries has been promoted by the steady influx of a healthy emigration of men of industry, enterprise and capital; and it is well known that much of that immigration has been secured by the active measures adopted by those countries to circulate broadcast throughout Europe full information respecting their resources. They have well understood the art of advertising upon a large scale. They have rightly estimated the importance of keeping their claims prominently in view, of renewing and continuously distributing descriptive details of the chief attractions of their respective districts, and of the advantages offered to various classes of emigrants, until they have become subjects of general and absorbing interest; while to the faint and irregular efforts put forth by our Canadian Government to make known the resources of this rising country it may be attributed that we have for some years received so small a share of the stream of Emigration flowing from the Old World.

The Committee therefore conceive it to be their duty to press this consideration upon the Government and the Legislature, and to urge the adoption of a more vigorous policy in regard to this vital interest. Of all the Departments of the Government, there is not one entrusted with the charge of weightier interests than the Bureau of Emigration and Statistics, and it is strange that ever since the establishment of this new Portfolio, it does not appear to have been considered as one charged with heavy responsibilities like the other Departments, viz.: the Crown Lands, Public Works, or Finance. It has generally been filled up from political considerations, and we find the present Minister in his annual report observing "that it has been subjected more than any other to neglect, and its organization and internal discipline have been left in a condition so little efficient that the public have begun to question the utility of keeping it up under the special management of a member of the Government."

Can it be a matter of surprise that immigration should languish under such a state of things? Committees of the two Chambers may be appointed Session after Session, may investigate the errors and defects of past systems, elaborate the most comprehensive statements, suggesting broad principles of action, but after all this has been done, it rests with that Executive Department whether effect shall be given to the suggestions offered.

Our efforts to induce Emigration have been hitherto almost entirely and very properly confined to the influx of the laboring classes, to whose unswerving toil and endurance we chiefly owe the giant growth and prosperity of the Province, and it is deeply gratifying to learn how richly rewarded have been their labors: for we can traverse no county in the Province without finding thousands of families who, a very few years ago, entered the forest with the most limited means, but are now living under the happiest circumstances in a position of perfect independence, possessed of beautiful farms and surrounded by every thing to grace and adorn life. One cannot but regard with admiration and astonishment the marvellous changes which have been effected within the last quarter of a century by the great industry and enterprise of our people. Who can traverse at the present day the settled portions of this vast and fertile territory extending along the valley of the St. Lawrence, with its endless tributaries and those great inland waters, which, along with our complete Railway system, afford to the most remote settlements unparalleled facilities for trade, without feeling that our country still presents an unlimited field for enterprise.

When we regard the natural advantages of our geographical position, the capability of our territory to sustain a population at least fourfold what it is at present, the rapid introduction of improved systems of husbandry, the general state of well-being of our agricultural population, and the consequent increase of our wealth, we may truly say that Canada now presents attractions of no ordinary character, not only to agricultural labourers and mechanics, but also to men of moderate capital. Many men in Europe who have no definite profession or pursuit are living with little satisfaction upon the small rate of interest they receive at home from a capital of from £1,000 to £10,000; whereas here, with ordinary prudence and enterprise, they would soon secure to themselves and their families a position far more independent and satisfactory than they can hope to gain in the Old World. But it is necessary that your Committee should here observe in regard to that class of per-

sons, that Canada is not a country for mere men of pleasure; and that persons coming hither without sufficient means to tide over the first inevitable difficulties, retaining a small independent income, must be prepared to pursue a course of steady industry. If, however, they are active, energetic, and persevering, and wish to identify themselves with the higher interests of the Province, there is a noble field for their ambition. If their predilections lead them to choose commercial and industrial life, ample rewards await them, and if they give preference to agricultural pursuits, they can easily find beautiful and fertile locations which they can obtain upon easy terms—farms near railway stations, already planted with the choicest fruits, and in such a condition of advancement, as at once to secure to them the comforts of life in their greatest abundance. For their spare capital they can get, upon perfectly reliable securities, much higher rates of interest than they can obtain in Europe; but great caution must necessarily be observed in the selection of investments. To such classes, Canada now offers the greatest attractions, and interposes no obstacles to their attainment of the highest honors which society or the State has to bestow.

When we view the great increase in our population, now numbering upwards of two millions and a half, and rapidly increasing—regard the extent of the unemployed water-power upon our rivers—and then examine the trade returns which are herewith submitted, we cannot refrain from expressing the conviction that the greater part of those articles which we have been importing from the United States, may hereafter be advantageously manufactured in this Province. It is deeply gratifying to observe from the reports of our past Industrial Exhibitions, how rapidly our manufactures have been extending; and the Committee cannot but regard the present as a most auspicious moment for fostering many branches of industry, for the promotion of which we simply require manufacturing enterprise and skilled labor.

When we look at the vast amount of capital in Britain seeking investment, and perceive that the unhappy struggle still pending between the Northern and Southern States has thrown out of employment a large portion of the skilled labor of Europe, from the interruption of one of the leading branches of industry,—when we further consider that this deplorable war must necessarily at its termination leave our neighbors surrounded by overwhelming financial and other difficulties, taxing all their industries to the utmost—we cannot but feel that our own rising Province will be in a comparatively highly-favored position, offering attractions to all classes of emigrants.

The Committee would therefore represent the urgency and importance of the most strenuous efforts being put forth by the Government to obtain full and reliable information in regard to the vast and latest resources of the Province, with the view of diffusing the same widely throughout Europe, as well as throughout the other portions of this continent. The committee have endeavored, in the mean time, to elicit the opinions of many of our own enterprising and successful settlers in regard to this subject, which they now have the honor to submit to the House, begging only to observe, that from the limited time granted to them at this late period of the Session, those gentlemen to whom we are indebted for the communications herewith appended, have only been able to state their views in a hurried manner. In subjoining, also, extracts from certain articles published under the authority of the Board of Arts and Manufactures for Upper Canada, your Committee have pleasure in bearing testimony to the admirable manner in which that Journal is conducted, and to the important bearing it may have upon this great interest.

It is further proper that they should bear their testimony to the valuable services rendered to the country by Mr. Hope, to whom they are indebted for many excellent suggestions.

In conclusion your Committee beg leave to submit the following resolutions:

1st. That the Government should endeavour to obtain, through the Board of Arts and Manufactures or other channels, full statistical returns of the progress of all branches of industry, and detailed information regarding the present position and probable extension of existing manufactures, the field which is now open to enterprise and capital, and the best manner in which that field can be occupied.

To obtain this, it would be necessary that some additional appropriation should be made for that special object.

2nd. That in view of the necessity for having some medium of communicating full and perfect information of the resources of Canada, to the inhabitants of Europe and the United States, it would be desirable that a Journal should be published at stated intervals, for that special object, regularly transmitted to the leading papers and reviews of various countries, to members of the Imperial Parliament known to take an interest in Canada, to the Sheriffs of Counties throughout Great Britain, to the Chairmen of Quarter Sessions, Farmers' Clubs, Commercial Rooms, the Chairmen of the Poor Law Unions, the Imperial Emigration Agents, and especially to all those officially connected with the Emigration Societies now established in Europe.

3rd. That the interests of the Province are now such as to make it desirable that we should have a permanent Colonial Agent in London, who should be a person of talent and influence, having an intimate knowledge of our whole progress and position, whose whole energy and attention would be devoted to our emigration and other interests. Through him access could be obtained to the Press and other channels of communication, and the attractions and advantages of the country made generally known. His office should be regularly furnished with pamphlets, statistics, local maps, and the French and English reports of all descriptions published by our Provincial Legislature.

All of which is respectfully submitted.

GEORGE ALEXANDER,
Chairman.

Safety Plugs.

In France every steam boiler is required by law to be furnished with a safety plug of fusible metal It is composed of tin, 3 parts; lead, 2; bismuth, 4 parts.

LETTER FROM WM. EDWARDS, ESQ.,

Secretary to the Board of Arts and Manufactures for Upper Canada.

Board of Arts and Manufactures for U. C.,
Toronto, April 10th, 1863.

To Hon. Geo. Alexander, Chairman of the Committee of the Legislative Council on Immigration.

Sir,—In compliance with your request, I herewith mail you several numbers of the Journal of this Board, containing articles more or less bearing on the industrial arts of the Province, some of which may be interesting in connection with the subject of immigration, now engaging the attention of your Honorable Committee.

The article in the *Journal* for October, 1861, is a history of the "Agricultural Association of Upper Canada," and its "Annual Exhibitions," and is both interesting and valuable, as marking the progress made in agriculture, arts and manufactures, for the last sixteen years; and affording a correct index to the intending emigrant of the facilities of this Province for sustaining a large and rapidly increasing population.

The other articles referred to are in the numbers respectively, for July, 1862, "Home Manufactures *versus* Imported Articles;" for August, 1862, "The use we make of our Mineral Resources;" October, 1862, "Canadian Manufactures and Obstacles to their Progress;" February, 1863, "The Importance and Wealth of our Forests;" March, 1863, "Immigration;" and proof sheets for April, 1863, on "Canada a field for Capital and Manufacturing Enterprise."

I have to regret not being in a position to furnish reliable information in regard to the various manufactures now carried on in this part of the Province, and the extent to which they might be increased, or new branches profitably introduced. It is by the strictest economy that this Board, with its annual grant of but $2,000, has been enabled to establish and maintain its valuable Free Library of Reference; to sustain an annual heavy loss in the publication of its *Journal*, and to meet rent of rooms and other contingent expenses.

If a small annual appropriation were made to this Board, I have no doubt but that a large mass of valuable information regarding the present position and future extension of existing manufactures —the field which is now open to enterprise and capital—and the best manner in which that field could be occupied—might be obtained. To collect this information it would be necessary to send a competent person through the country, to collect facts and put them into proper shape ready for publication, under precise instruction from this Board; and for such service a sum of not less than $1,000 would be required. The information thus obtained might be published, free of cost, in the pages of the *Journal*, and ought to be equal in quantity to at least one hundred of its pages in each year.

I would beg to refer, as merely suggestive to your mind, to a few of what ought to be staple manufactures of the country, and of which the present supply by our own manufacturers falls so far short of the demand.

Of boots, shoes and other leather manufactures, we imported in 1861 to the amount of $268,738; of woollen manufactures, hosiery, carpets and clothing, $4,661,821; of cigars and manufactured tobacco, $354,494; of wood manufactures, $100,604; of musical instruments, $139,766; of machinery and steam engines, $156,158; of iron and hardware, $1,489,645; of carriages, cordage and cabinet ware, $163,761; of confectionery, candles, pickles, sauces, preserved meats, soap, starch and vinegar, $191,040; amounting in the aggregate to $7,526,027.

Some of the articles enumerated can at present only be manufactured here profitably to a limited extent—such as musical instruments, machinery, hardware, and the finer kinds of cloth; but of the remainder there are few which might not be produced with advantage and profit, not only for home consumption, but many of them for exportation also, if a sufficient supply of surplus capital and skilled labor of the mother country were introduced amongst us. The high price of coal for manufacturing purposes is undoubtedly a serious drawback, but our water power and supplies of wood fuel are enormous, and go a long way in meeting objections as to the high price of coal.

The Board of Trade for the City of Toronto in their last annual report remark:—"It is also gratifying to note the steady progress and improvement which is being made in the manufacture of woollen cloths by our Canadian manufacturers, whose productions are fast superseding English and foreign goods of a similar description." If more skilled labor and machinery could be introduced, the very large demand for this class of home manufactured goods, and also for hosiery and all kinds of knitted woollen fabrics, would be enormously increased; and that in proportion as immigration shall increase the population, so will the demand for home manufactures be also increased; and in proportion to the increase of manufactures and of a manufacturing population, so will agriculture also prosper. The agriculturist and the manufacturer are a mutual aid to each other, and the nearer they are brought together the better for both.

I have the honor to be, Sir,
Your most obedient servant,
Wm. Edwards, *Secretary.*

India-Rubber Manufactures.

The quantity of caoutchouc (india-rubber,) in its raw or manufactured state, imported into the United Kingdom in 1861, was 57,834 cwts., the value of which was £435,923. Of this quantity, Brazil sends 59,042 cwts.; British India 14,050 cwts.; Fernando Po, 1,000 cwts.; and all other countries 3,286 cwts. The price of this commodity varies from £6 5s. 2d. to £3 8s. 1d. per cwt. Of caoutchouc in its manufactured state, the chief items are overshoes and boots, which show a total of 743,535 lb., valued at £41,311—the price ranging frem 1s. to 1s. 7d. per lb. Of that quantity Hamburg contributed 289,079 lb.; Hanover, 291,289 lb.; France, 110,328 lb.; United States, 14,208 lb.; British North America, 15,629 lb.; and all other parts, 4,702 lb. Of other descriptions of this manufacture the quantity imported was 116,611 lb. valued at £12,441, the principal portion whereof came from Hamburg, Belgium, France, and the United States.

Board of Arts and Manufactures

FOR UPPER CANADA.

The advertisement department of this Journal, commencing with the No. for July, has been placed in the hands of Mr. Rodd, of 79 King Street West, Toronto, who will receive all communications in relation thereto; all other communications to be addressed to the Secretary of the Board as usual. The increasing circulation of the Journal cannot fail to command a corresponding result from the advertising public.

EXAMINATIONS FOR 1863.

The January number of this Journal for the year 1861, contained a programme of examinations established by this Board, in various subjects; the object being to encourage and reward by certificates of merit, efforts made by the industrial classes for self-improvement.

These examinations are open to all members of incorporated Mechanics' Institutes or Library Associations in Upper Canada, who are not students of any college, graduates or under-graduates of any university, or certified school teachers; or who are not following any of the learned professions.

This year but seven candidates have presented themselves. The number is small, but now that a beginning has been made, and the benefits to those who avail themselves of them are being appreciated, we may fairly anticipate that they will grow in importance, and that year by year the number of candidates will largely increase.

The subjects taken up this year, and the Examiners therein, are:

English Grammar and Composition—M. C. Howe, LL.D., Toronto Grammar School.

Arithmetic—M. Barrett, M. A., M. D., U. C. Coll.

Book-Keeping—J. H. Mason, Esq., Toronto.

Drawing—W. G. Storm, Esq., Toronto.

Penmanship—W. R. Orr, Esq., Toronto.

Committee of Management—Rev. Professor W. Hincks, F. L. S., and Professor G. Buckland, University College, Toronto; and Professor H. Y. Hind, M. A., Trinity College, Toronto.

Certificates Awarded to Candidates.

No. 1. Woodsworth, Richard, aged 16, Toronto Mechanics' Institute Class; Clerk—Grammar and Composition—3rd Class Certificate.

2. Lewis, Richard, aged 16, Tor. Mech. Inst. Class; Pupil Grammar School—Grammar and Composition; 1st Class Certificate.

4. Woodsworth, Richard, aged 16, Tor. Mech. Inst.; Clerk—Arithmetic.; 2nd Class Certificate.

5. Graham, Wm., aged 24, Tor. Mech. Inst. Class; Carpenter—Arithmetic; 3rd Class Certificate.

6. Milne, John Alex., aged 24, Tor. Mech. Inst. Class; Salesman—Book-keeping; 2nd Class Certificate.

7. Charles, George, aged 18, Tor. Mech. Inst. Class; Wood Carver—Drawing; 3rd Class Certificate.

8. Rogers, Charles, aged 19, Tor. Mech. Inst. Class; Carver—Drawing; 3rd Class Certificate.

In the July No. we will embrace the opportunity which this subject affords for explaining more at length the object which the Board has in view in instituting these annual examinations, and show the extent to which a similar work is carried on in the mother country and the excellent results which have already arisen from it. To indicate the care taken in conducting the examinations, and the relative value of the certificates granted we subjoin the questions on different subjects which were submitted by the Examiners to the candidates, and the "Advice to Candidates" in reference thereto.

EXAMINATION FOR 1863.

The Examinations in English Grammar and Analysis, Arithmetic and Book-Keeping, were held on the evenings of June 3rd and 4th, from 7 to 10 o'clock.

Advice to Candidates.

Note the day and hours appointed for the subject in which you wish to be examined. Be at your seat in the Examination Room *five minutes before the hour appointed* for the Paper which you are to work.

When the paper is given to you, read the questions carefully over, marking those which you think you can answer best. Do them first, and if any time remains, try some of the others, but do not exceed the number of questions appointed to be answered. Remember, that a few accurate and sensible answers will gain a higher number of marks than a great number of indifferent attempts.

As soon as notice is given (10 minutes before the end of the time) finish your Papers, see that they are are numbered rightly and in their proper order, fasten them together at the upper left-hand corner, and leave them UNFOLDED at your seat.

Each Candidate will have a number, which he must affix to his Papers when completed. The

name of the candidate is not to appear on his Paper in any case.

Caution.

No Candidate may speak to another Candidate, on any pretence whatever, under pain of immediate expulsion.

If a Candidate has any question to ask, or wants anything in the course of the Examination, he should not leave his place, but *should stand up and call out his number*, when some one will attend to him.

No Candidate will be allowed to resume the working of a Paper after he has once left the room in the course of the time appointed for that Paper.

Any Candidate detected in taking unfair advantages, such as referring to any Book, or Written Paper, or in seeking or receiving assistance from another, will be immediately expelled.

Whoever gives assistance will be treated in the same manner as he who receives or asks for it.

Stationery, including blotting-paper, will be furnished by the Committee, for the use of the Candidates. No one can be permitted to bring any book, paper, or other thing into the Room with him, except an inkstand and a supply of pens.

The Papers should be carefully and neatly written.

Ill-spelt Papers will be rejected by the Examiners.

EXAMINATION QUESTIONS.

English Grammar and Analysis.

1.—What is the difference between a Grammatical and Logical subject?

2.—What is the Predicate in a sentence and of what does it properly consist?

3.—In the following sentence point out the Grammatical and Logical Predicates, and show whether the Predicate is simple or compound. Show its extension (if any).

"Cæsar conquered the Gauls but was himself slain by Brutus on the Ides of March."

4.—Define the term "Subjunctive Mood." Give other names for it and state the condition of the verb in the second clause, when the first verb has an Indicative and when it has a Subjunctive meaning.

5.—What Adjectives admit of comparison? Give examples of Adjectives with a *positive* form but a *superlative* meaning and state what is meant by the "Superlative of eminence."

6.—Give examples of Adjectives used as Nouns and Nouns as Adjectives.

7.—When do Intransitive verbs govern an Objective, and when do they assume a passive form?

8.—Give six adverbs (each) expressive of *time, place, quantity, quality* and *manner*, and give examples of Adverbial phrases.

9.—Divide the following passage into sentences, paying due attention to Punctuation and Capitals: "after the student for the church has completed his college course he applies for orders to the presbytery within whose bounds he resides he is taken on trial by that church court he is examined in all the branches he has studied at college and is required to compose and read to the presbytery five or six discourses."

10.—Convert into other forms (retaining the same signification) the sentence, "Believe in the Lord Jesus Christ and thou shalt be saved." Parse the word *retaining*, as employed in the question.

11.—Distinguish between a *Nominative Absolute* and a *Nominative Independent*. What other name may you give the latter term?

12.—Analyze the following expressions:—

A. "Generally speaking, they were very civil."

B. "Considering their means, they lived very comfortably."

C. "To say the least of it, you acted imprudently."

13.—Correct the errors (if any) in the following sentences: "Their own affairs were quite satisfactory to every one." "They were both unfortunate, but neither of them were to blame."

14.—Parse the italicized words in the following expression: "He was such *as* I had ever known him." "It is *as* broad *as* it is long." When do we use *as* followed by *as*, and when do we use *so*, followed by *as*?

15.—Derive the words, *Heaven, smith, birth, tricial*, and *candidate*.

SUBJECT FOR COMPOSITION.

"Home influence in the education of youth."

Arithmetic.

1. Simplify $\left\{ 2\tfrac{3}{4} + \tfrac{5}{6} \text{ of } \frac{7}{3\frac{1}{5}} - \frac{1\frac{2}{3}}{2\frac{1}{2}} \right\} \div 1\frac{77}{228}$

2. Find the vulgar fractions equivalent to the recurring decimals $85.60\dot{8}0\dot{6}$; $3.6\dot{4}2857\dot{1}$; $127.000220\dot{3}\dot{6}\dot{4}$.

3. Express $\frac{1}{2}$ $(6\frac{1}{2} + 2\frac{2}{3} - 3)$, $\frac{8}{31}\frac{9}{25}\frac{7}{25}\frac{8}{25}$, and also the product of $3\frac{5}{8}$ and $(3\frac{1}{4} - \frac{2}{3})$ of $\frac{5}{7}$ as decimals.

4. Express the sum of $.4\dot{2}8571\dot{4}$ of £15, $\frac{1}{4}$ of $\frac{1}{2\frac{5}{7}}$ of $\frac{5}{6}$ of £1 12 0 and $\frac{4}{7}$ of 3d., as the decimal of £10.

5. A block of stone is 2 yds. 1 ft. 3 in. long, 1 ft. 7 in. broad, and 2 ft. thick; find its solid contents and its value at $2.25 per cub. ft.

5. A clock which is 4 minutes $8\frac{3}{12}$ seconds too fast at half-past nine, a. m., on Tuesday, loses 2 min. 45 sec. daily; what will be the time indicated by the clock at a quarter past five, p. m., on the following Friday.

7. If 560 flag-stones, each $1\frac{1}{2}$ feet square, will pave a court-yard, how many will be required for a yard twice the size, each flag-stone being 14 in. by 9 in.?

8. At $7\frac{1}{2}$ per cent. what will be the cost of insuring property worth $500, so that in the event of loss the worth of the goods and the premium of insurance may be recovered?

9. A person lays by $230 at the end of each year, and employs the money at $6\frac{1}{2}$ per cent., compound interest; what will he be worth at the end of 3 years?

10. Extract the square root of .0365 to five places of decimals.

11. Find the square rootof $\frac{5}{7}$. to 6 places of decimals.

12. Extract the cube root of 95143993.

Book-keeping.

1. What is the distinguishing principle of the double entry system as compared with that of single entry?

2. What description of errors are prevented or detected by the double entry method, and to what kind of errors does it afford no check?

3. Name the principal books required in double entry for the most simple ordinary business.

4. Name the subsidiary books generally required for a similar business.

5. Prepare specimens of the foregoing principal and subsidiary books, and state the use and purpose of each.

6. Assuming that all accounts may be divided in "Personal" and "General," or "Impersonal," what does each of these classes of accounts properly represent?

7. Name the ordinary "General" or "Impersonal" accounts and the particular object of each.

8. Journalise in proper form entries of the following transactions:

William Robinson commenced business with a capital of $10,000, consisting of

Cash	$2,000	
James Smith's Promissory Note	5,000	
Stock of Groceries, as per Inventory	5,000	
		$12,000
Less the following liability:		
His acceptance of Brown, Bros. draft	$2,000	
Total	$10,000	

Purchased of Joseph Robinson & Co., 30 hhds Sugar, 385 cwt. @ $8 per cwt		$3,080 00
Purchased of Boyd & Arthurs, 30 chests Tea, 2597 lbs., @ 60 cts. per lb		1,558 20
Sold to Peter Lenfestey, 1 hhd. Sugar, 11 cwt. @ $12 50 per cwt.		137 50
Paid cash to Boyd & Arthurs		1,000 00
Accepted Joseph Robinson & Co.'s draft at 3 months, due 4th April		3,080 00
Sold to Wm. Horton, 5 chests Tea, 313 lbs., @ at 75 cts. per lb		234 75
Received cash of Peter Lenfestey, on account		100 00
Received Wm. Horton's note at 4 months, due 4th June		234 75

9. Post the foregoing transactions to their appropriate Ledger accounts.

10. What is the object of a Trial Balance?

11. What account shows the gain or loss sustained by a merchant on his business?

12. What facts are entered respectively to the debit and credit side of the Profit and Loss account, and what does the final difference of that account exhibit?

13. How is the balance of the Profit and Loss account disposed of?

14. How are ascertained bad debts and expenses disposed of?

15. How are unascertained or estimated losses and deductions brought to account in the books? Give the form of the Journal Entries required in answering the three previous questions.

16. What constitutes the balance of the merchandise and stock accounts respectively?

17. What should a Balance Sheet exhibit?

A Musical Bed.

Foreign journals speak of an invention just produced in Germany—namely, a musical bed, so constructed that, by means of a concealed piece of mechanism, the pressure of the body produces the softest harmony, which lasts long enough to lull one to sleep. At the head of the bed is a dial with a hand, which can be placed at whatever hour the person wishes to awake; and at the time fixed the bed plays a march of Spontini, with drums and cymbals, loud enough to wake the soundest sleeper.

Railway Carriages.

It is asserted that the largest carriage manufactory in the world is that of a Berlin company formed for the supply of railways. Last year it is said to have employed 1,552 men, and to have made sales to the amount of 1,815,489 thalers (about £270,000).

BOOKS ADDED TO THE FREE LIBRARY OF REFERENCE.

Shelf No.		
F 53	Concise History of the Int. Exhibition of 1862: it rise and progress	*J. Hollingshead.*
H 52	Field and Garden Vegetables of America; containing full descriptions of nearly eleven hundred species and varieties; with directions for propagation, culture and use. 1 vol., 8vo., 1863	*Fearing Burr, jr.*
H 53 & 4	Prehistoric Man; Researches into the Origin of Civilization in the Old and New World. 2 vols., 8vo., 1862	*D. Wilson, LL.D.*
I 67	Catalogue of Provincial Exhibition, Montreal, on occasion of visit of H. R. H. the Prince of Wales; and Prizes awarded. 1860.	
I 74	Canada: by A. T. Galt, 1849 to 1859; Caird's Slanders on Canada Refuted; Canadian Manufactures—a Lecture; Canada, a brief outline of, official; "Credit Foncier" Bank Scheme; Homœopathy; Middle Class Education; Prize Essay, by C. W. Cooper; Address, Highgate Literary Institute; and Association for Protection of Canadian Industry—*Bound pamphlets.*	
I 75	Manual of Geology; treating of the principles of the Science, with special reference to American Geological History. Illust. 1 vol., 8vo., 1863	*J. D. Dana.*
L 35	Metals in Canada; a Manual for explorers, containing instructions in searching for and testing the value of ores, with special reference to Canada. 12mo., 1861	*Willson & Robb*

Donated.

T, S	U. S. Patent Commissioners' Report on *Mechanics* for 1860, 2 vols; and on Agriculture for 1861, 1 vol., 8vo.: being in continuation of works on the shelves	*Com. Pat., U. S.*
"	Proceedings Institution of Mechanical Engineers, Manchester, July, 1862	*By Managers.*
	Smithsonian Institute; Annual Reports of the Directors, 1853 to 1855, and 1857 to 1861. 8 vols., 8vo	*Smiths'n Institute*
"	Do.; Miscellaneous Collections. Vols. I to IV, 8vo., 1862	
	Vol. I.—Directions for Meteorological Observation, &c.; Psychrometrical Table for determining the force of Aqueous Vapour, &c.; Tables—Meteorological and Physical.	
	Vol. II.—The Chemical Arts; The Electro-Magnetic Telegraph; Catalogue of N. A. Indians and Scenery; Catalogue of American Birds, Reptiles and Shells; Preserving Specimens of Natural History; Circular to Hudson's Bay Co.; Instructions in collecting Eggs, Birds, Grasshoppers, and Shells; Relationship between different Nations.	
	Vol. III.—Catalogue of the described Diptera, Lepidoptera, and Coleoptera of North America; Catalogue of Publications of Societies.	
	Vol. IV.—Synopsis of the described Neuroptera, and Lepidoptera of North America.	
T, S	Meteorological Report to the Senate of the U. S.; by Prof. S. P. Espy; 4to., 1857	*Smiths'n Institute*
"	Results of Meteorological Observations, made under the direction of the U. S. Patent Office and the Smithsonian Institution, from the years 1854 to 1859, inclusive. 4to., 1861	*Smiths'n Institute*
F 51 to 53, I 65 to 73, L 35	Twenty-three London International Exhibition Catalogues of Articles and Products, exhibited by the United Kingdom, India, Austria, the Zollverein, Jamaica, New South Wales, Trinidad, Russia, France, Belgium, Victoria (Australia), Prussia, Venezuala, Portugal, Sweden, British Guiana and Spain; and eleven pamphlets on the Natural and Industrial Resources and Statistics of Victoria, Wisconsin, South Australia, Tasmania and Hungary. 1862	*C. Com. to Int. Ex.*
	Three large Photographic views of Canadian Department of London International Exhibition. 1862	" "

BRITISH PUBLICATIONS FOR APRIL.

Appleby's Illustrated Hand Book and Price Current of Machinery, 8vo	0	2	6	*Spon.*
Arctic Discovery and Adventure, by author of "Brazil and its People," &c., roy. 18mo	0	3	6	*Rel. Tract Soc.*
Bates (Hon Walter) Naturalist on the River Amazons, 2 vols., post 8vo	1	8	0	*Murray.*
Beeton's Dictionary of Universal Information, vol. 2, Co-In, 8vo	0	6	0	*Beeton.*
Benfey (Theodor) Practical Grammar of the Sanscrit Language, 8vo	0	7	6	*Trübner.*
Bray (Chas.) Philosophy of Necessity; or, Natural Law applic to Moral Science, 2 e., 8vo	0	9	0	*Longman.*
Brenin (Justin) Composition and Punctuation familiarly explained, 12th e., 12mo	0	1	0	*Virtue.*
Buckmaster (J. C.) Elements of Chemistry, Inorganic and Organic, 2nd e., 18mo.	0	3	0	*Longman.*
Calvert (F. Crace) Lectures on Coal Tar Colors, with Specimens, 8vo	0	2	0	*Trübner.*
Cassell's Popular Natural History, Illustrated, in 2 vols., imp. 8vo., 2 vols., each.	0	15	0	*Cassell.*
Cruchley's County Atlas of England and Wales, roy. 8vo., plain 6s., col.	0	8	0	*Cruchley.*
Disraeli, the Author, Orator and Statesman, by John Mill, post 8vo	0	7	6	*Darton & Hodge*
Emblematic Illumination: collected and edited by F. M. R., 3rd edit., sm. 4to	0	5	6	*Day & Son.*
Fisher (Lt.-Col., C. B.) Personal Narrative of Three Years' Service in China, 8vo.	0	16	0	*Bentley.*

Gumpach (J. Von) On the Historical Antiquity of People of Egypt, 8vo	0	8	6	*Dulau.*
Hedderwick's Miscellany of Instructive and Entertaining Literature, vol. 1, r. 8o.	0	3	6	*Hedderwick.*
Hibbard (Shirley) Profitable Gardening: a Practical Guide, sm. post 8vo.	0	3	6	*Groombridge.*
Howe (Hon. Joseph) England's Relation with her Colonies	0	1	0	*Stanford.*
Lectures Delivered before the Young Men's Christian Association, 1862-63, c. 8vo	0	4	0	*Nisbet.*
Newberry (Robert) Gleanings from Ornamental Art of every Style, 4to	1	10	0	*Spon.*
Phear (J. B.) Elementary Hydrostatics, with Examples, 3rd edit., cr. 8vo	0	5	6	*Macmillan.*
Practical Mechanic's Journal (The) vol. 7, second series, 4to	0	14	0	*Longman.*
Ramsay (Prof. A. C.) Physical Geography and Geology of G. Britain: Six Lectures crown 8vo	0	2	6	*Stanford.*
Ridge (Benjamin) Ourselves, Our Food, and Our Physic, 3rd edit., sm. cr. 8vo	0	1	6	*Chapman & H.*
Scott (A. de C.) and James (Sir H.) Photo-Zincography and other Processes, 2nd edit., roy. 4to	0	12	0	*Longman.*
Thomson (Wm.) On the Cultivation of the Grape Vine, 3rd edit., 8vo	0	5	0	*Blackwoods.*
Traice (W. H. J.) Hand Book of Mechanics' Institutions, 2nd edit., 8vo	0	2	0	*Longman.*
Wayland (Francis) Elements of Moral Science, by G. B. Wheeler, 7th edit., f. 8vo	0	2	6	*Tegg.*
Wilme (Benj. P.) Handbook for Mapping, Engineering, &c., 2nd edit., 4to	2	0	0	*Weale.*

NEW AMERICAN PUBLICATIONS.

Annual of Scientific Discovery for 1863. 12mo	*Gould & Lincoln.*
Book-keeping by Double Entry; by Potter & Hammond	*Schermerhorn & Co*
Geological Evidences of the Antiquity of Man; with remarks on the origin of the Species. Illustrated	*Childs.*
Lectures on the elevation of the Laboring portion of the community; by Dr. Channing	*Crosby & Nichols.*
Moon, a series of twelve Photographs of; by A. A. Turner	*D. Appleton & Co*
Origin of Species; or the causes of the Phenomena of Organic Nature: Six Lectures to Working Men; by Thos. H. Huxley	"
Parlor Gardener: Treatise on house culture of Ornamental Plants, adapted to American use	*Tilton & Co.*
Races of the Old World: A Manual of Ethnology; by C. L. Brace	*C. Scribner.*
Sorgo; or the Northern Sugar Plant; by J. A. Hedges	*D. Applegate & Co*
Trips in the Life of a Locomotive Engineer	*J. Bradburn.*

Proceedings of Societies.

THE TORONTO MECHANICS' INSTITUTE.

The Annual Meeting of Members was held in the Music Hall of this Institute on Monday evening, the 11th of May, and was largely attended. The retiring President, Rice Lewis, Esq., occupied the chair.

A communication was read from the Secretary of the Montreal Mechanics' Institute, stating the intention of its Members to visit Toronto during the ensuing summer.

Moved by Mr. W. Edwards, seconded by Mr. W. Halley, and

Resolved.—That the members are pleased to hear of the intended visit of the members of the Montreal Mechanics' Institute to this city during the ensuing summer; and do hereby cordially invite them as guests at a Conversazione, to be held in the rooms of the Institute on such evening during their stay as may be convenient for them.—Carried unanimously

The report was read by the Secretary, of which we give the following summary:

MEMBERSHIP.—The number of members at the date of the last report was 745; subscribers, 143; honorary members, 18; life members, 83; total, 989. The total number of members and subscribers at present is 1,061. The rates of subscription are as follows: Members, $2 50 per annum. Subscribers: Ladies, and youths under nineteen years of age, 75 cents per quarter, or, $2 00 per annum; Gentlemen, per quarter $1. 00.

FINANCES.—Receipts, from all sources $9,130 62; expenditure $8,921 84; balance in hand $208 78. Appendix B of the report contains a full statement of the assets and liabilities of the Institute to the 30th April, which are briefly thus: Available assets, $591 89; liabilities, exclusive of loan on building and ground, $2,221 26; excess of such liabilities over available assets, $1,629 57. The floating liabilities have been reduced during the year by the amount of $240 97. The Report also recommended that in future no liabilities should be incurred by the Directors, until the same shall have been submitted to the Finance Committee, for their report thereon.

LIBRARY.—The total number of books, according to last annual report, was 5,067; additions during the year 498; periodicals which have accumulated in reading room, and having been bound transferred to library, 53; donations, 24; total, 5,642; being an addition of 575 volumes during the past year. In the Reading Room, the number of British journals and magazines received, 38; American, 15; Canadian newspapers, 9; periodicals gratuitously furnished during the year by various publishers and other gentlemen, 37; total, 99.

CLASSES.—These have been fully referred to in the Journal for *February* and *May* for the present year

THE CHESS CLUB.—This Club had some time ago a membership of between 50 and 60, but has lately dwindled to about 30 regular members. This is attributed

to the fact that at the commencement of the Club the Directors were unable to give the members a room for permanent occupation, but now that a comfortable apartment has been furnished them, it is hoped that ere another year has closed this Club will be in a more prosperous condition.

Re-unions.—These meetings have been held every alternate week and proved quite a success. The first two of these re-unions were held in the Lecture Room. That department was insufficient to accommodate all who came, and latterly the Music Hall has been required for this purpose. These re-unions, together with the classes inaugurated during the winter season, have been the most successful features of the institution.

The Secretary.—The Directors feel it their duty to express their entire satisfaction with the manner in which Mr. Longman, the secretary, has discharged his multifarious duties since his appointment. The account books and papers of the Institute have been neatly and accurately kept, and the various departments have been admirably managed by him during that time. They are happy to state, that they have found him in every respect a very efficient officer.

The Report was then moved, seconded, and unanimously adopted.

The Report of the Auditors, showing the accounts of the Institute as having been kept in a very satisfactory manner, was submitted.

It was then moved by Mr. Walter S. Lee, seconded by Mr. F. W. Coate, and

Resolved,—That the thanks of this meeting are due, and are hereby tendered to Mr. Charles Robertson and Henry Joseph, for the valuable services they have rendered the Institute in auditing the accounts of the past year.

Scrutineers of the ballot were appointed, and the following members elected office-bearers for the ensuing year:—

President—William Edwards.
1st Vice President—C. W. Bunting.
2nd Vice President—W. H. Sheppard.
Treasurer—John Cowan.

Directors.

R. J. Griffith.	H. E. Clarke.
F. W. Coate.	William Hamilton, jr.
Rice Lewis.	Robert Freeland.*
W. Halley.	George Carroll.
Richard Lewis.	H. Langley.
John J. Withrow.	Daniel Spry.

Mr. Carnegie then gave notice that at the next quarterly meeting he would, in accordance with the suggestion of the Auditors in their Report, move that the office of Treasurer be combined with that of the Secretary for the time being.

* Mr. Freeland subsequently resigned, and Mr. J. H. Richey was appointed in his stead.

Mr Edwards gave notice that at the next quarterly meeting he would move an addition to the bye-laws, to the effect that the retiring President shall not be eligible for re-election until at least one year shall have elapsed after the expiration of his year of office.

Resolutions of thanks were voted to the retiring *office-bearers;* to the scrutineers of the ballot; to donators of publications to the Reading Room; to the teachers of the various Classes conducted during the past winter; to Col. W. B. Jarvis for a copy of the *York Observer* published in October 1823, and presented to the Meeting; and to the ladies and gentlemen who gave their valuable assistance at the several re-unions held during the winter.

The meeting then adjourned.

Correspondence.

To the Editor of the Journal of the Board of Arts and Manufactures.

Toronto, May 13, 1863.

Dear Sir,—Can you or any of your readers inform me if there is in the Canadas, and in what city or town, a manufactory for galvanizing Iron. If there is not, perhaps some of your correspondents will kindly inform me the best and cheapest method now adopted for galvanizing or coating cast iron with zinc.

Another question I wish answered, viz: If there is any composition made for preventing iron from rusting, if coated upon iron, so that any damp clothes may come in contact with such composition without injuring the article.

Yours respectfully,
A Patentee.

To the Editor of the Journal of the Board of Arts and Manufactures.

Sir,—In the December number of your interesting and valuable monthly, you published a lecture delivered before the members of our Institute upon the occasion of the organization of our Classes, by Mr. Richard Lewis. My impression at the time was that many gentlemen had been brought from a great distance, heavily feed, advertised in large type, and introduced to Toronto audiences as the great so and so, who could not begin to compare with him, one of our own citizens. I do not know, not having consulted him, whether his responsible position would permit of his lecturing before other Institutions at a distance from Toronto, but my impression is, that, if he could be induced to do so, hardly anything would conduce more to their success, I know of but few as well acquainted with the requirements of men seeking an education, or of the means necessary to be employed to obtain it, than Mr. Lewis.

He has, moreover, the power to wield an influence over an audience superior to the majority of speakers. Let me refer you to the lecture before mentioned, such was the effect of it, that, in a very short time one hundred and fifty pupils joined the Classes, which, as you have reported from time to time, proved a great success, and that too in a city where the attempt to establish evening schools *free* had been given up as a total failure.

The first prerequisite in any undertaking is to begin right, how many Mechanics' Institutes have failed in consequence of beginning wrong? And how many now exist, only to drag out a miserable, profitless, lifeless existence because they either can not, or will not, arouse themselves to begin aright now. Permit me to suggest that, if Mr. Lewis could be induced to make a tour of the Province, and arrangements could be made for him to lecture before the various Institutes, with a view of putting them in the right track on the formation of classes, or of libraries, or in fact of Institutes, I have no doubt it would prove of lasting benefit to all.

Of course the Lecture season will not begin until about November, but now is the time to make arrangements.

Very truly yours,

MEMBER.

May 20, 1863.

To the Editor of the Journal of the Board of Arts and Manufactures.

SIR, — At the Annual Meeting of the Toronto Mechanics' Institute, held on Monday evening last, a letter was read by the Secretary, from the Montreal Mechanics' Intitute, to the effect that that body had under consideration the propriety of an excursion to Toronto sometime during the ensuing summer, probably in the month of July. The writer from the Montreal Institute, as I understood it, also suggested the propriety of the Toronto Institute getting up an excursion to the Falls at the same time, from which a profit might be made, inasmuch as the great majority of the Montrealers would naturally feel anxious to visit the great Cataract. Now, sir, I think it could be easily shown that the idea is both desirable and practicable, but as that is not my object in writing to you, and as it has been decided in the meantime to endeavour to entertain them in another way, let me throw out an idea in connection therewith. I have for a long time entertained the impression, that if the leading *spirits* of the various Institutes of the Upper Province could by any possibility be brought together, in some central locality, for the purpose of discussing matters of interest to all, for counsel, for encouragement and for united action, much, very much good might be the result. Here then is the opportunity. The Toronto Institute has agreed to entertain the excursionists from the Montreal Institute at a conversazione in their beautiful Music Hall, why not entertain delegates from all the Institutes at the same time? What is to hinder? Could any harm come of it? On the contrary, is it not more than probable that much good would result to all concerned?

I have always looked upon the Board of Arts and Manufactures as the centre around which the Institutes should cluster as the members of one body to its head, and submit this matter to you, as such, for your consideration.

S.

Patent Laws and Inventions.

ABRIDGED SPECIFICATIONS OF ENGLISH PATENTS.

2400. GEORGE DYSON. *Improvements in machinery for finishing and polishing circular metal rods, bars, and shafts: applicable also to the manufacture of metal tubes and pipes.* Dated August 29, 1862.

This machinery consists of a pair of rolls, set slightly at an incline, and each inclined in an opposite direction to each other, both rolls being driven in the same direction. The rod, bar, or shaft is introduced between guides and between the ends of the rolls, and at right angles or nearly so to the direction in which the rolls are driven; then upon the rolls being made to rotate through toothed gear, the rod, bar, or shaft is drawn between the rolls in a direction at right angles or nearly so to the circumference thereof, and is thereby rendered cylindrical, smooth, and polished.

2446. W. CLARK. *Improvement in the manufacture of colouring matters.* (A communication.) Dated September 4, 1862.

For the purposes of this invention the inventor takes equal parts of aniline, red and crystallized tolnidine, and heats them for five or six hours at a temperature not exceeding 324 deg. of Fahrenheit, and of not less than 270 deg., after which time a paste of a beautiful blue colour is produced, of a slightly violet hue. This raw paste contains besides the blue colouring matter traces of red which has not become changed, and also an excess of tolnidine. In order to purify it, he boils the paste with dilute sulphuric or muriatic acids which form salts very soluble in tolindine and red aniline, without injuring the blue. A mixture of one part of common muriatic acid with eight or ten parts of water is preferable for effecting this purification. The matters are boiled in the diluted acid until there is no longer any trace of red colour in the washing waters. The insoluble residue will be pure blue, which may be used for dyeing and printing.

2532. E. BALURFORTH. *Improvements in machinery employed in finishing textile fabrics, commonly called "raising gigs."* Dated September 15, 1862.

This invention consists in the application to raising gigs of a cylindrical brush placed in contact with the teasels on the swift, to which rotary motion is given at a greater surface speed than the surface speed of the said swift, and in the direction

of rotation thereof, by which means the flocks and dirt are constantly removed and prevented from accumulating on the teasels during the time the machine is in operation, thus avoiding the frequent stoppage of the machine for the purpose of cleansing the teasels, as heretofore.

CANADIAN PATENTS.

BUREAU OF AGRICULTURE AND STATISTICS, PATENT DEPARTMENT, *Quebec 14th March*, 1863.

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

ABIMELECH HILLMAN, Cabinet Maker, and NATHAN CAMPBELL, Furniture Dealer, both of the town of Stratford, County of Perth, for an improved Churn, to be called the "Prince Churn."—(Dated 22nd August 1862.)

JOHN ANGELL CULL, assignee of Edward Lefroy Cull, both of the City of Toronto, County of York, Gentleman, for an article styled the "Forest Cultivator,"—(Dated 6th October, 1862.)

HUGH MILLER, of the City of Toronto, county of York, Druggist, for an Illuminating Oil, to be called "Miller's Illuminator,"—(Dated 9th October, 1862.)

DAVID ALLEN ROSE, of the township of Ernestown, county of Lennox and Addington, Mechanic, for "An improvement of a Churn for making Butter,"—(Dated 10th October, 1862.)

CHARLES HENRY WORTMAN, of the township of Camden East, county of Addington, Mill-Wright, for a Force and Suction Pump, called "Wortman's Combined Force and Suction Pump,"—(Dated 17th October, 1862.)

JOHN MCCONNELL, of Cornwall, county of Wentworth, Tinsmith, for "A Shifting Hinge, Joint or Coupling,"—(Dated 17th October, 1862.)

JOSEPH COULTHARD, of the city of Montreal, pattern Maker, for "A Cross Angle Sliding Cog Combination Wheel,"—(Dated 18th October, 1862.)

D'ARCY PORTER, of the city of Toronto, county of York, Machinist, for "A Railroad Car Roof,"—(Dated 23rd October, 1862.)

MICHAEL ROBINSON, of the town of Oakville, county of Halton, Boot and Shoe Manufacturer, for an improved Boot Treeing Machine, to be known as "Robinson's Boot Tree,"—(Dated 23rd October 1862.)

CHARLES POWELL, of the township and county of York, Pump Maker, for "An Improved Double Action Swing Force Pump,"—(Dated 24th October, 1862.)

JAMES HILBORN, of the township of Reach, county of Ontario, Mill-Wright, for "A Door, Table and Counter Bell,"—(Dated 24th October, 1862.)

JOHN WILLIAM HENRY SCHNEIDER, of the township of Thorold, county of Welland, Gentleman, for "New and useful improvements on Straw or Hay Cutting Boxes,"—(Dated 24th October, 1862.)

D'ARCY PORTER, of the city of Toronto, county of York, Machinist, for "A Depillating Compound for Skins and Hides,"—(Dated 24th October, 1862.)

D'ARCY PORTER, of the city of Toronto, county of York, Machinist, for "A Wringing Machine,"—(Dated 25th October, 1862.)

THOMAS PRITCHARD, of the village of Aurora, county of York, Tanner, for "A Colouring Machine, to be used in the Tanning of Leather,"—(Dated 27th October, 1862.)

WILLIAM LINTON THOMPSON, of the township and county of Stanstead, Clerk in Holy Orders, for "A new and improved Window and Blind Fastener,"—(Dated 30th October, 1862.)

DAVID RODGERS, of the village of St. Eustache, county of Two Mountains, Trader, for "An Instrument for measuring unknown distances,"—(Dated 30th October, 1862.)

RICHARD LEWIS, of Melbourne, county of Richmond, Carpenter, for "New and improved Hanging Gates,"—(Dated 30th October, 1862.)

HENRY BOOTH, jun., of 77 Victoria Street, Toronto, County of York, Coppersmith, for "A Chimney for Coal Oil or other Lamps,"—(Dated 17th November, 1862.)

ELIJAH GLENDILLEN, of the township of North Dorchester, county of Middlesex, Cabinet Maker, for "A Washing Machine,"—(Dated 17th November, 1862.)

THOMAS MORRIS, of the town of Brantford, county of Brant, Blacksmith, for "Morris's Rail Repairing Machine,"—(Dated 25th November, 1862.)

ABIMELECH HILLMAN, of the town of Stratford, county of Perth, Cabinet Maker, for an improved Churn, to be called "Hillman's up and down self-acting rotatory reversible dash Churn,"—(Dated 25th November, 1862.)

EDWARD LOUNSBURY STILLWELL, of the village of Klineburgh, county of York, Cabinet Maker, for "A self-setting Rat Trap,"—(Dated 27th November, 1862.)

NATHAN CAMPBELL, of Stratford, county of Perth, Furniture Dealer, for "Certain improvements on the Prince Churn,"—(Dated 29th November, 1862.)

REVEREND J. LEACH, of Goderich, county of Huron, Clergyman, for "A non-freezing Printing Ink,"—(Dated 1st December, 1862.)

LEWIS PANNABAKER, of the township of Normanby, county of Grey, Farmer, for "A Grain Cradle Finger Adjuster,"—(Dated 1st December, 1862.)

WILLIAM RANDALL, of the township of Uxbridge, county of Ontario, Carpenter, for a new and useful improvement in Saw Mills, called "The Excelsior Saw Mill,"—(Dated 9th December, 1862.)

JOSEPH BRIKLEY, of the township of South Dorchester, county of Elgin, Yeoman, "for a self-acting Hand Loom,"—(Dated 9th December, 1862.)

WILLIAM MILLER, of the township of Markham, county of York, Yeoman, for "An improved geared box Churn,"—(Dated 10th December, 1862.)

EDWARD TRENHOLM, of Trenholmville, in the township of Kingsey, county of Drummond, Farmer and Miller, for a new and improved Apparatus, for cooling Grain, Coal or other articles kept in bulk on Shipboard or in Stores, to be called "Trenholm's Apparatus for Cooling Grain, Coal, &c.,"—(Dated 13th December, 1862.)

RICHARD JONES SHERROT, of the city of London, county of Middlesex, Carpenter, for "A Clothes Horse for airing and drying Linen or Clothes within doors,"—(Dated 16th December, 1862.)

WARREN MILLAR, of the city of Montreal, Sewing Machine Agent, for "A new and useful loop check in Sewing Machines using a rotating hook,"—(Dated 16th December, 1862.)

PETER ROTHWELL LAMB, of the city of Toronto, county of York, Manufacturer, for a machine to be called "Lamb's Cutting, Flanging, and Embossing Machine,"—(Dated 19th December, 1862.)

Selected Articles.

UTILISATION OF SEWAGE.

From a chemical point of view the sewage question has long been definitively settled. There is no doubt of the immense intrinsic value of the manure constituents of sewage which are annually wasted under the present system of disposing of it. Nor is there any less doubt that, under this system, those valuable constituents are distributed through such a disproportionately vast mass of water, that it is entirely out of the question to think of turning them to any profitable account in agriculture The case is precisely analogous to that of the gold-bearing minerals in Wales, or the auriferous Rhine sand. The gold is undoubtedly there in immense quantity in the aggregate; but it is so disseminated throughout a preponderating mass of worthless material, that it is practically inaccessible. No chemist acquainted with the subject; no engineer or farmer at all capable of appreciating the chemical facts relating to it, has, or can have, but one opinion as to the utilisation of sewage, viz.: that it is a thorough delusion to suppose that it can be carried into effect, so as to admit of the sewage of London being disposed of, and made a source of profit.

This opinion, however, is far from being accepted or acquiesced in generally. A great number of persons believe—for it is only belief with them—that the sewage of London, representing an aggregate value of perhaps not less than a million sterling per annum, can not only be utilised in agriculture, but even made a source of profit to those whose business it is to get rid of it somehow. There are, indeed, a few who endeavor to bring forward evidence of such a possibility, and there is no doubt that many of the facts which they rely upon are unquestionable. There is no doubt that sewage, when put upon cultivated land, does act as a powerful manure, and produce very excellent results in augmenting the produce of the land. This has long been proved and admitted by every one; and this is precisely the circumstance which leads people astray in their opinions as to the utilisation of sewage. If, they argue, this can be done here or there on this or that patch of ground, why should it not be done with the whole of the sewage of London, and why should not the value of the immense quantity of material now wasted be realised? The reasons why it cannot be done have been given over and over again—any time these six years past—but they have not been heeded. Those reasons are of precisely the same kind as the reasons which operate against the extraction of gold from Welsh minerals, and are probably much more forcible. It is all very well to say there is a bar of gold weighing forty or fifty ounces, and to appeal to that as a conclusive proof that it can be got; or to say that such and such results have been obtained by applying sewage to land. This kind of evidence and argument will have great weight with many, but it is not conclusive, nor is it to the point. If the gold that has been extracted, and which is worth some 4*l.* an ounce, has cost 6*l.* an ounce to get, and if this fact can once be perceived, there is an end to the chimerical opinions as to its value and the possibility of extracting it. To all intents and purposes it might as well not be there.

Now this is just the case with regard to the agricultural application of sewage, with the additional difficulties, in the case of London, that the quantity of the sewage is so immense, and subject to such large increase, as to render it probably impossible to find a sufficient area of land to receive it within a resonable distance. Further difficulties then arise from the situation and level of the land round London, and, above all, from the fact that it is only to grass land that the sewage could be applied so as to meet the absolutely necessary requirement of disposing of it continuously every day throughout the year. No doubt a larger proportion of the land immediately round London is under grass than is the case in some other districts, but still it is only a fraction of the land that is so situated, and precisely that land is in no want of sewage, being abundantly supplied with manure produced by the consumption of its own hay in London, and carried to the land by the carts bringing up the hay.

There was, some years ago, a bare prospect of the utilisation in some degree of the sewage of London being effected. The inhabitants of London having determined upon incurring a vast expenditure for the purpose of getting rid of the sewage, which might have applied that expenditure in such a manner as to render the sewage available to farmers round London, instead of devoting it to a means of throwing it away into the sea, as is to be done now. This was a prospect that was certainly worth investigation at that time; but it may safely be said that even with regard to it, there are no data which would in any way justify the opinion that such a mode of disposing of the London sewage would have been attended with advantage, or have been at all practicable.

So far as the expenditure on sewage disposition, originally contemplated, is concerned, this opportunity is past. It may be that it will recur again, if, as some are disposed to consider, the means that have been adopted for getting rid of the sewage should prove to be insufficient to meet the requirements of the case. If the discharge of the whole bulk of the sewage into the Thames at one place should be attended with the disadvantages of reflux up the river, and of pestilential exhalations in the neighborhood of its discharge, the question as to the disposition of sewage will revert to the position in which it stood some six years ago.

The obstinacy with which, from time to time, schemes for the application of sewage in agriculture are urged upon the notice of the public, without any adequate foundation and in the face of overwhelming antagonistic evidence, is simply a revival of the spirit manifested years ago in the attempts to manufacture solid manure from sewage, attempts that were, if anything, more visionary and absurd than the advocated utilization of sewage under present circumstances. In Mr. Lawes' pamplet it is stated that an expenditure of some 60,000*l.* was required to satisfy those who insisted upon the very high agricultural value of solid manure obtained from sewage by lime, that the value assigned to it by himself and others was correct. And yet this was a fact that was almost self-evident, and which required only a consideration of the simplest chemi-

cal data to be perceived. But years after the utter worthlessness of this method of treating sewage had been laboriously demonstrated *adnauseam*, ignorant and plausible adventurers succeeded in persuading the authorities of provincial towns to renew the attempt under some novel disguise, and for a time outweighed the sound and trustworthy opinions and advice of men competent to pronounce a judgment on the subject.

The notion now most in favor is to distribute the sewage of London in small quantities over an enormous area, applying it to all kinds of crops; but, if there be any evidence as to the utility of sewage as manure, it is that it depends upon the copious application of it on a comparatively small area, in regard to the actual amount of manure substance it contains. This is the course indicated, not only by practice but also by considerations as to the cost of distribution, and various other important particulars. Hence, it is not surprising to find it stated, as the result of investigation, than an attempt to apply the sewage of London, in its present state of dilution, to crops generally, in quantities of a few hundred tons per acre annually, would result in great pecuniary loss and signal failure, and that it is clearly quite fallacious to assume the general applicability to all crops, of manure so diluted, on the ground of any considerations as to the value and applicability of the same constituents in the undiluted state. The practical manure value of sewage cannot with any justice or reason be calculated according to the amount of manure substances it contains, since it is not known how far they can become available when the sewage has been applied to land.

Over and above all these uncertainties there is the engineering question as to the cost of putting it on the land, of which, perhaps, nothing more than a mere approximate guess has been made.

It would be a strange result if it should be found that the water-carriage system of disposing of town refuse, which has of late years been a source of so much satisfaction to sanitary reformers, has been altogether a mistake, and a retrogression instead of an improvement. Such a result is not without its probabilities, when considered from more than one point of view, nor is it at all improbable that means might be devised for inoffensively disposing of the excreta of a large population without the aid of water-carriage, and that by retaining them in a comparatively portable form they might be rendered available in augmenting and maintaining the fertility of the land in the place of the materials now imported at such considerable cost for the purposes of agriculture. Whether such a change is ever likely to be effected is, however, far beyond the range even of conjecture.

In a review of a little work by Mr. Lawes on this subject, the *Chemical News* has the following statistics:—

The Royal Commissioners appointed some years ago "to inquire into the best mode of distributing the sewage of towns, and applying it to beneficial and profitable uses," commenced their inquiry by visiting almost every locality in this country and on the Continent where sewage was applied in any way for the purposes of agriculture, and the evidence they collected on the subject was in every respect very conflicting. Though relating to the practical application of sewage as manure, it consisted almost entirely of mere opinions more or less favorable and unfavorable, and therefore the Commissioners, feeling the importance of the question they were called upon to investigate, and the necessity of obtaining more exact and trustworthy data on which to base their opinion in regard to a subject of such vast sanitary and economic interest, determined upon instituting a series of experiments. These experiments were made on a farm at Rugby, which had previously been manured with sewage, and the above named pamphlet contains an account of the mode in which they were conducted, and the results arrived at.

The quantity of sewage applied per acre varied from 3,000 to 9,000 tons per acre per annum, and the quantities of grass obtained per acre were from 14 to 33 tons per acre, as compared with about 9 tons per acre obtained from the land without sewage, the increase in the quantity of green grass per acre being from 3 to 5 tons, according to the quality of sewage applied and the situation of the land. As an average of all the results, this increase was equal to about three-fourths of a ton of hay per acre for each 1,000 tons of sewage supplied.

The grass thus obtained was consumed in feeding oxen and milch cows in sheds. Neither the oxen nor cows were found to do well on the grass alone, without a mixture of oil-cake, which was supplied to both during the latter part of the experiments. In the case of oxen, the produce of grass per acre proved to be capable of feeding one ox from 45 to 99 weeks, according to the quantity of sewage applied to the land, and as compared with the produce of unsewaged land, which yielded grass sufficient to keep an ox only 33 weeks; but in the latter case the grass was of better quality than the grass from the sewaged land. The increase in live weight of cattle fed varied from 134 lbs. to 297 lbs. per acre, as compared with 88 lbs. in the case of unsewaged land. Taking the average of the oxen, those fed on unsewaged grass gave scarcely 2½ lbs. increase per week on 1,000 lbs. live weight, and those fed on sewage grass scarcely 2¾ lbs. increase; whereas, with good fattening food, such oxen should give an increase per week of from 9 to 10 lbs. per 1,000 lbs. of live weight. The result of this application of the large quantity of grass obtainable by the use of sewage was therefore far from favorable.

In the case of cows more favorable results were obtained. The average yield of milk per head was less in the case of sewaged grass than in the case of unsewaged grass, being in the one case 20 lbs., and in the other nearly 25 lbs. daily; but the consumption of unsewaged grass per head was greater than the consumption of sewaged grass, in the proportion of 150 lbs. to 124 lbs. The produce of the unsewaged land would keep one cow 19 weeks per acre, while the produce of the sewaged land kept one cow from 41 to 69 weeks per acre, according to the quantity of sewage applied. The total yield of milk per acre was 321 gallons in the case of unsewaged land, and from 570 to 961 gallons for the sewaged land; the quantity of milk obtainable being dependent very much on the quantity of sewage applied; the increase in the quantity of milk per 1,000 tons sewage used varying from 5*l.* to 6*l.* in value per acre.

There was apparently but little difference in the average composition of the milk in any case.

The amount of dry substance in the grass varied very considerably—from 7 to 30 per cent.—according as it was of an earlier or later crop, to the state of the weather, and the condition in which it was cut. The composition of the dry substance of the sewaged and unsewaged grass presented considerable differences. That of the more luxuriant sewaged grass contained a much larger proportion of nitrogenous substance than the unsewaged grass; it also contained more fatty and mineral substances. It would seem, however, to be the greatest succulence of sewaged grass that is chiefly conducive to the production of the greater yield of milk. The cows on the unsewaged grass consumed more fresh food, containing a larger amount of dry substances than those on the sewaged grass; they at the same time gave more milk per head than the latter, almost in proportion to the larger quantity of food consumed. But as the sewaged grass contained much less dry substance than an equal weight of unsewaged grass, the dry substance of the sewaged grass produced weight for weight, a much larger proportion of milk than the dry substance of the unsewaged grass.

The composition of the sewage used in these experiments varied very much at different periods, according to the weather, but the average composition was almost the same in the two fields. It contained on the average 1 part in 1,000 of dry substance, suspended and in solution, or about 78 grains per gallon. The average amount of ammonia was nearly 7 grains per gallon, and in 1,000 tons of the sewage it was 204 lbs., equal to the nitrogen of the annual mixed excreta of 21 or 22 persons of a mixed population, and also to that in 11 cwts. of Peruvian guano, and the average amount of solid substance was rather more than 1 ton in 1,000 tons. Comparing this with the average increase in produce resulting from the application of this quantity of manure, and amounting to only three-fourths of a ton of hay per acre, it will be seen that the manure constituents of dilute sewage cannot be valued at the same rates as those in manures such as guano. This is a most important result as regards the value of sewage as manure, and notwithstanding the striking effect produced in the proportionate increase in the quantity of grass by the increased application of sewage, it requires considerable attention. The experiments made at Rugby are the first in which the circumstance has been at all brought out in a tangible form, and when it is more fully developed it will doubtless constitute a very appreciable correction to be applied to some of the extraordinary statements and exaggerated calculations that have been made public in reference to the value of sewage for agricultural purposes.

ON THE SOILS OF GREAT BRITAIN.

BY PROFESSOR VOELCKER.

The chemical analysis of fertile soils, the lecturer said, always revealed the presence of certain constituents, lime, magnesia, silica, and phosphoric acid, for example, which were also found in the ash of plants, and were essential to the existence of the plants. In one sense these constituents were all of equal importance, but in another they were not equally valuable. They were all necessary, but their value in one sense depended on their greater or less abundance. Phosphoric acid, for example, was very minutely distributed, while lime, magnesia, and silica were very abundant. The merit of recognising the importance of the mineral constituents of plants as nutriment for them in the soil belonged to Liebeg, who gave the deathblow to the old, or humus theory of vegetable nutrition. The necessity of these mineral constituents being demonstrated, the natural inference followed, that fertility depended upon the abundance of these. It is true within certain limits that the potash and phosphoric acid did decide the relative fertility of a soil; but there were instances in which all the essential mineral constituents of a plant were present in the soil, and yet the soil was unproductive. The physical conditions of surface and subtoil greatly effected fertility, and the mineral ingredients must be present in the surface soil in an available form. Some of the purely physical characters of a soil had not been sufficiently well brought forward. The capillary power of a soil, for example, was of the utmost importance. An apparently exhausted soil might sometimes be restored by giving it increased capillarity. With regard to exhausted soils, it was a question whether they had even been fertile, as it was impossible to exhaust more than a small portion. The permanent fertility of a soil, the lecturer said, could never be economically altered. The productive power might be changed to a certain extent by heavy doses of manure, but the permanent fertility could not be increased; as soon as the manuring was left off, the soil sank back into its natural barren condition. The fertility of good land which had been badly treated might be restored by proper treatment, for nothing could permanently destroy the power of a soil. There were soils, however, so poor that no skill or treatment could permanently increase their fertility; still, there was no soil so poor, not even sand, that could not by a proper system be made to yield astonishingly large crops. The lecturer instanced Flemish husbandry, which produced so much from very poor soil. After a caution against placing too implicit a reliance on the purely chemical properties, the lecturer proceeded to notice Professor Way's experiment on what he termed the "chemico-physical" properties of soils, namely, their power of decomposing salts, and absorbing or fixing some bases. Professor Way had discovered that soils possessed the power of decomposing potash salts, retaining the base, and allowing the acid to pass away in combination with lime or soda. Ammonia was freed from its combinations, and retained in the same way. Phosphoric acid was also separated from soda, and laid hold of by the soil, while the soda, which was of no importance passed away. The general conclusion arrived at from these experiments was, that soils possessed the power (in different degrees) of selecting and retaining matters which were essential to the growth of plants. Professor Voelcker had extended these investigations, and detailed some of the results obtained from passing liquid manures through soils of known composition. He had found that a calcareous clay absorbed a good deal of ammonia and potash, and a little silica, losing a good of lime. A sandy soil absorbed but

little ammonia and potash, but it took some lime, and allowed some silica to pass away. Professor Way ascribed his results to purely chemical causes, and supposed they were obtained in consequence of the decomposition of certain double silicates which existed in the soil; but there was no proof, the lecturer said, that these double silicates were really present in soils. The lecturer believed the cause was partly chemical. Lime, which was present in all soils, would fix phosphoric acid, and hydrated sesquioxide of iron would fix both potash and ammonia, and in general all compounds having the formula $R_2 O_3$ would fix alkaline substances. The lecturer then referred to the harm resulting from having the mineral constituents of plants in too soluble a condition, and explained how this was controlled by the rain-fall. He then referred to Liebeg's latest work, and said that the statements made therein were true only in special cases, and had no bearing on general practice. In attempting to give too comprehensive a view, Liebeg had missed the truth. His statements, however, did not deserve ridicule. The office of the soil was not merely to support the plant, but to manufacture the food into a condition for assimilation; it was the workshop in which the food of plants was prepared. The chemistry of agriculture was a subject full of practical interest, but also full of difficulties, which, however, might be overcome, by extended observation and study. Professor Voelcker then referred to the threatening exhaustion of the soils of England, and said that that was a matter about which we need be in no great anxiety at present. Although phosphoric acid was very minutely distributed in our soil, yet there were large deposits of it in various parts of the globe, which English enterprise was converting to use. English soil had wonderfully improved within the last fifty years, and was improving still, notwithstanding that our sanitary laws compelled us to waste much of that which ought to be returned to the soil. In 1775, Norfolk produced fifteen bushels of corn to the acre; it now produces from thirty-two to thirty-six bushels. In some other counties there was an equal improvement,—the result of proper drainage, proper manuring, and the selection of proper plants. In everything concerned with agriculture, from the plough-boy upwards, there had been a most marked progress in the last fifteen years. Superior mechanical skill and knowledge had been called into action. Still, however, the primeval curse remained, that man must earn his bread by the sweat of his brow. But if man be only be true to himself, the promise also remained that "seed-time and harvest should never fail."

OSCILLATION OF LOCOMOTIVES.*

Few subjects connected with the locomotive have met with more attention than its oscillation at high speeds. Careful experiments have been conducted, long treatises written, and discussions seemingly endless carried on, to ascertain its cause, its amount, and its remedy. In the infancy of the locomotive, regarded as a matter of little importance, we find it of late looked upon as a matter of increasing moment, concerning not alone the stability of the permanent way, the wear and tear of the engine, and the economy of fuel, but even the lives and limbs of passengers: many of our most deplorable railway accidents being doubtless the result of an oscillation so excessive as to force out a rail, or break a leading wheel-flange. Nevertheless, all that has been hitherto said, written, or done, has not only failed to give us a steady engine, but even to give a satisfactory answer to the question, "What causes oscillation?" At the present moment three parties may be found, each representing our highest talent and scientific skill —one holding that its sole cause must be found in the want of balance in the reciprocating masses of the engine; another, that it is wholly due to imperfections in the permanent way; and the third, and by far the most numerous, that it is the result of both these disturbing causes. Although the opinions of the last party are doubtless correct as far as they go, still they are faulty in that they almost totally disregard one or two disturbing forces of considerable but much underated importance, to which we wish to call the attention of our readers.

Mr. D. K. Clarke conducted a very valuable series of experiments some years ago—we forget the exact date,—to determine the effect of want of balance in the reciprocating machinery of a locomotive. In order to obtain accurate results, he suspended the engine by long ropes from the roof of the workshop, and fixed a pencil to the front or back buffer beam in such a manner that the oscillation, when the driving wheels were put in motion was duly registered on a cord suitably placed. The resulting diagram, with an unbalanced engine, was about $\frac{5}{8}$ of an inch long, oval in shape, and about $\frac{1}{2}$ inch wide. Weights were then applied on the trial and error system, and the result was, that the oscillation decreased by degrees, as proper weights were better distributed, until the diagram from a perfectly balanced engine dwindled down to a mere point. Such a locomotive was found to run much steadier in regular work than before it was balanced, although a ride on the foot-plate demonstrated plainly enough that it was still far indeed from being perfectly steady; better it certainly was, so much better, indeed, that it became practicable to run at speeds which it would have been madness to attempt had it not been balanced. The remaining oscillation was attributed naturally enough to imperfections in the permanent way; much of it is due to this cause, no doubt, but not all.

There are some points worthy of note in these experiments—one, that the pressure in the cylinders never exceeded the few pounds on the square inch necessary to overcome the friction of the engine, the driving wheels resting neither on the rails or a brake; another, that there was no propelling thrust whatever on the axle boxes. The experiments were perfect, and attended with the happiest results, as far as they dealt with want of balance as a cause of oscillation; but dealing as they did with an engine under abnormal circumstances they were utterly useless as far as any other disturbing causes were concerned. They could give us no idea of the effects produced by the drag of a loaded tram, itself oscillating violently, the imperfect state of the permanent way, the want of truth in the diameters of the wheels, or many other things—

* From the *Mechanics' Magazine.*

trifles, it is true, by themselves but of considerable influence when taken in the aggregate.

As unsteadiness remains after the most accurate balancing, it is quite evident that some other disturbing cause is at work; that this is not wholly due to imperfect rails, is proved by a fact well known to most drivers, namely, that the character of the oscillation changes in any engine the moment steam is shut off, although the speed is still the same. This, it is true, may not be always evident, for the permanent way may be so uneven as to become a disturbing force, so great as to swallow up, as it were, all other causes of oscillation; but the statement is so far correct, in a general way, that it might not be worth while to undertake a series of experiments, which would determine exactly the character of the oscillations when the engine was, and was not, under steam at a high speed on a good and level road. We have little doubt that such experiments might afford very valuable results. We should always avail ourselves of every scrap of information which can throw light on a doubtful subject.

Admitting, as we do in the fullest degree that want of balance, and faulty permanent way, are two principal sources of oscillation, there remains, as we have already said, a third, which has not as yet received anything like the attention it deserves; it is simply that the centres of propulsion are constantly changing while the engine is in motion.

Most writers on this subject take it for granted that the locomotive is propelled solely by the forward thrust of the axle or crank shaft, in its brasses—a strange error, for not only is it propelled by this thrust, but also by the direct pressure on the forward cylinder covers; and this not indirectly, but directly; and instead of the crank shaft always pressing forwards, as does the shaft of a steamer with vertical cylinders, it presses both backwards and forwards with nearly equal force, once each way in each revolution. When the piston is moving forwards, the pressure on the back cylinder lid is precisely equal to that on the piston, and of course no locomotion could be produced, were it not that the piston rod acts through the medium of the connecting rod and crank pin, then above the wheel centre, with a leverage equivalent to the distance of the crank pin above the rail, as compared with the distance of the wheel centre from the same. If we suppose, for the sake of illustration, that the wheel is 4ft. in diameter, and the stroke 2ft., it is evident that when the crank is vertical, the strain on the axle brass will be just one-third more than that on the cylinder lid; and the engine will, in consequence, advance on the rails against the retarding force due to that pressure, solely by the action of the crank shaft; but when half a revolution is completed, we find that the crank pin is now vertically below the wheel centre, and as the radius of the wheel is 2ft., and the length of the crank 1 ft., it is evident that, so far from the crank shaft propelling the engine, it now retards it with a force just half that of the whole pressure on the piston — in consequence, the engine is wholly propelled by the pressure on the forward cylinder cover, the piston being held in space as regards the forward motion of the engine on the rails, and acting as the fulcrum for the steam in the cylinder. The pressure is thus transferred from the axle-box, which gives its thrust in a line with the frame to a point inside or outside it, according to the arrangement of the cylinders, twice in each revolution—a fact in itself sufficient to account for a very considerable oscillation, independently of the change of position of the centre of propulsion from a part of the engine close to the centre of gravity to one far in advance of it. If we draw a railway waggon, by a rapid succession of pulls, first at one of the front corners, then at the other, it would be folly to assert, that oscillation would not necessarily ensue, yet each cylinder lid does this many times in a second with a locomotive running at high speed.

It has been urged, however, that the wheels being keyed on a shaft strong enough to prevent sensible torsion, the thrust forwards must be the same in both axle-boxes—an assumption contrary to fact, for the forward thrust in one box, even if we supposed one cramp to be straight up while the other is straight down (which, of course, never occurs in practice), would be in the case we have supposed, one-third more than the whole pressure on the one piston, while the tendency of the opposite piston to force the other end of the shaft against the back brass is equal to half the whole pressure on its surface. When we consider that, in actual practice, one crank is always at the dead point, while the other is exerting full power, it is easy to see that the action of the pistons must constantly tend to twist the driving shaft out of right angles with the rails by as great a distance as the play of the axle-boxes in the horn-plate will permit. It is impossible to make these boxes fit the horn-plate slides at first with mathematical accuracy, and, of course, after the engine has been a few months at work, they will get much worse; we do not think we exaggerate, when we say that, the play here may amount, on an average, to as much as one-eight of an inch for each box. It is evident, therefore, that each side of the engine may be thrown backwards and forwards alternately, through a distance equal to this play, provided the wheels do not slip on the rails. One-eighth of an inch of longitudinal oscillation at the axle-boxes, may amount to more than half-an-inch of transverse oscillation at the forward engine—an amount equal to that produced by want of balance as demonstrated by Mr. Clarke.

If, however, the inertia of the mass of the engine is greater than the adhesion of the wheels, they may slip a little in advance of each other alternately; and the axle, no longer at right angles to the rails, will of course tend powerfully to throw the leading flanges against them, when the recoil of the wheel from the elastic rail may be quite sufficient to set up a long-continued and dangerous oscillation.

We have hitherto spoken very much as though our suppositious engine had but one cylinder; but the question assumes a very complicated form, when we consider the varying action of two pistons. We shall then find that the engine is first driven forward by the pressure of the steam on, say the left-hand cylinder lid; then by strain on this box alone; then by the strain on both boxes; then by the strain on the right-hand cylinder cover, and so on; the consequence being that all these forces varying constantly, both in direction and amount,

give resultants constantly changing, and seldom or never passing through the centre line of the engine. We know the result.

While considerable oscillation exists we can never have a really permanent way. It is too much the habit to attribute the derailment of a locomotive to a faulty rail. Oscillation may easily become so excessive that either rails and chairs give way, or the engine mounts the trucks. We acknowledge the difficulty of pointing out a remedy. At low speeds the oscillation is seldom so great as to be regarded as of much consequence; at 50 or 60 miles per hour it becomes a plentiful source of accident. Engines are so accurately balanced in modern practice, that we have nothing to hope from any further development of that principle. The single cylinder arrangement seems, with many drawbacks, to hold out much that is desirable; the resultant of all the forces due to the action of the steam must be central, and we believe such an engine, carefully balanced, would run almost free from oscillation, other than that due to the faults of the permanent way; the objections raised against it, of difficulty in starting trains, and the increased height of the centre of gravity although of some weight, are far from insuperable. Many expedients might be employed to obviate the first difficulty, which would be of less importance, as this arrangement would, of course, only be applied to fast express engines, which would run 80 or 90 miles without a stop. A pilot engine could easily be provided to start them from a station, as is very frequently done now, when an express engine has a heavy train to deal with.

The second objection is of little weight. Mr. Clarke proves conclusively enough that a high centre of gravity affects the stability of an engine very little indeed, and even that need not be raised if we adopt a 7 ft. wheel, which is large enough for the highest speeds, instead of the 7 ft. 6 in. and 8 ft. wheels now frequently met with.

PETROLEUM GAS.

The following report is from Mr. George Bower, of Huntingdonshire, gas contractor to the Duke of Marlborough, the Earl of Shrewsbury, Viscount Hill, &c.:—

Having had a large quantity of crude petroleum oil placed at my disposal by Mr. A. S. Macre, of Liverpool, for the purpose of ascertaining its gas-yielding properties, and also whether it could be used along with common coal, wood, or peat, for the purpose of enriching the gases made from these substances, so as to compete with boghead, which is the material now generally used, I am now enabled to make the following observations:—

Before giving the results of the experiments, I think it right to describe the apparatus which I have constructed purposely for these experiments.

The retort is double acting, four feet long, and of this shape in section S, and known as the Fitzmaurice retort, the principle being that of the regenerative system, as practised by Malam some forty years ago, but with this difference in construction—Malam had two retorts, a large and a small one, set one over the other, the coal being placed in the large retort in the bottom, the vapors passed through the smaller one at the top, and those which were not permanently gaseous were made so by their passage through this highly heated surface.

Although by this process the yield of gas was increased per ton of coals distilled, yet it was at the cost of both the illuminating power, wear and tear, and fuel—in short, the cost was greater than the value of the larger product, and so did not obtain extensive use. This system was applied to coal gas, which of itself only gives a moderately illuminating gas; and though some of the tarry vapors were arrested, yet the second application of heat to the already formed gas deteriorated its illuminating properties, by causing it to deposit carbon, and thus more than counterbalanced the advantage of an increased yield. The evolution of gas from coal in an ordinary retort is a slow and gradual operation, the outside being first acted upon; and hence it requires six hours to obtain the whole of the gas from 1½ cwt. of coal, with which the generality of retorts are charged; but with oil the vapor is evolved so rapidly, as without a considerable surface for it to pass over, a very great proportion of it would be condensed into a thin black tarry oil; hence the advantage of the Fitzmaurice retort, which is also equally adapted for coal, wood or peat, and the gases from which can be enriched with oil.

It has been a common practice in making gas from oil, to fill retorts with coke, broken bricks, or any material which will give surface, and the oil has been dropped or run into them, or made to traverse through them; but this seems to be a very effective way of absorbing the carbon, to which all gas owes its luminiferous property. The result of a great number of experiments has made me determine that a high heat with a large surface is the very worst plan that can be adopted for making gas from oil; but that in order to get the best results, a moderate heat—dull cherry red by daylight—and the double form of retort without anything in it, give the best results; not for volume of gas, but for quantity of light; in other words, there is more light from 80 cubic feet of gas produced in accordance with the latter plan from the gallon of oil, than from 160 feet produced according to the former made from the same quantity.

The test of the apparatus is the same as for ordinary coal, excepting that no purifier is required; but the condenser has double the surface of that for coal, on account of the rapidity with which the gas is evolved. A meter to measure the quantity of gas produced, and a gas-holder, complete the apparatus.

Two qualities of oil were supplied to me by Mr. Macrae, one of specific gravity ·805, the other ·910; water being 1.

It may be stated that the higher the specific gravity of the oil the better the yield of gas, and the heavier it is the greater the heat required to get the best results.

I now proceed to consider the cost of gas from petroleum oil, and how far it may be used for this purpose.

The present price of the lighter of the two oils is about 1s. per gallon. I will dismiss the heavy oil, and confine my remarks to that of specific gravity ·805, as it is, upon the whole, more economical to use than the other.

With the present prices of oil the gas cannot be other than very costly, when compared by volume

alone against ordinary coal gas; but when all the collateral advantages are taken into consideration, and a comparison instituted upon the basis of quantity of light from equal volumes, then the contrast is not so remarked.

The advantages which oil gas has over coal are in the fact, that it requires no purification, being absolutely free from impurities; hence it may used in the most sumptuously decorated saloon, library or picture gallery, without the slightest fear of its injuring anything whatever; the process of making the gas is much more simple, the apparatus to produce an equal quantity of light as that from coal is much less costly, and consequently the wear and tear is also less; and not only is a less quantity required for an equal amount of light, but the heat is considerably less than from coal gas.

If the comparison be made as between coal and oil, coal undoubtedly makes the cheaper light by far; but, if it be instituted as between tallow and oil, as ordinarily burnt in lamps, then the light from petroleum oil gas is very much less than from either of them.

One ton of oil will produce as much gas as will give the light of that produced from good Newcastle coal; thus where carriage forms the chief item of the cost of the material at its destination, oil may, in such a case, enter into favorable competition with coal; or, where the first consideration is purity, and to have a gas which, light for light, shall be more brilliant and powerful than the oil burnt in the solar and moderator lamps, then not only is petroleum superior, but is also of considerably less cost.

His Royal Highness the late Prince Consort, took great interest in portable gas, and I have in my possession a vase which he had made specially for his own use to contain compressed oil gas. One foot of oil gas will give the light of three feet of ordinary coal gas, and though, gas, under very high pressure loses some of its luminous qualities, yet it may be condensed at fifteen atmospheres, and thus become perfectly portable; so that beginning with a gas of three or four times the illuminating power of common coal gas, and condensing a given volume into a fifteenth of its bulk, there is in this fact alone a large field for the use of oil gas for the lighting of railway trains, ships, private carriages, and country houses, where it may not be feasible or policy to erect small gasworks for the supply of gas at ordinary pressures. For instance the Albert vase already alluded to is of a capacity equal to half a cubic foot, and if charged with oil gas compressed to fifteen atmospheres, it will then deliver seven feet, and as this is, to begin with, three times more powerful than common gas, its effect will be equal to twenty-one feet, and will give a light equal to six or eight candles for seven hours.

The daily cost of petroleum oil gas, when made to supply one hundred lights burning for six hours, with each light being equal to eight candles, is as follows:—

15 gallons of oil, 1s - - - -	0	15	0
Coke to heat the retorts, 3 cwt., 1s -	0	3	0
Labor—part of a lad or man's time	0	1	6
Wear and tear - - - - -	0	0	9
Interest on capital - - - -	0	0	4
Fund to maintain plant in perpetuity	0	0	6
Net cost of 1200 cubic feet -	£1	1	1

This is about five times what coal gas would cost made on the same scale; but as the illuminating qualities of the 1200 cubic feet are equal to about 3500 of ordinary coal gas, the oil does not compare very unfavorably when everything is taken into consideration, so that if the gas be required only for lighting purposes, and not for cooking or heating (for which it is totally inapplicable), then there are very many who will doubtless prefer paying a high price for oil gas, in order to get a light which is absolutely pure, and which, though not nearly so cheap as ordinary coal gas, is nevertheless infinitely cheaper than oil, tallow, or wax, as ordinarily burnt, and without their inconveniences.

The supply of oil in Pennsylvania and Canada, in Moldavia and Wallachia, is practically exhaustless; and as the means of transport to the shipping ports are increased, so will probably the price be reduced, though every day almost is adding a new product obtainable from it, so that it may be some time before the price will be materially reduced. —*Grocer.*

ON THE VARIETIES OF COMBUSTIBLE MINERALS USED ECONOMICALLY, CONSIDERED IN RELATION TO THEIR GEOLOGICAL POSITION AND RELATIVE VALUE FOR CERTAIN PURPOSES.

BY PROFESSOR ANSTED.

After describing the general characters of carbonaceous combustible minerals, including those rare kinds only used for ornamental purposes, and arranging those that are met with in sufficiently large quantity to be employed for industrial purposes, as fuel and otherwise as—1. Coal; 2. Lignite; 3. Bituminous shale; 4. Asphlate, petroleum, &c., he went on to state the geological conditions in which coal is met with, and the differences of the of the several varieties, pointing out that the true practical distinction between lignite and coal does not, as many geologists have considered, bear any constant relation to the geological position of the mineral. Bituminous shales were described as minerals of a peculiar class, containing so large a per centage of earthy substance that they could not be advantageously used as fuel. The richest of the numerous varieties of this class of minerals are found in Scotland associated with coal. Under the names of Boghead coal, Torbanehill mineral, &c., they have come into use for gas-making and for the manufacture of oil by distillation at a low temperature, in the manner practised some thirty years ago by Selligue, in France, and since introduced into Scotland by Mr. James Young. These minerals were described as being intermediate between coal and shale. Some of them burn like coal, others are unlike it in every respect; but it is impossible to fix any line of distinction between them and coal. All agree, however, in refusing to coke, and retaining their slaty appearance after burning. The native bitumens were described as being in some instances analogous to coal, in yielding, by distillation oils; but they were regarded as having an origin different from coal, and petroleum was mentioned as being related to these minerals. Next to the common coals used for fuel and gas-making, the shales—from which light illuminating oils, heavier oils, lubricating oils, and paraffin, can

all be obtained—are among the most interesting; they are also the least known. Professor Ansted considered it to be certain that the slaty and stratified minerals, capable of distillation for these very useful purposes, are not strictly bituminous. The term bituminous shale is familiar, but not correct, since no bitumen, properly so called, is contained in these shales. They agree, however, in yielding valuable hydrocarbons by a process of distillation now familiar enough; and in this they agree with some of the bitumens properly so called. It has been proposed to call them pyroschists, but this name is yet more objectionable. In reference to the subject of shales valuable for distillation, he pointed especially to the considerable number of substances of this kind that exist, most of which are still untried. The partings of coal seams, the tough brown and black shales of the old red sandstone and Silurian periods, and the so-called bituminous schists of other series, many of them not highly colored, may prove extremely valuable. Some of them would probably fail, but the means of ascertaining their value are neither troubleseme, tedious, nor costly. Hitherto it is chiefly the black schists, about whose value there can be no doubt, rather than those that apparently occupy doubtful ground between coal and shales, that have been used for slow distillation on the Continent; while only the rich and remarkable Boghead and Torbanehill minerals have been extensively employed in the British islands. It is not everywhere that such rich or profitable minerals can be found, but valuable results might perhaps be obtained from minerals that have not yet been much thought of. In this case, as in the case of iron ores, there are many very unpromising materials that may turn out when examined, to be the most valuable of all. There is no doubt that the coal measures have hitherto yielded the most numerous and the richest bituminous shales, as well as the largest and most valuable supplies of coal. It is equally certain that in England the deposits of this period are most likely to retain their reputation in all these respects. Anthracite, steam coal, bituminous coal, cannel coal, Boghead and Torbanehill minerals, are all of the same age. But, although this is the case in England, and, to a great extent, in Belgium, Prussia, France, Spain, and Bohemia, and in the chief American coal fields, still there are marked differences in the differences in the position of the different minerals, and there are wide and important deposits of coal, some older, and others much newer. The Indian coal fields are probably very new. The Virginian coal fields have long been known to belong to the secondary period. There are excellent lias coals worked in various places on and near the Danube, in Hungary—there are cretaceous coals in Hungary, and excellent tertiary coal as well as lignite in the same country. It is also remarkable that, although in England and Scotland the valuable and rich bituminous shales are close to the coal, in France and elsewhere they are altogether removed. The great deposits of bitumen in North America are below the bottom of the whole series. Rich beds of shale, yielding 50 per cent. of all kinds of oil, near Autun, in France, are far above the highest bed of coal—the Lias bituminous shales are quite unconnected with any workable coal seams, and so are those of tertiary age on the Rhine. There, is then, no geological limit of the age for these minerals; neither is there any limit of color and appearance. Many of the blackest shales are worthless, and some that are of a very pale brown are very rich—experience and analysis are required to form an opinion in any particular case. The relative value of the combustible minerals, of all of which carbon forms a large proportionate part, is not, on the whole difficult to determine. Pure carbon does not afford the best fuel. Pure, or nearly pure, carbon, such as is seen in some samples of anthracite, is, indeed a very difficult and unmanageable combustible, and can hardly be regarded as an economical fuel at all. A very strong draught, or mixed gases supplied rapidly, are necessary to enable it to continue burning when once heated. A coal containing a moderate per centage of oxygen and hydrogen gases, and a reasonable small per centage of ash, is the best for all purposes as a combustible. Some kinds, especially of the Newcastle coals, cake, or run into a kind of slag while burning; other kinds, such as Yorkshire aud Lancashire coals, burn through without caking, and fall to a white and red loose powdery ash. None of them, however, retain their exact form when burnt, either in an open fire or in a retort. Most of the cannel coals, and those varieties called Boghead coal, and Torbanehill minerals, are very valuable for distillation of all kinds, but they retain their form, and behave like slates in the retort. Some of them, however, are capable of being used alone as fuel. They are all especially rich in gases, paraffin oils, and lubricating oils, but their peculiar value in this respect is accompanied by a corresponding diminution of their value as true coals. The lias coals of Europe and America, the oolitic and cretaceous coals, and such tertiary true coals as are known, all resemble rather the Yorkshire and Lancashire varieties than the caking coal of Newcastle. Most of the French coals and many of the Belgium varieties are of the same kind. It is difficult to draw an exact line that shall separate the true coals from the richer, blacker, and more coal-like shales used for obtaining gas or paraffin oils, but it seems that the slaty character recognised in burning affords a good practical definition. It is a point of considerable importance that some of the lignites may also prove available for distillation, but of this there is at present hardly sufficient evidence. The assistance of the chemist is required to determine how far the varieties that are most abundant or available for this purpose, and whether some modification of the process or the addition of some ingredient may render profitable operations at present not worth carrying on. The demand for light oils, for illuminating purposes and for paraffin, seems only limited by the price, and the manufacture is extending in most countries in Europe. It is certain that there is no geological period and no rock that may not contain useful minerals of this kind. Mineral oils and true bitumens are less common than bituminous shales, but they also are more widely dispersed than is generally thought, and when found in large quantity they possess great value. Some are obtained from considerable depth, and are very tenacious; others, as naphthas, are thin, and float on water; some occupy definite geological positions in certain rocks, while a few, comparatively rare, offer peculiar mineral combinations, and are found described in mineralogical works by special names.

TECHNICAL CHEMISTRY.

Chemistry of American Petroleum and the Products of Destructive Distillation.

MM. J. Pelouze and Aug. Cahours have published* the results of their examination of the more volatile portion of American petroleum, that boiling under 200° C. They have succeeded in isolating seven distinct hydrocarbons, homologous with marsh gas, viz.:—

		Boiling Point.
Butyl hydride	$C_8 H_{10}$	—
Amyl hydride	$C_{10} H_{12}$	30°C
Caproyl hydride	$C_{12} H_{14}$	—
Œnanthyl hydride	$C_{14} H_{16}$	92° 94°C
Capryl hydride	$C_{16} H_{18}$	116° 118°C
Pelargonyl hydride	$C_{18} H_{20}$	136° 138°C
Rutyl hydride	$C_{20} H_{22}$	160° 162°C
" hydride	$C_{22} H_{24}$	180° 184°C

The amount of amyl hydride in commercial samples of the more volatile portion of petroleum, used as a substitute for turpentine, was found to be about one-sixth to one-seventh by weight.

MM. Pelouze and Cahours express the opinion that these substances appear to be related to paraffin, which is always associated with them in American petroleum, and which like these hydrides is characterized by great chemical stability. The same conclusion has already been arrived at by Mr. Schlorlemmer† with regard to the hydrocarbon products of boghead cannel, and is one that appears to have a high degree of probability. They also consider it possible that there are several solid hydrocarbons constituting distinct varieties of paraffin. This has actually been found to be the case with the solid hydrocarbons obtained from boghead cannel and from peat, those hydrocarbon products being separable into several portions, differing in melting point. In Reichenbach's original memoir on paraffin, the melting point is stated to be 43°-75 C., and this melting point is given in most chemical works. But the paraffin now manufactured for candle making has a melting point of 54° C.

The presence of benzol and toluol in American petroleum, pointed out by Mr. Schlorlemmer, indicates an interesting relation, on the one hand, between that substance and the oil obtained from cannel coal by distillation at a low temperature, and, on the other hand, between the oil obtained in this way and that obtained by distillation at a high temperature. The coal tar of gas works, and especially that obtained from cannel coal, contains chiefly benzol and its homologues,‡ the only substance belonging to the hydride series yet known to be present in it being paraffin. The oil obtained from cannel coal at a low temperature contains chiefly hydrocarbons belonging to the hydride series, together with some benzol and toluol, as shown by both Greville Williams§ and Schlorlemmer.‖ The proportion of these substances is much smaller than in the coal tar of gasworks, but at the same time it is much larger than in petroleum.

These facts seem to show that so far as the influence of temperature is concerned in the production of these hydrocarbons, the consequent difference in the oily product of destructive distillation is one of degree more than of kind. That is to say, the hydrides are produced in larger amount at a low temperature, or, more correctly speaking, they escape decomposition to a greater extent at a low temperature, while at a high temperature the hydrocarbon products belong chiefly to the benzol series. This is certainly the fact as regards the oily products obtainable from coal by distillation, and if petroleum has originated from coal in a manner analogous to distillation, which appears to be highly probable from every point of view, the preponderance of the hydrides over substances of the benzol series in it would be strong additional evidence in support of the above view.

It has, indeed, been very positively asserted that the chemical nature of the hydrocarbons obtained from coal by distillation depends entirely upon the temperature, but this assertion has never been supported by any kind of chemical evidence.

Altogether, the chemistry of destructive distillation is exceedingly scanty and defective; very little is known as to the conditions which really determine the production of substances of different series, beyond the vaguest and most empirical generalities; There are no facts known which justify the opinion that the chemical nature of the hydrocarbons produced depends upon the temperature of distillation, and what is known with regard to this subject tends to lead towards an entirely opposite conclusion, viz., that the difference which is found to exist in tars obtained at high and low temperatures, as to the relative amount of hydrocarbons belonging to the hydride and benzol series, results from the influence of heat in decomposing substances of the former series, and not from its influence as determining the production of hydrocarbons belonging to one or other series.

The well-known facts observed in gas-making, that the ratio of hydrogen to carbon in the gas is greater in proportion as the temperature is higher, and, on the contrary, that the ratio of carbon to hydrogen is greater in proportion as the temperature is lower, necessarily involve the existence of converse ratios in the oily hydrocarbons simultaneously produced. Hence we find in the oily products obtained from coal at a low temperature a preponderance of substances homologous with œnanthyl hydride $C_{12} H_{14}$, and in the oily products obtained from it at a high temperature a preponderance of substances homologous with benzol $C_{12} H_6$.

In the absence of any evidence as to the existence of a similar relation between the products obtainable from other materials than coal by distillation at high and low temperatures, it is only possible to point out the probability that such a relation would be found to obtain generally in the products of destructive distillation. But there are other circumstances to be taken into account of equal importance, and probably of much greater importance as regards the nature of the hydrocarbons obtained by destructive distillation. Chief among these is the nature of the material from which they are obtained. Even in the case of coal, the differences in the nature and proportions of the individual substances obtainable under the same conditions from different varieties of coal are exceedingly

* *Comptes-Rendus*, lvi. 505. † *Chemical News*, vii. 157.
‡ Mansfield. § *Phil. Trans.*, 1857.
‖ *Journal of the Chemical Society*, Oct., 1862.

great, far surpassing the differences in the products obtainable from the same coal under different conditions of temperature, &c.

The natural products analogous to the oily products of destructive distillation afford an illustration of the differences of this kind that may exist. In all probability native petroleum has in all cases originated in a similar manner, but it is very likely that the materials from which it has originated have been various. Consistently with this probability we find the petroleum of Rangoon* containing, in addition to a considerable amount of liquid hydrides, benzol, toluol, and other members of this series, while the petroleum of Galicia† contains also substances belonging to the carbolic acid series.

Altogether the products and general phenomena of destructive distillation present features of the highest interest in a chemical point of view as well as in a technical sense, and it is matter for surprise that they have not received a greater amount of attention and study, especially since the production of the substances originating from this process has become of such immense importance as it now is in so many different branches of industry.

ON THE COMPOSITION OF GAS REFUSE.

BY DR. T. L. PHIPSON, F.C.S., &C.

It has been estimated that one ton of Newcastle coal gives off in distillation as much cyanogen as is contained in five to eight pounds of Prussian blue. As sulphuretted hydrogen is disengaged at the same time in greater or smaller quantities according to the nature of the coal, it is natural that sulphocyanides should form also. My attention having been lately directed to gas-refuse obtained after eliminating the sulphuretted hydrogen and carbonic acid by hydrated oxide of iron and lime purifiers, I found in this substance certain sulphocyanides, and it occurred to me that it might prove a source of sulphocyanide of ammonium for photographic purposes. But the samples I have hitherto examined, having been used as long as possible, with a view of obtaining the maximum amount of sulphur, have not promised so much sulphocyanide as I should expect to find in the refuse purifiers which had not been employed for so long a period. It is curious to note, however, that this substance, which is offered to manufacturers of sulphuric acid on account of the sulphur it contains, has also been recommended to makers of artificial manures and to agriculturists as a cheap source of nitrogen! It will be seen by the analysis I subjoin that the employment of this substance for agricultural purposes is not only useless, but may become highly injurious to any soil. Besides the cyanogen compounds I have found in it, and which must be considered as prejudicial to vegetation, the existence of tar-products, highly antiseptic and therefore capable of preventing organic decomposition in the soil—a process indispensable to vegetation—is evident; it contains also a very large amount of free sulphur.

When this gas-refuse has been exposed for some time to the air it contains the following substances;—Free sulphur in considerable quantity, oxide of iron, carbonate of lime, cellulose in small quantity, some hydrocarbons soluble in alcohol, double cyanide of iron (green), ferrocyanide of iron (blue), sulphocyanide of calcium, sulphocyanide of ammonium, chloride of ammonium, sulphate of lime, ferrocyanhydric acid (to which the mass owns its acid reaction), and water. Some of these are present in small quantity only, but is is not difficult to put them all in evidence. A rough analysis of of the whole has given me—

Water	14·0
Sulphur	60·0
Organic matters insoluble in alcohol	3·0
Organic matters soluble in alcohol: sulphocyanide of calcium, chloride of ammonia, hydrocarbons, &c.	1·5
Clay and sand	8·0
Carbonate of lime, oxide of iron, &c.	13·5
	100·0

Hot water extracts sulphocyanide of calcium and ammonium, sulphate of lime, and ferrocyanhydric acid. The solution takes a red color with persalts of iron.

Hydrochloric acid dissolves a considerable amount of the substance, and the solution obtained is deep blood-red, almost opaque, from the presence of sulphocyanide of iron formed.

Alcohol extracts principally sulphocyanides of calcium and ammonium, chloride of ammonium, a small quantity of hydrocarbons, and ferrocyanhydric acid.

By evaporating the aqueous solution to dryness, after having added enough carbonate of potash to neutralize its acidity, and treating the residue by alcohol, the ferrocyanhydric acid is left behind as ferrocyanide of potassium, and the alcoholic solution contains only chloride of ammonium and sulphocyanides of calcium and ammonium. By evaporating in presence of an excess of carbonate of potash to complete dryness, and treating with alcohol, the latter takes up principally sulphocyanide of potassium, and by using carbonate of ammonia, in place of carbonate of potash, the alcoholic solution consists of sulphocyanide and chloride of ammonium, which would serve for fixing photographic proofs.

The green compound which forms when gas-refuse is exposed to the air, is no other than the double cyanide of iron, $FeCy+Fe_2Cy_3$, discovered by Pelouze, the composition of which corresponds to magnetic oxide. By prolonged oxidation in the air it becomes blue; cold acids have no action on it, but hot nitric acid decomposes it.

THE WELSH OIL SPRING.

The paragraph which lately went the rounds of the papers relative to the discovery of a supposed Oil Well at Blains, Monmouthshire, requires a little explanation. The only Oil Spring, it now turns out, was a hogshead of oil, which sprang a leak some time since near the spot, and by some means a portion of the oil got into the well; hence the discovery of the supposed Oil Spring.—*Builder.*

* Warren de la Rue and Hugo Müller.

† Pebal and Freund. *Annalen der Chem.*

Miscellaneous.

THE BRITISH AMERICAN ELECTRIC TELEGRAPH SYSTEM.

The whole of the telegraphic system of Canada (except the private lines belonging to railway companies) is in the hands of one company.

The Montreal Telegraph Company was organzed in 1847, and first opened between Quebec and Toronto. The following figures show the progress of this company:

	In 1847.	In 1861.
The capital stock	£15,000	£100,000
Length of line	540 m.	3,422 m.
Number of stations	9	150
Persons employed	35	400
Number of messages transmitted	33,000	300,000

	Miles.
The main line extends from Woodstock in New Brunswick to Detroit in Michigan	1,050
And from Quebec C. E. to Buffalo, N. Y.	650
With the following branches:	
River du Loup to Father Point	70
Quebec to Richmond, on Grand Trunk R. R.	96
Montreal to Portland, Maine, on do	292
" Troy, New York	250
" Waterloo, C. E	60
Prescott to Ottawa City	54
" Oswego, New York	120
Belleville to Stirling	15
Trenton to Pictou	80
Port Hope to Peterboro' and Lindsay	55
Toronto to Collingwood, on Northern Railway	97
Toronto to Sarnia, on Grand Trunk R. R.	170
Goderich to Buffalo	160
St. Mary's to Port Stanley	50
Brantford to Port Dover	32
Windsor to Amherstburg	18
Various branches to small towns and villages	153
	3,422

The lines enumerated above embrace all the important towns and villages in both provinces.

There are thirty-two poles to the mile, and the wire is number eight and nine, galvanized. The line is worked on the Morse principle, and nearly everything is taken by sound. The business, after the crisis of 1857, fell off to a considerable extent, but during the last two years it has gradually increased, and the number of messages passing over the line in 1861, amounted to 300,000.

Nova Scotian Telegraph.

	Miles.	Built
Halifax to New Brunswick line	130	1849
Truro to Pictou	40	1850
Halifax to Liverpool	102	1851
" Yarmouth (*via* Windsor	224	1852
Pictou to Sydney, C.B	195	1852
" Amherst, (*via* Pugwash	80	1853
Liverpool to Barrington	62	1853
Halifax to Truro (second wire)	64	1853
Barrington to Yarmouth	45	1854
Antigonishe to Cape Canso	67	1854
St. Peters, C. B. to Arichbat C. B. (about)	20	1854
Plaister Cove to Port Hood	28	1855
Wolfville to Canning	9	1858
Total miles,	1,066	

All except the second wire between Halifax and Truro, are of number nine ungalvanized wire; the poles are spruce and tamarack, from thirty-five to forty to the mile. The second wire, from Truro to Halifax, is number nine galvanized wire.

The telegraph in Nova Scotia was constructed by the provincial government.

New Brunswick Telegraph.

	Miles.	Built
Calais to St. John	90	1848
St. John to Nova Scotia boundary	140	1849
" Fredericton	64	1850
Fredericton to Woodstock	64	1851
Monckton to Chatham	100	1851
Newcastle to Bathurst	55	1858
Bathurst to Campbelltown	68	1860
Salesbury to Hillsboro'	22	1860
Total miles,	603	

—*Eighty Years' Progress.*

London Fires.

Much care has been bestowed upon the following analysis, which (although far from perfect) gives the proximate causes of a large proportion of last year's fires, which, it will be seen, are much of the usual character; bearing out the remark of Dr. Winter, in his "Curiosities of Civilization," that "among the more common causes of fire (such as gas, candles, curtains taking fire, children playing with fire, stoves &c.,) it is remarkable how uniformly the same proportions obtain from year to year. We are informed by the Post Office authorities, that about eight persons daily drop their letters into the post without directing them—we know that there is an unvarying per centage of broken heads and limbs received into the hospitals—and here we see that a regular number of houses take fire, year by year, from the leaping out of a spark, or the dropping of a smouldering tobacco."

It may, perhaps, excite some surprise, to find how many fires are attributable to the last-named cause. The greater number of these fires occur in he tap-room, in the skittle-ground, or before the bar of public-houses and beer shops. The remains of a pipe of tobacco, the end of a cigar, or an unextinguished fusee thrown carelessly into the street, is frequently blown into an area, or into the basement of buildings, where, meeting with combustible matters, a conflagration is commenced. In the greater number of such instances the damages done is trifling; sometimes, however, it is otherwise, and two of the largest and most destructive fires of 1862 originated in skittle-grounds from unextinguished tobacco. The most painful part of the subject is the very large number of fires that are well known to have been wilfully occasioned, as well as those that have been suspicious in their origin, and the very few instances in which the perpetrators have been brought to justice. It must be confessed there is a delicacy ou the part of the fire-offices, touching this question, which is most mischievous. At the same time, it is well known that when a fire-office resists a claim they know to be fraudulent (even if the fire cannot be proved to be wilful,) they receive but scant justice at the hands of juries. I have heard this accounted for on the ground of sympathy; that it was so difficult to find a jury of which at least one member had

not had a fire! The crime of incendiarism is most frequently associated with others; and during the past year more than one well-known incendiary has received his deserts at the hand of justice for other villanies committed by him. Under a well organized system of fire-police, it is probable that the greater number of incendiary fires would be nipped in the bud, the offenders fearlessly grappled with, and such crimes become almost as scarce in London as they now are in Gravesend, where but a few years since they were so rife. Prompt discovery and early extinction of the fire is fatal to the scheme, and often leads to the detection of the incendiary.

Considering the extensive use of lucifer-matches, it might have been supposed that a larger number of fires would have been traced to their agency. There is good reason to believe that many of the *unknown* fires have originated from the accidental ignition of these matches. Such accidents are preventible. Messrs. Bryant has produced a match which is ignitable only by a properly prepared surface, and is therefore not liable to accidental or spontaneous ignition. These matches have the further advantage of containing no phosphorous or poisonous materials, and do not give out any sulphurous or unpleasant odour. They are but of little more expense than the ordinary lucifer matches and are much esteemed by careful housekeepers.—*Mechanics Magazine.*

USEFUL RECIPES.

Preparation and Dyeing of Woollen Stuffs.*

(From Muspratt's Chemistry.)

Woollen is banded with wire into spindles, previous to being put under operations for scouring or dyeing. It is then steeped over night in soap lye, or Old Alkaline solutions, and then scoured through clean soap, to remove all oil or grease that may be upon the wool; or, what is more common, a scouring liquor is prepared with one pound of soft soap, and one pound of common soda, or half a pound of soda ash, in ten gallons of water, and scoured through this.

This is the only preparation that new wool is subjected to previous to dyeing.

For re-dyes, every care should be taken to remove all grease or oil first, or no good dye can follow. This is done by steeping and scouring in soap and soda. If the remaining color be unequal or dark, the goods are steeped or wrought for a little in a sour, made up of bisulphate of potassa, dissolving two ounces to the gallon of water.

Woollen is always dyed hot; the liquid usually being near to the boiling point, which necessitates its being dyed in a boiler. Iron vessels are not used for this purpose; copper, and copper with tin, is most generally used. The dye-stuffs, such as ground wood, are generally put into the boiler, and the goods wrought with it; but it is cleaner to make a decoction, and use the clear liquor.

All washings are made in cold water, except warm be specified in the directions.

In the following recipes, the quantity of goods referred to is ten pounds, whether in cloth or yarn:

1. *Black.*—Work for twenty minutes, in a bath, with eight ounces camwood; lift, and add eight ounces copperas; work other twenty minutes; then withdraw the fire from the boiler, and submerge the goods in the liquor overnight; then wash out. Into another bath, with five pounds of logwood, and one pint of chamber lye, work for an hour; lift, and add four ounces of copperas; work in this half an hour longer; wash, and dry.

2. *Brown.*—Work for an hour in a bath made up with two pounds of fustic, two pounds of madder, one pound of peachwood, four ounces of logwood; then lift, and add to the bath a solution of two ounces of copperas, and work half an hour in this; wash out, and dry.

3. *Brown.*—Work for an hour in a bath of four pounds of fustic, two pounds of camwood, half a pound of logwood; lift, and add to the bath four ounces of copperas; work half an hour in this; wash, and dry.

4. *Crimson.*—Work in a bath for one hour with one pound cochineal paste, six ounces dry cochineal, one pound of tartar, one pint of protochloride of tin; wash out this, and dry.

5. *Scarlet.*—Work for an hour in a bath with one pound of tartar, two ounces of dry cochineal, eight ounces of sumac, eight ounces of fustic; wash out, and dry.

6. *Red.*—Work half an hour in a bath with one ounce of bichromate of potassa, one ounce of alum; wash out this through cold water; then work for half an hour in another bath with three pounds of peach or limawood; lift, and add one ounce of alum; work in this for twenty minutes; wash, and dry.

7. *Claret Red.*—Work for an hour in five ounces of camwood; lift out, and expose until the goods are well drained and cold; in the interim, add to the bath with the camwood, four ounces of copperas, two ounces of alum, eight ounces of logwood; work the goods in this for half an hour; wash, and dry,

8. *Lack Scarlet.*—Work for half an hour in a bath with one pound of tartar, eight ounces of sumach, two pounds of lac; lift, and add about a gill of bichloride of tin, and work in this for half an hour; lift, wash, and dry.

9. *Pink.*—Work one hour in a bath with one pound of tartar, eight ounces of alum, one pound of cochineal paste, one gill measure of red spirits; wash out in cold water, and dry.

Glass Stains.

Red Stain for Glass.—1. Rust of iron 100 parts; glass of antimony 99 parts; yellow glass of lead 98 parts; sulphuret of silver 3 parts. Mix.

2. White hard enamel 100 parts; red chalk 50 parts; peroxide of copper 5 parts. Reduce to fine powder, and mix.

Blue Glass.— Plain paste 300 parts; zaffre 3 parts; manganese 1 part. If the glass should be of too deep a blue, use less zaffre and manganese; if too purple, omit the manganese altogether.

Black Stain for Glass.—1. Black scales of iron 29 parts; white crystal glass 4 parts; antimony 2 parts; manganese 1 part; vinegar to mix.

2. Glass of antimony 1 part; oxide of copper 2 parts; crystal glass 3 parts. Mix.

Orange Stain for Glass.—Precipitated silver powder, yellow ochre, red ochre, equal parts. Turpentine to mix.

Brown Stain for Glass.—White glass 2 parts; manganese 1 part. Mix.

Flesh Color for Staining Glass.—Red lead 1 part; red enamel 2 parts. Mix with alcohol.

Yellow Stain for Glass.—Chloride of silver 1 part; burnt pipeclay 3 parts. Reduce to fine powder and mix. This stain must be applied to the back of the glass.

To Marble a Glass Globe.—Grind well on a stone, minium for red, turmeric, or rather cerussa citrina, for yellow, smalt for blue, verdigris for green, ceruse, or chalk for white. Work each in oil separate, and with a hog's hair pencil, single or mixed as you think fit, scatter the same into the glass, and roll it, or dispose the colors, as you like. Then, last of all, fling a little mead amongst them, which covers all.

For the Magic Lantern, paint the glasses with transparent colors, tempered with oil of spike.

Analysis of Cast Iron.

Few subjects present features of greater importance than the best means of obtaining accurate information regarding the constituents of any sample of cast iron. From the iron-master, who, from the crude pig manufactures sheets, rails, bars, the panoply of an armour-plated frigate, perhaps, to the civil engineer, the success of whose works may depend on the ultimate strength of columns and girders of cast iron—all are concerned; by all any further progress in the means of obtaining an accurate analysis of a material so largely used, must be hailed as a welcome aid to their labours. Hence, if we regard the subject in this point of view, everything, no matter how apparently trivial it may seem, which tends to throw light on an admittedly difficult subject, must be regarded as of more or less importance. We would call the attention of our readers to a phenomenon which we have found sufficiently obvious, yet has not yet, we believe, received any share of attention from those who might possibly draw valuable deductions from it.

When melted pig iron is tapped into a ladle in moderate quantities, so that excessive heat may not prevent pretty close observation, it will sometimes be found to boil violently, sometimes its surface is calm from the first. Now, if this molten iron is allowed to stand a few minutes until it becomes perfectly quiet, and is then carefully skimmed clean, we shall find that a beautiful irridescence covers its entire surface, due to the constant breaking up of the extremely thir film of oxide formed on the iron. This irridescence, frequently called by moulders the "pattern of the iron," may, on close inspection, be found to consist of a multitude of many sided or rayed stars, in constant motion; breaking up on vanishing, and forming anew with the velocity of thought, and almost eluding the eye. It is a matter of extreme difficulty to determine the number of rays in each figure; we believe we are correct in saying five; one thing is certain that their shape and character, is invariable with every species of iron with which we are acquainted.

This much premised, we would call attention to what we are inclined to consider as a proved fact —namely, that the size of the different figures which make up the "pattern," in all cases, depends on the size of grain of the iron when in the pig. Thus, hematite, which is a large-grained iron, will, when melted, present a large pattern. Fine-grained irons, such as the grey forge pig of some of the Staffordshire works, give an extremely small pattern. This distinction is, we understand, so well marked, that in some cases a glance at the melted iron will enable an accurate opinion to be formed as to the size of grain in the pig.

We have already said that it is almost impossible to determine exactly the form of the figures presented by the irridescence. Might not instantaneous photographs be taken, which would give us all the information we require on the subject? We throw out the hint to those skilled in that department of science. We believe it might be possible to obtain photographs from the surface of vessels containing different samples of melted iron, whose comparison might lead to valuable results. As it is, it seems clear that the character of the figures bears some relation, more or less fixed and determinate, to the laws regulating the crystallization of the iron on cooling; and in this belief, without wishing to be understood as making any positive assertion on the subject, we would suggest it to those occupied in scientific research, as one which, while certainly not devoid of interest, may, in able hands, lead to useful practical results. —*Mechanics' Magazine.*

Libraries.

Harvard College stands among the oldest of our literary institutions, and its library outnumbers, we believe, every other collection of books in this country. W. F. Poole, Esq., Librarian of the Boston Athenæum, drew up the report of the Committee of the Overseers appointed to visit the Library in 1862. To his excellent report is appended the annual statement of Mr. J. L. Sibley, the Librarian, and the minor reports on the Theological and Law libraries of the same college. It appears that the whole number of volumes in the various libraries of Harvard is now about 150,000; viz., in the College library (Gore Hall), 90,000 volumes (exclusive of 65,000 pamphlets); in the Theological library, 9400 volumes (besides 4,000 pamphlets); in the Law library, 13,300 volumes; in the Medical library, 2,000 volumes; in the Scientific school, 7,000 volumes; in the Phillips Astronomical library, 1,500 volumes; and in the Society libraries, about 17,000 volumes. The College library proper is increasing at the annual rate of 5,000 volumes, and 3,500 pamphlets. During the year ending in 1862, 3420 volumes, and 324 pamphlets were bought, at a cost of $7,000. Over 1,700 volumes, and 32,000 pamphlets were presented to the library. The library has annually the income from a fund of $21,000, to be spent in books, and of late years $5,000 additional has been annually given by Mr. William Gray. The library employs a librarian, an associate librarian, two male assistants, a janitor, and five female assistants, who are engaged in cataloguing. We shall refer, in another number, to the plan of a classified catalogue by Mr. Abbot, the assistant librarian.

The Boston Public Library makes an annual report in November to the city corporation. This vigorous establishment continues to flourish under

the presidential guidance of Hon. E. Everett, and the superintendence of Prof. C. C. Jewett.

The collection of books now includes 105,000 volumes, besides 28,874 pamphlets. 84,000 volumes belong to the Reference library in the upper hall, and 21,000 volumes to the Circulating library in the lower hall. Last year 7,400 volumes were added, of which 6,100 volumes were purchased, and 1,300 volumes were presented. Among the gifts, special mention is made of a large and rare collection of volumes pertaining to the life of Moliere. Mr. W. H. Prescott began the collection in 1837, with the plan of writing a life of the dramatist, and, after he abandoned this purpose, Mr. George Ticknor, by whom the books are given to the library, cherished the theme and augmented the number until it reached 132 volumes.

The expenses of the library during the year were as follows:—for books and periodicals, $9,400; for other purposes, $18,200; total, $27,654. During the year the loan of books made a daily average of 626 volumes. On some days it was ascertained by count, that 2,000 persons visited the library for literary purposes. The tastes of those who make use of the Reference library are indicated in the following table, which shows the number of books consulted in each department:—

English History	18	per cent.
American History and Early Literature	12½	"
Theology and Ethics	12	"
Useful and Fine Arts	8	"
Medicine	7	"
French History and Literature	6½	"
Mathematics and Physical Science	5½	"
Oriental History and Literature	4	"
German History and Literature	3¼	"
Jurisprudence	3	"
Greek and Latin Classics	2½	"
Italian History and Literature	2¼	"

—*Am. Pub. Cir.*

Gisborne's Electric Compass.

Mr. Gisborne's electric compass, to which we have before called attention, is nothing more than the ordinary ship's compass, with a battery in the box, and two insulated wires maintaining the electric currents round the needle. This is the whole contrivance. This simple application of electricity supersedes the elaborate enquiries of the Astronomer Royal, the life-long mathematical labours of Mr. Smith, the philosophical observations of Mr. Evans, and eminently practical experiments of the Liverpool Compass Committee. Hereafter, compass variations need not appear in the loss of life and property, and the sailor may range the trackless ocean, assured that he steers his course with safe precision. Captain Washington once made the remark that but for the labours of the Compass Committee, Mr. Evans, Mr. Smith, and the Astronomer Royal, it would have been impossible to send iron ships to sea. Mr. Scott Russell, at the same time, while reproaching himself and the shipbuilders of the country with the oversight of the compass, congratulated the officers and seamen of the fleet and the merchant service with the fact that, while he and the shipbuilders were doing their best to advance the science of ship construction to final forms, scholars, scientific and practical men, were constantly toiling to reduce the variations of the compass to intelligible and certain laws. At the next meeting of the Institution of Naval Architects, these gentlemen are likely to congratulate each other and the world, that further labour in that direction is superfluous, and that the application of electricity to the compass is, in our day, of as much importance in the safe navigation of iron and iron laden ships, as the invention of the compass was in early times. Iron ships and iron cargoes may be said to have deprived the sailor of the use of the compass; and the application of electricity to have restored it to him.

Mr. Gisborne's electric compass was tried recently for three days on board the iron steamer "Resolute," in the Mersey. It was uninfluenced by the iron of the vessel, and worked correctly when placed over the engines and between the chimneys. Not so the ordinary compass of the "Resolute" with the well-known magnetic adjustments; the variations being 1½ to 1¾ points. Piles of steel and iron shavings placed round the electric compass do not act upon the needle, and it is alike insensible to the presence of bars of iron on the top of the box. Tests such as these are demonstrations that currents of electricity restore the compass to the sailor as unvarying and trustworthy as when steam machinery, iron hulls, masts, and rigging were unknown. Mr. Gisborne is an eminent electrician, and having crossed the Atlantic frequently, it occurred to him to try electric currents as a means of checking compass variations. The thought was a happy one, and Mr. Gisborne is now to be regarded as one of the benefactors of mankind. The immediate and peremptory adoption of the electric compass would spare thousands of lives and value to the extent of millions every year.—*Mec. Mag.*

Big Ships and Cannon.

Mr. James Bruce in a letter says:—The first ship seen in Greece, arrived at Rhodes, A.D., 1485—Hiero's ship, which was built under the direction of Archimedes, had wood enough employed in it to make gallies to the number of sixty. It had all the varieties of apartments of a palace—banqueting rooms, galleries, gardens, fishponds, stables, mills, baths, a temple of Venus, &c. It was encompassed with an iron rampart and eight towers, with walls and bulwarks furnished with machines of war, particularly one which threw a stone of 300 pounds, or a dart 12 cubits long, the space of half a mile, &c. This ship has been described by Athenæus, the mathematician, who wrote a Greek treatise "On Machines of War." Mahommed II., at the siege of Constantinople, A.D. 1453, used 800-pounders. In 1807, when Sir J. Duckworth passed the Dardanelles, his fleet was dreadfully shattered by the immense shot! The "Royal George," of 110 guns, was nearly sunk by one shot, which carried away her cutwater, and cut the mainmast of the "Windsor Castle" nearly in two; one single shot knocked two ports of the "Thunderer" into one. The "Repulse," 74 guns, had her wheel shot away, and 24 men killed and wounded by a single shot, nor was the ship saved

by the most wonderful exertions. These shot were of granite, and weighed 800 lb., and were 2 ft. and 2 in. in diameter. One of these huge shot stove in the larboard bow of the "Actiæ," and having then crushed the immense mass of timber, the shot rolled ponderously aft, and brought up abreast the main hatchway. One of these guns was cast in brass in the reign of Amurath, it was composed of two parts, joined by a screw at the chamber, its breech resting against massive stone work. Baron de Trott resolved to fire this gun, the shot weighing 1,100 lb., and he loaded it with 330 pounds of powder. He says, "I felt a shock like an earthquake, at the distance of 800 fathoms."

Driving a Business.

"Drive your business, but never permit your business to drive you," is a motto containing great wisdom, and yet few act in accordance with its teaching. To drive one's business is a proposition easily understood, but how to prevent its becoming the driver is a more difficult problem. Who does not meet every day merchants, worthy men, almost out of breath, and always under high pressure during banking hours? How often, too, do we see them bowed down with premature old age, resting under the pressure of heavy business cares. These men are all permitting their business to be the driver, and we undertake to say that very few of them really enjoy one moment of their lives, while more than four-fifths of them die poor. On the other hand, were these same men willing to do less, always seeing the end from the beginning they could show at the close of life their wordly work accomplished, without taking all their time from higher and better thoughts and works, a fair balance in money made, blessed with infinite satisfaction and comfort. The evil of the day is the desire to do a large business. "If" says the enthusiast, "I can net five thousand pounds out of a year's business, I can surely realise more than twice the business." This may or may not be true. If you *triple* your capital you may safely *double* your business, but not more. For it should be remembered that a larger business requires additional thought, attention, and work, and hence more capital than the proportionate increase of the business—for there will be less time for financiering. We frequently forget that when we double our business we are doubling labours and cares which are already as great as ought to be undertaken. Unless therefore, we observe some such rule as the above we shall find that in increasing our business we shall only be increasing our troubles and leaving a balance at the end of life of simply so many obligations met, so much interest paid, so many extra steps taken, so many anxious days and sleepless nights passed, with nothing to the other side of the account except premature old age and dissappointed hopes.

Steam Fire Engines.

Seventy steam fire-engines have been made up to this time by the Amoskeag Company, of Manchester, N. H., including some for almost every large city in the Union, two for Halifax, and one for the Russian city of Amoor.

Petroleum for preserving Wood

The oil wells near Prome, in Burmah, have been in use from time immemorial. Wood, both for ship-building and house-building is invariably saturated or coated with the products of those wells. The result is entire impunity from decay, and the ravages of the white ants that in that country are so generally destructive. M. Cr[illegible]n, a Belgian Goverment engineer, who has tried experiments upon the relative advantages of cresote and sulphate of copper for the preservation of timber in marine constructions from the attacks of worms, &c., says that creosoting is the only process he has found to succeed for this purpose. He states that sulphate of copper affords no protection whatever against the action of salt water and marine insects. The Belgian Government now require that all the wood sleepers used in the State railways should be creosoted; and the Government of Holland have also made the same resolution, and upwards of 300,000 sleepers per annum are now being creosoted by the Dutch Goverment, and more by the Belgian Government.—*Scientific American.*

Mr. Glaisher's Tenth Scientific Balloon Ascent.

Mr. Glaisher made his tenth scientific balloon ascent from the Crystal Palace on Saturday las at 1.17 p.m. The descent was accomplished at Newhaven at 2.50 p.m. amidst circumstances attended with some considerable danger. The wind, which at starting was blowing steadily from the north at an estimated velocity of forty miles an hour, would have carried the balloon and its occupants out to sea, but for the intrepid conduct of Mr. Coxwell, who effected their descent, by using the valve so freely as to convert the balloon into a monster parachute. They descended the last two miles in four minutes; had they done so less rapidly they must have missed the land, the place where they descended being less than half a mile from the sea. The wind at the time was blowing at the rate of nearly a mile per minute directly out to sea; it is clear therefore that a stay in the air of half a minute more would have placed them in great peril.

Mr. Glaisher made a number of observations of the thermometer, and obtained a series of results which tend to confirm his previous experiments, and conclusively establlsh the necessity of rejecting the theory of uniform decrease of temperature with increase of elevation. From 2.15 to 2.31 numerous observations were made of the lines of the solar spectrum. When the direct light of the sun entered the slit the lines were, of course, present in great numbers, the spectrum being considerable lengthened at the violet end, and the nebulous lines H being distinctly visible. At the red end A was seen very clearly. The light from the sky in the immediate neighbourhood of the sun gave a shorter spectrum, the lines from B to G only being visible. From this point the spectrum shortened considerably, until the spot opposite the sun was reached, which gave no light at all.

The photographic observations made by Mr. Glaisher are interesting. He took with him slips of sensitized paper, having arranged that similar slips made at the same time should be exposed at the Royal Observatory, Greenwich, and the amount

of coloration per minute noted at simultaneous intervals. On comparing results, it was found that, when about three miles high, the paper did not colour in half-an-hour so much as it did in the grounds of the Royal Observatory in one minute. This fact is so singular as to require confirmation before any explanation is sought. The temperature at three miles was 21° F., but this great degree of cold could hardly account for so great a diminution of sensitiveness.

The registrations of temperature were 61½° before starting; 41° at one nile; 32° at two miles; 21° at three miles; 16° at four miles; and 12° at four miles and a-half, the highest point reached. The air was extremely dry, both at starting and during the whole ascent. Clouds were reached at the height of one mile, and, on passing them, the shining white clouds extending to the horizon, was exceedingly fine.

James Watt a Photographer.

A discovery of great historico-scientific interest is said to have been just made. It is alleged in a letter published in a Birmingham contemporary that "distinct evidence has been got to show that James Watt was engaged in photographic experiments, and that he took portraits." This announcement is certainly startling enough, but we are assured that "it is true."

The Times.

It is stated that there 350 persons employed in the office of the London *Times*. The usual circulation is 65,000, which requires eleven tons of paper daily. This paper is made wholly of linen. *The Times* is printed on Hoe's lightning press the large cylinder of which turns out eight pages every second and a half, or allowing for stoppages about 12,500 an hour, equal to 1000 every five minutes. When the whole paper is set up, papier-mache stereotypes are made from it, so as to attain greater rapidity of production by printing simultaneously on several presses. The whole business of *The Times* is on the cash principle. The papers are issued directly from the office. If intending subscribers send their addresses and cash, both are handed to a reliable newsman, who supplies the paper. The great newspaper-vendors settle in cash, once a week. The smaller ones have credit from day to day, and sometimes no credit at all. Advertisements are almost invariably paid for before insertion. *The Times* like the *Illustrated London News*, owns an extensive paper mill of its own.

Illustrated London News.

Mr. W. J. Steward has been appointed editor of the great English pictorial. The salary is about $6000 a year,—the same as that of Mr. Delane, editor of *The Times*. In addition however, Mr. Delane has a twenty-fourth share in the "Thunderer" Mr. Steward is author of a novel entitled "Footsteps Behind Him," and has another, called "Picked up at Sea," now in the press. Among the previous editors of the *Illustrated London News* have been Mr. F. W. N. Bayley, Mr. John Timbs, and Dr. Charles Mackay.

Pictorial Newspapers.

Mr. McLean, proprietor of "Fun" now in its fourth volume, is about establishing a new illustrated weekly in London. Of the Royal Marriage number of the *Illustrated London News* over 200,000 copies were sold. The clear profit is estimated at nearly £15,000.

The Rose, Thistle, and Shamrock.

A monthly magazine bearing this name, edited by a lady and printed by women, at Edinburgh, has reached its fourteenth number. Among its contributors are Archbishop Whately, Cuthbert Bede, J. O. Halliwell, and Mr. Sergeant Burke.

The Young of Salmon.

Dr. Alcock exhibited before the Manchester Philosophical Society a young living salmon, about fourteen days old, attached to part of the ovum. Dr. Alcock particularly called attention to the form of the vertebral column, which, whilst young, is similar to that of the lower grade of cartilaginous fishes when fully grown; the skeleton of the salmon however, becomes gradually changed, until at maturity it is that of the higher class of osseous fishes.

Sulphur Rendered Flexible.

A very curious chemical discovery has been made by Dissenbacher, a young German chemist. By the addition of a small quantity of chlorine or iodine, pure sulphur is rendered soft; and the Paris Academy, to whom the experiment was exhibited by H. Deville, were astonished to see a thin leaf of sulphur treated as flexible as if made of wax.

Glue for Ready Use.

To any quantity of glue use common whiskey, instead of water. Put both together in a bottle, cork it tight, and set it away for three or four days, when it will be fit for use without the application of heat. Glue thus prepared will keep for years, and is at all times fit for use, except in very cold weather, when it should be set in warm water before using. To obviate the difficulty of the stopper getting tight by the glue drying in the mouth of the vessel, use a tin vessel, with the cover fitting tight on the outside, to prevent the escape of the spirit by evaporation. A strong solution of isinglass, made in the same manner, is an excellent cement for leather.

Weights and Measures.

Mr. Ewar has obtained leave to bring in a bill for decimilising our existing system of weights and measures, and for establishing an accordance between them and those of foreign countries.

Rouge for the Complexion.

A correspondent in the east writes, having lately wondered what was the composition of the rouge with which the arabian girls paint their faces, he analysed a bottle of it bearing a French and American label, and was not a little surprised to find a solution of Hofmann's "acetate of rosaniline" in rose water.