THE JOURNAL

OF THE

Board of Arts and Manufactures

FOR UPPER CANADA.

MARCH, 1866.

EDUCATION IN SCIENCE AND ART.

(CONTRIBUTED BY MR. RICHARD LEWIS, TORONTO.)

In the annual report of the Board of Arts and Manufactures for Upper Canada special attention is directed to the necessity of establishing a science and art department in connection with its operations. We attach the highest importance to this recommendation. It claims the earnest consideration at once of the government and the general public. The material progress of a people depends so entirely on its industrial development and energy that no obligation presses itself stronger on a government than that of encouraging and aiding the agricultural and manufacturing efforts of a country; and the successful development of these efforts depend so much on science and art, that a general and wide-spread knowledge of their principles and their application to industrial operations is of the first importance to national prosperity and greatness. If we regard ourselves as pre-eminently destined to be an agricultural people, a knowledge of the sciences on which a prosperous agriculture depends is imperatively demanded. Our material prosperity will be advanced in proportion as we improve and export our superfluous agricultural produce. Hence the importance of science and art as the great means for increasing the productive powers of the soil and of supplying the agriculturist with the resources of mechanical skill and invention. The nation whose farmers have a scientific knowledge of the soil and atmosphere—who are educated in chemistry and geology and mathematics, and whose mechanical genius, guided by science, is largely devoted to the improvement of agricultural implements, will take the foremost place in the agricultural markets of the world; while its internal economy and prosperity, as well as its physical and sanatory condition, will be improved and exalted. But with our splendid mineral and vegetable resources, it is vain to deny us a great manufacturing destiny. We belong to a race eminently mechanical and commercial, and with almost boundless natural advantages, we cannot fail to take a high place in the ranks of manufacturing nations. Hence the duty of government to spread a knowledge of science and art amongst the people. We need scarcely say that our manufacturing prosperity will depend altogether on the superiority of our productions; and the value of these productions will be as much due to the beauty and finish —in other words, the æsthetic character of the workmanship, as to the material of which it is made and its substantial utility. A taste for ornamentation and beauty of structure in articles of manufacture is growing throughout the civilized world, because civilized nations are advancing in intelligence. It is the inevitable consequence of education, and is at once its most important element and its most hopeful result. For the love of ornamentation and the beautiful, is the love of order and harmony and truth and nature. It tends to an *ideal* which only the infinitely good and pure can satisfy, and thus it has a high moral and religious influence on the character of our civilization. Hence it is as much the duty of government and the interest of the people to spread a knowledge of art, and kindle an æsthetic taste in a manufacturing community, as it is to foster and protect manufactures by legal enactments and prohibitions.

It is this view of the subject which gives such importance to the suggestion for establishing a school of art and design, and the study of all sciences bearing on the progress of material industry in these provinces. The superiority of French manufactures a few years since—superiority both of structure and appearance—was entirely due to the better education of the workmen. Science and art were popularized by means of schools of art and design within the reach of all who desired the instruction; and the manufacturing operative, having his mind cultured in a knowledge of the sciences bearing on his daily work, and his eye and hand disciplined by art studies, rose at once to the rank of an intelligent artizan—his judgment enlightened and guided by scientific truths and refined and ennobled by correct and pure taste.

The example and success of France in art culture have led to similar efforts in England. Art schools and schools of design have been established in every part of the kingdom, and elementary drawing instruction forms a part of the studies of every common school throughout the country. Thus art education has been practically admitted to be a public duty of the highest consequence to the public interests. It has not been the issue of philanthropic speculation; but animated by that genius of common sense which makes the English people often the last to accept new theories of progress, until tried by experience and sanctioned by success, and the foremost in availing themselves of every improvement necessary to their material greatness—art education has been accepted and established throughout the kingdom and made available to all classes, because it has been clearly seen that it is indispensable to the manufacturing and commercial prosperity of the empire. The government has become the great patron of science and art instruction, not only supporting schools with substantial grants, but by its admirable organization cultivating a taste for works of art and the application of science and art to manufactures amongst the common people; and its wisdom and liberality have already been richly rewarded; for the art instructions pays the cost of the outlay. English manufactures, always distinguished for their intrinsic and substantial value, have now added to them the higher attractions of artistic excellence and beauty, and are taking precedence of those of all other countries as articles of commerce.

The first step toward accomplishing this important work in Canada is the establishment of a School of Arts and Design, as proposed by the Board of Arts and Manufactures; where also in conjunction with art instruction the study of all sciences related with manufactures, mathematics, chemistry, mineralogy, geology, &c., should be pursued. A knowledge of these sciences is indispensable to manufacturing progress. As we increase the scientific knowledge of our artizans and practical workers of every kind, whether of the bench, or in the mines, or the field, we multiply the resources of inventions, improvements and discoveries. For the labourer who comes into direct contact with the material world is in the most favorable condition for applying theory to practice, and for enriching a country by the improvement and development of its industrial powers; and therefore it is impossible to over estimate or foresee the immense advantages that must repay the efforts of the nation in this direction. No doubt a school of Art and Design should ultimately have higher objects than elementary instruction in drawing, the first object of such institutions being to teach the principles and practice of applied art; but in the present artistic condition of our people they would have to begin as elementary drawing schools. Instruction in elementary drawing ought to be as universal as in writing, and doubtless when the people learn to appreciate the commercial and moral advantages of such instruction, elementary drawing will be regarded as an indispensable qualification in every teacher of a common school, as it is in the advanced states of Europe, and as it is fast becoming in England, and will form as necessary a part of the daily studies as writing or arithmetic. But the taste has to be fostered and established; and the School of Art and Design is the proper field for the culture of that taste.

We have no fear as to the rapid progress in art studies that would follow. Wherever art exhibitions take place they are crowded with delighted spectators. The love of the beautiful, whether in nature or art, is a human instinct, a passion that needs only means and method to lead to lasting and noble issues; and while its development, under intelligent guidance, cannot fail to have a deep moral influence on the national character, its culture rapidly advances wherever art instruction and art productions in pictures or manufactures are supplied to the people. It is certain, therefore, that a School of Art and Design of the kind proposed would not only become the nursery for the artistic and scientific education of the national mind, but would make the instruction so popular and profitable as to render it necessary to introduce it into every school in the land. Schools of design would then take their legitimate position as the proper agents for leading pupils—already disciplined in the elementary principles, capable of drawing with correctness whatever was placed before them; with the eye trained to "see forms, lights and shadows, and sensible of the harmonies and discords of colors, and the hand tutored to follow the perceptions of the mind"—to the application of art to manufacture and to the highest triumphs of design and painting.

It is vain for us to suppose that the natural riches of our country will enable us to dispense with these great aids to progress. The competitive spirit animates nations as it does individuals; and those alone will advance to prosperity and greatness who bring all the power of cultivated minds and high taste to bear upon nature and her ample resources. But besides and above all this material prosperity which the cultivation of art and practical science so greatly aids, there is the deep and lasting moral benefit. Every advance we make in refinement, in higher tastes, in a love of the beautiful and the true, reacts on the moral nature of man, and strengthens his reverence for purity and virtue. In this light the ornamentation and decoration of the humblest homes exercise an important influence over the character and happiness of the people; while the workman who would carry to his daily toil the sense of a taste disciplined by art, and of a judgment strengthened by scientific truth, would cease to feel its drudgery, because toil, directed and enlightened by intelligence would cease to be monotonous and unprofitable. The tendency of art studies is to awaken new interest in every-day objects by shewing nature and labor in new forms. Beauty must be analyzed to enjoy it, and countless objects of beauty and interest lie around our daily steps disregarded and profitless, because we have not been trained to see them with the eye of art, and to examine them with the intelligence of science.

In another article we shall lay before our readers details of the methods adopted in England and other countries for carrying into effect the important objects we have on the present occasion endeavoured to urge on their consideration.

PROVINCIAL AGRICULTURAL ASSOCIATION EXHIBITION, 1866.

We hoped to have been able to give the Rules and Regulations of the ensuing Exhibition to be held in this city, and the Prize List of the Arts and Manufactures Department, in this number of the Journal; but as their final revision and adoption is appointed for the last day of this month (April), we shall be obliged to defer their publication for the June number.

With a view to informing intending Exhibitors as early as possible, we note a few important changes already decided upon by the Council of the Association.

1st. In all Departments of the Exhibition—Agricultural, Horticultural, Fine Arts and Manufactures—the Prizes will be open to competition by Exhibitors from any part of the World, on equal terms; but entries must in all cases be made in the names of the manufacturers or producers only.

2nd. No Exhibitor in the Arts, or in Manufactured Articles, shall be awarded more than one prize in any section of a class.

3rd. Manufactured Articles or Works of Art which have been awarded prizes at any previous Provincial Exhibition, shall not be eligible to compete for prizes named in the Prize List, but may be awarded Diplomas, if, in the opinion of the Judges, such articles are superior to any others of the same kind exhibited, and are in other respects worthy.

4th. All Fine Art Specimens must be delivered on the Grounds on the Friday before the Show, so as to allow of their being classified and properly hung on the Saturday, ready for the Judges to examine on Monday, the first day of the Exhibition week. All Articles of Manufacture must positively be in on the Monday of the Exhibition week, so as to allow of their being judged on the morning of Tuesday, the first day of the Exhibition. Articles sent in after the days named may be exhibited, but will not be allowed to compete for prizes.

5th. The President will deliver his address at 3 p.m. on Thursday, instead of Friday, as heretofore.

6th. The Crystal Palace will be closed to visitors on and after 2 o'clock of the Friday of the Exhibition week, when parties may proceed to remove their goods.

7th. The Judges in Fine Arts will meet at 10 o'clock a.m. of the Monday of the Exhibition week; and the Judges in Manufactures on the following day, Tuesday, at the same hour, to commence their duties.

8th. There will be no Ploughing Match during the time of holding the Exhibition. There will also be some changes in the Prize List.

In Fine Arts, originals will be distinguished from copies, both of Professionals and Amateurs. Coloured Photographs must in all cases be accompanied by plain copies, and the name of the Artist who Colours any Photographs exhibited must be stated.

In the Class for Ladies' Work, all articles entered must be strictly the production of Ladies, and no prizes will be awarded but in conformity with this rule.

In Textile Fabrics, all entries must be made in the name of the actual manufacturer, or person by whom the fabric was woven. We mention this matter particularly, as heretofore, both at Provincial and Local Exhibitions, parties have been in the habit of spinning their yarn at home, sending it to the cloth mill to be woven, and then entering the cloth in their own names; and occasionally—as in one case at last Provincial Exhibition—taking the first prize in competition with the Manufacturer of both specimens of cloth.

We would here again call attention to the delay caused yearly in the opening of the Exhibition, and the very unsatisfactory classification and arrangement of goods, through the tardiness of Exhibitors in forwarding their specimens. It is to be hoped that an improvement will be apparent in this respect next September. It is just as easy to be early as late, if the will is so inclined.

SHAVER'S SAFETY CAP.

We beg to call attention to the Patent Safety Cap for covering the joints of connecting rods of machinery, advertised in this number of the Journal. A useful arrangement for preventing accidents from projecting bolts used in coupling these rods.

Board of Arts and Manufactures
FOR UPPER CANADA.

FINAL EXAMINATIONS.

Notice to Institutes.

Directors and members of Mechanics' Institutes are reminded that the Final Examinations of the Board will be held during the first week in June next, and that the names of Candidates, and the subjects they propose to be examined in, must be communicated to this Board on or before the tenth day of May, so as to enable the Examiners to *set* the papers necessary for the examinations.

BLANK FORMS, upon which to make these returns, will be mailed to any Institute applying for them.

The details of the preliminary and final examinations will be found in this Journal, for Dec. 1864; but any further information required will be furnished on application.

W. EDWARDS,
Secretary.

TRADE MARKS.

Trade Marks registered in the office of the Board of Registration and Statistics, Ottawa, and open for inspection at the Library of this Board:

(*Continued from page* 91.)

Perry Davis and Son, Providence, R I., U. S.—Trade Mark No. 17, dated January 11th, 1866, entitled "Lyman's Universal Pain Killer"—was cancelled March 22nd, 1866; and Perry Davis and Son's "Pain Killer" substituted for same, (Vol. A, folio 104, No. 105,) after trial under the Act. (24th Vic., Chap. 21).

Joseph Burnett & Co., Boston, U. S., "Florimel." Vol. A, folio 107, No. 154. Dated March 24th, 1866.

Joseph Burnett & Co., Boston, U. S. "Oriental Tooth Wash." Vol. A, folio 108, No. 154. Dated March 24th, 1866.

Joseph Burnett & Co., Boston, U. S. "Jonas Whitcomb's Remedy for, &c." Vol. A, folio 105, No. 154. Dated March 24th, 1866.

Joseph Burnett & Co., Boston, U. S., "Kalliston." Vol. A, folio 106, No. 154. Dated March 24th, 1866

B. F. Brown & Co., Boston, U. S., "French Dressing." Vol. A, folio 109, No. 155. Dated March 24th, 1866.

Mason and Hamlin, Boston, U. S., "Cabinet Organ." Vol. A, folio 114, No. 158. Dated March 27th, 1866.

J. C. Ayer & Co., Lowell, Mass., U. S., "Compound Concentrated Extract of Sarsparilla." Vol. A, folio 113, No. 160. Dated March 27th, 1866.

J. C. Ayer & Co., Lowell, Mass., U. S., "Cherry Pectoral." Vol. A, folio 112, No. 160. Dated March 27th, 1866.

J. C. Ayer & Co., Lowell, Mass., U. S., "Ayer's Cathartic Pills." Vol. A, folio 110, No. 160. Dated March 27th, 1866.

J. C. Ayer & Co., Lowell, Mass., U. S, "Ayer's Ague Cure." Vol. A, folio 111, No. 160. Dated March 27th, 1866.

A. M. F. Gianelli, Montreal, "Royal Italian Bitters." Vol. A, folio 115, No. 162. Dated April 2nd, 1866.

Saml. Davis, Montreal, "Havana Whips." Vol. A, folio 116, No. 182. Dated April 9th, 1866.

S. R. Van Duger, New York, U. S., "Mrs. S. A. Allen's World's Hair Dressing, or Zylobalsimum." Vol. A., folio, 188. Dated April 12th, 1866.

S. R. Van Duger, New York, U. S., "Mrs. S. A. Allen's World's Hair Restorer." Vol. A., folio 117, No. 188. Dated April 12th, 1866.

RECENT PUBLICATIONS.

British.

Boulton and Watt, Lives of, principally from the Original Soho MSS., comprising also a History of the Invention and Introduction of the Steam Engine. By Samuel Smiles. With Portraits and Illustrations. 8vo, pp. xvi—521. *Murray.*—24*s.*

Dyer (Thomas H., LL.D.,) History of the City of Rome: its Structures and Monuments. From its Foundation to the End of the Middle Ages. With Maps. 8vo, pp. 415. *Longman.*—15*s.*

Goodwin (E. W., F.S.A.) Handbook of Floral Decoration for Churches. 12mo, sd., pp. 17. *Drake.*—(Bristol)—*Masters.*—1*s.*

Wheeler (William A., M.A.) Dictionary of the Noted Names of Fiction; including also Pseudonyms, Surnames bestowed on Eminent Men, &c., &c. Post 8vo, pp. xxxii—410. *Bell & Daldy.*—5*s.*

Hardwicke's Science Gossip: an Illustrated Medium of Interchange and Gossip for Students and Lovers of Nature. Edited by M. C. Cooke. Vol. 1. Sup.-roy. 8vo, pp. xii—288. *Hardwicke.*—5*s.*

Jackson's Gymnastics, based on Anatomical Principles, for Development and Strengthening the Muscles of the Hand, for Musical, Mechanical, and Medical Purposes. With 37 Diagrams. Fcap. 8vo, pp. x—99. *Trübner.*—3*s* 6*d.*

Hopkinson (Joseph) Working Engineer's Practical Guide to the Management of the Steam Engine and Boiler; with Rules and Instructions for Valve Setting, so as to secure a full Development of the Motive Power. Illustrated. 8vo, sd. pp. x—166. *Weale.*—4*s.*

American.

Agassiz. The Structure of Animal Life. Six Lectures delivered at the Brooklyn Academy of Music, in 1862. By Louis Agassiz. 8vo. pp. viii., 128. N. Y., *Scribner & Co.* Cl.—$2 50.

Art of Confectionery (The). With various Methods of Preserving Fruits and Fruit Juices, &c., and Directions for making Cakes, and Ice-Cream, Sherbet, etc. 12mo. pp. 347. Boston: *Tilton & Co.* Cl.—$4.

Fitzgerald. The Boston Machinist. Being a Complete School for the Apprentice, as well as the Advanced Machinist. Showing how to Make and Use every Tool in every Branch of the Business. With a Treatise on Screw and Gear Cutting. By Walter Fitzgerald. 12mo. pp. 80. N. Y.; *John Wiley & Son.* Cl.—75 cts

Lippincott's Pronouncing Gazetteer of the World. New Revised Edition, with nearly Ten Thousand new Notices according to the last Census. Roy. 8vo., pp. 2314. Phila: *J. B. Lippincott & Co.* Shp. $10.

Mackenzie's Ten Thousand Receipts. An entirely New Edition, carefully revised and rewritten, containing Improvments and Discoveries up to October, 1865. 8vo. Phila: *T. Ellwood Zell.*

Muench. School for American Grape Culture: brief but thorough and practical Guide to the Laying Out of Vineyards, the Treatment of Vines, and the Production of Wine in North America. By F. Muench. 16mo. pp. 189. St. Louis: *C. Witter*. Bds.—$1.

Nystrom. Pocket-Book of Mechanics and Engineering. By John W. Nystrom, C. E. Tenth Edition, revised, with Additional Matter. 14 Plates. 18mo. pp. 326. Phila.: *J. B. Lippincott & Co.* Tuck leather, $2 50.

Prescott. History, Theory, and Practice of the Electric Telegraph. By George B. Prescott. Third Edition, revised and enlarged. 12mo. pp. 508. Boston: *Ticknor & Fields*. Cl.—$2 50.

Ruskin. The Ethics of the Dust. Ten Lectures to Little Housewives, on the Elements of Chrystallization. By John Ruskin. 12mo. pp. 250. N. Y.: *Jno. Wiley & Son.* Cl.—$1 25.

Silversmith. A Practical Handbook for Miners, Metallurgists, and Assayers. By Julius Silversmith. Comprising the most recent Improvements in the Disintegration, Amalgamation, Smelting, and Parting of Ores; with a comprehensive Digest of the Mining Laws. 12mo. pp. 271. Illus. N. Y.: *D. Van Nostrand*. Cl.—$3.

Sylvester. The Taxidermist's Manual, giving full Instructions in mounting and preserving Birds, Mammals, Insects, Fishes, Reptiles, Skeletons, Eggs, &c. By S. H. Sylvester, Taxidermist. 16mo. pp. 29. Middleboro', Mass.: *The Author*. Cl.—$3.

Warren. Notes on Polytechnic or Scientific Schools in the United States; their Nature, Position, Aims, and Wants. By S. E. Warren, Professor of Descriptive Geometry, etc., in the Rensselaer Polytechnic Institute. 8vo. pp. 58. N. Y.: *J. Wiley & Son.* Paper.—40 cts.

Wildman. Instructions in the Manipulation of Hard Rubber or Vulcanite for Dental Purposes. By E. Wildman, M. D., D. D. S. Imp. 8vo. pp. 46. Illus. Phila.: *S. S. White*. Cl.—$1 25.

Transactions of Societies.

THE TORONTO MECHANICS' INSTITUTE EXHIBITION.

(*From the Toronto Leader, March 31st*)

The exhibition at the Institute has been a remarkable success. In its pecuniary results, it has exceeded all past efforts in this direction, and if regarded simply as a means for increasing the revenue of a useful public Institute, which is now carrying a debt of $18,000, it is highly satisfactory and suggestive. Mechanics' Institutes are never supported on a large scale by the mere subscriptions of their members, and have generally to appeal to the benevolence of the wealthy for pecuniary aids. But this system induces a spirit of dependence and patronage adverse and prejudicial to the spirit of self-reliance and personal effort that distinguishes this age and forms so large an element of its progress; and when mechanics' and similar institutes can derive revenues from enterprises that contribute to public amusement and instruction, they are in the safest and healthiest condition. The exhibitors in this instance are assisting the Institute and serving the public better by lending their articles of interest and beauty, than by gifts of money. The assembling of large crowds of all classes together for rational and elevating enjoyment, has high social and moral advantages. Exhibitions of this kind level all ranks, not by degrading those above, but by exalting those below; and enjoyment, as well as suffering, when it is shared in common by all, knits men together, kindles and fosters the courtesies of life and civilizes and humanizes the race. But no one can look upon visitors that throng the Music Hall and fail to see, that, other high intellectual and moral results must attend such exhibitions. The intense earnestness and delight with which all inspect the objects of nature and art before them are highly suggestive and encouraging. No doubt the great majority of these visitors are ignorant of the principles of coloring and composition, of light and shade and harmony, and all else that contributes to make a picture attractive; they may know nothing of the characteristics of "schools," and be quite incapable of deciding whether a picture before them is a Raphael or a Murillo a Reubens or a Guido. But wherever there is good taste and intelligence, there will be a just appreciation of nature and of beauty; and even where the culture is not high a truthful, natural, beautiful picture, will always give the highest enjoyment and have a refining influence on the coarsest nature. No one can look long on a masterly painting, which expresses some deep human passion—a good copy for example of the Madonna and Child without being moved and influenced for good. The tender, loving, and inspired expression of the holy mother passes from the canvass, as it seems to breath with life, into the soul of the beholder, and lifts it up into its own atmosphere of divine glory and passion. Thus, too, the Beatrice of Guido, of which there is a beautiful copy in the exhibition, so angelic in its expression of child-like innocence, yet so sad and touching that it suggests at once feelings of sorrow and sympathy and horror, such as move all who know the awful tale of the sufferings of Beatrice and of the terrible crimes of the Cenci. Hazlitt has said that a man cannot commit an ignoble action in the presence of the picture of a beautiful woman, and this is true of all beautiful and truthful pictures; for the picture of a lovely and virtuous woman or a great and good man or a landscape, with its glories of earth and sky, and field and flower awakens in us a mysterious consciousness of a higher and purer Presence. It is with these views that we regard with more than common interest this department of the exhibition. It is one that has the most important relations with the refinement and prosperity of the people and must owe its development to their patronage. Like literature, art has cast off the bondage of lordly and princely patronage, and like literature it must now owe its sustenance and life to the multitude, who are always in the end the most just and liberal patrons of true merit. Literature, however, in this respect is in advance of art, because every one learns to read and few learn to paint. The artistic taste must precede the artistic power, and it is by public exhibitions of every species of works of art, whether in painting or sculpture, or in their numerous applications to manufactures, that this taste is awakened and sustained. It is thus, with the highest satisfaction that we see so many excellent paintings and drawings by Canadian artists, in the exhibition. They attract as much attention as any pictures in the exhibition, and this chiefly on their own special and very superior merits.

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"But it is not simply a love of art productions that such an exhibition fosters. It abounds in specimens of natural history, of stuffed birds and animals and fishes, of beautifully and scientifically arranged shells; it presents some most interesting curiosities, ancient coins and manuscripts, and books, that realizes to us the skill and civilization of man in the past, all rich in the instruction they give and the tastes they gratify or awaken. It is impossible for us in thus sketching the nature and objects of the exhibition to pass over the beautiful specimens of ladies' work. The entire department abounds in evidences of admirable taste and skill, and patient industry devoted to a beautiful and useful art. Many of the wax works are of exquisite construction, and the harmony and richness of colors in some of the needle work and the wonderful delicacy of workmanship in all, are strongly suggestive of a power, limited and trammelled by social prejudices, but capable, when fully developed and applied, of a thousand triumphs in pursuits now monopolized by man.

The great success of this exhibition is the best reward that can be offered to the exhibitors. To all of them public gratitude is due for the great pleasure and instruction derived from their liberality and generous confidence. No doubt many of them put themselves to inconvenience, but the presence of so many thousand visitors receiving such pure and elevating enjoyment through their liberality must be gratifying; and they have the additional and higher satisfaction of knowing that the exhibition they have created, brief as is its duration, will have its influence in advancing and improving the people of this country. Nor can we omit all reference to the Directors of the Institute and their indefatigable Secretary, to whom the thanks of our citizens are largely due for the success of the exhibition.

BOARD OF AGRICULTURE FOR 1866.

The first meeting of the Board of Agriculture for the ensuing year was held at the Board Room, Agricultural Hall, Toronto, on Tuesday the 17th of April. The Board was regularly organized by the reading of a communication from the Hon. the Minister of Agriculture, reporting the names of the new members elected to fill the place of the four gentlemen who had retired by rotation.

The Hon. David Christie, M.L.C., was unanimously re-elected President of the Board, and the Hon. A. A. Burnham, M.L.C., Vice-President, for the ensuing year—W. Ferguson, Esq., M.P.P., having declined re-election to the latter position, and proposed Mr. Burnham in his stead.

The Board as now organized consists of the Hon'bles David Christie, Brantford, A. A. Burnham, Cobourg, and George Alexander, Woodstock; W. Ferguson, Esq., M.P.P., Kingston; R. L. Denison, Esq., Toronto; Dr. Richmond, Gananoque; F. W. Stone, Guelph; J. C. Rykert, Esq., St. Catharines, with the following gentlemen as *ex officio* members:—The Hon. the Minister of Agriculture; George Buckland, Esq., Professor of Agriculture, University College, Toronto; N. J. McGillivray, President of the Provincial Agricultural Association of U. C., Glengarry; Rev. Dr. Ryerson, Chief Superintendent of Education, U. C., Toronto. Secretary, Mr. Hugh C. Thomson, Toronto.

COUNCIL OF THE PROVINCIAL AGRICULTURAL ASSOCIATION OF U. C. FOR 1866.

The Council of the Agricultural Association, composed of the entire Board of Agriculture, with Dr. Beatty, President of the Board of Arts and Manufactures for U. C., and Professor Buckland, Vice-President of the same Board, held its first meeting on the same day and at the same place. *Ex officio* Secretaries of the Association: Mr. H. C. Thomson, as Secretary of the Board of Agriculture, and Mr. W. Edwards, as Secretary of the Board of Arts and Manufactures, for U. C.

It was resolved to hold the next Annual Exhibition of the Association in the week commencing Monday September the 24th, at the City of Toronto—the place previously determined upon at the last Annual Meeting of the Association.

The names of the following gentlemen were submitted by the Council of the Corporation of the City of Toronto, as fit and proper persons to constitute the Local Committee for making due provision for the ensuing Exhibition, viz: His Worship the Mayor, (F. H. Medcalf, Esq.), Aldermen J. E. Smith, Strachan, Hynes, Harman, Thomas Smith, Dickey, Sheard, and Coun. Boustead, Denison and Bell; John Macdonald and A. M. Smith, Esqs., members for the city; the Presidents of the Electoral Division Society, Horticultural Society and Mechanics' Institute, (P. Armstrong, Esq., the Hon. G. W. Allan, and F.W. Cumberland, Esq.); the President of the West Riding of York Agricultural Society, (John Dew, Esq.), the Sheriff and Warden of the County, (F. W. Jarvis and H. S. Howland, Esqs.); J. P. Wheler, Esq., Scarborough, (1st Vice President Agricultural Association); Messrs. James Fleming, John Gray, W. H. Sheppard, and Major A. Shaw, Toronto. The list as submitted was approved of, and the gentlemen named therein duly appointed, who, with the Council of the association as *ex-officio* members will form the Local Committee.

The Council revised the rules and regulations, and prize lists, for the next exhibition, making some important changes; and appointed committees to finally revise the same, and report before publication.

Rules and regulations and arts and manufactures prize list in our next.

Selected Articles.

CHEMISTRY BY THE FIRESIDE.

We propose to publish a Series of short papers under the above title, cut from that excellent weekly the *Maine Farmer*. The object of these papers appear in the introductory chapter:—

No. 1.

We propose to take up the subject of Chemistry for the study of our readers during the long winter evenings. We do not intend to enter into all the minutiæ of the science on any particular subject, but rather present such portions of the immense study of chemistry as may apply to our daily experience in life. Whether we take up the study as a source of knowledge, merely, or for its effect towards disciplining the mind, or for its brilliant experiments, or for its commercial value, the patient reader and student cannot fail of reaping a rich harvest.

Chemistry is the science of the present century. But little worthy the name was known to science a hundred years ago. The copy slips of our boyhood was considered as literally true, that fire, air, earth and water, were the four elements of the philosopher. Nobody knew any better, because nobody could prove to the contrary. Now, Chemistry has laid hold upon everything, and analyzes everything. The mechanic of every kind deals with chemistry in its practical applications at every step. The farmer cannot perform a single operation on his soil without performing a chemical experiment. He may not be able to explain the reasons for his course, but he has learned that such and such operations bring about certain results. Chemists could make sulphuric acid two centuries ago, but could not tell its composition. Chemistry teaches us the composition of bodies. This definition is good enough for our present purpose.

The first thing to which we would call the attention of our fireside student is the nature of an element. An element is a substance that cannot be separated into anything more simple. If you take a lump of gold and melt it, and hammer it, and make it into whatever form you please, it still remains gold. If you take a piece of brass and separate it into its elementary parts, it will be found to be a compound of zinc and copper. Thus gold is an element, while brass is a compound substance. An element cannot, under ordinary circumstances, be changed in its character by any treatment so long as it remains uncombined with other elements. Gold, silver, copper, iron, oxygen, and hydrogen are among the elements. Sixty-four elements are now known to chemists, yet only fourteen of these are of common occurrence, so that you have only to learn the names of fourteen different elements and their properties and combinations, to become familiar with about all that will be necessary to know in whatever department of life you may be engaged.

Nearly all the elements, when set free are in a solid state. Only two are in a fluid condition at common temperature. These are mercury and bromine. If you look at a thermometer on a cold day, you will see the mercury in a fluid state, though it may be cold enough to freeze water. It must be as low as forty degrees below zero before it will freeze. Bromine will freeze at zero.

It must be constantly borne in mind that most of the elements are combined with other elements forming compounds, so that their elementary character is entirely concealed. Oxygen, carbon, nitrogen, hydrogen, and some nine or ten metals are all that are ever found in a free or uncombined state. What is very wonderful about these elements, and what we might have anticipated, is the fact that these elements unite by weight. Thus one pound of hydrogen requires eight pounds of oxygen to combine with it so as to form water. You cannot take three, nor six pounds of oxygen. Nothing short of eight pounds of oxygen will produce water. We see something of the same kind in making soap. If we mix oil, water and potash in certain proportions by weight we obtain soap, but if one or the other of these substances be in excess it will remain uncombined. Too much grease for the potash will leave the former floating on the surface after the soap is made. If we should take eight pounds of oxygen and unite it with one hundred and three pounds of lead, we should have a compound called oxide of lead. This is the litharge used by painters for drying their paints. No smaller numbers by weight could be used to form this compound. This is called the law of *definite proportions*, and is one of the most remarkable discoveries ever made by man, and the most extensive and important in its results. The proportion in which elements unite is fixed and invariable. If it were not so, we should not be able to put any dependence upon anything in nature. Thus, common salt in a pure state is composed of two elements, chlorine and sodium, in fixed and definite proportions. Go where you will, and you will recognize common salt by its color, shape of crystals, which is that of a cube, or by its taste. If these two elements could unite accidentally in all proportions, we should have as many different compounds with as many different properties as there were variations in the combinations. We should not know only by testing whether the substance was a poison, or whether it was harmless, whether useful or useless. Thus Divine wisdom has said to the elements, Thus far shalt thou go, and no further.

We will give the combining numbers by weight of a few of the elements to be committed to memory. It will be convenient for reference hereafter. Hydrogen, 1; oxygen, 8; sulphur, 16; carbon, 6; mercury, 100; iron, 28; nitrogen, 14.

No. 2.

In our last chapter, we noticed the very simple yet remarkable law, that the elements unite in definite proportions. In this respect chemistry is a mathematical science. One pound of hydrogen and eight pounds of oxygen form water. No other proportion will produce it. Thus we see that nature has fixed laws, giving us the clearest evidence of a great plan in the creation of the world.

But we want to explain to you another equally simple and remarkable law. We have seen how two elements unite. Now let us see if there are any other conditions in which these elements unite. It is often the case that one element will unite with another in a certain ratio of weights. Let us see. We have just told you that one pound of hydrogen combines with eight pounds of oxygen to form water, but it has been found that just twice as many pounds of oxygen will combine with hydrogen—that is, sixteen pounds to one. If the oxygen could unite in a still higher proportion it would be twenty-four pounds, and so on, by adding eight pounds at each time. This principal runs through all the operations of chemistry, and is called the law of *multiple proportions*

The third law is called the law of *equivalent* proportions, which can be easily explained. If it requires eight pounds of oxygen to unite with one pound of hydrogen to form water, in case oxygen unites with any other element, it must be represented by the same number (8,) as before, so that the number representing the elements are fixed and invariable in all cases.

But there is one more remarkable law. We have just seen how different elements unite among themselves to form a compound; now let us see if there is any law for uniting two or more compounds. It has been found by experiment that compounds unite in proportion to the sum of their elements. Let us see. Hydrogen one pound and oxygen eight pounds form water. Adding these elements we have nine pounds, the combining number for water. Now water combines in definite proportions with a great many other compounds, but it must be in the proportion of nine, eighteen, or twenty seven pounds, and so on. Dry sulphuric acid unites with other compounds with the combining number of forty. If water combines with it it must take nine pounds of water for this purpose, so that the combining number of liquid sulphuric acid is forty-nine pound. This is called the law of *combined properties*. Thus we have four laws of combination, on which the whole science of chemistry depends. A careful study of these simple laws will lay the foundation for an extensive acquaintance with the science of chemistry.

Hydrogen unites with a smaller weight than any other element, and it is supposed, though not yet proved, that all the elements unite with hydrogen in a simple multiple ratio of that element. About thirty of the elements have been proved to unite in this manner, and the number is gradually increasing as the science arrives at a higher degree of perfection.

Several of the elements when not free are in the form of gases. Hydrogen and oxygen are examples. You may submit these elements to the highest pressure and you cannot make a liquid of them; but just burn them together and they will form water. Thus chemistry is all the way along a scene of wonders, and a careful attention to a few leading principles will unfold to us ten thousand objects of interest all around us.

No. 3—Chemical Affinity.

In our last number, we spoke of the laws by which the elements unite among themselves. Let us see if there are any other principles pertaining to the union of the elements. The elements do not all have the same affinity for each other. Some of them will not combine with a certain class of elements at all. Oxygen is the only element capable of combining with all the other elements. In fact, oxygen is found in almost everything in nature, so that in chemical language, almost everything in nature is an oxide. This difference of affinity is sometimes called elective affinity. We can illustrate it by a very simple experiment. Chalk is composed of carbonic acid and lime. Now if we pour upon the chalk some sulphuric acid, the lime will leave the carbonic acid and unite with the sulphuric acid, leaving the carbonic acid at liberty to escape in the form of a gas to unite with something else. Instead of a chalk we shall have an entirely different substance, gypsum, or plaster of Paris.

Another important law should be remembered. The more unlike the elements, the stronger, as a general rule, is their affinity. Elements nearly alike in proportions have little or no affinity for each other. We know what potash is and what soda is. Now these two substances resemble each other in their properties, being especially known as alkalies. Now we cannot make a chemical compound of these two elements, because they have no affinity for each other. But if we unite either of these with sulphuric acid, their affinity will be very great. We might illustrate the law by a hundred experiments if necessary.

In order that the elements may unite, they must be in a state of solution. Sometimes it is necessary to make use of a powerful heat to effect this. If you mix sand and potash together at ordinary temperatures they will not unite, but if you apply the powerful heat of a furnace they will unite and form glass. Some substances act as solvents. You may not be aware of the fact that water will dissolve a greater variety of substances than anything else known. Though there are some things that alcohol will dissolve which water will not affect, yet water will dissolve a great many substances not affected by alcohol. You can dissolve the gums in water, but all the resins require alcohol for the purpose. Sometimes an element is in a solid and sometimes in a gaseous state. Oxygen is usually found in a solid state. Red precipitate is composed of oxygen and mercury, in a solid condition, while the atmosphere is a gas compound of oxygen and nitrogen. So a liquid may be suddenly changed into a solid. In slaking lime, we have a fine example of changing water into a solid. You may pour several gallons of water upon a cask of quick lime and it will all disappear. It has combined with the lime and become a solid. When the farmer buys plaster of Paris, in every one hundred pounds he has almost twenty-two pounds of water. Thus in chemistry, gases may be changed to liquids and then liquids to solids. So on the other hand, the chemist can change a solid to a liquid, and the liquid to gases, and he can then resolve the gases themselves in their elements and tell us their composition.

No. 4—The Nomenclature.

As chemistry began to unfold itself in the most rapid manner after the discovery of the principal elements, commencing with that of oxygen in 1774, an almost infinite number of new compounds were formed by combining these elements. But they had no names, and it was found impossible for the strongest memory to retain the names and composition of all these new substances. To remedy this difficulty, which was increasing every day, a committee was appointed by the French Academy to devise some plan for naming chemical substances. They hit upon an excellent plan which renders it easy not only to name, but also to number at the same time the composition of substances. This is called the *nomenclature*, and it is as important in the study of chemistry as the multiplication table in arithmetic, and should be as carefully studied. We shall only refer to its simplest rules.

Chemical compounds receive their names from one or more of the elements that compose them. When two elements unite, it is called a *binary* compound. When oxygen, chlorine, iodine, bromine, hydrogen, and some few other elements, unite, by terminating one of these elements in *ide* or *id*, and repeating the name of the other element, we have a chemical name together with its composition. Let us see. Oxide of iron is a compound of oxygen and iron. This is the chemical name for iron rust, and just as easily remembered. Oxide of hydrogen is the chemical name for water, and if we have the chemical name for water, we know its composition. Chloride of lime is a compound of chlorine and lime, and so on through all the binary compounds. By the older chemists the termination *uret* was employed in some cases instead of *ide*, as sulphuret of iron, phosphuret of lime, but it is better to employ the termination *ide* in all cases.

When two elements unite in more than one proportion, we prefix the words *prot*, *deut*, and *trit*, to designate the different degrees of combination. Protoxide of iron signifies one proportion of oxygen and one of iron, deutoxide, signifies two proportions of oxygen, and tritoxide three proportions. The highest known combination of an element is called a peroxide. But it is sometimes the case that oxygen forms binary compounds having acid properties. When this is the case we add the terminating *ous*, and *ic* to the element with the word acid. Thus, sulphur and oxygen forms a weak acid, called sulphurous acid. Another proportion of oxygen makes a stronger acid, called sulphuric acid. A weaker combination than sulphuric acid has the prefix *hypo*. A stronger acid than ic has the prefix *hyper*. We will write four acids according to their strength, beginning with the weakest. Hypo-sulphurous acid sulphurous acid, sulphuric acid, hyper-sulphuric acid.

No. 5—The Nomenclature continued.

In our last article we gave a simple rule for naming compounds formed by the union of two elements. A large number of substances are now employed in the arts which receive their names in this way. Such as oxide of iron, oxide of lead, iodide of iron, whose composition you can readily know by simply having them pronounced.

The ternary compounds, that is, those compounds formed from the union of three elements, are generally formed by the union of an acid with some element. All that is necessary, is simply to change the acid terminations *ous* and *ic* into *ite* and *ate*. Let us see. Sulphite of soda is composed of sulphurous acid and soda. Sulphate of iron (copperas) is composed of sulphuric acid and iron. This simple rule and the former one are worthy of being carefully fixed in the memory, as the chemical names are fast taking the place of the old empirical ones. Oil of vitriol is the old name for sulphuric acid; but it gives you no idea of its composition as does the latter chemical name. Farmers read much of phosphate of lime. They can by the rule just given see that it is composed of phosphoric and lime. Limestone is a carbonate of lime, and plaster of paris is a sulphate of lime. Quicklime is the oxide of lime, and bleaching powder is chloride of lime. There are some other terms in use, but we think those already explained will answer our present purpose.

Heat is capable of separating these compounds into others more simple. We take bog iron ore, which is an oxide of iron, and heat it in a powerful furnace, and the oxygen is driven off and the metal iron is left. We can give you a pretty little experiment which you can perform at any time, and make it very instructive. Take a common tobacco pipe and fill up the bowl with sulphate of iron, (copperas) cover the bowl with clay, and place it in the fire with the stem sticking out. Pretty soon a dense vapor will rush out of the stem, which is the sulphuric acid set free from the iron. When the vapor is done issuing from the stem, remove the clay covering, and you will find a very dark, reddish powder left. This is oxide of iron. Rub some of this on a board, and it will be of a bright red color. This is the common red ochre which is used for painting. Water often combines with substances so as to form a compound. Such compounds are called hydrates. If you should pour water on to quick-lime it would disappear. In other words. it combines with the lime, so that slaked lime is called a hydrate of lime. You have sometimes seen in ditches a yellow looking substance which is a hydrate of iron, or better, a hydrate of the oxide of iron, This is yellow ochre which is used for painting. If you heat this in a vessel, the water will be driven off, and you will have left the red oxide of iron as in the former experiment.

No. 6—Alchemy.

Before taking up the elements separately for examination, it may interest the reader to know something of the history of chemistry, and show how long it was before scientific truth burst upon the human mind. If at the creation, the earth was without form and void, and darkness was upon the face of the deep, surely, the human mind was groping in darkness with reference to a knowledge of the composition of bodies till within a century. We can hardly realize that men are now living in this State who were born before a single element was really known as such.

Chemistry, in a certain limited sense, is almost as old as man himself. There were artificers in brass and iron before the flood. Gold was also known, so that the art of extracting the metals, iron, copper and gold, must have existed at that time. The passion among mankind to possess gold and silver, caused men to search for it in order to add to the business of life, and as they experimented upon the metals they soon found that by melting different metals together, a compound was formed possessing different properties. In this way bronze and brass were formed. Having no fixed ideas in reference to the character of an element, they were very naturally led to discover, if possible, some method by which the less valuable metals could be turned to gold, so as to render this precious metal more common. Endless experiments were performed to bring about this result. Men spent their fortunes and their lives in search of this art. Nobles and kings lent their aid, and nothing was left undone by which to accomplish their object. In connection with this, there sprung up another idea, that some remedy could be found for all the diseases to which the human body was exposed, a universal panacea. The inherent desire for long life led to this. The class of men devoted to this object were called alchemists, and their science, alchemy.

In order to change the metals into gold, and at the same time find a universal panacea for human ills, they had only one leading idea, which was to find a universal solvent, that should have the property of dissolving all the elements. No one substance had ever been discovered that could do this, and if once discovered, they thought the great question of human happiness settled. This universal solvent was called the *philosopher's stone.* The Alchemists made use of symbolical and mysterious language like the ancient Egyptian priests which served to retard the progress of real discovery. The Greeks received their knowledge probably from the Egyptians, who transmitted it to the Romans and perhaps to the Arabians. The alchemists made much use of quicksilver in their operations as it was very easy to experiment upon, and the changes in appearance more remarkable than in any other substance. About the eighth century the Arabians had learned the art of preparing quicksilver and other metals and one of their authors, Geber, published a book giving rules for their preparation. As this science began to unfold itself in the 16th and 17th centures, alchemy rapidly lost ground, and was confined chiefly to the monks, and persons desirous of defrauding silly people. Alchemy made some discoveries and paved the way for the introduction of chemistry, a sketch of whose history we will give in our next chapter.

THE PROPAGATION OF TROUT.

BY STEPHEN H. AINSWORTH.

Since the printing of the article on the propagation of Brook Trout, in which my name is mentioned, I have been overwhelmed with letters from all parts of the United States, asking further information in the various departments of their cultivation. This great desire for further knowledge, so extensively manifested by a large number of your readers induces me to ask you to print the following article, giving minute answers to the most important information required in growing trout, both naturally and artificially. Also a pretty full description of the celebrated Caledonia Spring Creek, the vast number of trout it yearly produces naturally, with Seth Green's gigantic operations in growing trout in it artificially, &c.

To cultivate brook trout successfully, the water must be pure, clean, spring water, free from all sediment; but a tincture of lime, or sulphur, does no harm, as far as I have been able to discover in six years' observation and practice. I have seen them hatch and flourish remarkably well in such water.

The temperature of the water in the hatching races, or troughs, during the time of incubation must be between 36° and 48° to insure success. The best temperature, in my opinion, all things considered, is from 42° to 45°. When above this temperature they hatch too soon, and are too weak and tender. When below, more or less die during incubation. Consequently great care should be taken to place the hatching boxes for artificial propagation, or to make the spawning beds in natural cultivation, where the water will be within these temperatures during the coldest weather in winter. The temperature of our best springs is 48° the year round.

Trout will not do well where the water rises in the summer above 60° or 64° at most. The best temperature to grow them to perfection is between 50° and 58°.

This fact should always be born in mind when constructing ponds, so as to have the size of the ponds correspond with the volume of water in the stream supplying them.

For example, a spring that produces as much water as will run through an inch square hole, will supply a pond 20 by 30 feet square, or 600 square feet surface, and keep the water below 64° through the summer, and if covered with a house, or boards, so as to shade the water effectually, it may be double this size. I have one of this size shaded, supplied with an inch stream, the temperature never rises above 64°, and the trout are always perfectly healthy in it.

When the spring or stream will fill a four inch square hole, then the pond may be sixteen times as large, containing 9,600 square feet, or a pond 80 by 120 feet square, and so on, according to the size of the stream.

For growing large trout, the water should be from 8 to 15 feet deep; for small ones, from 2 inches to 5 feet, according to the size of the trout.

An inch stream running through two perfectly arranged hatching troughs, will hatch 200,000 spawn, and grow them till about 1½ inches long, when a part of them, from time to time, must be put into other streams. This stream will grow 10,000 trout the first year, 2,000 the second year, and 500 the third year, thus decreasing rapidly in number as they increase in size.

A 16-inch stream might hatch 3,200,000 trout; grow 160,000 the first year, 32,000 the second year, and 8,000 the third year, and 3,000, or 4,000 the fourth year that would average one pound each.

Young trout, till from 1 to 2 inches long, do much the best in shallow water, say from two inches to 3 inches deep, but as they increase in size the water should be increased in depth. By the first of November, if well fed, they will be from three inches to 5 inches long. At this time the water may be increased to the depth of three feet.

The most difficult period in growing trout artificially is about the time they commence feeding. This period is from forty days to sixty days after hatching, according to the temperature of the water. At this time a large proportion of them are very weak, and are entirely unable to stand the least current, and consequently are carried with the current through the whole length of the hatching-box against the screen (if any) at the lower end of the box, and are soon suffocoted and die. I have lost them by the thousand in that way. To obviate this, put a tank 12 feet square at the lower end of the hatching-box, so that the water will run into it, with a gentle current, carrying the weak trout with it into the tank, where they can rest in still water from 2 to 3 inches deep. In this way they will soon recover and come into the very slight current to look for food, and, as they grow stronger, run up the hatching-box again. By this arrangement I have decreased the mortality so that I lose but a very small percentage compared to what I did before. I first feed boiled eggs rubbed very fine, also lobbard milk beaten very fine. One egg will feed several hundred thousand trout a day. After they get a little larger I feed hashed liver and lobbard milk. Trout feed and grow well on meat of any kind, but will not eat any vegetable matter with me.

The cheapest dam, when the soil will answer, is of dirt. When it is porous, it can be built with a double stone wall, with a two inch space between, and this filled with water lime grout; or, when clay is at hand, it can be built of dirt with a foot of clay in thickness, the whole length of the dam in the centre, from bottom to top; or with matched plank, as may be the cheapest and most handy to obtain.

Depopulated streams where trout have once flourished, can be restocked with spawn, or young trout with but proper spawning beds prepared, they would increase at little expense, and with wonderful rapidity, and if protected as private streams afford all the sport one or two anglers with fly and rod could desire, and furnish a meal of trout daily for a large family during the fishing season, and, if the stream is of some size, a large amount for sale in addition. By putting a small dam across the stream to raise the water a few feet, with a screen on top to prevent the trout from running over, with the creek wall gravelled above to the spring, so as to make good spawning beds, the trout would increase naturally tens of thousands yearly; and produce a large income at the present price of trout, $1 per pound.

There is a small spring brook in the town of Springwater, dammed and screened in this way, where the trout have increased naturally in a few years to over 100,000, and hundreds of them to over two pounds in weight each. I am told that the proprietor has lately sold the ponds, stream, and trout for $8,500. I visited the ponds three in number by invitation, last summer, with rod and fly. and took trout from one to two pounds in weight, almost every cast, in certain parts of the ponds. They were beautiful, fat and healthy. In other parts of the ponds I found one, two, and three-year olds in vast numbers. The creek was alive with little ones. The stream did not afford more than 30 square inches of water at the time I was there. This shows to what extent trout may be increased and grown by properly damming, screening, and gravelling small spring brooks.

The most prolific streams for trout that I have ever seen, or of which I have ever heard or read, are the Caledonia springs, and brook from them. This celebrated trout brook rises from the rocks in the village of Caledonia, Livingston County New York. Its whole length is but one mile, when it unites with Allen's Creek, one of the tributaries of Genesee, in the village of Mumford. The stream falls about 50 feet from the springs to its junction with Allen's Creek. The country is all thickly settled, and one of the richest and best farming towns in the State. The surface of the land is quite level, with banks but little above the surface of the water.

The stream in places is very rapid, and in others has quite a gentle current, of a mile or more per hour. The springs as now situated, cover about six acres, being dammed slightly for milling purposes, They afford about 80 barrels of water per second, and make a creek from three to four rods wide, and from 18 inches to 6 feet deep, according to the current. The bottom is covered with small white shells and gravel. The water is clear, pure, and perfectly transparent, so that any object can be seen for three or four rods very distinctly. It is tinctured with lime and sulphur. Its temperature at the springs is 48° the whole year round, but down the creek, three-quarters of a mile it rises in the hottest days in the summer to 58° by night, but it is down in the morning to 52°. In winter it settles at times to 43° but generally keeps up to 45° or 46°. The temperature of the water to Allen's Creek is very even the year round, but very cold in summer, and warm in the winter, never freezing the very coldest weather. The water through the whole length of the creek, as well as every stone, stick, weed and blade of grass, is alive, and literally covered with numerous insects and larvæ of flies, summer and winter, so that the trout, however numerous they are, easily obtain all the food they want at all times of the year.

There is but very little surface water that makes into the creek, hence the volume of the water is very even, and seldom disturbed. The first settlers of the country found the creek literally filled with trout of great size and beauty, and it has remained so to this day, notwithstanding it has been constantly fished, night as well as day, from that time to this. The largest and finest trout are taken in the evening with a large artificial white or gray miller. Dark nights, the banks of the creek in spring and summer are often lined with fishermen, when they reel in the speckled beauties, hand over hand, and often carry them off by back loads. In this way they sometimes take some that weigh four pounds each. The most ordinary pupil of old Isaak can take them in the evening when in the mood of rising, with the right miller, and with a small piece of angle-worm on the point of the hook, to induce them to hold on to the hook till the novice can make his twitch to hook them. But in the day time none can succeed but the expert. The water is so clear and they are so shy and so well educated, that it requires a 50 or 60 foot line, a fine 10 foot leader, and very small flies or hackles, and those must be cast upon the water so gently and life-like, to induce them to rise and take the fly, and when they do take it they discover the deception, and spit it out so quick that but very few are ever able to so cast the fly and to jerk quick enough as to hook them. The fishermen among the oldest inhabitants tell me at the least calculation there are 4,000 pounds of trout taken from the creek yearly, and yet they compute the number of trout now at 1,000 to each rod of the stream, or 320,000 in the creek, of all sizes, from four or five pounds down to five inches in length. On the 18th of this month I took 110 fine trout in about three hours, with the fly, from the creek, and put them into one of Mr. Green's ponds. The day was bright, and the water so clear and transparent that I had to fish with a 60-foot line which took the most of the time to get the line out to this length and to reel in the trout against the strong current after being hooked.

The next day I took eighty-five splendid fellows from one place, hardly moving from my tract. These facts show how plenty they were, and how ready they are to take the fly in winter. These trout were as fat, active and gamy as ever I saw them in any other stream in May or June.

Seth Green, Esq., the celebrated marksman and fly-thrower of Rochester, bought this creek a year last Fall, for the purpose of growing trout artificially as well as naturally on an extensive scale. He has since prepared ponds, races, hatching-house and hatching-boxes and troughs for 3,000,000 of spawn, which he expects to fill during the spawning season, which is, with him, from the 1st of November to the 1st of April. Last winter his two best months for spawn were January and February, and he expects they will be this year.

He has one pond, only 75 feet long, 12 feet wide and 5 feet deep, which has 9,000 trout in it from 9 inches to 20 inches long, that will weigh from a quarter of a pound to three pounds each, as fat as seals and as beautiful as trout can possibly be, all caught with the fly by his own hand, since he bought the creek, and all can be seen now, any day, at one view, by any person who will take the trouble to call upon him. Only think of what a sight—9,000 such trout all in the eye at once. What a gigantic and magnificent aquarium!

I am certain that this is the largest and finest exhibition of trout in America, and, probably in the whole world. This alone would well repay a journey of any lover of Izaak from any part of the country to see. But this is not all. He has another pond, right by the side of this, 30 by 50 feet, which contains 20,000 beautiful trout, mostly one and two years old, from six to nine inches long, all taken by his own skill, as above. He has still another pond, filled with last spring's fry, from three to five inches long.

It seems incredible at first thought that such a number of large trout should live in so small a space, but it is also accounted for and made plain, when one learns that the water in the ponds are changed every minute through the day by the large current constantly pouring in upon them, of this cold, pure spring water.

Some of the trout produced 6,000 spawn each, and from that down to 200, according to size. Last year Mr. Green hatched as high as 98 per cent. in some instances—in others, about 80 per cent. This year he expects to hatch nearly all, as he has become master of the business, and knows the right time to take the spawn to insure perfect impregnation. I could see the young trout in almost every egg that had been taken fifteen days, with the naked eye, so that I know his success is perfect so far. With this continued success he will very soon be able to stock all the private streams and ponds in the country with spawn and young trout, as well as to furnish tons yearly for the table of this, the most delicious and costly of all the finny tribe.

It costs him but little to feed his trout. He tells me they get fully three-quarters of their living from the insects (as above) in the water running through the ponds. He thinks the trout in his ponds, and in the creek, devour fully 600 pounds of these various insects daily.

These facts show how profitable the cultivation of trout can be made with proper water and care, and also the ease with which all the depopulated waters of the country can be restocked.

The spawn can be transported from the eighth to the fifteenth day after impregnation, in glass bottles filled with water, by express to any part of the country with safety, and will nearly all hatch if distributed thinly over well-prepared gravel beds in the stream near the spring where the current is gentle, and the temperature remains from 40° to 46° through the winter, and will nearly all take care of themselves after hatching through the spring and summer, and grow to from 3 to 5 inches in length by the fall. This is the easiest and cheapest way to stock all streams and ponds where the temperature and water will permit. But where they will not, then they must be stocked with trout.

An outlay of $5 to $500 in spawn, and preparing the stream and gravel beds according to the amount any one may feel disposed to invest, will produce a corresponding show in the early spring of young trout. Some of these young trout will spawn in the fall, and all the fall following, and with proper care in a few years fully stock the stream or pond, and will pay the owner and angler for all the expense and trouble, in the very exciting sport of taking them with the fly, as well as a delicious meal daily.

Well-impregnated spawn can be obtained as low as $10 per thousand.

The cheapest and best time to transport trout is while very small, or about the time they commence feeding, say in March or April. Then about 5,000 can be carried in a barrel half or two-thirds filled with water. They can be transported in this way any distance by waggon or railroad. All the care required is to keep the water cool, say from 50° to 60°, and in constant motion to fill it with air as fast as the trout exhaust it, or to change it often when standing still. Trout of this age are worth $50 a thousand.

Large trout may be moved in the same way just as well, only a much less number in a barrel, say about seventy-five one, two, and three-year-olds. Trout of this size are worth $200 a thousand.

With this information, any one can consult his own desire and purse in the manner and extent of stocking his stream or pond.

From my experience in growing large trout, I would not advise any one to grow them for profit to more than three or four years of age, or from eight ounces to sixteen ounces in weight. After this age and size it requires so much more to feed them, and water to keep them, and they are so much more subject to die, that I find it does not pay.

I have no spawn or trout for sale, and have never taken or grown any for that purpose, nor do I intend to hereafter. I commenced raising trout artificially in 1859 as an experiment merely for my own recreation and gratification. I have spent some time and money in these experiments, but have been abundantly paid in the information and gratification it has afforded me in these six years. I have hatched as high as ninety-nine spawn in the 100, and grown trout by the 1,000 to weigh from one to three pounds each during this time, and all with only one square inch of water during the dry weather in the summer.

THE MANUFACTURING ERA.

Our earth has had its eras, and it was by passing through various stages of development that it became fitted to be the abode of man. Nations in like manner have had their eras. The history of Great Britain and other countries is very instructive as it regards the successive periods, which, stamped with some distinct feature, have moulded the people into their present characteristics of nationality. The American Republic has lately had its war era, and is entering on a new phase of its existence, burdened if not crippled with its national debt and consequent taxation. We Canadians are to all appearances about passing into an altered condition of things. A new era will shortly dawn upon us. It will be ours to determine its character, and if we are wise we shall make it THE MANUFACTURING ERA OF OUR HISTORY.

Though agriculture is our leading interest, and is likely to be such for many years to come—perhaps for ever—yet we are already engaged to a respectable extent in manufactures of various kinds, and there is scope for indefinite expansion that way. In prospect of an end being put, at least for a time, to Reciprocity, no one can doubt that our continued prosperity must depend very much upon the exertions we make, and there is no line in which we can move that promises results so certain as that we have indicated. Our only safety lies in adopting an aggressive policy, (?) and the opportunity now afforded to develop manufactures is a most favourable and inviting one. The export trade of the United States has greatly declined during the past four years, owing chiefly to the high prices of the productions of that country, compelled by war taxation. We are in a position to do the business that glides out of their hands, and we shall be blind to our interest if we do not seize the tempting chance. Besides, there are many products of American industry which we are largely consuming, upon which our government will, of course, impose duties after the 17th March, and these articles ought at once to be produced on our own soil.

A large proportion of the timber we have exported, has been shipped to its destination *via* New York. This will now come to an end and we must ship directly ourselves. The change will be greatly to the advantage of our commercial interests. A large trade in manufactured timber,—has been done by us through the United States with the West Indies and Brazil. It is to be hoped that our delegates to these countries will make arrangements that will facilitate a direct trade thither with our manufactured timber products. A large business can be done by us with Great Britain in wooden ware, such as patent pails, tubs, measures, and other like articles. The British import duty on these things is but nominal, being only one shilling a ton, with complete exemption from duty if made of certain kinds of wood. With improved machinery, nine men and a few boys, can turn out a thousand pails a day. The demand for these articles in Britain is a large and increasing one. The manufacture of furniture for exportation to Britain is another practicable branch of business. The Oshawa Cabinet Factory has passed into the hands of a company of English capitalists, who, under the name and style of E. Miall & Co., limited, have begun to manufacture extensively for the English market. This establishment shipped a lot of furniture to Australia *via* Liverpool, last summer—a long way to go for a market. To carry on this business profitably, furniture must be so made that it can be shipped in pieces, and put together on arriving at its destination. By this plan, Yankee cabinet-makers can sell furniture shipped to California by way of Cape Horn, more cheaply than it can be furnished by establishments in operation on the Pacific coast. We do not know what financial results the new Oshawa company is achieving, but certain we are that the furniture manufacture for the British market is a branch of business that can be made profitable. A common Windsor chair costs for freight and all charges only 10 cents to Liverpool, and can be delivered at that port at 2s. 1d. stg. The commonest wooden chair made in England, unpainted, retails for 4s. 5d. stg. Is not this a pretty wide margin for profit? We have in a recent article pointed out the inducements to engage in the manufacture of flax and woollen fabrics, and need only name these in this connection. The manufacture of cheese is another branch of business that we ought to cultivate. In 1865 we imported, chiefly from the States, 2,530,650 ℔ of cheese, at a cost of $318,891. Not a cent of this amount ought to have gone out of Canada. We ought to export instead of importing this article. The present United States tariff will impose a duty of four cents per ℔. on cheese, and at the close of the Reciprocity Treaty, our government can hardly impose less. Surely such a state of affairs will foster this branch of rural industry. We should not only supply the home demand for this article, but send a surplus to the British market, in which we can very successfully compete with our American neighbors—*on the condition*, viz., that we may make as good a quality of this dairy product as they do. In order to do this we must have cheese factories. Only on this plan can an article of uniform prime excellence be made. Cheese factories are springing up all over the States, and they must become more common in Canada. Instead of three or four we ought to have, and might soon have, as many hundreds, The factory plan of cheese making is advantageous to the farmer, profitable to the factor, and its introduction would help to recover our exhausted wheat lands. There is no branch of manufacture we know of in which a small capitalist can invest more safely than this.

There is an establishment at Dundas which shows what may be done by way of competing with our neighbors in the working up of the raw material, for the growing of which they are famous. We refer to the cotton mill, a detailed account of which recently appeared in the Hamilton *Spectator*. It is the largest establishment of the kind in the Province. From small beginnings it has grown in eight years to a capacity to give employment to from 150 to 200 persons, and to turn out 12,000 lbs. of yarn and 20,000 yards of cloth. Our contemporary gives no statements as to the profits of the business, but its enlargement and growth during the past eight years is evidence that the business is found to be remunerative. If the Americans decline reciprocity on fair terms, they will not only be losers by it, but in more ways than one they will punish themselves. Live and restless Yankees will come across the lines and set up their factories in Canadian valleys. They will sell their wares to middlemen without troubling themselves to ask whether Uncle Sam's dues are honestly paid on the articles when they cross the lines. People who have fattened on their government like leeches, in army contracts and war supplies, will not be more particular in time of peace. It is their genius to make money somehow or other, and they are proverbially quick-sighted as to openings. Already we hear of a clock factory being projected in the town of Guelph, where there is now in operation a large and money-making sewing-machine factory. Let but our own endeavors be put forth in the direction toward which events are tending, and there will be no difficulty in making the close of the era of Reciprocity, the beginning of THE ERA OF MANUFACTURES.—*London (C. W.) Advertiser.*

SUSPENSION BRIDGES OF THE WORLD.

The Menai bridge, constructed by Thomas Telford, Esq., was at the time of its erection regarded as one of the wonders of the world. Its complete success gave a great impulse to the erection of bridges on the same principle, and though its dimensions have since been far surpassed, if it be considered with reference to the then state of bridge engineering, the genius of its designer will still command deserved admiration.

The Fribourg Suspension Bridge is a wire bridge, and crosses the Sarine at a height of 167 feet. The span from pier to pier is 870 feet, and the deflection of the cables 55 feet. These cables are four in number, and are suspended in pairs at each side, the cables of each pair being close together, in order to support double hooks which rest upon and embrace both cables. To the centre stems of these hooks are attached the suspenders, which thus hang down between the two cables of each pair.

The cables are formed of iron wire about one-twelfth of an inch in diameter. Each cable consists of 15 strands containing 80 wires each, which are not twisted as in a rope, but go straight from end to end, being retained in a cylindrical form by soft wire, which is wound round them at intervals of two or three feet.

La Roche Bernard, a town in the north-west of France, possessed a few years since a fine wire suspension bridge. An elaborate description of it was published in 1841 by M. Leblanc, from which it appears that the span was 650 feet, and the deflection of the cables 50 feet, and that it crossed the Vilaine 108 feet above high water. Further description is needless, the bridge having since fallen. This catastrophe appears to have occurred from the usual causes—too great lightness and flexibility.

The St. John's Bridge, New Brunswick, was also originally constructed by Colonel Serrel, but having since fallen, has been replaced by a stronger structure erected under the superintendence of Mr. Roebling. The span was 630 feet, and is about the same now.

The St. John's Bridge is remarkable, and is more especially mentioned here for the picturesque beauty of its situation, in which respect it has been compared with the Clifton Bridge in England. It is however inferior to it not only in height above the water, but in general effect.

The Wheeling Suspension Bridge, across the Ohio, was erected in 1848 by the Hon. Charles Ellet. The span from center to center was 1,010 feet, and the actual platform 960 feet. The roadway was 26 feet wide, and was suspended from twelve wire cables about one-tenth of an inch in diameter.

This bridge "obtained considerable notoriety from the litigation it caused; strenuous and long-continued efforts having been made during its continuance to obtain its removal on account of the alleged injury to navigation." All disputes were, however, set at rest on May 17, 1854, when the structure was completely destroyed by a high wind.

The fall of this bridge is the greatest disaster of the kind on record, and had great influence in bringing wire bridges into disrepute. That it cannot, however, be attributed merely to the use of wire as a material, is proved by experience in other cases; and the real cause appears to have been the too great lightness of the structure altogether. The Wheeling Bridge only weighed 450 tons in all; it had very little trussing, and no stays either under or over the floor. Eye-witnesses of the catastrophe describe the vertical oscillation of the platform just before the final crash as absolutely terrific: one spectator estimated it at twenty feet, an amount almost incredible, and which should, by proper precautions, have been rendered impossible. Without provision to secure stiffness as well as strength, no suspension bridge built with any material can be considered safe.

The Queenston Bridge was erected in 1852 by Lieut. Colonel E. W. Serrel. It crossed the Niagara about six miles below the railway bridge, connecting Queenston and Lewiston. The span from center to center was 1,040 feet and the width of the platform 22 feet. The cost was under $50,000, or about £10,000.

While this bridge remained it was much admired for its immense span—"the longest in the world."

After suffering severe damage on a previous occasion, however, it finally fell during a severe storm in January, 1862, and has not been rebuilt, the traffic being insufficient to defray the expense.

This disaster also is plainly attributable to the great lightness and want of stability of the bridge, which rendered it unable to withstand the heavy gales which blow up the river from the lower lake. The platform was only suspended from two wire cables about four inches in diameter—quite insufficient for such an exposed situation. The immense span of course increased the danger, which ought to have been provided for by increased precautions to secure strength and rigidity.

The Niagara Railway bridge was erected under the superintendence of Mr. John A. Roebling. It was commenced in September, 1852, and opened for railway traffic on March 18, 1855. The lower floor, for common travel, was in use the previous year.

The span of the bridge is 821 feet 4 inches from center to center, and the length of suspended platform exactly 800 feet.

The bridge consists of two floors, one 19 feet above the other, leaving 15 feet clear between them. The lower floor is appropriated to ordinary traffic, while the upper is used for railway business, and "sidewalks." The top floor measures 25 feet 4 inches across outside the railings; the bottom floor is a foot narrower. The railway track is 145 feet above the river.

Each floor is attached, by separate suspenders, to a separate pair of cables; though, of course, by means of trusses and other connections, any load is mutually borne by all the cables. The cables are, therefore four in number; each cable is 10¼ inches in diameter, and composed of 3,640 wires about one-tenth of an inch in diameter. These wires are made up into seven strands of 520 wires each, which are bound round at intervals to keep them in their places. The strength of all the cables is calculated at 12,000 tons, each wire being able to bear 1,648 lbs. without breaking. The total length of the top cables is 1,261 feet and of the bottom cables 1,194 feet. The cables supporting the lower floor descend 10 feet lower than the top pair, the deflection from a straight line being 54 and 64 feet respectively.

The suspenders are 624 in number, placed 5 feet apart.

The structure is remarkably steady and free from vibration; to secure which desirable object various means have been employed.

The principal cause of the stiffness of the bridge is the system of trussing adopted. On each side of the bridge the upper and lower floors are connected by wooden posts, arranged in pairs side by side, just sufficiently apart to allow the diagonal truss rods crossing between them. These truss rods are of wrought iron an inch in diameter, and extend at an angle of 45 deg. from the bottom of one pair of posts to the top of the fourth pair from it. As the posts are 5 feet apart, like the suspenders, the pressure above any pair of posts is by these truss rods spread over a space of forty feet. The truss rods are screwed at the ends; and thus, if the timber should shrink at any time, all can be made right again by simply tightening the nuts on the truss rods, which braces all tight up together again. In short, the two floors, connected by the system of posts and trusses described, give much of the rigidity of a tubular bridge, with only perhaps a tenth of its weight.

There are also a number of diagonal wire stays, extending from the top of each tower. These stays are 64 in number, and though they do not bear much of the weight of the bridge, Mr. Roebling believes them to guard it against vertical oscillation. A number of smaller stays are also attached to the underside of the structure, and anchored to the rocks below.

The inclination of the upper cables also greatly guards the bridge against horizontal vibration. The centers of the towers are 39 feet apart; but instead of hanging straight from tower to tower, the top cables are brought in the middle to within 13 feet of each other. The suspenders are also inclined inward; and the whole arrangement, though it puts a very slight additional strain upon the cables, tends greatly to maintain the steadiness of the structure.

The construction of the masonry is one cause of the economy of the bridge. Instead of a massive tower on each pier, as in most European examples, there are two towers one for each pair of cables, so slender that they look like mere chimneys, yet abundantly sufficient for the purpose. The basement is a mass of masonry 60 feet by 20 feet, pierced by an arch 19 feet wide, which forms the entrance to the lower floor at each end. Above this are built two towers, each 60 feet above the arch, 15 feet square at the base, and 8 feet square at the top. By this light construction, without incurring any risk, much masonry and money is saved.—*Lewis Wright.*

PHENIC ACID.

The *Mechanics' Magazine* says:—

"Not long since we referred to the extraordinary disinfectant and conservative powers of this acid, and to the fact that it was but little known, and scarcely procurable in England. We observe that a work, replete with interest, has just emanated from the able pen of Dr. Semaire, in which that intelligent and scientific author points out the marvellous effects produced by this newly discovered acid, not only upon the human body, but also on plants and animals. The Paris correspondent of the *Star* states that he was led to study this clever volume owing to his having lately witnessed the good results obtained by the use of Phenic Acid as a disinfectant when the cattle disease broke out at the Jardin d'Acclimation. It not only cut short the progress of that fatal disease, but has been found of the greatest advantage in that establishment to expel noxious vapours, and clear stables and sties of foul air. Dr. Semaire traces with minute accuracy the action of phenic acid on the human skin in cases where virus has declared itself, or disease engendered by miasmas has set in; he likewise details the use which has been made of it in destroying oidium in the vine, and in extirpating the potatoe disease. The great Mexican traveller and entomologist, M. Lucien Biard; used this acid with wonderful success to preserve his precious collection of natural history. M. Biard further makes mention of having made use of this acid during his sojourn in Mexico, to rid himself of the mosquitoes, ants, and other obnoxious insects with which the country abounds. Dr. Lemaire deserves the highest credit for his laborious and energetic efforts to propagate the use of phenic acid. He has brought much acuteness and information and enlightened zeal to bear upon his favorite theme."

In a late number of the same journal, attention is again drawn to the valuable antiseptic properties of phenic or carbolic acid; to which are appended, from the *Chemical News*, M. Muller's notes on its preparation:—

"Phenic acid, or phenylic alcohol, is usually accompanied by its congeners, xylic and cresylic alcohols, which adhere to it with great tenacity and give it the property of becoming brown in contact with the air. For its purification the author has recourse to a partial neutralisation and afterwards to the fractional distillation of the product. The crude tar cedes to soda or lime water a mixture of the matters before mentioned, as well as naphthaline, which is soluble in the concentrated solutions of the alkaline phenates. Water is added to this until it ceases to cause a precipitate, when the liquid is exposed in wide vessels, to facilitate the formation of the brown bodies and their deposit. After filtering, the approximate quantity of organic matter held in solution is determined; formed principally of phenic acid and its congeners, which are easily displaced by acids. The phenic acid is always the last to separate, so that it is easy to disembarrass it of its associated matter and brown oxidised products by adding carefully the proportion of acid determined by calculation, so as to precipitate at first only these matters, and by means of several trials it is easy to arrive at the proper point to stop, so as to retain the phenate nearly pure. The acid is now separated and rectified, and soon crystalises. As a little water prevents its crystallisation, the author removes it by passing a current of dry air over the phenic acid nearly boiling. The crystallisation is facilitated by cooling or by the introduction into it of a small quantity of the crystallised acid. The author insists on the necessity of exposing the alkaline solution of the acid for a long time to favor the resinification and deposition of the brown matters; phenic acid is always impure when it is colored. It should be quite pure when employed to make picric acid, because the impurities waste the nitric acid. Phenic acid often contains a fœtid substance, which appears to be a sulphuretted compound of phemyl or cresyle. It is removed by rectification from oxide of lead."

The Cholera Coming.

Uunder the above heading the *Scientific American* says:—

"Next summer we are to have the cholera. Its course so far has been just the same as its course in previous visitations, and next summer it will be due in this country. Thousands of the inhabitants of New York will be in the full vigour of health one day, and the next will be hastily borne to their final resting place. A universal panic will seize upon our people; business will be prostrated; and general gloom and stagnation will take the place of our present prosperity.

"And yet, all this can be prevented. There is no necessity for the prevalence of the cholera in this city next summer. While the causes of most diseases are hidden from knowledge, the cause of cholera has been positively ascertained. It is filth. The proof of this is conclusive. The progress of the disease in its several epidemics has been carefully watched, and faithfully recorded; its history is remarkably full and minute; and, without exception, it has attacked filthy cities only, and it has prevailed in the filthy portions of the cities which it has attacked.

We have before us a report made to the Citizens' Association of New York, by their Council of Hygiene and Public Health, on the subject of the cholera. This council is composed of the leading physicians of the city—men of the very highest position for learning and character—and their report treats the subject with the masterly ability which was to be expected. It traces the progress of the cholera in each of its visitations, and shows that in all places the one cause of its prevalence was want of cleanliness.

"The following are a few among the numerous facts cited in proof of this:—

"In the city of Buffalo, where there was fearful mortality from the epidemic of 1849, its principal ravages were witnessed in the filthy and undrained sections of the city, and in the purlieus of vice, and levers along the canal. In Sandusky, where nearly one-third the resident population died in a single month, Dr. Ackley states that a stench pervaded the streets. At Louisville, Ky., the centers of the epidemic were associated with filth, malaria and crowding. In Cincinnati, where the epidemic killed 5,314 persons, out of a population of 116,108, it was first associated with local filth and crowding. In St. Louis, 4,557 inhabitants perished out of 50,000. Dr. McPheeters reported that the epidemic elected as its chief centers the crowded tenant buildings, the streets and dwellings alongside the stagnant ponds and open ditches that then abounded in that city; also that seven-tenths of the mortality was among the German and Irish population. In New Orleans, when the epidemic appeared, the streets and gutters were filled with filth, so that even the Board of Health declared that 'the elements of putrefaction had accumulated fearfully in every direction, until the atmosphere was polluted by poisonous exhalations in which a sickly acid smell predominated.'

"The report then cites numerous proofs that by proper attention to cleanliness, the pestilence may be avoided; we select two of these:—

"In various towns and cities in England, the actual benefits of preventive measures, the sanitary works of cleansing, drainage and ventilation, have been fully tested. For example, the city of Worcester, on the river Severn, having been twice scourged by cholera, undertook to avert the later epidemics by means of effectual cleansing and efficient sanitary regulations. The result was, that while the pestilence swept through the neighbouring cities and villages, the populous city of Worcester escaped, "and the destroyer of uncleanly cities made a passover with the people of Worcester for on every lintel and door-post was written, 'cleanliness, cleanlines.' Not a house was entered, and the town was saved in the midst of the most frightful desolation.

"In Philadelphia the cholera broke out and made some progress in the districts of Moyamensing and Southwark, where the work of cleansing was incomplete. But the citizens had anticipated the coming pestilence by the most comprehensive and energetic effort to effectually purge their city of all nuisances, and all the known causes that produce or localize disease; 2,970 privies were cleansed; 340 houses were cleaned by authority; 188 ponds were drained; 66 rag and bone shops were closed, etc., and in all the city removed upward of 6,000 separate sources of nuisances and disease. Cholera sent about 474 persons to their graves in Philadelphia, while in the city of New York it claimed 5,071 dead.

"Is there not in this energetic community, sufficient energy, is there not among this provident people enough provident spirit, to arouse us to take hold of the work, and avert the awful pestilence, when it can be so surely done?"

IRON.

In a recent lecture delivered before the Society of Arts (London) Dr. Crace Calvert said ;—

"As far as our present day's knowledge extends, no metal is more influenced than iron, either for good or for bad, by the presence in it of a minute quantity of another element; thus a few thousandths of carbon transform it into steel, and a few per cent. of the same element convert it into cast-iron; a few thousands of sulphur, or a few per cent. of silicium, render iron 'red-short'—that is to say, brittle at a red heat—whilst the same quantity (thousandths) of phosphorus makes it 'cold-short,' or brittle at natural temperature. These facts explain why iron smelters and manufacturers do all in their power to use ores as free as possible from these impurities, or apply all their skill to remove them from the ores or metal when present. I am, therefore, satisfied that all iron smelters will appreciate the value of the following facts published by M. Caron, in the *Comptes Rendus* of the Academy of Sciences of 1863, on the influence of manganese when used on the blast furnace to remove silicium from cast-iron. The following table shows the relative quantity of manganese and silicium existing in the cast-iron thus produced ;—

	Manganese.	Silicium.
No. 1	7·93	0·05
" 2	6·32	0·08
" 3	4·70	0·30
" 4	3·81	0·55
" 5	2·25	0·76
" 6	3·90	0·50 cold blast.
" 7	2·10	0·75 hot blast.

"This table shows that as the quantity of manganese decreases in the pig-iron the quantity of silicium increases; further, that the higher the temperature (all the rest of the operation being conducted in the same manner) the quantity of silicium increases and the manganese decreases.

"M. Caron has further made the important remark that it is the interest of the iron-smelter to use as much lime in the blast furnace as practicable when manganiferous ores are employed, for not only does lime facilitate the introduction of manganese into the iron, but also helps in a marked degree to remove the excess of silicium.

"Eight or nine years ago I made the observation that if manganese had not the property of removing phosphorus from iron, it had the one of hiding or of counteracting the bad influence of that element on iron; in fact, I found that cast-iron, containing as much as one or two per cent. of phosphorus, would yield good mercantile iron if the pig-iron contained at the same time five or six per cent. of manganese, and I have lately heard that manganiferous ores have been used with great advantage by the Cleveland iron smelters to overcome the 'cold shortness' of their cast-iron, which is due, as is well known, to the presence of phosphorus compounds in the Cleveland iron ore.

"It is highly probable that the advantages which have been derived from the employment of 'spiegeleisen' iron, in improving the quality of steel produced by Bessemer's process, is owing, not only to the fact that this peculiar iron contains a large quantity of carbon, which it yields to the molten iron contained in the large crucible used in Bessemer's process, but that the manganese it contains contributes also to hide the influence of the phosphorus or to overcome the detrimental properties which a trace of phosphorus would impart to the steel produced by this process. I say hide, because the phosphorus is still present, since that substance cannot be removed by the above process from any pig-iron in which it may be present.

"M. Caron has published in the *Technologiste* for 1864 a paper in which he shows that no amount of lime on the blast will remove phosphorus from any ore which may contain it; and that tin-plate manufacturers and others who employ charcoal iron, should pay the greatest attention to the quantity of phosphorus contained in the charcoal they employ for refining ordinary iron; thus some charcoals are susceptible of yielding as much as 1 per cent. of phosphorus to iron, while others only 0·12 per cent., and lastly some only a trace.

"If phosphorus, sulphur, and silicium are injurious to the quality of iron, the metal called tungsten, on the contrary, appears to improve in a marked degree its quality, especially when in the state of steel. This fact has not only been demonstrated beyond all doubt by Mr. Mushet, but also recently by some scientific researches due to M. Caron, who has proved that steel containing tungsten presents greater tenacity, and can be used with great advantage for many purposes; in fact, he thinks that tungsten can be used instead of carbon as a converter of iron into steel. There can be no doubt that the employment of tungsten in connection with the hardening of steel, and other various applications of which that metal is susceptible, will be found highly important."

The gyroscope was invented by M. Foucault, and first attracted attention from its power of rendering the rotation of the earth visible.

The thickness of the film of a soap bubble has been ascertained to vary from 1-19,000th to 1-35,000th of an inch.—*London, Eng.*

Machinery and Manufactures.

Honiton Lace.

I wished much to see how this delicate fabric was wrought, and by what kind of fingers, and in what kind of houses. So the proprietress of the warehouse sent one of her assistants with me to a small cottage on a back street, where three women were at work on a floor of cement spread on the natural earth. It was a small apartment, hardly high enough for a man to stand upright with his hat on, which he never ought to do in such a presence. I felt impelled to lower mine with unusual reverence at the sight. Two of the women, the occupants of the cottage, were sisters, between sixty and seventy years of age. The third was a neighbour who had dropped in with her working pillow, and was plying her needle with her bonnet on; just as in the olden times neighbours in New England would make a morning call, taking their spinning-wheels with them. I sat down on a stool, and had a long talk with them on their art and occupation. The eldest of the sisters wore spectacles, and a long, still, solemn face, which seldom took on the sunshine of a smile in the course of the conversation. She had worked on lace for more than fifty years. She wrought on the wedding-dresses of three generations of Queens—Adelaide. Victoria, and Alice. She worked the arms with the lion and the unicorn and the motto, put up before the window of the sales depot—an exquisite specimen of taste and art. The business was now very much depressed. She could hardly earn a penny an hour. Many of the young women had been obliged to abandon it altogether, and seek service as common house servants, scrubbing-floors and handling pots and kettles with fingers that had worked white tissues of flowers and foliage, which queens were proud to wear on their coronation days. She had heard of some of the causes that made the trade so low; but she had understood them dimly. She did not read the newspapers; but she had heard of the war in America. They had told her something about exchange that hindered sale of lace. Poor woman! I looked into her still and solemn face, at her worn, lean fingers, as she spoke of these things in such a subdued and unmurmuring tone. She little knew the long-reaching and ruinous sweep of war, the infinite ramifications of its destructive issues. She had not vigour of mental vision to see, though she felt it to the core of her hungry wants, how the invisible sirocco of war blows with unabated breath over the widest oceans and continents, and blights the humble industries of the poor in distant lands. The process of lace-working is exceedingly interesting, requiring the nicest judgment of the eye, and a finger of the greatest facility. Although it is wrought in clay-floored cottages, and in the one room that serves as parlour, kitchen, cellar, and sometimes sleeping apartment, the lace, worked in the most elaborate and varied patterns, is delivered at the sale room as pure and unsullied as the thread at its giving out. It is wrought on round, plump cushions, or pillows, and as fast as the finger progresses, it is covered with a thin belt, or veil, of oiled silk, so that only a very narrow slip or space is exposed at any one time to any subtle dust, or accidental touch of the finger. Of course, the Honiton lace is all wrought by hand, and has to compete with a very elegant article made by machinery in Nottingham, and other towns that manufacture it in vast quantities for the markets of the world. In face of such almost overpowering competition, this slowly-worked fabric of the fingers struggles to hold its own. It still 'rules' as the most perfect and durable, as well as the most elegant embroidery of bridal dresses of princesses and ladies of high nobility and fashion. It is a pity when they are so proud to wear it, that the *artistes* who clothe them with such flower work should be so poorly paid. Somehow or other, this inequality between the wearer and the maker is the widest and the worst in articles of luxury. Diamond-diggers and pearl-divers, and ermine hunters have always had a harder time of it than even the Honiton lace-workers. The blunt-fingered men who follow the plough and wield the sickle fare better.

Concentrated Meat.

The London *Grocer* says;—"It will be remembered by most of our readers that when Liebig introduced his *extractum carnis*, Dr. Hassal did good service to the public by his searching inquiry into its merits. He showed that although its introduction marked an important step in the progress being made in the preparation of food in a concentrated form, it did not represent in a concentrated form *all* the properties contained in the immense proportionate bulk of the original material for which most persons gave it credit. The part taken in this matter by Dr. Hassal no doubt placed a check upon the too great faith with which the public are liable to lay hold of any new and agreeable food substance, and doctors were induced not to place too great a reliance upon *extractum carnis* as a perfect substitute for meat. In the course of a very instructive discussion, Liebig, the inventor of the food, expressed a decided opinion that were it possible to furnish the market, at a reasonable price, with a preparation of meat containing in itself the albuminous, together with the extractive principles, such a preparation would have to be preferred to the *extractum carnis*, for it would contain all the nutritive constituents of the meat. At the very time when Leibig uttered this, and added to it his opinion that there was no prospect of such an end being realised, Dr. Hassall was engaged upon a series of experiments, with the object of removing the water of meat, without essentially altering its composition, and thereby obtaining a material of a high dietetic and medicinal value which would not change by being kept for a reasonable time. We have the scientific fact before us that of every four pounds of the flesh of fresh beef or other meat, freed from bone and visible fat, nearly three fourths, or three pounds, consist of water, the remaining pound containing the whole of the constituents of meat—viz., the albumen, fibrin, gelatine, interstitial fat, creatine, sarcin, the various phosphates and other salts of the blood, both organic and inorganic. The object of Dr. Hassall, as we have before stated, was to concentrate them into the smallest possible compass, and we are exceedingly glad to say that he has succeeded. We have before us four samples received from the

Concentrated Meat Company, for the purpose of giving commercial effect to Dr. Hassall's discovery. These samples are described in an accompanying circular thus:—

1st. For the speedy preparation of beef tea.

2nd. With the requisite vegetable and flavouring substances, for the speedy preparation of soups.

3rd. Combined with farinaceous matter, forms a highly nutritious food, well adapted for children, the dyspeptic, and invalids.

4th. Mixed with cocoa, it furnishes a highly nutritious breakfast beverage.

There is a further preparation called a Meat Biscuit, which we have not yet had the pleasure of seeing. The numerous dealers in packet foods who read this journal will, we feel confident, join with us in giving a thorough practical welcome to a discovery, the effect of which is not only to add a condiment luxury to the table in a new and handy form, but, more important than all, to provide for the invalid an excellent variety from one nutritious substance ingeniously disguised so as to flatter the palate, whether at breakfast, dinner, tea, or supper. We heartily agree with Dr. Hassall in this, although on certain other subjects we have, in the performance of our duty to the trade which we represent, felt bound to disagree with him. He says it is almost impossible to over-estimate the importance of the concentrated meat to invalids. By it they are enabled to receive into the stomach the whole of the constituents of the meat, no mastication being required, and no greater effort at deglutition than is needed for swallowing a liquid, and the material is moreover presented to the stomach in the form most easy of digestion. It is not too much to say that it will doubtless be the means of saving many lives. The four preparations of the concentrated meat alluded to above are in the form of a fine dry powder, sweet to the taste, and when diluted and otherwise prepared for use, exceedingly palatable.

We believe that the company will shortly call upon the grocery trade to adopt the sale of these preparations. If they adopt this as one means of distributing the food, we hope the trade will give it every encouragement until it is well known and appreciated, when no doubt excellent profits will revert to the retailers. We are informed that the present profits allowed are thirty-five per cent. on orders exceeding ten pounds, and twenty-five per cent. if under that amount. The samples will remain on view at the office of *The Grocer* for a short time."

Iron Forgings.

In the manufacture of iron forgings, according to the system at present in use, various impurities or extraneous matters become incorporated with the iron during the manufacture These matters, which usually consist of small particles of carbon, ash, or cinder, are chiefly derived from the fuel used in the heating of the iron, and they cause it to present a rough or irregular surface when turned. This is a serious evil, especially when the forgings are shafts, axles, or rods, which are to be subjected to friction, as such extraneous matters when allowed to get into the bearings or on the rubbing surfaces of machinery create unnecessary friction, and thereby cause the heating of the parts. Mr. William Clay, an iron manufacturer of Liverpool, has found that the presence of extraneous matters, such as those above referred to, is mainly due to the powerful draughts of the reverberatory furnaces, which carry over from the grate containing the flue employed for heating the furnace small particles of the fuel, which thereby become intimately mixed with the iron, and cannot afterward practically be separated therefrom. In order to produce metal that will admit of forgings being made without these defects, Mr. Clay proposes to use pig-iron which has been cast in clean iron molds, or he operates upon refined or plate iron. Either of these irons is boiled or puddled in a furnace heated by means of combustible gases, whereby the introduction of extraneous matters is avoided. The furnace he proposes to use is an adaptation of Siemen's regenerative gas furnace.

When it is desired to manufacture forgings of the best quality the puddling furnace is charged with refined or plate iron, which affords the additional advantage of dispensing with the ordinary fettling used in the boiling furnace, and which fettling gives off impurities and extraneous matters which it is exceedingly advisable to keep out of the iron. When the iron has been sufficiently boiled or puddled in the regenerative gas furnace it may be balled up and hammered, rolled, piled, and re-heated in the ordinary manner. The subsequent re-heating is conducted in gas furnaces to prevent the possibility of the metal absorbing any solid particles of fuel or other solid extraneous matters. After this the forging is completed, which will be found when turned and finished to be much brighter and freer from the specks or defects which prove so injurious in ordinary forgings. Clippings of iron or scrap-iron obtained from iron made in gas furnaces in the manner above referred to may also be advantageously employed in making superior forgings.—*Mechanics' Magazine.*

Burglar-proof Safes.

A writer in the *London Engineer*, who had charge of the engineering department of the late Dublin exhibition, speaks of the absurd construction of iron safes, as shown in evidence given at a recent trial; and urges the necessity of bringing scientific and mechanical knowledge to bear in the arrangement of the simplest and most ordinary constructions in common use.

Referring, however, to some specimens shown by a Lancashire firm, he says:—"It may be interesting to refer briefly to a few contrivances I saw employed to baffle the arts of the burglar. The most powerful tool known to the burglar is the serrated wedge. By simply forming the edges of the door and the seat against which it fits of a curvilinear form, so as to afford no hold or purchase for a wedge, this tool has been rendered useless to the burglar. Nevertheless, in addition to this, the bolts are arranged to resist lateral as well as cross strain. The doors and sides of the safe were composed of double steel plates, between which a layer of very hard metal was run in a molten state, filling a series of conical indentations in the outer plate. A composite plate was thus obtained, combining toughness and brittleness, and absolutely impenetrable by any cutting tool, as it is clear any cutter in its progress coming in contact with the hard metal points would soon be rendered useless. The use even of gunpowder was rendered harmless by means of an ingeniously contrived valve or 'escapement' which, by slightly opening under pressure of an explosion, permitted the escape of the gases without damage to the safe. * * * Surely the engineer, with all the advantages of his tools and skilled labour, ought to be in a position to defeat the attempts of a 'self-taught mechanic' like the convict Caseley, compelled, as he was, to 'labour under such disadvantages' in attacking the work constructed under such superior advantages."

Messrs. J. & J. Taylor, of this city, in a late communication to one of our daily papers on this subject, says it is a matter of no difficulty with them in producing burglar-proof safes, but simply a question of dollars and cents on the part of purchasers.

Printing Rollers.

Messrs. Hoe & Co., of the U. S., give the following directions for making and preserving composition rollers:—

"For cylinder-press rollers, Cooper's No. 1. × glue is sufficient for ordinary purposes, and will be found to make as durable rollers as higher priced glues.

Place the glue in a bucket or pan, and cover it with water; let it stand half an hour or until about half penetrated with water (care should be used not to let it soak too long), then pour it off, and let it remain until it is soft. Put it in the kettle and cook it until it is throughly melted. If too thick, add a little water until it becomes of proper consistency. The molasses may then be added, and well mixed with the glue by frequent stirring. When properly prepared the composition does not require boiling more than an hour. Too much boiling candies the molasses, and the roller consequently will be found to lose its suction much sooner. In proportioning the material, much depends upon the weather and temperature of the place in which the rollers are to be used. 8 pounds of glue to 1 gallon of sugar-house molasses, or sirup, is a very good proportion for summer, and 4 lbs. of glue to 1 gallon of molasses for winter use

Hand-press rollers may be made of Cooper No 1¼ glue, using more molasses, as they are not subject to so much hard usage as cylinder-press rollers, and do not require to be as strong; for the more molasses that can be used the better is the roller. Before pouring a roller, the mold should be perfectly clean, and well oiled with a swab, but not to excess.

Rollers should not be washed immediately after use, but should be put away with the ink on them, as it protects the surface from the action of the air. When washed and exposed to the atmosphere for any length of time, they become dry and skinny. They should be washed about half an hour before using them. In cleaning a new roller, a little oil rubbed over it will loosen the ink, and it should be scraped with the back of a case knife. It should be cleaned in this way for about one week, when lye may be used. New rollers are often spoiled by washing them too soon with lye. Camphene may be substituted for oil; but owing to its combustible nature it is objectionable, as accidents may arise from its use."

Mushroom Ketchup.

The London *Grocer* thus describes the Manufacture of what is sold in England as "Mushroom Ketchup":—"This is how the crisp mushrooms of Smithfield are prepared for the delicate palates of the British public, who find poison in and forswear pickles, and lick their lips at the delicious juice of decayed animal matter. Enormous quantities of bullocks' livers—we beg pardon, Smithfield mushrooms—are collected in England, and imported in closed bags from the Continent. These are bought up by ketchup makers—not one or two known rogues, but men who are not generally known as publicans and sinners, and who have the confidence and, we may add, the cash, of the largest distributors of pickles and sauces in the United Kingdom. The mushrooms are salted in tubs, until the mass becomes thoroughly putrid, and—the details are nasty, but we cannot, in justice to the anti-adulteration league, withhold them—the contents of the tubs are then boiled in iron tanks holding about one hundred and fifty gallons each. Each boiling occupies a whole night. It is never carried on by day, for the simple reason that the stench from the boilers would bring down the indignation of the neighbors, who inconsistently hold out one hand to the poor retailer for cheap luxuries, and with the other destroy the sources of their production. Copper tanks are never used for the boiling operation, for reasons that will be apparent to our readers. All that remains now is to strain off the liquid carefully, and add to its natural fragrance and pungency by mixing with it the spices of 'Araby the blest.' That which remains after the straining operation is immediately covered with a layer of ashes, and sold at convenience to manure dealers.

"At a public meeting an attorney for the manufacturer defended his client by denying that the livers were from bullocks; they were from hogs."

Blowing out Boilers.

A Mr. David M'Curdy, of Ohio, gives the following experience in cleaning out steam-boilers:—"I have been running a steam saw mill for the past thirteen years, and have had some experience with steam boilers, and from my experience and observations on the subject, I have come to the conclusion that, if a boiler is cleaned in the right way, incrustations can be prevented even if the water is strongly impregnated with lime or other impurities. A boiler should never be 'blowed out.' For two years I cleaned by blowing out, and, after cooling, to brush out the dust with a broom, wash out with water, etc., in the usual manner, I found that the boiler retained sufficient heat to cause the lime and sediment to unite with the iron, and after it once commenced forming scale, the deposit of lime was greatly increased. I found that the above method of cleaning would never do, as it was ruining my boiler. I then adopted the following method of cleaning: I run the water down, say on Saturday evening, nearly to the top of flues, let it stand till Monday, opening the manhole. The water is quite warm; I then use a long rake or scraper running it on the top of flues on the sides at the water lime, stirring effectually. I then have a man to knock in the hand-hole, keeping my rake on the bottom, and stirring it rapidly while the water is running out—carrying with it all the sediment and dirt in the boiler. I then let in cold water sufficient to cool it; then have a man enter with broom and scraper, and in twenty minutes the boiler is clean, ready for filling. I have adopted the above course of cleaning for eleven years past. My boiler is bright and clean, and nearly as good as new, and shows no sign of forming scale, although the water in use was strongly enough impregnated with lime to form a stone half an inch thick in my feed pipe three different times in eleven years. I will guarantee that whoever tries the above plan will never 'blow off a boiler' again."

A Watch for Business Men.

A Mr. Oppenheimer, of New York, has invented "a watch which shows on its face or dial, besides the hour, minutes, and seconds, also the day of the month, or the date, which appears through a small aperture in the dial, being marked on a disk, which revolves under the dial, and to which an intermittent motion is imparted once in twenty-four hours, so that the date changes automatically at the proper time, and a watch is obtained which, with a trifling additional expense, will prove to be of great convenience for business men, clerks, and, in fact, for the public in general."

Smooth Iron Castings.

Facing is made by mixing coal and sand together in the following proportions: One of coal to eight or nine of sand. Facing alone does not make smooth castings, except for light ones—such such as railing, brackets, etc. If S. V. E. wants to make machinery he had better use facing, and then dust on blacking and soapstone, in proportions of one of soapstone to two of blacking, and then return his pattern or slick it down with a tool, as circumstances may prove best, and leave his castings in the sand over night and they will turn out smooth.—*Cor. Scientific American.*

Fly Wheels for long Shafting.

Long lines of shafting that communicates power to machines at a distance from the prime motor, spring and buckle greatly where the work is variable. The torsional or twisting strain tending to wrench the shaft asunder, causes back-ash in the machinery driven, so that it runs fast and slow, or unevenly; this is often a source of great loss. The remedy is to put a moderately heavy fly wheel on the extremity of the shaft, close to the hanger. This wheel takes up the strain and gives it out, or, in other words, equalizes the power, so that no change is perceptible. It is practiced in some of the Eastern cotton factories, and is found of great benefit.—*Scientific American.*

Slate Quarries.

A company is being formed to work the slate quarries near Danville, C. E., for the manufacture of school and roofing slates, floor-tiles, billiard-slates, mantle-pieces, &c. The property is said to be large, slate of excellent quality is abundant, and the facilities for working and shipment are exceedingly good. It is close to the G. T. railway, and only 58 miles from Montreal.

Sawing Stone.

Stone is now sawn in France with great rapidity and economy by means of a perforated disk of iron on which a coating of lead has been cast, the perforations serving to connect and bind the plates of lead thus formed on the two sides of the disk. The lead is kept well covered with emery, which falls on it from a reservoir above.

Useful Receipts.

Cure for Cold in the Head.

The *Gazette des Hopitaux* points out a method of curing coryza (cold in the head) with rapidity. It consists in inhaling the tincture of iodine, a vial of which is to be held in the hand and placed under the nose. The warmth of the hand causes the vaporization of the tincture. The inhalations are to be made every three minutes, and soon all symptoms of the malady will disappear.

To Blacken Zinc Statues, etc.

Make a solution of six parts of chloride of antimony in one part of alcohol and four parts hydrochloric acid, and apply it to the object with a brush. Wipe the figure over with a wet cloth, and then apply the solution a second time. Now dry the object as quickly as possible in a warm place. When it is perfectly dry rub it all over with oil.—*Deutch Illust. Gewerbzig,* 1864.

Hydrate of Magnesia for Molding.

The hydrate of magnesia, formed by calcining the chloride or nitrate at a red heat, sets very soon on the addition of water, without losing its good qualities. It may thus be cast in molds like ordinary plaster. It may be mixed with pounded marble for the purpose of giving it a grain or color.

Solvent for Shellac.

Coal-tar naphtha will dissolve it perfectly. This is not expensive, and can be furnished at about seventy cents per gallon—perhaps cheaper. The odor, however, is offensive. Coal oil or petroleum naphtha will not answer.

Starch Paste.

Add to the starch after it is dissolved and ready for use, a little alcohol; this makes a mechanical mixture, not a chemical one, preserves the starch a long time from fermentation, and does not interfere with the adhesiveness of the paste.

How to Purify Rancid Lard.

A correspondent of the *Country Gentleman* writes:—"We had some forty pounds rancid lard, which was valueless as it was. Knowing the antiseptic qualities of the chloride of soda, I procured three ounces, which was poured into about a pailful of soft water, and when hot, the lard added. After boiling thoroughly together for an hour or two it was set aside to cool. The lard was taken off when nearly cold, and it was subsequently boiled up. The color was restored to an alabaster white, and the lard was as sweet as a rose."

Way to Granulate Zinc.

A correspondent of the *Scientific American* says: "Take a common corn broom, wet it thoroughly and shake out the superfluous moisture. Then pour the molten zinc through it, at the same time shaking it sideways; the fine splints of the broom divide the drops of metal finely, and being moist it does not stick to them, being repelled by the film of steam made by its contact. The broom had better be held over a pan of water, to prevent the running together of particles not congealed in passing through. Brass may be done in the same way for brazing.

Preservation of Frescoes.

Vohl coats the picture with a saturated solution of paraffine in benzole, and when the solvent has evaporated, washes the surface with a very soft brush. Paraffine has the advantage over other greasy matters of not becoming colored by time. *Dingler's Journal de la Societe Chimique, etc.* Feb. 1866. [A similar solution, we may add, has been used in England for the preservation of photographs.—*Chemical News.*

Mr. Worm's Cure for the "Rinderpest."

Take a pound of small red pickling onions and a pound of garlic, peel them, put them together into a mortar, and reduce them to a fine pulp; to this pulp add a pound of ground ginger, and mix thoroughly. Take three-quarters of a pound of asafœtida, pour sufficient water over it to cover it, then allow it to boil till no sediment remains, carefully removing all hard portions. Pour this decoction of asafœtida over the pulp of onions, garlic and ginger, and stir the whole mass thoroughly; add to this eight quarts of rice-water, and allow it to cool. This is sufficient for fourteen full-grown animals. Sufficient stress cannot be laid on the necessity of administering the medicine the moment the breath is tainted. [Mr. Worms has recently written to say that the proportions of onions and garlic in the mixture may be doubled with advantage.]—*London Chemical News.*

Glycerine and Perfumes.

The uses of glycerine are daily extending and as it is now a commercial article as easily obtained as alcohol, there is one application which ought to become popularly known. This is the property that it possesses of dissolving out the odoriferous principle of flowers. The leaves of roses, of hyacinth, jasmin, geranium, etc., are to be put into a stoppered bottle, and glycerine left in contact with them for three or four weeks. All of the perfume will be extracted, and as the glycerine will mix readily with water, a scented wash can be prepared for the hands, as well as an extract made for use in the preparation of perfumery. If the glycerine be left in contact with red pepper balls, it will extract a principle very strengthening to the hair, and less dangerous than the preparation of cantharides now often used. We could fill a column with an account of the uses of glycerine which have sprung up within ten years, and may recur to the subject again.—*Amer. Mining Index.*

Fire-Proof Paint.

1 ℔ of best black-lead, 1 ℔ of fine Gilder's whiting, and ½ ℔ of Quarterman's patent dryer—the whole ground together finely with linseed oil, and then thinned for use with linseed oil alone, and applied like other paints. It is said that wood thus covered will not take fire from sparks.

Remedy for Damp Walls.

The *Builder* gives the following recipe as a preventive of damp passing through brick or stone walls: ¾ ℔ of mottled soap to 1 gallon of water. This to be laid over the brick-work carefully and steadily with a large flat brush, so as not to form a froth or lather on the surface. The wash to remain 23 hours, to become dry. Mix ½ ℔ of alum with 4 gallons of water: leave it to stand for 24 hours, and then apply it in the same manner over the coating of soap. Let this be done in dry weather.

Practical Memoranda.

Table of Stamp Duties.

Stamps required on notes, drafts, or bills of exchange, executed singly:

For $25 and under	1 cent.
" 50 and over $25	2 "
" 100 " 50	3 "
" each additional $100	3 "
" " " fraction of $100...	3 "

On drafts or bills of exchange in duplicate:

For $100	2 cents.
" each additional $100	2 "
" " " fraction of $100...	2 "

On drafts or bills of exchange in more than two:

For $100	1 cent.
" each additional $100	1 "
" " " fraction of $100...	1 "

Interest made payable at the maturity of any bill, &c., shall be counted as part of the principal sum.

Stamps must be cancelled at the time of affixing the same, by writing or stamping thereon the date; and if no date be stamped or written thereon, such adhesive stamp shall be of no avail.

The stamps for notes, &c., to be affixed by the maker or drawer; and in case of any draft or bill of exchange drawn out of the Province, by the acceptor or indorser.

Any person wilfully writing or stamping a false date on any stamp incurs a penalty of $100 for each offence

Any person who makes, indorses, or pays any note, draft, or bill of exchange chargeable with duty, and upon which a stamp has not been affixed, incurs a penalty of $100; but no party or holder of any such note, draft, or bill of exchange incurs any penalty on account of the necessary stamp not having been affixed at the proper time, provided that at the time it comes into his hands he affixes the necessary stamp thereto.

Strength of Ice.

As people are a little timid about travelling on ice at times, we give the capacity of the ice as afforded by the U. S. Ordnance Department, which is correct. Ice two inches thick will bear infantry; four inches, cavalry with light guns; six inches, heavy field guns; and eight inches, the heaviest siege guns, with 1,000 pounds weight to a square inch.

In a subsequent number a correspondent makes the following remarks on the above:—"Your statement in your last number, as to the strength of ice, is calculated to mislead, and any officer trusting to it in moving a body of men would be very apt to give them a cold bath. Two inches of good ice will bear a man, but not a number of men. In deep water it will always crack a little even with one man's weight, and would very soon be weakened. Four inches will scarcely bear a horse. You could not invent a more perfect ice breaker than a horse's sharp shoe. All his weight is on two feet, and the sharp caulkers do not give one inch surface for it. Ice also is very different in its strength when formed in excessively cold weather; it is then flinty and brittle, cracks easily and requires some days of milder weather to make it bear well. This is one of the mysteries of the formation of ice. I have resided many years on Newburgh bay, and the matter of crossing it in winter either for business or pleasure is of some importance. Six inches of good ice is safe for a tun load on a sleigh, and for a few days safe for a wagon. A valuable team of horses was lost last winter with a load of 1,500 lbs. of coal on a wagon. The ice was six and one-half inches. A drove of cattle running too much together broke through ice measuring ten and one-fourth inches, in 1864. In very cold weather the water, where ice is formed, goes down to thirty-two and one fourth degrees and is the same temperature at any depth. This year I have not seen it lower than thirty-two and one-half. When it rises to thirty-three the ice melts rapidly. Many years since a heavy gun was run over from West Point to Cold Spring, and the thickness of ice was published, I think, in the *Franklin Journal.* I have made many experiments on the ice and temperature of the water, and if interesting to your readers, will be pleased to give them to you."—*Scientific American.*

Attractive force of Magnets.

The attractive force of a magnet being 150 pounds when free from disturbance, fell to one-half by causing an armature to revolve near its poles.

A magnet, the lifting force of which was 220 pounds when the magnet was in contact, sustained 90·6 pounds when the armature was $\frac{1}{150}$ inches distant, and 40·5 pounds when $\frac{1}{25}$ inches distance. Thus at 1-50th of an inch distance $\frac{3}{4}$ of the power are lost.

Projectiles.

The greatest distance to which a ball from a fire-arm can be projected occurs when the weapon is at an angle of 45 deg. with the horizon.

Snuff.

Snuff becomes poisonous if kept in leaden vessels or wrapped in tin foil containing lead, by taking up a portion of the metal.

Absorbing power of soils.

100 lbs. of pure clay absorbs 70 lbs. of water, while the same weight of pure sand absorbs 25 lbs.; clay loam absorbs 50 lbs.; chalk, 45; loamy sand, 40; and calcareous sand, 25. Cubic yards of soil required to cover an acre four inches deep, 538; six inches, 807.

Statistical.

British Trade.

The returns issued by the Board of Trade for 1865, are published. They give the annexed value of the shipments of British goods and produce during the last three years:—

1863	£146,602,342
1864	160,449,053
1865	165,862,402

Showing an increase of nearly five and a half millions in 1865, as compared with 1864, and of £19,260,000 compared with 1863.

Of these exports, the United States was the heaviest purchaser, taking £21,235,790; India, £18,254,570; Hanse Towns, £15,091,373; Australia, £13,352,357; France, £9,034,883; Holland, £8,111,022; Egypt, £5,985,087; Brazil, £5,668,089; Italy, 5,376,886; Turkey, in Europe, £4,931,742; British North America, £4,705,079; China, £3,609,301; Russia, £2,921,496; Belgium, £2,921,300; New Granada, £2,372,497; Spain, £2,249,822; Cuba and Porto Rico, £2,207,511; Prussia, £2,102,714; Portugal, £2,070,381. The balance is made up of amounts under £2,000,000.

The leading articles of export with the amounts shipped were as follows:—Cotton manufactures, £55,964,726; Woollen manufactures, £24,714,918; Linen manufactures, £11,587,927; Silk manufactures, £1,884,178; Iron and steel, £12,988,068; Copper, £2,787,808; Tin, £1,982,167; Lead, £582,569; Haberdashery and millinery, £5,013,757; Hardware and cutlery, £4,334,273; Coals, £4,431,492; Machinery, £5,213,530; Apparel, £2,639,949; Beer and ale, £2,060,369; Oil, £1,548,700; Leather, wrought, £1,462,309; Earthenware and porcelain, £1,442,934. The principal increase was in textile fabrics.

The imports are only made up for the first eleven months of 1865, and are as compared with the corresponding period of 1863 and 1864:—

1863	£173,575,298
1864	197,448,426
1865	180,820,357

Showing a decrease, as compared with 1864, of £16,628,069.

The following are the leading articles imported with the declared value:—Cotton, £49,294,092; Wool, £13,190,761; Sugar, unrefined, £10,136,383; Silk, raw, £9,505,714; Wheat, £8,573,672; Tea, £7,642,218; Silk manufactures, £6,284,419; Timber and wood, sawn, &c., £5,882,987; do., not sawn, &c., £4,528,941; Butter, £5,104,442; Flax, £4,616,426; Metals, £4,150,065; Wine, £3 411,602; Oil, £3,253,313; Seeds, £3,192,098; Hemp, jute, &c., £2,814,381; Tobacco, £2,544,880; Oats, £2,466,955; Hides of all kinds, £2,405,195;

Tallow, £2,400,510; Guano, £2,243,578; Barley, £2,236,109; Cheese, £2,094,366; Flour, £2,072,702; Indian Corn, £1,954,441; Bacon, £1,648,189; Woollen manufactures, not made up, £1,546,365; Spirits, £1,335,159; Sugar, refined, &c., £1,135,694; Rice, £1,038,191; Currants and raisins, £1,022,080.

The decrease in imports in 1865, as compared with 1864, occurred principally in Cotton, Wheat, Sugar, Wine and Wool.

The following is a summary of the exports and imports of Gold and Silver Bullion and Specie registered in the year ending 31st December, 1865, compared with 1864:—

GOLD.

	1864.	1865.
Imports	£16,900,951	£14,485,570
Exports	13,280,311	8,493,332

SILVER.

	1864.	1865.
Imports	£10,827,325	£6,976,641
Exports	9,877,204	6,717,662

The number and tonnage of vessels entered and cleared at British ports for the year ending 1864 and 1865, were as follows:—

ENTERED.

	1864.		1865.	
	Ships.	Tonnage.	Ships.	Tonnage.
British	24,962	7,812,634	25,881	8,358,068
Foreign	17,146	3,489,662	18,629	3,806,185
Total	42,108	11,302,296	44,510	12,164,253

CLEARED.

	1864.		1865.	
	Ships.	Tonnage.	Ships.	Tonnage.
British	28,229	8,590,780	28,480	9,045,781
Foreign	19,026	3,578,793	19,701	3,771,661
Total	47,255	12,169,573	48,181	12,817,442

—*Trade Review.*

Health Statistics.

From the returns of the Registrar General, of births and deaths in London and twelve other large cities in the United Kingdom, it appears that for the week ending on the 3rd March, the deaths registered in London were 1,545, while in the corresponding week for ten years, 1856-1865, the average number was 2,172. The births were 2,087—of whom 1,026 were boys, and 1,061 girls. The annual rate of mortality in London was 26 per 1,000; in Edinburgh, 27 per 1,000; in Bristol, 29; in Hull, 26; in Dublin, 32; in Birmingham, 33; in Sheffield, 35; in Glasgow, 33; in Newcastle-upon-Tyne, 36; in Salford, 37; in Manchester, 37; in Leeds, 39; in Liverpool, 40. For the week ending the 3rd March, the deaths in these thirteen cities were 3,620; and the births 4,409; the average annual rate of mortality, 31 per 1,000. In London, the deaths had been less than 1,400 in the first and second weeks of February, but had risen in the third to 1,630—owing, it was said, to the great coldness of the weather. In the three weeks ending March 3rd, the deaths from bronchitis were successively 131, 210, and 230; those from pneumonia, in the same time, 59, 95, and 60; those from phthisis, 170, 214, and 201.

The Expense of Iron-clads.

An official return gives an account of the expenses incurred on the iron-clad ships in the British navy. The expenses of building and fitting hulls have been as follows:—Warrior, £385,285; Black Prince, £289,911; Defence, £206,783; Resistance, £213,889; Hector, £242,395; and Achilles, £388,218. In addition, however, to these sums there have been incurred up to the latest date the following expense in repair, maintenance, and alterations:—Warrior, £22,517; Black Prince, £11,107; Defence, £11,061; Resistance, £11,426; Hector, £2,215; Achilles, £1,549. The large sum expended on the Warrior since she was built includes part of extensive refit since she was paid off. Forty-five months have elapsed since her building was completed and only thirty-three since the finishing of the Black Prince. The following ships are not yet completed, but the expenses are given up to latest date in office:—The Valiant, £263,258; Minotaur, £345,873; Agincourt, £346,445; the Northumberland, £260,865; Prince Albert, £144,489; Bellerophon, £345,509; Viper, £31,790; Vixen, £36,485; Water Witch, £18,667. The Penelope, Hercules and Monarch are on the stocks or building, but no return is made of their cost. The Prince Albert is a turret ship. The Valiant, Minotaur and Agincourt have been tried, and the Viper and Vixen have been launched. The Water Witch and Northumberland are building. Those now in commission are the Warrior, Black Prince, Achilles, Defence, Resistance, Hector and Prince Albert.

The Precious Metals.

Hunt's *Merchants' Magazine* gives the following as the production of gold and silver for the past eighteen years:—Total yield of gold during that period $3,341,500,000, or an annual average of $185,638,888. Of this amount, California and other Pacific States are credited with $1,056,500,000, Australia and N. Zealand giving $792,000,000. Of silver, the production, during same time, was $1,620,400,000, or an annual average of $90,022,222, Mexico, Peru, Japan and China, (including Thibet) are the chief producers of this metal, giving respectively $580,000,000, $120,000,000, $144,000,000, and $206,600,000.

Penny Postage.

Between the years 1840, when the penny postage system went into operation in England, and the year 1864, the post office revenue increased from $7,500,000 to $20,000,000 annually, giving a clear profit, during the last year, of $5,800,000.

United States Debt.

The total debt of the United States, on the 1st of March last, less cash in the treasury, was $2,711,849,800. The aggregate legal tender notes in circulation at the same date was $605,984,414.

London Thoroughfares.

There are, it appears, 339 thoroughfares in the city of London, and 163 of these are only of sufficient width to allow of a single line of traffic, while there are 101 which afford only a double line of traffic, and only 70 which afford room for three lines or more. There are 60,000 vehicles passing daily through the city.—*London Artizan.*

Photography.

The Modern Practice of Photography.

This is the title of a new work by R. W. Thomas, F.C.S. which is thus recommended by the London *Photographic Journal*:—

"The introduction is followed by papers on 'How to Make the Negative,' 'How to Clean the Glass Plate,' 'How to Varnish the Negative,' 'How to Print from the Negative,' and 'How to Prevent Fog, Stains, and Streaks in the Negative.' The practical information contained under these heads is brought down to the latest date, and the book altogether is an excellent introduction to the art.

"The following 'Rules and Cautions,' which we extract (with the exception of the last, against which we, knowing the extreme danger of cyanide, must protest), are well worthy of committing to memory:—

"1. Do not disturb the deposit which will occasionally be found at the bottom of the bottle containing the collodion.

"2. Remove all particles of dried film from the neck of the bottle before pouring the collodion on the plate.

"3. Never use damp cloths, leathers, or buffs for giving the final polish to the plate; negatives with an indistinct and muddy surface are frequently produced from this cause.

"4. Let the film set properly before immersion in the nitrate-of-silver bath; its condition can be ascertained by gently touching the lower part of the coated plate with the end of the finger.

"5. Never omit to pass a broad camel-hair brush over the plate just before pouring on the collodion.

"6. Bear in mind that as light is the producing agent so it will prove a destructive one; no less than four folds of yellow calico should be used to obstruct white light; and in that case the aperture covered should be no larger than is necessary to admit sufficient light for working by. Examine occasionally the yellow calico: when this material is used to exclude white light, it becomes bleached by constant exposure. Do not trust alone to any coloured glass; no glass yet made, is adiactinic under all aspects of light and conditions of exposure.

"7. When the negative requires intensifying, carefully wash off all traces of the first developing solution before proceeding to intensify. This operation may be performed either before or after the iodide is removed by fixing.

"8. Glass baths are preferable to porcelain, ebony, or gutta-percha baths for solution of nitrate of silver.

"9 In using either spirit or amber varnish, before pouring it off, keep the plate horizontal a few seconds—this gives time for soaking in, and prevents the formation of a dull surface arising from too thin a coating.

"10. Rub the lenses occasionally with a soft and clean wash-leather; the rapidity of action is much influenced by the brightness of the lenses: their surfaces are constantly affected by moisture in the atmosphere, which, condensing, destroys the brilliancy of the image.

"11. The white blotting-paper used for some photographic purposes is not suitable for filtering solutions; that only should be employed which is made for this purpose, and is sold under the name of filtering-paper.

"12. *Hyposulphite of Soda.*—A great deal of rubbish is sold under the name of this salt; as a test of its quality, 1½ drachm should entirely dissolve in one drachm of water, and this solution should dissolve rather more than 4½ grains of iodide of silver.

"13. *Chemicals.*—The purity of photographic chemicals cannot be too strongly urged—the cheapest are not always the most economical. The commercial preparations are generally not to be depended upon, as these, though perhaps unadulterated, are, strictly speaking, not chemically pure. It is best to procure them from well-known chemists, who understand the purpose for which they are intended, and make the preparation of these substances peculiarly a branch of their business.

"14. Never leave chemical solutions exposed in dishes; when done with, pour them back into glass-stoppered bottles and decant for use from any deposit, or filter if necessary.

"15. In all photographic processes it is absolutely necessary to be chemically clean; and this sometimes is not easy: as a rule, never be satisfied with cleanly appearances only but take such measures as shall ensure the absence of all extraneous matter in preparing the solutions, cleaning the glasses, dishes, &c.

"16. All stains on the hands, linen, &c. may be removed by means of cyanogen soap or cyanide of potassium, which should be applied without water at first, then thoroughly washed off. To assist the operation, the hands may be now gently rubbed with a fine piece of pumice-stone, when the stains quickly disappear."

Transferring Lithographs.

M. Rigault proposes a new method for reproducing lithographs. The lithograph to be transferred is first laid face uppermost on a surface of pure water, whereby all the parts not inked absorb water. It is then put between sheets of blotting paper, which absorb the excess of liquid. The lithograph is then laid face downward on the stone, to which it adheres perfectly with a little dabbing. Upon this a sheet of paper moistened with one part of nitric acid and ten of water is laid, and the whole is subjected to the action of the press. The nitric acid penetrates through the lithograph, and the stone receives its action equally in all the lights of the picture.

Miscellaneous.

Periodic Phenomena.

Considerable interest attaches to what may be termed the "periodic phenomena" of nature. Of such a character are the appearance and disappearance of animals, as bats and badgers, which conceal themselves during the winter, and pass through their hibernation; the change of dress at different seasons by the ermine, the stoat, and their allies; the coming and going of the regular winter and summer migratory birds; the retirement and hibernation of reptiles; the movements of certain fish up and down stream for the purpose of spawning; the appearance, transformations, and disappearance of insects; the leafing of trees; the flowering of plants; the ripening of seeds; the fall of leaves—all these, and more, are worthy of the attention of the lover of nature, and not beneath the dignity of man. Linneaus constructed for himself a floral clock, in which the periods of time were indicated by the opening of or closing of certain flowers. Gilbert White, and others since his time, not disdaining to be his disciples in such a work, constructed a calender, of which periodic phenomena presented themselves to their notice. Humboldt observes of the insects of the tropics, that they everywhere follow a certain standard in the periods at which they alternately arrive and dissappear. At fixed and invariable hours, in the same season, and the same latitude, the air is peopled with new inhabitants; and in a zone where the barometer becomes a clock (by the extreme regularity of the horary variations of the atmospheric pressure) where everything proceeds with such admirable regularity, we might guess blindfold the hour of the day or night by the hum of the insects, and by their stings, the pain of which differs according to the nature of the poison that each insect deposits in the wound. And the Rev. Leonard Jenyns, the naturalist, remarks:—"If an observant naturalist, who had been long shut in darkness and solitude, without any measure of time, were suddenly brought blindfolded into the open fields and woods, he might gather with considerable accuracy from the various notes and noises which struck his ears, what the exact period of the year might be."

All such observation as we have alluded to are easily made and as easily recorded, and of all, none are of more interest than the migratory movements of birds. We know that some visit us in the spring and abide during the summer; others direct their flight hither late in the autumn, and spend with us their winter. But why this change, whence do they come, and whither do they go? We can partly answer this question, but only partially. We may declare, in general terms, that self-preservation and the perpetuation of the species, is the great moving cause. That the journies undertaken in search of food, or a milder climate, or both, as consequence of the former or the latter, or in search of suitable conditions for rearing their young; yet there are many special circumstances in which this answer is inapplicable or insufficient."

Knapp, in his "Journal of a Naturalist," remarks of the willow wren:—"It is a difficult matter satisfactorily to comprehend the object of these birds in quitting another region, and passing into our island. These little creatures, whose food is solely insects, could assuredly find a sufficient supply of such diet during the summer months in the woods and thickets of those mild regions where they passed the season of winter, and every bank and unfrequented wild would furnish a secure asylum for them and their offspring during the period of incubation. The passage to our shores is a long and dangerous one, and some imperative motive for it must exist; and, until facts manifest the reason, we may, perhaps, without injury to the cause of research, conjecture for what object these perilous transits are made."

The record of periodic phenomena made in the same district over a series of years is always of interest: but contemporaneous records made at numerous stations distant from each other, and in which the same kind of observations are made, would be of more interest still. Take, for instance, the first appearance of a swift for ten successive years in twenty stations between the Isle of Wight and Caithness; or the last note of the cuckoo heard between the Land's End and the Tweed. Many such trifles, apparently insignificant in themselves, become of importance when carefully and faithfully recorded, and such a work may be accomplished by those who make no pretensions to be men of science, but are content to call themselves "lovers of nature."—*Scientific Gossip.*

Paris Exposition of 1867.

The following extract from the official circular issued by the French Government shows the periods fixed for the reception of goods, and the opening and closing of the Exhibition:—

Before January 31, 1866: Preparing and sending by the foreign commissions the detailed plan of arrangements of their countrymen, on a scale of 0m 020 to the metre, and of information intended for the official catalogue.

Before December 1, 1866: Finishing the palace and the building in the park.

Before January 1, 1867: Notifying French artists of their admission.

Before January 15, 1867: Finishing the special arrangements for exhibitors in the palace and in the park.

Before March 6, 1867: Admission of foreign products at the seaports and frontier towns indicated in article 44 of the general regulations, with permission for them to be forwarded to the Exposition, which shall be used as an actual custom house depot.

From January 15, to March 10, 1867: Receiving and unpacking goods in the Exposition.

From Marrh 11 to March 28, 1867: Arranging the goods unpacked in the spaces ascribed for them.

March 29 to March 30, 1867: General cleaning of all parts of the palace and park.

March 31, 1867: Inspection of the whole Exposition.

April 1, 1867: Opening of the Exposition.

October 31, 1867: Closing of the Exposition.

November 1 to November 30, 1867: Removal of goods and of fixtures.

The following passages from the published regulations will be interesting to persons who intend to contribute:—

Art. 53. The goods are to be exhibited under the name of the producer. They may, however, with his consent, bear also the name of the dealer usually acting as agent for their sale. The Imperial commission may, in case of need, agree with dealers to have goods exhibited in their names in the Exposition when they are not exhibited by the producer.

Art. 54. Exhibitors are invited to write after their names, or that of their firms, the names of those having had a special part in the production of the objects exhibited as inventors, designers of models, mechanical processes, or by their exceptional skill as workmen.

Art. 55. The cash price and place of sale may be affixed to objects exhibited. This indication is required for all objects belonging to class 91. In all classes the prices marked shall exclude the exhibitor for competing for the prizes. Objects sold cannot be removed before the close of the Exposition without a special permit of the Imperial commission.

Art. 56. The Imperial commission shall take all necessary measures to guard the goods exhibited from receiving any damage; but it shall in no way be responsible for accidents by fire or otherwise, whatever may be their cause or the extent of the damage. It leaves the exhibitors free to insure their goods directly and at their own expense, if they see fit to take that measure.

Charcoal.

Adhesion is generally promoted by subdivision, or in other words, by increasing the extent of surface; because, as adhesion takes place between the surfaces of bodies, minute subdivision greatly increases the extent of surface. For example, a cube of one inch to the side exposes a surface of six square inches; if this cube be broken up into a number of smaller cubes, each having $\frac{1}{1000}$ inch to the side, there will be 1,000,000,000 of such cubes; and as each cube has six sides, it will expose a surface of $\frac{1}{100000}$ of a square inch, or 100,000 of them will expose a surface of six square inches, or as much surface as a solid cube of one inch to the side; the 1,000,000,000 cubes will, therefore, expose 1,000 times as great a surface, or upwards of 41.6 square feet. We can thus understand how it is that the force of adhesion is increased by subdivision. Of this charcoal is a familiar, but striking example. The cellular structure of the wood causes the charcoal to be very porous, so that one cubic inch of box-wood has been calculated to expose a surface of 73 square feet on the cells of which it is formed. There is a strong attraction between charcoal and the colouring matter of vegetable and animal bodies, so that on passing these in the liquid state through beds of charcoal, the colouring matter will adhere to the latter, and the liquids will pass through colorless, or nearly so. In this way vinegar and port wine may be rendered white. *Bone-black, ivory-black,* or *animal charcoal* is used by the sugar refiner for getting rid of colour [sugar cyc.]; but in bone-black the charcoal is minutely subdivided by being distributed through the earthly matters of the bone, viz: the phosphate and carbonate of lime; in fact the charcoal does not form above $\frac{1}{10}$ or $\frac{1}{12}$ of the mass. When the bone-black becomes saturated with coloring matter it is thrown aside, and allowed to ferment, after which it is thoroughly washed, and again calcined, and is then fit for being used again when it acts with nearly equal effect as compared with fresh bone-black. The charcoal furnished by calcining dried blood is a more powerful discolorizer than bone-black, and the addition of a little carbonate of potash to the mass before it is calcined augments the decolorizing power.

But it is not colors alone that adhere with such singular force to charcoal. Graham pointed out that metallic oxides in solution in potash or ammonia, arsenious acid in water, and bodies generally of feeble solubility, possess this property; as do also various vegetable matters, and especially vegetable bitter principles. If bitter beer or porter be agitated with charcoal and filtered, it will not only loose color, but much of its bitterness also. It was formerly the practice to get rid of the coloring matter of medicinal extracts and juices by passing them through charcoal, but it was found that so large a portion of the active vegetable principle was retained by the charcoal that the plan was abandoned. Hence, in certain cases of vegetable poisoning, animal charcoal may be safely used as an antidote. Miller has found that very dilute aqueous solutions of salts of lead are decomposed by filtration through a column of animal charcoal.—*Tomlinson's Cyclopedia.*

Agricultural Chemistry.

Dr. Vœlcker, Chemist to the Royal Agricultura Society of England, thus states the practical value of Agricultural Chemistry in the analysis of soils:—

"In the first place I would remark that the chemical analysis of soi's can give very decided answers to the following questions:—

"1. Whether or not barrenness is caused by the presence of an injurious substance, such as sulphate of iron or sulphide of iron?

"2. Whether soils contain common salt, nitrates, or other soluble salts that are useful when highly diluted, but injurious when they occur too abundantly?

"3. Whether or not barrenness is caused by the preponderance of organic matter, or lime, or sand, or pure clay?

"4. Whether sterility is caused by the absence or deficiency of—

a. Lime.

b. Phosphoric acid.

c. Alkalies, especially potash.

d. Or available mineral (ash-constituents) matters generally.

"5. Whether clays are fertile or barren?

"6. Whether or not clays are usefully burnt and used in that state as manure?

"7. Whether or not land will be improved by liming?

"8. Whether it is better to apply lime or marl, or clay on a particular soil?

"9. Whether special manures, such as superphosphate or ammoniacal salts, can be used (of course discreetly) without permanently injuring the land, or whether the farmer should rather depend upon the liberal application of farm-yard manure that he may restore to the land all the elements of fertility removed in the crops?

"10. What kinds of artificial manures are best suited to soils of various compositions?

"11. Whether deep plowing or steam cultivation is likely to be useful as a means of developing the natural stores of plant-food in the soil?

"12. Whether the food of plants in the soil exists in an available or inert condition?"

Oxidation of Vegetable Oils.

M. Cloez, in a memoir read before the Academy of Sciences of Paris, announces the following results of his experiments and observations:—

1. That all the fat oils absorb oxygen from the air, and increase in weight by quantities which differ, for different kinds of oil placed under the same circumstances, and for the same oil under different circumstances.

2. That the height of the temperature exercises a very marked influence on the rapidity of the oxidation.

3. That the intensity of the light also manifestly influences the phenomena.

4. That light transmitted by coloured glasses checks more or less the resinification of the oils by the air. Starting from colorless glass as the term of comparison, the decrease of oxidation is in the following order: Colorless, blue, violet, red, green, yellow.

5. That in darkness the oxidation is considerably retarded; starts later and progresses more slowly than in light.

6. That the presence of certain materials, and the contact with certain substances, accelerate or retard this effect.

7. That in the resinification of the oils there is both a loss of carbon and hydrogen of the oil, and an absorption of oxygen.

8. That the different oils, in oxidizing, furnish in general the same products: volatile acid compounds, liquid and solid fat acids not altered, and an insoluble solid material, which appears to be a definite proximate principle. Oils oxidized in the air no longer contain glycerin.

9. The drying and non-drying oils are not chemically distinguishable. All contain the same glyeric proximate principles, but in different proportions.

Substitute for Magnesium.

Science has discovered, through the skill of a French chemist, a good substitute for the new metal magnesium, which will produce a light nearly as brilliant, at a very much lower cost. The new light is produced by the combustion of a mixture of twenty-four parts of well-dried pulverized nitrate of potash with seven parts of flour of sulphur and six of the red sulphide of arsenic, and the mixture can be sold at about 3d. a pound. Professor Tyndall has been exhibiting at the Royal Institution (London) some more of the marvellous phenomena of the connection of light and sound—*London Artizan.*

House Furnishing.

Our theory is that no one thing should catch the eye. There should be harmony throughout; and we would recommend that great attention be paid to the colour of the walls. If they, the ceiling and the carpet are well selected all other points of detail are like the finishing touches of a picture. The right tone having been attained, the rest is comparatively easy.

We have found grays, light greens, and pale mauve to work up well; and the less pattern there is in the paper the better, unless for some special reason, a chintz paper is desired. If the room faces the south, a cool gray or mauve is good; and for a north room we have seen a yellowish green answer admirably, imparting to the room an appearance of sunshine.

As a rule, we have found it best to avoid reds, especially a dark red, which is offensively dingy.

Blue is a dangerous colour to use. It is so apt to make a room either gaudy or cold; though we have seen it effectively used with pink to give a Pomadour look.

For carpets we incline to small inoffensive patterns and generally avoid those which are flowery, as being in theory and effect bad.

As to the arrangement of the furniture, it is difficult to say much, as everything depends upon what it consists of. But we have generally found it desirable to keep the centre of the room and the space before the fire quite free, and to eschew a round table. If we must have one we prefer pushing it into some corner of the room —anywhere but in the middle.—*London Society.*

Coal in Russia.

The fact will be heard with surprise by the large number who have hitherto considered that the expansion of the Russian empire was necessarily limited by the lack of coal, that the coal resources of Russia are shown to be considerably greater than even those of the United States. In the Oural district coal has been found in numerous places, both on the west and east sides of the mountain chain, its value being greatly enhanced by the fact that iron is found in its immediate neighborhood. There is an immense basin in the district, of which Moscow is the centre, covering an area of 120,000 square miles, nearly as large as the entire bituminous coal area of the United States. And there is the coal region of the Don, covering 18,000 square miles, and being, therefore, considerably larger than the anthracite region of Pennsylvania; as large as the whole of the bituminous coal area of British America, and more than half as large again as all the coal fields in the United Kingdom. Besides the three coal regions above described (whose aggregate area equals all the coal fields in the United States, British North America, and Great Britain combined), coal has been discovered in the Caucasus, Crimea, Simbirsk, Ekatarinofski, and the steppes of the Kherson, in the government of Kief, and in Poland. These facts alone may materially interfere with the calculations which have been hazarded as to the probable duration of our coal fields, and should at least allay some of the anxiety as to the future coal supply for the world.—*Mining Journal.*