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

AUGUST, 1866.

PROVINCIAL EXHIBITION.

The Toronto Buildings and Grounds.

The Local Committee for the City of Toronto, appointed to provide buildings and other requisites for the ensuing Provincial Exhibition, have adopted plans and entered into contracts for the necessary works, which, if carried out to completion, will afford accommodation superior to any heretofore provided.

The present building, erected eight years since, and known as the Crystal Palace, is 256 feet in length, 64 feet in width of nave and 128 feet extreme width at transepts. The frame of this building is iron, put up in squares of 16 feet, of which there are 84 squares on the main floor—or 21,504 square feet of floor space. The galleries contain 44 squares, or 11,264 square feet of floor space—in all 32,768 square feet.

On the north side of the Crystal Palace, 60 feet distant therefrom and parallel with it, is an open building 256 feet long × 40 feet wide, heretofore used as a carriage and machine shed. This building, erected four years ago, is now to be enclosed, lighted and floored, and fitted up as a Hall for Horticultural and Agricultural products, the carriages and light machinery to take the place heretofore occupied by the last mentioned articles in the main building.

At previous Exhibitions, the Ladies' and Fine Arts Departments have jointly occupied the north gallery, resulting in that portion of the building being all the time overcrowded and uncomfortable, and the articles but poorly seen. To obviate this difficulty, and to do justice to the Fine Arts exhibitors, who are every year becoming more numerous, and worthy of additional attention; a junction building, to be known as the FINE ARTS GALLERY, is to be erected between the Crystal Palace and the Horticultural Hall. This building will in its dimensions be 64 feet × 60 feet, lighted by a lantern roof; and by erecting a screen up the centre, north and south, it will furnish upwards of 4000 feet of good wall space for pictures, lighted altogether from above; and totally distinct from although opening into the two main Exhibition Buildings.

This range of buildings, when completed, will give 1,352 running feet of exterior walls, and 46,848 square feet of floor space.

Running the entire length of the north side of the Horticultural Hall, will be the Poultry Shed; and a short distance therefrom a shed will be erected in length 200 feet, width 24 feet, for Threshing Machines and Mowers and Reapers.

In the centre of the main Horse Ring, a very handsome and commodious stand will be erected for the Judges and Directors. 400 Sheep Pens and 100 Pig Pens, of a permanent character, are also to be provided. Admirable ranges of Horse Stables and Cattle Sheds of a permanent character, were erected for the last exhibition held in this city, four years since; all of which are in good order.

On the south side of the Exhibition grounds, which is bounded by the track of the Northern Railway, that Company proposes to construct arrival and departure platforms, and to run trains to and from the City Hall Passenger Station, during the Exhibition; to complete this arrangement, the Committee are preparing the necessary gates and ticket office, and a plank sidewalk from thence to the main entrance of the Crystal Palace. This, in addition to the Yonge and Queen Street Railways, will afford admirable modes of conveyance from the city to the Exhibition grounds, and will no doubt be thoroughly appreciated by those who may have the opportunity of taking advantage thereof.

Provision has been made for proper offices for Secretaries and Treasurer; Feed Barns for cattle; and water pipes and other outside conveniences.

The interior of the Palace and Fine Arts gallery are to be properly coloured, and the Fountain put in working order.

The contractor for the carpenter and joiner work is Mr. Wm. Moulds, of Toronto, who appears to be pushing the work with energy. The other contractors are: painting and glazing, Joseph McCausland; plumber's work, George Harding; tinsmith's work, George Ringham; colouring, Messrs. Mack & Hoult.

The estimated cost of the works here contemplated, covering all contingencies, is $6,500. A few hundred dollars additional might be spent with advantage on the grounds, but as the whole expense has been guaranteed by the Corporation of this city, the Committee has kept down the expenditure to the lowest amount possible, compatible with necessary accommodations for the Exhibition.

It is to be regretted that an arrangement was not come to between the city and neighboring municipalities, 'ere the pledge was given by the city to furnish the necessary means. Had such a proposition been made in time, we cannot doubt but *their* proper share of the funds would have been cheerfully contributed, as, of the $12,000 awarded in prizes at each Annual Exhibition, a very large proportion is distributed amongst the farmers, and their wives and daughters, in the counties immediately surrounding the place of exhibition. We trust that the Counties of York and Peel will yet feel it to be their duty, as well as a privilege, to contribute to this fund; and may we have every accommodation necessary, and in every other respect a successful exhibition.

THE HABIT OF PROFANE SWEARING.

Profane swearing is an evil habit, degrading to the person who indulges in it, and injuring the public moral tone. Men who practice it cannot but feel humiliated, whenever circumstances may lead them to reflect upon their conduct. If individuals will use profane language, it should be at such times and places, that none but their Maker will hear—and thus avoid publicly perpetrating so great a moral crime against society.

We often tremble for the man who, in presence of others, and it may be within hearing of youth, or, worse still, in communication with his family, uses language that shocks the moral sense, and lead others, *perhaps* imperceptibly, to become as oblivious as himself to the proprieties of respectable society, and the duties he owes to his fellows.

The practice is often indulged in because it is considered *manly* to do so. No greater mistake can be made. The writer is now considerably past middle age, and does not remember ever but once having used a profane oath, and that was in boyhood, and in imitation of others; and that *once* is still painfully impressed on the memory; and he cannot now hear any man use profane language without loosing all repect for that person—and this is no doubt the feeling prevailing in the minds of almost all respectable members of Society. Swearing and lying are *both* mean practices, which intelligent minds should avoid.

A profane oath by the party using it is often considered as giving force to arguments used—it does not do so. A man's word should always be doubted, so soon as he endeavours to establish it by a profane oath; for if he will thus dare his Maker, he will not hesitate to lie to his fellow-man.

Our Volunteers! Our noble Volunteers! brave men for their country! how unseemly has it appeared to hear them indulging in oaths and cursing when going forth to meet their enemies—for aught they knew their great enemy, death. How sad that intelligent minds should be so obscured by this disreputable practice.

Our object in writing, however, is, more especially, to draw attention to this evil practice as it exists in our workshops, amongst our artizans—the bone and sinew of our town populations. Having spent at least twenty-five years at the *bench*, we feel and write as one of them; and, if asked as a father what we most fear for our sons, who intend learning some mechanical business, we answer—the contamination of *profanity in the workshop.* Why should this be so? We have filled the various positions from the apprentice to the employer, and we unhesitatingly answer, it is an evil that need not exist if employers would but understand and attend to their duty,

If any person takes into his service youths, especially bound apprentices, who are to spend in such service their brightest days just preceding manhood, it is that person's duty, as far as in his power, to prevent them from being corrupted by evil communications during the hours of labour. We know whereof we speak. Where employees are under judicious discipline—a discipline that tends to make them respectable and respect themselves—they will respect their employers and render them cheerful and profitable service. The employee should know that the rules of *his* workshop do not allow of the use of profane swearing or filthy conversation; and that if he indulges in it, it is at the risk of loss of his position. These rules we have known to be strictly enforced, and with the most satisfactory results; but to be in a position to enforce such rules, the employer must keep his own skirts clean. We would retain no man in our employ for a day that would not submit to so wholesome a discipline, although his dismissal should cause us any amount of pecuniary loss or inconvenience.

Employers, as well as parents, have immense responsibilities resting upon them with regard to our youth, who are to be the men and women—aye the rulers—of the next generation. Let all see to it that they do not, for ease or lucre, shirk these responsibilities. Upon the good moral character of these youths does the future progress and well-being of our country depend.

THE STREETSVILLE FLAX WORKS.

We had intended paying a visit to these works, with the view of furnishing our readers a description thereof: the following article, copied from our excellent cotemporary, the *Canada Farmer*, obviates the necessity of doing so. The description in the *Farmer*, as will be observed, is illustrated by a good wood-cut engraving—a luxury which we can seldom afford to indulge in.

The Scutch Mill referred to has since been destroyed by fire, with a large quantity of flax it contained. It will, no doubt, be soon re-built and in active operation again, as everything the members of this firm engage in is prosecuted with energy:—

"Everything connected with the progress of the flax industry in this country, will be regarded with interest by all who can lay just claim to the possession of patriotic feeling, and we are sure that all such will gaze with pride and pleasure at the engraving which accompanies this article. It is a faithful picture drawn by our own artist on the spot, of the Linen Mill recently put into operation by the Streetsville Linen Manufacturing Company. This Company was formed by the junction of two enterprising and well-known firms, Messrs. Gooderham & Worts of Toronto, and W. D. Perine, Brothers of Doon, and other places westward. Though the building which forms the chief object in our engraving presents a most imposing appearance, the principal outlay of capital has been for what is out of sight, viz.: the elaborate and costly machinery, with which the interior of the Mill is fitted up. Some idea of the magnitude and importance of this enterprise will be formed when we state that already no less than $100,000 have been invested in it. The Flax Works consist of a Scutch Mill, on the opposite side of the river from the building which figures so conspicuously in our engraving; connected with which are out-door vats with capacity for retting 25 tons of flax at once; the Linen Mill, consisting of a main building 50×75 feet, and a wing 40×60 feet, both being five stories high; a separate brick building for generating the steam with which the establishment is heated in winter; a rope walk and some smaller offices. From 70 to 100 hands are ordinarily employed about the works, but in spreading time a much larger number is required. All the process of flax dressing are carried on from the retting of the straw to the preparation of the finest description of fibre. Certain articles of linen manufacture are also produced. About 900 tons of flax were obtained last winter in the immediate vicinity of the mill. Most of this was bought with the seed on, at $14 per ton. The crop last season was not a very even one as to amount of yield, varying from 1½ to 3½ tons per acre. In the farming county round Elora, Maryborough, and Peel, the usual average is about 3 tons per acre. Scutching was commenced at these works in November last, and the linen manufacture in March. The quantity of flax obtained in the neighbourhood is only about one-fourth of what is required to carry on the mill. There is, therefore, pretty wide scope yet for increasing the acreage of flax in the adjacent county. The additional material required at the mill has thus far been obtained from Perine Brothers in the shape of "long-live fibre," as it is called.

A brief account of the operation carried on at these works will doubtless interest our readers. First there is the retting process, which in favourable weather takes from five to eight days. Next the retted fibre is spread out to dry. This takes from three to ten days, according to the season and state of the weather. The dried fibre is then broken and scutched. For breaking, "Randall's Flax Break" is used, a simple machine in which the ordinary roller breaks are so adjusted as to do the work without risk of catching the hands of the attendants. Revolving scutch-knives are used, and moveable perpendicular boards, against which the bunches of flax are held while in contact with the knives. Next to the scutching comes the hackling,—a sort of combing process which separates all the refuse material and inferior fibre, leaving on an average about 50 or 60 per cent. of long fibre. One hackler is constantly busy preparing "long-line flax." After it leaves his hands, it goes to the spreading machine, then it is subjected to the first and second drawing, next it passes through the roving-frame, then the spinning-frame, when its preparation as warp is completely finished. Tow of various grades is left after hackling. The best quality is first dusted in a kind of cylinder; then sorted; next it goes to the picker, and from him to the lapper who laps it on to laps for the cards; next it goes through the carding-machine from which it passes to the drawing-frame which puts it into webs or belts; then it is passed to the speeder which lays it up and puts it on bobbins; next it goes to the spinning-frame and from that to the quiller which puts it on to a number of quills, each of which in turn goes into a shuttle, is put into a loom and wove. At present the mill is engaged in weaving the double-webbed linen out of which seamless bags are made. Each of these is 1½ of a yard in length. The bags are cut off by machinery and hemmed with a sewing-machine, after which they are pressed and baled, 100 being put in a bale. Three bales per day are turned out, or from 1800 to 2000 per week. Their wholesale price in the market varies from $10 to $15 per bale. Counter-twine is also manufactured. This passes through all the stages that have been mentioned except weaving. Instead of being woven, it is formed into balls by a very ingenious piece of machinery invented for the purpose. Cordage is also made. This requires a good quality of tow. The poorer grades are made into rope of various thicknesses. After passing through the processes already described, it is put through the spinning-jenny, the strand-former, and the laying machine. Afterwards it is dressed on the rope-walk and coiled ready for the market. At present only about 300 lbs. of rope per day is being turned out, but the mill has capacity for making from 600 to 700 lbs. The cordage manufacture is not yet fully under way. When everything is in complete operation, all the material yielded by the flax fibre will be worked up on the premises, except the refuse tow which is sold to the paper makers, and used by them in the manufacture of certain kind of paper."

If hydrogen gas be breathed for a few moments it has the curious effect of changing the voice. The effect very soon disappears.

At Amiano, in Italy, petroleum has been extracted for two hundred years. The supplies from this source were used for lighting the cities of Parma and Genoa.—*Mechanics' Magazine.*

BOARD OF ARTS AND MANUFACTURES.

Free Library of Reference.

We call the attention of the industrial classes to this valuable library, which is accessible to all, *without charge*, from 10 a. m. to 4 o'clock p. m. each day; and, for the benefit of those who cannot attend during the day, it is also opened every Tuesday and Friday evening, from 7 till 10 o'clock. The rooms are comfortably furnished and lighted, and every facility is afforded for study or copying, or taking tracings of the various designs.

Although containing but a few hundred volumes of books, it is one of the most valuable libraries of reference on the continent, of a purely practical character. It comprises works on Decoration and Ornament; Architecture and Building; Engineering and Mechanics; Trades and Manufactures; English, American, and Canadian Patents; Parliamentary Statutes and Publications; Encyclopœdias and Dictionaries; British and American Mechanical and Scientific Journals; and many works on general science.

This library, though moderately well used, ought to be much more so. It is true that it is not generally available for non-residents of Toronto, but still much advantage may be derived from it through agents or correspondents, or through the Secretary of the Board, who is at all times ready to furnish information within his reach.

We propose shortly to publish a revised catalogue in the JOURNAL.

TO OUR SUBSCRIBERS.

We must ask the indulgence of our readers in regard to the delay in issuing the past two or three numbers of the JOURNAL. Our publishers keep in their employ a staff of loyal men; and when the Fenian raid occurred, the cry was "To the front!" and to the "front" many of them went, leaving a large amount of work—amongst which was this journal—to fall somewhat "behind." We trust to be *up to time* by the next number; and also, as two-thirds of the present volume is now issued, we hope to realize that our readers will be *up to time* in the payment of their subscriptions for the year. Postage on remittances may be deducted from the annual subscription of 75 cents.

TO CORRESPONDENTS.

Mr. J. C. Simms, of Montreal, will please accept our thanks for his communication. Mr. Simms says: "In looking over the last number of your valuable journal, I was much pleased with the admirable treatise on Chemistry; but in the article on Chlorine discovered an error;" and then goes on to explain that the action of sulphuric acid on chloride of sodium will produce chlorhydric (or hydrochloric) acid, some times called muriatic acid, and not chlorine; and also very fully gives the formula of the changes that take place, and processes for obtaining chlorine; but as the article referred to—No. 14 of the series, "Chemistry by the Fireside," from the *Maine Farmer*—was evidently given in mistake, we have had the article in great part re-written, and publish it in another page of this No. of the JOURNAL.

We shall be glad to hear from Mr. Simms at any time he may favour us with a communication.

Board of Arts and Manufactures

FOR UPPER CANADA.

TRADE MARKS.

Trade Marks registered in the Office of the Board of Registration and Statistics, and open for inspection at the Library of this Board.

(*Continued from page* 177.)

Hugh Miller, Toronto: Trade Mark—Two sheep standing near each other, on a little rising ground, with "Miller's Tick Destroyer" printed above and on each side. Vol. A, folio 129, No. 330. Dated June 22nd, 1866.

BOOKS WANTED.

For Books wanted for Free Library of Reference, see first page of cover of this number of the JOURNAL.

MEETING OF SUB-COMMITTEE.

BOARD ROOMS, July 6th, 1866.

The sub-committee met at one o'clock p. m. Present: the President, Vice-President, and Messrs. Shier, Marston, Sheppard, Carty, Langley and Sheldrick.

Minutes of previous meeting were read and approved as correct.

The Secretary reported communications from the Bureau of Agriculture; the Board of Arts and Manufactures for L. C.; the Smithsonian Institution, the Natural History Society of Montreal; Professor Bell, of Queen's University; W. Armstrong, Esq., of Toronto; Secretary of Kincardine Mechanics' Institute; D. Fowler, Esq., Amherst; &c., &c.; and the answers thereto or manner in which such communications had been disposed of, which were severally approved of.

The Treasurer's Rough Balance Sheet was submitted, showing total receipts for six months ending 30th June, ultimo, $1178.32; total expenditure, $939.35; balance in hand, $238.97. Outstanding liabilities about $65, which are more than balanced by assets due on the *Journal* of the Board.

Professor Buckland suggested the desirability of the Board endeavouring to secure rooms in the Hall of the Board of Agriculture, should suitable accommodation be afforded; and that the Board might thus act jointly with the Board of Agriculture in establishing an Agricultural and Industrial Museum in the large rooms provided for that purpose. After full discussion it was

Resolved,—That Messrs. Langley, Sheppard and Carty be appointed a committee to confer with any committee the Board of Agriculture may appoint to consider such a joint occupation.

The President reported that he had received no communication from the Hon. the Minister of Agriculture, as had been contemplated, relative to the Paris Exhibition. It was

Resolved,—That the several members of the subcommittee, residing in Toronto, do constitute a special committee to act upon any communication that may be received from the Government in relation to such Exhibition.

The Committee on Examinations reported that but two candidates had applied for examination this session; and that, as their papers of application had not been sent until some days subsequent to the date named in the programme for receiving such returns, the committee had not proceeded to appoint examiners.

It was suggested that if the several Mechanics' Institutes based their awards of prizes, in the respective classes, upon the examination papers submitted to the Board, instead of upon local examinations held, more success would attend the efforts of the Board, and with advantage to the Institutes and their classes.

The meeting adjourned.

W. Edwards, Secretary.

Transactions of Societies.

WHITBY MECHANICS' INSTITUTE.

The annual meeting of this Institute, was held on 6th of July. The officers of last year were reelected, with one or two exceptions; to all of whom a vote of thanks was given for the very efficient manner in which they conducted the business of the Institute. The following is a list of the officebearers for the ensuing year:—

"J. H. Perry, *President;* G. H. Dartnell, *1st Vice-President;* M. O. Donovan, *2nd Vice-President;* G. Y. Smith, *Recording Secretary;* Thomas Kirkland, *Corresponding Secretary;* J. Bain, *Treasurer;* H. Fraser, *Librarian.*

"*Managing Committee.*—M. Thwaite, George Cormack, Major Harper, John Ferguson, John Shier, R. J. Wilson, James Byrne, George Blake, J. H. Greenwood, B. J. Hickie.

From the annual report we learn that "an enlargement of the hall has been accomplished by the erection of a wing on the south 20 × 33 feet, two stories high, at a cost of $671,00. The public hall is now the whole size of the main building, the library room, enlarged and otherwise improved, and suitable apartments provided for a reading room, and necessary committee rooms for the Institute. The building is now convenient and commodious for the purposes for which it was originally erected. To meet the extra cost of the addition, special subscriptions amounting to $143, have been obtained, of which amount your secretary, (M. Thwaite, Esquire,) contributed the handsome sum of $100, and $500 has been raised on mortgage on the property, repayable in five years.

"The memberships for the year ending 1st April, number 114, showing a decrease from the year previous The cost of membership is $1 per year. For a town of 3000 inhabitants, with a wealthy surrounding country, the membership is certainly small.

"The usual course of lectures for the winter season were delivered, by gentlemen well qualified to perform that duty, and to whom your committee, on behalf of the Institute, desire to return their warmest thanks. The attendance at the lectures was but small, and during the year not a single lecture ticket was sold. The receipts at the door for lectures were $2.40. It will be a question for your committee's successors to determine whether the lectures shall be continued, or some other means for public instruction and amusement be devised for the coming winter.

"The rents received for the year, amounted to $219.32, of which amount there was received for casual rents $147.32.

"The library contains about 1100 volumes. During the year 20 new volumes have been added. The number of readers 104, and number of volumes taken out 1470 The library is sadly in want of new works, and at the least 200 additional volumes should be obtained the coming autumn.

"But one re-union has been held, yielding to the funds $9.10. Your committee suggest, that early and efficient steps be taken, for a course of re-unions affording amusement and instruction to the public and securing a revenue to the Institute.

"The requisite accommodation for a reading room, has now been provided, but whether it is advisable at this time, for the Institute to incur the necessary outlay to place a reading room on a successful footing, is a matter of serious consideration: while the expense of maintaining a good reading room is large the receipts at least are very precarious and fluctuating, and not unfrequently small in comparison with the outlay.

"During the month of August, your committee, in conjunction with the Oshawa Institute, organized an excursion to the Niagara Falls. The receipts were $772.55, and expenses $788 87, leaving a deficiency of $16.32.

"Your property is now estimated at the following value:—

Building and real estate	$1,800 00
Furniture, &c.	400 00
Works in Library	700 90
	$2,900 00

And against which is the Mortgage before mentioned of $500. The Institute was originally built in 1854, since which time no direct appeal to the public for material assistance has been made. The property is one that every ratepayer in town may justly feel proud of, and although the volumes in the Library are not so numerous as we could wish, nevertheless it is one of, if not the very best country Library in Upper Canada. Since the establishment of the Institute, now some 17 years ago, the managing committee have given their yearly services free of charge, and every person on the payment of the small annual fee, has equally the same privileges of the use of the Library, and the same right in the property, as the oldest members in the Institute. Surely where all are equally interested, and feel the same just pride in having in our midst an Institute of this description, an appeal to the public for assistance, ought not to be in vain. When so little is required, and so much given in return, no difficulty should be experienced in raising the necessary funds to pay off our small debt. Fifty subscribers of $10 each, or one hundred of $5 each, your committee believe can readily be found in a town of the wealth, population, intelligence and public spirit of Whitby, to accomplish that object.

"*Abstract of the Receipts and Expenditures for the year:*

RECEIPTS.	
Balance of Cash from last year	$61 74
Rev. Mr. Pomroy acc't do.	3 50
Episcopal Church rent	72 00
Sundries casual rents	147 32
Membership Tickets	114 00
Receipts at Lectures	2 40
Re-union	9 10
Subscriptions for extending and repairing Institute	143 00
Mortgage on Mechanics' Institute	500 00
	$1053 06

EXPENDITURES.	
Paid note at Bank from last year	$100 00
" Geo. Yule's account	34 29
" Fire Insurance and Carpenter's Risk	50 90
" Lecturers	10 00
" Books and Reviews	23 90
" Librarian's Salary	52 00
" Cleaning Hall	40 00
" Wood and Cutting, Benches, &c.	64 73
" Enlarging and Repairing Building, &c.	671 00
" Balance of Cash to next year's acc't	6 21
	$1053 06

"*Statement of Assets and Liabilities:*

ASSETS.	
Cash in hands of Treasurer	$6 21
Assemblies from 1864 & 1864-65	9 50
C. B. Robinson, for 1864-65	2 00
Scholars at Evening Schools, do	11 00
Funds in New York to buy Books	9 22
Mechanics' Institute, Building and Lot	1800 00
Books in Library	700 00
Furniture and Scientific Apparatus	400 00
	$2937 93

LIABILITIES.	
Geo. Yule	$42 15
Reviews	10 00
W. H. Higgins	6 50
Major Harper	15 30
Wm. Bryan	19 00
Mortgage	500 00
Balance, shewing excess of Assets over Liabilities	2344 98

Correspondence.

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

DEAR SIR,—Annexed is a rude sketch of a very simple machine for easily separating the grounds in preparing Coffee. I am not acquainted with Mr. H. Boyle, of Napanee, C. W., the inventor, but have tried the machine and find it to answer the purpose perfectly, and send you this short notice as I find it has not been introduced into Toronto as yet. After the Coffee begins to boil, in any common coffee-pot, the machine is introduced into the pot, where it is to remain until the Coffee is sufficiently boiled. The "Settler," as Mr. Boyle calls it, is then taken out, when it will be found that it contains all the grounds, without leaving any *grounds* of complaint against the ingenious inventor of this clever "dodge."

Now, as to the *philosophy* of Mr. Boyle's Settler. Has the reader ever observed, in travelling along the margin of a stream running through a flat country, how, by a provision of nature, the banks on either sides are raised *higher* than the adjacent lands, and thus the country is protected from the effects of future inundations. While the stream is confined to its usual channel, the mud and sand are carried along. But as soon as it overflows its banks the current is decreased by diffusion, and thus the mud is deposited, and a natural barrier is formed. In the case of the "*Magic Settler,*" the liquid in boiling is impeded in its motion by the outside of the *Settler*, when instantly the current ceases, and the Coffee grounds are deposited in the inside.

I remain, dear Sir, yours respectfully,

J. W. DUNBAR MOODIE.

Belleville, C. W., July 6th, 1866.

P. S.—Perhaps Mr. Boyle, of Napanee, might send you one of his machines, on application. At all events, he *ought* to do so, in order to bring it into notice through your excellent journal, which should have a very large circulation through its merits. J. W. D. M.

[We will with pleasure publish a wood cut illustration and description of Mr. Boyle's "Settler," if forwarded to us by that gentleman.—ED. JOUR.]

The Earth moves upwards of 68,000 miles per hour, whilst Mercury travels 108,000 miles per hour.

13,392 tons of water are every day converted into steam and discharged into the air from locomotive engines alone, in Great Britain.

Selected Articles.

POPULAR BOTANY,

AN ILLUSTRATION OF SOME OF THE MOST INTERESTING PHENOMENA CONNECTED WITH VEGETABLE LIFE.

BY H. A. GRAEF,
Chairman of the Section on Botany in the Long Island Historical Society,

The study of Natural History opens for us so many sources for moral reflections and pure enjoyments, and rewards us at the same time with so many valuable developments useful to practical life that it can hardly be sufficiently appreciated. Whoever has an opportunity should regard it as a duty, to aid and to sustain every branch of this science to the best of his ability. And as it was my fate to pass more than thirty years of my life among plants, where the most favourable opportunities were offered to observe and study their life and habits, it affords me great pleasure to communicate to those who take interest enough in this branch of natural history some of my own observations and reflections in connection with other facts more generally known. The main object of this essay will tend to sum up and explain some of the manifold and interesting phenomena connected with vegetable life; to show some of the important functions which vegetables have to fulfil in the natural economy, and also the great wisdom and care which have necessarily been bestowed upon them, with regard to their creation, preservation, propagation, and diffusion over the surface of our globe. It would be to me a great gratification should these remarks make a lasting impression on the moral feelings of those who peruse them, and lead to a greater interest in the study of Natural History in general.

In order to be more perfectly understood I will try to avoid as much as possible all scientific terms, and wish, therefore, to have this paper regarded as an essay on popular botany.

The English word Botany is derived from the Greek, and signifies that branch in Natural History which comprehends all that relates to the vegetable kingdom.

With regard to its purpose, botany is divided into two branches, namely:—The theoretical, which has for its object the investigation of scientific matters; and practical, which aims to take advantage of this science for pecuniary profit. In the last named are included agriculture, floriculture, pomology, &c.

The origin of plants dates, without doubt, as far back as the period when the surface of our globe was sufficiently prepared for their reception and lasting nutrition; at all events, the creation of vegetables must have been long before that of the quadrupeds, for these being for their subsistence almost exclusively dependent on vegetables, either directly or indirectly, and as one single animal frequently devours more vegetable matter in one day than many thousand plants will produce during a whole year, an abundant number of the latter were needed for the continuation of animal life.

There is good reason to suppose that plants at first were constructed on much more simple forms than we are accustomed to meet, and that in the course of time and through the might of influences, they have gradually become more various and perfect.

This change in the forms of plants, however, passes on so very slowly, that a man's life is not sufficient to observe them. The evidence for the supposition already mentioned must, therefore, be derived from other facts, namely, by excavations.

A great many well preserved antediluvial plants have been thus discovered, which are recognized as plants of our days, but more simply constructed.

The indispensability of vegetables in natural economy cannot be better illustrated than by the fact of their existence everywhere. Plants are found on our globe as far north and south as it has been explored; their region extends from the deepest cave up to the boundary of snow on the highest mountains; far beyond that of the spheres of animal life.

They grow in almost every kind of soil; in sand, in gravel, clay, chalk; in swamps, in water, on stone and rocks; on living and mouldering wood, and even on living animals. It is obvious that according to their location and the different functions they have to fulfil, they must be differently constructed.

Vegetables are not only created for their own existence, but also as an indispensable means of maintaining animal life. Should it happen, for instance, that all the vegetables of our globe were destroyed, hardly any animal would be found alive in a short time thereafter. With regard to this great function, plants have been particularly favoured by nature, especially in regard to their independence, propagation, vitality and reproduction. While animals have been gifted with free will and voluntary motion, plants are chained to the ground; but vegetables, in return, have been endowed with other advantages, which will counterbalance them to a certain degree. So, for instance, most of the plants are hermaphrodite, combining the conditions of propagation in one individual. When most of the land animals produce, as a general rule, from one to two young ones per annum, and rarely more than twenty, a single plant usually produces during the same time many thousands; nay, ferns, lichens and mosses even several millions of seeds—each containing the germ of a new vegetable life.

Besides by seeds, the propagation of plants takes place in a natural way, by root-shoots, suckers, runners, layers; by bulbs, by bending over of branches, by dropping of twigs and leaves—without regard to the many different artificial manipulations, whose success is really astonishing.

In regard to vitality and reproduction I refer to the fact that animals usually die when deprived of integral parts of their body; plants retain their vitality when totally deprived of their leaves, branches, and even stems; as the grass on meadows, where cattle graze, is eaten off and reproduced sometimes once in twenty-four hours. As further evidence for my statement, I will mention that plants produce, with the assistance of light, air, and water, nourishment enough of themselves for the sustenance of their life and growth, independent of any other succour.

As soon, for instance, as the frost has interrupted the circulation of sap in vegetables, the leaves of most of the trees and shrubs, or the whole growth of annual and perrennial plants drop to the ground, and not only serve as a natural protection for the roots or seeds against the cold, but more warmth is also produced by the chemical process of decomposition, for the same end. From the dropped and decaying leaves, brushwood, and other matter, a quantity of humus or leaf-mould is produced, of which the rain water will dissolve the soluble parts and penetrate, with them, the bottom; from which latter the roots will absorb them again, in order to use them for the further growth of the plants.

Besides the nourishment from the humus, the roots also absorb some different liquid earth-salts out of the soil; while the leaves absorb and decompose on their surface a part of the carbonic acid gas of the atmosphere. By this reason the foliage produced in this way weighs always more than both the absorbed humus and salt together would amount to. This fact has given rise to the introduction of a peculiar mode of manuring. In countries, for instance, where manure is scarce, poor fields are sown with the seeds of easy and vigourously growing plants, such as peas, vetches, lupins, &c., and as soon as they reach their maturity, they are plowed under. Now, by the decomposition of these vegetables, the ground will gain more manure or humus than the previous crop had absorbed from the poor soil, and in this way the fields are very much improved.

The constituent parts of the plants are, in general, roots, stem, leaves, calyx, corolla, germ, pistil, filaments, fruit, and seed. Besides these, many plants are found to have other organic parts which, however, would be too numerous to mention in this place. Every one of these organs has its certain function to fulfil. The root, for instance, serves simultaneously as an anchor to fasten the plant to the ground, and, at the same time, to absorb nourishment therefrom. In the tender stage the plant must depend on the root only for its support. Roots and stem always grow in their due proportion: the former, however, must always be a little in advance, in order to fulfil its functions as the anchor, as well as supporter. The stem serves as the medium of communication between the root and the other parts of the plant. The leaves absorb and decompose a portion of the carbonic acid gas from the atmosphere. The calyx affords protection for the developing blossom. The corolla envelopes the delicate germ, pistil and filaments. The germ is the nucleus of the future fruit; the fruit contains the seed, which latter, for the most part, furnishes the common means for future propagation.

It would become too tedious here to describe all the functions of the parts above enumerated; I will therefore confine myself, on this occasion, to a few hints on the different ways and means of which Nature makes use for the distribution of plants over the surface of our globe. Although plants are not endowed by Nature with voluntary motion, still they will travel by degrees over the whole earth. One of the most common means for this effect is the wind. The seeds of many families of plants, as for instance, ferns, mosses and lichens, are so exceedingly dust-like that they are taken up by the wind in large quantities and transported to a distance of hundreds, nay, thousands of miles.

At certain seasons the atmosphere is filled with these invisible atoms by the million, and they are kept afloat until they come in contact with some object to which they adhere, and under favourable conditions they germinate and grow. This fact is easily observable on the shady side of brown-stone houses. Where there is sufficient moisture to germinate the plants, there we find a green substance accumulating particularly about the steps, which is nothing else than the young plants of mosses, lichens or ferns.

The seeds of many other plants are covered at the apex with a hair-like tuft—pappus—for instance, the thistle, dandelion, aster, &c. This renders such seeds also bouyant and susceptible of being easily floated through the air, yet not to so great a distance as in the former case. In other cases the seeds are enveloped in a woolly substance, as the cotton, willow, poplar, asclepias, &c., and they are conveyed away in the same manner as the former. Some seeds are provided with membranaceous and wing-like appendages, as the maple, ash, elm, pine, &c. These are also carried away by the same agency of the wind, to a shorter distance.

Another very important agent for the distribution of seeds is water. By heavy showers of rain, producing inundation—a great number of different seeds will be taken up and transported from rivulets to rivers, and by these to the sea, and thus be wafted to distant shores, where under favourable circumstances they may germinate and find an asylum.

Another agency for this distribution we find in birds. These are in the habit of using berries for nourishment; they swallow them frequently without crushing the kernel. And as the digestive power of their stomach is not sufficient to destroy the vitality of the germ, and they sometimes fly to great distances before these undigested seeds are discharged through the natural channel; these seeds are frequently found to germinate and thrive in parts far away from the place where the berries were swallowed. Amateur gardeners in Sicily are in the habit of shooting migrating birds which return early in spring from Arabia, and to sow the contents of their stomachs, with the purpose of raising in this very manner new Arabian flowers for their gardens.

The same case will sometimes, though more seldom, occur with quadrupeds. But animals contribute to the distribution of seeds in other ways. Some seeds, such as the burdock, agrimony, Bidens, &c., are provided with barbs. When animals come in contact with those seeds, they become fastened to the hair or wool, and thus they are carried often for a length of time, and frequently are not deposited before the hair or wool drops off. Sometimes such animals, covered with seeds, are killed, and their hair, wool, or hides exported to foreign countries. In cleaning these products, the seeds are often cast into the rubbish of the street, and thence they find their way into the fields, where under favourable conditions, they successfully germinate and occupy a new home. In this way many Asiatic plants were imported in camel hair; many South American ones in the the hides of oxen and the wool of the alpaca, &c., and many Russian plants in Northern furs.

Plants are furthermore distributed by the elasticity of their seed-capsules. In approaching maturity, or when the capsules have attained a certain degree of hardness, the cohesion of parts will be broken, as that part immediately containing the seeds rolls itself up with great rapidity and a sort of spiral contraction, by which process the seeds are scattered about for a distance of sometimes ten yards, and even more. To this class belongs our common lady's slipper, Fraxinella, sweet peas, &c.

Another and peculiar process by which seeds are scattered abroad occurs with the *Momordica Elaterium*, a plant used in the old school of medicine, and which is one of the cucumber tribe. On approaching maturity the juice of this cucumber undergoes fermentation to such a degree that the contents of the same, pulps, seeds, fluids and gases are thrown off through the aperture of the fruit stalk with such force as to reach sometimes a distance of fifteen yards. This will happen, also, if the ripe fruit is pressed by a too careless handling, so that the uninstructed may be served a severe practical joke, and find themselves much surprised and annoyed on having the contents of this repulsive fruit thrown in their face.

Finally, one of the most extensive distributions of seeds is effected by the commercial exchange of grains. Through this channel we find not only the desirable supply of breadstuffs and the useful products of different climes exchanging localities, but also the undesirable varieties of noxious weeds, and foul plants, surprising and annoying the gardener and farmer, who only bargained for a new variety of wheat or some other grain. The greater part of these so-called weeds, and many other plants growing in the vicinity of cultivated grounds, have been introduced in this way. It is, therefore, now difficult to determine which of these plants are of American or foreign origin. I shall never forget my surprise on finding, in the year 1818, in the vicinity of Cologne, such a variety of strange plants. The weather in the year 1816 and 1817 was so exceedingly wet that no grain of any kind could come to maturity, on which account the government thought it prudent to import the necessary seed-grain from Russia, at government expense, in order to prevent famine, and with these grains a number of Russian plants were introduced to the vicinity of the Rhine.

It is very interesting to observe with how much effort plants endeavour to produce seed, or to propagate themselves in other ways; for instance, in the case of plants whose flowering season in a natural state is only of a short duration; if we pluck their flowers before they have matured their seed, the plants will persevere to flower again and again, as if never satisfied short of the full maturing of their seed, for succession. In accordance with this principle, amateur gardeners keep most of their favourites almost constantly in bloom.

As before mentioned, plants propagate themselves in many other ways than by the production of seed; for instance, the weeping willow, the wild cotton tree, the weeping ash, &c. When their long pendant twigs reach down to the ground and are supported by the wet weather they take root, and by reaction the little twig becomes the trunk of a new tree. This tree, in its turn, elaborates the same process, until sometimes, in wild uncultivated countries, a space of even several miles in extent is thus spontaneously produced from one original standard tree.

The same occurs with some perennial plants, driving out runners; for instance, our strawberries, ranunculus, Potentilla, &c. These plants send forth slender feelers, so far from the mother stock as not to interfere with each other, and then take root, and become independent plants. As soon as these young plants have attained a certain size, they also throw out their own feelers, and in this way we find often a considerable surface covered from a single plant. One of the most interesting of this kind of plants is the *Saxifraga stolonifera*, a plant most commonly used for hanging pots. This plant which grows, as far as I can recollect, at the northern sides of the Italian Alps, will certainly not reach the lower regions with the rapidity of the wild goat, but it will reach them just as well and surely with much less trouble and danger. Some other plants resemble those just described, but throw out their runners *under* ground instead of over the surface; for instance, our quackgrass, thistle, convolvulus, and others. These plants embrace some of the most troublesome weeds; as the smallest piece of root will become a new plant, if not carefully taken up after digging or ploughing.

The power of reproduction in many plants is so strong that small twigs or even dropped leaves, if placed in the least favourable position will take root and form a new individual.

Of many perennial plants the old root will decay every season, but not until it has produced a number of young roots, each of which will become a new plant at the next succeeding season.

The so-called bulbous roots, for instance:—hyacinths, tulips, crocus, and others, yield a brood of small bulbs every year. Some others, as *Lilium bulbiferum* and *Dentaria bulbifera*, bear besides those of the root, small bulbs between the leaf axil; and others again, as *Allium viviparum* the so-called grape onion, bear, entirely developed, small onions instead of flowers, and each of these little onions also often drive out another stem, each of which is crowded with still another crop of onions.

For their full development plants in general need a full share of light; without this they will pale, droop and die. The effect of this is nowhere more forcibly manifested than in very dense forests. As the light in such places can fall only from above, every tree endeavours to receive as much of light as can possibly be obtained, and for this end a strife as for life and death will ensue. Accordingly, the trees grow with an almost incredible rapidity to an enormous height; such are generally quite straight, but often not thicker at the bottom of the trunk than at the top. And should any one of them fail to keep up the contest he is lost! His neighbour trees will overgrow and then spread their branches over such a weary one; shut out from the necessary light the tree will suffer death, while the remains of his decomposition will serve as food for the more successful rivals.

Plants are generally organised in a way to live in soil of very different composition; the quality of the latter, however, bears still a great influence upon their habits. So, for instance, may a plant in poor barren soil grow to the height of ten inches which would reach the size of twelve feet in rich or more convenient soil. For this reason it is often very difficult to recognize these two so unequal individuals as sisters.

Many other plants, however, are so dependent on a certain admixture of soil, that their appearance can serve as a true hint to geologists for the discovery of certain strata of earth. As, for instance, we can surely depend on finding a layer of zinc, where *Viola calaminaris*, *Statice Ameria* and *Spergula muscosa* grow naturally on the surface.

While these three plants indicate the presence of zinc, other kinds in return point to the layers of lead, copper, iron, coal, lime, chalk, gypsum, marl, &c.

A very interesting demonstration in regard to the abilities of plants to accommodate themselves to conditions of locality, presents itself to the naturalist in swamps which are occasionally inundated, particularly if the water on some places is kept running for some time. For instance, plants grown in swamps, and constructed to live in the open air, would certainly be drowned, when set under water for a long time, if they were not provided with the means to rescue themselves from such a dilemma. Under this difficulty, full grown plants begin once more to grow, not seldom to a great extent until they have reached the surface of the water, where the leaves lay down; while the stem takes up again its ordinary functions. On places, however, where the water is running, the plants or their parts will appear in entirely different forms; namely, by the continual side pressure of the water the new growth will be unnaturally extended, or, as if it were, pulled into the shape of long slender threads, and the foliage will undergo a similar change, whose flat forms were altered into long thin splits. In case such an extended stem should reach a place where the water stands still, the leaves will appear again in their original large shape. When the water on such inundated places runs off or is evaporated, the plants become so tender that they cannot live in the open air any more. The whole growth, therefore, must decay, as deep as to the roots, and the new plants which shall spring up from them appear also in their original form again.

These and other similar changes in the forms of plants bring young botanists often into great confusion, and have also given rise to many discussions and different opinions among the experienced.

(*To be continued.*)

CHEMISTRY BY THE FIRESIDE.

(*Continued from Page* 180)

No. 15. Carbon.

We come now to one of the most interesting of the elements. Carbon exists in some form in all the kingdoms of nature. It is in one form among the cheapest of substances, and in another the most costly. Your charcoal, your mineral coal, your black lead, and the diamond are only different forms of carbon. If you knew how to crystalize charcoal, you could make diamonds for your own use. A vast number of experiments have been made to obtain diamonds by artificial means, but like perpetual motion, it is probably one of those things beyond our reach.

I wish to introduce a new term called allotropism. It has been found that the element sometimes exists in different forms, and possesses entirely different properties. This is strikingly the case with reference to carbon, for it exists in three distinct forms, charcoal, plumbago, or blacklead, and the diamond. They call this condition allotropism. The diamond has been seen by mineralogists in its native rock. There is a mystery still hanging over the minds of naturalists with reference to its native rock. It is usually found in the loose sands of rivers, and generally where gold and platinum abound. The diamond is well known as the hardest substance in nature. It can be ground and scratched only by its own dust.—Hence its great value in jewelry and for cutting glass. The planes of these crystals are curved, and when they come to a point they are set in a handle and are used for cutting glass. The diamond is so much harder than the glass that it actually cuts into the glass as clear a cut as a sharp knife cuts into a piece of pasteboard. It is not a scratch then, but a cut that causes a piece of glass to separate. If you burn the diamond, it will produce the same result as when you burn charcoal. This is proof positive that it is pure carbon.

Carbon exists in vegetable matter. When you burn wood for charcoal you drive off a large portion of the other elements, and have left nearly pure carbon.— This is really an experiment in chemical analysis. This form of carbon is indestructible like any other element. Bury it in the ground, and it will remain there for thousands of years unchanged. Fresh charcoal will absorb large quantities of air and other gases. Hence it is found to be a good disinfectant. Take some charcoal just burned, powder it up, and bury a piece of tainted meat in it, and it will be materially improved. It combines readily with oxygen in combustion, throwing out a great deal of heat.

Mineral coal is another form of carbon. Go to a blacksmith shop when it is used, and you will find the variety known as bituminous coal. It smuts the fingers. It burns with a good deal of smoke, Anthracite coal is not smutty. It has a shining, metallic lustre, burns almost free from smoke, and makes an extremely hot fire.

Plumbago, graphite, blacklead, are all the same thing. This is another form of carbon. It is found in the rocks in beds, and contains a small per cent. of iron in combination, though the latter only appears as an accidental substance. You are familiar with this substance in your lead pencils. It withstands a high degree of heat. Consequently the chemist has his crucibles made of plumbago. Thus you see that carbon is an abundant element in nature. In our next number we shall notice more of the compounds of carbon, when we shall learn that it is still more abundannt.

No. 16.—Carbonic Acid.

We told you last week that charcoal, mineral coal, and the diamond, were the same thing under different forms, and that we give them all the name of carbon. Suppose now we burn a piece of charcoal; during the process of burning, the oxygen of the air combines with the carbon and it passes off in the form of a gas, to which we give the name of carbonic acid. If we burn a diamond in oxygen gas the result is the same. This is the proof positive that the diamond is pure carbon. It was first discovered by Dr. Black in 1757, and called by him *fixed air*, because it was found by him to exist in a fixed or solid state in limestones.

You can easily prepare carbonic acid. Put some chalk, which is composed of carbonic acid and lime, into a glass jar, and pour on some diluted sulphuric acid. Effervescence immediately takes place by the escape of the carbonic acid from the chalk in form of a gas. As the gas is once and a half times heavier than common air, it remains in the jar. It is invisible, but has a pungent odor, such as you can smell after burning charcoal. Under an immense pressure it is condensed into a liquid, and when the pressure is removed it will evaporate so rapidly that it freezes its own vapor so as to produce a white substance looking like the purest snow. Owing to its weight you can pour it from one vessel into another like water, though you cannot see it. Take a tumbler and set a short bit of lighted candle in the bottom, and pour some of the gas from the jar, and it will put out the light as suddenly as if it had been water. A test for carbonic acid is lime water, which, on agitation, produces a milky looking substance. Lime then has a great affinity for carbonic acid, and forms a carbonate of lime. This is the composition of all our limestones and marble. It is found in all natural waters. If you boil water you drive off the carbonic acid and the water tastes flat and insipid. Your soda water, sparkling cider, beer and wines owe their character chiefly to carbonic acid.

Carbonic acid is a deadly poison when breathed. If you should put a kettle of burning charcoal in your tight sleeping apartment when you go to bed you would be found dead in your bed in the morning. Sometimes it exists in the bottom of wells that have not been used, especially in limestone countries. A case of this kind occurred a few years since in the town of Alexandria in this State, when a man descended a well and fell dead. Another descended to rescue him and he too fell dead. A third was with difficulty saved. A few buckets of water thrown into a well will prevent any such catastrophe. Every time you throw out a quantity of air from your lungs, you throw out with it a quantity of carbonic acid. Just make some fresh lime water, and blow into it through a tube or tobacco pipe, and it will become white from the carbonic acid which you have thrown into it.

Plants breathe carbonic acid instead of oxygen. Deprive a plant of carbonic acid and it would sicken and die. Over the surface of leaves are countless numbers of pores or open mouths which take in the carbonic acid. Thus the leaves of plants are like the lungs of animals. It escapes whenever fermentation takes place and whenever bodies are decomposed. Such are some of the properties of carbonic acid—a substance deadly poisonous when breathed, yet absolutely necessary for our very existence.

No. 17—Compounds of Carbon and Hydrogen.

Among the substances useful to man, are the various compounds of carbon and hydrogen. Whenever vegetable matter is undergoing decomposition, a portion of the carbon unites with the hydrogen and forms an inflammable gas, called carburetted hydrogen. If you would go to some stagnant pool, where vegetable matter is decomposing at the bottom, and stir up the sediment, immense bubbles of gas would rise to the surface. This will catch fire, and burn on the surface of the water with a blue flame. It is a pretty experiment to perform on a dark summer evening. We remember reading an account in a scientific journal a few years ago, of a teacher in a boy's school in Pennsylvania, who promised the boys that if they would behave well, he would set the river on fire. The appointed day arrived when he ordered the boys to strip off their clothes, go into the water and stir up the sediment from the bottom. As soon as they had done this, the gas began to rise, when the master touched a flame to the gas and it burned all over the surface of the water, and scorched the boy's skins so that they were glad to hurry on shore, perfectly satisfied with their teacher's experiment. It is this gas that collects in coal mines, which sometimes explodes with terrible violence, killing the workmen in the mines. This gas receives different names, such as fire damp, marsh gas, and light carburetted hydrogen.

Another compound of hydrogen and carbon is called the heavy carburetted hydrogen. This is obtained by a sort of distillation. It is the gas light of our cities. You can make some in a very cheap way. Take an old iron teakettle and fill it with white birch bark or pitch pine wood, put on the cover and lute it down with clay, and then put a cork into the nozzle with a tobacco pipe-stem run through it. Now set it over a fire in a fire-place and pretty soon a dark smoke will issue from the stem, which is this gas. Set it on fire and it will continue to burn two or three hours, if the heat of the fire is not too great. Turn up the wick of a kerosene lamp and the smoke will be this gas. This gas is purified for illuminating purposes by passing it through cold water so as to condense various impurities, and then through dry lime, and afterwards a solution of copperas. It explodes with oxygen with terrible effect, forming as a product water and carbonic acid.

One of the most familiar objects to us is the flame of a lamp, and we may now understand how it is formed. On the application of heat to the wick the temperament is raised so as to disengage a portion of carburetted hydrogen in the form of a gas. When this is inflamed the hydrogen of the gas combines with the oxygen of the air, and forming an intense heat, burns the millions of particles of carbon to a white heat. It is the carbon then that is illuminated. It is only that portion of the gas in contact with the air which is illuminated. The inner portion of the flame is still a gas. You can prove this by holding a piece of glass over a candle, pressing it down on the flame, when you will see a dark spot on the centre of the flame.

Thus you see that by the study of the simplest principles of chemistry yon can understand a thousand things that come before you every hour of your life. It is always more pleasant to be able to give a reason for what you see before you, than to be compelled to say that you do not know, or what is worse, expose your ignorance by attempting to give an explanation utterly at variance with the truth.

No. 18.—Silicon.

Thus far we have examined the principal elements oxygen, nitrogen, hydrogen and carbon, which abound in all vegetable and animal matter as well as in the mineral kingdom. We propose now to examine those elements which go towards making up our soils, and see how far we can build up a soil from the different elements.

Silicon is the most abundant element in nature. About one-sixth of the globe is composed of it. Pure silicon does not exist in nature, but combined with about equal parts of oxygen it forms the substance known under the names of quartz, sand and flint. Pure white sand is composed of silicon and oxygen. We shall make use of the word silex as the most convenient term. When silex is crystalized it forms a six-sided prism terminated by six-sided pyramids. In this form it is called quartz. Suppose now you pulverize in a mortar one of these crystals, you will have a pure white sand, the base of your soils. You may pulverize it as long as you please, and it will be harsh to the fingers and gritty between your teeth. It can be dissolved only by one acid, the fluoric, at common temperatures. If you mix it with potash, lime or soda, it will melt in a powerful furnace, and form glass. This is your common window glass. In the language of chemistry your glass may be called silicate of potash. The different kinds of glass depend upon the purity of the materials, and the use of oxides of the metals for the purpose of giving them different colors.

The most interesting point for you to remember about silex is the fact that silex enters into the composition of your wheat, corn and other vegetables. But silex must first be in a state of solution before it can become food for plants; and how can it be accomplished, for pure water will not dissolve it, as you already know. But let us take a round about way for reaching the truth in this case. Suppose we take a trip to Arkansas. We shall find there some springs that have silex in solution in the water. This is brought about by the potash in the water, which in a state of solution attacks the silex and dissolves a portion of it. When this comes in contact with moss on the banks of these springs, it covers it with a coating of this silex so that it is actually petrified. You have seen an agate used in jewelry. It is composed of stripes of different colors. Suppose now a pebble should receive a coating of this silex; this would form one stripe; now suppose another layer of silex of a different color should surround the pebble, you would have another stripe, and so on, till the pebble might be as large as your hand. If now this pebble were sawed through and polished you would have a fortification agate. Chalcedony, jasper, opal, bloodstone and cornelian, are essentially the same thing. They are generally harder than glass, and will scratch it, which artificial jewelry will not do. They are also colder to the tongue than the artificial gems, as they are better conductors of heat. They are therefore called siliceous minerals. Now it is in this way that silex is rendered soluble as food for plants. The plant has no power to effect this, but the potash and waters in the soils can dissolve enough for the use of plants. The ratan, bamboo, and sugar-cane have a complete crust of this element. The scouring rush, stalks of Indian corn, rye and wheat, must have it so as to support the plant. The moss and litchens on the rocks are composed largely of this element and potash.

Suppose now you had a soil of pure white sand, do you think you could raise anything on it? If you can find a plant of pure silex, it might do so, provided the silex may be in a state of solution. But it would be like the desert of Sahara—an ocean of sand. Silex forms about 60 per cent. of our granite soils. Barren sand hills contains something as high as 90 per cent. of sand, while clay land contains much less than 50 per cent. In our next we will see if we can add anything to our soil by which to make it productive.

CHLORINE.*

This element was discovered by Scheele in 1774 If you should take a saucer and put into it a little common salt, some black oxide of manganese, and then pour on sulphuric acid, slightly diluted with water, a gas would pass off which you would ascertain to be very difficult to breathe. This is chlorine. Common salt is composed of chlorine and sodium, the metallic base of soda; the latter being the oxide of sodium. By adding together the ingredients mentioned, the following exchange of elements occurs:

Chloride of Sodium.	Chlorine.........	Chlorine.
	Sodium.	Sulphate of Soda.
Sulphuric acid..............		
Bixoxide of Manganese.	Oxygen	
	Protoxide of Manganese	Sulphate of Manganese.
Sulphuric acid..............		

The sulphates of soda and manganese remain in the vessel, while the chlorine, left free, escapes in the form of a gas. You may then infer where it exists in nature, as it is one of the elements of common salt. It is a remarkable element in several respects. Cold water absorbs large quantities of this gas, while warm water does not. It is exextremely suffocating when breathed, and it is poisonous. Unlike the other gases which we have described, it can be seen of a greenish-yellow color. It can also be condensed by pressure into a liquid, and on exposure to cold it forms crystals of a yellow color. A test for chlorine is made by dipping a feather in ammonia, and if chlorine be present, it will form a white cloud of chloride of ammonium.

A most remarkable property of chlorine is its power of bleaching substances where moisture is present. A half century ago the good housewife bleached her cloth in the sun; now it is done by chlorine. It would cost you much more than it does, if the chemist had not discovered chlorine.

---

* The former article on Chlorine, page 180 (selected), gave a process for making Hydrochloric acid gas in mistake, so we have had the article re-written.

Chlorine has a powerful affinity for hydrogen. If you put a rag saturated with turpentine into a jar of chlorine it will immediately catch fire. It is also a powerful disinfectant. If you put salt and black manganese in a vessel and pour on sulphuric acid, and set it in a room, it will neutralize noxious gases by combining with them and forming other compounds.

In consequence of its poisonous qualities, it is sometimes used to destroy rats on board of ships. When this gas is mixed with hydrogen gas in a vessel, and exposed to the sunlight, they will unite suddenly and make a violent explosion. Chlorine does not unite directly with oxygen, there are various compounds of these elements formed by certain processes which we cannot now explain. Hydro-chloric acid, which was formerly called muriatic acid, is composed of hydrogen and chlorine. This acid is much used in the arts. Common salt is a well known and important constituent of our food, and is valuable as a manure. The presence of common salt in the waters of the ocean serve, no doubt, to prevent them from becoming unhealthy by the generating of noxious gases. Thus we see that all the elements, so far as we have examined them, play an important part in all that serves to maintain our existence here.

THE FENIAN INVASION.

(*Continued from page 176.*)

Colonel Lowry's Report.

Fort Erie, C. W., 6 p.m , 4th June, 1866.

SIR,—In accordance with your orders, I left Toronto, per train, at 2 p.m., on the 2nd instant, with four field guns, &c., under command of Captain Crowe, R.A., and accompanied by Col. Wolseley, A.Q.M.G., by Lieut. Turner, R.E., by Lieut. Dent, 47th, and by Lieut. Col. Cumberland, P.A.D.C., to the Governor General and Manager Director of the Northern Railway, who had kindly placed his services at my disposal. There were also two gentlemen, Mr. Clarke and Mr, Kingsmill, possessing considerable knowledge of the country of which we were to pass, attached to me by order of the Major General, and Mr. Hunter, Telegraphic Operator. On arrival at Oakville, I was joined by its Company of Rifle Volunteers, 52, rank and file, under Captain Chisholm. On arrival at Hamilton, I, requiring information, telegraphed to the officer commanding at Port Colborne, asking to know the state of affairs there, and requesting answer to St. Catharines. At the Hamilton station, I learned that the detachment of the 60th Royal Rifles and 16th Regiment, which had been at first ordered to join me there, had already proceeded by railway to reinforce Col. Peacocke who, the Superintendant of the Great Western Railway said, had twice telegraphed for reinforcements. Under these circumstances, and finding at St. Catharines no answer from Port Colborne, and that difficulty and delay would be occasioned in getting the train from the Great Western Railway to the line of the Welland Railroad, I determined to proceed to Clifton and thence to the support of Col. Peacocke, *en route* to Fort Erie. I arrived at Clifton about 8 p.m., and was there, a few hours after, joined by Colonel Stephens, with a volunteer force to the number of 350, which had been despatched by steamer from Toronto to Port Dalhousie, to meet me at St. Catharines.—At Clifton I received pressing telegrams urging me to proceed to assume command at Port Colborne, whence I also received an urgent request for rations and ammunition, reported exhausted. Believing an early arrival at Fort Erie to be most important, I despatched all the rations and ammunition I could spare to Port Colborne. I telegraphed to Col. Peacocke to send Lieut. Colonel Villiers, if possible, across the country to Port Colborne to command the volunteers at that place; but soon finding that impossible, telegraphed to Capt. Akers, R. E., to assume that duty, adding that I did not anticipate pressure at that point. Having waited for the Erie Railway line to be cleared of other trains, I proceeded at 3 40 a.m., on the 3rd instant, to Black Creek, at which place I had telegraphed to the officers commanding detachments of the 60th Rifles and 16th Regiment, if not in communication with Col. Peacocke, to meet me at daybreak. After some delay, I was joined by 200 rank and file of the 60th, under Captain Travers, and by 140 rank and file of the 16th, under Captain Hogge. As the railway line had not been previously open for transport, I awaited its examination by Lieut-Col., the Hon. J. H. Cameron, who had joined me at midnight, at Clifton, from some point in advance, and who proceeded with a locomotive engine for that purpose. On Lieut.-Col. Cameron's report that the road was passable, I proceeded to a point about three miles north of Fort Erie, called Frenchman's Creek, said to be the nearest point to where the Fenians were reported skirmishing, and fast escaping across the river. Here, unloading the force from the railway cars, I advanced with some volunteer companies, the detachments of the 16th Regiment and the 60th R. R. towards the Niagara river, throwing out an advance guard and a few skirmishers in the woods on either flank. As soon as two field-guns could be got out, they were pressed to the front; but on reaching the river, Col. Wolseley, found we were too late, and that Fenian prisoners, to the number, apparently, of some five or seven hundred, were in a large barge made fast astern of the United States war steamer, *Michigan*, lying in the centre of the stream. I reached Fort Erie at about 8.15, a.m., and found that the whole village had been abandoned. Soon afterwards, I was joined by the force under Col. Peacocke, who had come up through the woods to the right, bringing in some prisoners. The whole force was now hurriedly placed in position on the rising ground at the rear of the village of Erie. Shortly afterwards, a small steamer having been sent from the United States ship *Michigan* with the proposal that I should communicate with its Commander and Her Britannic Majesty's Consul, then with him, accompanied by Col. Wolseley, Captain Crowe, R.A., and Lieut. Turner, R. E., I proceeded on board and had an interview with Capt. Bryson, U. S. N.; M. Dant, U. S. District Attorney, Mr. H. W. Hemans, H. M. Consul at Buffalo, and subsequently with General Barry, commanding the United States troops in the Erie and Ontario districts of the State of New York. These officers, in expressing their reprehension of the infraction of international law, said that nothing in their power had been or would be neglected to arrest such infraction, that such were their orders, and that they had prevented many reinforcements from getting across to the British territory on the two previous nights. In the course of the afternoon, Captain Akers, R. E., with a volunteer force of about 1,000 men, arrived from Port Colborne, making the number under my command about 3,000 of all arms. In compliance with telegraphic orders, I despatched to Kingston, at 7 p.m., the troops as per margin—Capt. Crowe's field battery, four guns, and 200 men of the 47th Regiment, under Major Lodder—sending 22 Fenian prisoners by the same train under escort of the 47th Regiment. Further telegraphic orders directed me to send forward to London without delay the detachment of the 60th Royal Rifles, the London companies of the 16th Regiment, and the London Volunteers. In consequence of the difficulty of procuring the necessary railway transport, that order could not be carried out till 10 30 to-day, when about 800 were forwarded by the Great Western Railroad, *via* Clifton to Hamilton. Any delays in the transport of troops, so far as relates to the service of the Great Western Railway have arisen chiefly from the fact that, on the Erie and Ontario R. R., there being but a single line of track and with sidings still incomplete, there were no means of shunting or of passing trains, whilst that part of the line approaching Fort Erie is still in a very unfinished and unserviceable state. It was impossible, therefore, even with the most prompt assistance afforded by Mr. Swinyard the manager, and all the subordinate officials, of the G. W. R., to secure the desired rapidity of movement. The weather during the last few days has been uninterruptedly fine. The force at present encamped here is a little over two thousand men, and considering the nature of the emergency and of the nature of the place itself, the troops are pretty well supplied. I telegraphed to Lieut.-Col. Denison, with 450 men, to halt at Suspension Bridge. One company of volunteers is at Chippewa, and more than 250 men are at Port Colborne, under Major Skinner. In concluding my report of the last 48 hours—a report which should, but for the nature of the duties and the pressure of telegraphic communication, have been submitted before—I have the honour to state the following:—That I have received greater benefit than I can well express, from Col. Wolseley's indefatigable energy, judgment and promptitude of resource; that Lieut. Turner, R. E., has proved of the greatest assistance to me, night and day working with a thorough spirit and most wise forethought; that Lieut.-Col. Cumberland, A. D. C., has spared no trouble or exertions to give me information and to render valuable assistance in every way—in matters connected with railway transit, his knowledge has proved specially useful; the untiring nature of the exertions made by the Hon. J. Hillyard Cameron, M. P. P., also deserves cordial acknowledgment; Officers and men, whether of the regular or volunteer service, did all in their power to reach and re-occupy Fort Erie at the earliest moment, and to arrest the flight which had been almost completed before our arrival. All appears quiet at present on this frontier. I find I have forgotten to state that General Barry, U. S. A., offered to furnish me with the earliest notice of any intended movements of importance which might come to his knowledge among the Fenians in the States. Capt. Bryson, commander of the United States war steamer *Michigan*, appraised me that he had telegraphed to Washington for instructions as to the disposal of his 700 prisoners. I replied that this was a matter for settlement by our respective Governments.

(Signed) R. W. Lowry.
Col. Commanding
Field Force on Niagara Frontier.

The Brigade Major.

Col. Dennis' Report.

Erie, 4th June, 1866

Col. Lowry, Commanding the Niagara Frontier:

Sir,—Availing myself of the earliest moment, I have the honor to report, for the information of His Excellency, the Commander-in-Chief, the following narrative of events connected wtth the late Fenian invasion at this place, in which I was directly concerned. Subsequently to my leaving Toronto on the morning of Friday last, my orders were on that occasion to proceed with the 2nd or Queen's Own, 400 strong, to Port Colborne, occupy it, and if necessary entrench a position there, and wait for reinforcements and further orders before any attack was made on the enemy, who, it was represented, numbered 1,500 men, and was advancing on that point. Although finding great excitement at the different stations along the Welland Railway on the way up, at Port Colborne, where I arrived about noon, things were quiet—no definite news having reached there, in consequence of the Fenians having cut the wires at Fort Erie, of which place they had driven away the officials at 5 a. m. that morning. Report, however, said that they had, some two hours subsequently, sent a party up the track and burned a bridge crossing a small stream known as Sauerwine's Creek, six miles from Fort Erie on the railway to Port Colborne. No news of any other approach having been brought in by any of the numerous scouts sent out by the villagers during the forenoon, I proceeded to billet the men in order to get them dinner; and then before determining to commence the construction of any defences, I despatched a messenger across to Buck's Tavern at Stevensville, between Erie and the town of Welland, to ascertain and report any movement of the enemy in that direction, which I thought probable, as sufficient time had elapsed to enable him to reach Port Colborne, had that been his intention. Having, through the kindness of Mr. Larmour, the Superintendent of the line, obtained a locomotive, I started down the railway upon a reconnoissance, getting down to within six miles of Fort Erie—the burning of the bridge mentioned preventing my closer approach. I then learned that the bridge had been destroyed by a party of some seven men, who had come up about 7 a. m., who, in addition, stole a number of horses from the farmers in the vicinity, and then went back towards the main body, which, from testimony I received, it appeared had gone down the river about a mile below the lower ferry and camped close to the river road, on one Newbigging's farm. Their number was variously estimated at from 450 to 1,200 men. This testimony was corroborated by the statement of the mounted scouts from Buck's Tavern, and Stevensville, who returned in the evening, and went to show that with the exception of the parties out horse-stealing, there had been no Fenians seen in that direction, and was rendered certain by the arrival from Fort Erie of one who had been in their camp at six o'clock that evening. Shortly before this time, however, Lt.-Col. Booker, of Hamilton, had arrived with the 13th battalion of volunteers, and, being senior officer, took command, and continued the communication by telegraph which had been going on between Col. Peacocke and myself respecting the position and the strength of the enemy, and the best method of attacking him. Col. Peacocke, then at Clifton, having, about 5 p. m., telegraphed to me that he had ordered the *International* steamer up to Port Colborne, for me to put upon her a gun, or detachment, in order to patrol the river from Fort Erie to Chippewa. She not having arrived at 10.30 p. m., I ordered the *Robb*, a powerful tug-boat, owned by Captain McCallum, down from Dunville, for that purpose, intending to place upon her the Welland Battery, without guns—the men armed with Enfield rifles—and received a reply that she would be down at 3 a. m. the following morning. This was the position of affairs when Capt. Akers, R. E., arrived from Chippewa, sent over by Col. Peacocke to consult and to explain Col. Peacocke's views as to the best mode of attack. After due consideration between Captain Akers, Lieut. Col. Booker, and myself, a certain course was decided, arranging for an attack in concert on that morning, and Col. Peacocke was telegraphed accordingly. In accordance with this plan, Capt. Akers and myself embarked in the tug, which did not arrive, (Memorandum—Our object in this was to ascertain definitely the position of the enemy's camp, as preliminary to the attack), however, till about 4 a. m., having been delayed in consequence of Mr. McCallum wishing to bring with him his naval company from Dunnville, and proceeded down to reconnoitre the river and the Fenian camp, arranging to meet the Port Colborne force back at the railway depot, three miles above the enemy's camp, at seven or at the latest half-past seven o'clock. On our way past the village of Fort Erie, we were brought to by the armed patrol tug boat from the United States steamer *Michigan*, who, on finding out who we were, informed us that the Fenian camp on the Newbigging farm had been broken up at 3 a. m. that morning, the enemy having marched down the river road. We proceeded down the river to the mouth of the Black Creek, eight miles above Chippewa, when we learned that they had turned off the river to the west, directly in rear of a place called New Germany. A messenger was at once sent off to Col. Peacocke, we presumed then under previously concerted arrangement to be there moving up, and we returned with the tug in accordance with that arrangement to meet Col. Booker and the upper force at the R. R. depot at Fort Erie. On our arrival there we could see or hear nothing of them. This was accounted for subsequently by the fact that Lieut. Col. Booker had received, after we left, an order from Col. Peacocke directing him off the R. R. at Ridgeway, some eight miles above Fort Erie, and cross the country in order to meet and attack in concert. This being the case, presuming a combined attack would be made in the course of the day, of the result of which we could have no doubt, I considered, as I could not then join my proper force, that important service could be rendered by patrolling the river to intercept and capture fugitives, and to prevent by every possible means the escape across the river of any large body of the enemy. This having been determined on, Capt. Akers and myself were engaged all day in patrolling the shore and scouring the wood along the river as far down as Black Creek, arresting in all, including six prisoners made about nine o'clock in the morning at Fort Erie, some 23 men. During the course of the afternoon, we learned through some of the prisoners that an engagement had taken place at some point in the interior, in which the Fenians had been utterly dispersed. This I was quite prepared to believe, as I had from the steamer observed Col. Peacocke with a strong force on his way up from Chippewa turning in from the river road towards New Germany, and I knew that Lieut. Col. Booker's force was coming down upon him from the south. Concluding that the action which was known to have come off had resulted in the capture of the enemy, I returned to Fort Erie about half-past five o'clock p. m., proposing to get what information I could about the position of our troops, and to telegraph for instructions as to what should be done with the prisoners who had amounted now, including those taken in the village and neighbourhood during the day, to some 60 or 65 men. The number I can't give precisely, as I had only got as far as those names given in the margin, making out a memorandum of each case. Having, in the meantime, made up my mind to send the prisoners by tug to Welland gaol, I had them brought down and embarked there in charge of the reeve, when the alarm was given that the Fenians were entering the town in force. In fact, the first messenger had hardly delivered the news when a second came in to say that they were within a quarter of a mile coming down the street along the river. I went over from the pier to satisfy myself, and saw them in numbers as I judged about 150, advancing upon the street indicated. Supposing them to be of the material and of the same miserable character, physically, as the prisoners we had been taking all day, I thought the detachment I had with the boat, even if we had to resort to the bayonet, sufficient for them, and concluded that my duty lay in making a stand against them. This detachment consisted, as before mentioned, of the Welland field battery, 54 men and three officers, and of a portion, some eighteen men and one officer. Exclusive of the guard over the prisoners on the boat of the Dunnville Naval Company. I first took the precaution to put the prisoners under hatches, and then advancing to meet the enemy about 150 yards, drew up my little command across the street. As they came within about 200 yards they opened fire on us, when my detachment, by order, fired a volley from each of the companies, upon which a severe flank fire was opened on us from the west, and on looking in that direction, I observed for the first time two considerable bodies of the enemy running in a northerly parallel with the river, evidently with the intention of cutting us off, and getting possession both of us and of the steamer at the same time. Under the circumstances, as I considered if we tried to escape by the tug, the enemy might be there as soon as we, and so achieve his double object, I therefore concluded that my duty lay in saving the prisoners we had on board, and preventing the enemy from getting possession of the vessel which I knew, and he probably knew also, was his only means of escape, and I therefore ordered the captain to cast off and get out in the stream, and ordered my men to retreat and do the best they could to get away, each man for himself. During this time a heavy fire was kept up on us both in front and in flank, and I had the grief of seeing several of my men fall. We retreated down the front street under a very heavy though comparatively inaffective fire. Several of the men, contrary to my advice, took shelter in a house, the door of which stood open as they passed—there being little or no cessation of the fire upon us. I directed them not to remain under it longer than was necessary, and I turned into the premises of a friend in the lower part of the village where I lay concealed. Although the premises were searched twice, the ruffians stated their intention to come a third time, threatened if I were not given up, as they had seen me enter the gate, that they would destroy the property. Two of my men, one of them wounded, had previously taken shelter in the house. They were captured. Fearing another search, I dressed in disguise furnished by my friends, and then came out and remained in the village till night-fall, when I got through the lines, and struck across the country in search of Col. Peacocke—finding his camp about five miles back of Fort Erie, arriving there at 3 o'clock a. m. I then accompanied his force back to this place during its operations later in the day; all of which, as also of the escape of the enemy during the night, that officer's report will doubtless inform you. On my return, I was able to learn, for the first time, something of the casualities in the affair of the previous evening. I feel rejoiced not to have to report any loss of life in my detachment, although I was given to understand that there were some five wounded in the Welland Battery, two of them so severely as to result, in each case, in the loss of a leg. These cases, I regret to say, were Capt. King, of the Welland Battery, and one man of the Dunnville Naval Company. None of the officers, excepting Capt. King, were wounded. A return of the casualities is appended hereto. The enemy suffered more severely. Three of his number were killed outright, and four were mortally wounded, two of whom died yesterday morning. The other two had been allowed, under the circumstances, by the reeve, Dr. Kempson, with the permission, as I understood, of Col. Lowry, to be taken to the Buffalo Hospital. Mr. Scholfield, the Lieutenant of the Welland Battery, had gone to Welland to get his men together again, some of them having escaped across the country to their homes, during the night, is ordered without delay, when in a position to do so, to prepare an accurate list of casualities in the battery. I have detained this report somewhat in order to get his return. Should there prove to have been any casualities not as yet reported, I will lose no time in sending forward a list of the same. I append the report of Capt. McCallum, commanding the Dunnville Naval Company, and owner of the steam tug referred to—to whom particularly, as also to his lieutenant, Mr. Robb, the sailing-master of the steamer, I have to express my obligations for their zealous and efficient assistance during the operations of Saturday. I have also the gratification of saying that the other officers and the men forming my little command, behaved most nobly in the affair during the afternoon at Fort Erie. I firmly believe that had I not ordered them to retreat they would have remained steady and fought until shot down in the ranks.

(Signed,) J. S. Dennis,
Lieut. Col. commanding detachment
on Saturday, June 2nd.

Captain Aker's Report.

"Montreal, 7th June, 1866.

Sir,—In accordance with the orders of Major General Napier, C.B., I reported myself to Col. Peacocke at Hamilton, on Friday, 1st June, and proceeded with him to Chippewa. The same night about midnight, I was directed by Lieut. Col. Peacocke to proceed to Port Colborne, to arrange with Lieut. Col. Dennis for making a combined attack on the enemy supposed to be entrenched on Black Creek, about three miles down the river from Erie, seven miles from Chippewa, and two from Stevensville. Col. Peacocke was to move on Stevensville, so as to arrive there about 9.30 a.m.; Lieut Col. Dennis to move along the railway to Ridgway, as far as the state of the railway would permit, and march from thence to meet Col. Peacocke at Stevensville, at the above hour; and from thence the combined forces were to march on the supposed position. Arriving at Port Colborne at about 2 a.m., I found the whole force under arms and in the cars. Lieut. Col. Booker being senior to Lieut. Col. Dennis, had taken the command. They had obtained from a custom-house officer, arrived from Erie, exact information as to the position of the Fenian camp. This was on Frenchman's Creek about half-way between Black Creek and Fort Erie. The officer who had been in the camp at six o'clock, considered there were not more than 700 men. They had been drinking whiskey hard during the day, and might fall an easy prey to a sudden attack. Lieutenant Colonel Dennis was anxious to move off at once to the attack, and Lieut. Col. Booker was prepared to carry out the proposal, if properly authorized. Knowing Col. Peacocke's anxiety to combine his force with the volunteers in attacking the enemy, I could not in his name authorize the movement, nor did I think it prudent; as, from the accounts we had received, it appeared that the enemy's force would be doubled during the night. Having ascertained, however, that the railway bridge at Ridgway, partially burnt in the morning, had been repaired, and that the line to Erie was open, I arranged a somewhat different plan of attack, subject of course, to Col. Peacocke's approval. The plan was as follows:—Lieut. Col. Booker, to proceed by rail to Erie, with the greater part of his force, to arrive at Fort Erie at 8 a.m., Lieut. Col. Dennis and myself to go round the coast in a steam tug, taking a company of volunteer artillery to reconnoitre the shore between Fort Erie and Black Creek, and to return to Fort Erie in time to meet Lieut. Col. Booker at 8—should Col. Peacocke approve of this he would march by the river road from Chippewa and make a combined attack with Lieut. Col. Booker at some point between Fort Erie and Black Creek, cutting off the enemy's retreat by the river; the tug employed cruising up and down the river, cutting off any boats that might attempt to escape and communicating between the forces advancing from Chippewa and from Erie. I communicated this proposed change to Col. Peacocke; both by letter and telegraph, omitting however, I think, to mention the use proposed to be made of the tug. The plan was merely a modification of that proposed by Lieut. Col. Dennis, who wished to move at once with the volunteers without arranging a junction with Colonel Peacocke. Before receiving any answer from Col. Peacocke, I went off in the tug with Lieut. Col. Dennis and the company of artillery, leaving word with Lieut. Col. Booker to take care and obtain Col. Peacocke's approval to the proposed change before acting on it, and explaining the plan previously determined on in case Col. Peacocke should desire him to adhere to it. We arrived at Fort Erie about 5 a.m., steamed along there, and past Frenchman's Creek, where we saw the enemy's camp apparently deserted. After carefully examining the shore from Erie to Black Creek, and seeing no signs of any armed force, we went ashore at Black Creek, and were informed that the enemy had broken up their camp during the night. A party was seen by the inhabitants moving along the river in the direction of Chippewa, and the remainder to have turned inland at Black Creek. As far as I could make out from the size and appearance of their camp, and from the reports of the people, their combined force could not have exceeded 700 or 800 men. I then returned with Lieut. Col. Dennis, by water, to Fort Erie, as appointed with Lieut. Col. Booker. That officer not having arrived, I became aware that Col. Peacocke had acted on his original plan; but from the information I had gained was of opinion that he would not have more than 400 or 500 men to contend with. Lieut. Col. Dennis then landed the company of artillery, and I proceeded with it patrolling the road and heights between Fort Erie and Black Creek. Between 30 and 40 prisoners were taken by the company or handed over by civilians and put on board the tug at Black Creek. Seeing nothing more to be done at Fort Erie, I drove up to the railway station, on the line to Colborne, to ascertain whether telegraphic communication had been opened, and obtained what information I could. This station is about half a mile from Fort Erie and to the westward of the high road from Colborne. I had hardly entered the station when I heard a cry that troops were coming down the hill between myself and the town. I jumped into my conveyance and turned towards Erie to give the alarm to the company of volunteers left there. Finding the approach to Erie cut off and the enemy's skirmishers stealing round to surround me, I turned round and drove to the shore in the direction of Colborne. Near Ridgway, I turned up towards the high road, and passing the railway bridge found it on fire. I stopped and got some buckets from a neighbouring farm, and, with the assistance of the driver, managed to put out the fire. I then went on to the garrison road, when I heard an account of the engagement with Col. Booker's force and of its retreat to Colborne. I found two wounded men at a road-side house; one of them I took into Colborne; the other was too badly hurt to move. I arrived at Colborne between 6 and 7 in the evening. The force had been increased since the previous day, and now consisted of the seven P. A. O., with 4 Companies of the 22nd Oxford and the Drumbo Company attached, 2 Companies of Home Guard, the Caledonia and the Queen's Own and 13th—in all about 1,400 men. The garrison was in the greatest state of confusion, and the troops that had been engaged in the morning considerably exhausted from want of rest and food. I ordered what assistance I could to Col. Booker who appeared quite overcome by fatigue and anxiety. He begged me to undertake all necessary arrangements, and later in the evening requested me to take the command out of his hands. Finding this was the wish of other volunteer officers of superior rank to myself, I telegraphed for instructians, and was desired by Col. Lowry to take the command. I posted a line of out-lying pickets, at a radius of one mile from the town, extending from the shore to the Welland Canal, with strong supports in rear, and ordered the remainder of the troops to lie down and get what rest they could. I telegraphed in various directions for food and ammunition, and by 2 a.m. on Sunday 3rd had an ample supply of both. About 1 o'clock, the alarm was sounded, and officers and civilians rushed up informing me that the enemy was marching on us in force and within 500 yards west of the town, where I had placed no pickets. The alarm was entirely without foundation, but had the effect of depriving the troops of the few hours rest they might have had. All through the night, reports were coming in of large forces being landed on the shore between Colborne and Erie, also without foundation. I sent the tug boat, however, still kept at our service by its owner, Mr. McCollum, to watch the shore between Colborne and Erie, and called on some of the civilians to act as scouts, and keep me informed of any movements in the neighbourhood. Reveille was sounded at three, and I immediately made what arrangements I could for serving out rations and ammunition. At five o'clock, sending a pilot engine in front, I moved by rail towards Erie, taking the whole of the troops except the 13th, whom I left to guard Port Colborne. Hearing the enemy were posted near Ridgeway, and finding a favourable position for forming up the troops, at B. in Sketch, on a road known as Skirk's crossing, I disembarked the men, threw out a line of skirmishers, with four supports from the 7th P. A. O., with orders for the flank supports to wheel outwards and extend at once in case of any sign of a flank attack. In this order, and with a strong rear-guard, I advanced from "B" to the garrison road, and from thence towards Fort Erie. On coming to the scene of the previous day's engagement, at "C," I ascertained that the enemy had attempted to cross the river during the night, and that Erie was in possession of our troops. After halting the men for about an hour at this spot, I marched them quietly in to Erie, where I reported myself to Col. Lowry. On the following morning I was relieved from my command.

I have, &c.,
(Signed,) CHAS. S. AKERS,
Capt. R. E.

Capt. McCallum's Report.

To Lieut. Col. Dennis, Fort Erie:

SIR,—At your request, I have the honour to make the following report:—On Saturday last, 2nd June, between the hours of 3 and 4 p. m., after your departure, I retreated down the river under a galling fire, a distance of about three miles, with two men of the Naval Bragade and 13 men of the Welland Canal Field Battery—the rest having been cut off, and consequently taken prisoners, including the following officers, viz: 2nd Lieutenant Macdonald, of the Naval Brigade; Lieutenant Scholfield and Ensign Nimmo, of the Field Battery, wounded, and one man of the Naval Brigade. Lieut. Robb, with the steamer *Robb*, came in boats and took us on board. I then held a consultation with Lieut. Robb as to future proceedings. We then determined, on account of being encumbered with so many prisoners on board, 57 in number, and so very few men left to guard them, to run to Port Colborne, and send the prisoners to a place of safety. In passing Fort Erie up the river, we, for a distance of a mile's run, were under a heavy fire of musketry from the Cana ian shore. We passed without any casualities worth mentioning, and arrived safely at Port Colborne at half-past 6 p. m. of the same day, and delivered the prisoners over to Lieut. Col. McGiverin, with committment and names inserted, all of which is respectfully submitted.

(Signed,) L. McCALLUM,
Capt. N. B. Dunnville.

CARBOLIC ACID AS AN ANTISEPTIC.

The *American Artizan* says:—Mr. Wm. Crookes, F.R.S., has made a "Report to Her Majesty's Commissioners on the Application of Disinfectants in arresting the spread of the Cattle Plague," from which we extract the following relative to carbolic acid:

Pure carbolic acid is a white crystalline solid, melting at 34° C., and distilling at 180° C.; a trace of water or oily impurity renders it liquid, and for disinfecting purposes it is always supplied in this form, to avoid the extra expense and trouble needed for the separation of the last traces of impurity; cresylic acid is liquid, it boils at 203° C., and closely resembles carbolic acid in odor and other properties. Before the commencement of these inquiries it was thought to be of little or no value as a disinfectant, but Dr. Angus Smith has lately shown that it rivals, if it does not surpass, carbolic acid in antiseptic properties. For the present purpose of cattle plague disinfection it is immaterial which acid is used, and to avoid unnecessary repetition I shall use the term carbolic acid to express either acid, or the commercial mixture of the two acids.

From time immemorial carbolic acid, creosote, or bodies containing them, have been used as antiseptics. Passages in Pliny, read by the light of chemical science, show that the Egyptians used for embalming their mummies, a compound made from pitch, which must have contained large quantities of creosote. Carbolic acid is the active agent in tar, which, either in its ordinary state or burnt as a fumigator, has always held high rank amongst disinfectants. Pitch and tar were the most popular medicines in use against the cattle plague when it visited this island in the last century; the animals being preserved against contagion by having their noses and jaws rubbed with tar, whilst the cow-houses were disinfected by burning pitch and tar in them (in which process a certain quantity of the vapors of carbolic acid would escape combustion). The almost universal custom of burning gum resins and odoriferous woods in connection with religious ceremonies may have originally arisen from the disinfecting powers of the creosote in the smoke. The well known efficacy of smoke in preserving meat is entirely due to the presence in it of this agent.

Pitch oil, oil of tar, and similar products, owe their value entirely to carbolic acid (22). This body may in fact be called the active principle of tar, just as quinine is the active principle of bark, or morphia of opium, and it has the advantage of being easily prepared in any country where coal or wood can be obtained.

Sulphurous acid probably owes some of its antiseptic value to its affinity for oxygen, whereby the oxydation of the matter under treatment is retarded. It has been suggested that the value of carbolic acid is due to a similar property, and that it acts merely by preventing oxydation. It being important to a thorough understanding of its action that this point should be settled, the following experiments were made:

1. Lumps of metallic sodium were cut with a sharp knife; the progress of the oxydation could be readily followed by the change of color of the surface. The experiment was tried several times in an atmosphere strongly charged with the vapor of pure carbolic acid and cresylic acid; comparative experiments being made at the same time in pure air. No difference in the rate or amount of oxydation could be detected.

2. A colorless solution of subchloride of copper in ammonia was prepared and divided into two parts; one being mixed with a little carbolic acid. On pouring them through the air into flat white dishes no difference of the progress of the oxydation could be detected.

3. A mixture of pyrogallic acid and solution of potash was shaken up in a large stoppered bottle. It was then opened under water, and the amount of absorption of the atmospheric oxygen noted. The same experiment was repeated after the addition of carbolic acid to the potash solution. The same quantities were used and the agitation was continued for the same time. On again opening the bottle under water the absorption was found to be the same as before.

4. The last experiment was repeated, substituting crystals of sulphate of iron for pyrogallic acid.

The result showed equally that the presence of carbollic acid exerted no retarding influence on the oxydation.

5. Iron filings were shaken up with the water with the same result.

6. A "philosophical lamp" was made by arranging a platinum spiral over the wick of a lamp containing alcohol mixed with a little ether; on lighting, and then blowing it out, the platinum continued to glow brightly. Pieces of solid carbolic acid were then carefully placed in the cup of the brass wick-holder, surrounding, but not in contact with, the wick. The heat soon melted the acid and raised its vapor round the platinum spiral, but without occasioning any alteration in the brightness of its glow.

7. Lead pyrophorus was poured into two long and narrow jars of air, one of which had its interior moistened with liquid carbolic acid. Not the slightest appreciable difference could be detected between the rapidity of oxydation in the two jars.

8. Paper moistoned with sulphate of manganese solution, and dried, was dipped into caustic ammonia, both with and without carbolic acid. No difference whatever could be detected in the rate of its darkening.

These experiments prove conclusively that the tar acids have no special power of retarding oxydation.

Other experiments were then instituted in the endeavor to understand more clearly the mode of action of carbolic acid.

9. Some meat was hung up in the air till the odor of putrefaction was strong. It was then divided into two pieces; one was soaked for half an hour in chloride of lime solution, and was then washed and hung up again; the offensive smell had entirely gone. The other piece of meat was soaked in a solution of carbolic acid containing 1 per cent. of the acid; it was then dried and hung up again. The surface of the meat was whitened, its offensive odor was not removed, though it was masked by the carbolic acid. In two days' time the bad odor had quite gone, and was replaced by a pure but faint smell of carbolic acid. In a few weeks' time the pieces of meat were examined again. The one which had been deodorized with chloride of lime now smelt as offensively as it did at first, whilst the piece treated with carbolic acid had simply dried up, and had no offensive odor whatever. It was then hung up for another month and examined; no change had taken place.

10. A piece of fresh meat was soaked in a 1 per. cent. aqueous solution of carbolic acid for one hour; it was then wrapped in paper and hung up in a sitting room in which there was a fire almost daily; at the end of ten weeks it was examined. It had dried up to about one-fourth its original size, but looked and smelt perfectly good and fresh, a very faint odor of carbolic acid being all that was perceptible. It was soaked for twenty-four hours in water, and then stewed with appropriate condiments and eaten. It was perfectly sweet, and scarcely distinguishable from fresh meat, except by possessing a very faint flavor of carbolic acid, not strong enough to be unpleasant.

11. Animal membranes in the forms of gut, skin and bladder, were perfectly preserved if immersed direct in aqueous solution containing 1 per cent. of carbolic acid; but if previously moistened with water, and then immersed in dilute carbolic acid, the preservation of the skins was not so complete.

12. Animal size and glue mixed in the form of solution, with small quantities of carbolic acid, were perfectly preserved from change even in hot weather.

These are important experiments. They point out in a striking manner the difference between mere deodorizers and antiseptics. Hitherto attention has been almost entirely confined to the deodorization of gases arising from putrescence. The effect has been combated, whilst the removal of the cause has received scarcely any attention. Chloride of lime, one of the strongest of the class of deodorizers, acts, as has been shown, only on the gases of existing putrefaction, but it has no influence over the future. Carbolic acid, on the other hand, has scarcely any action on fetid gases. but it attacks the cause which produces them, and at the same time puts the organic matter in such a state that it never re-acquires its tendency to putrefy.

CHOLERA A POISON.

Two months have elapsed since cholera first made its appearance in New York, and yet up to Saturday last only 34 deaths had occurred in that city. It is now believed to be a poison, and is treated as such, Dr. Harris in his report to the Sanitary Committee of the Board of Health, New York, says:

We must speak of and treat cholera as a poison. It attacks the vital functions as a poison. It arrests the circulation, interrupts the respiratory processes, dams up all excretions by the great emunctories of the liver and kidneys, decomposes the blood, and kills as virulent poison kills.

That cholera is an infectious poison every one of your medical officers ought to believe. That this infection may be controlled and destroyed by our agency, if means are well chosen and promptly applied, I believe so fully that I would as soon see the torch applied to a thousand mansions in our city as to hesitate to assume what we know. The rice water of albuminous fluids of cholera patients have the property of creating very soon after being voided and exposed to the atmosphere. In every instance, I rejoice to say, you, the Superintendent and the President of the Board have promptly indorsed this view of the danger and the duty, and in every instance I believe. every precaution has been used that science, experience, and exact knowledge could suggest. That there are other and widely different diffused factors of an epidemic of cholera to be feared, we very well know, but with profound reverence we can fearlessly assert that all such factors will be harmless if the few factors of cholera which human agency can control are actually controlled by the Board of Health and the inhabitants of the city. In dealing with these uncontrollable poisons that make up the epidemic causes of cholera there is greater demand for vigilance than in the management and control of nytro-glycerine or the most subtile chemicals. Instant cleansing and absolute disinfection must be conferred wherever the germs of cholera seek a foothold, or we may re-enact the solemn farce that was witnessed in Paris last Autumn, when the French Government withheld from the public the information and the warning that were required to save the 8,000 lives which were sacrificed to the epidemic in 91 days.—Well did the chief medical officer of registration in England say, in a note to me at that time "They (the Parisians) do not see, as we do, that an accurate knowledge of facts, far from terrifying reassures and braces up the nerves of our people." Let the inhabitants of New York know what exists, what is needed, what are sources of danger, and what are the best means of sanitary protection, and there will be no pestilence. This statement is due to ourselves when ignorant men and theorists may brand us as alarmists, or may exclaim we fight against Providence. That the cholera poison is in this city we know, and that it has thus far struck down its victims in accordance with the principle that removable causes have localized it or excited it into fatal activity we have seen proof in 12 cases that have occurred. Could we read a more important lesson?

Machinery and Manufactures.

New Process for Indigo Dyeing.

Before it can be used for dyeing, indigo must be rendered soluble in alkaline and caustic solutions by being treated by a reducing body; by this reaction indigo loses its color, but after being fixed on stuff and exposed to the air, it absorbs fresh oxygen and returns to its original color. This process, theoretically so simple, is practically complicated by serious difficulties, and requires, on the part of the dyer, much practice and great dexterity. Thus, for instance, with indigo reduced by fermentation with vegetable matters, in a caustic solution, the various acids produced during the fermentation combine with the alkali, the liquid soon ceases to be caustic, and loses the property of dissolving the reduced indigo. To remedy this a fresh quantity of alkali (soda potash, or lime) must be added from time to time; but should an insufficient quantity be added, a portion of the reduced indigo remains undissolved, and soon decomposes under the fermenting matter. If, on the contrary, an excess of alkali be added, a certain quantity of white indigo is lost by its combining with potash, and forming an insoluble product.

According to M. Leuchs, of Nuremberg, all these objections are obviated by effecting the change from blue to white indigo by pectine. Pectine exists in considerable quantities in turnips of different species, in pumpkins, melons, etc., it may be extracted from these fruits, or they may even be directly used to reduce indigo. The most simple process consists in heating 45 or 50 kilogrammes of the caustic lye to 75° C., adding half a kilogramme of well pulverized indigo, then suspending in the vat a kind of basket of iron wire, containing from 8 to 10 kilogrammes of fresh turnips, cut into small pieces. Then heat gradually to boiling point; the indigo soon loses its color, and the solution decanted into special vats and diluted with water freed from air, will be ready for dyeing purposes. Contact with air must of course be as far as possible avoided.

When the dye bath is exhausted it may serve for a fresh operation by adding indigo, a little caustic soda, and boiling it as above with a certain quantity of turnips.

On the iron wire trellis there will remain hardly five or six per cent. of the original quantity of turnips. This residue may be used in paper making.

The simplicity of this new process may easily be proved by introducing into a closed tube a small quantity of indigo mixed with a few drops of soda or caustic potash, adding a small piece of turnip, and boiling; the indigo will rapidly lose its color, and re-dissolve and return to its original color by exposure to the air.

As turnips are not everywhere cultivated, and during certain seasons are not to be procured fresh, the author has found that the active principles may be extracted by boiling the turnips with water, under a pressure of two or three atmospheres. C. Leuchs & Co., of Nuremberg, now manufacture on a considerable scale an extract of turnips, 1 kilogramme of which will dissolve cold 4 kilogrammes of indigo.—*Annalen Chem. and Pharm.*

Strength of Punched and Drilled Plates.

Experiments have recently been made by the British Admiralty on Bessemer steel of the best quality. A piece of steel 4 feet long and 12 inches broad was cut from a half-inch plate, of which the proof strength was 33 tons per square inch. This piece was reduced to 5 inches in width at the middle, was supported at the ends by square plates rivetted to it, and was carefully centered. The plate should have broken at 82½ tons, and through the narrow part. It actually broke at 95¼ tons; and then, strange to say, broke through the wide part of the plate, tearing away through the rivet-holes. Thus while the material in the middle of the plate withstood a strain of 38 tons per square inch, it actually broke through the holes at 16·38 tons per square inch, or less than one-half the strain. In a precisely similar plate, differing from the other only in the fact that the rivets connecting the end pieces were 1¼ inches from the edge instead of 2½ inches, the plate broke in a similar manner at 73 tons, which is only 15 tons per square inch of the section of steel broken. The holes in both these cases had been *punched*. In order to ascertain whether these curious results were due to the injury supposed to result from punching, an exactly similar arrangement of plates was again tried, in which the holes were, as in the first, 2½ inches from the edge, but were *drilled* instead of being punched. The plate then broke through the narrow part at 106·75 tons, or 47·53 tons per square inch of the steel broken.—*London Artizan.*

Glass Brick Mould.

A new mould for bricks is in use in Baltimore which is said to turn out most elegant specimens of pressed brick. The mould of wood is lined with plate glass, which forms a perfectly smooth surface and naturally gives excellent results. The cost of the mould is but little, if any, more than the ordinary wooden mould, and it can be easily applied to brick machines already in use. The brick comes out smooth, with perfect sides and edges, the mould being raised from the palette or plate on which the bricks are made. It has, we understand, given perfect satisfaction wherever used. Rights can be obtained of P. Murguiondo, Baltimore, Md., who is the patentee's agent for the United States.—*Scientific American.*

Process of Hardening Copper.

A correspondent at Upper Sandusky, Ohio, says the *American Artizan*, states that a Mr Disman, of that place, has discovered the process of hardening copper, and has secured a patent for it. The art is supposed to have been lost since the days of King Solomon. The material is properly called silicated copper, and can be worked without friction. All necessity for oiling machinery made from it is obviated. The writer says the Cleaveland, Columbus, and Cincinnati Railroad is now testing the prepared metal, and in case of its success are prepared to give the inventor $10,000 for its use on the road. There is much excitement and interest in Upper Sandusky over the subject.

Caloric Engine.

Another caloric engine has been patented in the United States, by a Mr. T. McDonough, of Newburgh, N. Y., which is thus described in a communication to the *Scientific American*:—

"This machine consists of a cylinder, open at the top and closed at the bottom. The furnace is at the lower end of this; a plunger moves in it above the fire, and also a piston at the upper or open end. The air to feed the fire is drawn into the cylinder through holes in its periphery, which are uncovered when the piston is at the upper end of its stroke. The plunger moves the air through a side pipe and under the fire. It expands and does its work by forcing the piston upward, after which the plunger expels it through an exhaust valve near the top of the side pipe.

By this arrangement only cold air reaches the piston, and as the parts affected by heat are covered with fire-clay, it forms a durable machine. The engine has furnished a power of more than six pounds per inch to a fifteen-inch piston, of eight inches stroke, 150 revolutions per minute—the power only acting one way—and consuming fourteen pounds of coal in four hours. The heat is utilized at more than 600 degs., probably, and escapes at 100 degs., being a step toward the development of a machine superior to the steam engine in economy of fuel."

Bright Annealed Wire.

The process is to pack the coils in cylindrical cast-iron pots, with double lids, the outer one resting on a projection or rim half an inch below the top of the pot, leaving room between the outside of the inner lid and the inside of the outer, for dry sand to exclude the atmosphere. The pots should not be opened until quite cool after the heating process, otherwise the atmosphere will so far oxidize the surface as to turn the color to a blue or black.

Bessemer Steel Rifle.

An Enfield rifle barrel made of Bessemer steel withstood the Government test, 8½ drachms of powder and a bullet, although it weighed one pound only. It was then turned down till it weighed but eight ounces, and yet still sustained the charge!

A New Mechanical Aid to Surgery.

The *American Artizan* says an hospital has just been fitted up in Prussia, in preparation for the coming war, in which all modern improvements are intended to be used. A circular saw, driven by steam, for use in amputation, is one of the improvements; the quickness of its working being the obvious advantage of it. The old "saw-bones" surgeons may be astonished by it. With a saw that runs at 3,000 revolutions per minute, and under the influence of laughing gas, an unlucky soldier may have a leg or arm taken off very pleasantly.

Steel Tubes.

Engineering says:—"The cold drawn steel tubes, made by the Hydraulic Tubedrawing Company, will probably soon come into use for locomotive boilers. They cost but half as much as brass, are much thinner, and are proved to 1,000 lbs. pressure. No corrosion is anticipated; and it is not apprehended that there will be any difficulty in setting them so as to make tight joints." We should like to be informed whether these tubes can be drawn with thick ends, to insure strong joints; and how much the additional cost would be.

Cleaning Horses by Machinery.

"At the establishment of the Manchester Carriage Company, at Pendleton, there is now in practical operation a novel system of cleaning horses by a steam brushing machine, invented by Mr. Haworth. The idea is derived from the revolving brush which many hair-dressers have had in use. In the lower stableyard at Pendleton there is a large shed, where a dozen horses can be cleaned at one time. Along the centre of the roof is a long shaft, from which hang several endless straps. Each strap gives motion to a horizontal pole, at one end of which is a conical brush that rotates rapidly. On a horse being brought into the stable, after his three hours' work, he is taken to this shed, and a man applies to him the machine brush. In about half an hour the animal is thoroughly cleaned, and only the head requires finishing by hand. The cleaning effected by the machine is much more searching and effectual than the most diligent hand-currying can possibly be, and to the majority of animals the greater cleanliness of their skins, as well as the improved circulation of the blood which is produced by the machine brush, appear to be acceptable. Most horses undergo the operation quietly and patiently, but in some animals timidity is produced by the rattle of the machinery. In a large establishment the most important result of the adoption of this invention is the economy of labor which results from it. Under the old system, a man was thought to have done a fair day's work if he cleaned ten or a dozen horses, but by the machine he can clean thirty in the same time, and with considerable less bodily labor. When it is remembered that from Pendleton several hundred horses are daily sent out to work, it will be seen an important saving in money is effected by the employment of this new process.—*Manchester (England) Examiner.*

The "Iridoscope."

A new instrument has been invented, by the aid of which an individual is able to see all that is going on in his own eye. It is simply an opaque shell to cover the eye, pierced in the center with a very small hole. On looking through steadfastly at the sky, or at any diffused light, the observer may watch the tears streaming over the globe, and note the dilation and contraction of the iris, and even see the aqueous humour poured in when the eye is fatigued by a long observation. It is needless to say that with the aid of this instrument a man can easily find out whether he has a cataract or not. If he has, he will only see a sort of vail covering the luminous disk, which is seen by a healthy eye. The instrument is certainly simple and curious, and will no doubt excite attention in those who are anxious to know more of themselves. An "iridoscope" may be readily extemporized by making a hole with a fine needle in the bottom of a pill box.—*Medical Reporter.*

Useful Receipts.

To Prevent Chafing.

The editor of the *Scientific American* seems to be a person of "full habit," and accustomed to "walk much;" for in a late number of his journal he says:—During the "hot term" persons of a full habit, who walk much, are inclined to chafe. This can be cured or prevented by the use, once or twice a day—at retiring and rising—of a solution of common alum in water. The alum may be dissolved in warm or cold water, but should be used cold, applied with a soft linen or cotton cloth to the parts affected. The proportions are a lump of alum large as a walnut to half a pint of water. If too strong, where the flesh is excoriated, weaken with cold water. We know by personal trial this simple remedy is effectual.

Cure for Hydrophobia.

The Leeds (England) *Times* says that the nitrate of silver rubbed into the wound made by the teeth of a mad dog will certainly cure hydrophobia, or prevent all injurious consequences of the wound. It should be applied as soon after the accident as may be. In six weeks the virus is disseminated through the system and then hope is gone. Youatt says he has been bitten eight or ten times and always cured himself by this means.

Gunpowder Marks.

Dr. Davies, in the London *Lancet*, states that he has found the following treatment most successful: Smear the scorched surface with glycerin, by means of a feather. then apply cotton wadding; lastly, cover with oil silk. In one case the discoloration was very great, the patient looking more like a mummy than a living being. It entirely subsided in a month by the above treatment.

Artificial Stone.

Dolomite, or magnesian limestone, calcined at a lowered heat and powdered, and then made into a paste, forms under water a stone of extraordinary hardness.

To Clean Vinegar Casks.

In the first place they should be well rinsed out with hot water, then for every twenty gallons contents, dissolve a pound of ordinary soda crystals in three pints of boiling water, and when the soda is thoroughly dissolved pour the solution into the cask. The latter must then be well closed and rolled about vigorously several times during twenty-four hours. A few quarts of hot water will readily cleanse out the cask when rolled about. It is well to repeat the latter operation twice, leaving the hot water some hours in the cask each time, and then, finally, to rinse out with cold liquor. If the casks are not to be used immediately let them drain and dry; burn a sulphur match in them and bung them up tightly.—*Grocer.*

Indestructible Ink.

The following is said to be an indestructible ink, very useful for some purposes, which may be made thus:—Dissolve thirty grains of sugar in thirty grains of water, to which add a few drops of concentrated sulphuric acid. Upon heating this mixture the sugar becomes carbonized by the acid, and when applied to the paper it leaves a coating of carbon which cannot be washed off. This stain is rendered more perfect by the decomposing action of the ink itself upon the paper, and thus it resists the action of chemical agents.

Practical Memoranda.

Composition of Alloys.

Lead.	Tin.	Bismuth.	Point of Fusion.	Point of Solidification.
120 parts.	140 parts.	120 parts.	130° C.	112° C.
145 "	145 "	100 "	140	129
150 "	150 "	75 "	150	135
150 "	150 "	50 "	160	150
170 "	180 "	35 "	170	153
210 "	190 "	30 "	180	165
140 "	155 "	30 "	190	180
200 "	185 "	30 "	200	180
200 "	180 "	30 "	210	180
240 "	150 "	30 "	220	180
207 "	194 "	30 "	180	180

It is generally to be remarked that the fusion point of an alloy is not in relation to the proportions of the metals which enter into its composition. The alloy of 150 parts of lead, 150 parts of tin, and 50 parts of bismuth (proportions evidently corresponding to 6 atoms of lead, 12 atoms of tin, and 1 atom of bismuth), is one of those which solidify most regularly—that is to say, that no one of the metals entering into its composition crystallizes separately on cooling, and that the alloy remains perfectly homogeneous.

It may be observed that the point of solidification of the last five alloys on this table is constant at 180°. When those alloys are melted and then allowed to cool, small crystals form at 220°, 210°, 200°, or 190°, according to their composition, and when the temperature has descended to 180°, the whole mass solidifies. It is noticeable that during the whole time of solidification the temperature remains at 180°, and that the mercury of the thermometer again begins to descend only when every part of the alloy has become solid.

Another alloy remaining very homogeneous, and unvarying in temperature during solidification, is that composed of 207 parts of lead and 294 parts of tin (2 equivalent lead to 5 equivalents tin). This alloy melts at 180°, and solidifies at precisely the same temperature.

In these two alloys, which have the most useful properties, the different metals are united in atomic proportions, which seems to prove that, to obtain a good alloy, it is necessary to take into consideration the atomic weight of the metals composing it. It is beyond a doubt that such alloys, remaining so homogeneous during solidification, are possessed of valuable properties not belonging to other and less homogeneous alloys. This question is certainly of great interest in the manufacture of printing type, and for similar purposes; and deserves to be thoroughly studied.—*Bulletin de la Societe Chimique and Chemical News.*

[It will be observed that the temperatures are given in the centigrade scale. To reduce them to Fahrenheit degrees, multiply by 9, divide by 5, and add 32. In the centigrade thermometer, the interval between the freezing and the boiling point of water, is divided into 100 degrees, and the freezing point is made the zero. Fahrenheit divided the interval into 180 degrees, and made his zero 32 degrees below the freezing point. The proportion of 180 to 100 is the same as that of 9 to 5.—Eds.]
—*Scientific American.*

Horse Power.

A pull of 250 lbs. is the maximum effort which a good horse can exert for a mile.

Effect of Gas on Silks and Metals.

Mr. Howell, of Regent Street, states that during the winter months, when much gas is burned, the color of silk dyed of delicate colors is taken out. With regard to metal goods, the gas deposits a thin film on the metal, and unless it is removed every day it eats into the metals, so that the articles must always be regilded. This necessitates the use of air-tight cases for such goods. French goods are much more affected than English. The former are attacked in a day or two; the latter may not show the film for a week or two.—*London Engineer.*

Impure Water.

The presence of poisonous organic matter in water frequently is imperceptible to taste and sight. The pump in Broad street, Golden square, London, yielded water perfectly clear, yet its waters killed 500 people in the first three nights of September, 1854. A drain from a neighboring cess-pool had broken into the well.—*Ibid.*

Adulteration of Flour.

The presence of a mineral adulteration of flour or meal may be readily detected. A small quantity of the suspected flour is shaken up in a glass tube with chloroform. All mineral adulterations will collect at the bottom, while the flour will float on the liquid. In this country, where the comparative cheapness of flour makes adulteration unprofitable, this test may not be valuable; yet the fact may not be without interest.—*Scient. American.*

What is Saleratus?

Wood is burnt to ashes, these are lixivated, and lye is the result. Lye is evaporated by boiling, black salt is the residuum. The salt undergoes purification by fire, and the potash of commerce is obtained. By another process we change potash into pearlash. Now put these into sacks and place them over a distillery mash tub, where the fermentation evolves carbonic acid gas, and the pearlash absorbs it and is rendered solid; the product being heavier, whiter, and drier than the pearlash. It is now saleratus. How much such salts of lye and carbonic acid gas one can bear and remain healthy, is a question for a saleratus eater.
—*Ibid.*

Mineral Oil.

The illuminating power of one gallon of mineral oil is equal to that of 18 lbs. of paraffine candles, 22 lbs. of sperm, 26 lbs. of wax, 27 lbs. of stearine, 29 lbs. of composite, or 39 lbs. of ordinary tallow candles.

Depth of Milk for Cream.

A correspondent of the Boston *Cultivator* says that the form of the vessel containing milk, from which it is intended to collect the cream, does not affect the quantity of cream raised. He says: "desiring to test this matter, I took glass cream jars, in which were graduated scales, and set milk at different depths, from 2 to 18 inches. The depth of cream was always in proportion to the quantity of milk."

Waters of the St. Lawrence.

It is said the St. Lawrence river carries by Montreal 50,000,000 cubic feet of water per minute; and in the course of one year bears 143,000,000 tons of solid material, held in solution, to the sea.

Gaseous Bodies in Water.

Mr. Grove states that it is almost impossible to free water from gaseous bodies, and that the steam liberated from this liquid, when boiled under oil, always leaves a small bubble of permanent gas; when condensed this gas is found to consist of nitrogen.

Surveyors Tables.

In England surveyors tables for laying out curves are now printed on a pack of cards. In use the proper card is placed on the theodolite and it allows the surveyor the use of both hands.

Commercial Numbers.

12 Articles	1 Dozen.
13 Do	1 Long Dozen.
12 Dozen	1 Gross.
20 Articles	1 Score.
5 Score	1 Common Hundred.
6 Do	1 Long do.
80 Deals	1 Quarter.
4 Quarters	1 Hundred.
24 Sheets of Paper	1 Quire.
20 Do	1 do outsides.
25 Do	1 Printer's Quire.
20 Quires	1 Ream.
21½ Do	1 Printer's Ream.
2 Reams	1 Bundle.
10 Do	1 Bale.
5 Doz. Skins of Parchment	1 Roll.
90 Words in Chancery	1 Folio. *
80 Do Exchequer	1 do *
72 Do Common Law	1 do *

—*Salt's Tables.*

* Imperial.

Statistical Information.

The States of the Union.

The following is a list of the States constituting the Union, with the dates of their admission. Colorado and Nebraska had authority, but refused to form State constitutions. The thirty-six stars in our (U. S.) national flag are therefore designated as follows:—

Delaware	December 7, 1787
Pennsylvania	December 12, 1787
New Jersey	December 18, 1787
Georgia	January 2, 1788
Connecticut	January 9, 1788
Massachusetts	February 6, 1788
Maryland	April 28, 1788
South Carolina	May 23, 1788
New Hampshire	June 21, 1788
Virginia	June 26, 1788
New York	July 26, 1788
North Caroline	November 21, 1789
Rhode Island	May 28, 1790
Vermont	March 4, 1791
Kentucky	June 1, 1792
Tennessee	June 1, 1796
Ohio	November 29, 1802
Louisiana	April 18, 1812
Indiana	December 11, 1816
Mississippi	December 10, 1817
Illinois	December 3, 1818
Alabama	December 14, 1819
Maine	March 15, 1820
Missouri	August 10, 1821
Arkansas	June 15, 1836
Michigan	January 26, 1837
Florida	March 3, 1845
Texas	December 29, 1845
Iowa	December 28, 1846
Wisconsin	May 29, 1848
California	September 8, 1850
Minnesota	December, 1857
Oregon	December, 1862
Kansas	March, 1863
West Virginia	February or March, 1863
Nevada	October, 1864

Consumption of Cast-Iron.

The consumption of cast-iron in England in the year 1863, with a population of 26,800,000 souls, is set down at 4,357,000 tons, or about 230 lbs. a head: while France, with a population of 37,500,000, consume only 70 lbs., or one third of the consumption in England. The consumption in France is now rapidly increasing, in consequence of the number of new buildings in progress. Ten years ago almost all the railway bridges were built of stone, in consequence of the high price of iron. At present similar works may be constructed at a less cost in iron than in stone.—*Lond. Engineer.*

Consumption of Alcoholic Beverages, Corn, &c.

The alcoholic beverages, exclusive of cider, British wines, and home-brewed beer, on which we paid duty during 1862 amounted to 373,000,000 gallons, or sufficient to fill a canal 3 feet deep, 6 feet wide, and 640 miles long; that is, 40 miles in excess of the distance from Land's End to John o' Groats. In the year 1862 we imported 128,000,000 bushels of corn, or sufficient to build a wall 13 inches thick, 20 feet high and 1,460 miles long; that is, the peremiter of the triangle of which the Land's End, the North Foreland, and Dunnet Head are the angular points. The flour and meal imports were 360,000 tons.—*Ibid.*

American Fishing Vessels.

The following is a statement of the number of American vessels engaged in the fisheries, their tonnage, and value of fish taken for 12 years:

Year.	Number.	Tonnage.	Crew.	Value of Fish taken.
1852	260	18,200	3,400	$294,000
1853	220	15,400	3,000	276,000
1854	234	16,380	3,220	280,000
1855	334	23,380	3,580	632,400
1856	476	36,320	6,600	1,265,700
1857	452	31,640	6,240	1,053,000
1858	453	31,710	6,170	634,500
1859	380	26,600	5,160	528,000
1860	370	25,900	4,980	459,000
1861	354	24,920	4,840	416,400
1862	274	19,180	3,740	267,009
1863	235	16,450	3,230	249,750

With the termination of the treaty of 1854 these privileges to a great degree are surrendered. The herring and mackerel fisheries become the sole property of the Provinces. We go back to the time of the treaty of 1818—a system more calculated to embroil the citizens of the respective countries than any that could be devised. How this can be obviated is not easy to foresee. We must have negotiation, and yet it is not likely that the British Government will be willing to make a new treaty which does not embrace the entire subject of commercial intercourse between this country and the Provinces.—*Amer. Paper.*

Yield of Petroleum.—U. S.

The *Scientific American* says the yield of petroleum in the United States during the last five years has been as follows:—1861, 24,000,000 gallons; 1862, 40,000,000; 1863, 70,000,000; 1864, 87,000,000; 1865, 91,160,000. The product is now 14,000 barrels a day.

The Northern Overland Telegraph.

This telegraph line will be a gigantic one, extending through British America, 1,200 miles; through Russian America, 900 miles; across Behring's Straits, 184 miles; across the Gulf of Anadyr, 210 miles; and thence overland to the mouth of the Amoor River, 1,800 miles,—or a total of 4,294 miles. At the Amoor it is to be continued by a Russian line connecting it with Irkoutsk, through Western Siberia, communicating with Nijni Novgorod and Moscow, and thence to St. Petersburg. The capital involved amounts to $10,000,000.

Miscellaneous.

Earth as a Deodorizer.

A correspondent of the *Maine Farmer* says:—The paragraph in your last paper entitled "Dry earth as a Deodorizer," may naturally lead some persons to suppose that it is *only* dry earth which has this valuable effect as a disinfectant, and hence, as it would be a matter of some trouble to get the earth prepared and properly *dried*, its use is likely to be neglected. But *damp* or moist earth is exactly as good for all practical purposes. Dig up the common soil anywhere, pulverize it tolerably well with the spade or hoe, mix it with or throw it upon any offensive substance, and the deodorizing effect is produced completely at once. Common sense teaches this, and practice also.

The Rev. H. Moule, England, in his work on *National Health and Wealth*, says:—

"The power and efficacy of this agent, will, however, be best understood and believed if I give a simple narrative of what, during the last six months, it has done for my own family, averaging during that period fifteen persons daily. Eight months previous to this period, under a strong impression of the evils either occasioned or likely to be occasioned by the vault or cess-pool on my premises, and feeling it to be a nuisance to my next neighbor as well as to myself, I filled it up with earth, and ever since I have had everything that would otherwise have gone into it received and removed in buckets. And even this mode of removal, though offensive in idea, has proved far less so, in reality, than even a very small portion of the evils it is intended to remedy. At first, the contents of these buckets were buried in trenches about a foot deep in my garden; but on the accidental discovery that in three or four weeks after being thus deposited not a trace of this matter could be discovered, I had a shed erected, the earth beneath it sifted, and with a portion of this the contents of the buckets every morning mixed, as a man would roughly mix mortar. The whole operation of removing and mixing does not occupy a boy more than a quarter of an hour; and within ten minutes after its completion neither the eye nor nose can perceive anything offensive. This was the first observation I made. The next was this: that when all the earth, which did not exceed three cartloads, had been thus employed, that which had been first used was sufficiently dried to be used for the same purpose again; and it absorbed and deodorized the offensive matter as readily as at the first time. And so singularly does this capability continue, that a portion of it is now being used for the *fifth* time for the same purpose; and thus all that offensive matter which otherwise would have been wasted in the vault, a nuisance to my house and the neighborhood, and a source, it may be, of sickness and disease, is now a mass of valuable manure, perfectly inoffensive to the eye and nose. I have taken fifty or sixty persons to see it without first acquainting them with its nature, and not one has guessed it. All have declared it to be wholly without offence. Two have handled and smelt that in the afternoon which had been mixed in the morning, without being able to discover its nature. And more than this, I have the same day submitted some to strong fire-heat; and that which, unmixed with earth, would, under such heat have been intolerable, in this mixed state emitted no offensive smell whatever. Again: a supply of manure for the garden is thus readily provided. A farmer and several laborers to whom I mentioned the following simple plan at once entered into it: the present vault is to be discontinued, and in the place of it there is to be under the seat a small enclosure of brick or stone, six or nine inches deep. To preserve the full value of the manure for the garden, this enclosure should be paved, or have a flat stone for its bottom. It would, of course, be closed with a door. On one side would be a small, rough shed, capable of covering and keeping dry a cart-load of earth for the purpose of mixing, and on the other side a similar shed into which the soil so mixed would day by day be thrown, for the purpose of drying. When dry, this would be used again,* and the uses of the two sheds be reversed. By thus repeatedly using it, and shifting it backwards and forwards from one shed to the other, one load of earth will be found sufficient for five persons certainly for six months, and, I believe, for twelve. This is the simplest, but by no means the least offensive mode of applying this remarkable agent."

[* We see no necessity for using it over again, and do not think it advisable to do so. This system of using dry earth for deodorizing night-soil is now practised by some of our citizens, with decided success.—Ed. Jour.]

The winds and the Trees.

Philosophers tell us that the winds gain velocity by unobstructed travel; and the fact is verified by the dreadful hurricane on the ocean, the raging tempest on lake, and sea, the awful simoon on the African desert, and the furious tornado on the American prairies—all which strew their paths with desolation, because there are no trees to check the violence of the winds. Even our sudden gusts in summer, when the air becomes too much rarified by heat, are often destructive to life and buildings.

All these besoms of destruction would be greatly modified could trees be planted in their paths. The trees getting the first strokes, and being flexible, would bend before the blast, breaking its force and making it pass harmlessly over buildings or other stationary objects, The electric fluid, so destructive of life and property, also is attracted by trees, and conducted into the ground; and, in fact, trees are the best protectors against all the natural destructive agencies with which man has to contend.

Another consideration as to the value of growing trees is the fact that a park of any size is warmer when belted and grouped with trees, in winter, and cooler in summer, which has been demonstrated by practical experience for centuries. Many fruiting and ornamental plants flourish when so protected, that would not live if exposed to bleak winds. Domestic animals, too, grow faster, thrive better, and give better returns if sheltered and protected by trees. Much better is it also to rest under their broad branches on a hot summer's day or to be enlivened by their cheering green when all else is dull and cheerless.

A feeling of admiration and awe comes over me when I think of the wonderful wisdom shown in the forms or natures of trees to suit our various wants. If we plant trees with naked stems and branchy heads to shut out unsightly views, the work is only half done, as we can see through and under the branches; but when we plant evergreens, whose largest branches are near the ground, they fill up the gap and the work is complete With fruit trees the same beneficence is manifest. We have to climb up trees to pick the large fruits, which when green are unfit for eating; while it would be tedious to pick the thorny gooseberry and blackberry, did they grow upon trees.

We say, therefore, plant trees for shelter and shade, for embellishments to your grounds and adornment to the landscape; they are grand and ennobling to look upon, and their fruits and timber in a few years growth will be as valuable as gold.—*Gardener's Monthly.*

Numerals of Different Sizes.

As the decimal system of notation is *supposed* not to be universally understood, it may be well to consider whether we can render it clearer by introducing into numerals distinctions in size and shape analogous to the distictions between capital and small letters. If in printing sums of money we used common figures for the dollars, and figures of smaller size for the cents (as is often done on coupons), it would be more easily understood by persons who are not familiar with decimal notation; and even experts might sometimes be saved from errors of sight; so if decimal fractions were generally, or always, printed in smaller type, it would contribute to clearness, and to prevent mistakes; and it would avoid a difficulty which, without sufficient reason, is thrust upon us in many recent mathematical or partly mathematical works in which the decimal point has been changed from a period to a comma—the period being wanted for another use. And in the printing of the timetables of railways it might also be an improvement to print the minutes in small type; for example, 12_{30} instead of 12:30, to express half-past twelve; and, $\$25_{16}$ instead of \$25·16, or \$25 and 16 cents. In decimals generally it would be easier and surer for the eye to distinguish them if they were printed thus 452_{87347}, instead of 452.87347. We suggest this for the consideration of editors, and others concerned; hoping that if the idea be deemed sound, there may be an expression of opinion upon it. Of course it would be improper to attempt the introduction of such a change without previous discussion, and a conventional agreement upon it. —*American Artisan.*

Alkali.

This term is constantly used by farmers in speaking of manures. It is well to understand its derivation and precise meaning. It is of Arabic origin. Dr. Dana says that *Kali* is the Arabic word for bitter, and *al* is like our word *super;* we say fine and superfine; so kali is bitter; alkali, superlatively bitter, or, truly, alkali means the "dregs of bitterness."

Alkali is a general term which includes all those substances that have an action like the ley of wood ashes. It this ley is boiled down, it forms potash. What is chiefly understood by the term alkalies, means potash, soda, and ammonia. *Potash* is the alkali of *land* plants; *soda* is the alkali of *sea* plants; and *ammonia* is the alkali of *animal* substances.

Potash and soda are fixed; that is, not easily raised in vapor by fire. Ammonia always exists as vapor unless fixed by something else.

Lime, fresh slacked, has the alkaline properties of potash, but weaker,—so has calcined magnesia, but in less degree than lime. Here are two substances, earthy in their look, having alkaline properties. They are called, therefore, *alkaline earths.* When the tongue is touched with a bit of quicklime, it has a hot, burning, bitter taste. These are called alkaline properties. Besides these, they have the power of combining with and taking the sour out of all sour liquids and acids; that is, the acid and the alkali neautralize each other. Were it not for this, there would probably be no such thing as vegetable growth. *N. Eng. Farmer.*

Transportation of Nitro-Clycerine.

The United States Congress has passed a bill prohibiting the transportation of nitro-glycerine on any vessel or carriage conveying passengers, under penalty of a fine of not more than \$5,000; in case of death from a violation of this law, the parties transgressing are to be indictable for murder. Nitro-glycerine is not to be transported unless packed in a metallic vessel separate from all other substances, and labeled "Nitro-glycerine—dangerous." Violations of this clause are to be punished by a fine not exceeding \$3,000.—*American Artisan.*

Colors, as Applied to Dress.

Few people give themselves the trouble to understand the rules of color. They consider them as belonging to an obtruse science. The principles, which are supposed to be too much wrapped in mystery to be worth the trouble of acquiring by any but professional persons, are those comprehended in the laws of contrast of color and contrast of tone.

First, as regards contrast of color. There are three primary colors—red, blue, and yellow. From these every other color is formed, and each has its perfect harmony in its contrasting or complementary color. The complementary of each simple color is formed by the union of the other two (and is therefore called also the secondary), that is, green being the mixture of blue and yellow is complementary to red; violet, being formed of red and blue, is complementary to yellow; and orange, a compound of red and yellow, to blue.

Each of these colors, when placed near its complementary intensifies its effect. Green causes red to appear redder, blue adds a brighter tint to orange; and yellow enhances the color of violet. In other words, every color looks its purest and best when it is beside its complementary.

By means of this simple law of contrast therefore, we have the power of imparting any tint we choose to the complexion, and of rendering our costume agreeable to the eye by the harmony produced by properly contrasted colors; and we may learn to avoid increasing the undesirable tints of a sallow complexion by the juxtaposition of blue or violet, or rendering a florid complexion still more highcolored by contrasting it with green. On the other hand, ladies with golden hair and clear complexions will see that they should wear blue in preference to any other color, harmonizing agreeably, as it does, with the former, without exercising any ill effect on the latter; while those upon whom nature has bestowed dark hair and a rosy complexion should consider green as their especial color.

Very dark people may wear extremely light brown, gray or slate color with impunity, but those who have light brown hair should only venture upon pure white and the light tones of the three primaries, bearing in mind that, where-ever there is agreeable contrasts there is agreeable harmony.—*The Boudior.*

The Monkey and the Drunkard.

Mr. Pollard states that in his drinking days he was the companion of a man in Arundel county, Maryland, who had a monkey that he had valued at a thousand dollars.

We always took him out on chesnut parties, and when he could not shake them off, he would go to the very end of the limbs and knock them off with his fist. One day we stopped at a tavern and drank freely. About half a glass was left, and Jacko drank it up. Soon he was merry, hopped and danced, and set us in a roar of laughter. Jacko was drunk. We all agreed, six of us, that we would come to the tavern next day, and get Jack drunk again, and have sport all day. I called at my friend's house next morning, and we went out for Jack. Instead of being, as usual, on the box, he was not to be seen. We looked inside, and there he was, crouched up in a heap.

"Come out here!" said his master.

Jack came out on three legs; his fore-paw was on his head. Jack had the headache. I knew what was the matter with him; he felt just as I did many a morning. Jack was sick and couldn't go. So we waited three days. We then went, and while drinking, a glass was provided for Jack. But where was he! Skulking behind the chairs.

"Come here Jack, and drink," said his master, holding out the glass to him.

Jack retreated, and as the door was opened, slipped out, and in a moment was at the top of the house. His master went out to call him down, but he would not come. He got a large whip and shook it at him. Jack sat on the ridge-pole and refused to obey. His master got a gun and pointed it at him. A monkey is much afraid of a gun. Jack slipped over the back side of the house when he saw his predicament, at once whipped upon the chimney, and got down in one of the flues, holding on by his fore-paws. The master was beaten. The man kept the monkey twelve years, but could never persuade him to touch another drop of liquor. The beast had more sense than the man who has an immortal soul, and thinks himself the first and best of God's creatures on earth.

Sulphuretted Hydrogen.

This gas, which for experimental purposes is usually obtained by means of sulphuret of iron, may be procured more conveniently, and in a state of great purity, by the use of sulphuret of calcium. The latter is formed very easily by mixing uncalcined powdered gypsum with one-fourth of its weight of calcined gypsum, and powdered pit-coal equal to one-third of the whole of the gypsum used, and working up the mixture to a stiff dough with water; next forming it into pieces four inches long, two wide, and one and a-half thick, sprinkling them with powdered coal, and drying them, then placing them with coke in a wind furnace, and keeping them at a very high temperature for two hours. When cold they will be found externally to consist of oxysulphuret of calcium; but internally of pure peach-colored sulphurate of calcium, which may be broken in pieces the size of nuts, and preserved in well-stoppered glass bottles. If water is added to these, and then sulphuric acid in small quantities at a time, sulphuretted hydrogen is given off with great uniformity.—*Scientific Review.*

New Test for Acids and Alkalies.

Owing to its property of being reddened by acids and turned blue by alkalies, prepared litmus is perhaps the most generally useful of all the chemical tests which have hitherto been known. A test of a similar nature, but very much more sensitive than litmus, has recently been found by Schönbein to be furnished by the artificial blue coloring matter obtained by acting on chinoline with iodide of amyl, and known as "cyanin." This body is so readily acted upon by acids and bases, and its tinctorial power is so enormous, that its delicacy as a test for either acids or bases is quite marvelous. It will detect the presence in water of one-millionth of either sulphuric acid or caustic potash, and of quantities of carbonic acid which cannot be detected by means either of lime or of barytes. Pure distilled water colored with it so as to be quite blue while preserved from contact with the atmosphere has its color instantly destroyed by being blown into from the lungs, by reason of the carbonic acid in the expired breath. Magnesia is incapable of dissolving in water to a sufficient extent to enable the solution to react upon litmus, but pure water in which magnesia has been shaken up gives a most distinct alkaline reaction with cyanin. So does distilled water which has had oxyd of lead shaken up in it, albeit sulphureted hydrogen, which will detect one part of lead in 350,000 of water, is incapable of showing that any oxyd of lead has been dissolved.—*Mechanics' Mag.*

Perkins's Portable Steam Oven.

On Monday last a trial was made at the works of Mr. A. M. Perkins, Seaford street, Regent square, in the presence of some of the principal officers of the Commissariat department, of a new portable steam oven, constructed by Mr. Perkins, for military purposes. The oven consists of a casing of an O-form, 10 feet 7 inches long outside, 9 feet of this length being occupied by the oven proper, and the remainder by the furnace and the division wall between it and the oven. The casing is made double, being formed of two shells of 1-16th inch wrought-iron plates placed 2 inches apart, and the space between the shells is filled in with vegetable black to prevent radiation, which it does most effectually. The oven is heated by twenty-four water tubes, 10 feet 3 inches long, 1 5-16th inches diameter outside, and ⅞ inch bore; twelve of the tubes are placed under a false bottom, and twelve along the top of the oven. The tubes are inclined downward towards the furnace, into which one of them projects 9 inches, the twelve lower tubes forming the fire-grate; they are filled with water for 3 feet of their length, and then have their end welded up so that no evaporation can take place. Similar tubes have been long successfully employed by Mr. Perkins for heating purposes, and some which had been in use for upwards of nine years have been recently opened, and found to contain the same quantity of water as was originally placed in them. When heat is applied to these tubes steam of a high pressure is, of course, found within them, and the tubes thus become of an equal temperature throughout their length. In the case of the oven forming the subject of the present notice, the heat transmitted to it by the tubes is found to be uniform in all parts. Above the furnace, and surrounding the short chimney leading from the top of it, is placed a copper boiler; this absorbs some of the waste heat from the furnace, and gives a good supply of hot water. The oven is fitted at the end farthest from the furnace, with a pyrometer for indicating the temperature, and glazed sightholes for watching the process of baking, and the whole apparatus is carried upon four wheels, and is intended to be drawn by two horses. The oven tested on Monday is capable of baking at one time eighty "three-ration" loaves, each weighing 3¾ lbs, the time required for heating the oven for baking being only one hour, and the time occupied in baking each charge being two hours. About 60 lbs. of coke are used per day for working the oven, and the bread baked in it is found to be slightly heavier, for the same weight of dough, than that baked in an ordinary oven, a result ascribed to the uniform temperature of the oven not destroying the saccharine matter of the bread. The weight of the whole apparatus complete is a little under 38 cwt. Another oven, made by Mr. Perkins on the same plan, is now in use at Aldershott, and is working very satisfactorily. In that tried on Monday, however, several improvements have been made, and the weight has been materialy reduced. This portable oven appears to be a very great improvement upon that now used, and there seems to be no reason why it should not be extensively employed for military and naval purposes, as well as in a modified form in other situations.—*Engineering.*

New Photographic Printing Process.

We have received from the inventors, Messrs. G. E. Desbarats and W. A. Leggo, of Quebec, C.E., some specimens of prints—done upon a common hand-printing press—of their newly-patented process for making printing plates by means of the photograph.

The object of the patentees is to produce electrotype plates of pictures, ready for common printing like ordinary type printing, without engraving or other hand work.

The process is briefly as follows:—Upon the varnished side of an ordinary negative, pour a solution of gelatin containing bichromate of potash. Dry, and expose the uncoated surface uppermost to light, which fixes that portion of the bichromate upon which the rays fall. Dissolve off the unfixed portion by dipping in warm water; drain, and we have a film upon the glass more or less raised, according to the strength of the lights in the picture. Take an impression of this film in plaster. Dip the impressed plaster in hot wax, and place the waxed surface upon a glass plate also covered with hot wax. The wax upon the plate unites with the wax upon the plaster, and the latter may then be removed, leaving upon the plate a fac simile in wax of the original photographic gelatin film.

The fac simile being now dusted with plumbago and electrotyped in the usual manner, a printing block in copper is produced, capable of use with printer's ink upon any press.

The specimens we have received are for the most part copies of steel plate engravings, and the pictures are comparatively well done. There is, however, room for improvement.—*Scientific American.*

The diminution of the magnetic dip has been going on in London for the last half century with great regularity at the rate of about three minutes annually.

Management of Steam-Boilers, Pocket Guide to: W. C. Chewett, & Co., Toronto. Price 25 cents.

This is a short but valuable treatise on the subject of which it treats, written by W. Gill, Esq., of this city, and first published in the June number of this Journal. It is done up in a neat form, suitable for the pocket, and should be in the hands of every person either owning or having charge of a steam-boiler. The writer is a gentleman of long experience, and for several years past chief engineer of the Toronto Rolling Mills, where eight large boilers have been in use day and night, almost continually, for the last six years; and although the water used is usually extremely muddy, these boilers by careful attention and regular inspection have been kept in the most perfect working order. Secure a copy of this little work, which we suppose will be for sale by various booksellers.