The Journal of the Board of Arts and Manufactures for Upper Canada.
JULY, 1866.

TO THE MEMORY OF

OUR BRAVE DEFENDERS,

Who fell at Lime Ridge,

ON SATURDAY, JUNE 2nd, 1866,

IN AN ENGAGEMENT WITH A HORDE OF FENIAN MARAUDERS,

WHO HAD CROSSED FROM

BUFFALO, IN THE UNITED STATES,

AND LANDED AT THE

VILLAGE OF FORT ERIE, COUNTY OF WELLAND, CANADA WEST,
TO THE NUMBER OF FROM 800 TO 1,500 MEN;

BUT WHO

ON ADVANCING TOWARDS THE WELLAND CANAL WERE BRAVELY MET AND REPULSED

BY THE

"Queen's Own" Battalion of Volunteers, of Toronto;

THE

13th Battalion of Volunteers, of Hamilton;

AND THE

York and Caledonia Volunteer Companies of Rifles.

DIED ON THE FIELD:

ENSIGN McEACHREN,	Queen's Own.
CORPORAL DEFRIES,	"
PRIVATE ALDERSON,	"
" MEWBURN,	"
" McKENZIE,	"
" SMITH,	"
" TEMPEST,	"

SINCE DIED OF THEIR WOUNDS:

SERGEANT MATHESON,	Queen's Own.
CORPORAL LACKEY,	"

ART EDUCATION IN ENGLAND.

(BY MR. RICHARD LEWIS.)

The system of art education now fully organized and established in England is so complete in its fitness for the great end in view, the national culture of art and science, and so characteristic and worthy of a practical people in the economy and liberality of its arrangements, that it may safely serve as a model for this country. It is essentially popular, that is to say, it is not a luxury for the advantage of a class or the special cultivation of artistic genius. On the contrary, it starts on the principle that art education is just as necessary and as profitable in every point of view, moral or commercial, as reading and writing or arithmetic. If it be the duty of the government to secure to every child the power to read, it is equally its duty to give every child in the realm the power to draw. This is the avowed doctrine of the educational authorities. In the spirit of this doctrine is art education being established throughout the kingdom—not as a luxury, but as an imperative obligation essential to the moral and commercial greatness of the people.

Hence the first and leading object has been to prepare qualified teachers for giving art instruction to every elementary school, and to every mechanic who may desire such instruction. The training school established at Kensington is the centre of operation. It originates the art instruction which is carried into every school of the kingdom. It establishes a high standard and a systematic programme, in strict harmony with correct principles —with the science of art. Thus in all schools claiming aid from the central department, whether for the children of the rich or the poor, whether for mechanics or artists, the studies are based on Practical Geometry, and, to a certain extent, on ornamental forms. The pupils are practised to acquire facility in drawing straight lines in all their geometrical combinations, and curve lines with all their graceful and symmetrical proportions, until the hand acquires freedom and power, and the eye correctness in its calculations. Then the central department sustains the high character of the education it has inaugurated; it keeps it up to the highest point of advanced knowledge by making the teachers of art in every part of the country responsible to its authority for the progress of their scholars, while, at the same time, it gives to local government all the power necessary to secure a faithful fulfilment of contracts. Thus the central school is the focus of action—the soul of the whole system. "The courses of instruction," it is announced in the Prospectus of the Normal Central School, "pursued in the School have for their object the systematic training of teachers, male and female, in the practice of art and in the knowledge of its scientific principles, with the view of qualifying them to impart to others a careful art education, to develop its relation to the requirements of trade and manufactures, and its application to the common uses of life. Special courses are arranged to qualify schoolmasters of parochial and other schools to teach elementary drawing as a part of general education, concurrently with writing." Consistently with this preamble, the programme of instruction is comprehensive and thorough. Fifteen teachers—or professors as they would from their high qualifications doubtlessly be called anywhere but in England—have the duty of giving instruction in every department of art. Thus there are teachers of Freehand Drawing of Ornament, Geometry and Perspective, Mechanical Drawing, Architectural Drawing, Painting, Modelling, Moulding and Casting, Ornamental Design, and special lecturers on Ornament, Anatomy and Botany. The School is opened for ten months in the year, divided into two sessions of five months each. Students are permitted to attend half a day or the whole day, or in the evening; the fees per session being £4 for the whole day, and £2 for the half day or the evening classes. But special encouragement is given to students proposing to qualify themselves as teachers of art schools, and in this spirit, when they have passed examinations in Geometry and Perspective and given evidence of their skill in Freehand Drawing and Drawing from nature, of plants, from models, &c., they are admitted free, and are also eligible to receive weekly allowance varying from 5s. to 25s. Equally liberal arrangements are made in behalf of the lady-teachers. The course of instruction comprises twenty-four stages, divided into six groups, embracing elementary Drawing, Colouring, Painting, Figure Drawing, Modelling, Ornament, &c. Art certificates are granted to all who pass the prescribed examination in each group, and every recipient of certificates receives a grant of £10 per annum for each certificate held in each group. The examinations, in the liberal spirit which should govern all public institutions, are open to all persons, whether educated in the Normal School or not; and as capacity for teaching is as necessary a qualification to the instructor as attainments, the candidates are required to teach a class in the presence of the examiners.

In connection with the school of art there is established the splendid museum of ornamental art, open as well to the general public as to the students. The collection was commenced in 1851 by a grant from the Board of Trade of £5,300, but it has been greatly enlarged since by additional purchases and contributions. "The object of the museum is to illustrate the history, theory, and practical application of decorative art, and the collection embraces works of all ages, from the commencement of the christian era to the present time."—(*Directory.*) Hence the collection comprises in classified order every variety of specimen in sculpture, painting, glyptic and numismatic art, mosaics, furniture and general upholstery, basket, leather, japanned work, glass painting and manufacture, pottery, works in metal, jewellery, textile fabrics, &c. The mere enumeration of the contents of such a museum, which can give no idea of its magnitude and splendour, shews how thoroughly the institution has been made practical and subservient to the main design—the education of the people in the arts that will improve the national manufactures.

But all the liberal, costly and elaborate provisions for training teachers is made subordinate to the public good. The principle, frequently enunciated by the Lords of Council, is that the education of the public in science and art is of prior importance to the education of a special class. "If you leave the public ignorant," said Mr. Cole, C.B., in an admirable address delivered in 1852 at the opening of an elementary drawing school at Westminster "the educated artizan will not be employed; but if you lead the public to feel the want of beauty and propriety—to be sensible of their presence and impatient at their absence—to distinguish between symmetry of form and disproportion—to demand from art, at least, the aspiration after the perfection of nature, and the recognition of nature's eternal fitness and simplicity, I am sure the public will soon demand good designs in manufactures, and be willing to pay for them; and I feel morally certain that the instincts of traders will teach them to find the means of supplying such demands, and of causing their artizans to acquire the power of administering to them." Hence, in connection with the central system, a national system of general art education was prepared and has been extended over the whole kingdom, which, for its magnitude and excellent organization, can scarcely be surpassed, and already places England in the foremost rank of art educating nations.

The following is a brief outline of the arrangements adopted for the education of the public in local schools, separate from the central school, but claiming its aid and supervision:

The first step recommended is, to form a special committee, on which, besides others qualified for the duty of superintending schools of art, it is suggested that there should be one or two *ex officio* members, such as parliamentary representatives, the mayor of the town, the principal of any neighbouring training school, &c., which may tend to give a public character to the proceedings. In detailing the objects of such committee, which are regarded as twofold, the Committee of Council recommend that one of these objects should be "to introduce the elementary study of art into *all* the existing educational institutions in the neighbourhood, whether public or private; and the other to establish a special or district CENTRAL school for artizans in the evening, and for those who may desire to acquire a more extended knowledge of art than could be obtained in the short time devoted to it as only one branch of general education."

As the government grants aids, extending to 25 per cent. on local contributions, as well as supplies other advantages, it assumes the duty of suggesting the form of the building intended for an art school, both with regard to the health and comfort of the teachers and the pupils, and to the fitting up, the furniture and the lighting, even to the kind of gas burners necessary to successful art study. The course of instruction in all the local schools is also prescribed by the central authority, and is at once uniform, systematic, and thoroughly scientific. There is a plain, practical, but ample and efficient course for primary schools, which commences with Linear Geometry, advances from Perspective to Freehand outlines from copies and objects, to drawing from solids, then to copies of the human figure, of flowers and foliage, and finally painting from flat examples with instructions in the elementary principles of colour. There is also a course for general education, more comprehensive but not less particular and exact in elementary principles. Then there are special courses for machinists, engineers, and foremen of works, and for designers, ornamentists, and those intending to be industrial artists. How different is all this from the old methods still prevalent where drawing is taught in this country, and, with rare exceptions, notwithstanding the high claims of its educational institutions, in the neighbouring States. Those old methods consisted and still consist altogether in copying landscape drawings in pencil or water color, set off, pruned or improved afterwards by the teacher, while the pupil acquired no independent power to apply art on scientific principles to the demands of life or the gratification of taste. Now the chief end, next to the cultivation of correct judgment and a pure taste and love of the true and beautiful in art, is, as we have already suggested, the training of the eye and the hand to swift and correct delineation, so that the pupil of a common school or the artizan at his bench should be able to delineate—to describe in drawing any object before him or conceived by his mind for invention or improvement as easily as one who wields the pen of a ready writer. The old school method was a waste of time, because after much labour nothing was acquired; but the method established in the English art schools, and previously universally adopted in France, which no doubt is the *older*, because the more natural method, is to educate the scholar in the elements of form, and to train him in the practice of those elements until they become as easy, as with such training they invariably do, as common writing.*

It is of the first importance to the success of art education that the pupils should have the best examples of art presented to them. The Museum of Ornamental Art in South Kensington afforded all that could be desired in this regard to its pupils. But the provincial schools could not avail themselves of these splendid resources. In order, however, to secure to them this necessary and important advantage, the lords of the Committee of Privy Council or Trade, have established travelling museums. The object of this novel effort of the Committee is to circulate the articles belonging to the Central Museum among the various Schools of Art throughout the country, and by securing their public exhibition to aid the instruction given in such schools, or in their own words "to encourage the formation of local museums, assist the founding of schools of art and generally to improve the public taste." In order to make this scheme effective for the great end in view, the Committee of Council propose certain conditions, to which all schools borrowing the articles are expected to conform; and these conditions are, generally, that the museum shall be exhibited both in the day time and in the evening, that the students of the schools shall be admitted free and that to allow the working classes access to the exhibition, the fee for three nights in the week shall not exceed *one penny* each person.

But besides all this noble and profuse, but wise liberality of the government to educate the common people in art, it has also provided at very reduced prices for public schools—and private schools are not excluded from the benefit—all the necessary materials and instruments for drawing, together with copies of every form of outline, shaded architectural and mechanical drawing, coloured examples, solid models and forms, casts of ornaments and books of instruction &c. in Art. This wise and liberal provision is not only calculated to preserve uniformity and harmony in Art studies, but as the materials and apparatus are of the best quality, and as the casts and copies and photographs are only such as are reccomended by skilskilful and experienced judges, there is the fullest assurance given that public taste shall not be perverted through the parsimony of school managers or the bad judgment of unskilful teachers—that the wretched daubs and shows which have so long been imposed on parents should be expelled for ever from all school instruction, and that the poorest child in the realm shall be taught the principles of art and good taste, and enjoy the privileges and power and delight which these give, as well as the sons and daughters of the Queen.

Finally, and not less important, are the rewards held out to the students of art schools: the successful drawings and paintings of the pupils are hung on the walls of the museum "as trophies of past success to gratify the eye, influence the taste, and direct the judgment of future students and frequenters of the school. The schools which are thus entitled to prizes, may choose them out of a large collection of copies and fac-similes of the best works of the fine and ornamental art of different countries and periods. For those who desire metal work, they have provided electro-gold, electro-silver, and electro-copper reproductions of admirable salvers and ewers of Italian and in German workmanship of the sixteenth and seventeenth centuries, and accurate copies of the fine shields and other pieces of armour forming the Artillery Museum at Paris; for others, they have obtained photographs of ornamental drawings of Raffaelle, a fruitful mine of suggestion to those who will earnestly study the ancient masters; and in ornamental art, they proffer photographs of the collection of the Louvre, and such valuable books as Owen Jones's Grammar of Ornament."*

Such is an outline of the system established in England for art education. As we have already stated, the principle which prompts this high movement is not that of regarding art education—learning to draw, as a luxury—but a necessity pressing itself on the country almost more urgently—because it is so deeply related with its manufacturing interests—than any other branch of popular instruction. The government, and the thoughtful and leading minds of England, believe, notwithstanding frequent weak and factious sectarian statements to the contrary, that the

* Drawing and Penmanship are, in fact, kindred arts, and mutually aid each other; and the educational authorities in England, who always attach great importance to the practical views of teachers on educational subjects refer with satisfaction to the fact that it was stated, publicly, at a large meeting of school masters. at Marlborough House, and assented to, that if of five hours a week devoted to writing, two were given to drawing (of course on the scientific method,) more progress would be made in writing in the remaining three, than in the five hours previously, and the general power of drawing would be a clear gain.

* Speech of Rt. Hon. W. Cowper, delivered at the distribution of national medallions at Manchester, 1857.

education of the people, through the instrumentality of common schools, is the surest and best method of subduing vice and crime and of elevating them morally. In the spirit of that faith it attaches the chief importance to the moral influence of art education. It is this which gives it so high a claim to the support of the country, and it is in the lofty spirit which this sentiment creates, that the advocates of art education present its claims on the public mind. But it is the law of a beneficent Providence that whatever is good for the moral welfare is also good for the material prosperity of men; and the care bestowed in educating the people in art and science —the expenditure of public money, and the elaborate organization and legislation to advance this work—is not a mere effort of philanthrophy, but is founded in the soundest views of political economy. The art culture of the people is the sure foundation of their manufacturing prosperity; it is already showing its fruits in the superior character of manufactured produce, and in the face of growing competition in this direction—in the rivalry of France and the United States—the commercial greatness and prosperity of England are dependent on the superiority of her manufactures; and as that superiority can only be sustained by the superior culture of her people, her statesmen and philosophers wisely regard the expense and labour devoted to art education, to be as necessary to material prosperity as it is favourable to moral and intellectual improvement.

We maintain that the necessity for similar efforts in this country presses itself as urgently upon our government as it has done upon that of England or France. In its moral aspect and influence, indeed, education of this kind is more needed here than in France or England. The tendency of mere industrial pursuits—the struggle for subsistence or for wealth is not in itself generous or elevating. It is too strongly pervaded by the selfish element, and is often antagonistic to high sentiment, to refinement of mind, and to all that constitutes moral or intellectual greatness. Now it is in a new country, where the necessity and the motive to labour are so imperative, where there does not exist an aristocracy of wealth or of birth, and where, therefore, there are few of the refining influences, which, with many evils, belong to such a class—that the industrial tendency is dangerous. Hence the great importance of all education; but especially of that education which is antagonistic, in its very nature, in its culture of the imagination, in its study and love of the pure and the beautiful, in its contemplation of all that is grand or truthful or perfect in nature, to the industrial tendency. At the same time, as has already been said, the material interests of the province demand attention and effort in this direction. The agricultural interests are well cared for. It is the manufacturing interests, so necessary to the prosperity of the agricultural, and to the commercial greatness of the country, that call for more liberal aid. How important to the development of these interests art and science education is, the liberal and successful efforts of France and England in this direction sufficiently prove; and no subject connected with the material prosperity of Canada urges itself with more force on our consideration than that of the art education of our people. The cost of such an education should never enter into our calculations in presence of the manifold advantages—of the overwhelming necessity. Our very growth increases the force of that necessity. We are springing out of disunity, isolation and political weakness into the dignity and strength of Confederated States, and the event, when it is consummated, will draw us inevitably into closer and deeper relations, and, consequently, into a noble rivalry with the outer world. But the relations and the rivalry are to be those of the arts of peace and not of war; and the government which establishes the political unity of the provinces, but neglects to legislate and labour for their manufacturing and commercial development, will but half do its work for their permanent prosperity.

THE FENIAN INVASION.

On the morning of the issue of the last number of this Journal, June 1st, this Province was invaded by a band of Fenians, who crossed from Buffalo, in the United States, to the village of Fort Erie, Canada West, in numbers variously estimated from 800 to 1,500.

The patriotic and noble spirit of our Volunteers, who, within twenty-four hours from the reception of the news in Toronto and Hamilton, left their homes and met and held in check this band of marauders, at Limeridge, some sixty or seventy miles distant, is deserving of all praise.

Although not in accordance with the designs of this Journal, to publish aught but what relates in some degree to education in, and the advancement of, the arts and sciences amongst us, we need make no apology for a departure in this case from our usual course, so as to place on permanent record, in its pages, as full an account as may be necessary to afford a clear idea of the various military movements of the past month. We had intended to have done this by remarks of our own; but having now received the official reports of the several commanders, we deem it the best and most reliable course to give them in full. We do so because so many adverse criticisms are current, that it is but fair all parties concerned should be fully heard; and because the ordinary newspapers, in which these reports have already appeared, are not in a convenient form for binding or preserving for future reference.

The first is the report of Lieut. Col. Peacocke, of H. M. 16th Regiment, lying at Hamilton, who had command of the force until the arrival of Col. Lowry, of the 47th Regiment. The second is the report of Lieut. Col. Booker, who commanded the Volunteers in the engagement at Limeridge, and, as relating to the same engagement, we here introduce a letter from the Rev. N. Burwash, present with the troops. The third is Col. Lowry's report. The fourth is the report of Lieut. Col. Dennis, commanding the force on the tug Robb. The fifth is the report of Capt. Akers, R.E., acting with Col. Dennis; and the last is the report of Capt. McCallum, of the Dunville Naval Brigade, and owner and commander of the tug Robb.

Col. Peacocke's Report.

"Fort Erie, 4th, June 1866.

"Sir,—I have the honor to make the following report of my operations in the field since the 1st inst. In compliance with a telegram received from you, I joined at 2 o'clock, at Hamilton, with 200 men of my own battalion, the force proceeding from Toronto to St. Catharines, consisting of one battery of Royal Artillery, under the command of Lieut. Col. Hoste, C.B., and 200 men of the 47th Regiment, under the command of Major Lodder. You had also placed under my command, for the defence of the frontier, 7 companies of the volunteer force stationed at St. Catharines, under the command of Lieut. Col. Currie; the Queen's Own Regiment of volunteers at Port Colborne, and the 13th Battalion of volunteer militia, commanded by Lieut. Col. Booker, at Dunville; and you had informed me that I should be reinforced at St. Catharines by 800 men. Your instructions were that I was to make St. Catharines my base, to act according to my own discretion, to advance on Clifton or elsewhere, and to attack the enemy as soon as I could do so with a force sufficient to ensure success. On arriving at St. Catharines, I received telegrams to the effect that the Fenians, about 800 strong, were marching on the Suspension Bridge, and were actually two or three miles from Chippewa; I pushed on immediately to the Bridge, leaving orders for all troops arriving at St. Catharines to follow me as soon as possible. On reaching the Bridge, I heard that the enemy had not yet reached Chippewa, and being anxious to save the bridge over the creek, I pressed on with 400 infantry, preceded by a pilot engine—the battery marching by road in consequence of the reported want of platform accommodation at the Chippewa station. It was dark when we arrived at Chippewa. We bivouacked there that night. I there received numerous reports from scouts sent out by Mr. Kirkpatrick, the reeve. They agreed generally in the statement that the Fenians had entrenched themselves roughly a little below Fort Erie, at Frenchman's Creek, and had sent on a party towards Chippewa. Their strength was variously estimated from 800 to 1,500. I resolved on effecting a junction with the force at Port Colborne, to which place I had already ordered the battalion from Dunville. With this object in view, I selected Stevensville as the point of junction, and having explained to Captain Akers, of the Royal Engineers, who accompanied the force from Toronto, what my object was, and that this point was chosen, because, judging from information received, we could not be anticipated at it by the evening. I despatched that officer at 12 o'clock, to communicate with the officer commanding at Port Colborne, to make him conversant with my views and to make him meet me at Stevensville between ten and eleven o'clock next morning, informing him that I should start at six o'clock. I continued to send out scouts during the night, and to receive reports which made me believe that my information was correct, and that the enemy had not left their camp. At about two o'clock, I received a telegram from Colonel Booker, despatched before he was joined by Captain Akers, informing me that he had given orders to attack the enemy at Fort Erie. At about half-past three I received another one from Captain Akers, despatched after he had reached Port Colborne, saying the enemy was at French Creek, and proposing that Lieut. Col. Booker's force should advance on Fort Erie and join us at Frenchman's Creek. At about 4.30 o'clock, I was joined by the seven companies of volunteers from St. Catharines formed into a battalion 350 strong, under Lieut. Col. Currie, and by the expected reinforcement under Lieut. Col. Villiers, of the 47th Regiment, which consisted of 150 men of the 47th, and of the 10th Royals, 415 strong, under Major Boxall. The volunteers being unprovided with the means of carrying provisions and of cooking them, had not been able to comply with an order I had sent the previous evening, that they were to bring provisions in their haversacks. I saw that the absolute necessity of furnishing them with some would cause delay, and I telegraphed to Port Colborne that I should be one hour later in starting. We marched at 7 o'clock, leaving the Garrison Volunteer Battery, from St. Catharines, under Captain Stoker, to hold Chippewa. The day was oppressively hot, and our guides took us by a road much longer than necessary. When about three miles from Stevensville, at about 11 o'clock, I received a few words from Lieut. Col. Booker, written at 7.30 o'clock, to the effect that he had just received my telegram, but that he was attacked in force by the enemy at a place three miles south of Stevensville. At the same time, I received information that he had retired on Ridgeway. I encamped a mile further on at a small place called New Germany, across a road leading due south to Stevensville. At about 4 o'clock, having gathered information that the enemy was falling back on Fort Erie, I left everything behind which would encumber the men and started to follow them. At the moment of starting we received an important accession to our strength by the arrival of the Cavalry Body Guard of His Excellency the Governor General, 55 strong, under Major Denison. We marched until dark, and halted two and a half miles from Fort Erie, the men sleeping on their arms, due precautions being observed. During the night I sent out scouts to collect information. It appeared that the Fenians on retiring, had posted themselves at once near the old Fort. Some said they had been reinforced, some that they were attempting to re-cross into the United States. I also heard that three companies of the 16th Regiment and three companies of the 60th Rifles had arrived at our vacated camp at New Germany, and that a force had reached Black Creek; also that 10 more companies of volunteer militia had arrived at Port Colborne. The Volunteer Garrison Battery, which I had left at Chippewa, joined me during the night. Anxious to prevent the escape of the Fenians, I sent word to the officers commanding at those places that I was going to attack Fort Erie, and asked when they would be able to co-operate. Subsequently fresh reports of the attempts of the Fenians to escape having reached me, I determined to advance at once. We were about to move when Lieut. Col. the Hon. John Hillyard Cameron came into camp and informed me that the Fenians had escaped. The intelligence caused great mortification in my little force. I desired Major Denison to scour the country and enter the town. He sent me a message that he was informed that there was still a body of Fenians about the old Fort. We at once marched in that direction, skirmishing through the woods. Major Denison soon informed us that they really had escaped. As many scouts and farm people assured us they had not escaped, we took a long sweep through the woods. On our right on Lake Erie, a few stragglers were seen, and four were reported shot. On entering the old Fort, traces were found of its having been recently occupied. During the short operation which extended only over forty hours, the troops under my command underwent very great fatigue, and bore it with the best spirit and with great cheerfulness. I received all possible support and co-operation from the officers of all ranks. The conduct of the men was excellent. A great number of private individuals rendered me service in various ways, and the inhabitants generally displayed a good and loyal feeling. Mr. Swinyard, Manager of the Great Western Railroad, gave me the benefit of his services in person. He placed at my disposal the resources of the railway; and the officials on the line exerted themselves to render these available. I have the honor to enclose a report of Lieut. Col. Booker, of his operations on the 2nd inst.

(Signed) GEO. PEACOCKE,
Col. and Lieut. Col. 16th Regt.

MAJOR-GEN. G. NAPIER, C.B.,
Com. First Military District, Toronto, C.W.

Lieut-Col. Booker's Report.

Port Colborne, June 2, 1866.

Sir,—I have the honour to report that, in accordance with instructions received from Colonel Peacocke, through Captain Akers, I proceeded by train at 5 a.m. to day, to Ridgeway station on the Buffalo & Lake Huron R. R., with the Queen's Own, of Toronto, Major Gilmore, say 480 men of all ranks; the York Rifles, Capt. Dennis; the Caledonia Rifles, Capt. Jackson; and the 13th Battalion of Hamilton—together about 360 men—total of all ranks, say 840 men, in order to form a junction with Col. Peacocke, at Stevensville, at 9 to 9.30 a.m. On arriving at Ridgeway, I sent the Great Western Railway train away; and as I could not obtain a horse or waggon in the place for the conveyance of the force, I was compelled to leave without the stores, and sent them back to Port Colborne at a little before 8 a.m. We were feeling our way on the Stevensville road, and were about three miles from that village, when our advance guard felt the enemy—Major Gilmore extended the Queen's Own in skirmishing order, in admirable style—the men advancing in good spirits. They were supported and relieved, as required, by the 13th Battalion of Hamilton and the Rifle companies from York and Caledonia. After Major Gilmore had expended much ammunition, he reported to me that his ammunition was failing. At 9.30, after being engaged under a hot fire for an hour and a half, I observed the enemy throwing back his right and reinforcing his left flank. I immediately ordered up two companies in support, to counteract the movement. At this moment I received a telegram by the hands of Mr. Stovin, Welland Railway, on the field, informing me that Col. Peacocke could not leave Chippawa before 7 o'clock, instead of 5 a.m., the hour named by Capt. Akers on his behalf. The enemy was strongly posted in the woods on the west of the garrison road, the road forming the entrance as it were to a *cul de sac*. We outflanked him, when he brought up his centre reserves and out-flanked us. We drove them, in the first place, over a mile, and held possession of the rifle pits. A cry of cavalry from the front, and the retreat of a number of men in our centre on the reserves, caused me to form a square and prepare for cavalry. The mistake originated from relieved skirmishers doubling back. I immediately re-formed column, and endeavored to deploy to the right. A panic here seized our men, and I could not bring them again to the front. I regret to say we have lost several valuable officers and men. I estimate the strength of the enemy as greater than ours; and, from the rapid firing, they were evidently armed with repeating rifles.

I have, &c.,
(Signed) A. BOOKER,
Lieut. Col. Com. Vol. Militia.

Rev. Mr. Burwash's Letter.

(To the Editor of the Christian Guardian.)

DEAR BROTHER,—A short account from an eye witness, of the first effort of our brave volunteers, to defend their country and their homes, will, perhaps be acceptable. On Friday evening the Rev. D. Inglis, of the Canada Presbyterian Church, and myself, left Hamilton, to do what we could for the spiritual interests of our men, should they be called to meet the enemy in battle.

By travelling all night we arrived at Port Colborne at 5 a.m., Saturday, just in time to proceed with the army to the scene of conflict. Shortly after six, we arrived at Ridgeway station. Here intelligence was received that the enemy were within two or three miles; and leaving the train at once, our little army was formed in column on the road leading to New Germany and Stevensville. On arriving at the old garrison road, leading to Fort Erie, the skirmishing lines in front discovered the enemy. They had chosen a very advantageous position, principally to the right of the road along which we were advancing. Their advance lines were all under cover; their left wing in a wood on the summit of the ridge or hill to our right; then a stone fence along the brow of the ridge, protected them in a field on the summit, while their right wing was posted in an orchard, by the road along which our column was advancing. Here they were protected by the large apple trees, the farm buildings, and the breastworks which they formed by setting up rails along the fence. The enemies camp was in the woods on the summit of the ridge, some distance in the rear of this line, and in the same advantageous position their main body was, posted and well protected.

The Queen's Own were the first to engage the enemy. A part of the battalion took the fields and swamps which lay to the left of the road, endeavouring to outflank the enemies right wing. Another portion advanced directly to meet the enemy, who were posted in the orchard, behind the stone wall, and in the woods above the road. Of this body of our forces, Capt. Edwards and his company were in advance, armed with Spencer rifles. They opened fire, and by the second or third shot returned by the enemy, Ensign McEachren fell mortally wounded—the first of our brave heroes whose life has been given for his country in this conflict. In a short time the engagement became general, and notwithstanding their advantageous position, the advance line of the enemy was driven back at every point. By this time the ammunition of the Queen's Own was getting short, and the order was given that they should retire, and that the thirteenth battalion should advance to the front. Four companies were quickly in the fields above the road, No. 3 company, commanded by Capt. Routh, being on the right. A part of this company gained the very summit of the hill and were covered by a farm house in the edge of the woods, which had before protected the enemy. Meanwhile the enemy were dashing forward in a large body to recover their former position. For a moment or two the right wing of the Hamilton boys poured in upon them a most galling fire from their covert. Some of the Fenian prisoners stated that under this fire they were just about to break and run, when our unfortunate retreat commenced. At this moment, by some unfortunate mistake, it was supposed that cavalry were coming. The order was given to form a solid square, which was instantly done, the thirteenth, of Hamilton, forming in the field, and the Queen's Own in the road to which they had retired. This seemed to be the fatal mistake. Into the square a deadly fire was instantly poured by the enemy from the hill above. Then came an order which seems to have been but imperfectly understood; then another to advance, which the men nobly endeavoured to obey; then a third to retreat, upon which our lines were broken, and for a few moments all was confusion. However, Major Skinner, with some of the 13th, formed in the rear, and kept up a retreating fire, which made the enemy tardy in their pursuit. By the time we had returned to Ridgeway, the great body of our men were reduced to something like order, and from that point marched back to Port Colborne. After a time the enemy followed us down to Ridgeway, making prisoners of a few who had been overcome by fatigue, but treating both prisoners and those of the wounded whom we could not take with us with the greatest kindness. From Ridgeway the enemy immediately retreated to Fort Erie, part by the lake shore or railway track, part returning by the battlefield, and passing down the old garrison road. They left all of our wounded and some of their own behind, and made no attempt to bury any of the dead. Of the engagement at Fort Erie by the Welland Battery, under Col. Dennis, and also, of the final escape of the Fenians from our shores on Sunday morning, you have full particulars in the daily prints,—also, full and authentic lists of our killed and wounded.

Might I say that our volunteers need the prayers of our Christian people. Profanity is fearfully prevalent. Intemperance has its victims. Death upon the battlefield is a fearful thing even for the long-experienced Christian. Day and night let us remember the spiritual as well as the temporal necessities of our brave brothers who have gone forth to defend us.

N. Burwash.

(Continued in our next.)

THE PROVINCIAL EXHIBITION.

The trouble and excitement incident to the Fenian invasion have somewhat delayed the proceedings of the Local Committee, in their preparations for the ensuing Exhibition in this city. The Committee will, however, meet on Friday, the 6th instant, when the architect's plans and estimates for the necessary buildings will be submitted; and no doubt vigorous measures will be adopted to carry them out to execution. We trust that our manufacturers and artists will not neglect to make early and effective preparations, that this may be the *most* successful of our successful Exhibitions. The Exhibition will be held during the week commencing on Monday, the 24th of September.

Board of Arts and Manufactures

FOR UPPER CANADA.

TRADE MARKS.

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

(Continued from page 157.)

J. D. King, Toronto. Trade Mark for Cigars, "Royal Arms," and inscription. Vol. A, folio 124, No. 217 Dated April 23rd, 1866.

J. Eves, Toronto. Soda-water bottle with inscription thereon: "J. Eves, Soda-Water Manufacturer." Vol. A, folio 125, No. 241. Dated May 4th, 1866.

F. Loomis, per S. J. Lyman, Montreal, " Canada Pain Destroyer." Vol. A, folio 126, No. 293. Dated June 1st, 1866.

J. D. King, Toronto. Trade Mark for Cigars: "Canadian Coat of Arms," with inscription as described in register. Vol. A, folio 127, No. 303. Dated June 12th, 1866.

John H. Stratford, for "Lubric Oil Co," Brantford. Trade mark: Intersecting triangles, with the word "Lubric" in centre. Vol. A, folio 128, No. 336. Dated June 26th, 1866.

NEW BOOKS ADDED TO THE FREE LIBRARY OF REFERENCE.

SHELF No.

F. 55.—Geological Survey of Canada: Atlas of Maps and Sections. By Sir W. Logan, 1865.

M. 60.—Geology, Oil Fields, and Minerals of Canada West: How and where to find them. With Geological Maps of C. W., and the Oil Regions. By Henry White, P.L.S, 1865.

T. S.—Proceedings of Mechanical Engineers, Birmingham, 1864.

T. S.—Smithsonian Institution Annual Report, 1864.

T. S.—Transactions of State of Maine Board of Agriculture, 1864.

P. P.—Canadian Statutes, 1865.

P. P.—Journals of Canadian Legislative Council, 1865.

P. P.— " " " Assembly, 1865.

Legislative Sessional Papers, for 1865.

Periodicals Bound up from Reading-room Table.

Artizan, American, 1865.
Artizan, London, 1865.
Builder, London, 1865.
Commissioner of Patents Journal, British, 1865.
Canada Farmer, 1865.
Canada Gazette, 1864-5.
Canadian Journal, 1865.
Coach-Maker's Monthly Magazine, 1865.
Canadian Naturalist and Geologist, 1856 to 1865.
Engineer, London, 1865.
Educational Journal, U. C., 1865.
Educational Journal, L. C., 1865.
Engineer and Architect, London, 1865.
Mechanics' Magazine, London, 1865.
Practical Mechanic's Journal, London, 1865.
Popular Science Review, London, 1865.
Photographic Notes, London, 1865.
Scientific American, 1865.
Technologist, London, 1865.

In addition to the foregoing, the following are also regularly received:—

American Publisher's Circular; American Gas Light Journal; British Gas Light Journal; Bookseller; London Grocer; American Farmer; Gardener's Monthly; Morgan's Trade Journal; Photographic Journal; American Agriculturist; Trade Review; Willis' Price Current; and all Parliamentary papers as published.

The Library is open to visitors, free, during office hours each day, and also on Tuesday and Friday evenings.

RECENT PUBLICATIONS.

British.

Afternoon Lectures (The) on Literature and Art. Delivered in the Theatre of the Museum of Industry, St Stephen's Green, Dublin, in April and May, 1865. Third Series. Fcap. 8vo, pp. viii—224. *Bell & Daldy.*—5*s.*

Baker (B.) Diagrams giving Weights of Girders up to 200 Feet span. 4to, in case. *Span.*—3*s.*

Brande and Cox. A Dictionary of Science, Literature, and Art. Comprising the Definitions and Derivations of the Scientific Terms in General Use, together with the History and Descriptions of the Scientific Principles of nearly every Branch of Human Knowledge. Edited by W. T. Brande, D. C.L., F. R. S. L, and the Rev George W. Cox, M.A. In 3 Vols. Vol. 2. 8vo, pp. 952. *Longmans.*—21*s.*

Burnell (George R., C.E) Rudimentary Treatise on Limes, Cements, Mortars, Concretes, Mastics, Plasterings, &c. 5th edition, with Appendices (Weale's Rudimentary Series 45.) 12mo, cl. ad., pp. viii—136. *Virtue.*—1*s* 6*d.*

Devere (Louis) Handbook of Practical Cutting. In Four Parts. Containing nearly 350 Model Patterns or Diagrams. 2 Vols. obg. *Simpkin.*—21*s.*

Dictionary of British-Indian Dates. Being a Compendium of all the Dates essential to the Study of the History of British Rule in India. Fcap. 8vo, pp. 177. *Blackwoods.*—3*s* 6*d.*

Griffin (John J., F.C.S.) Chemical Handicraft, a Classified and Descriptive Catalogue of Chemical Apparatus, with copious explanatory Notes, 8vo. *J. J. Griffin & Co.*—4*s.*

Handy-book of Shopkeeping (The); or, Shopkeeper's Guide. Designed to give stability to the interests of the Shopkeeper, by instructing him how to place his business upon a secure foundation. By the Author of "Enquire within upon Everything." 15th thousand. Cr. 8vo, sd. pp. 96. *Houlston.*—1*s.*

Hodgkin. Monograms, Ancient and Modern, their History and Art-Treatment; with Examples collected and designed by John Eliot Hodgkin, F.S.A. Shield-form. *Longmans.*—21*s.*

Loudon's Encyclopædia of Plants. Edited by Mrs. Loudon. New edition. 8vo. *Longmans*—42*s*

Rimmel (Eugene) Book of Perfumes. With above 250 Illustrations. 4th edition. Large post 8vo, pp. xx—266. *Chapman & Hall.*—5*s.*

Stanley's Descriptive Treatise on Mathematical Drawing Instruments. Illustrated. 8vo, pp. 250. *Stanley.*—5*s.*

Starforth (John) Designs for Villa Residences. Comprising Perspective Views, Elevations, Ground Plans, Stone and Timber Details, and Ceilings. With 40 Plates. Royal 4to. *Blackwoods.*—25*s.*

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American.

Alford. A Plea for the Queen's English. Stray Notes on Speaking and Spelling. By Henry Alford, D. D., Dean of Canterbury. 16mo. pp. xvi., 287. N. Y.: *A. Strahan.* Cl.—$1 25.

Burr. The Field and Garden Vegetables of America. By Fearing Burr, Jr. Second and enlarged Edition. 8vo. pp, 700. Boston: *J. E. Tilton & Co.* Cl.—$5.

Disturnell. Influence of Climate, in a Commercial, Social, Sanitary, and Humanizing Point of View. Also, a Paper on the Influence of Climate in the Equatorial Regions. With a Map of the World. 4to. pp. 32. N. Y.: *D. Van Nostrand.* Pap.—$1.

Draper. A Text-Book of Chemistry. For Schools and Colleges. By Henry Draper, M. D. 12mo. pp. 507. N. Y: *Harper & Bros.* Cl.—$1 50.

Elderhorst. A Manual of Blowpipe Analysis, and Determinative Mineralogy. By Wm. Elderhorst, M. D. Third edition, Revised and greatly enlarged. 12mo. pp. 179. Phila.: *Ellwood Zell.* Flex. Cl.—$2 50.

Fowler. Manual of Instruction for an Improved Method of Building with Concrete, or, How to make the best House at the least Cost. By S. T. Fowler. 24mo. pp. 36. Brooklyn: *The Author.* Pap.—25 cts.

Gilbert. Chemistry Victorious over Cholera. By J. P. Gilbert, M. D. 8vo. pp. 23. N. Y.: *Amer. News Co.* Pap. 25 cts.

Larkin. The Practical Brass and Iron Founder's Guide: a Concise Treatise on Brass Founding, Moulding, the Metals and their Alloys, etc. To which are added Recent Improvements in the Manufacture of Iron, Steel by the Bessemer Process, etc. By James B. Larkin. Fifth Edition, revised, with extensive Additions. 12mo. pp. 301. Phila.: *Henry Carey Baird.* Cl.—$2 25.

Newman. Newman's Manual of Harmonious Coloring as Applied to Photography. Together with Valuable Papers on Lighting and Posing the Sitter. Edited, with a Preliminary Chapter on Obtaining Harmonious Negatives, and with Notes, by M. Carey Lea. 12mo. pp. 148. Phila.: *Benerman & Wilson.* Pap.—75 cts.

Pallett. The Miller's, Millwright's, and Engineer's Guide. By Henry Pallett. Illustrations. 12mo. pp. 286. Phila.: *H. C. Baird.* Cl.—$3.

Strong. The Culture of the Grape. By W. C. Strong. Tinted paper. 12. pp. 355. Boston.: *J. E. Tilton & Co.* Cl.—$3.

Zeis. The Gas-Meter, and its Operations. Illustrated for the Benefit of the Consumer. By Victor Zeis. 12mo. pp. 8. Cincinnati: *The Author.* Pap.—$25 cts.

Selected Articles.

CHEMISTRY BY THE FIRESIDE.

Continued from page 162

No. 11.—Hydrogen.

We told you in our last conversation that hydrogen exists in water, animal and vegetable substances, and that by decomposing water by means of zinc and sulphuric acid, we could readily obtain it in large quantities. We wish now to notice its properties.

In looking at a jar of hydrogen you would see nothing to distinguish it from common air. It has neither taste nor color, nor has it ever been liquified. Place it in the most powerful press ever invented by man and it would still be a gas. When mingled with air in large quantities, you can breath it, but you would not know your own voice; you could only give a shrill squeak which would seem as hideous to yourself as to those who heard you. Ring a bell in hydrogen, and you can scarcely hear it. No animal can live in pure hydrogen, for it must have oxygen to sustain life.

But the most remarkable property of hydrogen is its great lightness. It is fourteen and a half times lighter than common air. A soap bubble filled with it will rise in the air. This is the substance usually employed to fill balloons. If you should take a turkey's crop, and carefully clean it and dry it, and fill it with hydrogen, you would have a balloon on a small scale. Balloons have been constructed on this principle capable of holding several hundred pounds in weight. But there is one great difficulty in using hydrogen. It is supposed that the molecules, or particles of which hydrogen is composed are smaller than in any other substance. The smallest crack in a glass jar will cause the hydrogen to pass through it. Balloons are made of varnished silk, but it is a very difficult matter to prevent the hydrogen from passing through it and escaping. There is now a standing prize for some kind of varnish that will the better prevent the escape of hydrogen than anything now known. Hydrogen is employed as the unit of comparison with other elements, because it combines with them in a smaller proportionate weight than any other known substance.

Hydrogen is very combustible. If you set it on fire in combination with oxygen or common air, it will explode with a loud report. A bladder filled with one-third of oxygen and two-thirds hydrogen will make a stunning report. We once blew up a mixture of 1200 cubic inches, which tore open the reservoir and exhibited a force like that of gunpowder. Its effects were most stunning. Prof. Webster once had his clothing nearly torn off from him by an explosion of hydrogen. These accidents arose from the use of badly constructed instruments for burning it, called the oxyhydrogen blowpipe, or more commonly, the compound blowpipe. By means of this instrument the hardest known substance can be melted or burned.

There is one experiment which you can perform very easily: Take a small bottle and fit a good cork to it, and then bore a hole through the cork and force a pipe-stem through it so as to be perfectly tight. Now put into the bottle two ounces of very small nails, or bits of zinc, or iron shavings from a machine-shop; pour in just water enough to cover them, and then pour in about one-third as much sulphuric acid as there was of water. Hydrogen will immediately escape through the tube. Wait a minute till the air is all out of the bottle, because if you should set it on fire, it would blow up by the mixture of the air and hydrogen. Touch a lighted taper to the jet and you will have the philosophical candle. Hold an inverted tumbler over the flame and press it down upon it somewhat, and the candle will go out, but will continue to burn round the edges of the tumbler where the hydrogen is in contact with atmospheric air. Blow out your lamp and hold a bladder over it and you can collect the gas. Take an old pistol barrel, place your thumb over the vent, and hold the muzzle over the gas from the bottle and let it be partially filled with hydrogen, and then touch a lighted taper to the vent and it will explode with a smart report. Re-light the bottle, and as soon as the flame burns very small, so you can scarcely see it, let down over it a glass tube about three-fourths of an inch in diameter and a foot or more in length, and you will hear the sweetest musical tones. A tune may be played on a flute by means of these tones. After you have exhausted your list of experiments, pour out the liquid contents of your bottle on a plate and let it evaporate, and you will have a new salt formed.

If you used zinc, you will have a sulphate of zinc; if you employed iron, you will have sulphate of iron. One day spent in experimenting in this way at the cost of a few cents, will have a better impression than a week of study could possibly do without it.

No. 12.—Compounds of Hydrogen.

We have now examined three elements,—oxygen, nitrogen and hydrogen—and consequently are prepared to notice the compounds formed from them.

If you should burn some hydrogen gas in the air, the oxygen of the air would combine with the hydrogen; but would it be destroyed? That is impossible. We may change the forms of bodies, but we cannot destroy the elements of which they are composed. This fact must be kept constantly in view. If now by combustion we combine one pound of hydrogen with eight pounds of oxygen, we have a compound of nine pounds water;—a result the most remarkable, that by *burning* two substances we should *produce* a substance which is the greatest enemy to combustion. But such is the fact, that water is produced by the combustion of bodies.

The union of two or more elements to form a compound is called synthesis; the separation of a compound into its elements is called analysis. We have just shown how water may be formed by synthesis. If we should pour some water into a bottle containing granulated zinc, the oxygen of the water would slowly combine with the zinc, forming an oxide of zinc, while the hydrogen having nothing with which to combine would escape in the form of a gas. This is a case of analysis. You can now understand why a piece of iron rusts when left in water. The oxygen of the water combines with the iron and forms an oxide of iron, which we commonly call iron rust. Water parts with its oxygen so easily that most of the metals form oxide in this way. Gold, silver, and platinum are exceptions, hence their use for coin, and the name of the *noble* metals which is applied to them.

You are familiar with many of the properties of water so that we need not repeat them. It evaporates at all temperatures. A constant stream of water is going up from the surface of the earth during the day, it is deposited in the form of dew, frost or rain. It enters into the composition of the sap of vegetables. There is one curious thing which is very common, but yet seldom noticed, and that is, its form of crystalization, which is shown in snow, frost and ice. A single crystal of snow is a six-sided prism; but we generally see several of these crystals grouped together, more commonly in a star-shaped form. Hundreds of forms of these grouped crystals may sometimes be seen in a single snow-storm. When the air is still, and the snow falls very gently, you may often see these crystals by letting them drop on your sleeve or on any dark object. The crystals of frost on your windows all form at a certain angle. Ice is only crystalized water, which causes it to be lighter than water and to float on its surface. Pure water does not exist on the surface of the earth. It dissolves some of the earths and salts from the earth. It also has a portion of air and carbonic acid air dissolved in it, which renders it palatable as a drink. If you boil water you drive off the air and carbonic acid and it is unpleasant as a beverage. It is only by distillation in glass vessels that water can be obtained in a pure state.

You may be surprised to know that water will dissolve a greater variety of substances than any other known fluid. Most persons know that water will not dissolve camphor, and that alcohol will, and hence infer that alcohol has greater solvent powers than water, but it is far otherwise. Alcohol will not dissolve the various gums at all, but water will. On the other hand, alcohol will dissolve the resins, which water will not. Hot water, especially if potash or soda be dissolved in it, will dissolve many substances better than pure cold water. The hot springs found in Arkansas will dissolve sand. We have lying before us a specimen of moss from these springs, all covered with silicious matter which had been held in solution.

It not only has great solvent power, but has the power of combining with many substances with great energy. These compounds are called hydrates. If you pour a pailful of water on a cask of quick-lime it will immediately combine with the lime and form a compound. You will not see a drop of the water in a few minutes. Here is an example of a liquid combining with a solid. This compound is called the hydrate of lime. Water will combine in the same way with caustic potash. You have seen a rusty looking substance in the water by the road-side. Well that is oxide of iron and water. We call it the hydrate of the peroxide of iron. Most of the salts contain a portion of water in a solid state. Plaster of Paris contains about twenty-one per cent. of water.

There is a pretty experiment which you can perform for five cents. Dissolve Glauber salts in boiling water as much as it will hold, and put it while hot into a two-ounce viol and cork it up and set it away where it will cool and be undisturbed till the next day. Then take it carefully down and uncork it, and touch the point of your penknife in it and it will instantly form into a crystallion mass. The water has suddenly been changed into a solid. This is called the water of crystalization.

Mild as it appears to us, it is nevertheless essential to the energy of sulphuric, phosphoric, and nitric acids, with which it is combined.

Such are some of the properties of water. It plays an important part in the history of the globe. It forms the waters of the ocean, which holds in solution all the other elements, and without it man must cease to exist.

No. 13.—Compounds of Hydrogen Ammonia.

Among the many interesting compounds, and one which especially interests the farmer is that of ammonia. It is composed of three parts of hydrogen and one of nitrogen. If you should mix in a vessel one pound of nitrogen gas with three pounds of hydrogen gas, they would not unite so as to form the compound which we call ammonia, but they would still remain as mixed gases. If now you should pass through this mixture a series of sparks from an electrical machine, they would cause a union of a limited portion of the gases and produce ammonia. We learn one fact, then, that ammonia is not formed simply by mixing the two gases. We will now give you a very important rule. Whenever a vegetable or animal substance containing hydrogen and nitrogen, are undergoing decomposition, these two elements unite at the moment of disengagement, and form the compound called ammonia. When you burn a piece of horn, a lock of wool, or any animal substance, you recognize a peculiar animal odor. This is ammonia. When you burn a shred of flax or cotton, you recognize no such odor, because there is no nitrogen in them to form ammonia. Thus it is that any good housewife does when she goes to the store to purchase cloth. She tests a shred of it by burning it and deciding whether it be of vegetable or animal production.

Almost any absorbent will retain ammonia. Dry earth, plaster, iron rust, all absorb it. It is exhaled from the perspiration of animals, even from certain plants. Rub a little quicklime with guano or salammoniæ and you have ammoniæ in abundance. The principle value of guano is owing to its ammonia and phosphate of lime. Many persons would better recognize it by the old term "hartshorn," because it was formerly obtained by the distillation of the horns of the hart.

It is a powerful alkali, very volatile, easily escaping into the air, and lost from the decomposition of animal matter. Hence the farmer takes every precaution to prevent its escape from his manures by the use of absorbents, or of substances which will combine with it, such as plaster, copperas and dry clay. Water absorbs it immediately, which constitutes the liquid hartshorn of the shops.

Thus we have noticed the elements, oxygen, nitrogen, and hydrogen, and some of their compounds. In our next we will tell you something about carbon.

No. 14.—Chlorine.

This element was discovered by Scheele in 1774. If you should take a saucer and put into it a little common salt, and then pour on some sulphuric acid, and apply a gentle heat, 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 soda. By pouring upon it the sulphuric acid, the soda would prefer to unite with the latter acid, so it leaves the chlorine to shift, as it were, for itself, and it passes off 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. Water absorbs large quantities of the gas. It is extremely 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 ammonia.

A most remarkable property of chlorine is its power of bleaching substances. A half century ago the good housewife bleached her cloth in the sun; now it is done by chlorine. Your white paper is made so by chlorine. It would cost you much more than it does, if the Chemist had not discovered chlorine. 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 some salt in a vessel and pour on sulphuric acid, and set it in a room, it will absorb all noxious gases. 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, but there are various compounds of these elements formed by certain processes which we cannot now explain. Hydrochloric 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 kown 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.

CAPILLARY ATTRACTION.

(From the Marine Farmer.)

There are some of the laws of nature which can be comprehended just as well by the farmer as by the most profound philosopher. Among these laws is that of capillary attraction. We believe we can explain it so as to be easily comprehended, by carefully reading this article. It shows in a simple manner, some of the relations between science and the practice of agriculture.

If you take a piece of glass and dip one end of it in water, you will see the water rise up a little above its level and cling to the glass. The glass attracts the water sufficient to overcome its tendency to a level. Take two cork balls, place them on the water and let them approach each other, and there will be a hollow surface of water between the balls, and they will rush together. Two mill logs in still water will rush together in the same way. If instead of one piece of glass, we put two pieces together, and dip them into water, the liquid will rise up between them. Now, suppose that instead of the strips of glass, we make use of a very fine glass tube not larger than horse hair. Dip one end of this tube in water and it will rise several inches up the inside of the tube. The attraction of the sides of the tube for the water is greater than the attraction of gravitation, so that it ascends the tube far above the level of the water on the outside. This is called capillary attraction. A tube one hundredth of an inch in diameter will cause the water to rise between five and six inches.

Suppose now, instead of the tube, we take a lump of loaf sugar. Dip one corner of it in water, and the water will make up through the whole lump. In other words, the sugar contains an immense number of these capillary tubes through which the water works its way till the whole mass is wet with the fluid. Touch a sponge to the surface of water and it will soon wet it throughout. Take a towel, wet it, twist it slightly, and put one end in a basin of water and hang the other on the outside, and the water will run out of the dish through the towel. Make a dry snow ball and touch its surface to the water and it soon passes through the whole. Suppose again, that you take a tube of glass one inch in diameter and two feet in length, and fill it with dry sand, and set it on end in a little water. In a single night the water will work up through the sand more than a foot. This is an instructive experiment to the farmer, because it shows precisely how our soils are furnished with moisture. Dip a piece of porous wood with one end in water, and it will pass up through the pores. Here are simple experiments enough to establish a simple law in nature—that porous bodies allow water to pass upwards through them.

Let us now notice its application to the soil. If a piece of land be well pulverized, it consists of millions of these capillary tubes, in the shape of pores. Suppose now we have a heavy rain. It passes down through the soil, carrying with it a short distance the soluble parts of the soil, but which are mostly filtered out by the loose earth, a wise provision of nature to retain the nutritious portion of the soil within reach of the roots of plants. But suppose a drought comes on. The surface of the earth begins to dry and the water below begins to work up through the pores of the soil within reach of the plants. Were it not for this provision, one dry summer would make a barren waste of our fields in a short time. Every one may have noticed how a ditch full of water by the side of the road will cause the whole road to be wet. The bank of a stream will be covered with luxuriant vegetation. The peat moss will keep moist at all times on the same principle. Without this principle, our manure heaps would dry up at once, and fail to ferment and decompose.

There is another curious fact. However short the capillary tubes of glass may be, though the water may rise to the surface, it will never run over. So on this principle the water will never overflow the ground by capillary attraction alone. There is still another curious fact. Let these tubes be open at both ends and put them in the sunshine, and the water will not separate from them. We see sometimes akin to this in putting wet moss over anything. It will evaporate very slowly. Were not this check wisely provided for, the surface of the ground would evaporate water so rapidly, that from this cause alone the earth would soon be utterly parched up.

Now a word for the practical application of this simple law. Land, like clay, that is baked hard, has but few pores for the admission of water. Consequently, there is a small supply from below, and such a soil soon becomes perfectly dry. Land that has been carefully tilled will be supplied with moisture from the stratum of earth below bringing with it the soluble salts, such as lime, potash and soda, which have been dissolved out of the earth below the roots of plants, and brought up by capillary attraction within their reach. Farmers are generally aware of the value of hoeing and cultivating the ground to promote this object, and we have only endeavored to explain to them the simple and beautiful manner in which these simple laws operate for their benefit.

There is, however, one point in connection with this subject, which we have never seen discussed, but which we are inclined to believe to be true, that it is of more injury than benefit to a crop to stir the ground when the drought is very severe. We are inclined to the opinion that the evaporation is increased, while the moisture ceases to rise from below, thereby increasing the intensity of the drought. We learn, also, another lesson that the different laws of nature work in harmony. When we have a severe drought, the rains which follow seem to slake and more completely dissolve the particles of soil. Freezing the soil promotes the same object. Hence, it has been noticed that we usually have abundant crops after a severe drought.

The value of this same principle is seen in covering ice in our ice houses. If the melted ice could not pass through the sawdust, and keep up constant evaporation, the ice would all be melted in a short time. Hence another practical lesson may be learned. A large basket filled with ice and covered with sawdust will keep it much longer than in a tight box of the same size. The absorption of water by the skin is another illustration of the use of this principle.

Thus the simple fact of the rise of water in a small tube gives rise to some of the most important principles pertaining to agriculture. It is always gratifying to an enquiring mind to be able to explain whatever comes before us; and we write this article with the hope that some of our readers may comprehend the interesting facts here treated of as they shall hereafter witness them in their daily avocations.

Machinery and Manufactures.

Wood Paper.

The *American Artisan* says;—"The largest establishment in the world for the manufacture of wood paper pulp is that of the Americon Wood Paper Co., known as the Manayunk Wood Pulp Works, situated at Manayunk, Pa., between the Schuylkill river and the canal. These works, covering ten acres of land, have been leased jointly by Messrs. Jessup & Moore and Martin Nixon, of Philadelphia, and are now capable of producing daily from ten to twelve tons of wood pulp. This pulp is now being manufactured into excellent white printing paper by Martin Nixon, at the Flat Rock Paper mills, adjacent to the Pulp Works, and by Messrs. Jessup & Moore, at the Rockland Paper Mills, on the Brandywine Creek, near Wilmington, Del. These pulp works are among the most completely organized and appointed manufacturing establishments we have ever seen. Their erection cost half a million dollars, and the investment in them and the paper mills worked in connection with them is over a million. At the flat Rock Mills there are straw pulp works, of a capacity to produce daily from seven to eight thousand pounds of straw pulp, a certain proportion of which it is found advantageous to mix with the wood pulp. The daily production of paper from these wood and straw pulp works and the paper mills run in connection with them will be fully thirty thousand pounds.

The process by which the wood, after being cut into chips, is reduced to pulp and the apparatus employed in the reduction are the subject of the several patents of Charles Watt and Hugh Burgess, Morris L. Keen and C. S. Buchanan. The process consists in boiling the wood chips in a strong solution of caustic alkali, under pressure in closed boilers, from which the pulp is discharged into expanding chambers, in which it is partly drained, and whence it is afterward discharged into wagons in which it is further drained before being taken to the bleachery, the discharge from the boilers and expanding-tanks being effected by the pressure of the steam above it. The pulp when discharged into the wagons is of a dark grayish brown color, but after having been drained begins to show some promise of eventually assuming the white color it has after the bleaching process. Some idea may be formed of the immense scale on which the process is carried on when we state that the ten boilers with the expanding-tanks and receiving-waggons fill a building 132 feet long and 75 feet wide. The wagons, while receiving the pulp, are arranged upon turn-tables, from which they are run off on a railway running the whole length of the building.

It may appear to the uninitiated that the expense of the enormous consumption of alkali involved in this process would be fatal to its commercial success, but fortunately no less than eighty-five per cent. of the alkali is recovered after every boiling, to be used over again with fifteen per cent. of fresh alkali for the repetition of the process, upon a new supply of wood. To recover the alkali, the liquor drained from the pulp is collected in drains under the floor of the boiling-house, and thence conducted by underground pipes to the evaporating-house, where it flows through evaporating furnaces, subject to heat both below and above. The water having been evaporated in these furnaces, the recovered alkali is collected to be redissolved with the fresh alkali in immense tanks in a building called the mixing-house. In these tanks the dissolution and mixing are expedited by revolving stirrers within the tanks. The evaporating-house is a large circular building, 200 feet in diameter, resembling the locomotive sheds at some of the largest railway depots. The trains of furnaces radiate from the center of the building, and all communicate with one central chimney.

The wood best suited for the manufacture of pulp is of the kinds which are plentiful and the least valuable for other purposes—poplar, hemlock, and white wood. It is brought to the works in the condition of ordinary cord-wood, and it is cut into chips by two immense machines having cutters attached to rotary disks, something like rotary straw-cutters. The feeding-troughs are inclined so that the wood is cut obliquely to the grain. These machines are each capable of cutting up between thirty and forty cords of wood in twenty-four hours. The chips are received in wagons, in which they are conveyed to the pulp-boiling house, and from which the chips are delivered by mechanical elevators into the boilers in which the reduction into puly is effected. The pulp received from the boilers is conveyed to pulp engines like those employed for the reduction of rags, and after having been worked in these engines is run through cleaning-machines, substantially like what are known as cylinder paper-making machines, but having no dryers. From the cleaning-machine the pulp is taken to the bleach-house, and after being bleached is fit to be made into paper in the same way as any other pulp. In the Flat Rock paper mills the wood pulp has mixed with it about twenty per cent. of straw pulp; this mixture making a better paper than the wood pulp alone. The paper made at these mills is of a quality suitable for ordinary newspapers, and much better than is often used, and its price is three cents per pound less than paper of equal quality made from rags.

The entire production of the Flat Rock and Rockland Mills is sold by Messrs. Jessup & Moore from their stores, No. 27 North Sixth street, Philadelphia, and 128 William street, New York."

[Would not this be a great improvement on the "Straw" paper used for some of our Canadian dailies, which is a most unsatisfactory article?—Ed. Journal.]

Production of Aluminium.

In a lecture recently delivered before the Royal School of Mines (England) Dr. Percy said:—"Aluminium is made indirectly. You cannot take alumina, as you can ordinary metallic oxyd, and heat it in contact with a body having a strong affinity for oxygen, and so separate the aluminium; at all events, you cannot do so economically. But we can succeed in effecting the separation by an indirect process. We will take some alumina—that is, the compound of aluminium and oxygen—and mix it intimately with charcoal. We will then moisten the mixture and fashion it into small pellets or large pills. Well, we know that charcoal at a high temperature will tend to combine with oxygen, and we might expect that it would do so in this case, and set free the aluminium; but if I heat one of the pellets of alumina and charcoal alone, even to the highest temperature of our furnaces, we cannot succeed in setting free the aluminium. It holds the oxygen with such tenacity that notwithstanding the high affinity of carbon for oxygen at a high temperature, no reduction takes place. But if we heat these pellets, and then pass over them a gaseous body which has a strong affinity for aluminium, then, by means of this twofold affinity the affinity of the gaseous body for the aluminium, and that of the carbon for the oxygen in the alumina—we effect a disruption, if I may use the expression: we separate the aluminium from the oxygen, but we do not yet obtain the aluminium in a metallic state. Now, the gaseous body to which I allude is chlorine gas. Chlorine is an element which exists, you know, in common salt—chloride of sodium, which is nothing more than the metal sodium combined with chlorine, that wonderful disinfecting gas. Well we take these pellets, put them into a porcelain or glass tube, and expose them to a high temperature, and pass over chlorine gas. We thus get chloride of aluminium and carbonic oxyd gas; and the chloride of aluminium being volatile, passes forward, and may be condensed in any suitable receiver. Here is some chloride of aluminium which has been prepared exactly in that way. Now, you will observe that we have succeeded in replacing the oxygen of this alumina by the analogous element chlorine. That is the first step in the process. Having done this, we have now no difficulty whatever in separating that chlorine from the aluminium by a direct means. We have only to heat the chloride of aluminium in contact with sodium, and the thing is done at once. The sodium having a high affinity for the chlorine, combines with it, forming common salt, and the aluminium is set free in a metallic state. It is necessary to employ certain precautions—such, for example, as an atmosphere of hydrogen. Such is the manner in which aluminium is produced on the large scale at the present time."

Aerated Bread Bakery.*

The making of bread by forcing carbonic acid gas into the dough, instead of generating it by fermentation in the dough itself, or by soda, ammonia, cream of tartar, or other chemicals, has been for several years practised; but in most cases there have been difficulties which baffled the ingenuity of the operators, and prevented commercial success. The quality of the bread was dependant on the quality of the flour to such an extent that good flour that had not the right proportion of gluten would not make good bread; and there were others causes, such as the presence of air instead of carbonic acid gas, which sometimes impaired the bread; and generally there was a peculiar flavor, which the people did not relish, though it was claimed that the novel flavor was the natural and pure flavor, and more agreeable than that of fermented bread, and that it was only suspicion and prejudice that hindered people from prefering it. It was not until the system of Dr. Dauglish was perfected that aerated bread was made entirely satisfactory to people of ordinary taste. In this process there is no hand labor. From the time the flour is emptied from the barrel into the machine until the bread is taken from the baking press, it is not touched by a hand. This must be appreciated by those who know that perspiration from the hands and arms, not to mention feet, more or less mingles with common bread; and that in many cases the perspiration is that of diseased persons, certainly offensive, and perhaps unwholesome.

The leading idea of the process is, to make a mixture of flour and water spongy without fermenting it or adulterating it with chemicals. This idea is accomplished as follows:—The flour is emptied from the barrels, and sifted by machinery. It is thence carried in a small car on a railway to the mixer, which is a strong air-tight vessel that can hold three barrels of flour; and being put into it, with a proper quantity of salt, the cover of the mixer is put on, air-tight. Water is then put into a vessel over the mixer; and the air in this water vessel and in the mixing vessel is then exhausted from them by the air-pump in the tank, which are driven by a steam engine, whose boiler is under the platform on which the pump-tank stands. When the air is exhausted, carbonic gas is let into the mixer and the water vessel, and is also forced into them by pumps, until it has a psessure of two atmosphere. The water is then admitted to the flour in the mixing vessel, and a kneading-fan in the mixing is set to work by the machinery; and in from three to six minutes, according to the proportions of gluten in the flour, the mixing is completed. The dough is then ready to be made into loaves. In order that the apparatus above described may not be idle until the batch is molded into loaves, there is, under the mixer a receiver, into which the dough falls when a valve is opened. As soon as the dough has fallen into the receiver, the valve is closed, and the mixer is ready for another batch, which will be mixed while the previous batch is being molded. At this stage occurs an important part of the process, called "vesiculation" by which a proper texture is given to the dough, by compression of air, within each baking-pan before it receives the dough from the measuring valve. Attached to the receiver is an automatic apparatus, which receives compressed air from the column, so that there is always the required pressure in the vessel in which the dough is measured into the pans. Several pans being filled, the pressure in this vessel, is gradually lowered, so that the bread *rises* gently and steadily, without bursting its gas cells, and losing its carbonic acid gas. When this part of the process is well arranged, the bread has an even, fine spongy texture, without large air-holes, or lumps insufficiently spongy, or "vesiculated."

The delivery door of this vesiculating chamber is close to the oven-door, and the pans in rows on boards as long as the oven mouth is wide, are drawn out of the vesiculator and put into the oven. The oven has in it a revolving apparatus which carries in the pans, and delivers them when the baking is completed. The bread is then shaken from the pans into the baskets in which it is carried to the dealers or consumers, and the baker's hands never touch it or any of the materials of which it is made. In an hour, thirteen hundred and forty-four loaves are made from flour in the barrel; by the old process several hours are necessary to form the sponge, and more time in kneading, raising, and baking.

The company which owns the American patent for this process and machinery claim that their bread has the following advantages:—1st. It is better than the aerated bread formerly made, being free from all unpleasant flavor, more delicate, lighter, and softer. 2d. It is perfectly clean, being made solely by machinery. 3d. It is pure, being made from flour, water,, and salt, without yeast, alum, saleratus, or other adulteration, the raising being by carbonic acid gas, obtained from mollasses, grapes, fruit, etc. 4th. It is delicate in texture, and easily soluble in water, milk, and in the digestive fluid. Its flavor is agreeable, wholly free from the bitterness and sourness often found in fermented bread. 6th. It may be eaten fresh, even by invalids, without harm, and it may be kept for many days. 7th. It is recommended by eminent chemists and physicians, in Europe, and this country, for its digestibility and high nutritive quality. 8th. It is the cheapest bread ever made.

We have tasted this bread, and found its flavor as pleasant as that of any bread we have ever eaten, and far more pleasant than that of the bakers bread in this region. And we have seen testimonials in its favor, from eminent physcians and chemists, which convince us that there is nothing in the mere absence of yeast, and the effect

*From the *American Artisan*, of May 9th, which also contains a large woodcut illustration of the Machinery and bakery, with initial letters for reference. [ED. JOURNAL.]

of fermentation, which can render it less digestible than the best fermented bread, as some have imagined it might be. We therefore regard this process as a great improvement upon the laborious and generally uncleanly old process; and, if it be honestly applied, we may hope that bread made by skilled persons, in large bakeries, will supersede the poor bread made by inexpert domestics, and the still worse bread made by common bakers. Consumers may save much, while bakers make liberal profits, by such a system of division of labor and application of capital.

The Daughlish patents are owned by the Boston Wheat and Bread Company, 1010 Washington street, Boston. Application may be made to this company for licenses and machines.

Cast-iron Columns and Beams.

In cases of fire, where the heat is intense, cast-iron columns and beams become weak. The same is the case with wrought-iron. Hence, although iron makes a safe building for offices, in which there is not enough combustible to heat it above 600°, it is unsafe for buildings in which combustible goods are stored, unless access of air is prevented, so that there cannot be combustion enough to heat the iron above this point. Attempts have been made to protect iron from heat, by plaster and brick-work and by water inside; but there are decided objections to these expedients. Whether wood has been used as the core of a hollow column or beam we do not know; but as wood, when shut up in iron, so that air could not reach it, would be a long time in charring to a depth that would much weaken it, it is evident that hollow cast-iron columns might be prevented from bending under their load while hot, by fitting in pine columns inside, and the pine would greatly strengthen them while at the ordinary temperature; and by shutting the wood tightly, so as to exclude air and moisture, it would be made almost imperishable. Columns thus stiffened need not have so much iron in them as is necessary when they have nothing in them, and the saving of iron might partly pay the cost of the wood. In the same way box-girders might be stiffened with wood; the iron in case of fire, when too hot to bear much load, would preserve the wood from combustion; and the strength of the wood might suffice to hold up the weight, and prevent the crash that usually happens when iron buildings get so hot as they are liable to get when they contain large stores of combustible, and ignorant firemen smash in doors and windows to give free access to the air to make the fire intense.

For dwellings, offices, and other buildings that contain little to heat them, iron alone will make them fire-proof; but for stores, wood that is absolutely excluded from air will be necessary to sustain the load while the iron is weakend by heat.—*American Artisan.*

History of Fire-engines.

The promised work of Mr. C. F. T. Young on fire engines, etc., is published. *Engineering* has some engravings from it, and a brief notice of the first steam fire-engines, built in England and this country. The first were by Braithwaite & Ericsson, who built five; one of them, the "Comet," in 1832, for the king of Prussia. It had two horizontal steam cylinders 12″ bore and 14″ stroke, working pumps 10½″ by 14″, and weighed 4 tons; raised steam in 13 to 20 minutes, and throw 336 gallons per minute. The first American engine was built in New York by Paul R. Hodge, in 1840-1. It had two steam cylinders 9½″ bore and 14″ stroke, driving 8½″ pumps of the same stroke; and threw 1,032 imperial gallons 166″ high per minute through a 2¼ nozzle. It has a short and thick locomotive boiler, surrounded by a dome. Its hind wheels were connected to the engines, and acted as fly-wheels when pumping, and were sometimes used to assist in propelling the engine through the street; but usually were disconnected, and the engine was drawn by two large horses. By this account it appears that this engine was about as effective as the "Cary" and "Storm," self-propellers, built by Lee & Larned, at the Novelty Works, in 1857. We never saw this engine, but we are informed by an old fireman that she worked well. Mr. Carson, who was at one time chief engineer of the Fire Department, makes the same report of her. The reason assigned for her failure to keep in use is, that the insurance companies which built and worked her found the expense greater than the estimated saving to them. As for the public authorities, they, as usual, did not move themselves, and the firemen did not move them. From the engraving and the reports, we judge that this plan of engine is better than those now in favor with the department; and if it were perfected in details and proportions, and fitted with steering gear to make it independent of horses, it would be a good engine.—*American Artisan.*

Wooden Waggon Springs.

A new spring for road waggons has been introduced by the Messrs. Brenditers, of New York, one of the oldest waggon firms in the country. The idea of a wooden spring, it appears, originated with a young house carpenter named Parker, who believed they could be made with greater elasticity, and capacity, while free from the brittle, uncertain and comparatively unmanageable nature of steel. He accordingly worked out the idea, and has succeeded in producing a spring consisting of a pair of bows of hickory, weighing, when finished, and of the proper strength to carry two persons, about six pounds—or about forty-five pounds lighter than a pair of the lightest eliptic springs.

The arches of these springs rest upon the axle as usual; the ends, rising at a moderate angle, meet midway between the axles, and are there champed to a couple of light brackets, which support the body of the waggon, one along the center of each side. It is also demonstrated that the supple hickory wood will yield more gracefully to any jar than even well-tempered steel, especially as all pressure is necessarily exerted in the direction of the pressure is an insurance against breaking under a sharp and sudden strain, such as snaps the ordinary spring by cracking its leaves across. The tough vitality of the wood promises durability, and it needs but a glance to perceive the additional beauty which this method of construction gives to the lines of a light vehicle.

A Water Filter.

At a recent meeting of the Polytechnic Association of the American Institute, Mr. Thompson, of Cayuga, N. Y., thus described his method of making a filter. He divides a deep wooden tub by a tight vertical partition through the middle, perforating the partition at the bottom with numerous small holes. The tube is nearly filled on both sides of the partition with granulated charcoal made from sugar maple, and screened through a mesh one-sixteenth of an inch, the fine dust being separated by bolting. The foul water enters the tub on one side at the top, passes downward and through the small holes in the partition, and rises upward on the other side, leaving its impurities, both solid and gaseous, in the charcoal.

Mr. Thompson stated that one practical difficulty that he had encountered in filters was the adhesion of the water from cohesive attraction to the walls of the filter, down which it flows in narrow channels without passing through the purifying material. To remedy this he now surrounds the filter on the inside with a series of narrow ledges, sloping downward and inward, which conduct all the water into the body of the charcoal.

The best wood for making charcoal for filters is boxwood, but it is impossible to obtain enough boxwood for the purpose. The wood that comes next to this in excellence is sugar maple, and this, consequently, is employed. It must be burned twice, once under turf, and afterward in a tight retort or cylinder, the combustion being continued till all the gaseous products are expelled.

Professor Everitt remarked that the mode followed by the *powder* makers in preparing charcoal is more simple than that described by Mr. Thompson.

Dr. Parmallee observed that the best filtering material is soft brick.

[We have formed a cheap and efficient filter by grinding up a portion of Ohio building stone, washing the sand therefrom, and placing it in a large funnel with a piece of canvas tied over the spout. This is a convenient form for placing under a tap from which persons are accustomed to obtain water to drink.—Ed.]

A Sure Test for Kerosene Oil.

The great number of serious accidents resulting from the careless use of kerosene oil makes its explosiveness a subject of much importance. Three deaths have been caused by it in Lowell within a fortnight. The subject is now before the Legislature of Massachusetts; and efforts are being made to enact a stringent law to prevent the adulterations now practiced. The testimony is very important, and reveals a simple and safe plan by which any of our readers may accurately test the danger or safety of oil before using it. Dr. J. W. Huntoon, of Boston, testified that *good* kerosene oil is not explosive to any dangerous degree whatever, but that it is only when it has an excess of benzine or some other explosive substance that it becomes dangerous. The following test was given before the committee with perfect success, as showing the difference between oil sufficiently pure to be safe, and that which is otherwise:—Fill a tumbler three-fourths full of moderately cool water, and pour one-half of a table-spoonful of oil on it; stir it together, then hold a lighted match over it, and if it takes fire from the vapor before the flame comes in contact with the oil, it is dangerous and ought not to be used, as good oil will not thus ignite, and will not burn readily even when a lighted match is thrown into it, but most of the adulterated oil will burn freely. All refined-oil manufacturers corroborated this testimony.—*Boston Journal.*

A New Method of annealing Wire.

A New principle has lately been introduced in the manufacturing process of wire-drawing, by Messrs. Hibell & Colbourn, of Birmingham. Mr. Hibell is the inventor of the improvement, which consists of an entire alteration of the method of annealing. Under the old system, annealing pots consisted of hollow cylinders of cast iron, closed at the bottom, and furnished with a lid or cover at the top, which was closed nearly air-tight during the annealing process. These pots were built in a furnace, and charged with the articles required to be annealed. When the pots were filled, the furnace was heated to the required degree, and allowed to cool together with the pots. By this process, however, the surface of the wire became more or less covered with scales, which had to be removed by pickling, before the wire could be drawn to the required thickness. By the new process the annealing pots are constructed of two hollow cylinders of cast iron, of different diameters, the smaller one being placed within the larger; a ring-like space is thus left between the two cylinders, which constitutes the chamber in which the articles to be annealed are placed. The bottom of this chamber is closed; and the top is also closed and made air-tight during the annealing process. When these pots are placed on the furnace the flames not only encircle them, but come up through the hollow center, and the wire is thus more thoroughly and uniformly heated. They are made air-tight by a very simple process, and when the wire is taken out it is as smooth as possible—there is no scale about it—and therefore does not require pickling, as under the old system. The quality of the wire also is much improved; it is considerably more ductile, and a considerable saving is effected in weight, as the process of pickling reduces the wire considerably. Under the old system, a No. 4 rod before it could be drawn to No. 18, would require pickling six times, and annealing five times. Under the new system, the same rod requires pickling once, and annealing once. By the old process it would take eleven days to draw the wire to the required thickness, but by the new plan it is done in five days. It will therefore be seen at once that the saving of time, fuel, and vitroil (for pickling) must be very great, while the quality of the wire must be much improved. The new pots take four diameters of wire; they are only 18 inches in depth, but hold 10 cwt. 2 qr. Being so much smaller than the old ones they can be easily moved about.—*Mechanics' Magazine.*

The Theoretical and Actual Power of a Pound of Coal.

The best anthracite coal contains 98 per cent of carbon. Favre and Silberman found that if all the heat is utilized, one pound of carbon in burning will generate sufficient heat to raise the temperature of 8,080 pounds of water one degree of the centigrade scale; and, according to Andrews, it will heat 7,900 pounds one degree. Taking the smaller of these results, 7,900 pounds, and reducing it, we find that one pound of carbon will raise the temperrature of 14,220 pounds of water one degree of Fahrenheit's scale. Multiplying this by Joule's equivalent, 772, and we have 10,977,840 foot-pounds as the quantity of work which one pound of carbon will perform. If we suppose it burned at the rate of one pound per hour, by dividing the foot-pounds of work by 33,000 and by 60 we shall have the horse-power 5½. If all its heat could be utilized, therefore, we should have a horse power from $\frac{2}{11}$ths of a pound of coal per hour. This point is worth remembering—that theoretically we should have a horse-power from two-elevenths of a pound of coal per hour.

The very best engines give a horse-power from about two pounds of coal per hour, and it is a good engine that produces a horse-power from four pounds of coal per hour. An engine that gives a horse-power with two pounds of coal per hour utilizes in work about nine per cent of the whole power of the coal; and one that yields a horse-power for four pounds of coal per hour, utilizes about four and a half per cent of the power of the coal.—*Scientific American*

Fare Indicator for Hacks.

An ingenious little machine has been put on some of the Parisian hacks. It indicates to the passenger who engages it, at once the time he is riding, the distance he has made, and the price he has to pay, according to the official regulations.

Breaking up Large Castings.

Mons. Le Gugenheim has communicated to *Les Mondes* a simple and ingenious method of breaking up large masses of cast-iron. He drills a hole about a third through, fills it with water, inserts a steel plug, and strikes the plug with a steam hammer, or any other means to give a powerful blow. The mass is generally split at one blow.

It appears to us that this process may be applied to split stones. Drill a row of holes, fill them with water, drive into them plugs, which have pipes through them, and are connected with a hydraulic press. Strike the same as directed by Mons. Gugenheim. The force of the blow will be diffused through all the holes; and, if the holes be properly situated, the split will be more accurate than is attained by common methods. The advantage will be that the force is applied at the same instant throughout the pipes and holes.—*American Artisan.*

Beet-Root Sugar in France.

We have before us the official returns relative to the manufacture of beet-root sugar down to the end of February. The sugar makers have had a magnificant campaign, as the season is called in France, the roots which yield on the average 5 or 5½ per cent. of their weight in sugar gave this year, in many instances, 7½ per cent. of crystallized sugar: this is partly owing to the beet-root itself, and partly to the improvements which have been made in the modes of manufacture which enable the sugar maker to save more from the molasses.

The increase, as compared with the previous season, is most extraordinary; the total quantity produced to the end of February was 242,114 tons against 141,802 tons in 1864-5, an excess of more than a hundred thousand tons, or about 70 per cent. To this will have to be added the produce of the month of March, not yet published; but as the quantity of sugar and molasses in the course of manufacture at the end of February was upwards of twenty thousand tons, there is no doubt that the total make of the season will exceed 250,000 tons. It appears that there were twenty-one more sugar houses at work during the campaign now just concluded than in the preceding season. The stock in hand at the commencement was less by about 2500 tons in the former than in the latter case; the home consumption has been larger by 50 per cent.; the distilleries took nearly twice as much as during the preceding season; and the exports, which were 1598 tons in 1864-5, rose to 35,948 in 1865-6. The stock in hand is 64,314 tons against 30,920 on the 28th February, 1865.

Such extraordinary figures would revolutionise many trades, but the demand for sugar is so large and so general that the world seems ready to take all that can be produced, and England is one of the most urgent customers. It is well to add that it is now confidently stated in well-informed quarters in Paris that still greater improvements in sugar making are likely next season still further to increase the yield in sugar and to diminish the quantity of molasses, it which case it is thought that a large mass of inferior beets, which cost too much to convert into sugar, will be left to the distillers. This will have the tendency to bring down the price of raw sugar to a certain extent, especially if the manufacture continues to develope itself.—*The Grocer*

Safety Apparatus for Steam Boilers.

The invention of Mr. J. M. Courtauld, of Brocking, consists in the employment of a copper or other suitable metal tube, carried through the upper part of the boiler, and descending below the proper working level therein, and in connecting to the upper part of the tube carried to a greater or lesser height from the top of the boiler a rod, which, by the expansion of the tube, acts upon a safety valve, when the water falls below the proper level, and allows steam to escape from the boiler.—*Mining Journal.*

[This gage is an American invention and has been in use in this country for some time. It is owned by Messrs. Carpenter & Van Riper. It works satisfactorily. Eds.—*Scientific American.*

French Glove Manufactures.

It is estimated that the value of the gloves manufactured in France is between $8,000,000 and $10,000,000, and is still rapidly increasing. The kid and lamb skins used for glazed gloves are dressed at Paris, Grenoble, Annonay, Romans, and Charmont. The Paris manufacturers, whose gloves are most highly esteemed, employ workmen from Vendome.

Useful Receipts.

Citric Acid in Cancer.

The cooling and tonic effects of lemon juice are well known. Citric acid is to all intents and purposes crystalized lemon juice, and is often used as a substitute for lemons in making lemonade, etc. An Italian physician, Dr. Brandini, finding that a patient, with a cancer of the tongue, received great relief in eating lemons, was induced to try the effect of citric acid on other cancer patients, which he did much to their relief. In a case of hopelessly incurable cancer, under our own observation, it has been used with the happiest results, and afforded a greater relief from pain than any other application that has been tried. We found that this use of citric acid was not known to the physicians of our acquaintance, and we give it for the benefit of our medical readers. The crystalized acid is used one part by weight, to 90 parts of soft water. The weight of a common nickel cent to a pint of water comes sufficiently near. The solution is applied by moistening a piece of lint, and renewed when the pain returns.

Protection of Iron.

It has been ascertained that sheet iron may be protected from oxidation by coating it with a thin fused layer of magnetic oxide. For this purpose it is embedded in native oxide of iron in a state of powder, and kept at a red heat some hours.

Process for Silvering.

An employee of the Bavarian Mint has published an improved process for silvering copper, brass, and other alloys by means of a solution of silver in cyanide of potasssium; the difference from the usual method consists in the zinc-filings, with which the objects are coated; when the solution is applied, an immediate deposition of a much more durable character taking place. The filings are easily removed by rinsing in water, and may be used repeatedly for the same purpose. Metallic iron may be coated with copper in the same manner, by substituting for the silver, a solution of copper in cyanide; and over this copper deposit a coating of silver may be applied.

To Remove Paint from Clothes.

It is suggested in the London *Chemist and Druggist* that chloroform is an excellent medium for the removal of stains of paint from clothes, etc. It is found that portions of dry white paint, which resisted the action of ether, benzole, and bisulphide of carbon, are at once dissolved by chloroform.

Destruction of Vermin.

A correspondent in the *Builder* says that chloride of lime placed in rat or mice holes will drive away these pests, as well as other description of vermin. Too much should not be used at a time, as its smell is, to some people—very unpleasent; nor should it be placed where there is china, or polished iron or steel goods, as it will injure the one and rust the other. [We have tried it, and noticed the entire absence of rats until the peculiar pungent smell of the lime had ceased.—Ed.]

Artificial Stone.

A hard factitious stone, which in some respects may take the place of Turkey or Arkansas oilstones, can be made by mixing 24 parts lithographic stone pounded into coarse powder, 4 borax, 1 saltpeter, and 4 very fine emery. This is placed in a mold, subjected to a heavy pressure—twenty tuns to the square inch—and then heated to a white heat. Cutting or polishing wheels may be made in this way cheaper than they can be cut out of the hard stone.

Black Walnut Polish.

Take asphaltum, pulverize it, place it in a jar or bottle, pour over it about twice its bulk of turpentine or benzole, put it in a warm place, and shake it from time to time. When dissolved strain it and apply it to the wood with a cloth or stiff brush. If it should make too dark a stain, thin it with turpentine or benzole. This will dry in a few hours.

If it is desired to bring out the grain still more, apply a mixture of boiled oil and turpentine; this is better than oil alone. Put no oil with the ashphaltum mixture, as it will dry very slowly. When the oil is dry the wood can be polished with the following:—Shellac varnish, of the usual consistency, two parts; boiled oil, one part. Shake it well before using. Apply it to the wood by putting a few drops on a cloth and rubbing briskly on the wood for a few moments. This polish works well on old varnished furniture.

Bell Metal.

Melt together, under powdered charcoal, 100 parts of pure copper, with 20 parts of tin, and unite the two metals by frequently stirring the mass. Product very fine. Another method is to take of copper 3 parts; tin 1 part, as above. Some of the finest church bells in the world have this composition.

Cure for Bugs.

With a small brush or feather apply *oil of tar* to the parts where insects are known to be, or are likely to secrete themselves, and it will immediately destroy them, and effectually prevent their location in that place. Too much tar should not be applied, as it is decidedly odoriferous—the smell, however, is of a healthy and purifying nature, and no inconvenience will arise if used in small quantities. Thorough ventilation and cleanliness of bedrooms is, no doubt, a sure preventive and is better than a cure.

Fusible Metal.

The "fusible metal" *par excellence* has hitherto been composed of bismuth 2 parts, lead 1, and tin 1, and its melting point is about 169° F. But an alloy, composed of 4 cadmium and 5 each bismuth, lead, and tin, fuses at about 118° F.

To keep Milk sweet.

Milk may be kept sweet by having it constantly in the presence of fresh water. In a milk-room provided with tubs, in which the water is changed twice a day, milk will not be soured even by lightning.

CURE FOR SEA SICKNESS.—Surgeon C. W. Walsh, in a letter to the *Medical Times and Gazette*, states that he has found two grains of oxalate of cerium and one drachm of compound tincture of valerian invariably gives great relief in sea sickness. The dose may be administered at intervals of thirty minutes.

Statistical Information.

The Extent and Resources of the British-American Provinces.

Canada contains 330,000 square miles; Newfoundland, 40,200; New Brunswick 27,710; Nova Scotia, 18,600; Prince Edward Island, 2,131; British Columbia, 213,500; Vancouver Island, 16,000; Hudson Bay Territory, 1,570,500; making 2,218,641 square miles, a territory nearly twice as large as all Europe, if we deduct Russia.

According to the statistics of 1861, the area of land held by private individuals in the North American Provinces was: In Upper Canada, 17-708,232 acres, of which 6,051,619 were under cultivation. In Lower Canada 13,680,000 acres, of which 4,804,325 were under cultivation. In Nova Scotia 5,748,893 acres, of which 1,028,032 are are under cultivation. New Brunswick, 6,637,329 acres, 855,108 under cultivation. Newfoundland 100,000 acres, 41,108 under cultivation. Prince Edward Island 1,365,400 acres, 368,127 acres under cultivation. The annual agricultural products of the Provinces now yields $150,000,000. Competent authorities have given the actual annual yield of the Fisheries at $20,000,000, much of which is lost by those who should profit by it, and has gone to the enrichment of foreigners. "The British North American Provinces," says a recent writer, "possessing 5000 miles of sea coast, if consolidated into one power, would possess not only all the materials necessary for constructing ships of war, but also bands of skilful and hardy seamen wherewith to man a powerful fleet. The tonnage of the commercial marine of the Provinces, inward and outward, required for the accommodation of trade is 13,419,614, of which Nova Scotia requires 1,432,954 tons, New Brunswick 1,386,-980, Prince Edward Island 167,098, Newfoundland 1,392,345, and Canada 9,040,337. The sea going tonnage of Canada amounts to 2,183,000 tons. In 1832 the tonnage of vessels built in British North America amounted to only 33,776 tons. In 1863 the number of vessels built was 645, with a capacity of 219,763 tons (according to the speech of the Finance Minister, February 7, 1865), costing $9,000,000. According to the last census returns the number of sailors and fishermen of the Colonies was 69,256, and the population of the six Provinces, by the census of 1861, was: Upper Canada, 1,396,-091; Lower Canada, 1,111,566; Nova Scotia, 338,857; New Brunswick, 252,047; Newfoundland, 122,635; Prince Edward Island, 80,857; total, 3,294,059. The whole population is at present over 4,000,000. The imports and exports of 1863 were:

	Imports.	Exports.	Total.
Canada.........	$45,964,493	$41,831,532	$87,776,025
N. Brunswick.	7,764,824	8,964,784	16,729,608
Nova Scotia ...	10,201,301	8,420,968	18,622,359
P. E. Island...	1,428,028	1,627,540	3,055,568
Newfoundland	5,242,720	6,002,312	11,245,032

Besides a fertile soil and magnificent forests the Provinces possess inexhaustible mineral resources. Gold, iron, coal, and copper are found in Nova Scotia in abundance, and the coal beds are not exceeded, in richness and availability for mining, by any in the world. The mineral wealth of New Brunswick is also enormous, and her coal formation is of a thickness almost incredible. Canada has her mines of copper and iron ore in abundance, which only need development to become a great source of wealth. Gold has been found on the Chaudiere and elsewhere to some extent. The coal of New Brunswick will, by and by, be required to work the furnaces in the iron mines of Canada. Reciprocal free trade between the Provinces is an absolute necessity forced upon them by the termination of the Reciprocity Treaty. They will find in a commercial union of their interests, and a unanimity of purpose with regard to their foreign trade relations, more than a sufficient compensation for its loss. It is plain that the British North American Territory, possessing such magnificent resources, should be a *power* on this continent.—*Trade Review.*

British Revenue.

The following is a statement of the revenue of the United Kingdom for the years ended 31st March, 1865 and 1866, with the sources from whence it has been derived:—

	Year ended March 31, 1866.	Year ended March 31, 1865.
Customs........................	£21,276,000	£22,572,000
Excise............................	19,788,000	19,558,000
Stamps	9,560,000	9,530,000
Taxes	3,350,000	3,292,000
Property Tax.................	6,390,000	7,958,000
Post Office.	4,250,000	4,100,000
Crown Lands.................	320,000	310,000
Miscellaneous................	2,878,292	2,993,436
Total..................	67,812,292	70,313,436

Canadian Imports and Exports of Wool.

	Imports.	Exports.
1859..............................	$125,265	$400,272
1860..............................	142,204	402,234
1861..............................	295,126	434,199
1862..............................	444,533	724,830
1863..............................	275,074	974,349
1864 half-year.................	241,861	392,373
1864-'5	265,232	1,353,168
	$1,789,295	$4,681,425

The Wheat Trade of the World.

A recent French calculation presents the price of wheat as follows at various points and in various countries: France 21f. 35c. per quintal, Belgium 22f. 71c. per quintal, Stettin 23f. 84c. per quintal, Cologne 21f. 55c. per quintal, Hamburg 25f. 50c. per quintal, Mayence 22f. per quintal, Rotterdam 19f. 85c. per quintal, Bale 23f. per quintal, Zurich 23f. 50c. per quintal, Vienna 17f. 90c. per quintal, Turin 24f. 25c. per quintal, Genoa 25f. 35c. per quintal, London 26f. per quintal, Liverpool 25f. 85c. per quintal, St. Petersburg 22f. 80c. per quintal, Odessa 17f. per quintal, New York 24f. 25c. per quintal, Alexandria 18f. 50c. per quintal, and Santander 19f. 50c. per quintal. The highest price would thus appear to have prevailed at London; and the lowest at Odessa.

Progress of Patents in United States.

Year.	No. of Applications.	Patents issued.
1850	2,193	995
1851	2,258	809
1852	2,639	1,020
1853	2,673	958
1854	3,324	1,902
1855	4,435	2,024
1856	4,960	2,502
1857	4,771	2,910
1858	5,364	3,710
1859	6,225	4,538
1860	7,653	4,819
1861	4,643	3,340
1862	5,038	3,521
1863	5,133	3,780
1864	6,740	4,637
1865	11,860	6,220

Streets and Traffic of London.

The crowded condition of the streets of London—that is, of the City—has been made the subject of a report by Mr. William Haywood, engineer of the Commissioners of Sewers.

* * * * * * *

According to the figures of Mr. Haywood's report, the population of the metropolis was 958,863 in 1801; and in 1861—the time of the last census—it had trebled itself, and was 2,803,989. It may therefore be assumed that the population doubles itself in about 40 years, and that, therefore, 40 years hence there will be six millions of souls dwelling within the metropolitan area. Within the 10 years—between 1851 and 1861—the resident population in the 10 most densely peopled districts of the 26 comprising the whole metropolis had decreased. The future density of the population of the yet uncovered area of the suburbs has been calculated, for purposes of the sewage interception scheme, at 30,000 per square mile. The area of the City is nearly 1 square mile, and the population diminished from 129,387 in 1851, to 113,387 in 1861, when it was lodged in 13,431 houses, at the rate of 8½ inhabitants to each house. This resident population is likely to still further decrease, as it will pay to erect lofty warehouses or tires of offices on the valuable ground now occupied by private houses. The sleeping population is mainly composed of the poorer labouring classes and of those left in charge of the various premises. The real population is that which frequents the City every day for business purposes—which goes there to make money, invest money, to lay out money, or to draw money; for it may be assumed that, of the multitudes who crowd the City thoroughfares on foot and on wheels, an infinitesimal per centage come for pleasure purposes. The public ways of the City consist of 7 miles of main thoroughfare, 28 of collateral thoroughfare, and 15 of minor streets, courts, alleys, passages, &c. In 1860 there were 48 points of inlet to the City, the total traffic of which was, on certain days, taken by the police. These inlets consisted of 3 bridges; 83 carriage-ways, with footways; 3 were footways only; 6 were steamboat-piers; and 1 was a railway-station. Since that date 4 more railway-stations have been opened, and a fifth will shortly be opened. In 1848, upon a day in May, the total number of persons entering the City between eight o'clock in the morning and the same time at night was 315,099; twelve years afterwards the number of persons entering the City was 700,000—that is to say, nearly a fifth of the whole population of the metropolis. Mr. Haywood calculates that increase of population and increase of traffic have raised day visitors of the City to three-quarters of a million, or as many as the combined population of St. Marylebone, St. Pancras, St. George, Hanover Square; Islington, and Lambeth in 1861; three times the population of Liverpool, four times that of Manchester, and more than the total population of Dublin, Edinburgh, and Glasgow combined. "And this is the true population of the City." Of those entering the City in 1860 there were walking 535,535; on wheels, 171,068; making a total of 706,621. Between 1850 and 1865 the mean increase of wheeled conveyances of all kinds at eight principal City inlets was 56·50 per cent. in 15 years ending in 1865; while during the same period the metropolitan population had only increased 33·62 per cent. Of the daily foot-traffic 54 per cent. entered by eight inlets, which are also the principal ways for wheeled traffic. The chances of accident at street crossings may be estimated from the following figures:—There crossed between eight a.m. and five p.m., at the junction of Mansion House Street, Prince's Street, Threadneedle Street, Cornhill, and King William Street, 56,253; at King William's Statue, by Cannon Street, and in various directions, 42,395; at Ludgate Hill, Fleet Street, Farringdon Street, and New Bridge Street, 37,075; at Cornhill and Leadenhall Street junction, 28,080. The great streams of traffic go first north and south; and, secondly, east and west. London Bridge is the narrow strait through which this ever-increasing north and south traffic is principally forced. The districts on each side which must use London Bridge contain a population of little short of a million. For this traffic there is one bridge, with a carriage-way of 35 feet wide, and two footways of 19 feet together. In ten years to 1860, after the Brighton Railway opened its Victoria Station, the wheeled traffic over London Bridge had increased from 13,000 to 16,000. Between 1860 and 1865, new Southwark Street was opened and Charing Cross Station, and Southwark Bridge was made toll-free; nevertheless, the wheeled traffic of London Bridge had risen to 19,400.—*British Gas Light Journal.*

Dr. Gallard stated, in a paper to the French Academy, that in many districts where intermittent fevers had prevailed from time immemorial, the drainage effected by railway works removed these disorders.

Photography.

A New Photographic Washing Apparatus.

The importance of having photographic prints thoroughly washed can never be too strongly insisted on. A breach of this duty proves disastrous not only to the permanency of the picture, but in many cases to the reputation of the photographer, and incidentally to our art-science itself. So much does it affect the photographer that it would not be difficult to point out instances in which once flourishing businesses have dwindled down to a serious extent through the bad reputation attached to the permanency of the prints issued. There are, indeed, few possessors of well-stocked albums who are not alive to this fact, that the otherwise high reputation attached to the name on the back of a photograph does not necessarily afford a proof that his photograph will resist the ravages of time for even a very limited number of years.

The majority of cases of photographic fading may be traced to the hyposulphite of soda, which, by so intimately associating itself with the fibers of the paper, is difficult of removal, and which, if not perfectly removed, induces an action by virtue of which the print eventually becomes destroyed. To remove the hyposulphite of soda in the most perfect manner, and in the shortest time possible, is to insure to photographs a longer tenure of existence than they otherwise would have held; and any means by which these requirements can be met, are entitled to the greatest consideration.

Availing ourselves of an invitation from Colonel Stuart Wortley to visit Rosslyn House, to see a new form of washing apparatus, we went and saw it in action. It proved to be an instrument invented and patented by Mr. John E. Grisdale.

Before entering upon a minute description of this washing machine, we may state that it is capable of washing a full charge of prints in twenty minutes, and that so perfectly that at the end of this time some ordinary tests for hyposulphite of soda fail to indicate its presence. But we shall allow its inventor to describe the washing apparatus in his own language. "My invention," he says, "relates to a peculiar construction and arrangement of centrifugal machinery or apparatus for washing photographic prints, and consists, according to one arrangement, in the employment of a peculiarly-constructed revolving drum in combination with a trough, in which such drum is partially immersed. The prints to be washed are taken from the water in which they have been placed on their removal from the fixing or other bath, and are packed in one or more piles, which piles are placed round the circumference of the drum, each pile being composed of alternate prints and sheets of wire gauze or other open or reticulated fabric, so that no two prints shall be in contact with each other. These piles are held in their places on the drum by means of open frames or gratings, which bear against the opposite surfaces of each pile, and are secured to the arms of the drum by screws or otherwise, the whole or a portion of such frames or gratings forming part of the drum itself. Or, according to another arrangement, the piles above described may be laid flat upon a disk, which is made to revolve either vertically or horizontally in a trough or cistern, provision being made in the horizontal arrangement for allowing the piles to be brought in or out of contact with the water as required; or in lieu of the photographic prints being disposed in the form of piles or packs round a drum of revolving disk, they may be laid separately and individually round the surface of a drum, a webbing of open or reticulated fabric being wound on such drum simultaneously with the placing of the prints thereon, so as to interpose a thickness of the fabric between each succeeding layer of prints. The process of washing consists in alternately driving out the moisture from the prints by the centrifugal action of the revolving drum or disk, and saturating the prints again. During the first part of the process, the prints are not immersed, but when the second part of the process, namely, the saturation, is to be effected, the trough or cistern is to be supplied with water, or the prints may be brought down into the water, and caused to revolve therein and thoroughly saturated, when the water may be run off from the trough again, or the drum or disk elevated, and the moisture expelled by centrifugal force as before."

The instrument is neat and compact, and immediately strikes any intelligent observer by the efficiency of its action; for, by an amount of manual labor capable of being performed by a child, the drum is rotated with extreme rapidity, and the freshly-supplied water is forced through every pore of the prints, the consequence being the elimination of every trace of hyposulphite of soda in a very brief space of time.—*British Journal of Photography.*

Varnishing Photographs.

In varnishing photographs M. Bussi first brushes the prints over with a solution of gum arabic, and when this is dry, applies a coating of collodion. The following are the proportions recommended;—1. Clear transparent gum arabic, 25 grammes; distilled water, 100 cub. cents; dissolve and strain. 2. Gun cotton, 3 grammes; alcohol, 60 grammes; ether, 50 grammes. By this double varnish the inventor ensures the prevention of the proof.

Photography on Silk.

The following formula for printing on silk is one that, on the whole, has given me the greatest satisfaction, and is identical with the one published by me two years ago:—

Pour 20 ounces of boiling water on 100 grains of chloride of ammonium, and 60 grains of Iceland moss.

When nearly cold filter and immerse the silk in it for 15 minutes. To sensitize, immerse the silk in a 20-grain solution of nitrate of silver for 16 minutes. Let the nitrate bath be rather acid. When dry, prepare for printing by attaching the silk to a piece of cardboard a little smaller than itself, by turning the edges over and fastening with small bits of gummed paper. Slightly overprint. Wash in two or three changes of water, and tone in a gold bath made thus:—20 ounces of water, 2 drachms acetate of soda, 4 grains chloride of gold, and a few grains of common whiting. Filter and keep for 24 hours before using. Let the prints be toned slightly bluer than they are required to be when finished. Rinse them in water, and fix in a solution of hypo., 4 ounces to the pint of water. 20 minutes is ample time for fixing. Wash well.—*H. Cooper, Photographic News.*

Photo-lithography with Half-tone.

The production of printing surfaces on stone, zinc, etc., by the agency of photography, has occupied the attention of experimentalists for many years, and in many respects a high degree of success has been obtained. The process of Mr. Osborne, for the working of which a company has recently been formed in America, gives results in line and stipple which leave little to be desired. Mr. Ramage of Edinburgh; Mr. Lewis, of Dublin; Col. James, and many others, have also attained great excellence in the same direction. Messrs. Simonau and Toovey, of Brussels, have attained some success in the production of half-tone, and the attempts of Col. James in the same direction have not been without promise. Still the fact remains, that no process for the actual production of photographs from nature by means of photo-lithography is in practical working, or has hitherto established a position, and that such a process remains an important desideratum, any means of meeting which would be hailed with a glad welcome by all concerned in the graphic arts.

Unless we are mistaken in our estimate of a series of specimens before us, by Messrs. Bullock Brothers, of Leamington, a process which they have recently patented bids fair to meet the long-felt want most successfully, and to render with a fair amount of delicacy, the true photographic gradation of negatives from nature. The subjects before us, consisting of landscapes with variety of foliage and architecture, are exceedingly excellent, and present all the good points of a good photograph, perfect gradation and half-tone, and great brilliancy, differing little in general effect from good silver prints from the same negatives.

Messrs. Bullock have followed in paths already partially trodden, but have made such practical deviations and modifications as have led them to success where others have only failed. Their aim is to secure in the transfer a suitable grain, so as to obtain the kind of gradation possible in lithography, without producing a coarse or woolly effect. Among the various methods by which they propose to effect this end, the plan used in producing these examples seems to be at once the most practical and efficient. A transfer paper is prepared with a plain solution of gelatin, and when this is dry a grain is printed on it from an aquatint plate. Paper so prepared can be kept in stock, and rendered sensitive when required by immersion in a solution of bi chromate of potash. It is then ready for printing and transferring in the usual manner, and produces on the stone a photographic image, the continuous gradation of which is broken up into the stippled gradation of an aquatint plate. This is the broad principle; but it admits of much ingenious modification in practice, which is so far effective that it produces the most successful and promising examples of photo-lithography with half tone which we have yet seen.—*London Photographic News.*

Re-touching Negatives,

BY J. GRASSHOFF.

By the above it is to be understood only a touching up and improving of the plates, which is especially of advantage in the portrait department, especially if it aid in the removal of freckles and brown spots which show themselves in the complexion, as disturbing and too dark. Following the instructions in a communication of Herr Hummel, photographer, I employed for this purpose the common soft lead pencil, and that in simple application to the varnished plate.

For parts to be very strongly re-touchad (*e. g.*, in the case of enlarged copies of pictures, where the fibre or texture of the paper proves a disturbing cause) it is preferable to use a black "oil chalk" (*creta polycolor*). With this it is more easily drawn, especially in the dark part under the eyes, etc., which are often too dark. In order to have a clearer and better view or insight into the work itself, it is best to work at a lamp which has an opal glass shade. A round piece of pasteboard, bent so as to suit, and in which a hole is cut of 1½ to 2 inches, is put over this as a dark shade. The plate is so directed that the light is always chiefly thrown upon the head, or the part to be wrought upon. If one works by day, however, lay the plate on a fine thin-cut pane of glass; cover the varnished side with a piece of pasteboard, which has a sufficiently large piece cut out, hold the whole toward the window, and get the light cast only on the parts to be worked on. By this arrangement the eye is kept from over exertion, and protected from the dazzling light; and the attention is concentrated on those places which are just to be worked upon. One perceives then the defects to be covered more easily and quickly.

The lead pencil or the "oil chalk" adhere both fast enough to the layer of varnish. There is no danger at all of the one or the other coming off on the paper in the copying.

Spots and pin-holes are best closed with India ink.

A certain skilfullness, however, is always necessary for this easy method, especially in the fixing of the lights; but one can very soon and very easily make himself thoroughly acquainted with the work, since it is always easier to work with pencils than with brush and colors. It should be noticed that in places where there is pencilling, the oil chalk no longer adheres. In such places, therefore, where lead pencil has not sufficiently covered, India ink must be used to intensity.—*Photographische Mittheilungen.*

Photographic Pictures produced by Pressure.

At the last meeting of the Photographic Society, in Paris, M. Girard described some experiments illustrating Mr. C. Lea's recent discovery of the production of latent photographic pictures by simple *pressure.* A plate is prepared and sensitized in the usual way, and a sheet of note-paper is written upon with a style, so that the letters may stand in some relief; this paper is pressed upon the sensitized plate, and when the ordinary iron developer is applied to the latter a copy of the words is obtained. All this is done in the dark; the action of light is completely excluded. We have thus, as stated by Mr. Lea, a *mechanical* cause as powerful as light in producing a latent image upon a plate.—*Paris Correspondent of the London Chemical News.*

White Enamelled Plates for Photography.

In a paper read before the Philadelphia Photographic Society by Mr. Wenderoth, he gives the following as the method by which he prepares white tablets for photographs. He coats the plate—a ferrotype or a glass plate—with a solution of albumen one ounce, water five ounces. He then adds to plain collodion so much fine precipitated chalk as will make a covering so thick as to prevent the plate from being seen through it. It should be poured on in the same manner as ordinary collodion, and care taken to prevent lines from being formed. Before coating, the collodion should be well shaken up, and then allowed to subside for a minute or two, to allow the heavy particles to fall to the bottom. When quite dry, coat with twelve parts of albumen and eight parts of water, adding two grains of chloride of ammonium to each ounce of the solution. Sensitize for one minute in a seventy-grain ammonia-nitrate of silver bath, then fume, print, and tone in the usual manner.

"Magic Photographs."

The familiar experiments of the laboratory have in the present day a great tendency to become the magic of the drawing room. Magic photographs are among the most recent of the scientific toys which take the public attention. These are of various kinds. The first and most common mode of producing them consists in placing an apparently common piece of blotting paper upon an apparently plain piece of white albumenized paper, moistening the two and producing at once a photographic picture. The explanation of this is simple, and is doubtless familiar to old photographic experimentalists; we practiced the same feat a dozen years ago. It consists in bleaching, until it is white and invisible, by means of bichloride of mercury, a silver print; then taking a piece of blotting paper which has been previously immersed in a solution of hyposulphite of soda, and placing it in contact with the immersed print; this, when moistened, at once darkens the bleached image, and a picture, consisting chiefly of sulphide of mercury, is produced. We have received some examples from Mr. Swan, and details will be found in Dr. Vogel's German letter in this number. We have just received from Mr. Hughes's establishment a still prettier application of parlor magic, in which, by placing an apparently blank piece of paper into a solution—the material for which is inclosed in the packet—a beautiful blue print is produced. This is doubtless the result of one of the applications of the Cyanotype process of Sir J. Herschell, which may be made to produce many beautiful transformations. — *Photographic News.*

Magic Photography.

Two sheets of paper are supplied to the purchaser, together with instructions. One of these sheets is albumenized, the other is a sheet of blotting paper. There is no picture visible on the albumenized paper; but when, in accordance with the instructions given, the sheet of blotting paper is moistened by means of a few drops of water and pressed in contact with the face of the albumenized paper, a picture immediately springs into existence. The question now arises, How is this accomplished? Light has evidently nothing to do with it, seeing that the same phenomenon occurs both in sunshine and in comparative darkness.

The following is the method by which these "magic photographs" are produced:—Print a picture on albumenized paper in the usual way, taking care not to print so deeply as ordinarily. Fix the print (without toning) in plain hyposulphite of soda, wash thoroughly, and then immerse it in a saturated solution of bichloride of mercury till the image disappears. Again wash thoroughly and dry. The paper now appears like a piece of plain albumenized paper, without any appearance of a picture on it, and in this condition it may be kept for an indefinite time.

To cause the image to appear instantaneously and in more than its pristine vigor, dip the paper in a weak solution of hyposulphite of soda; or, preferably, dip a piece of white blotting paper in a solution of hyposulphite of soda and dry it. This prepared paper may be kept in contact with the latent picture so long as moisture is excluded. When it is required to develope the image, moisten the blotting paper with common water and press it against the albumenized surface of the print, when, presto! the "magic photograph" is produced, and is, when well washed, as permanent as many of the photographs of the present day. The image, by being again immersed in the bichloride of mercury solution, may be once more rendered invisible, and by the hyposulphite solution again restored as often as may be desired.

The amusement that can thus be introduced into the social circle by the "magic photographs" may be easily conceived.—*Brit. Journal of Photography.*

Miscellaneous.

The Component parts of Oil.

Oils and fats incline into each other, their difference in consistence being only a relation to temperature, and not necessarily a distinction in chemical constituents. The presence of acids in oil is the cause of the formation of soaps, or more properly speaking, salts, on coming in contact with alkalies. Oils are of the organic products of nature, not including the subterranean oil now undergoing exploration. Oils are defined as being either fixed or volatile. The first cannot be distilled without undergoing decomposition, such as olive oil; with the oil of turpentine as a good example of the latter. The ultimate analysis of Codliver, Neatsfoot, Cocoa and Olive oils, is as follows:—

	Carbon.	Hydrogen.	Nitrogen.	Oxygen.
Cod-liver...............	80.18	13.72	0.246	5.854
Neatsfoot	64.33	12.50	0.054	23.100
Cocoanut	60.62	12.49	0.060	17.830
Olive.........	69.38	13.47	0.058	0.092

From the above it will be observed that codliver oil differs materially from the other oils in its composition. Olive oil has the closest correspondence in elementary composition with codliver oil, but is medically inert, while cocoanut oil is said to be comparable in efficacy in phthisis with the oil obtained from the cod. But as some credit has been given to codliver oil, its gunuineness may be tested as follows,—viz, In sulphuric acid we have a reagent by which oils may be tested. A few drops of this acid produce in olive oil a grey colour; while poured drop by drop into codliver oil, sulphuric acid produces a centrifugal movement, particularly where the drops fall; and at the same time a beautiful violet colour, which changes the moment the mixture is agitated, and ultimately to a rich Sienna brown. These colours are due to the action of sulphuric acid on the constituents of the bile contained in the oil, and perhaps to a trace of iodine. To take a half teaspoonful of the oil, spread on a white porcelain plate, and adding one or two drops of concentrated sulphuric acid, will readily complete the test and decide the question of genuineness.—*Oil Trade Review.*

The Burmese Oil Distillery.

A great improvement has recently taken place in the management of the factory at Rangoon. The canal which was commenced some time ago was completed in February, and the boats can now come to within ten yards of the works, so that the saving in the cost of coolie labour must be an important item in the Company's accounts. The burning oil produced by the Company is said to be of good quality. The mineral turpentine is very clear in colour, and the Company have produced an article under the title of "Tarozine" which is of great utility in washing ships' decks and beat bottoms. The *Rangoon Times* of February 24 states that the manager of the Company is manufacturing an article which will be of great use in greasing machinery, cleaning and preserving guns, and our contemporary hopes to hear soon of soap and candles being made at Naikbhan, and if the agents of the Company would but go to the necessary expense for machinery for soaps and candles a profit would be made upon these articles. The *Rangoon Times* also recommends that the oil as made at Kemendine should be used for lighting the town, and we hope the Company will consider the suggestion.—*Ib.*

A Romantic Oil Story.

Our contemporary, the *Philadelphia Commercial List and Price Current*, of March 10, tells a romantic story, which results in a most umistakeable petroleum moral, of how a steady, well-to-do farmer, of Laporte, Indiana, had a "ne'er-to-do-well" brother, for whom, some ten years ago he became bondsman. In due time he had to answer for his temerity, being compelled to sell his farm and commence life anew. He never heard of his brother until December last, when to his great astonishment that person presented himself and invited the ruined one and his family to a sumptuous repast. When the cloth was removed, the long-absent brother placed in the hands of the farmer the title-deeds which made him once more the possessor and owner of the farm and all it contained. The secret of all this was that the brother who had caused so much sorrow to his relative had struck "ile" in Western Virgina, and had become a very wealthy man, if not a millionaire; and our contemporary concludes its narrative with a moral aphorism to the effect that we ought never to endorse the bills of a friend unless confident that he will one day "strike ile."—*Ib.*

The Wool Business.

The *Economist and Dry Goods Reporter*, on the effect of the repeal of the Reciprocity Treaty on the Worsted Manufactures of the U. S., thus speaks:—

"The worsted manufacturers would earnestly appeal to Congress for the continued admission of the long, bright wools of Canada free of duty, were there any prospect of their appeals being heeded. They have, during the last few years, invested a vast amount of capital in their manufactures, and are dependant upon the supply of raw material from Canada. If the proposed new duties upon wool go into operation, they will have to pay fully 50 per cent. more for their wool than heretofore; and the result will be that they will find themselves unable to compete with foreign manufactures. This is another of the interests martyred to the exclusive policy of Congress. The same may be said of the lumber trade which, for certain descriptions of wood, is absolutely dependant upon Canada. Indeed there is no one branch of business which has had important connexions with the Provinces, under the late treaty, which is not injured by the cessation of reciprocal relations. The usually well-informed correspondent of the *Commercial Advertiser* stated a few days ago that proceedings were being initiated for the negotiation of a new treaty of reciprocity. We sincerely trust that such may prove to be the fact, though we fear that the Congress has not yet sufficiently realized the depth of its folly in abrogating the treaty, to admit of steps being taking for the formation of a new arrangement broad and beneficial in its provisions."

The Diving Bell.

The diving bell has been abandoned on the Thames in favor of the diving dress, principally because the men employed were found, while the Westminister Bridge was being built, to spend their time at the bottom in playing cards, and there was of course no effectual means of keeping a check on them. It is not easy to play cards in a diving dress alone, however, and the remedy has proved very satisfactory in its operation.—*London Engineer.*

Ancient Conduits.

The ancient conduits about Jerusalem are of wonderful structure. One, the lower level conduit, formed of stone, follows the contour of the country for twenty-five miles, passing along the bend of a depression in one case of 55 feet depth, and entering the city at an altitude of 2,450 feet. The other, the upper level conduit, is tunnelled through a hill at one part, and the blocks are so keyed together as to form a complete siphon.

The highest inhabited place on the globe is the Post-house of Ancomarco, in Peru, which is nearly 16,000 feet above the sea.

Clearing Steamboats of Water.

Some years ago, in the Polytechnic Association, Mr. J. K. Fisher proposed to exhaust bilge water from light draught steamers by a pipe running out astern, or under the bottom, but turned aft. He held that the forward motion of the boat would produce a motion sufficient to exhaust the water. A valve in the pipe would prevent influx when stopping, and would open to the outward pressure.

Iron for Plants.

It is stated by several agricultural journals that by watering plants with sulphate of iron most extraordinary results may be obtained; beans, for instance, will grow to double their size and acquire a much better taste; the same is the case with pears and other fruit. Water kept in a tub with a quantity of old nails in it may also be used for watering with good effect.

Let Horses Rest Occasionally.

We know a physician, in large practice, who is frequently compelled to drive his horses hard. He formerly drove the two together, and used them up in a few years. He now drives them singiy, and as far as possible on alternate days. They are now, although working harder, invariably healthy and strong. He attributes this to the fact that if a hard drive strains any of the muscles they have time to regain their tone the next day. Were the horses driven every day, a slight sprain would produce a little stiffness; the parts would rub against each other; inflammation would set in, and the horse be lame—perhaps incurably so. Farm horses are not so liable to injury in this respect, as those driven fast over hard roads. But a day's rest occasionally will help them materially. At all events do not work them Sundays. Man and beast *must* rest one day in seven, or pay the penalty. Better work harder and rest longer.—*Am. Agriculturist.*

Grafting Rats·

Rats are as plentiful in Paris as London, and they are often the vitims of physiological experiments. M. Bert, for example, gained the prize in experimental physiology for removing their tails from their natural position, and grafting them upon all sorts of odd places—the middle of the back of the animal, for instance, and even in the cavity of the peritoneum. M. Bert made one very curious observation. He succeeded in uniting the small end of the tail to the body, and found out that the large extremity, which was free, recovered its sensibility, thus showing that the nerves will convey sensation in a direction inverse to that in which they act under normal circumstances.—*Chemical News.*

Seeing the Inside of one's own Eye.

By the use of endoscopes, laryngoscopes, and ophthalmoscopes the medical man is enabled to get a sight of many things shut out from ordinary view. M. Houdin has added another to these ingenious instruments—the iridoscope—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 dilatation and contraction of the iris, and even see the aqueous humor 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 for himself whether he has a cataract or not. If he has he will only see a sort of veil 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 "iridiscope" may be readily extemporized by making a hole in the bottom of a pill box with a fine needle.—*Ibid*

House-room for the Working Classes.

The *Spectator* insists that to secure house-room for the working class, their dwellings in great cities must be built into the air. The cost of the site must be distributed among many floors. Inside corridors can be superseded by broad, continuous outside balconies. Each tenant would thus possess a separate house, and the sense of living in a barrack, which workmen so much dislike, would be obviated. Such balcony streets, moreover, would be thoroughfares, and allow of supervision much more easily than corridors, while they would allow the hard-working poor to open little shops above the ground floor—an impossibility with existing architecture.

Transmuting Silver, etc., into Gold.

M. Frantz, a metallurgist, and M. Henri Faure, editor of the *France Médicale*, have just announced to the learned world that they have discovered a method for transmuting silver, copper, and mercury into gold, "which," they say, "are only one and the same metal in different dynamic states."

Birds prefer to Fly against the Wind.

PROF. NEWMAN says, contrary to the generally received opinion, birds prefer to fly against the wind. The quails of Europe almost invariably start on their passage of the Mediterranean with a head wind, and if it chops round and blows fresh from the south-west, they are drowned by thousands, and their dead bodies washed ashore for weeks afterwards. When the wind is abaft, it gets under the bird's feathers in the most aggravating manner, and upsets his equilibrium and equanimity at the same time.

Trichina in American Pork.

The committee of scientific gentlemen appointed by the Chicago Academy of Science, have just made a very complete report on the origin, growth and disposition of trichina. Their researches show that as many as 10,000 of these insects are sometimes contained in one cubic inch of pork, and that an average of one in every 50 of the hogs in the Chicago market is more or less effected, and the comparative immunity from the disease which our own people have enjoyed, undoubtedly results from the habit of cooking meat before eating it, while in Germany it is eaten raw by the poorer classes on account of the high price of fuel. For its destruction the committee say:—"It is simply necessary to cook it thoroughly so that every portion of the meat shall have experienced a temperature of at least 160 degrees Fahrenheit. We cannot insist too strongly on this point."—*Scientific American.*

Water Fuel.

Few persons are aware of the large percentage of actual moisture that abounds in most fuels. The careful housewife, desirous to economize her fire, "backs" it up with cinders. The poor employ wet tan. And there are not many, I suppose, who have not watched the nailer with curious interest, when, after a good sprinkle with his handbroom, previously dipped in water, he had made his smithy fire glow again with a very few blasts of his bellows. The Rev. M. Moule, of Dorchester, has had constructed a cooking stove, in which the combustion, to a certain extent, of water is attempted, but with what success I have no exact means of knowing. A year or two back some trials, in respect to the combustion of wet fuel, were reported in *Chambers' Edinburgh Journal.* The results were perfectly marvellous. Fuel containing actually, I believe, 70 per cent. of moisture was burnt in an arched brick stove or furnace. The heat produced was so intense as, if I recollect rightly, the thick wrought iron door having been previously closed, to raise to whiteness the arch of the oven. The fire, indeed, in the first instance, was lighted with dry fuel; but afterwards the wet fuel was exclusively resorted to. Surely, here are indications of no little importance in a country where the normal state of our natural fuel is one of excessive moisture.—Cooking, heating, drying, lime and brick burning, wherein indeed vast quantities of water are burnt as it is, besides various other economic processes involving the application of heat, might probably be effected by the employment of wet fuel.—*London Morning Journal.*

Razors.

Engineers as a class were the first to head the modern "beard movement" in this country; but many may like to read the following extract from a little work by Mr. Kingsbury, a practical razor maker, of Bond street:—The edge of a razor, a pen-knife, and and every other keen instrument, consists of a great number of minute points, commonly called teeth, which if the instrument is in itself good, and in good condition, follow each other through its whole extent with great order and closeness, and constitute by their unbroken regularity its excessive keenness. The edge of such an instrument acts on the beard, the skin or anything else, not so much by the direct application of weight or force as being drawn, even slightly, along it; because by this operation, the fine teeth of which it consists pass in quick succession, in the same direction, and over the same part of the substance. My readers will be convinced of this if they will make the following experiment on their glove or their hand, as they like best:—Let them hold the razor either perpendicular or obliquely, and press on it with some considerable force in a direct line from right to left, and they will have no reason to fear the consequences. But let them move it from that direction, let them draw it toward them, or push it from them, in the smallest degree, in the gentlest manner, and it will instantly make an incision. When they have made this experiment, they will be convinced of the truth of what I have asserted, namely, that in the operation of shaving, very little weight and even very little force are necessary." Hence it follows that the best razor will have the teeth of its edge set almost as regularly as a good saw, and that the best test in buying a razor is to examine the edge by means of a strong magnifying glass. This also explains the good effect on the keenness of a razor caused by dipping it in hot water, which necessarily clears the edges of any small clogging substances. —*London Engineer.*

Preserving Grapes.

Mr. F. J. Boving, of Lancaster, Ohio, has been very successful in preserving grapes during the winter, in the following manner:—On a clear bright day he gathers perfectly ripe and sound bunches, and lays them carefully in stone jars holding one or two gallons each. The jars are then set in the ground, in a trench deep enough to allow their tops to be eight or ten inches beneath the surface. Some boards are then laid over the jars, the trench filled up over it. Grapes packed in this way keep perfectly well until the first of March.

Flies—How to Kill Them.

Provide a pole reaching to the ceiling when held in the hand. Nail a small piece of board upon the upper end. Fill a tumbler or other vessel two-thirds full of soapsuds; place it upon the board and confine by three nails or pins driven in the board. When the flies have settled in clusters in the evening, clap the tumbler of water over the clusters, one by one, and you will soon have a fine lot of chicken feed.

To Take Leaf Impressions.

Hold oiled paper in the smoke of a lamp, or of pitch, until it becomes coated with the smoke; to this paper apply the leaf of which you wish an impression, having previously warmed it between your hands, that it may be pliable; place the lower surface of the leaf upon the blackened surface of the oiled paper, that the numerous veins that are so prominent on this side may receive from the paper a portion of the smoke; lay a paper over the leaf, and then press it gently upon the smoked paper, with the finger or a small roller (covered woolen cloth, or some like soft material), so that every part of the leaf may come in contact with the sooted oil paper. A coating of the smoke will adhere to the leaf. Then remove the leaf carefully, and place the blackened surface on a piece of white paper, not ruled; or in a book prepared for the purpose, covering the leaf with a clean slip of paper, and pressing upon it with the fingers or roller as before. Thus may be obtained the impression of a leaf, showing the perfect outlines, together with an accurate exhibition of the veins, which extend in every direction through it, more correctly than the finest drawing. And this process is so simple that any person, with a little practice to enable him to apply the right quantity of smoke to the oil paper and give the leaf the proper pressure, can prepare beautiful leaf impressions, such as a naturalist would be proud to possess. Specimens thus prepared can be neatly preserved in book form, interleaving the impressions with tissue paper.—*Art Recreations.*

Somewhat Mixed.

Speaking of Mrs. E. Cady Stanton's recent announcement of her political preferences, the Springfield *Republican* says:—"We admire Mrs. Stanton's spunk. She is a gentleman of genius; she is a lady of parts; she has honorably achieved wide influence among the gentler sex of both genders. It is highly proper that she should not only sign a Presidential call, but go into the Convention as a delegate, and take others of her female brethren with him. Perhaps we are getting the pronouns a little mixed; what we mean to say is that this is a free country, and is going to be freer, and that every man and woman of either sex has a perfect right to speak her mind and follow the lead of his own progressive ideas, and we hope she will do it."

Schonbein on Ozone.

The rumour which you helped to spread abroad that Schonbein had succeeded in isolating ozone and antozone, attracted, it seems, the notice of the Scientific Association of France, and that learned body invited Schonbein to come to Paris and exhibit his experiments to the wondering gaze of Parisian savans. Schonbein's reply gives us the exact state of his knowledge or belief on the subject, and is worth communicating to English chemists. He says that he has been engaged almost exclusively, and without interruption, in the study of oxygen for thirty years, and during this time he has discovered a number of facts which allow of his drawing the following conclusions:—1. That oxygen may exist in three different allotropic states;—2. Two of these states are active, and opposed one to the other—he designates one of them ozone, and the other antozone; 3. Equal quantities of ozone and antozone neutralize each other to form ordinary neutral or inactive oxygen; and, 4. Ordinary neutral oxygen may be split up or transformed, half into ozone and half into antozone. The experimental demonstration of the truth of these conclusions, however, he admits, is not so simple—as for example, the composition and decomposition of water; and he adds that the experiments necessary for their logical deduction would occupy more time than could be devoted to a single lecture. "Some scientific journals," says Schonbein, "have been badly informed when they asserted that I had succeeded in isolating ozone and antozone in a state of purity. The assertion is without foundation. It is true that for a long time I have made a great number of attempts to arrive at this desirable end, but always without complete success. Ozone and antozone are always mixed with neutral oxygen from causes closely associated with the generation of the two active modifications." The Professor concludes his letter by offering to come to Paris, should it still be desired, and if his health permit, and give a short course illustrative of the whole subject. It is to be hoped he will be invited, and while here, perhaps he might be induced to go on to London, which I do not think he has visited since the year he announced his discovery of ozone.—*Paris Correspondent of Chemical News.*

A New Anæsthetic—Another use for Petroleum.

The Boston *Medical and Surgical Journal* has a paper communicated by Dr. Henry J. Bigelow, describing a new anæsthetic. The name "rhigolene," from the Greek word which means extreme cold, is proposed by Dr. Bigelow for a petroleum naphtha, boiling at 70 degrees Fahrenheit. It is one of the most volatile liquids obtained by the distillation of petroleum, and is applied to the production of cold by evaporation. It is a hydrocarbon, wholly destitute of oxygen, and is the lightest of all known liquids, having a specific gravity of 0·625. Dr. Bigelow, after speaking of the different products of petroleum says:

"When it was learned here that Mr. Richardson, of London, had produced a useful anæsthetic by freezing through the agency of ether vapor, reducing the temperature to six degrees below zero, F., it occurred to me that a very volatile product of petroleum might be more sure to congeal the tissues, beside being far less expensive than ether. Mr. Merrill having, at my request, manufactured a liquid, of which the boiling point was seventy degrees, F., it proved that the mercury was easily depressed by this agent to nineteen degrees below zero, and that the skin could be with certainty frozen hard in five or ten seconds. A lower temperature might doubtless be produced were it not for the ice which surrounds the bulb of the thermometer.

"Freezing by rhigolene is far more sure than by ether, as suggested by Mr. Richardson, inasmuch as common ether, boiling only at about ninety-six degrees, instead of seventy degrees, often fails to produce an adequate degree of cold. The rhigolene is more convenient and more easily controlled than the freezing mixture hitherto employed. Being quick in its action, inexpensive and comparatively odorless, it will supersede general or local anæsthesia by ether or chloroform for small operations and in private houses. * * * But for large operations it is obviously less convenient than general anæsthesia, and will never supersede it. Applied to the skin a first degree of congelation is evanescent, but if continued or used on a large scale, the dangers of frost bite and mortification must be imminent."

In 1861 Dr. Bigelow, in experimenting with kerosolenes, of four different densities, found the lightest of them, the boiling point of which was about ninety degrees, to be an efficient anæsthetic by inhalation.—*Scientific American.*

Within a radius of fifty miles Northern Pennsylvania, the oil discoverers have built four cities—Erie, Meadville Titusville, and Corry—with populations respectively of 20,000, 10,00 ,10,000, and 7,000.

Pine bark reduced into a pulp and bleached, by different processes, makes a paper of first quality.

It is estimated that 18,000 elephants are yearly killed to supply Sheffield alone with ivory.