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

SEPTEMBER, 1865.

THE EDUCATION OF OUR YOUNG MECHANICS.

Considering the very favourable opportunities afforded the youth of this country, engaged in industrial pursuits, for obtaining knowledge at the very lowest cost, and with but little sacrifice of time, it does seem strange that so few avail themselves of the facilities so freely provided.

In this city, for two or three years, the trustees of the public schools opened one of their best school-houses for the purposes of evening instruction, providing teachers, fuel and light, free of charge; but finally were constrained to discontinue their efforts, on account of insufficient attendance, and want of appreciation of the object sought to be attained.

The Mechanics' Institute, too, every season opens a series of classes, which are continued for terms of five months, at a very low rate of charge. Good teachers are furnished and rooms provided, and yet how few there are, compared with the number of youths that should be found in these classes, that avail themselves of them—only about 100 to 120 each season.

And here we would seriously enquire the cause of this want of interest in these educational efforts? It is not that our mechanic youths are so well instructed that they do not need any more, for a large proportion of them have only received the most rudimentary education, and many of them not even that. We remember entering a mechanic's shop on King-street, in this city, to pay an account, and it was with the greatest difficulty that the foreman, in the absence of his employer, could write his name to the receipt; and even those who have had the advantage of school education, before entering on business, very soon forget the most they may have there learned, and stand in need of occasional evening instruction.

We refer our youthful readers, and their employers and guardians also, to the practical and useful instruction given in Mechanics' Institute evening classes, as evidenced by notices in our pages for the past four years; and we call on them to ponder well the loss they are sustaining in letting these golden opportunities for mental improvement slip by.

It is a constant complaint amongst mechanics and artisans, that they are considered by the commercial and professional classes as belonging to a lower caste of society. Those who indulge in such complaints should be aware that education and manners alone constitute the difference—in our day—between these classes. We have not yet seen the mechanic who has received a fair education, and whose manners and deportment have shown that he respects himself, but what he has been respected by all classes of the community, and could take his position amongst them without any feeling of inferiority either on the part of himself or others.

If our young mechanics and artisans will lounge about the streets, or taverns, or places of improper resort, with their hands in breeches pockets, and pipes or cigars, or the chew of tobacco, in their mouths, and dress to match; and take every means within their power to demonstrate their independence of all legitimate restraints on impropriety of conduct, they must expect to suffer the inevitable consequences in the loss of respect from their more educated and better behaved fellow citizens; as well as the total absence of opportunities for advancement in life.

Young men who are accustomed to resort to the theatre and the bar-room, and to indulge in the grosser vices and passions that human nature is too apt to give way to, cannot expect to be placed in respectable and responsible positions—the fault is not in society but in themselves.

Young men! assert your manhood! not by a foolish independence of feeling in regard to the conventionalities and proprieties of respectable society, but by doing what is right; by shunning everything that in its practice tends to immorality or vulgarity; by improving your mental and educational acquirements, and determining that you will be a credit to society; and that your example shall not tend to debase those with whom you associate, but rather to elevate them in the social scale.

We have known one workshop in this city, in which for several years it was the object of a portion of the workmen therein to improve, by the influence of example and precept, the character of every fellow-workmen that entered it; and it is encouraging to know that their efforts were remarkably successful. Let a similar object be the aim of every intelligent young mechanic, and the improvement that would take place in the morals of workshop society in one twelvemonth, would be truly astonishing.

Parents, guardians, employers! are you doing your duty in respect to the youth placed under your charge and control? Do you look after the moral and educational improvement of those youths, with the same zeal and anxiety that you watch their progress in the art or business in which they are engaged? Do you, employers, fully realise the importance to your interests, and to the safety and well-being of society resulting from a high moral and intellectual training of your apprentices and employees? If not, and we are confident that you do not, we entreat you to take the initiative at once.

If the youth in your employ attend no evening classes during the winter months, purchase tickets for them for the coming season, and induce them to enter for instruction, if possible. Some of them will no doubt feel it irksome at first, but after a while the associations of the class room will be more attractive to many of them than were their former associates.

Encourage the institutions that are organized for the education of the industrial classes. Why should the managers of these institutions work on alone for the benefit of the employed, while the employers —in whose interests their labour is also to a great extent given—stand aloof, both as to their presence, and material assistance? Consider of how much more value to you is the workman or apprentice whose intellect has been sharpened by education, and correct moral training, than is the one whose mind is a vacuum to all but the grosser passions and indulgences, and whose mouths are frequently filled with oaths, or the coarse ribald jest.

Our language is strong, but not too much so. We know whereof we write, for we have both seen and heard the evil for ourselves, through a long series of years, and are anxious to see our fellow-mechanics take that position in society to which they *should* be entitled, and to which they should ever aspire.

REAPING AND MOWING MACHINES.

We are accustomed to hear, and generally believe, that the Reaping Machine was originally an American invention. This is by no means true, although the Americans have, no doubt, made various improvements on the machines previously in use; nor is the cutting of grain by machinery at all a modern idea, for we find Pliny the Elder, supposed to have been born A.D. 23, thus describing a machine then in use. He says "There are various modes of reaping. In the extensive fields in the lowlands of Gaul, vans of large size, with projecting teeth on the edge, are driven on two wheels through the standing corn by an ox yoked in a reverse position. In this manner the ears are torn off and fall into the van."

Palladius, an eastern prelate born A.D. 391, gives an account of this machine in the following words: "In the Gallic lowlands they employ a more expeditious method of reaping, requiring, in addition to the labour of man, the assistance of a single ox during the whole harvest time." After describing the construction of the machine he says: —"When he (the driver) proceeds to drive the vehicle through the corn, all the ears are caught by the teeth and fall in a heap into the cart, the broken stalks being left behind. The driver, who follows, generally regulates the elevation or depression of the teeth; and thus, by a few courses backwards and forwards, the whole crop is gathered in the space of a few hours."

This machine was probably as great an improvement on the modes of cutting previously in use, as the present reaper is on the ordinary cradle scythe of modern times. It seems, however, to have fallen into disuse, and until near the close of the last century no effort appears to have been made to devise a plan for mechanical reaping.

In the year 1783 the Society of Arts, London, offered a premium for "An efficient Reaping Machine," (*a*) which offer it continued to make for thirty-six years. The conditions annexed to this prize were:—

"For inventing a machine to answer the purpose of mowing or reaping wheat, rye, barley, oats, or beans, by which it may be done more expeditiously, and cheaper, than by any method now practiced—provided it does not shed the corn or pulse more than the methods in common practice, and that it lays the straw in such a manner as may be easily gathered up for binding—the gold medal.

"The machine, with certificates that at least three acres have been cut by it, to be produced to the Society on or before the second Tuesday in December, 1783.

"Simplicity and cheapness in the construction will be considered as principal parts of its merit."

The first English patent for a reaping machine, that we find recorded, was obtained by Joseph Boyce, in the year 1799; and in the following year Robert Meares obtained a patent for "a mechanical reaper." In 1805 Letters patent were granted to T. J. Plucknett, for "a reaping machine having an arrangement of parts for gathering the cut corn and delivering it in small sheaves. (*b*) In 1807 Mr. Salmon, of Woburn, also invented a machine, with apparatus for gathering cut corn and laying it in swathes. (*c*) Messrs. Kerr, of Edin-

(*a*) See Transactions of the Society, vol. I. p. 107.
(*b*) See Loudon's Encyclopedia of Agriculture, p. 427.
(*c*) See Farmer's Dictionary, plate 23.

burgh, and Smith, (*d*) of Deanston, also constructed machines similar in principle, which were both used in the harvest of 1811. Successful trials were made with Smith's machine in 1815, in the presence of a committee of the Highland Society, who gave a most favourable report of its operations. A piece of plate of the value of Fifty Guineas, was presented by the Society to Mr. Smith, as an acknowledgement of their opinion of his ingenuity. In this trial a Scotch acre of beans was cut down in an hour and a quarter. Mr. Kerr's machine was tried before the Dalkeith Farming Society, "and proved the efficiency of the principle of his invention on a field of corn near Edinburgh."

During this year Letters patent were granted to Donald Cumming, of Northumberland; and also to James Dobbs, (*e*) of Birmingham, for reaping machines invented by them.

In 1820 a machine was invented by Joseph Mann, of Raby, which was not brought before the public till the year 1832. It possessed considerable merit.

In 1822 Mr. Henry Ogle, of Birmingham, (*f*) invented a machine which was improved upon and brought into practical use by Messrs. Brown, of Alnwick, which appeared to answer well, and was supposed to be able to cut, with care, fourteen acres per day. Some working people threatened to kill Mr. Brown if he persevered in it any further, so that it was not afterwards tried.

In 1823 the first patent issued in the United States for a mowing machine was obtained by Joseph Bailey, which it was supposed would cut ten acres per day. In 1826, the Rev. Patrick Bell, of Forfarshire, invented a reaping machine which is described in Loudon's Ency. of Agr. as "the most perfect invention of this description." In September 1828 this machine was tried at Powrie, in the County of Forfar, when it cut a breadth of "five feet at once," and at the rate of an Imperial acre per hour (*g*) A prize of £50 was awarded Mr. Bell for his machine, by the Highland Society (*h*) The fact that none of these machines, even after so many successful trials, were brought into general use, affords "another instance, if such were wanted, of the utter inutility to the general public of the most valuable suggestions, unless thrust upon their notice by some party who is pecuniarily interested in introducing them in a practical form. That these machines contained the elements necessary for an efficient reaper there can be no doubt; and it is, perhaps, owing to this fact, that nothing was done by independent parties to bring them into use. But, however this may be, it is evident that neither the requirements of the farmer, nor the prospect of reward to agricultural implement makers, were sufficient to awaken public attention to the national importance of reaping by mechanical means. The credit of effecting this step in advance is undoubtedly due to our transatlantic brethren, whatever may be the ground for disputing the novelty of the two rival American reapers, which, from the practical illustrations of their efficiency, have of late excited so much interest in the agricultural world." (*i*) In May 1831 a patent for a machine for cutting grain was granted W. Manning of New Jersey, United States.

In 1833 Mr. Hussey, of Cincinnatti, Ohio, obtained a patent for his machine; and a patent was issued to C. H. McCormick, of Virginia, in June 1834.

Passing over several inventions that never came into use, both in Britain and the United States, we notice that in 1845 Mr. Ridley, of South Australia, invented a machine that was driven by bullocks or horses, and which was described by Captain Grey, the Governor of the Colony, as follows: "This machine reaps, thrashes, and winnows, all at the same time, and this at the rate of nearly an acre an hour—the machine requiring to be attended by two men * * * considerable improvements have recently been introduced in the mode of working this machine; it is now drawn in the same way as a cart, and has become extensively used in the Colony." The whole operation was said to be performed at a cost of about seven shillings per acre.

From this time forward numerous patents for reapers and mowers have been taken out both in Britain and in the United States; but in the former they did not come into any thing like favour with the agriculturists until after the great exhibition of 1851, when the "Hussey" and "McCormick" machines underwent repeated trials in different parts of England, on the crops of that year, with marked success.

During the year 1852, a trial of one of Bell's machines, and two of Hussey's, was made before the Highland Agricultural Society, at Perth, on fields of oats, barley, and wheat. The Judges gave a most excellent report of this trial, and awarded the prize to Mr. Bell's machine, for six different reasons, shortly stated thus:—

(*d*) See Ency. Britannica, 7th Edit., vol. II. p. 270 & 350.
(*e*) See Aris' Birmingham Gazette, Oct. 3d. 1814.
(*f*) See Mech. Mag. Vol. V. p. 49.
(*g*) Gard. Mag. Vol. V., p 600.
(*h*) Ency. Brit., 8th Edit. Vol. II. p. 276.

(*i*) London Journal of Arts, Science, and Manufacture, Vol. XL.

Economy of time and expense in cutting; clean cut and more regular swathe; less liability to choke; better adapted to deposit the grain, with less labour; leaving off the grain either on the right or left hand side of the machine; and greater efficiency when operating upon a crop partially lodged.

The transactions of this Society, for the same year, contains a communication from Mr. Slight, Curator for the Museum, calling attention to the fact that the identical Bell's machine to which the £50 prize had been awarded 26 years previously, "had for the last 14 years been statedly employed on the farm of Inch-Michael in the Carse of Gowrie, occupied by Mr. Geo. Bell, the brother of the inventor, who, during all that period, and on the average of years, succeeded in reaping four-fifths of his crop with it." Mr. Slight further states, "that at least four specimens of it had been carried to America, and that from the identity in principle betwixt them and those now brought from thence, with other corroborating circumstances, there is little doubt that the so-called American inventions are after all but imitations of this Scottish machine." (j)

The great abundance of labourers in Great Britain, and consequent low rate of remuneration, with the reasons previously given; and the want of drainage and consequent mode of laying the land up in high ridges, appear to have been the principal causes in preventing the earlier and more general adoption of these machines. In America, on the contrary, owing to the scarcity and very high rate of labour, they came rapidly into use. In both countries great improvements have been made, and a multiplicity of patents issued, during the last 14 years; but the credit of the invention and construction of the first practicable reaping machine undoubtedly belongs to Great Britain.

NATIONAL DEBTS AND NATIONAL PROSPERITY.

The Toronto *Globe* estimates that the interest on the National Debt of the United States, by the time the war expenses will be all paid, will necessitate an annual tax of about $16 per head for every man, woman and child in the Union, of every race and colour; and adds: "By the side of their large national and other public debts how small does our Provincial debt appear. We pay yearly about $1.50 per head for interest. * * * Yet we think we are heavily taxed."

(j) See Ency. Brit. 8th Edi. Vol. II. p. 276.

The difference in the circumstances of ourselves and the Americans is this: their creditors are principally their own citizens—ours are non-resident capitalists. With them, though the tax paid by the individual is large, the money does not leave the country, but goes immediately into circulation again amongst themselves. The taxes we pay for interest leave the country, and none of our citizens benefit by the process.

Increase our national debt as much as you please for useful works, so long as resident citizens are the creditors, and the tax-payers will not seriously feel the burden; but borrow heavily from abroad and the country is impoverished.

The national debt of Great Britain, on the 31st of March last, was no less than £808,288,000 sterling, and yet she increases yearly in prosperity. This would not be the case if the large annual amount of interest—some £28,250,000 sterling—was payable to foreign countries instead of to resident British subjects. The people can bear to be taxed in exact proportion to the amount of home capital the country possesses, and no more. This fact seems to be too generally overlooked.

To enable the people of Canada to sustain a larger annual tax than is at present borne, we must cease to borrow foreign capital except for the most productive public works; and by producing more of agricultural and manufactured products, realize what Mill the political economist contends for as necessary to a nation's prosperity, that "the aggregate value of what we sell must equal the aggregate value of what we buy." The soundness of this principle is evident, for if we buy goods of more value than those we export, the balance must be paid out of the country in cash, and we have just so much less capital left wherewith to develop and increase our home resources.

FLAX MANUFACTURES AND WINTER EMPLOYMENT FOR THE POOR.

(*Communicated.*)

Hand-spinning and hand-loom weaving in many parts of the North of Ireland, have been almost entirely superseded by factory spinning and power-loom weaving; and in consequence of that a want of employment exists in their old business for weavers, many of whom are of a class which would prefer to live under the British laws in Canada, and would not be so likely as those from the south and west of Ireland to pass on into the United States, if only the reasonable advantage of obtaining homesteads here, on easy terms, was afforded them.

The length of our winters causes a cessation of much out-door work, and throws out of employment vast numbers of its population, whose labours might be profitably employed in various branches of manufactures, during a period of the year now spent in idleness, consuming the earnings of other seasons. By providing such employment in winter, abundance of labourers would be kept in the country available for assisting farmers in the hurried work of the short spring and summer seasons. The farmers complain of a want of labourers in spring and harvest—the labourer complains of a want of employment throughout the winter; and it is fearful to contemplate the consequences of several months spent by the working population of Canada, especially in its cities, towns and villages, in perfect idleness, leading to want and perhaps to vice and crime. The only effectual cure for this admittedly existing evil is to employ this population in manufactures, and of such, flax stands foremost for this purpose.

Breaking, scutching, heckling, spinning and weaving, and other works of minor details in flax, would employ multitudes of males and females of all ages with healthful, cheerful in-door work.

The great advantages of this kind of employment have shown themselves, especially where young children and aged men and women in Ulster, unfit for any other work, find profitable employment in this branch of industry. During the winter, when out-door labour cannot be performed, the men weave; and not only the men, but young girls and women find employment on the loom in their own houses, thus enabling them also to look after their families and household affairs; whilst in factories and mills thousands of small girls find constant work in the spinning of yarn.

Whether we look for employment of the rustic or city population of Canada, we can in this find it. Any one who has made it his business to study the census tables, and to enquire into the state of the population of the towns and cities of Canada, cannot fail to observe that they contain large numbers of unemployed persons, sufficient to supply numerous factories throughout the winter; and there is little doubt but that if flax was abundant and of a quality sufficiently good, capitalists would soon be found erecting such factories as would afford the required employment.

Some will perhaps say that flax of a better quality than now produced cannot be grown in the country—there can be no greater error. The farmers have only to sow a better quality of imported seed, and sow it thicker, and they will have crops equal to those of any other country; but that will be only one step in the direction of producing good fibre fit for manufacturing purposes—they must improve their system of treating and preparing their flax. Dew rotted flax will never produce fine fibre, to attain which other processes must be resorted to under the direction of persons of experience in the practical details—mere theory will be of little use at this stage of the operations. The preparation by more modern processes will of course cost more, but the value of it will be more than proportionately increased.

The system of thin sewing, almost universally adopted in Canada, must lead to the inevitable consequence of growing short branchy flax, which may yield a supply of seed for the oil crusher, but can only produce fibre coarse in quality, short in quantity, and less remunerative to the farmer.

If at the approaching Provincial Exhibition it is found that good flax has been produced extensively this year, and that the government will give any pledge for encouraging the enterprise during the next few years—it will no doubt be found that capitalists will engage in the business—importing foreign seed and erecting factories for the preparation and manufacture of the fibre; but to induce them to do this the government must step forward and furnish every possible encouragement, and also in the payment of small salaries to local flax instructors.

It is to be hoped that the Minister of Agriculture will be enabled to be present at the forthcoming Provincial Exhibition, and that in the meantime he will give the subject the consideration it deserves. His recent visit to the Exhibition in Dublin, and the opportunities thus afforded him of acquiring a knowledge of the advantages of this branch of industry in Ireland, the aid given by government, and the exertions made by associations for the extension and improvement of flax cultivation in the South and West of Ireland at the present time, must have afforded him information sufficient to justify him in recommending to his colleagues the appropriation of a sum of money, and the adoption of a legislative measure, to aid the extension and improvement of this crop in Canada; thus leading to the introduction of manufactures, which must prove of importance, not only to the agricultural, but to the commercial interests and to the general wellfare.

Surely one of the best rules in conversation is, never to say a thing which any of the company can reasonably wish we had rather left unsaid; nor can there anything be more contrary to the ends for which people meet together than to part unsatisfied with each other or themselves.

Canadian Patents.

BUREAU OF AGRICULTURE AND STATISTICS,
PATENT OFFICE, Quebec.

LIST OF LETTERS PATENT OF INVENTIONS, *issued for a period of* FOURTEEN YEARS *from the date hereof.*

(Continued from p. 208, vol. 5, of this Journal.)

HENRI JULIEN, of the city of Quebec, machinist, "A new and improved Printing Press."—(Dated 11th April, 1865.)

HENRY WOOD, of the city of Montreal, mechanical engineer, "A new and useful improved Valve, for clearing the condensed water from the cylinders of steam engines."—(Dated 1st July, 1865.)

ANDREW B. TAFT, of the city of Montreal, architect, "An improved Automatic Safety Car Coupling."—(Dated 6th July, 1865.)

RICHARD SMITH, of the township of Sherbrooke, in the district of St. Francis, machinist, "A new and useful Flour Sifter."—(Dated 6th July, 1865.)

JEAN BAPTISTE CERAT, of the city of Montreal, mason and stonecutter, "A composition of matter, to be called Composition Cerat."—(Dated 6th July, 1865.)

RUDOLF MYLIUS, of the town of Berlin, in the county of Waterloo, physician, "A new and useful Gun Lock, to be applied to the breech-loading needle gun; the gun, with the addition of such improved lock, to be called Mylius' Breech-loading Needle-Gun."—(Dated 7th July, 1865.)

RUDOLF MYLIUS, of the town of Berlin, in the county of Waterloo, physician, "A new and useful composition of matter, consisting of an inflammable substance, for igniting, by friction with an iron or steel needle, the powder in a cartridge; the said composition to be called "Mylius' Primer."—(Dated 7th July, 1865.)

DAVID LISTER, of the city of Toronto, in the county of York, mechanical engineer, "A new and useful improved Steam-Packing for pistons."—(Dated 7th July, 1865.)

BROOKS W. WALTON, of the village of Kettleby, in the township of King, in the county of York, blacksmith, "A new and useful Drill and Cultivator combined."—(Dated 15th July, 1865.)

RICHARD LAMBERT, of the city of Quebec, mechanic, "A Machine for operating and working bored wells."—(Dated 18th July, 1865.)

WILLIAM GIBSON, of the township of Granby, in the county of Shefford, gentleman, "A new and useful Bag-String or Tie."—(Dated 19th July, 1865.)

MATTHEW L. ROBERTS, of the village of Smithville, in the county of Lincoln, potash manufacturer," "A new and useful Spade or instrument for digging post-holes and other holes."—(Dated 24th July, 1865.)

HENRY SNIDER, of the township of Sophiasburgh, in the county of Prince-Edward, carpenter, "A new and useful Clothes Dryer, to be called and known as Snider's Suspension Clothes Dryer."—(Dated 25th July, 1865.)

HUGH BAINES, of the city of Montreal, railway signal inspector, "A new and useful Machine for making railroad points, and for bracing the heels of the points with steel, as also the ends of all railroad rails."—(Dated 27th July, 1865.)

Board of Arts and Manufactures

FOR UPPER CANADA.

TRADE MARKS.

(Continued from pages 6 and 203, Vol. V., of this Journal.)

Trade Marks registered in the Department of the Bureau of Agriculture and Statistics, Quebec; and open for inspection at the Board of Arts and Manufactures for Upper Canada:

Thomas Griffith, Toronto, "Extra Stout." Vol. A, folio 76, No. 278. Dated 29th July, 1865.

Thomas Griffith, Toronto, "India Pale Ale." Vol. A, folio 74, No. 273 Dated 29th July, 1865.

D. Crawford & Co., Toronto, "Star Soap." Vol. A, folio 70, No. 274. Dated 29th July, 1865.

D. Crawford & Co., Toronto, "Imperial Soap." Vol. A, folio 72, No. 274. Dated 29th July, 1865.

J. Thurber, Toronto, "Thurber's Royal Anti-Friction Metal." Vol. A, folio 78, No. 306. Dated Aug. 22, 1865.

BOOKS ADDED TO THE FREE LIBRARY OF REFERENCE.

A Synoptical Index of the Consolidated Statutes of Canada and Upper Canada, with notices of the later Acts which affects them .... *Hancock.*

The Magistrates Manual: being a compilation of the Law relating to the duties of Justices of the Peace in Upper Canada .... *McNab.*

Statutes of Canada, Sessional Papers, &c. &c. ....

Transactions of the Board of Agriculture, and of the Agricultural Association of Upper Canada, 1860 to 1863 .... *Board of Agri.*

British and American Scientific and Mechanical Journals bound and placed on the shelves semi-annually.

RECENT AMERICAN PUBLICATIONS.

American Annual Cyclopedia, for the year 1864, Roy. 8vo. cloth	$6 00	*Appleton & Co.*
Bone's Petroleum and Petroleum Wells of Pennsylvania, Vir., Ken., Ohio, &c., 16mo.	0 75	*Lippincott & Co.*
Dussauce's complete treatise on Tanning, currying and Leather Dressing, 8vo.	10 00	*H. C. Baird.*
Flax Culture and Dressing, Manual of, Roy. 8vo. paper	0 50	*Orange Judd.*
Leavitt's Facts about Peat as an article of Fuel, 8vo. paper	1 00	*Leavitt & Hunn.*
Oil Districts of Canada, The, 16mo. paper	0 25	*Amer. News Co.*
Trimble's Treatise on Insect Enemies of Fruit and Fruit Trees, 4to. cl. plain, $5, col'd	8 00	*Wood & Co.*
Woodward's Graperies and Horticultural Buildings, 12mo. cloth	1 50	*Woodward.*
Well's Year Book of Facts in Science and Art, for 1865, cloth	1 75	*Gould & Lincoln.*

RECENT BRITISH PUBLICATIONS.

Armstrong, Robt., Construction and Management of Steam Boilers, 5th ed. 12 mo....	0	1	6	*Virtue.*
Bemrose, Jun., Wm., Manual of Wood Carving, 3rd ed. cr. 4to..........	0	5	0	*Bemrose.*
Bourne, John, Catechism of the Steam Engine, new ed. fcap. 8vo..........	0	9	0	*Longmans.*
" " Recent improvements in the Steam Engine, fcap. 8vo.	0	3	6	*Longmans.*
Dixon, Thomas, Millwright's and Engineer's Ready Reckoner, post 8vo..........	0	3	0	*Spon.*
Fadley, George, Study of Science and its undue neglect..........	0	2	0	*Willis & Soth.*
Gibbs, Wm., Decorative Alphabets for the Chisel, Brush, &c., 4to.	0	7	6	*Houlston.*
Mansfield, C. B., Theory of Salts: the Constitution of Chem. Compounds, cr. 8vo. ...	0	14	0	*McMillan.*
Marett, P. P., Yachts and Yacht Building, new issue, 8vo..........	0	6	0	*Spon.*
Odling, Wm., Practical Chemistry for Medical Students, post 8vo..........	0	7	6	*Longmans.*
Reid, Geo., Tables of Exchange of Sterling Money and of Dollars, 2d ed. 8vo..........	0	10	6	*Richardson.*
Taylor's System of Stenography, revised by J. H. Cooke, new ed. 12mo..........	0	3	0	*Simpkin.*
Templeton's Millwright's and Engineer's Pocket Companion, 14th ed. 12mo	0	5	0	"
" Engineer's Common-place Book, 6th ed. 12mo..........	0	5	0	"
White, J. B., Linen and Linen Yarn Trades' Ready Reckoner, 8vo..........	1	0	0	*E. Wilson.*
Wine Merchant, The, or the Art of making Wine, 12mo..........	0	4	0	*Loftus.*

Correspondence.

CORRECTION.

To the Editor of the Board of Arts Journal.

SIR,—In the Brantford firm's reply to the criticism on the article published in your Journal laudatory of their manufactures, &c., they point out a discrepancy in that criticism which may be corrected. The idea intended to be conveyed was simply this: that I did not believe they had all the mechanical talent of the country in their establishment; that many other mechanics in the country, though not given to puffing, could do all that this firm *can* do, and probably more.

With your permission I may have a few remarks to make shortly on their reply, though not in any unkind spirit towards this firm more than others that show themselves to be "*par excellence*" in the mighty art.

It is a disagreeable duty sometimes to undertake such criticism, but it is necessary in order to protect and encourage that unobtrusive class of men, who, though of good ability, from their modesty or diffidence, shrink from coming in contact with those who proclaim such wonderful improvements.

Z.

Selected Articles.

THE RAW MATERIAL OF THE LINEN TRADE.

BY PROFESSOR HODGES, M D., F.C.S., QUEEN'S COLLEGE, BELFAST.

The first portion of this paper relates more particularly to the cultivation and management of the plant, which scarcely comes within the scope of this journal; the following, on the structure and chemical composition of the stem of the plant, and its preparation for the spinner, will be found both valuable and instructive:—

"About the end of July, or early in August, when the seed has been sown about the middle of April, the flax plant may be expected to have attained that degree of maturity, which is regarded as affording the fibre in the most suitable condition for textile purposes. In Belgium, as we have stated, the flax is generally pulled in a greener state than in this country, as the object is to obtain the most delicate qualities of fibre; but the Irish growers find that the amount of loss in managing the soft and tender straw renders it more profitable to allow the plants to become more mature, before attempting their removal. We have already described the simple operations adopted in removing the crop. It might be expected that at this stage the business of the farmer properly terminated. Such is the case in many continental countries. In Belgium the crop is purchased by factors, who relieve the grower from all the trouble of further management, and undertake the various operations required to prepare the fibre for the spinner. If this system could be adopted in this country, it would tend in no small degree to facilitate the extended cultivation of the crop, especially in those new districts in the south and west of Ireland, in which efforts have lately been made to encourage the farmers to introduce it.

In Ireland, however, at the present time, the flax-grower also prepares the fibre for the market. When the crop has been pulled, the usual method adopted, where the farmer has learned to value the seed, is to proceed at once to remove the seed capsules or *bolls*. This is effected by drawing the straw through an implement called "a ripple," which consists of a number of tapering angular bars of iron, each 18 inches long, fixed to a block of wood. These bars are placed three-sixteenths of an inch apart at the bottom, and at the top are about half an inch asunder This row of iron teeth is screwed to a plank nine feet long, and is usually supported on two stools. The bolls are received upon a winnowing cloth placed under, and afterwards dried first by exposure to the sun, and finally to the heat of a kiln at a temperature not exceeding 70°. As the rippling proceeds, the straw deprived of the bolls is made up into small bundles, and secured by ties formed of rushes, which have previously been prepared for the purpose, by being dried and rendered pliant by beating; and thus arranged, it is carried from the field to be submitted to what may be regarded as the commencement of the special operations for the separation of the textile fibre.

Before entering upon the description of the process employed for the separation of the fibre, it will be useful to give a short account of the minute structure and chemical composition of the stem of the flax plant.

If you take a piece of flax straw and examine it, you will find that it can readily be split up into three parts, which are placed one round the other. The exterior of these is a thin membrane of a green colour in the unripe plant, which is replaced by a fine yellow as the plant approaches maturity. The second portion you will observe to consist of extremely fine hair-like filaments, while inclosed by these filaments, and occupying the centre of the straw, and usually perforated by a hollow canal, there is a comparatively thick layer composed of a brittle material which cannot be split into threads.

A transverse section of the straw with a penknife will show these three portions presenting the appearance of rings or circles of different diameters placed one within the other. So far it is possible by the naked eye, and especially when the stem has been softened by maceration in water, to recognize its division into three portions; and the flax grower is well aware that the thin investing skin and central brittle woody matter are of no value to him, but must be broken up and removed, to enable him to obtain the fine filaments which are inclosed between them. It is these delicate, but at the same time tenacious fibres, which give the flax plant its chief commercial value; and the separation of them in the most perfect form, and with the least expenditure of time and labour, has for several years occupied the attention of men of science and of manufacturers in all parts of Europe.

If we take a horizontal slice of flax straw, and examine it by the assistance of the microscope, we obtain some additional information respecting its structure. It shows us that the external layer or zone, the "skin" of the plant, is composed of extremely delicate membrane, formed by the union of minute cells or vesicles closely pressed together, while the middle layer or ring consists of a number of tubes with very minute cavities, their walls or sides being apparently formed of numerous layers of lining material, by which the cavity has been almost obliterated. These tubes or elongated cells have been termed *bast cells*, and constitute in flax, hemp, and other plants, the material employed for textile purposes. Proceeding inwards from the circle of bast cells, we find the third layer composed of short cells, hardened by deposits which render them brittle and inelastic.

The chemist, whose science enables him to resolve the various structures of plants into their elements, discovers that all the parts of which the flax straw is made up consist chiefly of a substance possessing, in every case and in every plant, from the apparently green slime-like covering of the stagnant pool to the stately tree, with its complicated arrangement of wood and bark and leaves, the same elementary composition, being formed by the union of the elementary body, carbon, and the elements of water, oxygen and hydrogen. Such is the composition of the simple rudimentary substance which forms, as it were, the skeleton of flax, and of every other plant. But associated with this universal building material of the vegetable world, to which the name of *cellulose* has been given, are discovered, lining and strengthening these cells, and contained either in a solid form within their cavities or dissolved in water, other substances, as starch, gum, sugar, a peculiar gum-like substance named dextrine, oils, colouring matters, and resins. The greater number of these substances are analogous to cellulose in composition, and consist merely of carbon and the elements of water; but accompanying them we find other substances, which contain, in addition to carbon, oxygen, and hydrogen, the element nitrogen, of which the gluten, or sticky matter of wheat, affords an example, and respecting which chemistry has made known to us the singular fact that they closely resemble in their composition the casein or cheesy matter of milk, the albumen of the white of egg, and the substance which forms the chief constituent of animal flesh. We also find invariably united with these compounds certain saline and earthy matters, derived from the soil, and indispensable to vegetable development.

From the results of numerous examinations of flax straw which have been made in the laboratory of the Chemico-agricultural Society, both of Irish and foreign flax, the following statement may be regarded as correctly representing the proportion in which these constituents of plants are usually associated in the mature flax straw immediately after its removal from the field of the farmer. One hundred parts consist of:—

Wax	0·270
Resinous matters, volatile oil, and lino-tannic acid	1·090
Sugar and colouring matter	5·630
Inorganic matters	2.910
Pectine	0·360
Nitrogenized compounds, soluble in water	0·835
" " insoluble in water	4·269
Insoluble inorganic matters united with the fibre	2·500
Fibre	82·137
	100.00

One hundred parts of the ash of flax straw consist of the following ingredients:—

Potash	13 88
Soda	5·33
Chloride of sodium	6·47
Lime	18·86
Magnesia	4·10
Oxide of iron	5·40
Sulphuric acid	11·16
Phosphoric acid	9·63
Carbonic acid	10·37
Silica	10.37
	100·43
Ash per cent. in the straw	3·89

Several of the substances which analysis shows to be contained in the straw of the plant dissolve readily in water, and may be removed from it by simple maceration. But the cellulose itself, which composes the walls of the cells, and also some of the substances by which they are filled, are completely insoluble in water, and can be removed only by the action of chemical agents. The nitrogenized compounds, however, both in plants and animals, are remarkable for the facility with which they undergo transformations when the conservative influence of life is removed, and also by communicating to substances which contain no nitrogen, as sugar and starch, the tendency to undergo decomposition, or, in other words, to dispose the elements of which these substances consist, to arrange themselves in new forms. We have many familiar examples of the effect produced by the presence of decomposing nitrogenized substances in brewing, starch-making, and other manufacturing processes, and we observe it when a heap of vegetable matter, such as flax straw, is exposed to a moist atmosphere, or steeped in water.

In the flax plant, the hemp, and other herbaceous plants which contain elongated cells possessing qualities which render them suitable for textile purposes, intermingled with the short and brittle cells of the cellular tissue, their separation from them may be effected by fermentation in the open air, by maceration in water or chemical solvents, or simply by mechanical means.

In many parts of Europe the flax is spread over the fields late in the autumn, or in the months of January or February, and the requisite fermentation induced by prolonged exposure to air and moisture. This method of treatment, termed "dew retting," is practised in several districts in Belgium, especially in the provinces of Hainault and Namur; but where water is suitable for steeping, and abundant, dew retting is seldom resorted to. In fact, from the earliest times, only one method has been found properly to separate the fibre in a condition suitable for its various applications, viz., the gradual decomposition by fermentation of the cementing matters of the straw, induced by the maceration of the flax either in stagnant pools or rivers. It is a remarkable circumstance to find both the natives of Hindostan and the ancient inhabitants of Egypt, employing methods precisely similar to those which are at present used in this country.

In Belgium the management of the steeping process may be regarded as having attained the greatest perfection. The system which is pursued in that country, is that which we would gladly find introduced into Ireland. Here the grower of the flax also steeps it, and submits it to the treatment required to prepare it for the spinner. In Belgium the work of the farmer is usually completed when he has brought the plant to maturity, and its technical preparation is taken up by factors, who devote themselves to the separation and preparation of the fibre. The beneficial result of this division of labour is exhibited in the high value of the Courtrai flax, which occasionally sells at £250 per ton; while in Ireland the average value of flax last year was only 6s. 6d. per stone. The Courtrai flax-factors usually convey the straw to the river Lys, the waters of which have acquired so high a reputation for steeping, that last year flax was sent to it from many parts of France to be steeped. We have analyzed the water of this river, and find that it is in no respect superior to that of many Irish streams, but it is deep and its current is gentle, and the flax-steepers have an amount of skilled knowledge, which gives them great advantages. Though we have not yet been able in Ireland to grow any flax equal in value to that of Courtrai, our experience has convinced us that, if properly managed, there are very few districts in which our farmers may not succeed in producing that medium quality of fibre which is most in demand.

In Ireland the flax on its removal from the field is placed in a shallow pond excavated in the neighbourhood of a stream, from which it can be filled with water. A careful farmer, long before the season for pulling the crop, makes preparation for the steeping. Some make ready the ponds during the preceding winter. Good water, with full exposure of the pond to the warming influence of the sun, and free from the shadows of trees, are regarded as essential requisites. What is termed by the flax-steeper "good water," is pure, soft water, free from mineral impurities. The presence of iron, from its forming coloured compounds with the peculiar tannic acid of the straw, is decidedly injurious; and calcareous waters act slowly and imperfectly on the constituents of the straw, and also form compounds which resist the solvent action of fermentation. The size of the pool is regulated by the quantity of flax to be steeped, and some of our most experienced farmers advise that no pool should be larger than can be filled with flax in one day. From eight to ten feet wide, and four deep, is a frequent size of the ponds in some districts. The flax is deposited in the ponds in layers so arranged that the tie by which each bundle is secured rests upon the root ends of the preceding bundle, and a covering of straw or sods, with some stones placed on the top of the flax to prevent its rising out of the water. In a day or two, according to the temperature of the season, fermentation commences, and is accompanied by a brisk disengagement of bubbles of gas. The water acquires the colour of ale, and a scum collects on its surface to remove which it is considered advisable to allow a gentle current of water to flow over the surface of the pond from the supplying stream.

In the steeping season the districts surrounding some of our small country villages are exceedingly disagreeable to strangers, who find the atmosphere in all directions impregnated with the odours from the numerous steeping pools. The peculiar odour of the flax pool we have found to depend upon the evolution of compounds of butyric acid and valerianic acid, produced by the decomposition of the constituents of the flax plant, during which also carbonic acid and other gases are given off in large quantities. In Belgium the vitiation of the atmosphere by the steeping of flax along the river Lys is regarded by many persons as productive of fever and other diseases, and petitions have been presented to the Chamber of Representatives to obtain an abolition of the practice. We have made numerous inquiries in this country, both from farmers and medical practitioners in the chief seats of the flax industry, and cannot discover that fever or other diseases can be traced to the effluvia from the steeping holes in Ulster.

The method by which the Irish farmer ascertains that the fermentation has sufficiently advanced to allow the flax to be removed from the water, is to draw a few stalks from one of the bundles. These he breaks across in two places, about two inches apart. If he can readily pull away the central woody portion without tearing the filament of the layer which surrounds it, he considers that the flax has been sufficiently "watered."

The next stage in the management of the flax is the "grassing" of the steeped straw, by which the separation of the loosened fibres is greatly facilitated. For this purpose a newly mown meadow or a short pasture ground is selected, and the straw is spread thinly over it, and allowed to remain exposed to the air. In showery weather six days will usually be sufficient exposure; and if at the end of that time the stalks are perceived to present the appearance of a bow and string, produced by the fibre contracting and separating from the inelastic woody portion, the flax may be "lifted" and put up in small stacks, so built as to allow the air freely to circulate through them. Thus steeped and grassed, the straw is ready for the application of the mechanical operations by which the worthless, brittle, woody matters may be removed, and its textile filaments dressed and rendered suitable for their important uses.

The ordinary method of steeping in ponds or rivers, though apparently simple, requires very careful attention, and is attended with great risk. Like the fermentation of the brewer, the peculiar series of decompositions which facilitate the breaking up of the various organic structures which compose the stem of the flax plant, are liable to be affected by changes of temperature and other disturbing causes; it is not, therefore, surprising that in the open air, in a variable climate, it should progress irregularly, and that, notwithstanding the anxious attention of the farmer, one part of the straw should be oversteeped, while another part has not experienced the alterations required to facilitate the perfect separation of the fibre. Even in districts where the management is conducted by trained workmen the imperfections and uncertainty of the old system are found so much to interfere with the profits of the flax-grower, that numerous attempts have been made both on the continent and in Ireland to substitute for it some more certain and less hazardous method. In some places "dry scutching," that is, the separation of the fibre from unsteeped straw by mechanical means, has been attempted, but has failed to produce fibre of good quality or requisite fineness. In France, chemical solvents, dilute acids, alkalies, and solutions of soap, have also been tried; but though it is possible by the action of these solvents to break up the structures of the plant and to obtain fibre apparently of good quality, yet experience proved that it was inferior in tenacity and other essential properties to that procured by the ordinary methods.

The first attempt in advance of the traditional methods which offered any prospect of more favorable results, was made by an American named Schenck, who, in 1847, arrived in Belfast with specimens of fibre prepared by exposing the straw to the action of water heated by steam, and maintained at the temperature of 90 degrees for sixty hours. The introduction of Mr. Schenck's method seemed likely to produce a complete revolution in the system of flax management, and it was expected that the preparation of fibre for the spinner would be made entirely a factory operation, and thus be rendered independent of the ignorance and unskilfulness of the farmers in those districts which it was most desirable that the cultivation of the plant should be extended, but in which the want of skilled labour opposed very great obstacles to its introduction. In Ireland, however, an establishment, erected under Mr. Schenck's patent, did not give satisfaction; spinners complained that the fibre was injured, and the expense of conducting was found so great, that it was found necessary to return to the old method of steeping. There is at present only one factory in Ireland in which the hot water system is followed; but in England and in Belgium, where it is known as the "rouissage manufactureur," it has given greater satisfaction. At Calne, in Wiltshire, certain modifications of the original method are employed, and from the reports of our spinners, we find that the fibre obtained there is regarded as of excellent quality.

We have had many opportunities of observing the application of Schenck's process both under the direction of Mr. Schenck and his intelligent successor, Mr. Bernard, and we have always regarded it as calculated, if judiciously applied, to prove of great value in the production of flax fibre. It is, in fact, merely the ordinary method of fermentation *accelerated* and *placed under control*, and, if managed by persons acquainted with the business, capable of preparing flax in the most satisfactory manner. In many of the works conducted on Schenck's method, the temperature of the water was raised too high, and the soluble constituents of the plant hardened and made obstinately to adhere to the fibre. Uniform temperature, not exceeding 70 degrees, which can be obtained at but trifling expense, and the application to the steeped straw of the pressure of a pair of smooth cylinders of cast iron, while, at the same time, a stream of water is made to flow upon the rollers as proposed, first, we believe, by Mr. Pownall, of London, so as to wash away the softened organic impurities, will enable the steeper to accelerate the process of steeping, and yield the fibre in the best condition.

In Belgium much interest has lately been excited by the application of a new process proposed by M. Julien Léfébure, at the London Exhibition of 1862, who obtained a gold medal for flax and hemp prepared by his system. Through the kindness of his Excellency Lord Wodehouse, Lord Lieutenant of Ireland, who has obtained a report from Belgium for the Chemico-agricultural Society of Ulster on this method, we are enabled to give some account of its chief features.

Léfébure's method is described as being based "upon a combination of chemical and mechanical elements." An alkaline solution is used as the solvent, and three successive operations are required. In an establishment in which 1000 kilogrammes of undressed flax are daily treated, producing 175 kilogrammes of prepared flax ready for spinning, the first operation is *crushing* the flax (*broyer*) so as to remove the woody matters: 1000 kilogrammes of green flax when crushed give 320 kilogrammes of filaments. The second operation is *washing* in water and alkali; the expense of the quantity of water required for the above quantity of flax is 16 francs. The third operation is *drying*. A "séchoir" machine for drying 320 kilogrammes of crushed and washed flax should measure 20 metres cube, and the flax is hung upon sticks placed one above the other at the distance of 45 centimes. The dried flax gives a return of 175 kilogrammes. The cost of preparation is stated to be from 26 to 27 centimes per kilogramme. The report unfortunately does not give us any description of M. Léfébure's machine for removing the woody matters, and though M. Rey, a leading Belgium "filateur," and the great linen manufacturer, M. Taek of Courtrai, report favourably of the merits of the system, yet we require more information to lead us to place much confidence in any method which attempts to separate the fibre from the straw, previous to its being submitted to some process of softening.

The next operation which the steeped and dried flax undergoes, when treated either by the ordinary method or by the hot water process, is "breaking" or rolling. This is performed either by machinery or manual labour. In Belgium a simple mallet shaped implement is much used for this purpose; but in this country a machine called a *break* is preferred; this consists of two heavy pieces of wood, each of which is furnished on one side with a number of parallel angular bars, so arranged that when the pieces of wood, which are connected by a hinge are brought together, the angular surfaces of the bars on one piece are screwed into the hollows formed by the bars on the other. One of the pieces is permanently fixed on a stand, while motion is communicated to the other by means of either an iron spring or by an elastic pole of wood attached to it, and connected with a treadle on which the workman presses with his foot. By placing a handful of the dried straw between the angular bars, and causing the movable piece to descend, it presses the straw between the bars, and breaks the inelastic structures of the central part, while the guiding fibre remains uninjured.

In large establishments, however, the flax is rolled by being submitted to the action of a series of fluted rollers of metal.

The woody matters having been broken by the break, it is necessary that the fibre should be deprived of its worthless appendages. This is effected in some districts by a simple manual implement, which is merely a thin blade of wood attached to a handle. The workman by whom the "scutching," as this operation is termed, is performed, takes in his left hand a handful of the straw and passes a portion of it through a slit in the side of an upright stand of wood called "a stock," and submits it to repeated blows, and presents every part of it to the blade, so that all the woody matters are beaten out and the flax rendered *clean*. The woody matters constitute what is known as "*shove*," while any short or injured fibres which are removed in the operation are sold as "scutching tow."

Numerous mechanical inventions for facilitating the labour of removing the woody matters from the textile fibre have been introduced by our engineers, but as yet only one form of scutching machinery has succeeded in acquiring the confidence of both farmers and spinners—viz., the scutching mill which is at present found in every flax-growing district in Ulster. The scutching arrangements in these mills consist of a number of wooden beaters screwed to wheels which, at distances of about three feet, are fixed on a horizontal iron shaft, usually driven by water power. Each set of blades is inclosed in front by partitions of wood, and is made in descending to revolve near an opening on one side of the partition, through which the workman can insert the flax without risk of being injured. The flax after breaking is prepared for the scutcher by being "stricked"—that is, made up into even parcels, each containing as much flax as the hand can grasp.

The cost of scutching a stone of flax in these mills is one shilling, of which twopence is charged for stricking. As yet no efficient substitute for the ordinary scutching mill, or any machine which can enable the farmer to dispense with skilled labour, has been introduced. The ingenious machines of Rowan, Potts, and Friedlander, may be regarded as on trial, and in the opinion of many experienced judges have not yet satisfied expectation. In the preliminary operation of breaking, mechanical ingenuity has been more successful in affording the farmer reliable assistance; and the breaking machines of M'Adam, of Messrs. Sanford & Mallory, and of Friedlander, have given satisfactory results both in this country and on the continent, and are at present extensively employed. No matter, however, what machinery is used if the crop has not been properly cultivated and carefully watered (steeped), it will be impossible to make it yield good fibre. A great deal of the flax brought to market last year, even in the north of Ireland, was almost worthless. Some of that grown in the south, Mr. Maguire, M.P., tells us, was so bad "that it would be as difficult to make fibre out of it as it would be to make it out of copper wire."

The flax straw—rippled, steeped, and scutched as described—is ready for market; and the textile fibre is purchased by the flax buyers of our northern spinners at prices which in 1864-65 were, for superior qualities, from 8s. to 8s. 6d. per stone; for inferior qualities, from 6s. to 6s. 6d. per stone."

PROTECTED GUNPOWDER.

(From the London Star, July 21.)

Mr. Gale's invention having survived the most severe and complex trials—which are the measles of the infancy of an invention—it is but fair that we should draw more particular attention to it than has been done by the scattered paragraphs which have from time to time appeared in our columns. From being a chimerical idea, calculated to astonish country gentlemen and provoke a smile of pity on the faces of respectable authorities, the non-explosive gunpowder, as it is familiarly called, has worked its way upward to be recognized as a definite practical fact. The paragraphs in quiet country papers which first announced its existence have been expanded to metropolitan leaders, and every true Briton knows the importance of a subject which has attained to a leading article. The experiments which were made on Saturday evening at Torwood, Wimbledon, differed in almost no particular from those by which the efficacy of Gale's powder have hitherto been tested; possibly because these experiments have been as subtle and searching as could well be devised. Slow matches were burned into vessels holding gunpowder mixed with the protective powder, and they only served to ignite a few isolated grains. Vesuvian matches were flung into the powder, and were ignominiously extinguished. A red-hot poker was stirred through the powder, with no better (or worse) effect. But by far the most convincing test is that which was was proposed by Lord Bury, namely, that a quantity of pure gunpowder should be placed in the centre of the protected gunpowder and the former fired. This experiment was also exhibited on Saturday; and if we remember the keen, permeating power of flame, especially where that flame has been propelled in every direction by a vigorous explosion, we can understand how gunpowder that may resist this attempt at ignition may, with some show of reason, be pronounced safe. The pure gunpowder was placed in a sort of pit inside the vessel, and carefully covered over with the protected powder; when the former exploded, it simply blew what was above it into the air, and had no effect in igniting the great mass which lay beneath and around it. Thereafter a portion of surrounding mass was riddled in the usual way, and the residue exploded as ordinary powder will explode. We may assume this test to be conclusive, and proceed to mention a few of the advantages accruing from the practical use of the invention.

In the first place, the cost of carriage of ordinary gunpowder is £7 10s. per ton, the highness of the rate being, of course, caused by the dangerous properties of the material. The carriage of a ton of protected powder for the same distance is 10s. But, if mixed in the proportion which Mr. Gale suggests as being indubitably safe, there are three tons weight of his powder to every ton of gunpowder; so that the cost of carriage of an actual ton of gunpowder, accompanied by its sufficient quantity of protective material, is £2, thereby saving £5 10s. per ton.

Then, as to storage of gunpowder, great difficulty is experienced in obtaining sites for magazines, Government not allowing above a certain quantity of powder to be stored in any mill or magazine, however remote or apparently safe. Mixed with Gale's protective material it matters not where the powder be stored. Thousands of barrels might with perfect safety be placed in vaults beneath the House of Commons, and a dozen black-visaged Guy Fawkes allowed to brandish torches in whatsoever subterranean Walpurg's-dance they pleased. The cost of forming shell-proof magazines within our shore batteries is at once done away with; and the enormous expense of building strong powder magazines in or near large cities is no longer necessary. Iron ships need no longer resemble gigantic bomb-shells which only require a spark to send them flying into the air; barrels of this powder may be kept with perfect safety on the deck of a ship while in action. In short, the cost of the storage of this powder is no greater than that of so many barrels of flour; while the further recommendation—greater than any saving of cost—that hereby the absolute prevention of explosion is ensured, is so apparent that it need scarcely be mentioned.

It requires only to be seen how larger machinery for the sifting of the powder and restoring it to its original state, may be constructed so as to be used in a sudden emergency. For though the advantages which the invention offer to the use of po der at home are sufficiently great, it is necessary to its adoption by the army and navy that its mechanical appliance should be of the swiftest and readiest kind. An objection has been raised on the ground that, after the gunpowder had been sifted, some portion of the protective powder would adhere to the grains. This is not the case, as has been proved by microscopic investigation; though Mr. Gale shows that, though it were the case, it would be no objection, as at present the coating of the powder with blacklead, while in course of manufacture, gives an additional force to the explosion.

The material which thus renders gunpowder temporarily innocuous is simple glass ground down to an exceedingly fine powder; various other substances have been tried (especially flint, which, however, became too floury and dusty), but no one has been found so useful and successful as glass. The cost of it, as we have already stated, is 30s. per ton, and Mr. Gale is prepared to furnish any quantity of it on the shortest notice, as the advertisements say, at that price. It may be used, besides, for a variety of purposes: scours copper and other metals into a brilliancy sufficient to make the inventor of polishing-paste die of envy. At present Mr. Gale advances three pounds of his powder to one of gunpowder as the safest proportion; but a much smaller proportion renders the gunpowder perfectly non-explosive; with this difference, however, that in equal parts of gunpowder and protective powder the former will burn, though it does not explode. A proportion of two to one burns slowly, three to one allows a few grains to ignite at haphazard, four to one is mere dead material. The rapidity with which the powder can be separated is somewhat remarkable; perhaps owing to the nature of the material with which it is mixed. The proportions we have mentioned are weight, not bulk; the protective powder being heavier than the gunpowder, what forms a proportion of three to one in weight is only two to one in bulk, and this is an important fact in considering storage. Another advantage offered by this material is that it keeps the powder perfectly dry, however the mixture may be exposed to the air; and it is well known that by itself gunpowder rapidly absorbs moisture from the atmosphere and becomes for the time useless.

Among the gentlemen present at Torwood on Saturday were Sir John Hay, Mr. Chambers, M.P., Mr. Gilpin, M.P., W. E. Rendle, Esq., and others more or less interested in the matter; but we should say that these partially private experiments are now almost unnecessary; and that Mr. Gale should bring his invention more immediately before the public, confident that its efficiency and simplicity will be apparent to all who may witness its results.

ON DYEING.—By W. Edmunds.

So numerous and of such importance are the applications of chemistry to the arts, that scarcely any of them can be successfully or profitably carried on without the assistance of this science, as it indicates the nature and inherent properties of all material substances, and points out as the result of experiment the laws regulating their composition and decomposition. Though the science of chemistry is daily becoming more and more perfect, yet many arts attained, when chemical science was in its infancy, great excellence—an excellence which, in some arts cannot be surpassed in the present day by the most experienced manufacturers—and in some cases processes have been entirely lost and cannot be recovered by our most skilful chemists. That many chemical phenomena should have been discovered in ancient times, and afterwards lost, is not to be wondered at, for in the early periods of chemical science, many of these phenomena were the result of chance experiments, the chemical laws governing the various changes being unknown, and consequently were lost as time lapsed.

To every seat of the arts chemistry descends, where it changes the forms and the qualities of the productions of nature, enabling them to be appropriated in a thousand different ways to our wants. The dyer, tanner, distiller, bleacher, the soap and candle-maker, the manufacturer of glass, porcelain, and sugar, the brewer, gas-factor, photographer, the etcher upon copper and steel, the lithographer, and many others, are all more or less beholden to this science for the perfection to which their several arts have arisen. By its aid we learn how to extract the metals from the combinations with which they are found in nature—how to fuse, purify and alloy them. It gives to waste materials new and increased value, for the chemist, by research and experiment, points out the application of matters supposed to be effete and useless, to some beneficial purpose. In the present day the manufacturer must possess a certain amount of chemical and scientific knowledge, so vastly are the arts indebted to chemistry for all improvements in their various processes, and especially if he would compete successfully with others in his productions. The manufacturer, by pointing out new processes, and discovering new materials, which cheapen the products of his art, is enabled to bring within the reach of the many the comforts and luxuries which otherwise would have been confined to the few. How necessary it is for the manufacturer of soap, if he would successfully and economically carry on his manipulations, that he should understand the affinities existing between the various oils and alkalies; to the candle-maker, that he should understand the decomposition of fats and oils into their acids and bases—he must learn the nature of fatty bodies, and know how to separate the superfluous matters of fats and oils from those parts which he requires in his art. The extraordinary improvements that chemistry has effected in this one manufacture is surprising. Before 1811, the candle manufacturer had only tallow, wax, and spermaceti at his disposal, and the great desideratum was to obtain substances possessing a certain amount of hardness and compatibility; the great objection to tallow, besides its disagreeable odour, is its want of uniformity in consistence—tallow being formed of two fatty bodies, one oily and soft, the other firm and hard: consequently, when burning the soft portion melts first, and we have what is known as guttering. In 1811, a French chemist, M. Chevreul, by his researches, explained the true nature of fats, their composition, &c., which up to this period had been veiled in obscurity; he separated fat into solid and liquid constituents, and placed at the disposal of the manufacturer the solid ingredients of fat, stearine, and margarine, possessing the required properties, and as the result, we see in the present day the tallow candle almost entirely superseded by a variety of candles called palm, composite, Belmont sperm, stearic acid, and many others, which almost equal wax and spermaceti in appearance and illuminating power, and from the cheap rate at which they can be manufactured the best varieties are open to all.

In very few cases has chemistry been more successful in its application than in those of dyeing and calico printing. Dyeing is strictly a chemical art. The great object of the dyer is to be enabled to impart to fabrics of various materials, whether of silk, cotton or wool, certain colouring matters, the colours being derived either from the animal, vegetable, or mineral kingdom, and so imparting these colours that they cannot be removed by washing. This art being so dependant upon chemical science, we shall expect to find that its development has taken place of late years only, and that amongst the nations of antiquity it existed in a very imperfect state. Amongst the Greeks and Romans indigo was known, but was used only as a pigment, not as a dye, the nations being ignorant of its proper solvent, it being insoluble in water, though in Egypt and in India this dye was known and used. Madder was also used as a dye, and the kermes insect, for the production of a crimson colour, by these nations; but it is well known the most renowned dye in ancient times was the imperial Tyrian purple, a most costly colour, and worsted dyed with this in the time of Augustus, sold for £36 the pound weight; it was used in dyeing the imperial robes, and exclusively employed for that purpose. It was procured from two shell fish, *buccinum* and *purpura;* a puncture was made in the neck of the animal, and when squeezed two or three drops exuded; or the entire shell-fish was pounded in a mortar, and the fluid thus obtained, collected, mixed with water, and used. The fluid thus extracted was at first colourless, but by exposure to air and light, became yellow, then green, afterwards red, and in twenty-four hours, of a beautiful purple colour. By adding to this dye various alkalies, &c., the Tyrians managed to get shades of this colour. The process for obtaining the Tyrian purple was kept secret and lost, but of late years some French chemists have obtained from these shell-fish, the beautiful purple of ancient days. When America was discovered, several dyeing materials were added to the list, such as logwood, arnatto, cochineil, Brazilwood and quercitron. But the great improvement in modern times in dyeing, (and this improvement owing to the rapid strides of chemistry) is the addition of colours derived from the mineral kingdom. Thus, about the end of the 17th century, Prussian blue, chrome yellow, chrome orange, manganese brown, prussiate of copper, green, &c., &c., were added to the list, and the use of Mordants became general. We do not, as would naturally be supposed, derive our dyes from the brilliant, and varied colours of plants, for it is found that in those parts of the plant exposed to free air and light, though the colour is brilliant yet it is small in quantity and soon lost. Most vegetable dye colours are obtained from the roots, bark, and berries of plants, which exhibit in their natural state but little of the beauty which is obtained from them by the chemist and dyer. The colours obtained from plants are chiefly yellows, browns, and blues; no proper black has yet been obtained. These are not soluble in water, but require spirits of wine, alkalies, or acids, to dissolve them.

Animal and vegetable tissues and fabrics possess a great attractive power for all colouring matter, whether animal, vegetable, or mineral. The common iron-mould stain is a very good example of the attractive influence of fibre for mineral colour—the iron having combined with the vegetable fibre remaining fixed, no washing will remove it. Dyeing materials may be classified into two groups:—1st. Colours capable of imparting permanent tints to various textures without the assistance of any other substance, these being called *substantive* colours. 2nd. Colours which cannot be permanently imparted without the assistance of a second body, these being termed *adjective* colours.

PHILIPPE GIRARD,

THE INVENTOR OF FLAX MACHINERY.

The *British Gas Light Journal* says: "We often repeat, after Sterne, when vexed by some shortcoming of the let alone system of legislation, 'They manage these things better in France;" and, whether it be true or not, it does us good to be discontented, and to ask the reason why this or that grievance should exist. We have nothing to boast of in the matter of our treatment of great inventors in the good old times. Crompton lived to show how slight are the rewards of an ingenious mechanic unprotected by a patent law. The Corts made untellable millions for England, and as a reward were tortured all their remaining lives by the endless vexations which the law, in the ages of the greatest lawyers, liberally applied to all claimants not backed by the largest capital. It is a vulgar error among the admirers of Cæsarism that under an enlightened despot, men who deserve well of their country and do not meddle in the talk of politics are sure to be appreciated and rewarded. We recommend to those with such opinions a study of the 'Life of Philippe de Girard," by Benjamin Rampol, lately published in Paris. Philippe Girard appears to have been born a gentleman of fine fortune, and a mechanic, to whom invention was a necessity. The author claims for him—on what grounds does not appear—several improvements in the steam-engine which are ordinarily attributed to Americans and Englishmen; but his reputation rests on his machinery for superseding hand-labour in flax-spinning. One of Napoleon's favourite ideas during his attempted conquest of all Europe, including England, was to make France independent of British commerce for either manufactured or raw produce. The biographer observes, 'To dispense with the produce of England was half way towards conquering her. None of Napoleon's lieutenants made a more effective campaign against England than Richard Lenoir, who established cotton factories on the English system in France, and even in Paris.' Considering the ill fortune of Napoleon's lieutenants in combats with the English, this is not saying much. However, Napoleon saw plainly that cotton factories without cotton, which British cruisers excluded, were of little practical value, and expected an enormous assistance in carrying out his Continental system if machine weaving which could be adapted to flax and hemp. With this view, on the 12th May, 1810, the Emperor issued a decree, in which he offered £40,000 as a reward for the invention of a linen combing and weaving machine. The *Moniteur* containing this decree reached the Girard family while engaged on their morning meal. 'Philippe,' said his father, 'this is your business.' Philippe read the paper himself, and shortly afterwards retired to his room with a handful of flax, and locked himself in. He did not reappear until the next morning, and then, we are told, he had already solved the problem and settled the principle of the machine that was destined to revolutionize the linen trade. He ran to his father, embraced him, and cried aloud, 'The million is ours." Up to that time his ingenuity had brought nothing but loss upon his family. The ancient patrimony of the Girards, which had been much diminished by the Revolution, was further embarrassed by his attempted improvements of the steam-engine and other inventions. The re-imposition of the duty on salt had ruined some salt-works in which he had invested a considerable capital, and the introduction of the natural soda of Spain had closed a manufactory of artificial soda which Philippe had established near Paris. The solution of the problem proposed by the Emperor seemed destined to repay him for all his previous disappointments. Philippe repeated before his family the experiments he had already made in his own study, observing: 'What I do with my fingers my machine shall do, and then the invention is complete.' On the 12th of June, 1810, just a month after the appearance of the decree in the *Moniteur*, Philippe Girard made an application to the Minister of the Interior for a patent of invention, with a memorial describing the two fundamental principles of his proposed machine; which, it is enough to say here, are the principles on which the present system of linen manufacture is still worked. The application was referred to the consulting 'Bureau' of Arts and Manufactures, and on their favourable report a preliminary patent, dated July 18, 1818, was granted to Frédéric and Philippe Girard. Unfortunately the officers of State with whom Girard had to deal seem to have been both narrow-minded and greedy. They doubted the value of an invention which was so rapidly produced; thus the fertility of Philippe Girard's genius was positively injurious to his fortunes. In November, 1810, a ministerial decree adjourned the examination of plans and the award of prizes for three years, and settled that the prize was only to be awarded on condition that the fabric should be of a degree of fineness not required in commerce, and sold at a very cheap rate. Finally, the promised reward was to be reduced by half or three-quarters, unless all the conditions of the new programme were fulfilled.

"In the meantime, Philippe Girard worked away at his invention, and produced a small machine with a dozen spindles. One of his friends and admirers (Chaptal) proposed to reward him in a manner eminently characteristic of French ideas; not by subscribing capital to enable him to work out his linen spinning machinery, but by creating for him the post of 'Minister of Inventions,' as if inventions could be grown like root crops. In his difficulties, Girard addressed a letter to the Emperor, couched in the language which Frenchmen and Italians seem to admire, but which to our colder ears sounds painfully inflated, bombastic, and almost ridiculous; and yet the writer was a man of genius, and deserved a better patron than the first captain of the age. In this letter, he says that 'the thin threads he presents shall, in the hands of his Majesty, be strong enough to break the cables of his enemies.' But the Emperor was too busy warring in Spain and preparing to march into Russia to listen to the petition of a mere inventor. A French reviewer mournfully exclaims that Girard's mechanical victory over flax might have done more than the victories of Friedland and Wagram 'to chain continental Europe to the fortunes of France, and crush the obstinate resistance of Britain.' Those who are fond of tracing the interference of Providence in small affairs might here perhaps remark, that the invention which was intended to be the ruin of England proved in the sequel one more addition to her sources of wealth, and the power so long used to preserve the peace of Europe. Girard determined not to wait for the expiration of the term of three years. He constructed not only, as required by the ministerial programme of November, 1810, 'a machine of full size, ready to work in a factory,' but he set it to work, and manufactured linen on a large scale. One factory, with two thousand spindles, was established in the Rue Meslay, and another in Rue de Charonne. In order to raise the necessary means, the brothers mortgaged their landed estates, which were in 1811 worth nearly £30,000. In 1812 Chaptal presented to the Emperor specimens of Girard's thread and linen, with the view of advancing the time for awarding the promised million francs. But the reverses of 1813 fully occupied Napoleon's attention. As a poet would say, Napoleon was too much occupied in weaving the winding-sheet of his own glory to think of such common things as ordinary shirts and shifts, and tablecloths. While working for the million of francs that never came, Girard tried to raise an income by selling his goods. The first sold well, but soon the general distress of the country stopped all business. With enormous expenses, and many thousand pounds worth of goods unsaleable, bankruptcy was approaching with rapid strides. On the invasion of France in 1813 he invented a steam-gun, thus preceding the now forgotten Perkins. The fall of the Empire completed the ruin of the Girards, and in answer to a request for time Philippe was threatened by his creditors with personal arrest. To add to his miseries, he was for a time robbed of the barren honour of his invention. 'Two foremen whom he had trained—Lanthois and Cachard—fled to England with tracings of his drawings and copies of the specification of his patent, which they offered for sale as their own, and found a purchaser at £25.000 in Mr. Henry Hall.' Hall on the 16th of May, 1815, took out an English patent, which is only a translation of the French one; and the honest Cachard—'honest Iago'—found profitable employment in the linen factory of the Marshall's, of Leeds.

"In the meantime the true inventor's position was growing worse every day. The looms of his great factory remained unworked; his debts accumulated by interest and law expenses. Under these circumstances, he very unwillingly, at the request of his creditors, entered into an agreement with the Austrian Government to establish machine spinning in that empire. But, in spite of the heavy pressure upon him, he reserved within his breast one part of his invention, with the hope of setting it to work in France at some future and happier period. He passed nine years in Austria, where he was well treated. A factory for the construction of his machinery was established on the Imperial domain of Hirtenburg. In the course of a few years his system was adopted in the linen manufactories of Bohemia, Moravia, Silesia, and Saxony. The central establishment prospered as long as it was confined to manufacturing and selling machines, but ceased to be remunerative when a spinning establishment was added. Girard invented a method for working up the waste flax, improved the water wheels, and worked at improving the steam-engine. While his flax machinery, highly appreciated in Austria, enriched those who used it, official scientific authorities in France reported on it as 'mechanically bad and practically useless.' 'It injured the quality of the flax, could never vie in quality with hand-work, and was finally objected to as likely to ruin the trade of the spinning women!' This ignorant and malicious verdict killed Frédéric Girard, and reduced the whole family to despair. The spinning operations at Hirtenberg, undertaken contrary to the advice of Girard, ruined the once flourishing establishment.

"In 1826, Philippe Girard, being then over fifty years of age, accepted from the Russsian Government the appointment of engineer in-chief of the Polish mines. He was compelled to accept this office in order to preserve a remnant of his paternal estate—consisting of a house for his family and the ruins of the old mansion—from his creditors. In order to carry out the wishes of the Russian Government, he revisited England to study our mining system, to engage foremen miners, and purchase machinery. It was then that for the first time he discovered the extent to which he had been defrauded by Lanthois and Cachard. He visited Leeds and saw the vast manufactories of Messrs. Marshall and Messrs. Ives and Atkinson, and he wrote to a friend—'I have seen the patents, and with grief found exact copies of my own drawings.' But even at that date the English flax-spinners had totally neglected the second part of his system, which consisted in deglutinizing the elementary fibres of the flax by pressure between cylinders. One, Mr. Key, an English mechanic, about the time of Girard's visit, had found the method in Girard's original patent, and took out a new patent for it on his own account. He would speedily have made a fortune had not the original inventor been on the spot, and ready to direct the attention of Key's competitors to the true source of his improvement. The strange thing is, that Girard seems to have derived no profit from his advantageous position. We are afraid that he was a thoroughly impracticable man, or perhaps, as his biographer suggests, he still cherished a wish to reserve his best ideas for his native country. It seems from his correspondence that he proposed to go from England to France, but was prevented by information that his creditors intended to arrest him on his way. He remained in Russia until 1844, and during that time benefited his employers with numerous mechanical inventions of value. He also founded a great flax-spinning factory, which gave rise to a village called after him, Girardow. For this manufactory he invented a second machine for combing flax, which is universally used at the present day. But while he was doing so much for his employers he was never able to accumulate any fortune himself. In 1833, the competition of the English linen manufacturers was so active that the French hand-made goods were almost driven out of the market. It never occurred to the French Government to avail themselves of the services of their countryman, the originator of the great improvement in flax-spinning. They could think of nothing better than to employ agents to copy and smuggle over English machinery, the exportation of machinery being at that time unlawful. Newspapers, and even deputies in speeches in the Chamber, were not ashamed to boast of the manner in which the system of spinning flax by machinery had been 'secretly smuggled away' from England.

"Philippe Girard addressed from Warsaw a memorial to the King of France, claiming his share of the English improvements. This memorial would have been forgotten, had it not been for the Exhibition of Arts and Manufactures in Paris, in 1844, when in consequence of a warm appeal from Arago, he returned to his native country, after an exile of 29 years. He was received with acclamation. He exhibited models of many of his improvements in lamps, in agricultural implements, in the manufactures of sugar, of muskets, and steam-engines, as well as flax machines. For these he received a gold medal, and at the same time his models were seized under an execution for one of his old debts, and he was obliged to hide himself in the country until the 1st of February, 1849, when his age, 69, privileged him from personal arrest! All attempts to obtain the promised prize of a million francs failed. 'Monsieur Cunin-Gridaine, the Minister of Commerce,' according to the French biographer, 'would never admit Girard's claims as an original inventor, because that would have diminished his own merit as a smuggler of the English machinery.' Louis Philippe appears to have supported Girard's claims, but on the 26th of August this unfortunate genius died, a few hours after writing the last lines of a last appeal to the Government. It seems that his sympathizing countrymen embraced him, crowned him, medalled him, serenaded him, but did not subscribe for him. For his family nothing was done until 1853, when they obtained an annuity of £480 as a national reward. Thus Philippe Girard, born rich, lived in exile, died poor and in debt, because he had invented a means of creating incalculable wealth.

"We must not boast. In the old days before newspapers spoke daily, we too have treated inventors ill enough; but it is not too much to say that the 'cold, egotistical, aristocratic islanders' could not have treated a great mechanic worse than the French treated Philippe Girard. Unfortunate gentleman!—for he was a gentleman—he should have been a brave, hard-headed, hard-hearted drummer boy, and then he might have died a marshal of France. We do not treat our soldiers so well in England, but we treat our mechanics better.—*British Jour. of Gas Lighting.*

TRADE WITH SOUTH AMERICA, QUITE PRACTICABLE.

Last year there were imported into this city alone Hides to the value of $220,000, and Green Coffee to the value of $94,000, almost the whole of it being the produce of South America. What was the quantity entered into the whole of Canada, we have not the figures at hand to show, but we must suppose it to be at least as much more. And yet not one vessel arrived at this port from any part of that continent. One of the principal articles of import at Buenos Ayres (whence most of the Hides are shipped) is lumber. They are also large importers of flour. Rio Janeiro is also a large importer of both of these articles. A great portion of the lumber which these two largest shipping cities in South America take is of Canada growth and manufacture, and yet not one particle of the trade is in our hands. We have a large supply of two of the principal articles of consumption in South America, and they have the same of two very needful articles which we consume in large quantities, and yet both are content to derive the supplies of the other through a third party—the merchants of the United States. We send our lumber and flour to the United States, and they ship it to South America, and derive the profit; and they purchase in South America the Hide and Coffee, and sell them to us and again make a profit. They are the factors and carriers for both parties. If the Reciprocity Treaty is actually rescinded it is to be hoped that it will make a change in this trade, and that Canadian merchants will take hold of it, and thus open up a direct market for our produce.

Some large firms in Boston have for a number of years cut lumber in Canada on the line of the Grand Trunk Railway, and had it carried to Portland, thence to be shipped to the La Plata. The description of lumber shipped was principally spruce, cut to certain dimensions known to the traders to that market. There is also shipped a certain quantity of pine. Ordinary spruce timber on the Grand Trunk Railroad, in the vicinity of Sherbrooke costs from seven to eight dol. per thousand feet, and sells in Buenos Ayres at six to ten times that price. Here is a large and profitable business from which the merchants of Canada might realise a considerable amount of money as well as finding a market for our produce. And at no better time than the present could that business be entered upon. Lumber is in exceedingly large supply and low, and consequently freights are low; and flour and grain are cheaper comparatively here than in the United States markets.

There is no reason why our inland position should keep us from entering into the most profitable shipping trades of the outside world. We trade with China, the West Indies, and the Mediterranean. Why could we not also trade direct with South America? A few years ago we would have occasionally an arrival from South America, but they have dropped off until now, we have had none for some years. We never did anything of an exporting trade to that country, but we did receive a portion of our coffee direct from Rio. If our merchants hesitate to avail themselves of the opportunity for an extension of our commerce, should the Confederation of the provinces take place, our fellow colonists of the Lower Provinces will soon take this trade from us. They have already a considerable trade in fish with Rio del Janeiro; and should the Intercolonial Railroad be built, as it undoubtedly will, they will be the great exporters of Canadian flour to South America and the West Indies, and the importers of their Hides and Coffee for us, as they now are to a certain extent of our sugar from the West Indies.—*Trade Review.*

INTERNATIONAL TRADE.

The *Trade Review*, writing on "Good Signs" of increased Trade with the United States, in articles of general commerce, closes with the following remarks on another branch of our industry:—

"Even in Canadian manufactures there are indications of a trade. In Canadian tweeds the transactions have been important. A leading Montreal house has sold to A. T. Stewart & Co., of New York, large parcels of this description of goods at remunerative rates, and we believe other transactions of a similar character have taken place. The reputation which this class of goods has now achieved ought to beget for them a large demand even from our neighbours. We can sell a class of goods to them better suited to their wants and at cheaper rates than they can be had from England. We know this is saying a good deal, but we think it may be demonstrated, and we shall shortly attempt to do so.

"We have indications, too, of an enlarged trade with our sister Provinces, satisfactory orders for leather, boots and shoes having been received and executed. Some tweeds have been shipped, and an occasional transaction in furs. There is no question whatever that, with an assimilation of the tariffs, there are a great many articles, as we showed last week, in which a profitable exchange could be made. There has also been very considerable shipments of leather to England, and an attempt is being made to introduce Canadian boots and shoes, which we earnestly trust will be successful. We are also happy to announce the success of a considerable shipment of furniture of Canadian manufacture, to the English market, from two of the largest manufacturers in Western Canada; and orders are now in the country for as much as can be manufactured of certain classes of goods, on which there is a good profit."

Useful Receipts.

Cement for Leather, &c.

An adhesive mixture to cement leather, india-rubber, or other soft material, to iron and other metals (patented in England by James Allen, of Dundee) is made as follows:—Dissolve 112 lbs. of glue with 7 lbs. of ammoniam, by fire or steam heat; stir them well, and then add 7 lbs of nitric acid. The mixture may be applied in either the liquid or solid state, and it can be applied as common glue is applied. If the metal is oily it does not prevent its adhesion.

To remove Iron Rust from White Stuffs.

Dissolve oxalic acid in warm water: spread the linen in the sunlight, and apply the acid to the spot, which will very soon disappear. It will remove many other stains. As the acid is a poison, it must be kept from children's reach. If too strong, it will injure the fabric itself. It should be well washed out almost as soon as applied.

Indestructible Labels for Bottles.

Coat the label with white of egg, and steam it until it becomes opaque; then dry it in an oven at 212°. The albumen becomes hard and transparent, and is unaffected by oils or acids.

Cure for Corns.

Take white turpentine, spread a plaster, apply it to the corn, let it stay on till it comes off itself; repeat this three times. Never fails curing.—J. L. Hersey.

Wonderful Liniment.

The following liniment is good for all sprains, bruises, lameness, &c.:—2 oz. oil of spike, 2 oz. origanum, 2 oz. hemlock, 2 oz. wormwood, 4 oz. sweet oil, 2 oz. spirits ammonia, 2 oz. gum camphor, 2 oz. spirits turpentine. Add one quart of proof spirits, 95 per cent., mix well together, and bottle tight. This linament cannot be equalled, and is actually worth one hundred dollars to any person who keeps valuable horses. Omit the turpentine, and you have the best liniment ever made for human ailments, such as rheumatism, sprains, &c. Try it.—*Wisconsin Farmer.*

Bandoline.

Many persons have a passion for smearing their hair with various substances, so as to make it smooth and shiny. We give below a list of some compounds for this purpose, which was published in the *Druggists' Circular*:—

1. Irish or Iceland moss, boiled in water, and the strained liquid perfumed.

2. Quince seed, half a teaspoonful; linseed, one tablespoonful; and a pinch of white mustard seed. Boil in a pint of soft water to half, and scent with oil of almonds.

3. Boil a tablespoonful of linseed for five minutes in half a pint of water.

To extract Grease from Woollen Cloth.

The cheapest and most effectual preparation for extracting grease from woollen cloth may be made of one part of liquid ammonia and four parts of alcohol, mixed with an equal quantity of water. If kept on hand, it should be placed in a glass-stoppered bottle. Apply with a piece of sponge, soaking the cloth thoroughly when the grease has remained any considerable time in the fabric.

To Preserve cut Flowers.

It is with great regret we see the flowers of a fine nosegay fade away in the course of a day or two, notwithstanding the care we take to change the water in which we put them. *The Memorial des Deux Sevres* informes us that if a good spoonful of charcoal powder be added to the water the flowers will last as long as they would on the plant, without any need of changing the water or taking any trouble at all.

Ink for Zinc labels.

The following is a receipt for an indeliable black ink to be used for writing on zinc:—Take 30 parts of verdigris, 30 of sal-ammonia, 8 of lamp-black, 8 of gum Arabic, 300 of water; dissolve the gum in the water, and pour it over the other ingredients, well mixed and reduced to powder. A quill pen should be used for writing.

Labels on Tin.

It is said that if tin is washed with common lime whitewash, and when dry wiped clean, pasted paper labels will adhere as well as to wood; or the tin may be washed with strong vinegar instead of whitewash.

Furniture Varnish.

A correspondent says, when black-walnut or mahogany-colored furniture becomes discolored or damaged, any one may, at a very small cost, "shine it up," like new. Provide a few cents worth of burnt amber and Indian red. For mahogany-color, mix Indian red with copal varnish till the right color is secured; thin with benzine, and add a little boiled linseed oil if it dries faster than desirable. For black walnut color, mix both pigments in such proportion as is necessary.—*American Agriculturist.*

To Powder Camphor.

Camphor may be beaten in a mortar for some time, without being reduced to powder, but if it be first broken with the pestle, and then sprinkled with a few drops of spirit of wine, it may be readily pulverized. Powdered camphor is much used in tooth powders, fireworks, etc.

Water-proof Paper.

A fluid for rendering paper water-proof may be made by dissolving 1¾ ounces of pure tallow soap in water, then adding a solution of alum in quantity sufficient for the complete decomposition of the soap.—This fluid ought to be mixed with the paper pulp, which may be worked up in the usual manner, but needs no glueing.—*American Druggist.*

Machinery and Manufactures.

Punched versus Drilled Holes in Boiler-Work.

Opinions differ very widely as to the comparative merits of punched and drilled rivet holes for work in general, but about so simple a matter as the riveting together of two plates something like unity of idea ought to be expected. But this is far from being the case. Punched boiler plates are advocated by some, whilst others strenuously support the drilling operation. There can be no doubt that the quality of the metal immediately around the punched hole must be injured to some extent by the splitting strain put upon the metal by the punch. This has, in fact, been shown to be the case, by cutting open plates riveted with punched holes, and with drilled holes, when the difference in the state of the metal round the holes in the two cases was plainly observable. But apart from this consideration, and solely upon mechanical grounds, is the question debatable. The punched hole is slightly taper in form, and in the case of bridge-work, where a number of plates have to be riveted together to form one thickness, the punched holes would clearly not all be filled by the rivet. It could be made to fill the holes in the two outside plates; and it would pass through the inside plates without touching them, except just at the smallest part of the hole. This is admitted by the advocates of punched holes, and it is further argued by them that this very fault of the hole in girder-work becomes the strong point in favour of its application to boiler-work. It is held that, for ordinary boiler making and similar purposes, when there are only two plates to be riveted together, a stronger joint may be made by punched than by drilled holes. To this end care must be taken to punch the plates the right way, and to place them together with the smaller ends of the rivet holes next each other. It is said that this allows the holes to be properly filled by the rivet, and that a section through the rivet, when in place, would show a form of increased strength for holding the plates together. Plates have been riveted together with both punched and drilled holes, and afterwards cut open down the centre of the line of rivets so as to show in both cases how the rivets filled the holes. It was then clearly seen that the rivets filled the punched holes as perfectly as they did the drilled holes. But it must be borne in mind that these were sample plates, and the whole secret of the matter lies in such careful and sound work as would be therein met with. But such care and such soundness certainly do not find their way into ordinary work in the present day, and therefore, notwithstanding the form of strength given to the rivet, or any other advantage claimed for it, the practical result of drilled will be found far superior to that of punched holes.

Any one who has had frequent opportunities of witnessing the testing of high-pressure steam-boilers, sometimes with punched and sometimes with drilled rivet holes, will come to a conclusion in favour of the latter. No one who has had experience of drilled holes in this particular class of work will be likely to return to punched holes for such a purpose. However carefully a punching machine may be arranged, and however well the work may be put together, there still remains the objection that the punched holes are always conical, and render it difficult to fill the holes completely in hand riveting. Boiler explosions have occurred which are clearly attributable to bad riveting in punched holes. In the case of an explosion which occurred some years since at Huddersfield. Mr. D. Adamson made an examination of the boiler after the explosion, and he failed to find a single instance in which the rivet filled the rivet hole completely from one side of the plate to the other. There were also very few rivet holes that were at right angles to the plates, both the riveting and punching being exceedingly bad. This is unfortunately by no means a solitary or an extraordinary case of its kind, and there are a number of circumstances constantly operating to multiply the examples of such work. In punching holes too much depends on the care exercised by the workman, and it has been found that boiler plates punched on the Monday are not done so well as those punched later in the week. This arises from the men not being so careful and accurate on the first day of the week's work as they are afterwards when they get more into it. It is therefore very desirable to place it beyond the reach of the men to produce defective work. This may be accomplished by drilling the holes in the plates of all boilers which are to be subjected to a high pressure, and not only this, but at the same time drilling the two plates together in the position in which they are to be riveted up. This will enable a correct allowance to be made for the curvature of the plates, and render it impossible for the workman to produce irregular holes. When the plates are riveted together all the holes will coincide exactly, and every rivet will take its proper share of the strain.

In the case of longitudinal seams of boilers say 6 ft. in diameter, made of 9-16th in. plates, to carry 100 lbs. steam, the single riveted joint is particularly unsafe, on account of the great shearing strain to which the rivets are subjected. Such a boiler, under a single test, may appear tight up to the testing pressure, but on subsequently raising the pressure rapidly up to the testing amount it will be found that the joints are not then tight, but will show signs of leakage or sweating in many places. This effect will be continued and increased in any subsequent testing when the pressure is raised quickly. This proves the insufficiency of a single test in trying boilers, and shows that a prolonged trial is necessary. The test may be repeated with advantage even fifty times a day, with intervals. By this method it has been found that in testing punched boilers for a day together, every time the pressure is put on there is more or less trickling from the joints. With drilled holes, however, the work is much more to be depended upon, and there is less of the ordinary sweating at the joints, nor is any serious leakage ever produced by repeatedly putting up the pressure rapidly. Hence, for locomotive boilers in particular, which are subjected to such rapid variations of pressure, it appears highly desirable that all rivet holes should be drilled, and also that the two plates should be drilled together in the position they will take when riveted up. Single riveted joints become impracticable in boilers of large diameter, say 7ft. with ⅝ in. plates, whether the holes are drilled or punched. The reason for this is, that the extra thickness at the lap of the joint throws the plate so much out of the true circle that every time the pressure comes upon them it springs the joint with a force which inevitably produces leakage when only a single row of rivets is used. A great deal of the external corrosion observed in boilers is due to the continual small leakages produced in this way by the variations of pressure. But there is a more serious evil, and one which is especially manifest in locomotive boilers; this is, that the constant springing of the joint has ultimately the effect of exfoliating the interior surface of the plates along the seam. The iron becomes guttered along the edge of the plates to such a depth through the thickness of the metal that in some cases locomotive boilers have exploded whilst working at the ordinary pressure. In riveting up punched work with steam or power-riveting machines, it it true that the rivets may be made to fill the holes, but it does not follow that the work, so put together, is as strong as if the holes had been drilled. On planing open the joint in the punched work it will be found that there is more or less irregularity in the holes, and, therefore, the rivets will not in all of them take their proper share of the strain along the whole length of the joint. But in drilled plates, where all the holes are drilled exactly at right angles to the plates, and when the rivets are accurately made so that each contains the same amount of metal as the other, and are afterwards put in the holes by a power-riveting machine, an unexceptionable joint is ensured. There can be no question that drilling possesses many advantages over punching: among others it affords greater security and much tighter work, which are especially desiderata in boiler work.—*Mech. Mag.*

The Manufacture of Steel.

There exists at the present time a strong and increasing tendency to substitute steel for iron in various branches of engineering manufacture. Steel girder railway bridges have already found their way into practical use in Holland, whilst in England steel rails are being extensively manufactured, not only for home, but for continental use. The manufacture of this latter article has also just been commenced in America, the first steel rail having been very recently rolled at Chicago from an ingot made by the Bessemer process. Ordinary rollers were used and the rail was rolled most effectually. Besides these purposes steel is being applied to many others of equal importance, and as the readier methods of its production become developed, so will its applications increase. It is already superseding wrought iron for many purposes as fast as a somewhat limited manufacture will permit, and its more general use in some respects only awaits an extended manufacture. During the last few years such important changes and improvements have been made in the production of steel as to constitute to some extent a revolution upon old customs. To Mr. Bessemer, perhaps, more than to any other man, are we indebted for the great changes which have been made in the process of manufacture. Added to what he has himself effected, are the results of the labours of others which he has been the indirect means of evoking. It cannot be denied that Mr. Bessemer has been a large contributor to our knowledge in dealing with iron in its crude state, so as to render it convertible into steel or refined iron direct from the pig. However much of incompleteness still attaches to the process of conversion, there yet remains the unquestionable fact that a vast amount of good work has already been accomplished. If the last ten years have greatly improved the production and quality of iron and steel, they have not supplied the means of producing the same quality continuously from the same ore and fuel. It is only too true that, with the greatest care, a want of uniformity is sometimes found to occur in the character of the article produced. A quantity of plates may be made of supposed uniformity in strength and character, but it has happened that one plate has proved of inferior quality and has been the means of condemning the whole bulk. It is, therefore, essential that uniformity should especially characterize the productions of our manufacturers, to the end that they may be able to set up a high standard of excellence.

The Bessemer system of manufacture will undoubtedly establish a new era in the production of iron and steel. It may ultimately tend to convert nearly the whole process of manufactured iron into the superior metal. But, besides the Bessemer process which has become so deservedly popular, there are other methods of manufacturing steel well worthy of notice. A cast steel, very useful for some purposes, is produced from wrought iron by fusion with carbon in a crucible. The degree of hardness attained in the steel depends upon the quantity of charcoal used; for tool steel 1·5 to 1·7 per cent. is introduced; for soft steel less than 1 per cent. is sufficient. This produces a soft metal capable of receiving a high polish, and which casehardens without bending. Some of this steel, or partially carburised iron, has been carefully tested and found capable of sustaining a strain of thirty-five tons to the inch. Under the name of homogeneous iron, a Sheffield firm has also introduced a mild steel of this kind, which takes an average tensile strain of forty-one and a half tons, or double that of wrought iron. A peculiar process of manufacturing steel is adopted at the works of M. Bugeney, near Paris. These works are managed by M. Chenot and his son, from whom Mr. Fairbairn obtained the particulars of manufacture. M. Chenot employs a peculiarly constructed furnace, fifty feet high and about eighteen feet square at the widest part, in which he makes steel direct from the ore by converting it into what he calls sponge. To the main furnace are attached other furnaces containing the fires, the greatest care being taken that the gaseous products alone shall come in contact with the ores. The heated currents from the minor furnaces are distributed through the main furnace by means of numerous intersecting flues, which also serve to equalise the temperature at those parts where they come in contact with the ores. The time required for producing the sponge from the ore is five days. About a ton of this sponge is withdrawn from the furnace every twenty-four hours, by means of a movable grated platform, which is elevated by rack and pinions to the proper height in the furnace, where it receives the charge, and is lowered at the required temperature to the space prepared for its reception below. The air is carefully excluded by placing a luting of clay all round the platform over which the sponge is removed. Upon the process of calcination, or conversion of the ore into sponge, being completed, it is supplied with carbon by being soaked in oil or other grease. It is afterwards placed in wrought-iron retorts, and exposed to the heat of a furnace for two hours, in order that any excess of carbon it may have received shall be driven off. The next step is to reduce the sponge to a powder, which is afterwards compressed into bars in strong iron by machinery. When it has reached this condition it is fit for melting, and is placed in a crucible with four tons of coke to one of steel. From the crucible it is run into ingots, and is finally prepared for the market by the hammer in the usual way. From this peculiar method of manufacture a superior description of steel is obtained.

In some works on the continent the German refining process is adopted, and steel is produced from crude iron by the decarburising effect of a blast in a furnace similar to a refinery. The pigs are melted by charcoal, and a strong blast is conducted over the molten surface of the iron. The mass of iron is stirred up so that every portion is brought under the action of the blast. The consolidation of the mass, and the colour of the flame, are the indications by which it is known that the process has been carried sufficiently far. The direct production of steel from cast iron in the puddling-furnace has for years been a fact well known to manufacturers, but only recently has puddled steel become an article of commercial importance. The process of converting cast iron into steel by puddling is similar to that employed for puddling iron, with, however, this difference; the iron is subjected to the oxidising action of the flame until the whole of the carbon is extracted, whilst in puddled steel the action is stopped before that point is reached. The iron is usually allowed to retain from half to one per cent. of carbon, and when this degree of carburisation has been arrived at, the puddler closes the damper and collects the steel into balls, which are hammered and rolled in the ordinary way. There is, however, one objection to puddled steel, and that is the want of uniformity to which it is liable. But mistakes in the manufacture may be corrected by breaking the bars, obtained as above, and rejecting the bad ones, the rest being piled, heated, and rolled into plates or bars. With care in selecting the iron, and in making, a tough malleable steel is produced, which has superseded wrought iron to a considerable extent in boiler making and shipbuilding. Its tenacity ranges from 35 to 40 tons per square inch, and its cost is about 25 per cent. in excess of that of wrought iron. Captain Uchatius produces cast steel direct from the crude iron by melting the pigs in a cupola, and running the products into a cistern of cold water. In the cistern is a dash-wheel which revolves very rapidly, and by striking the iron causes it to become granulated. The particles are afterwards intimately mixed with oxide of iron in a state of powder, or with sparry iron and fine clay. The quantity of oxidising material used is from 20 to 30 per cent. according to the amount of oxygen required. The ingredients are placed in a crucible, and fused in the steel melting furnace. The oxides cause the granules of cast iron to part with some of their carbon, and a slag is formed which purifies the steel. The quantity of steel obtained is somewhat in excess of the iron introduced in consequence of a portion of the oxides becoming reduced. The size of the granules affects the quality of the steel; if they are large the steel is hard, if small then the product is a soft steel, owing to the fact that decarburisation proceeds very slowly inwards from the surface. The tensile strength of this steel is about 90,000 lbs. per square inch.—*Ib.*

The Manufacture of Glue.

Ordinary glue is made by boiling the scrapings and clippings of hides, hoofs, horns, or the feet of horses, cows, sheep, and pigs, which has the effect of converting a certain substance, known to chemists as *osseine*, and existing in those parts of the animal, into gelatine or glue.

The raw material is first placed in large pits or tanks, containing milk of lime. The lime, being a strong alkali, removes the hair from the skin in the course of a few days, the time varying with the heat of the weather and the age of the stuff. When all the hair is removed, the skins are taken out of the lime-pits, and washed with large quantities of water to free them from the lime, which would act upon the skin in the same way it acted on the hair. When sufficiently washed, they are placed under a powerful hydraulic press, and as much of the water as possible squeezed out of them. Sometimes, instead of being washed after their immersion in the lime bath, they are simply spread upon frames in the open air to dry. The action of the atmosphere soon converts the lime into common chalk, which being perfectly neutral, has no further corrosive action on the skin. Manufacturers appear to be divided as to which of these methods of preparation is the better one.

The whole of the hair and most of the fat being removed from the skins, they are next thrown into a huge wrought-iron boiler full of water, which has a false bottom provided with a light framework of iron, to prevent the smaller pieces from sticking to the bottom and sides. Some manufacturers put the skins into a large network bag, made of rope, which is wound in and out of the boiler by a windlass,—but generally they are thrown in without this accessory.

The hair and waste pieces of the skin and fat left in the lime-pits are collected into heaps, allowed to rot, and then sold to the manure manufacturers.

The boiling gradually converts the *osseine*, which, as we have before stated, exists in the skins already formed, into gelatine, which dissolves in the water. The solution of gelatine thus made is, when sufficiently strong, run off into a settling vat, where, while still being kept warm, the mechanical impurities gradually fall to the bottom. When pretty clear, the solution is run off into a long trough, which communicates with a number of smaller ones, six feet long by two feet deep and one foot broad. As it runs into the trough a little alum is added, which appears to have the effect of clarifying the solution still further. As the solution cools in the trough, it forms a firm mass of the consistency of calf's foot jelly. The troughs are then carried into the cutting-up shed, where a man runs a knife round the sides to separate the glue from the wood, and afterwards divides it into "bricks," two feet deep by one foot long, and about eight or nine inches wide. These "bricks" are then taken out, and cut with a wire or a sharp knife into slabs about two inches thick. The slabs are carried on piles to the drying-houses, where they are laid upon network frames, a thorough draught of air being constantly maintained over their surface, by the sides of the shed being open to the four winds of heaven. The slices are turned from time to time, and gradually dry into the hard compact form in which glue enters the market.

This part of the process is a most critical one, a slight variation in temperature being sufficient to spoil a whole batch in a very short time. In winter, a sudden sharp frost will do a hundred pounds worth of damage in a few hours, by freezing the soft cakes, and cracking them into an infinite number of fissures. A sudden rise in temperature will have a disastrous effect from the opposite cause. The rise in the heat will sometimes increase the solvent power of the water contained in the glue to such an extent, that the cakes partially liquify and drop through the meshes of the network. Again, in damp, foggy weather, a sort of fungoid vegetation is apt to form on the surface of the cakes, destroying the transparency of the glue, and rendering it unsaleable. Several remedies have been tried for this latter misfortune, but none appear to answer perfectly.

To transform glue into the gelatine of the shops, it is simply necessary to dissolve it in water and allow it to settle. Clarifying agents are also used to destroy the last vestiges of colour. But this is a branch of manufacture which does not concern the *Ironmonger*.

There is almost as much fashion in glue as there is in bonnets—workmen showing themselves absurdly ignorant and capricious in their choice of various *forms* of glue. We say forms designedly, for many carpenters are not aware of the fact that the best glue is that which is made with the greatest care, whether in London, Salisbury, or Scotland; whether it is in long, broad, or thin cakes: has a piece of string run through it, or is destitute of that appendage. Others, again, have a fancy that the *darkest* glue is the strongest; but this is also a decided error. Thus, the principal difference between "Scotch" and "London" glue is, that the former is cut a little narrower than the latter, and has a string run through several cakes.

Size hardly comes within the province of the *Iromonger;* we shall therefore merely mention that it is a weak solution of glue allowed to gelatinize. About size, too, the most erroneous notions hove obtained credence among workmen, most of whom fancy that the *darkest* is necessarily the best. This absurd notion has led certain manufacturers to adopt artificial means of colouring their size.

The cakes being dry and hard, they are taken off the nets, the marks made by the meshes appearing in cross-barred impression on the surface.

If the glue has caught the "mildew," or has become dusty, each cake is scrubbed with a brush and hot water, to give it a clean and polished appearance. The cakes are then stacked in stores, in which every particle of moisture is driven out of them by artificial heat.

Such is the simple process of glue-making, the real secret of success in which is care and cleanliness.—*The Ironmonger.*

How Paper Collars are made.

"At the end of the first room are piles of pure white paper, awaiting their turn to be guillotined in a machine furnished with twenty-two shear blades, which cut the paper into the requisite strips for the collar, on precisely the same principle as a gigantic pair of scissors, thus leaving no rough edge. The product of two paper mills is consumed in this factory, at the rate of a ton to a ton and a half per day—the average production being about one hundred thousand collars per day, which find a ready sale, despite the numerous imitations with which the market is flooded. From the hands of the attendant who turns out the pure, even strips of paper, they pass into the hands of another fair executioner, who brings the incipient collar nearer its birth by passing it through another pair of knives, by which it acquires shape in an instant. Still another machine marches relentlessly up and down, and as the collar leaves its iron embrace, the three button-holes are visible—large, clean cut, firm holding, and easily handled.

"The collar is now placed between two dies or clamps, passed under a quick heavy pressure, and emerges again stamped with that close imitation of stitching which renders it so perfect an imitation of its linen brother that the difference can hardly be distinguished: it is stamped also with the size and corporate mark. Next comes the crimping machine, which draws the curved line on which the shape of the collar turns, and which by allowing space for the cravat insures a smooth fit. They then pass through the nimble hands of a damsel, who with deft fingers flying with lightning-like rapidity, turns the collar over as no machine has yet been able to do. From these hands it passes to the molding machine, where it is bent round into perfect shape and finished as a perfect collar.

"This process is an important one, requires skill in the operator, and strength in the paper, which must be of the best, to resist the immense strain required to mold the collar into perfect shape.

"The collar is now, as it were, born shapely, trim, and elegant, and ready to adorn the neck of the most fastidious, having passed through seven distinct processes in its manufacture. It is once more taken in hand by women and packed into boxes by the hundred, or in the well-known little round boxes of ten each, which are so convenient to toss into a valise when off for a week in the country or elsewhere. For the item of boxes, the company expend over $60,000 per annum. The first machine turned out the collar entire, performing the whole work at once, but slowly and imperfectly; but the genius of the inventor, quickened by the rapidly increasing demand for the article, added improvement after improvement, by one machine after another, until the manufactory is now capable of turning out five millions of collars per month.

"The American Model Collar Company employ in this manufactory seventy neatly-dressed intelligent looking American women, most of whom are young. These women earn a dollar per day, and their work is clean, healthy, and not very laborious. Mr. Gray, who first commenced to manufacture in the spring of 1863, has now eight patents on collars and machines, having previously secured them in Europe; three of the directors of the company went there this summer with skilled mechanics and American machinery, to take measures to establish the manufacture in England, France, and Belgium, where they will probably soon attain that popularity which the American model collar has achieved in this country."—*American paper.*

Mode of Rendering Wood Plastic.

A new and very simple method of effecting this has been lately discovered. It consists in forcing dilute hydrochloric acid through the cells of the wood, at a pressure of about two atmospheres. The impregnation must be continued for a length of time dependent on the nature of the wood. The bark is not previously removed, and by a very simple arrangement the fluid is introduced at one end of the log and passes out at the other. If while the wood is still wet it is exposed to pressure, the cells having been first washed out with water, its volume may be reduced to a tenth of what it was originally, the fibres being brought into the closest contact without being fractured or torn; and when dry they have no tendency to separate again. If it is pressed in dies, their details are brought out with the greatest sharpness and the most perfect accuracy. Impregnation in this way can be used for a variety of purposes. After the action of the hydrochloric acid, washing out with water, and drying, the wood may be cut with remarkable facility, and it answers admirably for the purposes of the carver. The drying is effected by forcing air, at a temperature of about 100° Fahr., through the cells. The moisture is thus carried off with great rapidity; and, as the contraction is uniform through the whole mass, no cracks are produced. Dyes also may be introduced in the same manner into the entire substance of the wood, or matter calculated to preserve it from decay. Soluble glass, or recently precipitated silex, renders it both very durable and thoroughly incombustible.—*Intellectual Observer.*

Boiler Filters.

Bourne, in his "Catechism of the Steam Engine," says that water containing solid matter requires to vaporize it a higher temperature than if it were pure; that the steam is formed in bubbles in contact with the solid particles, and balloons them up to the surface; and that advantage has been taken of this action to get rid of the impurities by blowing off from the surface, and placing sediment catchers at the surface; and that these methods have worked successfully, Within a few months the engineer of the Manchester Boiler Inspection Association has spoken favorably of the use of sediment vessels at the surface, with blow-off pipes. There have been in Germany some successful trials, which we have reported, of an apparatus to prevent the entrance of impurities into the body of the boiler; the water is sprayed into the steam in a separate vessel connected by a pipe; and in this vessel the impurities are separated, falling to the bottom, while the purified water goes from the top into the boiler, and occasionally the purifying vessel is opened, and an accumulation of soapy mud is removed. And not only does this prevent the formation of scale, but a foul boiler in a few weeks becomes clean; thus showing that pure water will in time remove scale. We do not feel satisfied with this report; it should have been said how much blowing-out was required; but the evidence, added to that of the English, and some of our own, show that there is reason to labor for the purification of boilers.—*American Artisan.*

Soap.

Soaps intended for toilet use ought not to contain any free alkali, seeing that free alkali exercises a corrosive action upon the skin. Soaps, however, which are perfectly neutral, containing no alkali which is not combined with the stearic or other fatty acid employed, are not nearly such powerful detergents as soaps containing an excess of alkali, and are not nearly so capable of dissolving the substances which it is the office of soap, when applied to the body, to remove from the skin. Singular to say, M. Bonnamy, a manufacturing chemist, residing at Saint-Germain, has found that if that very neutral substance, pure alumina, be added to a completely neutral soap, the soap becomes even more powerfully detersive than the most highly alkaline soap, while remaining entirely free from corrosive properties. The alumina may be introduced into the soap in various ways, the most advantageous, perhaps, being the use, in the process of manufacturing the soap, of an alkaline salt of alumina—as aluminate of potash or soda—instead of free alkali. An equally good result is however obtained by mixing free alumina, in dry powder, with melted soap which has been manufactured in the ordinary way. M. Bonnamy proposes to use alumina also in various cosmetics, and especially in cold-cream; and he moreover regards it as affording an admirable base for tooth-powders, by reason of its complete neutrality, and the ease with which it can be tinted by means of perfectly innocent colouring matter.—*Mechanics' Magazine.*

Tanning.

Mons. Picard has a new process of tanning, which consists in using oil of turpentine or resin mixed with the vegetable extracts or mineral matters that are used instead of bark for tanning, combined with a movement of the skins in a revolving cylinder, or other method of stirring them. After they come out of the water, the skins, for stout leather, instead of being put into trenches, are put into a revolving cylinder which contains a light decoction of alum if the skins are to remain white; or of catechu, sumac, or other colouring matter if they are to be coloured. The cylinder is then closed, and revolved for several hours, to cause the alum or colouring matter to penetrate the pores of the skins, and prepare them to receive the turpentine. The cylinder is then stopped and uncovered, and the turpentine is put in; the cover is replaced and the revolving continued. During this agitation the turpentine penetrates the pores of the skins, already impregnated with the astringent substance, and has the effect of a tannin so active, that in twenty-four hours the skins are completely tanned. They are then taken out, and cleansed from the adhering turpentine, and curried and finished in the usual way. For small skins, such as goats and calves, that are to be tanned, the process is the same, except that salt is added to the decoction of alum or colouring matter. The proportions of alum, turpentine, and colouring matter mixed with the vegetable or mineral tanning liquid, can be varied according to the nature of the skins and the degree of tanning and colouring required; but the following proportions do well:—100 lbs. skins: 6 lbs. alum and 3½ lbs. turpentine. For coloured skins, instead of the alum, 20 lbs. to 25 lbs. of catechu, sumac, or other colouring matter may be used.—*Translated from L'Invention.*

[How would petroleum do instead of turpentine? It makes good brandy, good salad oil, and good Mexican mustang liniment, and is death on bugs; why should it not do for tanning?—EDS. *American Artizan*]

Screw Soled Shoes.

We were shown a few days since a new style for making shoes, a rival to the copper nail shoe—and which we are informed, can be made equally cheap. The improvement consists of a brass screw inserted by machinery and cut off smoothly upon the outer sole. We see no reason why a pair of shoes screwed together would not be more durable than a pair nailed.—*Shoe and Leather Reporter.*

A Pump which Cattle can work themselves.

Mr. Cousins, of London, has invented a pump by which cattle can water themselves without human aid. The water is forced up by the weight of the animal operating on a platform, which sinks down a certain distance by its weight, causing the water to rise in the pump and to flow out to the extent of three pailsful. As soon as one has slaked its thirst, another takes its place on the platform, which brings up another supply, and so on until all the flock are watered. This is a labour-saving affair, certainly.—*Canada Farmer.*

Improved Petroleum Still.

Messrs. Bilby & Lapham, of Brooklyn, N. Y., have obtained a patent for an improvement in stills for petroleum, &c., one object of which is to keep the upper part of the still heated in such a manner as to prevent, as far as practicable, the condensation therein of the heavier vapours evolved by the heat in the lower part of the still. Another object is to collect and carry off from the still the heavier oils resulting from any condensation which may, and will unavoidably to some extent, occur in the upper part of the still. The invention consists in an elevated exit chamber surrounding a central chimney, and a number of dome-shaped plates in the body of the still, with surrounding gutters and proper outlets.

Boiler Incrustation.

A plan of preventing boiler incrustations recently adopted in France, consists in lining the boiler with a metallic network at some distance from the sides. The lime salts will, of course, be deposited upon the network, which can be easily removed, and from which the crust can be easily detached.

Practical Memoranda.

Horse Power.

Many have but an erroneous idea of the drawing power of a horse. Some, probably, have no idea that approaches correctness. The strength of different horses undoubtedly varies a great deal, but in calculating the power of an engine, the horse power is estimated as equivalent to a force capable of raising or moving 150 pounds 20 miles a day, at the rate of two and a half miles per hour. This seems small, but experiments have actually shown the power of the farm horses in this country to be considerably less.

On a level road or floor the horse is ordinarily as strong as five men; but up a steep incline the man has the advantage, for it has been found a man can rise a steep hill with a load where it would be out of the power of a horse to climb. A man of ordinary strength, placed in a position to exert his strength to the greatest advantage, can apply more power than a horse in drawing from a point two feet above the ground. It requires a heavy pair of horses to exert a force of five hundred pounds in such a position

As the horse's speed increases, his power of draught diminishes very greatly, till it becomes very difficult for him to move his own weight. On soft roads the draught is not so much affected by the speed, and the resistance is very little, if any, greater in a trot than in a walk; but a carriage on dry, hard pavement requires one-half greater force when propelled in a trot or a walk.—*Mass. Ploughman.*

Momentum.

If a train moving at the rate of twenty-five miles an hour were stopped instantaneously, the passengers would experience a concussion equal to that of a body falling from a height of nineteen feet; they would be hurled against the sides of the carriage with a force equal to that which they would be exposed to in falling from a window on the second floor of a house. If the train were moving at the rate of thirty miles per hour, they might as well fall from a height of three pairs of stairs; and an express train would, in point of fact, make them fall from a fourth story. Instantaneous breaks are therefore to be avoided if possible.

On Scientific Experiments in Balloons.

BY JAMES GLAISHER, ESQ., F.R.S., ETC.

The *London Artisan* publishes a long letter by Mr. Glaisher giving the results of his observations in balloons on the temperature and moisture of the atmosphere, from which we take the following tables:—

"DECREASE OF TEMPERATURE WITH ALTITUDE.

WHEN THE SKY WAS CLOUDY.

Feet.	Feet.		Deg.		Feet.
From 0 to	1,000	the decrease was	4·5	or 1 deg. on the average of	223
From 0 to	2,000	"	8·1	"	247
From 0 to	3,000	"	11·8	"	355
From 0 to	4,000	"	15·2	"	263
From 0 to	5,000	"	18·5	"	271
From 0 to	6,000	"	21·7	"	277
From 0 to	7,000	"	34·4	"	287
From 0 to	8,000	"	26·8	"	299
From 0 to	9,000	"	29·0	"	311
From 0 to	10,000	"	31·0	"	321
From 0 to	11,000	"	33·0	"	329
From 0 to	12,000	"	35·6	"	337
From 0 to	13,000	"	37·8	"	344
From 0 to	14,000	"	40·1	"	349
From 0 to	15,000	"	42·1	"	356
From 0 to	16,000	"	44·2	"	362
From 0 to	17,000	"	45·4	"	375
From 0 to	18,000	"	46·7	"	386
From 0 to	19,000	"	48·1	"	395
From 0 to	20,000	"	49·0	"	409
From 0 to	21,000	"	50 1	"	419
From 0 to	22,000	"	50·9	"	432
From 0 to	23,000	"	51·7	"	445

WHEN THE SKY WAS CLEAR, OR CHIEFLY CLEAR.

Feet.	Feet.		Deg.		Feet.
From 0 to	1,000	the decrease was	6·2	or 1 deg. on the average of	162
From 0 to	2,000	"	10·9	"	184
From 0 to	3,000	"	14·7	"	204
From 0 to	4,000	"	18·0	"	223
From 0 to	5,000	"	20·9	"	239
From 0 to	6,000	"	23·5	"	259
From 0 to	7,000	"	26·0	"	271
From 0 to	8,000	"	28·7	"	279
From 0 to	9,000	"	31·2	"	289
From 0 to	10,000	"	33·6	"	298
From 0 to	11,000	"	35·6	"	309
From 0 to	12,000	"	37·9	"	317
From 0 to	13,000	"	40·1	"	324
From 0 to	14,000	"	42·1	"	333
From 0 to	15,000	"	43·8	"	343
From 0 to	16,000	"	46·0	"	348
From 0 to	17,000	"	47·9	"	355
From 0 to	18,000	"	49·6	"	363
From 0 to	19,000	"	51·1	"	372
From 0 to	20,000	"	52·4	"	382
From 0 to	21,000	"	53·6	"	392
From 0 to	22,000	"	54·7	"	405
From 0 to	23,000	"	55·7	"	413
From 0 to	24,000	"	57·0	"	422
From 0 to	25,000	"	58·1	"	431
From 0 to	26,000	"	59·1	"	441
From 0 to	27,000	"	60·1	"	449
From 0 to	28,000	"	61·0	"	459
From 0 to	29,000	"	61·8	"	469
From 0 to	30,000	"	62·3	"	482

These results, showing the whole decrease of temperature from the ground to 30,000 feet, differ greatly, as just mentioned, from those with a cloudy sky.

The numbers in the last column, showing the average increase of height for a decline of 1° of temperature from the ground, to that elevation, are all smaller than those with a cloudy sky at the same elevation. Each result is based upon at least seven experiments, taken at different times of the year, and up to this height considerable confidence may be placed in the results; they show that a change takes place in the first 1,000 feet of 1° on an average in 162 feet, increasing to about 300 at 10,000 feet. In the year 1862 this space of 300 feet was at 14,000 feet high, and in 1863 at 12,000 feet. Therefore, the change of temperature has been less in 1863 than those in 1862, and less in 1864 than in 1863, but the experiments have all been taken at different times of the year.

Without exception, the fall of 1° has always taken place in the smallest space when near the earth."

Velocities.

A correspondent of the *Scientific American* says:—

"A heavy body falling from a height, for instance from a balloon, falls during the first second $16\frac{1}{12}$ feet, 3 times as far the next, 5 times as far as the next, and so on, with increasing velocity, in the ratio of the successive odd numbers 7, 9, etc.; hence it will fall 1,200 feet in 9 seconds, and three miles in 31½ seconds. A cannon ball fired perpendicularly ascends with decreasing but falls with increasing velocity, and describes each portion of its path upward and downward, respectively, in identically the same period of time.

Sound moves at the rate of only 1,142 feet per second. Therefore we see a train of cars at a distance fairly across a bridge long before the sound of their crossing reaches the ear.

Light moves with a velocity of 192,000 miles per second, which, for terrestrial observations, is instantaneous. But so remote are the fixed stars that the light of the nearest occupies more than three years in its journey to the earth of twenty billions of miles. Some idea of the inconceivable velocity of light may be obtained by comparing its speed with that of a cannon ball. The latter moving at the speed of 1,200 feet per second would require upwards of one million three hundred and eighty thousand years, to accomplish the distance of ten millions of millions of miles, the probable distance of Sirius from the earth. The light of Sirius is supposed actually to be 60 times greater than that of the sun."

Statistical Information.

Civil List of the Queen and other Sovereigns.

The civil list of the Queen is very much less than that of any of her predecessors, and is indeed very much exceeded by the sovereigns of several second-rate states in the world. The income of George I. mounted up to one million sterling; and even that of William IV. (who was relieved from the burden of many charges to which his predecessors were liable) was £510,000. The Queen's civil list is £385,000; and even the expenditure of that is dictated by parliament. £60,000 is allotted to the privy purse; £231,260 for salaries of the royal household; £44,240 for retiring allowances and pensions to servants; and £13,000 for royal bounty, alms, &c.

In order to give the reader some idea of the liberality with which the nation deals with its sovereigns, we subjoin the amounts of a few civil lists and incomes belonging to some of the more prominent sovereigns in the world, premising that, in several cases (in that of the French Emperor notoriously so), the maximum amount is by no means adhered to, but a large amount of debt is annually added to the regular allowance:—

Emperor of Austria	£760,687
Emperor of France (with a debt of (£3,200,000)	1,330,000
King of Italy	650,000
The Pope (total income calculated at over)	1,000,000
King of Prussia, about	450,000
Emperor of Russia (the income of the crown domains calculated at)	5,700,000
Queen of Spain	523,500
King of Sweden	266,500
King of Bavaria	249,653
Sultan of Turkey	1,333,882
Queen of Great Britain and Ireland, and of Colonies upon which "the sun never sets"	385,000

—*The Queen.*

Educational Statistics of Upper Canada.

Children of school age in U. C. in 1863	412,000
Do. do. do. 1864	424,000
Children attending school in 1863	322,000
Do. do. 1864	333,000
Local aid to common schools in 1864, by rates, &c., about	$1,275,000
Estimated total expenditure in 1864	$1,440,000
Libraries have been established all over Upper Canada, and in some back townships whose names are scarcely known.	
Library books sent out up to end of 1863	205,000
Do. do. do. 1864 (or 3,239 for the year)	208,300
Do. for 6 months of 1865 (or nearly 3,000 for the 6 months)	2,852
Prize-books sent out in 1860	20,000
Do. do. 1861	26,000
Do. do. 1862	29,000
Do. do. 1863	32,000
Do. do. 1864	33,500
Do. for 6 months ending June, 1865	18,200
Total library and prize-books sent out up to end of 1864	374,000
Do. to end of June, 1865	395,000
Value of books, maps, and apparatus sent out during 1863	$23,300
Do. do. 1864	23,600
Total value of do. sent out up to end of 1864,	$319,000

—*Upper Canada Journal of Education.*

Horses.

There are said to be more than 3,000,000 horses in France. The number of horses spread over the surface of the globe is estimated at 58,000,000, of which from 18,000,000 to 20,000,000 are to be found in the Russian Empire; in Great Britain and Ireland, 2,500,000; United States, 6,000,000; Austria, 3,500,000; Prussia, 1,500,000; Denmark 600,000; Bavaria, 400,000; English American Colonies, 500,000; Australia, 500,000; Southern Africa, 250,000.

British Museum.

At the British Museum about 4,150 volumes are used in the reading room daily; the number of readers has been about 106,000, or 360 per diem. 38,842 volumes have been added to the library during the past year, of which 2,730 were presented, 28,426 were purchased, and 7,686 acquired by copy-right. 819 maps, charts and plans have been added, in 3,326 sheets, and 44 atlases complete. 2,378 pieces of music have been obtained. The total number of articles received by this department has been 72,214 of which 1,283 were received under the international copyright treaties. 300,000 stamps have been impressed on these articles.

Population of New York City for 210 Years.

Population in 1656	1,000
Population in 1673	2,000
Population in 1696	4,302
Population in 1731	8,628
Population in 1756–one hundred years	10,381
Population in 1773	21,876
Population in 1786	23,614
Population in 1790	33,181
Population in 1800	60,489
Population in 1810	90,703
Populatien in 1820	123,700
Population in 1825	166,089
Population in 1830	202,589
Population in 1835	270,068
Population in 1840	312,852
Population in 1845	371,229
Population in 1850	515,394
Population in 1855–not quite two hundred years	629,810
Population in 1860	814,254
Population in 1865	1,003,250

The *Argus* states that the population of Albany is 62,825 persons.

The population of the city of Syracuse is now 31,924 persons, being an increase of 3,805 since 1860.

Miscellaneous.

Useful Plants.

According to a German author, the number of useful plants has risen to about 12,000; but it must be remembered that these researches have been completed only in certain portions of the earth. There are no less than 2500 known economic plants, among which are reckoned 1,100 edible fruits, berries and seeds; 50 cereals; 40 uncultivated edible graminaceous seeds; 23 of other families; 260 comestible rhizomes, roots, and tubers; 37 onions; 420 vegetables and salads; 40 palms; 32 varieties of arrowroot; 31 sugars; 40 saleps. Vinous drinks are obtained from 200 plants; aromatics, from 266. There are 50 substitutes for coffee; 129 for tea. Tannin is present in 140 plants; caoutchouc in 96; gutta percha, in 7; rosin and balsamic gums, in 389; wax, in 10; grease and essential oils, in 330; 88 plants contain potash, soda, and iodine; 650 contain dyes; 47, soap; 250, fibres which serve for weaving; 44, for paper making; 48 give materials for roofing; 100 are employed for hudles and copses. In building 740 are used; and there are 615 known poisonous plants. According to ENDICHER, out of the 278 known natural families, 18 only seem up to the present time, to be perfectly useless.—*Cosmos.*

New Experiment with Magnesium.

In experimenting with this new metal, Mr. J. N. Hearder, of Plymouth, is said to have discovered some explosive compounds of tremendous power and striking peculiarities. He ignited a small portion (about 20 grains) of one of these compounds during a lecture which he gave at the Plymouth Mechanics' Institute, the instantaneous and dazzling effect of which upon the audience was like that of a flash of lightning. On causing two bars of magnesium to form the terminals of a powerful voltaic battery, a most intense combustion ensued: one of the bars speedily became red hot, entered into ebullition, and then burnt so furiously that it became necessary to plunge it into the water to prevent its falling on the platform. In this process, portions of the burning metal detached themselves, floating blazing on the surface of the water, decomposing in the manner of potassium, and liberating hydrogen, which also burned.

A Chemical Freak.

A platina crucible is made and maintained red hot over a large spirit lamp. Some sulphurous acid is poured into it. This acid, though at common temperature one of the most volatile of known bodies, possesses the singular property of remaining fixed in the red hot crucible, and not a drop of it evaporates, in fact, it is not in contact with the crucible, but has an atmosphere of its own interposed. A few drops of water are now added to the sulphurous acid in the red hot crucible. The diluted acid gets into immediate contact with the heated metal, instantly flashes off, and such is the rapidity and energy of the evaporation that the water remains behind, and is frozen into a lump of ice, in a hot crucible! from which seizing it the moment before it again melts, it may be thrown before the eyes of the astonished observer. This is indeed a "piece of natural magic," and as much like a miracle as any operation of the forces of nature could produce. It is certainly one of the most singularly beautiful experiments imaginable. It was devised by a French savan, to illustrate the repellant power of heat radiating from bodies at a high temperature, and of the rapid abstraction of heat produced by evaporation.

New Process of Picture-Cleaning.

To see one of Titian's masterpieces in the state in which he left his easel is a pleasure now to be enjoyed. By a breath the chilling effect of 350 years is dissipated; the colors glow almost as they did to Titian at the moment he put aside his brush. The vivifying breath is the fume of alcohol; its application to this use is owing to Professor Pettenkofer's sagacity, and to the enterprise of Sir C. Eastlake and Mr. Wornum. Oil-pictures of ancient date become clouded by dust deposit; this can be wiped off. They also are observed by an opacity in the varnished surface; this can be scraped away, but rarely without serious detriment to the pictures. Too many flawed and glaring wrecks of what were once noble efforts of pictorial art exist to warn the artist covetous of immortality; but the professor's process gives us hope that their numbers need not be increased—that the picture-cleaner's noxious vocation will soon be finally superseded. Science has disclosed the true means of restoration. The opacity of the varnish arises from a molecular change; the resinous particles of which it is composed become displaced, in course of time, and when so displaced, their transparent quality is lost. These atoms, once restored to their original cohesion, recover lucidity; and this can be effected by exposing the surface of the picture to the fumes of alcohol. The spirit when absorbed, evaporates; the varnish coating has received new life, and is left as hard as it was before, perhaps harder. The hand of man throughout the operation has never approached the surface of the picture.—*American Artisan.*

Indentification of the Dead.

The *Alta California* of March 16th, reports that Dr. L. J. Henry, by the consent of the coroner of Alta, brought into use the process of Dr. Richardson of London for restoring the features of a dead man who had undergone such change from decomposition that he could not be identified. The man had been murdered and buried in a very shallow grave; the body was discovered from some animals having partly removed the earth. On the body being brought to the dead house it was quite unrecognisable. Dr. Henry placed it in a water tight shell, and then covered it (the body) with water containing twenty pounds of common salt and one pound of hydrochloric acid. After immersion for three hours, the body was removed; the face was washed first with simple water, then with chlorine water, and finally a free current of chlorine gas was passed over the face. After the operation, by which the face was bleached, the friends of the dead man were able positively to recognize him as one Charles T. Hill, and on his indentification a man was arrested in whose possession various articles belonging to Hill were found, and who is believed to be the murderer. The restoring process seems in this case to have been entirely satisfactory, and to have served a purpose which a few years ago it would have been considered impossible to carry out.—*Scientific American.*

Advertising.

An American exchange says:—"Never buy of the man who does not advertise; he sells so little that he has to sell dear." Our advice is: Never buy of the man who advertises 'larger stocks, better goods, and lower prices than any other house,' he will have no more hesitation in cheating you when he has your custom, than he had in trying to obtain it." '

"The Cratur" as a Rat Catcher.

A correspondent of the Haldimand *Tribune* proposes a new way to kill rats. His own house being overrun with the vermin, a servant girl who had seen the effect of "Old Bourbon whiskey" on bipeds, thought she would try an experiment on the rats. Accordingly she took a small quantity, made it very sweet with sugar, crumbled in bread enough for the crowd, and set the dish in the cellar. A few hours after she went down, and found several rats gloriously "fuddled," engaged in throwing patato parings, and hauling one another up to drink. These were easily disposed of; those not killed left the premises immediately, suffering with a severe headache.

Cure for Hydrophobia.

The efficacy of Dr. Buisson's treatment of hydrophobia (see page 221 of this Journal) is confirmed by the "French Revue des Provinces," which quotes the following from a journal printed in 1830. "I remember," says the narrator "a man who formerly lived in the same place as I did, who was unfortunate enough to be bitten by a mad dog. Some time after he fell ill, and very soon appeared all the symptoms of hydrophobia, which became so violent that his friends resolved to terminate his sufferings by suffocation. To accomplish that dreadful design, four of them extended a feather bed on the floor, threw the unhappy man upon it, and covered him with a second bed, on which they placed themselves to press upon and smother him. During this time, his wife was held in an adjoining room. The state of the unhappy woman may be imagined during the struggles and groans of the sufferer. She remained at first apparently stupefied, but when a frightful silence had succeeded the tumult, she seemed to break loose from her apathy; the full horror of the scene rushed upon her mind, and, with a shriek of despair, she rushed into the chamber of death. With superhuman strength she threw aside the men who were holding her husband down, and pulled away the bed which covered him. Life had almost departed, but respiration was soon re-established and at last he opened his eyes. The efforts he had made had covered him with so profuse a perspiration, that it ran in streams from the whole of his body. He was calm, and a short time after, to the astonishment of all present, announced that the symptoms of his cruel malady had quitted him. This man lived long after, had a numerous family, and never felt any recurrence of the attack.'

A Curious Calculation.

A rapid penman can write thirty words in a minute. To do this he must draw his quill through the space of one rod—sixteen and one-half feet. In forty minutes his pen travels a furlong; and in five and one-third hours one mile. We make, on an average, sixteen curves or turns of the pen in writing each word. Writing thirty words in a minute, we must make four hundred and eighty-eight to the second; in an hour, twenty eight thousand eight hundred; in a day of only five hours, one hundred and forty-four thousand; in a year of three hundred days, forty-three million two hundred thousand. The man who made one million strokes with a pen in a month was not at all remarkable. Many men make four millions. Here we have in the aggregate a mark three hundred miles long, to be traced on paper by each writer in a year. In making each letter of the ordinary alphabet, we must make from three to seven strokes of the pen—on an average three and a half to four.—*Commercial College Monthly.*

Setting Fence Posts.

Where it is necessary to set wooden posts, it will be found that their durability will be greatly promoted by slightly charring or carbonizing the surface before inserting them in the soil. There are few substances more indestructible than charcoal when buried beneath the surface and kept constantly in contact with moist soil, or soil that is constantly wet. We have seen posts thus protected, taken from the soil after having stood upwards of thirty years, in perfectly sound condition, so far as rot was concerned, below the surface, while the upper part, which had been exposed to the atmosphere, was in a state of complete decay. The cost of charring is but a trifle, and may be effected by means of chips, brush or refuse matter of any kind. A very slight charring will be sufficient to insure the preservation of most kinds of wood whether hard or soft. Stakes are also equally benefitted by this process.—*B. C. W. in Germantown Telegraph.*

Lake Superior Iron.

The quality ot the Lake Superior iron is conceded to be superior to any iron in the world, as is shown by the following analysis, giving the strength per square inch in pounds:—

Sailsbury, Conn., iron	58,000
Swedish (best)	58,134
English cable	59,105
Center Co., Pa.	59,400
Essex Co., N. Y.	59,962
Lancaster Co., Pa.	76,969
Com. English and American	30,000
Lake Superior	80,582

But little iron is worked into manufactures on Lake Superior except for home use. Car-wheels are made to some extent at Harvey, and at the railway car-shops at Marquette—a very complete establishment, by the way, which under the superintendence of Mr. Dunkersley turns out all the work needed on a railway. For car-wheels, gearing, shafting, boiler iron, and in fact for all uses where great strength and freedom from imperfections is required, the Lake Superior iron must ever take the precedence over all others.—*Green Bay (Wis.) Advocate.*

Profits of Fruit-Growing.

The author of "Ten Acres Enough" says in the *Horticulturist*:—"Looking more carefully into this matter of the profit realized from all description of fruit-growing, and running over only two or three authorities on the subject, multitudes of instances are to be found where extraordinary gains are annually realized without apparent care or skill. Some years ago there was an orchard of 70 'Mayduke' cherry-trees a few miles below Philadelphia, the daily sales from which, during the season, amounted to $800. I have this week seen an 'Amber' cherry-tree, growing in New Jersey, from which $60 to $80 worth is annually sold, and the owner declares that if all the fruit were gathered, and at the right time, the product would be $100. From twenty apple-trees of the 'Early-Redstreak, and the 'Early-Queen' varieties, growing near Philadelphia, 300 bushels of fruit have been gathered, which sold for $225. A single Washington plum-tree, in a city garden, has been known to yield six bushels of fruit, worth $10 per bushel. A vineyard some sixteen miles from Philadelphia, occupying three-eights of an acre, has produced $300, when the grapes sold for only eight cents a pound, or at the rate of $800 per acre. A single Catawba vine, in the same neighborhood, has produced ten bushels, worth $40 at marketprices. I have seen the Catawba clambering up the side of a barn in Delaware, and when only four years old it yielded hundreds of pounds of grapes.'"

Work.

The best lesson a father can give to his son is this; "Work; strengthen your moral and mental faculties, as you would strengthen your muscles by vigorous exercise. Learn to conquer circumstances; you are then independent of fortune. The men of athletic minds, who left their marks on the years in which they lived, were all trained in a rough school. They did not mount their high position by the help of leverage—they leaped into chasms, grappled with the opposing rocks, avoided avalanches, and, when the goal was reached, felt that but for the toil that had strengthened them as they strove, it could never have been attained."

Turpentine Vapour Bath.

Dr. Gilbert a few days ago read a report to the Academy of Medicine on a paper sent in by Dr. Chevandier, of Die (Drome), on the use of a turpentine vapour bath in case of rheumatism, gout, pulmonary catarrh, cramps in the stomach &c. The patients are exposed for half an hour to the action of the aromatic vapours evolved during the combustion of resinous shavings of the Mugho pine, by means of special fumigatory apparatus. The temperature should never fall below 45 deg. Reaumur (134 Fahrenheit).

To Keep Eggs.

M. Burnouf recommends in *Le Belier*, a French journal of agriculture, the following method of preserving eggs:—Dissolve in two-thirds of warm olive oil one-third of bee's wax, and cover each egg completely with a thin layer of this pomade with the end of the finger. The eggshell by degrees absorbs the oil, and each of its pores becomes filled with the wax, which hermetically seals them. M. Burnouf affirms that he has eaten eggs kept two years in this manner, in a place not exposed to too great extremes of temperature. He thinks also that the germ may in this manner be preserved for a considerable time.

Duty is a little blue sky over every heart and soul—over every life—large enough for a star to look between the clouds, and for the skylark Happiness to rise heavenward through and sing in.

There is a thread in our thoughts as there is a pulse in our hearts; he who can hold the one knows how to think, and he who can move the other knows how to feel.