THE JOURNAL
OF THE
Board of Arts and Manufactures
FOR ONTARIO.

DECEMBER, 1867.

CLOSE OF THE SEVENTH VOLUME.

This number of the Journal closes the seventh year of its existence. Its issue was commenced with some little fear as to a successful result, but with reasonable hopes that by furnishing monthly a carefully prepared synopsis of the records of inventions and improvements in other lands, and by the publication of other practical and valuable information, it would eventually be appreciated by, and receive the support of, practical men. To some extent these hopes have been realized. During the past year we have received many both written and verbal commendations as to the character of the Journal, and the judicious selection of foreign matter it contains. We cannot, however, although much we might desire it, leave out of consideration the financial question connected with its publication. If all the 1,000 copies issued were paid for at 75 cents per annum, the sum realized would be but $562 50; but as the cost of printing and publishing that number, charging nothing to the account for editing, is at least $800; and as at least 250 copies are sent free to members of Parliament, exchanges, &c.; about 250 copies furnished through Mechanics' Institutes and Agricultural Societies at 50 cents per annum; and a large number of Subscribers (we suppose on account of the trifling amount of the subscription) neglect to pay up promptly, and some not at all, the loss on its publication absorbs at least one-third the entire income of the Board, and tends to cramp it in its other operations.

What we now ask of our Subscribers and friends, is, that they forward us all arrears of subscriptions due; and, as early as convenient, their subscriptions for the year 1868. The amounts are small; but upon their prompt payment depends, in all probability, the continuance or otherwise of the Journal beyond another year.

We enclose a slip with amount due to December 1868. Fractions of the Dollar may be sent in postage stamps.

STATUTES FOR THE ENCOURAGEMENT OF AGRICULTURE AND MANUFACTURES.

From a summary of the History of Agricultural Societies, and enactments by the Canadian Legislature for the encouragement of agriculture in the Province, published in the transactions of the Board of Agriculture, for the year 1856, we learn, that although some few societies were formed as early as the year 1825, no Act to incorporate them was passed until the year 1830, which Act provided for "the establishment of Agricultural Societies in the several districts of this Province," and provided that each district should receive one hundred pounds annually so long as the society should raise fifty pounds.

In 1835 another Act was passed continuing the previous one for one year longer, which "Act was permitted to expire before further legislation took place on the subject." In 1837 an Act was passed "for the purpose of re-establishing Agricultural Societies," and providing that the grant to each should be double the amount subscribed, up to the sum of two hundred pounds; and also providing for the formation of County, Riding, and Township Societies.

On the union of Upper and Lower Canada, an Act was passed, September, 1841, continuing the previous Act without alteration, till the end of the session ensuing the 1st November, 1844. In 1845 another Act was passed, essentially the same as the preceding one, but providing that the amount subscribed by members should be trebled by the legislative grant, up to two hundred and fifty pounds.

In 1846 the Agricultural Association for Upper Canada was formed, and in 1847 it was incorporated by Act of Parliament. In 1850 the Board of Agriculture was organized under enactment by the Legislature; and in 1851 another Act was passed "intended to adapt the organization of the Agricultural Societies of Upper Canada, to the Board of Agriculture," defining the position and duties of each, and affirming the previous grants as to trebling the amount subscribed by any county society, up to two hundred and fifty pounds.

In 1852 was passed the Act "to provide for the establishment of the Bureau of Agriculture, and to amend and consolidate the laws relating to agriculture." This Act placed the supervision of all Boards and Agricultural Societies under the Minister having charge of the Bureau, and also further defined their duties. Thus far we have derived our information from the transactions referred to.

By the Parliamentary Representation Act of 1853, Upper Canada was formed into new Electoral

Divisions; and so as to extend the benefits of the previous Acts to such divisions, and also to afford some special encouragement to the arts and manufactures, and to horticulture, another Act was passed in the year 1857, and with other statutes was consolidated in 1859. This Act provided that a Board of Arts and Manufactures should be organized for each of the United Provinces of Upper and Lower Canada, and very fully defined the duties of such Boards; and also constituted the Boards of Agriculture, with whom for this purpose should be associated the presidents and vice-presidents of the Boards of Arts and Manufactures, the councils of the respective Agricultural Associations for Upper and Lower Canada; and also provided that the secretaries of the Boards of Agriculture and Boards of Arts and Manufactures should be, *ex-officio*, the secretaries of the respective Associations.

In accordance with a resolution adopted at the annual meeting of directors of the Association, held during the Provincial Exhibition in the City of London, in 1861, a meeting of delegates from all the Agricultural and Horticultural Societies, and members of the Board of Agriculture and Arts and Manufactures, was held in the City of Toronto, in January, 1862, which resulted in the adoption of a draft bill, to amend that of 1857–9. This draft was published in the *Canadian Agriculturist* for April, 1862.

A necessity for amendments was generally admited to exist; but although various bills were submitted to the Legislature, both by the Government and private members, the above draft among the rest, from some cause or other all were defeated, or had been introduced too late in the session to secure their passage.

At the annual meeting of the Association at Kingston, during the last Exhibition, it was resolved to hold another convention, similar to the previous one, with the addition of admitting delegates from the Mechanics' Institutes also, with a view to framing such amendments to the present law as the altered circumstances of the Province of Ontario requires. A report of this meeting, held on the 12th and 13th November, will be found in this issue of the Journal.

At present some forty-four counties or ridings draw each up to $800, and thirteen up to $1,000 each, on their subscribing one-third of these amounts, respectively. Five city electoral divisions receive each $400 annually, on contributing equal sums; and three towns receive, $400 each on contributing one-third of that sum. The convention would place all the counties and ridings on an equality, and grant them $800 each; and leave all the city and town divisions as they now are, except that the City of Toronto, which has two electoral divisions, should be considered one for the purposes of this Act, and be entitled to draw up to $600, on subscribing two-thirds that amount.

The annual grants to agriculture for all Canada have been, of late years, from $100,000 to $110,000—say for Upper Canada $55,000. Under the system now proposed, and with the seventeen new electoral divisions constituted by the present Act of Union, the sum total of legislative aid would be about $66,000. The whole of these grants is exclusively devoted to the promotion of agriculture and horticulture; except so far as prizes are awarded to articles of arts and manufactures (other than implements for agricultural purposes), the attraction of which brings in entries and admission fees more than an equivalent to the prizes paid for such.

We trust that in any new Bill that may pass our Local Legislature, more justice than heretofore will be accorded to its arts and manufactures interests.

Correspondence.

TECHNICAL EDUCATION—THE FOREIGNER AND THE BRITON.

(NO. II.)

SIR—As to the assertion of the superiority of the provision for the higher education of the people on this continent, let me say that, leaving out altogether the educating influence of our many-sided popular literature, with its mechanical and scientific information, in which the continent has little or nothing comparatively to show, Britain is not behind, but greatly a-head in educational appliances calculated to enable the whole people to advance in scientific information and art ability.

If we give full credit to the account given at page 264, in your October number, by an enthusiastic admirer not likely to err through underestimation, the provision for technical education in Paris amounts to little more than that which every city of Britain possess. The schools, academies, and studios of artists who depend entirely on their own exertions for their success and support, are but counterparts of the thousands of, private establishments under similar titles to be found in Britain, while the 3,000 francs expended by the government in providing houses for the purpose, is not half the amount proportionally usually expended by city corporations in Britain for a like purpose.

Or take Mr. Kitson's view, who also seems carried away by the fanfarronade of the Kensingtonians. He says: "The central school of arts and manufactures is specially designed to form engineers. London has a similar institution for the same purpose; while a cost of £32 per year in Paris puts it beyond the reach of all but the monied classes, whereas the cost in London does not exceed £4 per year, and puts the acquisition of a degree of equal merit within reach of all. The three schools of "Arts et Metiers" established at Aix, Angers and Chalons, for forming chiefs of blacksmiths and carpenters,* is not for a moment to be compared in efficiency to the theoretical education which every city in Britain offers to these workmen; while each workshop being practically a school where the best hand and brightest head, without loss of time or expenditure of money, can attain the distinction in Britain which these schools in France reserve for those able to give their whole time and £20 a-year, forby, to secure a year or two's special training.

The Conservatoire des Arts et Metiers, where public lectures on scientific subjects are given, may have all the value claimed for it, but when it is said there is no parallel to it in Briton, the allegation betrays but slight acquaintance with the subject, and is entirely erroneous. Now, Sir, Glasgow, Edinburgh, and other large cities, have all similar lectures, and some of them gratis, though that is no addition to their worth; and as to the library, London, in that matter, has no equal: and if at Creusot Mr. Schneider has established schools, what are they to those established at Nottingham, Stokestown, Halifax, and elsewhere in England? The very paucity of the instances of schools available to support the pretentions to continental superiority, shows the nakedness of the land. But look at Britain. In London there is *University College*, Gower street, with its faculties of arts, law and medicine. *King's College*, Somerset House, with its four departments—theology, general literature, applied science, and medicine—its forty-two professorships and several lectureships. In addition to the Colleges for special theological teaching in connexion with dissenting Churches, there is *New College*, Finchley Road, with its full staff of professors—classical, literary and scientific. *Regent's Park College*, with its theological and literary staff. *Manchester New College*, in Gordon Square, with professorships of theology, language and philosophy. *The Working Man's College*, Great Ormond Street, with its full equipment for teaching classics, modern languages, mathematics, physical science, history, political economy, and general literature, at fees which bring the instructions within the reach of the humblest artisan; and numbering among its professors Ruskin, Hughes, Maurice, and other most able and advanced pioneers of British progress. *The Medical Schools*, NINE in number, connected with the various hospitals, with their staffs of able medical teachers—men who have attained the highest eminence in the profession, and teaching, in addition to medicine and surgery, chemistry, anatomy, physiology, botany, natural philosophy, zoology, and natural history. And last, though not least, the UNIVERSITY OF LONDON, which does not teach at all, but which at stated seasons holds examinations and grants degrees according to efficiency. Formerly these degrees were granted only to those educated at certain Colleges. Now they are granted to all who can pass an examination, no matter how or where they have acquired their information, or whether they have attended either school or college, or not; and not only so, but the examinations, conducted by printed papers, are held simultaneously in such parts of the United Kingdom (the Colonies included,) as may be desired and considered expedient, thus putting its advantages within the reach of the whole nation, without the expense or inconvenience of visiting London; and while the thoroughness of the examinations gives the degree a very high standing, their adaptability to various capacities enables those of distinguished ability to take their degree and place with eminence in the departments in which they are peculiarly adapted to excel. To those in London, add the *University of Dublin*, which also, in addition to its teaching apparatus, grants its degrees to all who pass the prescribed examinations, and pay the fees, no matter how or where their information is obtained. The *Universities of Oxford* and *Cambridge*, with their recent adaptation for granting special degrees to artisans, and others passing examinations in certain subjects. The three Scotch Universities, with their low entrance qualifications, inviting all desirous of learning and rising, to accept the aid they surely afford, with their many Bursaries, enabling those with plenty of brains but little money, to push their own way to fame and fortune. The *Queen's College and University*, Ireland, with their many scholarships, affording the Irish peasant the means of making headway, or otherwise his impecuniosity must have proved an almost invincible barrier. The *Belfast Academical Institution*, the *Magill College*, the *Maynooth College*, the *Catholic University*, with several other institutions in Ireland of a collegiate character. The "High Schools" of Scotland, af-

* Mr. Kitson's paper reads "To form Chiefs of Workshops and workmen instructed for industries where iron and wood are worked."—ED.

fording education in every subject, from the Latin grammar and the *pons assinorum* to "the highest mysteries of Fluxius;" the *Durham University, St. Bees*, and other collegiate institutions of England, make up a provision for the higher education of the British and Irish people, such as no continental nation can show, and such as makes the cry about the superior provision for higher education on the continent not only ridiculous but positively an impudent falsification of fact. France has a few polytechnic institutions in two or three of its large cities; but for the higher education of the people of France, as distinct from the population of these cities, it is absolutely without provision; nor has it any provision whatever such as Britain possesses for enabling the humblest peasant, with brains and perseverance, to attain the highest scientific and other distinctions. Prussia, with all its primary educational machinery, is little better in this respect—the highest and most important at which any nation can aim, educationally—while other parts of Germany and Belgium are worse still. German education has made its Churches a by-word for sloth, empty pews, and inefficiency, and its clergy despised by the higher and hated by the lower classes; and any education of which that is a fruit can neither be wise nor worthy of imitation by Britons; nor does its industrial effects appear to have been greatly different from the higher education. Without taking into account the half-a-dozen educational agencies conglomerated at Kensington, and having their tenfaculæ for art and science education stretching into every corner of the kingdom, Britain is by no means ill provided with the means of higher education. Indeed, so great and palpable is the superiority of Britain in the appliances for enabling those with ability and perseverance, from every class of the people, and every spot in the empire, to attain the highest educational distinction, that the assertion to the contrary implies either surprising ignorance, or an astonishing amount of brass and unbounded faith in public gullability. The assertion being the reverse of correct, so far as the nation is concerned, it does not matter whether it be intentionally or ignorantly made; but it is of importance clearly to understand that it is wholly without foundation, glaringly and palpably not true; and therefore proceedings founded on the assumption of its trustworthiness are more likely to be absurd follies than wise and judicious measures. Yours, S. R.

[We suggest to our correspondent that he is not meeting the question, as put in our pages. It has not been argued that, either in Britain or in Canada, ample provision has not been made for the obtaining of *higher* education. The *felt* want is, a system of instruction for the working man—using the term in a liberal sense—specially adapted to his every-day wants, and his industrial pursuits. When S. R. has put his whole case before us, as he promises to do in our next number, we think there will be no difficulty in sustaining our first position, or the positions of the writers from whom we have given extracts, that "no provision has yet been made for the Industrial Education of the people" in Great Britain.—EDITOR.]

ELEMENTARY AND TECHNICAL EDUCATION.

To the Editor of the Journal of Arts.

In my last I very briefly alluded to our Common School system, and the absolute necessity there is, that, while endeavouring to communicate knowledge for the better prosecuting of special callings in life, we should not overlook or neglect the elementary but general education, which, though not for special trades, is equally necessary for all. The evidence of Mr. Mundella before the Special Inquiry Commission was given on this point; and your readers will remember that he called attention to the intelligence and superior education of the work-people in Saxony, but failed to draw attention to the means existing there to give all her people a good elementary education. This part is supplied by another gentleman who was at the Paris Exposition. The Rev. M. Mitchell, A.M., one of Her Majesty's Inspectors of Schools, was appointed to attend the Exhibition at Paris last summer, for the purpose of collecting and reporting information, as he could gather it at Paris, on Education, both as to the encouragement and facilities afforded by the different governments for its acquirement.

The Rev. Inspector, in speaking of Saxony, says, that it is *compulsory* on all parents or guardians to send their children to the public schools from six to fourteen years of age, *i. e.* for eight years. It is owing most likely to this law, strictly enforced by the Government, and that too with the full approval of the people, that Mr. Mundella found the Saxon work-people in their factories so intelligent and capable of carrying on so satisfactorily the business of their establishments. And hence those Saxon people are properly prepared to profit by a special training in technical education, being in possession of the necessary part already. Much difference of opinion exists as to the prudence or wisdom of introducing such a law into Canada. Seeing then that Common School education is so important in itself, and such valuable interests are dependant upon it, it may not be time misspent to look for a little into the amount of support the chief part of the education of the people receive from the Government, and how far appreciated by the people themselves, as evidenced by the manner in which they contribute to its maintenance. The figures will be taken from the public accounts for the year ending 30th June, 1865, as being the latest at hand:

PROVINCE OF QUEBEC.	
Superior Education	$67,260 00
Common Schools	111,816 40
Colleges	29,800 00
Medical Schools and Scientific Institutions	14,045 40
(In this last is included what the three Observatories get.)	
Total	$222,921 80

PROVINCE OF ONTARIO.	
Govern't grant for Com. Schools.	$165,972 50
The people vote for support of do.	1,089,734 53
Clergy Reserve and Maps	100,272 59
Grammar Schools get from all sources, *i. e.* Gover't grant, fees, local sources, for prize books, apparatus, maps, and libraries	100,654 51
Total	$1,456,634 13

The different colleges have other sources from which they obtain large incomes, but what these amount to cannot be very easily arrived at.

I must also say that in the above figures I do not include the expense attending the working of our educational system in both provinces, which by the way is considerable.

One fact well worth noticing in the above summary is, that for every dollar given by Government the people voluntarily implement by contributing *nine*. This is the crowning glory of our system; that it has succeeded in enlisting the sympathies of the vast majority of the people to such a degree that they are prepared not only to countenance but most heartily, in the great majority of instances, to provide ways and means for its support.

Whether the more than 4,000 schools in Ontario are directing their energies to their legitimate work is at least questionable; but of this there is no uncertainty, the inspection of them is exceedingly deficient. A rigid system of inspection must be inaugurated, and let us have less show and more of the useful and solid. It is not wise, when we have done so much, gone so far, and been so successful, not to put the finishing hand to our Common School system by having thoroughly qualified inspectors. I will not shew how it is done just now, or rather not at all done, but sincerely hope a change will take place very soon.

Grammar Schools next. Yours, WORKER.

Proceedings of Societies.

CONVENTION OF DELEGATES ON THE AGRICULTURAL AND ARTS AND MANUFACTURES BILL.

The convention of delegates called by the Board of Agriculture, on the authority of a resolution passed at the late annual meeting of the Directors of the Agricultural Association, at Kingston, met in the Lecture Room of the Toronto Mechanics' Institute, at 2 p. m. on Tuesday, the 12th of November, and continued its sittings till noon of the following day. There were present eight members of the Council of the Association, and the two Secretaries; thirty-eight delegates from County Agricultural Societies; three from Horticultural Societies; and nine from Mechanics' Institutes. The chair was occupied by Mr. J. P. Wheler, President of the Association for the current year; and Mr. H. C. Thomson and Mr. W. Edwards, Secretaries of the Association, acted as Secretaries of the Convention.

The object of the gathering was to frame such amendments to the present statute, as shall be suited to the altered circumstances of this Province, and conducive to the progress of Agriculture, Horticulture, Arts and Manufactures.

Nothing having been previously prepared to submit to the meeting, it was, after some considerable discussion, agreed that the various clauses of the present act, chap. 32 Con. Stat. of Canada, should be read and considered *seriatim*, and such amendments introduced as in the opinion of the delegates might be deemed desirable, with a view to the same being submitted for approval and adoption by the local Government and Legislature of Ontario, during the ensuing session of Parliament.

By noting the following resolutions and references, in connection with the act as it now stands, our readers will at once comprehend the action of the Convention. Clauses 1 to 8 were passed over without discussion, as only applying to the Government Department of Agriculture.

Clause 9, setting apart two and a half per cent out of the sums appropriated to Agricultural Societies, "towards the promotion of agricultural instruction and information," in addition to the ten per cent withheld for the annual Provincial Exhibition, was deemed unnecessary, and it was therefore recommended that it be expunged.

Clause 12, providing for elections to fill the annual vacancies in the Membership of the Board of agriculture, was discussed at great length. The present system of election; the plan of electing at the annual meeting during the Provincial Exhibition; and the mode proposed in Mr. Cowan's Bill, were all severally submitted. At the request of a delegate, the clause as in Mr. Cowan's Bill was read, and upon being put to the vote was carried by 33 to 22. By this plan the Province would be divided into twelve agricultural districts, to be designated by numbers, and each comprising the counties designated in the schedule. The Agricultural Societies in the several districts, at their annual meetings each to elect one person to the Board, by majorities; and that the Secretary of each Society within eight days, forward to the Minister of Agriculture, the name of the person chosen; and that in case of an equality of votes for one or more delegates, that the Minister should have a casting vote.

All the remaining clauses relating to the Board were passed without amendment, except that a clause providing for the establishment and maintenance of a Veterinary School in connection with the Board was ordered to be introduced.

Clauses 19 to 33, relating to the Board of Arts and Manufactures, were referred to a Committee of all the representatives present from Mechanics' Institutes, with Dr. Beatty, President of the Board, as Chairman. The Committee subsequently reported all the clauses as previously prepared by the Board, and introduced in Mr. Cowan's Bill. The Report of the Committee was adopted.

Clause 35 was amended by providing that the Council only of the Board of Arts, and the Presidents of all incorporated Mechanics' Institutes, be, in addition to others named therein, Directors of the Agricultural Association.

Clauses 37 and 38 were amended by causing them respectively to read, "the Council of the Association," instead of "the Board of Agriculture, so constituted as such Council."

A new clause was also ordered to be introduced, providing that at the annual meeting of the Directors, two persons should be elected for the purpose of auditing the accounts of the Association; and that it should be the duty of these auditors to transmit a copy of their proceedings to the county societies, prior to their annual meetings.

Clauses 39 to 44, relating to incorporation of Horticultural Societies, were adopted without amendment.

Clauses 45, 6 and 7, relating to Electoral Division Societies, were also adopted.

Clause 48 was amended by substituting "between the 14th and 21st" for "the third week in January" for holding the annual meetings of county societies; the clause was also amended by adding thereto, that, "in the event of the secretary or treasurer dying or resigning office during the term for which he has been elected, it shall be the duty of the Directors, and they are hereby empowered, to nominate and appoint a fit and proper person to fill the office for the unexpired term of the person so dying or resigning as aforesaid.

The 49th clause was considered, and struck out altogether.

Clause 51 was amended by striking out the words "the names of all persons to whom premiums were awarded, the amount of such premiums respectively, and the names of the animal, article or thing, in respect of which the sum was granted."

Clause 54, relating to Township Societies, was amended by providing "that township Societies get one-half of the government county grant. Subscribers to be not less than 75; and that no Township Show be held in a township in which the County Show is held, and that the funds of such Township Society for that year be given for the benefit of the County Society.

(WEDNESDAY MORNING.)

Clause 55 was also amended by providing that two auditors be elected at the Annual Meeting of each Township Society, in addition to other office-bearers. A new clause was also carried, by a majority of one, "that in cases where part of a township is in one electoral division and part in another, a Township Association may be formed in each part, and that each of said societies report to the County Society of the electoral division in which it is situated."

Clause 57, and to sub-section 3 of clause 58, were approved of. Sub-section 4 of the latter clause, providing for exceptional grants to some 13 counties, was expunged.

Clause 59, relating to electoral cities and towns was amended by providing that the City of Toronto, although by the Confederation Act embracing two electoral divisions, be considered as one division for the purposes of this Act, but that it shall receive $600 from the Legislative grant, provided it locally contributes $400, or in like proportion for whatever sum its members may contribute below the full amount of $400. The sub-section to this clause was ordered to be so worded as not to conflict with the foregoing.

Clause 60 was amended so as to read "that the Branch Societies be entitled to a share of the grant to the County Society in proportion to the amount subscribed and paid; and also providing that a certified list of the Township Society's members, and the amount paid by each, be forwarded to the treasurer of the County Society, &c."

The remaining clauses, 61 to 66, were adopted without amendment.

A concluding clause was introduced, on the recommendation of Mr. Cooley, providing for the organization of a special police force for the exhibition grounds, and for a certain space around the same, during the days of the Exhibition.

A committee of nine members, composed of Messrs. Rykert, Wheler, Stone, Cowan, Buckland, Shier, Cooley, Denison and Thomson, was appointed to draft a bill based upon the foregoing amendments.

A unanimous vote of thanks was accorded the Chairman and Secretaries, when the Convention adjourned.

TORONTO MECHANICS' INSTITUTE EVENING CLASSES.

In noticing the classes recently formed in this Institute, in our last issue, we promised to give the number of the pupils this month. They stand as follows:

Architectural and Mechanial Drawing	11
Ornamental and Landscape "	26
Mathematics	38
English Grammar and Composition	16
Bookkeeping	31
Penmanship	24
French	25
Chemistry and Natural Philosophy	13
Total	184

Pupils are still joining some of these classes.

Selected Articles.

TECHNICAL EDUCATION IN GREAT BRITAIN.

That was a wise, and searching, and widely applicable saying, both morally and intellectually of the Greek—"know thyself," and a pungent counterpart was that of the witty Frenchman, that "it is easy to be so ignorant as to be unconscious of it." Even a little wisdom should suffice to cause us to sound the depths or shallows of our own knowledge before we throw off flippant sentences, or utter fancied oracles upon any subject whose importance is great, and all whose bearings are not to be seen at a glance. Education in general has been looked upon from days even before those of Cyrus as a large and difficult subject, and technical education might seem even to add to its complication, and if we add to these such a question as whether technical education be needed or not needed by an entire nation comprising three distinct nationalities, if not four, and with at least as many systems of secular and ecclesiastical teaching and belief in existence amongst these, one would think that men in proportion to their ability to decide, would be in equal degree slow to dogmatise.

The subject embraces many distinct, large, and complex questions—such as to what extent, or if at all, the rapid progress in arts and manufactures of the chief continental nations during the last half century has been influenced by technical education? Whether such sort of education in Great Britain has been neglected, or, whether assuming it to exist amongst us, if improved and extended, it would prove of any value hereafter in enabling us to run the race that is now set before us as a manufacturing and commercial nation? What constitutes technical education—how is it best conferred? Is it indeed of any value at all—anywhere or at any time—or may it not be a mere whim of the doctrinaire?

These and a score more like questions, more or less fundamental, seem to some, such as almost any unlettered or half-educated scribe is fit to deal with, and apt to teach upon. The effects of these lucubrations are mischievous, because, unfortunately, as yet at least, the standard of knowledge upon these subjects on the part of the public of England, is not such as to enable a large portion of the middle and upper classes to form just conclusions of their own, they are thus poison without an antidote. Some half-dozen fallacies are hashed up again and again and entangled, upon this vast question, which only seems simple to the eye that cannot discern its proportions.

The style of inquiry of those who doubt the advantage or oppose the improvement of technical education generally take some such form as the following. Granted, as a fact, that up to the present, or nearly the present time, we have maintained our position as the first industrial nation in the world, and appealing to our past successes, *personal and national*, in manufacturing arts, which have been achieved without, or almost without, any system of technical education amongst us—is not this alone sufficient to prove either that we have as much technical education already as is good for us, or that technical education itself is either a much overrated thing, or perhaps even a humbug altogether?

"Improvements follow less from organised technical education than from spontaneous invention, competition, and practical experience," we are informed. The French have "great veterinary schools at Alfort and Lyons, but still they are not beating us in the breed of horses." In one word, "we are *not* beaten in any of our peculiar arts or trades either in France or on the Continent."

Well, let us admit this last as tolerably evident—if it were otherwise, if we were already fairly beaten and passed in the race, there would be little use in entering upon the question of how we may avoid being beaten. But, according to our view, the race has got perilously close—it becomes a neck-and-neck contest hereafter; and those who carry needless weight had best cast it off, or watch their opponents' riding to see if they can improve their own.

Having been led to adopt an image taken from the turf, we will venture to digress for a moment with a remark or two, not quite irrelevant, on this said subject of horses. We shall pass by the amusing absurdity above, which imagines that horses are *bred* in veterinary schools, and is innocent of any distinction between these and the

Haras, and because we do not ourselves profess to be at all stable-minded, and have on this subject to take our information in great part from others, we just humbly ask these questions:—Is it or is it not a fact that the race-course has long been upheld in Great Britain on the express ground that it is one of the greatest schools and encouragements to the improvement of the breed of certain high classes of horses, and through these, less directly of all other breeds? Is it also a fact that the Imperial Government of France has taken much trouble, and gone to no small expense, and been moreover highly successful in establishing races all over France? And is it not a fact that they buy our best race-horses to improve their own, and that the general standard of the French horse of all classes has been of late years greatly improved, and is still improving? If it be not so we can only say the impressions of some competent judges, who know what French horses were in 1830 and what they are now, as exhibited at the recent great horse show—which was held upon the esplanade of the Invalides at Paris, and is just closed —have been widely astray. And equally astray are the opinions of certain railway contractors' agents, and other good judges of money's worth, to be got out of a draught horse, who say that the compact gray or brown stallions which now pull the heavy traffic of Paris and of more southern France, are far more courageous, powerful, and economic draught horses than those ponderous sleek and slow equine aldermen that advance in London, and are the pride and panegyric of Londoners and of Englishmen generally. However, this may or may or not be so. But if this be true that the breed of horses generally in France is being improved, have we not here extracted from the very absurdity we have quoted, a proof of the value of rightly directed technical education? even as respects the improved production of horseflesh, for with the direct view to the improvement that is being effected as its consequence, has the Government of France promoted the racecourse as the best school for those wise in horseflesh.

Were it worth while we might follow this matter further in the other direction, and recall some unpleasant remembrances of veterinary professional ignorance and dogmatism in England emanating from our nearly voluntary and hap-hazard education in that particular, of which the *Times* took due notice at the time of the cattle plague. And *per contra* might notice as at least remarkable that in the only part of the United Kingdom in which the cattle plague got no hold and appears to have been most successfully treated—in Ireland—the leading veterinary surgeon charged with this matter by the authorities there, who is admittedly one of the most scientific men of his profession, was educated abroad, and chiefly at Alfort.

As we have followed into these low regions of illustration, we shall descend to a still humbler one.

However it may be debated, whether the developement of cookery be a proof of national heroism and virtue—it certainly may be accepted, like the consumption of soap, as in proportion to its goodness one measure of comparative civilisation.

"Providence gives meat, but the devil sends the cook," is a tolerably well known proverb, the unpleasant truth contained in which, we are all in England feelingly convinced of. There is plenty of bad cookery out of England also, as those who have had to satisfy their hunger in the more savage countries of Europe, or the less settled ones of the new world, know but too well; but how comes it that if this proverb exist, it has lost all its force in certain other nations of Europe —as in France, Germany, Switzerland and Northern Italy, for example, while it remains the expression of an active truth in every household, except that of the noble with his *chef de cuisine*, throughout England, Scotland and Ireland. Mainly because in our own country cookery is picked up anyhow and at hap-hazard; is not recognized as "an art," resting, like every other art, upon general principles, is never taught systematically at all, and scarcely could be taught as it should be taught to the poor ignorant women who usually form the substrate out of which English cooks are raised.

A "professed cook," as seen in the advertising columns of the *Times*, means a squabby, red-faced, well-fed, fire-proof old dame, whose "experience" consists in her having seen some tons of raw flesh thrust through with iron spits, and set to hiss and torrify before roaring banks of blazing coal—or little more.

We need not say what "the *chef*" even of a provincial hotel or restaurant is abroad, nor what the cook of the higher order of foreign household, either in town or country. Those who have had the opportunity of remarking the domestic *regimé* of the wide-spread middle-class of Germany and of France, know how the science of the management of the food for the family, is acquired both by mistress and cook. The former before she becomes a married woman, is in the habit, throughout a large part of German-speaking Europe, of putting on a "cooking jacket" and taking lessons in cookery, and acquiring its principles and actual practice, under the *chef* of some large hotel or restaurant. If in a lower rank, she engages as a cooking assistant at wages, (laid up for the future *trousseau*), often at a distance from her home, and for a period of several months. The man who has taught her does not do so, as himself a mere empiric, he knows something of the outlines of the chemistry and so forth, on which cookery, good or bad, depends—and he does not rhyme off "recipes" only—he communicates rules and principles.

Ask an English cook some such questions as these:—What is the lowest temperature at which it is possible to boil an egg? How do mushrooms and truffles differ from vegetable marrow or melon; and peas from all? Is it true that a junk of cheese helps to digest a slab of half raw roast beef? Have sweet puddings and the "emulsions" of the apothecary any near relations to each other? What sorts of food are most easily digested, which most nutritive, and which most fattening? Is a pound of fish as economic as a pound of flesh? When are potatoes poison, and why is the Irish mode of boiling those roots the best—if they be *boiled* at all? To such questions we may safely say not one cook in ten thousand in Great Britain could return any reply. Few would have any notion of what the questions meant; and amongst the equally ignorant we may include the mistresses of almost every British and Irish and Scotch household—not even excluding the noble authoresses of recent English cookery books. Yet we would venture to affirm that a thousand cooks or more could be produced out of any quarter of Paris who would return tolerably fair answers to any such set of questions as should test their knowledge of their art, as derived from a few not very recondite principles, and not held as a mere routine of operations to be performed.

The difference in skill spreads as it descends in society, and makes much of the difference between the economy, the comfort, and the health, and with these the general domestic peace and sobriety of the foreign workman and his children, and the thriftless discomfort and squalor that beset the British earner of better wages, in despite of the far finer raw material of food that those who cook for him and them, generally command in our islands.

An excellent illustration of the ill effects that result from cooking without any principles to guide occurs to us, and is within the scope of our own knowledge. The guardians of a provincial workhouse found that, weight for weight, rice was cheaper than oatmeal, and asked him who was called their cook could he not make the workhouse porridge with half of one and half of the other? Nothing was easier he replied, it would be an excellent economy. The unhappy paupers did not like it—but who cares for that; are there not interesting niggers and convertible savages for Exeter Hall and English sympathy to expend themselves upon? So it was rice and meal porridge or starve, which you please, for a time. But ere many weeks, in many a fragile wooden shell, the very old and the very young had gone forth from the house, and diarrhœa and dysentery were a plague within it. The doctor, good easy man, declared it had nothing to do with the excellent food the board had ordered. How should it —was not rice prescribed as the fit food for dysenteric patients? He, however, neither tasted nor looked at the porridge—pauper doctors are not paid for that. A lady, however, of more than common knowledge and intelligence, whose husband was a guardian, came and tasted it. "That," said she, "is the cause of the sickness. Don't you see that the temperature at which, and the time during which, you boil the oatmeal into pulp, is insufficient to cook completely the hard dry rice? The starch cells of the rice are not even half softened; you might as well feed the paupers with sawdust, and the effects upon the intestines would be the same." Rice to be wholesome requires a *moist baking*, at a temperature of from 250 deg. to 300 deg. But the workhouse cook knew nothing about that.

It is not, however, our object to digress further by dilating upon the desperately bad effects that have been and are being with increasing intensity produced amongst our workers for wages, by the almost incredible ignorance—not alone on cooking and other directly applicable domestic subjects, but on all subjects moral and intellectual, on the part of the girls and women that become the wives and the mothers of the future generation of English workmen yet to be. That will demand space for itself and graver treatment than belongs to what we here alone intend, viz., a mere illustration taken from an almost whimsically low point of view, that even in the commonest of the arts of life our systematised knowledge is less complete than that of our more advanced continental neighbours, and that the means for improving it, even in this lowest aspect, as yet scarce exist among us.

Our object more at large has been to illustrate that, which one might until recently have supposed required neither proof nor illustration, viz., that knowledge is better than ignorance, and that knowledge to be worthy of the name must be systematic and exact, and shall best and most powerfully serve us whatever be its nature, in proportion as it approaches nearer to the throne of science.

"Spontaneous invention, competition, and practical experience" are, it appears, however, the fountains of all industrial knowledge, the true sources of all national improvements in arts, the basis of all national power as derived from these. Woe be to those who darken counsel by words without knowledge; let England on this matter of education for her workers, rudimentary and technical, beware at this juncture whose counsel she follows, nor forget that there be "blind leaders of the blind."

Pray what is "spontaneous invention?" Has it a bit more existence in the universe than "spontaneous generation?" The very phrase is proof of the formless thought. Invention is but the exercise of imagination and judgment upon foreknown facts, themselves discoveries, &c., the unveiling of nature's "open secrets" (as Carlisle nobly calls them), in search of the means to a wished-for end. Upon what, then, can invention work, but upon the materials that science hath accumulated for it—by what shall its "footsteps and beatings in the dark" (to use Bacon's words) be guided, but by the clue that science bestows?

"Competition" forsooth—that sordid "drudge 'twixt man and man,"—that too, is a more clear and copious fount of improvement than all organised technical education; that is to say, is better than all applied science. Let us probe our memories for a moment, if it be worth while to try, if this be so. Pray how much had competition to do with the creation of the printer's art, with clocks and watches, with Hadley's sextant (the instrumental basis of all oceanic navigation), with the telescope, with gunpowder?

Competition for anything may be as keen as that for food, amongst the mouths of a beleaguered city, but unless it have the facts of science to work upon, and the guidance of science by which to rule its work, nothing can come to the competitors however eager and hungry. No manna falls from heaven into the lap of inventor or improver; his assistance comes from quite the opposite quarter, and is powerful and helpful to him in proportion as he looks steadily and thoughtfully to the earth, and learns with exactitude and system its materials, and the forces that rule those that are around him and beneath his feet. If he be wise and sees his aim and longs to accomplish it, all that competition can do, is to stimulate him to acquire more of the light of sciences to teach him the way, to that which no competition in the world can show or even hint at.

But there is "practical experience," always the big unmeaning word of the ignorant man. Practical experience without science is but the "cookery book" over again—a thing of recipe and custom—a cyclops without eye or light.

"*Monstrum, horrendum, informe, ingens, cui lumen ademptum.*"

And how much has practical experience had to do with the great discoveries, inventions (these are very different things) and improvements of the world?

What was the extent of Bessemer's practical experience in steel-making, when his clear insight of a chemical fact, gave at Cheltenham the first note of the process that will change the ironmaking and the structures and machinery of the world? What practical experience had Siemens of working a furnace of any sort or kind, when his equally keen insight as a man of applied science produced the regenerative furnace, that shall prolong our coal fuel and revolutionise the applications of heat of every sort? What practical knowledge had James Watt when his clear insight of the principles upon which the great losses of fuel in the older engine—learned by him as the pupil or assistant of Black—produced *the* steam engine? What practical knowledge guided the steps of Davy when he went—question after question put by experiment to nature,—straight to the mark of the safety lamp. No groping in the dark—drifting about without sail or compass, as was the case with George Stephenson the practical man, with a life-long experience of fire-damp and coal-pits, in *his* attempts to come to the same end, at which it is more than doubtful that he ever unassistedly arrived, if at all.

Ours is the country that has produced Brindley and Telford, Rennie, Smeaton, and Watt—men whose ideas and whose works all the world copies and follows. These were self-taught men, they knew nothing of technical education—some had little or no education at all—yet see what they have done. What great use can there be in technical education when these men have achieved such results—such fame, reflecting glory on the country that gave them birth, and yet without any. What need we fear. That country which for a century has led the van in arts, and holds the vantage coigns of the world in arms, is certain to reproduce those representative men in every generation. Perhaps so, there were brave men before Agamemnon, there is as good fish in the sea as has ever been caught.

But the argument—if such twaddle be worthy of the name—at once proves too much and too little, if it is to be taken as one against the advantages *to the average of men* of technical education. There have been always giants in the earth, and some few men see by a sort of intuition, like intellectual lightning, what the *average* of men, to see at all, must approach with previously trained and well opened mental vision. If the splendour of their successes is to be taken as a proof that technical education is useless or unnecessary, then it is, as respects some of them, an equally good proof that any education at all is useless, even that which these men picked up for themselves like weeds at the wayside of life. Great as were these men, and as have been thousands of others like them, in every age and clime, the true lesson that their lives should teach is this; how much greater would each and all of them have been had they started in their careers, sped with the mercurial wings of knowledge in place of being burdened by the impediments of ignorance. Who can look through "Telford's Pocket-book," in his life by Rickman, and not discern the life-long and daily struggle of that great spirit with the ignorance in which it was his misfortune to have been reared. On the other hand, Watt—who of all other great inventors is the very Newton of machinery—was not an uneducated man, but one who had sat at the feet of the very best teachers of science that Scotland possessed—was *au courant* with all that continental science and art was occupied with, so far as the means of communication of his day permitted; was not an unlettered man, but one acquainted with modern languages and literature, fond of *belles lettres* and fine art, and with the true zest for science in its wide encyclopædic aspects—and not as a mere shop for money-making—that belongs to the man of culture, of the highest order. But enough, appeals to such instances prove nothing, unless it be the utter incapacity of those who employ them to comprehend the great features of the subject of technical education upon which they pretend to treat; they are beside the matter altogether.

And equally so are random-shot catalogues of what wondrous things have been done in our days, and in the great days before us, in and by England, when such are meant to prove, that which is just the question in debate. If we are to derive any light as to what our industrial future is likely to be, from a retrospect of the past—and assuming us to go on as regards education general and technical, in the old jog-trot and well-rutted road—as it would seem Dr. Percy and some others deem sufficient and best—we say let the retrospect be full and sufficient. To be so, it must embrace *all the conditions* that during this nineteenth century have been operative and effective in conferring upon our country the paramount position in industrial arts, and in commerce, and in power, that she has so far maintained. And we must endeavour to ascertain how, and how far, these or any of these conditions have become changed, or are on the eve of being changed, and whether to our disadvantage or to the advantage of continental nations. Such a survey cannot neglect facts of history beside those of mere arts and manufactures; it must embrace international politics and treaties; the changed methods of locomotion traffic, and of warfare; the movements and increase of populations and their food supplies; and must estimate the relations of creeds and beliefs, of castes and classes, and of ancient corporations and of learned bodies, upon the average intellectual and moral force of a people, and still much more besides; then at last we may come with more adequate data to discuss this question itself. If our future industrial supremacy be threatened, how may we best provide against its decline or overthrow; and shall one of the methods consist in giving a better education to our people at large, including in that the establishment of an efficient system of organised technical education for various classes of workers? For the present we do not profess to have ourselves even fairly opened the question at large. Our aim here, and so far, has been almost limited to removing what we are compelled to call rubbish, out of the way; but we hope to pursue this subject (which we are satisfied is one of the most important that can engage the serious attention of English statesmen and Englishmen at large at this moment) with the fulness it demands hereafter.

It is with a real sense of responsibility, therefore, that in our last article on this subject we felt compelled, with entire plainness of speech, to point out what appear to us the fallacies on the subject of technical education comprised in Dr. Percy's late letter to the *Times*. Nothing is further from our wishes or intention than to utter a word personally disrespectful to that gentleman; but the very fact of his scientific reputation, and of the prominent position which he occupies as a metallurgical teacher and author, give a weight to whatever may pass from under his pen which leave no option to an honest journalist when dealing with such a subject as the present, to waive every other consideration in favour of truth alone. —*London Engineeer.*

PLATING OR COATING METALS WITH METALS.

Not very long ago, and quite in the remembrance of most who are likely to read this journal, the principal manufactures that might have been described under the above title were the manufacture of tin plates, of tinned culinary utensils, and the operation of Sheffield plating. The process of "galvanizing" (coating iron with zinc by immersion in the molten metal) has materially interfered with that of tinning, and the introduction of the principles of electro-deposition, to produce articles of beauty at a cheap rate, and to serve many useful purposes, has altered the condition of the Sheffield plating trade to such an extent that it only exists to produce certain articles of large consumption and well-defined form.

Great changes can also be traced in the theory and practice of electro-deposition itself. Smee, in his admirable work, laid down the "laws" of electro-metallurgy, as he was pleased to term them, in which the evolution of hydrogen during the time of deposition was made to determine the character of the deposit obtained; he also put forward certain views relating to the deposition of alloys in which the use of intense battery power was pointed out as a possible means of accomplishing that purpose. Now, it is found that, by the use of alkaline solutions, many deposits can be obtained in a reguline form during the evolution of hydrogen, and that, also, from certain alkaline solutions, brass and other alloys can be electro-deposited in a reguline form, without the use of more battery power than is necessary to compensate for the want of electric conduction in the solution employed.

In the five years that are comprised between the years 1861—1865, inclusive, the increase of knowledge (practical and theoretical) does not appear to have been very great in relation to the subject at the head of this paper. The chief attempts at improvement have been made in the practical details of the tin-plate manufacture. The use of ordinary resin as a flux, above the molten metal, is provided for by special arrangements by Messrs. Banks and Morgan, in their patent specification: Messrs. Morewood and Whytock employ ordinary resin, in conjunction with tallow, by using a plurality of coating baths worked in connection, by the aid of machinery. With a view to economy of material and of working, rollers, guides, and other machinery, are employed in certain inventions. Some inventors set forth improvements in the fluxes used (independent of the above-mentioned resin), comprising potassium, ammonium, zinc, tin, and cadmium chlorides. H. J. Madge manufactures a cheap alloy for coating iron plates, by using lead and antimony, with perhaps, a small quantity of tin, instead of tin alone. Messrs. Nurse use an annealing pot with a double case. Lastly, George Tomkins coats-lead and terne plates by pouring the melted metal over the plate, and uses an alloy of nickel, zinc, and lead.

Electro-gilding has made but little practical progress during this time. The ordinary solution of gold trichloride in potassium cyanide is used by Martin Miller to gild wire, and by Kuhlmann to ornament metal. The depositing solution employed by Moore contains potassium ferro-cyanide, "pearl potash," potassium iodide, sodium carbonate, copper cyanide, silver cyanide, and "fine gold;" it is said to give a rapid, durable, and richly colored deposit. J. B. Thompson prepares iron or steel articles for electro-deposition by tinning, and then pickling and washing them; he also ornaments silver surfaces by electro-gilding them with a polarized paint brush containing the electro-depositing solution.

In electro-silvering, the following are the principal points that appear:—Martin Miller employs a solution of silver chloride dissolved in potassium cyanide to coat wire. Moore uses electro-magnetic force, but does not state his silvering solution. Weil's solution for previously coppered articles is made by means of silver nitrate, hydric tartrate, ammonia, and potassium cyanide; this solution gives an adherent and either brilliant or dead coating.

All the solutions for electro-coppering are evidently intended to coat iron or other easily oxidable metals. Miller uses a mixture of copper carbonate, potassium cyanide, and potassium or sodium carbonate, to coat wire; the alkaline portion of the solution is first boiled, and then the copper carbonate is added, the mixture being kept boiling until ammonia is freely given off. Wallcott charges a strong potassium-cyanide solution with copper by electrolysis. Weil's electro-coppering solution is formed by adding a solution of cupric sulphate to a solution containing sodic potassium tartrate and sodium hydrate. Thompson deposits copper (on an article already electro-coated with iron) by means of a solution of hydrated cupric oxide in sodium hyposulphite.

Among the other inventions that may be mentioned are the following:—Marshall prevents the fracture of metals owing to their crystallization, by coating their bearings with soft metal, by running the molten metal on to the inclosed bearing. Le Chatelier deposits aluminum by electrolysis of fused sodic aluminum chloride. Bennet tins lead pipes, that are made by hydraulic pressure, by the overflow of the melted metal. Beslay electro-coats iron with tin preliminary to the final electro-coating. Holley coats iron with aluminum, in the fire, by means of a frit that contains felspar, silex, china clay, and a potash clay, when an external vitreous coating is required. When only a coating of aluminum is wanted, boracic trioxide is added to a potash clay; the slag throws itself off as the iron shrinks.

Owing to the trouble of arriving at the history of patented inventions prior to the year 1852, many important improvements have been repatented. This difficulty, however has been much lessened by the printing of the specifications, superintended by Mr. Woodcroft, in his successful endeavor to carry out the amended patent laws. Lately, and more especially since the year 1857, his attempts have received great accession of strength by the publication of "Abridgements of the Specifications," in series chronologically arranged, and drawn up by competent men acquainted with the subject to which each series refers.

Notwithstanding this, the number of inventions still repatented may be drawn from the following analysis of those relating to our subject between the years 1861—1865, inclusive:—

Resin was used on the surface of melted metal as early as A. D. 1786. Silvering glass with silver, which is afterwards electro-coated with copper, is referred to in the year 1852. Apparently, the first patent in which machinery was used for tinning iron or steel plates was secured in 1852. A solution of copper carbonate in potassium cyanide was used to electro-deposit copper in 1853. Although Smee sets forth the deposition of copper from its electro-solution in potassium cyanide, it forms the subject of Walcott's patent. Smee, in 1851, and Alexander Watt, in 1860, electro-deposit silver from a solution of its chloride in potassium cyanide. Smee points out the electro-deposition of gold from a solution of its chloride in potassium cyanide. The combination of hydric tartrate, ammonia, and potassium cyanide, was used in 1857 to electro-deposit silver.—*Ironmonger* (*London*).

MANUFACTURING INDUSTRY OF GERMANY.

An article in the *Revue Contemporaine* on the manufactures and industry of the Zollverein affords some interesting information at a time when the future of Germany so largely fills the public mind. When, about thirty years ago, the Zollverein was formed, and entered on a manufacturing career, the views of the promoters of that great commercial league were confined to supplying the home demand. The export trade was dependent on arrangements with the Hanseatic ports. In Germany, as in Erance, the rural population largely exceeeds in number any other.. There are no cities equal to Manchester or Glasgow. Iserlohn, Solingen, and Remscheid, can no more compare with Birmingham and Sheffield than Aix-la-Chapelle can with Leeds, or Chemnitz with Bradford. Nevertheless, the progress of the manufactures of the Zollverein has been very rapid. The populations have doubled, tripled and even quadrupled in forty years. Thus, Breslau has increased from 78,000 to 164,000; Elberfeld and Barmen, from 43,000 to 122,000; Cologne, from 56,000 to 122,000; Nuremberg. from 27,000 to 70,000. In like manner the capital cities which share in benefits of commercial prosperity. The population of Berlin has increased from 200,000 to nearly 700,000, and that of Dresden from 55,000 to 146,000 in the same period.

It is in Westphalia, in the county of Berg, and in the environs of Aix-la-Chapelle, that metal manufactures have been most developed. Linen manufactures, although suffering from too long adherance to hand-work against machinery, has held its ground in Westphalia, Saxony, and Silesia, where likewise woollen manufactures have made, and continue to make, great progress, as well as in Brandenburg and the districts of Aix-la-Chapelle. The town of Chemnitz, in royal Saxony, has become the centre of an important manufacture of printed woollen fabrics, which is also carried on in Thuringia. Spinning and weaving cotton are largely carried on in Saxony, in the valley of the Wipper, at Elberfeld-Barmen, and on the banks of the Rhine at Cologne, Gladbach, and Rheydt. Silk manufactures flourish at Crefeld and at Viersen, as well as at Elberfeld-Barmen, where also the production of mixed fabrics of silk has attained considerable importance. Beet-root sugar, one of the most important of the modern manufactures of the Zollverein, is most vigorously carried on in Prussian Saxony and Silesia. Chemnitz is often called the Manchester of Saxony. Having at its doors the rich coal mines of Zucchau, it produces not only cotton fabrics, but linen, hemp. and woollens, spinning, weaving, dyeing, and has also great factories for the manufacture of the necesssary machinery. The provinces which participate the least in this manufacturing progress are those on the shores of the Baltic and the North Sea, the only important manufacture being that of tobacco at Bremen. The least industrious of this vast region is Mecklenberg, where feudal laws still prevail, administered by an aristocracy of the narrowest and most bigoted character. South of the river Maine there is only one essentially manufacturing district, of which Nuremberg and Furth are the centres. Bavaria proper is the least manufacturing country of meridional Germany. The manufactures of Nuremberg are of a very varied character, and occupy two-thirds of the population. Augsburg has seventy establishments, employing eight thousand workmen. The manufacturing force of the south is, however, very inferior to that of the north. The production of articles of luxury is much less developed in the Zollverein than in France or in wealthy England, a country less successful than Germany in the cultivation of the fine arts, but where, for the last ten years, great attention has been paid to the application of art to manufactures. The superiority of France depends on the superiority of French taste, which is shown in design, colour, and form of everything produced for the wealthy and fashionable. Germany has nothing to rival the splendours of the best produce of Lyons or the magnificence of French shawls and carpets. France is also unrivalled in gloves, fine hats, Sèvres porcelain, bonnets, glass work, jewellry, and art bronzes. The only competition possible is in cheap imitations. The practice of art applied to manufacture is more actively centralized in Paris than in any city of the world, and Paris, the greatest school of design and modelling in the world, rules all France in matters of taste, and sets the fashions of the whole world. There is no such centralization of the artistic and industrial movement of Germany. The exportation from France to the Zollverein in 1865, when the treaty first came into force, amounts to 133,500,000 francs, and the importations from the Zollverein to only 18,500,000. This last figure is, however, double the amount of the preceeding year. The Zollverein possesses in Saxony, Erzebirge, Silesia, in the Hartz district—which is in the middle of Hanover—in Nassau, the two Hesses, in Thuringia, in part of Bavaria, and several other districts of Bavaria, Wirtemburg, and Baden, rich mines of coal, iron, zinc, tin, lead, and silver. Rock salt and salt springs also abound. The only countries with no mineral wealth are the duchies of Nassau, Oldenburg, and Luxemburg. For more than a century a celebrated mining academy has existed in the environs of Freiberg, in Erzgebirge. The extraction of silver in that district and the Hartz had much more importance in the middle ages than in the present day. The other metallic industries in great part date from the creation of the Zollverein, and the progress has been amazing.

The Prussian Minister of Commerce made for the Paris Exhibition a very curious collection of specimens of the produce of all the mines of the monarchy. It is accompanied by a scientific and explanatory catalogue prepared under the auspices of the chief of the department. Fifteen years ago the Zollverein only produced 150,000 tons of pig-iron, while France produced 400,000 to 500,000; Belgium, 200,000; Austria, 100,000; and Great Britain alone, 1,500,000, or more than all the rest of Europe put together. At present Westphalia produces more steel than England. The general production of smelted iron has been enormously increased. Germany still imports 1,500,000 tons of coal from England, chiefly for consumption in the ports and for steam navigation; but on the other hand, the Zollverein has raised its exportation of coal from 273,000 to 2,500,000 tons. A few years ago inferior in production to France and Belgium, the Zollverein now exports coal to an amount double that of those two countries, and nearly one-fourth of the exportation of Great Britain.—*London Gas Light Journal.*

Machinery and Manufactures.

A Race of Road Locomotives.

On Monday morning, August 26, in accordance with a previous arrangement, two road steam carriages—one made by Mr. Isaac W. Boulton, of Ashton-under-Lyne, having only one 4¼ inch cylinder, 9 inches stroke, the other, made by Messrs. Daniel Adamson & Co., of Newton Moor, having two cylinders 6 inches diameter, 10 inches stroke—started from Ashton-under Lyne at 4 30 A.M, for the show ground at Old Trafford, a distance of over eight miles. The larger engine, made by Messrs. Adamson & Co., is a very well-constructed engine, and had a good quarter of a mile start of the smaller machine. The little one, with five passengers upon it, passed the other in the first mile, and kept a good lead of it all the way, arriving at Old Trafford under the hour, having to go steady through Manchester. The engine made by Mr. Boulton ran the first four miles in sixteen minutes. The running of both engines is considered very good. On arrival at Old Trafford they tested their turning qualities, and both engines turned complete circles of 27 feet diameter, both to right and left, frequently.—*The Engineer.*

Silver's Self-lubricating Packing.

Mr. T. Silver, the American engineer, whose name has been so long connected with his well-known form of marine governor, is now engaged in introducing into England a remarkably original kind of packing for piston-rods. It works entirely without oil, being apparently self-lubricating, though we should say that its lubricating action is possibly aided by the presence of condensed steam. The packing put into the stuffing-box in the ordinary way, simply consists of a plaited cotton basket made up with a composition principally consisting of soapstone.—*American Artizan.*

Wet and Dry Lubricants.

Wet and dry lubricants are each said to be attracting much attention in Europe. The water-box of the French inventor vies with the dry, impalpable plumbago powder of the Battersea Plumbago Crucible Company; both being reported as giving results decidedly superior to oil, under comparative tests. The plumbago powder is said to adhere to the surface of the metal, perfectly filling the finest inequalities.

A New Mode of Horse-shoeing.

A great change is about to take place in the mode of horse-shoeing in Paris, it having long been understood that the method in present use is extremely defective. A man named Charlier has had the idea of altogether disembarrasing the hoof of the awkward appendage of a shoe, which not only impedes the movements, but also deprives the animal of a certain amount of steadiness and elasticity. Charlier does not cut the hoof, but leaves it just as nature forms it. He merely protects it from violent blows and accidents, and against the wear and tear of the Paris pavement, by inclosing it in a thin circle of iron, which wards it from danger without compressing it. In this way the horse stands upon a healthy member instead of upon one which is constantly wounded by the iron and knife of the smith. Not only does this simple invention spare much time and money, but also acts as a preventive against the various diseases of the foot.

English Steam Fire-engines in France.

The people of Lyons were much astonished last week at seeing a steam fire-engine running in their streets. The engine in question, is, we believe, the first English one supplied to a French town. It has been made by Messrs. Merryweather & Sons, of London, to the order of the Prêfet of the Rhone, for the town of Lyons, and is similar to one of the engines, "Le Prince Imperial," which has gained for this firm the gold medal at the Paris Exhibition. The engine has during the past week been thoroughly tested in every way, its performance, simplicity, and ease of management eliciting much satisfaction and applause. The official trial was made in the Place des Terreaux, in front of the Hôtel de Ville. Steam was raised from cold water, and the engine started in 11 minutes, and pumping through 160 feet of hose, water was projected continuously in a solid steam bare 1 inch in diameter to the top of the dome, a height of 160 feet; larger streams, and two, and even four at a time, were delivered far above the mural crown on the top of the facade of the building, 112 feet high. The engine was then taken under steam to the Quai de la Charité on the Rhone, and a hose 600 feet attached, leading to the Place Belle-cour, to see if its power should be in any way diminished; it was, however, found to play as well as with a short hose, although there was a suction lift of 15 feet, and two streams were being delivered; the pressure in the pump being 8, and that in the boiler 7 atmospheres. By this experiment the authorities plainly saw that the whole of Lyons lying between the rivers Rhone and Saone was under command in case of fire. Several other trials, some during the night, were made, chiefly to instruct the fire-brigade, with whom the new engine is quite a favourite.—*Mechanics' Magazine.*

Tortoise Shell.

A correspondent inquires as to the production and manufacture of tortoise shell. It is the product of a marine tortoise or turtle generally known as the " hawk's bill." The shell, so called, is in reality only the outer covering of the shell proper, and is found simply as scales or plates. These are removed by the application of fire. The turtle is caught and secured to the ground, when a light fire is built on his back, which loosens the plates so they can be removed by a knife. The animal is then left free and the separate plates are in time replaced by a plate or shield. The shell is rarely removed from animals weighing less than 160 or 170 pounds, as it is too thin for use in the arts.

The shell is manufactured into various articles by being softened in hot water, which renders it pliable and almost plastic. It is largely manufactured in Providence, R. I.—*Scientific American.*

The largest pair of Propeller Engines in the World.

The direct acting engines for the English iron clad *Hercules* built by John Penn & Sons, at Greenwich, near London, are the largest pair of screw engines ever constructed.

They are of the double trunk variety, a style built almost exclusively by the Messrs. Penn. There are two cylinders, each 127 inches in diameter by 4 feet 6 inches length of stroke of one piston; the diameter of the trunks is 47 inches, whose area being deducted, gives the pistons an effective diameter of 118 inches.

These engines are intended to run 60 revolutions per minute, consequently the two pistons, pass through a volume of 84,600 cubic feet per minute; they are to be supplied with steam by the ordinary horizontal tubular boilers, containing in the aggregate about 1,000 square feet of grate surface; they will be fitted with superheaters. It would seem therefore that these engines are intended to be worked highly expansively, and notwithstanding the comparatively small boiler capacity, the eminent engineer who constructed these monsters promises for them no less than 7,200 indicated horse power. Judging from the performance of many engines of similar style built by this firm we have no doubt that this enormous power will be realized. A comparison between the engines of the *Hercules* and those of the U. S. S. *Wampanoag* cannot fail to show that the planner of the machinery of one of these ships has made a big mistake.

The *Wampanoag* engines are geared and are expected to make 30 turns per minute, the cylinders are two in number and are 100 inches in diameter by 4 feet stroke of piston. Hence the piston will speed through a volume of 26,784 cubic feet per minute. So while the *Hercules* has a capacity of cylinder represented by 84,600 cubic feet, the *Wampanaog* has a cylinder capacity represented by only 26,000 cubic feet. In other words, although the eminently successful builder of these big direct acting engines employs over three times more cylinder capacity than Mr. Isherwood does in his "cog wheel" engines, he uses considerably less boiler than that blundering engineer. As a consequence, while the engines of Mr. Isherwood will only work up to some 4,000 indicated horse, those of Penn will work up to 7,200 indicated horse power. Again the 7,200 horse power engines take up about 8 feet 6 inches, in the length of the ship, less than the 4,000 horse power engines, and their boilers occupy some 20 feet less in the same direction. Thus if the *Hercules* engines were placed in the *Wampanaog*, she would be urged by more than double her power, and at the same time much less room would be occupied in the vessel by machinery, and, *ceteris paribus*, she would be driven over 18 knots per hour.

It would seem that Penn and other successful builders go ahead just as if the U. S. Navy Steam Blue Books with their "seven-tenths cut-off" and non-superheating theories had never been published.—*Scientific American.*

Telescope for Objects under Water.

A new Telescope for examining objects situated under water, was recently tested on one of the French canals. Reports affirm that pencil marks could be clearly distinguished at a depth of more than five feet. Its practical application will be the examination of the hulls of vessels without its being necessary to dock them.

The Lucimeter.

The various ways of measuring the quantity or intensity of light have always been a matter of paramount interest to philosophers. The earliest contrivance, and certainly an excellent one, due to Count Rumford, consisted in intercepting the light received from a given source, by means of a certain number of plates of dulled glass; the smaller the number required to make the light disappear, the smaller, of course, was its intensity. This was called a photometer. Others have since been constructed on various principles, but they are not generally applicable to one of the commonest problems that occurs in trade, viz., measuring the quality of burning oils by their illuminating power. This, *Galignani* informs us, has now been satisfactorily accomplished by M. Guérard Deslauriers, whose apparatus, which he calls a "lucimeter," consists of two constant-pressure lamps, and a photometer constructed on a new principle. Its shape is triangular, it is made of sheet iron painted black, and varnished, and is divided into two equal compartments. The latter are turned toward the lamps; the observer stands on the opposite side, which presents nothing but a flat vertical surface pierced with a hole bisected by the partition. Each of the two lamps is so placed as to transmit its light to one only of the two compartments, and exactly to the part where the hole is. The latter is covered with a piece of transparent paper on which, therefore, the rays of light from the two lamps are contiguously depicted If their intensity is the same, the eye of the observer will perceive no difference; if there be any, on the contrary, one of the lamps must be brought nearer or removed further off, until the same intensity be obtained. The difference of distance will then mark the relative qualities of the two oils; which, combined with the quantity burnt in a certain time, is sufficient to determine their marketable value. — *Mechanics' Magazine.*

Climbing Steep Gradients.

The London *Engineer*, in reference to the loss of power in crossing Mont Cenis by the Railway just constructed, says :—

Every time Mr. Fell's 16-ton engine and a train of 24 tons goes over the mountain in either direction, 80,000 foot-tons of available power are absolutely thrown away, taking the total descent as 2,000 feet. Nearly as much power is thus lost as is required to get the train up to the summit.

What is wanted is a single-line system whereby one train, going down at one hour, or one day, may store up its gravitating power to be used the next hour or even the next day, to help another train up. As a mechanical problem, and this is one of very great interest and importance, there are, perhaps, two or three ways of working this out. We may conceive a rope system in which the descending trains are made to pump water into an accumulator, the water pressure thus stored up in which is to be made available for taking up the train in the opposite direction, on the same line, at any time afterwards. This plan would involve, however, very considerable losses from friction, and a rope system is always objectional. In case of a sufficient supply of water at the summit of of the incline, the descending trains might be made to carry down a certain weight of water in tanks, say 10 or even 20 tons (2,240 to 4,480 gallons), to assist in pumping up a sufficient force for taking up other trains, not thus loaded, in the opposite direction.

There is another system, preferable, we think, to this. This is that of a pneumatic tube, not upon Mr. Rammell's plan, but one, nevertheless, in which the train goes through the tube. Rails could be laid, and an ordinary railway train (without the engine) could be run into a 10-feet or 11-feet tube, and a pressure of but 1 pound per square inch—not much greater than that corresponding to the difference between a very low and a very high barometer—would give a tractive force of 5 tons in the ten feet, and six tons in the 11-feet tube. This would take 20 tons easily up a slope of 1 in 4 to 1 in 5, and it is to be borne in mind that no locomotive is to be taken up. The air, under pressure, would not be blown from the engine into the tube, for in that case no advantage could be taken of it in descending. It would be accumulated in an airholder, or accumulator, like a gasholder, and having a capacity somewhat greater than that of the tube itself. For every mile of a 10 feet tube, the air accumulator would require to have about 400,000 cubic feet capacity, corresponding to a gasholder of very moderate size, the largest gasholders having a capacity of 2,500,000 cubic feet. The air-accumulator would require, however, to be of considerable strength, and to be loaded with considerable dead weight to be worked at a pressure of even 1 pound per square inch. If 120 feet in diameter, it should weigh, loaded, about 725 tons, merely in order to keep it down, in its tank, against this pressure, and the difference of level of the water, on the two sides of the "seal," would be 2 feet 4 inches. This airholder would be placed at the foot of the incline, and filled, at the outset, by a blowing engine of moderate size, and this would be afterwards employed in supplying the waste of air in working. The airholder would empty itself or nearly so, in sending a train up, and would be nearly filled again by the air forced in by a train of the same or of rather greater weight coming down, the difference of quantity of compressed air being supplied from the blowing engine. The principle and its great advantage will be seen and understood without difficulty. It requires a certain amount of detail in working out, but this presents no difficulty and may be designed with certainty and even with ease. The train would be run into the tube, leaving the locomotive behind, and the doors of the tube would be shut. A piston truck, nearly but not quite fitting the tube, would be placed in advance of the train, or perhaps two, one in front and one behind. The compressed air would then be let on through a valve whose opening would just suffice to send the train up at a proper speed. The upper end of the tube would be always open, unless a narrow summit had to be passed and a descent made on the opposite side. In the latter case, a short piece of level line would be introduced at the summit, and on reaching it, the pressure in the up tube would be let off into the down tube, thus placing the train in equilibrium, and storing up a certain amount of air in the down tube to check the train in the beginning of its descent. In the case of a plane rising merely from a low level to a table-land above, like those up the sierras in Brazil, or up the ghauts in India, the upper end of the tube would be always open. The carriages would require to be lighted in passing up or down the tube, but the ventilation would be perfect, the motion delightfully uniform, and nothing could possibly be safer. We have ourselves been through Mr. Rammell's little tubes, one of them equal in area only to a 33-inch and the other to a 54-inch main, and the motion, despite the small wheels of the trucks and the absence of springs, is like sailing, and the ventilation is very good.

Upon the plan we propose trains might be worked up any incline, however steep, or even be lifted vertically, in perfect safety, and with the utmost steadiness and comfort.

"Articles de Paris."

One of the chief characteristics of the *article de Paris* is that, whether it be necessary or unnecessary it plays upon the fancy and comes to us in disguise. It is not enough that you should have an ink-bottle on your table; it is above all things that this ink-bottle should appear to be something else. It is a cannon ball—it is a pound weight—it is a negro's head—it is a railway engine. You take the negro by his black woolly hair; you find that his skull opens on a hinge, and there is a pot of ink where his brains should be! So there is a store of ink in the heart of the cannon ball, in the pound weight, and in the boiler of the engine! The play of fancy which is allowed in this way is boundless. Mr. Harry Emanuel has in silver a railway locomotive, with tender attached. The locomotive contains whiskey, the tender hot water: sugar takes the place of coals upon the tender, and the stoker is converted into a silver sugar-tongs! If you see a silver drum upon a friends table, it is a riddle: and you must guess what it is. It may be anything from a match-box to a mustard-pot.

Here is a little model of an umbrella-stand with an umbrella, a walking-stick, and a whip in it. The umbrella is a pen-wiper, the walking-stick is a pencil, the riding-whip is a pen-holder. Here is a silver-gilt coal-scuttle with a coal-scoop in it; you are expected to use it for a salt-cellar. Here is a little hat-box; it is intended for matches. Here is a silver cow with a large fly on her back; you seize the fly, and find that it is the handle of a small lid upon the back of the cow. The animal is hollow; she is intended for a cream jug, and the cream pour out of her mouth. Here is a large acorn; it is a nutmeg-grater. Here is a small ivory coffee mill; it is a yard measure. Here is a fiddle; it is a tooth-pick. Here is a bee-hive; it is a box of bonbon. Here is a jolly farmer, whose paunch contains a clock.

In these fanciful designs the French are more prolific and, on the whole, happier than the English are; but they sometimes make sad blunders. Thus they have a fancy just now for making umbrella handles of rhinoceros horn, but this horn is cut into the appearance of a chain; it is a chain, however, which denies its own nature, for it is quite stiff, the links not being loose. You expect an umbrella handle to be solid in your grasp; the handle of rhinoceros horn offers itself to you as apparently a loose chain, but in reality it has nothing whatever of the nature of a chain except the appearance.

The chief centers for the manufacture of *articles de Paris* are Paris, Vienna, and London. What they make best in Paris are small bronzes and little boxes of enamel, of earthenware, and of inlaid woods. In the way of bronzes I have not observed much that is either very new or particularly good. You see the same old figures that you have known for years past, of horses, dogs, deer, cocks and hens, rabbits, rats, ducks, geese, doing service in connection with paper-weights, clocks, match-boxes, sand-trays, pen-trays, and other accessories of a writing-table or a chimney-piece. In the making of boxes the French are still unequalled. They have a wonderful sympathy with that extravagant passion of the human soul for small boxes and receptacles. They have boxes for everything—for gloves, for jewels, for handkerchiefs, for stamps, for bonbons. for pens, for wafers. As misers seem to love money for its own sake, and apart from the use to which it can be turned, there are crowds of people in the world who like little boxes for their own sakes, especially if they have curious compartments, and sub-divisions, and secret drawers. A little nest of drawers is their delight; a pretty set of pigeon-holes sends them into estacies; a box is a box whether it contains anything or not, and they will put it on their tables to look at and *imagine* it utilized. The French cunningly play upon this weakness of the human heart.

The Parisians who trade in *articles de Paris* have now a great rival, and must have suffered not a little of late in their custom. Herr Auguste Klein, the principal maker of this class of goods in Vienna —indeed in the world,—has just opened on the Boulevard des Italiens the most magnificent shop of its kind in Paris. He began business about twenty-six years ago with a capital equivalent to forty shillings; he has now an immense establishment, giving employment to six hundred persons, and with London alone he transacts business to the extent of £40,000 a year. His business there is wholesale. He supplies to a considerable extent nearly all the leading London houses.—*Correspondent London Times*

Preventing Railroad Collisions.

A correspondent of the *Mechanics' Magazine* proposes a plan whereby every train on a track shall communicate with another, before or behind it, whenever the two approach within a certain distance. Electricity is the means employed, the engines of the trains carrying batteries one wire from which connects with the engine bell, the other connecting with the earth. Light insulated supplemental rails, made in continuous length of two miles each, are laid by the side of the main rail, so that the tire of the locomotive wheel runs on both. As long as two trains are not at the same time on one length of conducting rail, no electric current can pass on account of the break joint, but as soon as they come within this particular distance of each other the circuit is completed and both bells will ring.

A New Process of Manufacturing Oil.

Dr. H. E. Tweddles, of Pittsburg, Pa., has patented a new process of manufacturing oil, whereby all the hazard and risk attendant upon the use of fire in distilling the crude petroleum, and the expense and nuisance of subsequent purification by acids and alkalies, are entirely avoided. Steam is the only agent used, and it is utterly impossible to ignite the oils during the operation. But six or eight minutes is required to convert crude into refined oil.

Useful Receipts.

To Imitate Mahogany.

The surface of any close-grained wood is planed smooth, and then rubbed with a solution of nitrous acid. Next apply with a soft brush a mixture of one ounce of dragon's blood dissolved in a pint of alcohol and with the addition of a third of an ounce of carbonate of soda. When the polish diminishes in brilliancy, it may be restored by the use of a little cold-drawn linseed oil.

Poisoning by Chlorine Vapor.

Professor Maisch says that a direct antidote to the poisonous effects of the inhalation of chlorine is sulphuretted hydrogen, the halogen combining instantly with the hydrogen, liberating sulphur. The professor has tried it himself after accidentally inhaling chlorine, and obtained immediate relief. The same remedy would doubtless be effectual in the cases of bromine poisoning.

Valuable Healing Ointment.

For old fever sores and ulcers, and all sores that do not heal easily, take linseed oil, one pint, beeswax and rosin each one ounce; melt together, and while boiling hot stir in seven ounces red lead, keep it boiling till it becomes a jet black, and thick enough when cool to make a salve. Stir it constantly while boiling and be very careful or it will boil over unless the vessel in which it is made is quite large. When removed from the fire and nearly cold, stir in half an ounce of pulverized camphor gum and half a teacupful of strained honey. To be spread on cloths and applied to the sores night and morning after first cleaning them with soap and water. This is one of the most valuable healing salves or ointments in the world for all cases where an application of this nature is required.

Hypochlorite of Magnesia in Bleaching.

The following has been discovered in an examination of the action of hypochlorite of magnesia, and the preference which is given for it when delicate tissues have to be bleached:—1. This hypochlorite decomposes more easily than the lime compound; 2. The liberated magnesia is without action on the tissue. This cannot be said of lime. The best way of preparing hypochlorite of manganesia consists in decomposing sulphate of magnesia with hypochlorite of lime. When the sulphate of magnesia contains manganese, the liquid assumes a red color and loses its bleaching power. —*Schweiz. Polyt. Zeitschr.* 1856.

China Green.

China green, or Lo-kao, has been produced by Mr Darvin from the *Rhamnus Catharticus*, forming as beautiful a dye as the original of the same name. The process allows the article to be afforded for $8 90 per lb., and is as follows: Two pounds of the bark is placed in a kettle of boiling water; in a few minutes a pink scum is produced, when the whole is placed in an earthen jug well covered, until the next day. The liquid, now yellowish, is turned reddish brown by the addition of lime water, and is then distributed in glass jars, very little in each, and thus exposed to air and light, when it takes a green shade. This becomes gradually more general, and the whole is mixed together and carbonate of potash is added, producing a green precipitate, which is finally collected and dried

Red Lead.

Red-lead, according to Barton, may be produced by heating oxyd of lead to redness with nitrate of soda, or by heating at the same temperature a mixture of 1,894 parts of sulphate of lead, 665 parts of carbonate of soda, and 177 parts of nitrate of soda. The resulting mass is to washed.

How to Make Good Cement Walks.

Having previously graded and rolled the ground, heat your tar very hot, and with a long-handled dipper begin at one end of a pile of quite coarse gravel, pouring on the tar. quickly shovelling over and over so as to mix thoroughly. Cover the ground two and a half or three inches deep with the tarred gravel and then roll. Clean the roller with a broom as you proceed. Then put on a layer of finer tarred gravel one and a half inches thick, and roll. Then sprinkle the surface with hot tar, spreading the tar with a broom; finally, cover the surface with a light coat of fine sand, and your walk is complete, ready for use. It will improve in hardness by age. Provide portable tar kettles, screens, a roller not very heavy, and tools for systematic work, and you can hardly fail to derive satisfaction.—*Scientific American.*

Sizing for Woven Fabrics.

Treppl has recently patented (for England) a mixture of 100 parts of glycerine (of 20° Beaumè), one of sal-soda, one of gelatine, soap, skarine, gum-arabic or tragacanth in varying proportions, together with soda, alum, and borax. These are perfumed, if required, with essences of peppermint, lavender, and camphor diluted by alcohol. By thickening this sizing by about one-tenth of starch, it can be brought into the solid form.—*Druggists' Circular.*

To print Letters by Sunlight.

Dissolve chalk in aqua-fortis to the consistence of milk, and add to that a strong dissolution of silver. Keep this liquor in a glass decanter well stopped, then cut out from a paper the letters you would have appear, and paste the paper on the decanter, which you are to place in the sun in such a manner that its rays may pass through the places cut out of the paper and fall on the surface of the liquor. The part of the glass through which the rays pass will turn black, while that under the paper will remain white. You must observe not to move the bottle during the time of the operation.—*Chemical News.*

Varnish for Maps and Drawings.

Dissolve one pound of white shellac, a quarter of a pound of camphor, and two ounces of Canada balsam in one gallon of alcohol.

Linament for Rheumatism.

On the closing day of the late Exhibition at Kingston, 3 portmonies were handed to us, as having been found under one of the tables. One contained a black bracelet, the second was empty, and the third contained the following receipt, for "Linament for Rheumatism." They had, no doubt, been stolen by "pickpockets," their money contents taken, and then thrown away—evidently the thief or thieves were not afflicted by rheumatic pains, or we should not now have the opportunity of publishing this receipt for their cure, as we now do, both for the sake of the party from whom it was stolen, and their afflicted fellow mortals :—

1 oz. oil of hemlock, 1 oz. oil of red cedar, 1 oz. oil of turpentine, 1 oz. of camphor gum, 2 oz. sassafrax, 1 oz. cayenne pepper, and 2 quarts of alcohol. Mix all together. One-eighth of the above makes ½ a pint, and costs 25 cents. "You may omit the pepper if you choose."

Cure for Scrofula.

Cranberry wine, taken internally and applied externally, is announced as a cure for scrofula.

Cure for Lumbago.

A friend tells us, that a belt of (Chinese) nankeen worn round the body, next to the skin, is a *certain* cure for lumbago.—Try it.

Alloy for Hard Tools and Bells.

20 parts iron turnings or tin waste, 80 steel, 4 manganese, and 4 borax. To increase the tenacity, the proportions may be varied and two or three parts wolfram may be added.

Practical Memoranda.

Szerelmey's Iron Cement.

A number of gentlemen of the mechanical and engineering world recently assembled at Messrs. Szerelmey's, Albion Works, near Battersea Bridge, to see their cement tested. This cement possesss most remarkable qualities as applied to stone, brick, glass, timber, and even iron itself. Slates for roofing were joined together firmly, and large brick and stone and iron blocks, by its means adhered closely, in spite of being subjected to an enormous pressure; glass was also shown adhering to iron, a feature rendering it most useful in the construction of light roofing. In another portion of the factory was exhibited a portable house, constructed entirely of paper, treated with what the inventor calls zopissa, which makes such buildings durable and waterproof, and fit for tropical climates. This zopissa is also most valuable in the construction of water-tanks, gunpowder cases, coffins, and panels, as being cheaper and more durable than those usually made. The whole exhibition was one of great interest.

Preparing Oxygen Gas.

Several accidents have happened, and some lives have been lost, while preparing oxygen gas from chloride of potash and oxyd of manganese in retorts made for the very purpose. Professor Doremus, of New York, uses merely a common iron tea-kettle, puts in his materials, lutes down the lid with clay or plaster of Paris, and attaches the tube to the spout. When placed over the fire, the kettle is tilted a little backwards. Now, if the gas should come off very tumultously, the worst that can happen in this case is that the lid of the kettle will be blown off.—*American Artizan.*

Disinfectants.

Mr. Crookes, says the *Medical Times*, has shown that the favorite disinfectant, chloride of lime, is about the least efficient of any of those substances reputed to possess disinfectant qualities. Chlorine itself is very little better, for if used in large enough quantities it will in time destroy the virus, but as it acts by way of oxydation, and as living virus resists this longer than dead oxydizable matter, before the gas can attack a virus everything else that it can oxydize will be oxydized first. And if when pure,chlorine is so slow of acting when adulterated with eighty per cent of lime, its value is proportionately less. In sulphurous and carbolic acid, on the other hand, there are substances absolutely destructive of every kind of living thing of low organization, such as cattle plague virus is supposed to be. These substances, besides destroying the virus, attack it at once, and arrest all putrefying tendency.

Engraving upon Glass

The engraver is often at a loss for utensils to hold his acid, but Stalba mentions that ordinary glass and porcelain vessels are protected from the action of the acid by paraffine. A thin coating of this material is easily given to a vessel by first of all carefully drying it, and then melting some paraffine in it, taking care to get the vessel rather hot; it must then be rapidly moved about to get the whole of the inner surface evenly covered, and the excess of the paraffine may then be poured out. Vessels prepared in this way may be substituted for those of lead and gutta-percha.

How to stop the Flow of Blood.

It is not generally known that the blood, even from severe cuts, may be staunched by binding on the wound the fine dust of tea. After the flow has been staunched, laudanum may be applied with advantage.

To find the Area of a Circle.

Mr. Rowland Hill, of Richmond, Va, gives this handy rule for ascertaining the area of a circle, when the diameter and circumference both are known and the decimals not remembered: "Multiply the circumference by the diameter and divide the product by 4. The quotient will be the area."

We have tested this rule and find it correct. It is worth remembering.—*Scientific American.*

Asparagus is a very healthful article of diet, for the reason that it is nutritious, easily digested, and contains no properties which are injurious to the human organism.

Statistical Information.

Fossil Ivory.

About forty thousand pounds of fossil ivory, that is to say, the tusks of at least one hundred mammoths, are bartered for every year in New Siberia, so that in a period of two hundred years of trade with that country, the tusks of twenty thousand mammoths must have been disposed of—perhaps even twice that number, since only two hundred pounds of ivory is calculated as the average weight produced by a pair of tusks.

The Dental Art.

Forty years ago surgeons and doctors generally officiated as teeth-pullers whenever occasion demanded. In 1820 there were but thirty practicing dentists in the United States. In 1850 the number had increased to 2,923, and at present there are about 5,000 regular dentists. A college for the education of those desiring to enter this profession, has been established over a year in this city, and the faculty of Harvard College, at their last commencement, provided for a department of dentistry in connection with that university.

The Niagara Suspension Bridge.

Ever since the middle of March, 1855, from thirty to forty railway trians have passed over the Niagara Bridge daily. With the exception of the timber girders, and some other wooden parts which showed signs of decay, no part of the suspended system has ever been disturbed. The work is considered just as strong this day as it was at the time when the first train of cars passed over.

The Public Debt of the United States.

The following is the statement of the public debt of the United States on the 1st of October, 1867:

Total debt bearing coin interest	$1,745,196,141 80
Total debt bearing currency interest	461,074,680 00
National debt not presented for payment	18,221,256 83
Total, debt bearing no interest	361,164,844 00
Fractional currency	29,864,713 37
Gold certificates of deposit	14,867,820 00
Total debt	$2,630,389,456 00
Amount in Treasury—	
Coin	$103,298,659 69
Currency	31,813,349 55
Total in Treasury	$135,112,009 24
Amount of debt less cash in Treasury	$2.495,277,446 76

Mining Items.

California Gold Mines.—The California gold mines are said to be yielding more freely than ever before. As a specimen: near Smartsville upwards of $1,000,000 of gold have been taken from one claim of 100 acres, since March 1861. "It takes a mine to work a mine" says an old Spanish proverb, and to open the mine under notice, took nine years of incessant labor, and an enormous expenditure of money. It has four miles of sluices, three rods wide and three feet deep, in which is distributed three tons of quicksilver to catch the gold. The water used in washing costs $25,000 per annum, and 125,000 pounds of powder are expended annually in blasting.

Lake Superior Iron Mines.—The total product of the Lake Superior iron mines last year was 306,252 tons of ore. The reasons for the exceedingly rapid development of these mines since the year 1855 when the shipments of ore were 1,445 tons—are many and obvious. The deposits are immense, easily worked, and nearly free from those noxious elements which render the flux of most iron or ores difficult and expensive. None of the mines, moreover, are over thirty-five miles from cheap water transportation, while most of them are only fifteen or sixteen miles distant.

Minerals in Mexico.—In Mexico there exist 187 different kinds of minerals, among which are gold, silver, iron, copper, lead, zinc, mercury, tin, etc.

Borax.—A California paper says that the company engaged in taking out borax in Lake county, will soon be in condition to extract five tons of this article per day from the Borax Lake.

Pennsylvania Coal.—It is calculated that Pennsylvania contains coal enough to supply 20,000,000 tons annually for the next 650 years.

Marmora Iron.—The Marmora iron mines in Canada, forty miles from Lake Ontario, have been purchased by Philadelphia capitalists. The purchase covers 23,000 acres, also the Cobourg and Peterboro railway. Ore from this mine has yielded from sixty to seventy per cent. of fine iron.

United States War Statistics.

From the records of the Surgeon-Generals' office during the war, it would appear that cold steel plays but little part in modern battles. In three years there were reported, on the Union side, only a hundred and forty-three bayonet wounds, and a hundred and five saber cuts. Gunpowder does the work. Modern artillery and long range rifles give no chance for the bayonet or the dashing cavalry charge.

Miscellaneous.

A New Cement and Building Material.

In a communication to the French Academy of Sciences, M. Sorrel describes a new cement, being a basic hydrated oxychloride of magnesium. It is obtained by slacking magnesia with a solution of chloride of magnesium in a more or less concentrated state. The denser the solution the harder it becomes on drying. This magnesium cement is the whitest and hardest known to this day, and it can be moulded like plaster, in which case the cast acquires the hardness of marble. It will take any color, and has been used by the inventor for mosaics, imitations of ivory, billiard balls, etc. The new cement posesses the agglutinative property in the highest degree, so that solid masses may be made with it at a very low cost by mixing it up on a large scale with substances of little value. One part of magnesia may be incorporated with upwards of twenty parts of sand, limestone, and other inert substances, so as to form hard blocks; while lime and other cements will hardly admit of the incorporation of two or three times their weight of extraneous matter.

By means of these artificial blocks, buildings may easily be carried on in places where materials for the purpose are scarce. All that is required is simply to convey a quantity of magnesia and chloride of magnesium to the spot, if there be none to be had there, and then to mix them up with sand, pebbles, or any other matter of the kind close at hand; blocks can be made of any shape, and imitating hewn stone. This magnesium cement may be obtained at a very low cost, especially if the magnesia be extracted from the mother ley of salt works, either by M. Balard's process, whereby magnesia and hydrochloric acid are obtained at the same time, or else by decomposing the ley, which always contains a large proportion of chloride of magnesium, by means of quick lime, which by double decomposition yields magnesia and chloride of lime containing a certain quantity of chloride of magnesium, and which, with the addition of various other cheap substances may be used for whitewashing.

Hints to Horsekeepers.

Never feed grain or give water to a horse when warm from exercise. Sweat is not always a sign of warmth; place the hand on the chest for a test.

Water given after a meal is safer than to give it before.

Never drive fast or draw them hard immediately after giving food or drink.

Never drive faster than a walk with heavy loads.

Do not let horses stand long in the stable at any time in the year, without exercising.

Feed regularly, and in quality according to the appetite of the animal, and the labor it performs.

Do not drive or work long in storms.

Do not let the horses stand in the stable cased in boots of dried mud, and coats of matted hair. Groom them.

At all times in the year make your horses comfortable when tied in the stable. They cannot help themselves there.

Teach your horses to trust and have confidence in you rather than fear.

Canada Provision Trade with England.

At a recent meeting of the *Food Committee* at the Society of Arts, Mr. Grainger said:—"The importation of provisions from Canada was considerable, consisting of beef, pork, cheese, and a large quantity of butter. The resources of that country were rapidly extending. There was great hope from the development of the provision trade in Canada, as the articles were of a character which suited our markets. Self-interest, however, would lead them to produce an article that would suit our markets as nearly as possible, and there was every encouragement to improve the quality."

The Uses of Walking.

Walking for young and active people is by far the best exercise; riding is good for the elderly, middle-aged and invalids. The abuse of these exercises consists in taking them when the system is exhausted, more or less, by previous fasting or by mental labors. Some persons injudiciously attempt a long walk before breakfast, under the belief that it is conducive to health. Others will get up early to work three hours at some abstruse mental toil. The effect in both instances is the same; it subtracts from the power of exertion in the afterpart of the day. A short saunter or some light reading before this meal is the best indulgence of the kind; otherwise the waste occasioned by labor must be supplied by nourishment, and the breakfast will necessarily become a heavy meal, and the whole morning's comfort sacrificed by a weight at the chest from imperfect digestion of food. These observations apply especially to elderly persons, who are prone to flatter themselves into the persuasion that they can use their mental or bodily powers in age as in youth.

Caen Stone.

The *Scientific American* says, the Caen Stone of France has a rival in the stratified limestone which underlies the whole of the high prairie land of Kansas. A correspondent describes it as white, cream colored, pink, yellow, and red, lying horizontally, and requiring no other quarrying than the use of a crowbar to lift it in blocks from its bed. So easily worked is it that he has seen it hewn into shape with a common wood-axe, and mortised with a carpenter's chisel as easily and quickly as a pine beam; he has also seen it planed with a jack plane, sawed with a scroll saw into brackets and ornamental door and window caps, and cut with a buzz saw into blocks for street pavements or bricks of any size. The material hardens on exposure to air, and becomes as impenetrable as Tennessee marble.

Elementary Education in France.

One third of all the inhabitants of the French Empire are unable to either read or write. This unwelcome fact has just been forced upon the attention of the enlightened among that nation by the publication of two maps entitled "France that can read, and France that can write." In the latter, the districts in which persons married in 1866 who could not sign the registry—in a proportion varying from thirty to seventy per cent—are marked in black. Fifty-five departments thus denounced comprise all the south, center, and west of France. The averages of the illiterate married in 1866 is thirty-three per cent. As regards primary instruction France accordingly is in the lowest rank of the European powers.

Discovery of a Sulphur Spring.

In digging a well on his farm, a few miles above this town, Mr. J. J. Wright, of the Huron Hotel, has discovered a sulphur spring, the water of which is pronounced to be very similar to that from the famous St. Catharine's mineral springs. Steps are being taken to have the water properly analyzed. If it proves to be what is expected, it will be a discovery of very great importance to Goderich, as we have every other requisite for a great watering place. Goderich seems to be favoured by nature even beyond what was ever anticipated.—*Huron Signal.*

England uses 850 million postage stamps annually, France 450 and the United States 350 millions.