THE JOURNAL

OF THE

Board of Arts and Manufactures

FOR ONTARIO.

AUGUST, 1867.

THE MARMORA IRON-WORKS, AND RAIL AND WATER COMMUNICATION.

On Thursday, June 27th, by the kind invitation of the Secretary of the Company, Dr. Beatty, of Cobourg, we participated in the grand opening of the Railway and Water communication between Cobourg and the Marmora Iron Mining Works, situated in the township of Belmont, on Crow Lake, the most easterly municipality in the county of Peterboro'. The ore-bed, as will be perceived, although named "Marmora," is situate in the adjoining township, and is distant some 3½ miles from the village of that name, where the original company first established its blast furnaces and other extensive works.

The visitors of the day numbered about 200, and included many of the leading citizens and municipal officers of the towns of Cobourg and Peterboro', and a few visitors from the United States, interested in iron manufactures. The railway connecting Cobourg with Rice Lake, some 12 or 14 miles in length, is a portion of the old Cobourg and Peterboro' railway, which, from the destruction of the bridge across Rice Lake, by the winter *shove* of ice, and other adverse causes, had long since fallen into disuse. This road has been purchased by the present iron mining company, and put in thorough repair.

Leaving Cobourg at 7 30 A.M., we soon arrived at Harwood, the R. R. terminus on Rice Lake, which place we left on the steamer *Otonabee*; and crossing the lake took up the visitors from Peterboro', whence we proceeded east some 16 miles down the lake and the river Trent—a noble stream varying from half a mile to a mile in width—to the pretty village of Hastings. This village is delightfully situated, and contains some good buildings, with brick and stone churches, with handsome spires. The northern part of the village is connected with the south side of the river by an excellent swing bridge, and a gravel road leading direct to Colborne, at the front, passes through the village. At this bridge there is also a well built and extensive Lock, rendered necessary by the fall of the river at this place. Here there is also a timber slide, through which we saw a large number of rafts either passing or preparing to pass down, on their way to the outlet of the river, at Trenton, on the Bay of Quinte. We must say we were not a little surprised at the apparently large amount of rafting done on this lake and river, and their tributaries, requiring the use of two tug steamers, beside the larger one on which we made our trip.

From Hastings we proceeded down the river some 10 miles, and on turning a slight bend in the river we came suddenly upon the company's new wharves, at what is called the Narrows, which, being profusely decorated with flags and streamers, had a most picturesque and novel appearance, as contrasted with the dark waters of the river, and the dense dark foliage of the opposite banks. Here we found the company's Manager awaiting the party, with a new locomotive and a train of platform cars, having temporary seats and guards, and shaded around with branches of foliage. This portion of nine miles of railway, over which we now travelled, is quite new, the first tree in clearing for the track having been cut down so late as the middle of February last. The road was in excellent order, and completed, with the exception of ballasting a short distance at the northern terminus, at which 150 men were actively engaged.

Leaving the cars, and proceeding on foot some two or three hundred yards along the track, we came suddenly upon about 15,000 tons of ore that had been blasted and carefully stacked ready for shipment, and 150 men actively at work preparing blasts in the side of the mountain—a dozen or more had already been charged, and were fired immediately after our arrival, and for our entertainment. We learned, also, that on the following day some 100 more men would be taken off the road into the quarries, thus providing a force of 250 men, who will necessarily produce daily a large amount of ore for shipment.

The company has built a number of large and strong scows—these will be floated between the cribs of the company's wharf, over which the loaded cars will run, and dump the ore direct into the scows. These will be hauled to the Harwood terminus of the Cobourg road, whence the ore will be conveyed to Cobourg, and shipped thence to the south side of Lake Ontario and on to Pittsburg, Pennsylvania, or direct from Cobourg to Buffalo and Cleveland.

Estimates of anticipated cost of production are often fallacious; but here a sufficient margin appears to have been allowed to cover any unforseen contingencies. The Lake Superior (Marquette) iron ore is said to cost $8 per ton, laid down at Cleveland, while the Marmora ore, of an equally good quality, can be laid down at the same city for $4 per ton. The superior quality of this ore has, undoubtedly, been the chief inducement presented to the Pittsburg capitalists engaged in iron manufactories, to invest so largely in the enterprize, it being considered fully equal to the Swedish or Norway iron, and exceedingly valuable for mixing with some inferior American ores; and not only is the quality good, but the yield is large, No. 1 quality of ore producing as much as 85 per cent of iron.

For the richest quality of ore, it will undoubtedly be the most economical plan to take it to the coal; but for the poorer ore, or that which yield perhaps from 40 to 50 per cent. only, it may be found cheaper to roast it in the neighbourhood of the mines, or at Cobourg, especially as the coal can be laid down there as *back* freight. So confident are some of the inhabitants that the ore will yet, and very soon, be roasted near the ore bed, that one individual having a large quantity of wood charcoal on hand, in the vicinity, refuses to sell a bushel of it just now, believing that the company will soon be purchasing it from him at an advanced rate. We trust that wood charcoal may not be found too expensive, as it is believed to make a better iron than does coal; and should peat be found in the vicinity of the ore bed, and Mr. Hodges' process for preparing it be introduced, a charcoal producing a still better quality of iron will thus be made available.

The *Scientific American*, alluding to the treatment of Magnetic Iron Ore, such as is found at Marmora, says:—

"In a recent interview with Mr. A. Thoma, who for a considerable time was a superintendent of iron works in Russia, Germany, and Asia, he described a process invented by him by which the iron can be produced with but little trouble and with a saving of from 50 to 75 per cent of labour and fuel. The invention, if it proves to fulfil what it promises, will be of the greatest advantage to all iron manufacturers in the United States, and parties interested in the business would do well to convince themselves of its merits."

This is a most important discovery, if reliable; and Mr. Thoma, whose address is No. 85 Sixth Street, New York City, is desirous of finding somebody with capital to aid him in bringing the invention into use.

Although the principal proprietors of the Works are American citizens, and the capital American, yet it will be of great benefit to that section of the country in which it is situate, and also to the town of Cobourg, the southern terminus of the Railway, and the place of shipment for the ore. We wish the enterprise the most unbounded success.

Going back to the iron quarries, we notice that the face of the mountain, upon which the company is at present operating, extends some two or three hundred feet in length, and in height perhaps fifty feet, which height is gradually increasing as the quarrying proceeds: we say *height*, for at present the working is not carried lower than the level of Crow Lake—an extensive sheet of water of which the iron mountain is the south-western boundary. As a test, however, the Engineers had made a boring eighteen feet in depth, the quality improving as the borer descended. It will not, however, be necessary for this generation to descend below the present working level, so extensive is the mountain upon which present operations are conducted—one estimate giving twenty million tons as the probable quantity it contains above that level.

We noticed a hewn stone well built magazine, with metal roof and doors, which the gentlemanly Superintendent informed us then contained 1,000 barrels of blasting gunpowder. Here also, on the side of the iron hill, was a beautiful spring of good water. Passing around and up the mountain perhaps a quarter of a mile from the workings, is the village of Blairtown, so named after the President of the company, a resident of Pittsburgh.

As will be readily understood, the village is "spanking new." Hotels, boarding-houses, stores and private residences are going up rapidly. At a large unfinished Hotel, lathed but not plastered, a very excellent dinner had been prepared, to which the invited guests and other parties sat down. We left the mines at 15.5 P.M., and arrived at the Harwood Landing at 11.15, on our way home, after a very pleasant and interesting trip—the Company's officers doing all in their power to render the occasion as agreeable as possible.

So far we have said nothing respecting the earlier history of the Marmora Iron Works. The property now purchased by the new company, was worked, we believe, some 30 or 40 years since, and some excellent pig and bar iron was produced; but for the want of sufficient capital, and more particularly the necessary skilled management and labour, and the best adapted machinery and appliances, the enterprise was a failure; and after the expenditure of several thousand pounds, the works were closed.

Some years later another company was formed at Belleville, and renewed attempts were made to work the mines. SMITH's Canadian Gazetter, Vol. II, page 248, says:—The following details of their proceedings were furnished us by a gentleman connected with the company.

"The Marmora Iron Works, the property of the Marmora Foundry Company, are situated on Lots Nos. 9 and 10 in the fourth Concession of that township. The works, which are erected on the bank of the Crow River, a short distance from the foot of Crow Lake, are very extensive, and consist of two blasting furnaces of good size, one of which has been within a few months almost newly built, and lined with Stourbridge brick, and is ready for use at any time when the operations of the company may be resumed. The blast (which is what is called the "hot blast,") is furnished by a new and improved cylinder apparatus with air-heating ovens on the most approved principle, and is driven by a powerful and never-failing stream of water, This furnace has been in blast but for a short period, and that only for the purpose of testing the practicability of working the ore, so as to produce such a quantity of iron per diem as would leave reasonable expectations of the manufacture proving profitable. The company, therefore, spared no expense in fitting up the furnace; which was done under the superintendence of an eminent iron founder, and practical assistants. The quantity of iron (pig) produced from this furnace was five tons per day of very superior quality; and it was found that the probable cost of manufacture, in a blast of longer duration, would not exceed three pounds or three pounds five shillings per ton.

"Owing to some difficulty between the directors and a portion of the stockholders who had refused payment of their stock, the works were stopped after this experiment, and will not probably be resumed for a year or two, unless the Company succeed in leasing the premises to some practical person; a course which they would prefer, rather than carry them on in future on their own account.

"The premises of the Company are very extensive, and comprise (in addition to the blast furnaces, and several large houses for storing charcoal) a large stone building with trip-hammer, for the manufacture of bar iron, of several stone buildings and houses used for shops, boarding houses, &c., and about twelve frame dwelling houses, occupied formerly by the work-people of the establishment, and which are now rented out to various parties. There are also a flouring mill, a saw mill, and a building formerly a tannery, but now about to be converted into a clothing and fulling factory, all driven by the same stream (which is capable of propelling three or four times as much machinery from the same head), over which a very handsome and substantial bridge was last year built. A church (Roman Catholic), built of stone, and of very neat construction, is situated nearly opposite the bridge, on the western bank of the stream. All of these buildings are on the property of the Company, and form together a compact and flourishing village, in which is a post office. On the north side of the village, and also on the property of the Company, a town plot has been laid out, and a few lots sold, on which buildings are now being erected by the purchasers; but the whole of the grounds on which the buildings above described stand is intended to be reserved by the Company for the purpose of leasing to tenants. On the south side of the village is a well cultivated farm, with handsome dwelling houses and suitable outhouses, gardens, &c., also the property of the Company.

"The ore bed (or rather the main ore bed from which the furnace was supplied, for there are many valuable beds of magnetic iron ore in the neighborhood, and some of bog ore,) is situated on a high bank on the shore of Crow Lake; it is mined easily, and loaded on board scows for transport to the works, from which the oar bed is distant about three miles and a half. The ore is a magnetic oxyde, very rich, three tons yielding two tons of iron. Excellent cast iron as is made from this ore, it is still more suitable for bar iron; the toughness and ductility of what has been made there giving it a preference to the best Swedes iron."

Prof. Chapman, in his valuable and very interesting work, "Minerals and Geology of Canada," speaking of *Magnetic Iron Ore*, says:—"This, when pure, is the most valuable of all the iron ores. Its black streak, and strong magnetism, (and, when crystallized, its form), easily distinguish it from specular iron ore. In the Laurentian rocks of Canada, it occurs in vast beds, rendering this Province one of the richest iron-containing countries in the world. It occurs abundantly amongst the metamorphosed silurian strata of the Eastern Townships. Its principal "Laurentian" localities comprise: the Townships of Marmora, Belmont, and Madoc, with those of south Sherbrooke, Bedford, and Crosby, in Canada West; and the Township of Hull and Litchfield, on the Ottawa, Canada East. The supply at these localities is apparently inexhaustible. In the form of black magnetic sand (either alone or mixed with *iserine*), this ore is also of exceeding common occurrence on the shores of many of our lakes, islands, &c. The black iron-sand of the Toronto "Peninsula" is a well-known example.

TECHNICAL EDUCATION.

In our last number, we briefly alluded to the educational and industrial future of our new *Dominion;* and demonstrated, we think, the neglect hitherto to afford a technical education for those of our youths who are, or may be, intending to follow engineering or mechanical pursuits.

In another portion of this number we publish a letter from an esteemed correspondent, approving, in very complimentary terms of some of our remarks, and objecting to others.

In referring to the liberal grants to agriculture, and the benefits thereby accruing to that interest, we did not intend to convey the idea that the improvement had been secured by means of technical education for farmers; but rather, by the offer of liberal prizes to those who, in competition, have excelled in the production of superior cattle, grains, seeds, roots, and agricultural implements; and that by furnishing schools for the technical education of engineers and mechanics, and prizes and rewards to successful students in competitive examinations, success in this department will be equally certain.

We fully agree with S. R. on the effects of the working of Trades Unions, upon the mechanical and other industrial interests of Great Britain; but, nevertheless, are convinced that to the technical education of the continental artizans, and especially of managers and foremen, must be attributed the marked progress made of late years in many of their mechanical departments of industry.

We think our correspondent wrong as to the effects of the establishment of schools of design in Britain. In 1851, the London International Exhibition demonstrated the fact that the art manufacturers and designers of Great Britain held but a very inferior position, as compared with France and some other continental countries. The statesmen of Britain at once made inquiry into the matter, and shortly after established a *Science and Arts* department, with affiliated schools of design in all the great manufacturing centres, and what was the result? Why, the French commisioners to the London Exhibition of 1862, reported to their Emperor, that "the art manufacturers of England were not only equal, but in many respects superior, to the French workmen," so great had been the progress made during the eleven intervening years. We might multiply testimony of a similar nature, as to the effect of these schools in Britain.

With all respect for our correspondent's opinion in other matters, we cannot but deem the London *Mechanics' Magazine*, and also the London *Engineer*, *Engineering*, and journals of a similar character, not only good, but the *best* of authorities as to the necessity, or utility, of technical schools to a manufacturing country.

Hear what the London *Engineer* says, in answer to a letter on this subject in the London *Times*:—

"The present moment, too, is no ordinary one. That which a few better instructed and further seeing men have been urging in these pages and elsewhere—as well as by speech, from time to time, for years past—the urgent necessity for a broad-based, thorough, and efficient nationalized system of technological education in Great Britain and Ireland, has at last, and suddenly seized with the full force and pressing reality, upon the conviction of many men of the most diverse avocations, the most different knowledges and specialities—the most opposite notions as to creeds and questions of rudimentary and general education. The Paris Exhibition alone has not done this; it has only been the fire that has lighted up that which has been smouldering in many minds, and with slowly growing heat and conviction for long past time. Are all these men—hundreds in number—many with as much scientific ability and practical knowledge as any in England, * * * Are they all wrong?

"The urgency for a *system of technical education* in England. The want of this is felt and admitted by thousands who have never expressed their views in print—many who could not do so, but are not the less competent judges. We could name scores, taken from every branch of manufacture and industry, who entertain, and have long, more or less, clearly done so—views analogous to those fearlessly expressed by the President of the Institution of Civil Engineers—by many able men (English jurors) at Paris, and by Dr. Lyon Playfair in his temperate, and, upon the whole, correct and able letter, addressed to Lord Taunton."

The *Engineer* speaks of a hundred special industries, "all craving for more light, better knowledge," and refers to some continental institutions, such as a special college for *Weavers* in Belgium, where all the intricacies of textile fabrics and machinery, and the principles upon which the strength, the pattern, beauty of colors, of texture, of harmony, &c., are taught by efficient professors—themselves taught in science and *reared to the art* to which they apply it. At Mulhausen, in Alsace, of colleges for training financial managers of large and small manufacturing establishments, and others specially organised for training foremen and managers in the principles and method of order and discipline of bodies of working men; and of the magnificent establishments for teaching tho more direct technical knowledge employed in the district whence the foreign printed muslins and fine calicoes and so forth, come, which are so much admired; and of which not a calico printer in Britain can approach in beauty, or supplant in the markets of the world.

The *Engineer* also draws attention to the *want* of expert chemists in the iron works, and in the manufacturing towns; and to the large number of those employed who are either German or French taught students; and the loss that Britain is sustaining in her metallurgical operations, through the want of skill in her metal assayers and workers; and after referring to the vastness of the subject, and its extensive ramifications, expresses a hope that "some of our leaders of scientific and industrial thought and energy, and who agree with us that effective organised technical education is a real and an instant pressing want for England, would meet and give collective expession to their views on the subject."

What says *Zerah Colburn*, in *Engineering*, at the conclusion of an article on English Engineering, in the present number?

"A higher school of Engineering Art must come partly with the spread of better taste among the public, and, for the rest, from a better system of engineering instruction. The present system of pupilage has a deadening influence upon every lofty aspiration. * * * Would that there were schools, genuine schools, where earnest, patient, and if we can make ourselves understood by saying so, *insinuating* instructors would, as such instructors only can, bring their pupils to fall in love with their studies."

Notwithstanding the diversity of opinion between S. R. and ourselves on some points, we thank him for the manner in which he has discussed the subject, and the approval he gives to the scheme we suggested for utilising the Mechanics' Institutes of the Province, in the good work of technically educating the operative classes. We close this subject, for the present, with an article selected from the *Maine Farmer*, of July 11, which, in several particulars, is singularly in accordance with the spirit of our previous article. The subject is:—

A System of Education for an Industrial University.

We commend to the attention and study of all interested in the problem of industrial education, and especially of those likely to be in any way connected with its practical development, a valuable and suggestive report on the organization of the Cornell University of the State of New York—which receives one half of the Government grant to that State in aid of industrial education—lately presented to the Trustees by Hon. A. D. White, Chancellor elect of the University. Although the report has been prepared for an institution of far greater magnitude than any of our State industrial colleges are likely to become, it has many points that will commend themselves to attention, if not adoption, and we regret we can give but a brief abstract of the document.

At the beginning we may mention—what many of our readers are probably already aware of—that by the union of the national land grant and the munificent gift of a single wealthy and benevolent gentleman, Hon. Ezra Cornell, a fund rivalling, if not surpassing the endowment of Yale or Harvard, has been obtained for establishing a new University. This new institution is not to be a college in the usual acceptation of the term in this country, nor a university in the French or German signification of the phrase; but the plan of organization is founded upon two leading convictions as to the educational needs of the country, and two corresponding ideas as to supplying these needs. The first of these convictions is, that there exists a necessity never yet fully met, for thorough education in various *special* departments, and, among them, the science and practice of agriculture, industrial mechanics, and kindred departments of thought and action. The corresponding practical idea is, that institutions be founded where such instruction can be conducted with every appliance necessary in discovering and diffusing truth, that such instruction be not subordinated to any other, that the agricultural and industrial professions be regarded as the peers of every other, that access to these departments be opened as widely as possible, and progress in them be pushed as far as possible. The second of these convictions is, that the system of collegiate instruction now dominant leaves unsatisfied the wants of a very large number, and perhaps the majority of those who desire an advanced *general* education; that although there are great numbers of noble men doing noble work in the existing system, it has devoted its strength and machinery mainly to a *single combination* of studies, into which comparatively few enter heartily; that where more latitude in study has been provided for, all courses outside the single traditional course have been considered to imply a lower caste in those taking them; that the higher general education has therefore lost its hold upon the majority of the leaders of society; that it has consequently become under estimated and distrusted by a majority of the people at large, and on this account is neglected by a majority of our young men of energy and ability. The corresponding practical idea is, that colleges of wider scope be founded; that no single course be insisted upon for all alike; that various combinations of studies be provided to meet various minds and different plans—thus presenting a *general course* to meet the *general want* which existing colleges fail to satisfy.

Proceeding upon this plan, the report suggests two fundamental divisions of instruction; the first consisting of nine special courses, and the second including five general courses. The former are agriculture, mechanic arts, civil engineering, commerce and trade, mining, medicine and surgery, law, jurisprudence, political and social science and history, education. The latter consists of three classical courses, similar to our older colleges, in two of which the modern languages wholly or partly supersede the ancient; a select scientific course for those who intend devoting themselves wholly or mainly to the natural sciences, and an optional course, in which the student is required to choose three subjects of study from all those pursued in the University, and pass an examination therein. The report does not recommend that all these departments be established at once; but to establish in the first division those relating to agriculture, the mechanic arts, civil engineering and mining; and in the second so many courses as shall be found necessary to meet the wants of students presenting themselves at the beginning of each term; providing for the others as fast as the demands of the insittution require it.

The plan makes provision for twenty-six professorships, all of which will be needed at an early day. The cast of the institution may be seen in the proposal to have at the commencement but one professorship of ancient languages, and none of comparative philology—the idea of providing a practical education, has evidently been kept in mind. A division is also suggested in the professorships, forming two classes, viz: resident professors and non-resident professors—the former to reside at the seat of the institution, and give daily recitations, lectures or experiments—the latter having a temporary residence at the university, and being required to deliver, each, a certain number of lectures, in that branch in which the professors have made especial study, and which they consider the highest results, or a summary of the main results, of their labors. This course of lectures to be fully announced in the public journals, and all within reach invited to attend them free of expense. Thus in this latter division they place the professorship of architecture, veterinary surgery, political economy, English literature, law, &c. It seems to us that such a plan would be well adapted to our own industrial school, and while having something to recommend it on the score of economy, much good would come from it, not only to the resident faculty and regular students, but to the public in general, which under ordinary circumstances would not avail itself of the ordinary privileges of the institution. It would be the best and surest means of extending the activity of the institution among the matured minds and those already in active life. and thus accomplish untold good.

But full, fresh and suggestive as this valuable report is, and much as we desire to lay its main features before our readers, we find we have not room to allude to many of its divisions. Under the head of character of scholarship in professors, where can they be found? modes of bringing the general culture of professors to bear upon the students, relations of professors to each other, official term of professors, &c., the views presented are eminently sensible and practical. The tuition of pupils will be very low; the salaries of the professors will also range low, from $1000 to $2,500; dormitories will be provided by the college, board will not; physical culture will receive especial attention, manual labor will be encouraged, and no specific sect or creed will find favor.

We may at another time allude to the views of Chancellor White upon the question of manual labor by the students, and also present his plan of the equipment and illustrative collections with which the institution should be furnished. At present we can say no more than that the report shows great familiarity with the practical working of several of the best colleges in the country, is an able argument in favor of industrial education, and presents the clearest and most practical plan for the establishment of an industrial institution, that has thus far come to our notice. With suitable modifications it is applicable to any contemplated industrial school, and we suggest its careful perusal by the Trustees of the State Institution at Orono.

PARIS EXHIBITION PRIZES TO CANADIANS.

Just before going to press we received the following circular from the Deputy of the Minister of Agriculture. The circular will explain itself. We reserve our comments until the *omissions* and *errors* referred to are corrected:—

BUREAU OF AGRICULTURE AND STATISTICS,
OTTAWA, *July 17th*, 1867.

SIR,—The annexed List has just been received from Mr. Taché, under date 1st instant, Paris. He reports that another series of awards will be decided on between that date and the 31st October next, and it has been intimated that omissions and errors which may have taken place will be then corrected.

I have the honor to be, Sir, your obedient servant,

A. J. CAMBIE,
Acting Deputy to the Minister of Agriculture.

List of Awards Granted to Canadian Exhibitors at the Paris Exhibitors, 1867.

NAME OF EXHIBITORS.	RESIDENCE.	AWARDS.	ARTICLES.	CLASS.
G. E. Desbarats	Ottawa	Bronze Medal	Printing Books	6
Brousseau Brothers	Quebec	" "	Printing Books	6
Brown Brothers	Toronto	Honorable mention	Binding	7
W. Notman	Montreal	Bronze Medal	Photographic Portaits	9
Public Works Department	Canada	Honorable mention	Photography	9
Leggo & Desbarats	Quebec	" "	Photo Galvanotyphy	9
A. Henderson	Montreal	" "	Photography	9
D. Laricheliere	Laprairie	" "	Apparatus for Fractures	11
BoardofArts&Manufactures	Toronto	Silver Medal	Collect'n of Canadian Birds	12
Rev. C. J. S. Bethune	Cobourg	Honorable mention	Coll. of Canadian Insects	12
Geological Commission	Canada	Silver Medal	Geological Charts	13
J. Bouchette	Ottawa	Bronze Medal	Topographical Charts	13
Government of Canada	Ottawa	Honorable mention	Furniture	14
Glass Company	Hudson	" "	Bottles	16
C. C. Spence	Montreal	" "	Painted Glass	16
Miss Bazin	River du Loup	" "	Embroidered Table Cover	18
Mrs. Bouchard	St. Valier	" "	Flax Spinning	27
Board of Agriculture	Of Lower Canada	Bronze Medal	Collection of Woollens	28 30
J. Barbeau	Quebec	" "	Boots and Shoes	35
Edwary Perry & Co.	Montreal	" "	Travelling Trunks	38
G. Barrington	Montreal	Honorable mention	Travelling Trunks	38

EXHIBITORS.	RESIDENCE.	AWARDS.	ARTICLES.	CLASS.
Geological Commission	Canada	Gold Medal	Collection of Minerals	40
Frothingham & Workman	Montreal	Bronze Medal	Various Tools	40
Morland, Watson & Co	Montreal	Honorable mention	Saws	40
John Higgins	St. Hilaire	" "	Tool Handles	40
W. H. Date	Galt	" "	Edged Tools	40
J. Flint	St. Catharines	" "	Saws	40
J. C. Bigelow & Co.	Montreal	" "	Hardware	40
H. C. Evans	Kingston	" "	Malleable Castings	40
John Dawson	Montreal	" "	Tools	40
E. E. Abbott	Gananoque	" "	Bolts, &c.	40
M. Billings	Montreal	Bronze Medal	Cooperator (Co-operateur)	40
L'Abbe Brunet	Quebec	Gold Medal	Collection of Woods	41
J. C. Tache	Ottawa	" "	Cooperator	41
Supervisor of Cullers Office	Quebec	Silver Medal	Col. of Merchantable Wood	41
J. Millar	Montreal	" "	Extracts of Hemlock Bark	41
E. C. Eadon	Montmorency	Bronze Medal	Woodware	41
J. Shearer	Montreal	" "	Doors and Sashes	41
Hamilton Brothers	Hawkesbury	" "	Collection of Woods	41
Nelson, Wood & Co.	Montreal	Honorable mention	Basket Wood	41
I. Champagne	Ottawa	" "	Collection of Woods	41
G. Hagar & Co.	Montreal	" "	Wooden Utensils	41
Luc Plouffe	St. Martin	" "	Axe Handles	41
O. Cote	Quebec	Bronze Medal	Furs	42
The Model Farm of	St. Anns	Silver Medal	Different Products	43
J. A. Donaldson	Toronto	Bronze Medal	Flax	43
Samuel Davis	Montreal	" "	Cigars	43
Dr. Genand	St. James	" "	Canadian Tobacco	43
A. Kirkwood	Ottawa	" "	Various Plants	43
Morton & Co.	Bradford	Honorable mention	Flax	43
Stark, Smith & Co	Montreal	" "	Manufactured Tobacco	43
Ed. Laroche	St. Foy	" "	Canadian Tobacco	43
Samuel Canover	Port Credit	" "	Hops	43
Lymans, Clare & Co.	Montreal	Silver Medal	Chemicals	44
Michel Lesperance	Grand Etang	Honorable mention	Cod Liver Oil	44
Mosely, Rickert & Co.	Montreal	Silver Medal	Patent Leather	46
D. Tetu	River Ouelle	Bronze Medal	Porpoise Skin Leather	46
N. Valois	Montreal	" "	Leather	46
P. Dugal	Quebec	Honorable mention	Leather	46
A. Duncan	Markham	" "	Plough	48
I. & G. Morgan	Markham	" "	Extirpator	48
Paterson & Brothers	Richmond Hill	" "	Win. Mach. & Straw Cutter	48
S. Campbell	Montreal	" "	Straps (Courroies)	53
J. C. Maclaren	Montreal	" "	Straps	53
Reed & Childs	Montreal	" "	Lasts	57
N. F. Boissonnault	Quebec	" "	Printer's Lock. Type Form Serreforme D'imprimerie.	59
Manager of G. T. R.	Canada	" "	Model of Sleeping Car	63
J. B. Bickle	Brooklin	Silver Medal	Flour & Wheat	67
Lawrence Rose	Georgetown	" "	Buckwheat & Ind. C'n Flour	67
G. McLean	Aberfoyle	" "	Oatmeal	67
William Lucks	Newmarket	" "	Elour	67
Agricultural School	St. Anns	" "	Cereals	67
Sir William Logan	Montreal	" "	Cereals	67
John Mitchel	Mono	Bronze Medal	Wheat	67
C. Irwin & Co.	Belleville	Honorable mention	Sewing Machine	57
J. Barclay	Innisfil	Bronze Medal	Wheat	67
John Paterson	Scarboro'	" "	Barley	67
A. Stewart	Bristol	" "	Cereals	67
J. Maldrum	Bristol	" "	Wheat	67
Jas. Peb	Whitby	" "	Rye	67
Clement Bois	St. Jean Port Joly	" "	Rye	67
Philip Bartholomew	Markham	Honorable mention	Oats	67
W. H. Vaughan	St. John	" "	Cereals	67
Etienne Caron	St. Jean Port Joly	" "	Wheat	67
Thomas Brownbie	York	" "	Wheat	67
Winning, Hill & Ware	Montreal	Bronze Medal	Syrups and Liquors	72

EXHIBITORS.	RESIDENCE.	AWARDS.	ARTICLES.	CLASS.
Narcisse Pigeon	Montreal	Bronze Medal	Sugar Corn	72
Olivier Thibault	L'Islet	Honorable mention	Maple Sugar	72
Agricultural Society	Beauce	" "	Maple Sugar	72
P. J. O. Chauveau	Montreal	Silver Medal	Books and Publications	89
Agricultural School	St. Anns	Honorable mention	Model in Relief	89
Department of Agriculture	Canada	Silver Medal	Collections and Reports	90
Jacques & Hay	Toronto	Bronze Medal	Furniture	91
Owen MacGarvey	Montreal	Honorable mention	Furniture	92

Medals—Gold, 3; Silver, 15; Bronze, 29; Honorable Mention, 47. Total, 94.

THE CANADIAN CONVEYANCER AND HAND BOOK OF LEGAL FORMS.

We have received a copy of the second edition of this useful work (adapted to the new registry law, and other recent statutes), from the publisher, Mr. J. Rordans, 88 King street east, Toronto; from whom the work can be had—sent postage free to any part of the Province—for the sum of $2 00.

As *law* is not our profession, we cannot do better than to publish the following recommendation from the *Upper Canada Law Journal*:—

This is a second edition of the useful little compendium issued by Mr. Rordans in 1859.

To the professional man who can provide himself with the elaborate works of Davidson and others on Conveyancing, &c., this volume might not be of much value; but to others it is found of much practical benefit, and all will find in it many forms which are not attainable without the loss of time or trouble. The size of the volume before us is more compact than the former edition, and appears to contain more information.

The Introduction gives a sketch of the laws relating to real property in the Province of Ontario, and may be read with advantage by students and others desiring elementary information on the subject.

Board of Arts and Manufactures

FOR ONTARIO.

PRIZE MEDAL FOR COLLECTION OF CANADIAN BIRDS.

We have received an official communication from the Secretary of the Imperial Commission, for the French Exposition, informing us that a Silver Medal, and a Diploma, had been awarded the Board of Arts and Manufactures for Ontario, for the collection of Canadian Birds exhibited by the Board. This will be gratifying to the several gentlemen who furnished us specimens, and also to the Rev. Prof. Hincks, who rendered such valuable assistance in the naming and classification of the collection.

SUBSCRIPTIONS TO JOURNAL.

We ask our readers to have the goodness to remit subscriptions due, for the current or past years. The amount to each is small, but if sent in early will materially assist the Board in its operations, as, owing to the change in the political affairs of the Province, it may be some time ere the usual legislative aid may be available.

W. Edwards,
Sec. B. A. & M.

TRADE MARKS.

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

(*Continued from page* 174.)

Lyman, Clare & Co., Montreal. Trade Mark:—"Dominion Mills." Recorded in Vol. A., folio 178 (No. 489). June 22nd, 1867.

Jeremiah Carty, Toronto. Trade Mark:—Representation of a steamboat in centre, and surrounded by the words "Empire Soap, J. Carty," and recorde. in Vol. A., folio 179 (No. 496). June 26th, 1867d

Canada Vine Growers' Association, per D. W. Beadle, St. Catharines, President. Trade Mark:—"Niagara Wine." Recorded in Vol. A., folio 180 (No. 416). July 8th, 1867.

Canada Vine Growers' Association. Trade Mark:—"Ontario Wine." Recorded in Vol. A., folio 181 (No. 416). July 8th, 1867.

Canada Vine Growers' Association. Trade Mark:—"Brandy Wine." Recorded in Vol. A., folio 182 (No. 416). July 8th, 1867.

W. D. Dickinson, Prescott. Trade Mark:—"Dickinson, Barker & Smith's Magnetic Balm." Recorded in Vol. A., folio 182 (No.——). July 9th 1867.

J. C. Morgan, Montreal. Trade Mark:—A circular shield, with the initials I. C. T. C. in the respective quarterings, and the lower portion surrounded with scroll ornamentation. Recorded in Vol. A., folio 184 (No. 549). July 12th, 1867.

Philadelphia boasts the largest music hall on the continent. Horticultural Hall, just opened, measures 75×200 feet giving 15,000 square feet of floor. The Boston hall has 10,206 square feet, Irving hall, New York, 9,375, and Steinway Hall 9,125.

Correspondence.

To the Editor of the Arts Journal.

Sir,—Your article in last number of the Journal is well timed, and just such as it is especially important should engage attention in the outset of our New Career as a Nation. The question to be asked in every department is, how may we in the future most effectually contribute to the prosperity of our people and the well-doing of the Nation. Though I do not agree with some things in your article, truth and right never loses by free discussion; and the inquiry your article suggests is one of the very first importance, while your treatment of the subject puts the discussion on a right basis, and that best adapted for leading to a right conclusion. The question is can we give an impetus to greater success in industrial pursuits, by special educational or other appliances? and if so, how? You answer yes, and by technical education; meaning thereby an education in the subjects a knowledge of which is especially desirable in each department, with a practical training in the art of doing so, that the student may not only know what is right and the reason of the operations he performs, but be trained to do the work; and in this you undoubtedly give prominence to a great principle, and one which is too often lost sight of, that education is in its true sense a training *to do* more than a teaching *to know*. Knowledge is power, but a power equally for evil as for good, and that instruction does not deserve the name of education which gives the power but does not train to its right exercise.

"Man is a soil which breeds
Or fairest flowers or vilest weeds
(Weeds deadly as the aconite—
Flowers lovely as the morning light)
Just as the heart is trained to bear,
The noxious weed or flowret fair.

But while this is true as regards morals, that training to do that which is right is even of more importance than teaching to know it; and admitting of no doubt or dispute, it is by no means clear or well established that a government provision for technical education is the best, or an advisable means of giving that training in industrial pursuits, which is necessary to enable men to work in accordance with right principles. You quote the Mechanics' Magazine (London), and Dr. Lyon Playfair, to the effect that by such a government provision for technical education the Continental worker is getting a-head of the British worker, who has no such aid. But while the Mechanics' Magazine would be an excellent authority for the strength of a bridge, the effect of an additional spoke in a wheel, or any other mechanical point of controversy, its opinion on a question like this—depending for its solution on principles entirely beyond its sphere and foreign to its peculiar walk—is of little consequence; while Dr. Playfair's letter is but a repetition in the past tense of a prophecy of his own, some years ago, as to what would be the result of such technical training; and the fact of its having been a prophecy, cautions us to examine narrowly the alleged fulfilment. If so examined, it will I think be found that, as a matter of fact, Continental workmen are not, as regards useful work, going a-head of British workers. That even if they were, trades unions—enforcing their strict prohibition against good workers doing more or better than the most ordinary, in every department of trade, will be found to have had more to do with it than schools of technical training. That in reference to such a subject, it would be exceedingly difficult to determine, with any approach to accuracy, the causes which might or did lead to the European superiority, if it did exist; and that, as regards Britain itself, where Schools of Design have been multiplied and in operation for many years, the effects anticipated from them have not been realised, nor, taking the facts as alleged by those who assert the superiority of European artists, do we stand a whit better in the comparison in this department, where we have had technical schools quite equal to any on the continent, than we do in the departments where we have none.

You argue, however, that grants to agriculture having been of great benefit to that department, it is therefore reasonable to conclude that aid to a proportionate amount to other departments would be equally beneficial in them. The advantages, however, to agriculture has not arisen from technical training, such as is found on the continent supplied at the Government expense, and to which Dr. Playfair attributes their success; but by encouragements held out to those engaged in it to aim at excellence. In Ireland we have an example exactly as regards agriculture—of the training referred to,—where, at an immense expense, Government provides model farms and teacher-farmers to train to the work of farming, and they have been a most miserable failure, not one of them being able to grow a crop to meet the strictly labour expenses, much less to pay rent; and there is, I think, little doubt but similar institutions for training in engineering or other work would have a similar result.

Very different, however, must necessarily be the result of the scheme submitted by your Board in 1862. Such a scheme, if carried out, could not fail to be of the very highest utility, and crowned with most desirable results. It has, however, little in common with the continental models we are asked, by the *Mechanics' Magazine* and Dr. Playfair, to follow; and when action is taken on this matter, it is of essential importance that they should not be confounded. This scheme would cost little and yield much advantageous fruitage. Any attempt to set up the other on continental models will cost much, and yield little beside disappointment and sources of strife and jobbery. All experience supports your plan as beneficial. No experience, so far as I am aware, supports the allegation of utility alleged on behalf of the Continental methods.

Yours, S. R.

Selected Articles.

ENGLISH ENGINEERING.

They were clever fellows, the cathedral architects of the middle ages, and the engineers—whether soldiers or monks—of the old Norman castles and our grand old abbeys. Their cleverness, much the same as with their degenerate successors, consisted partly in knowing how to get on; and, then as now, there were some who could not even manage this. They had no parliamentary practice that we know of, professional fees were nothing to speak of, and their offices—for they must have had dens of some kind wherein to scale their plans and daub their chiaro oscuros (and we are not speaking of holy offices)—probably contained no great number of pupils at heavy premiums. But the Holy Virgin was always liberal to those who were properly introduced by the bishops, and even the monk-engineer, and sometimes the fighting engineer, made a good thing of it. These old boys were no doubt the fathers of our profession. Not merely that they knew how to choose stone, and to hew it, and bond it, and cement it; not only that they knew, too, how to pick their men and to keep them to their work, and this when the luxury of rapid communication, contracts, competition, and trades-unions were unknown; but the medieval engineers were men of grand ideas, and, could they live now, we should recognize them as gentlemen, crotchety perhaps, but gentlemen nevertheless. True, there were among them those who had seen Rome, fallen yet grand in its engineering ruins—the Coliseum, the Forum, Trajan's noble shaft, the shattered temples upon the seven hills, the Aqua Juliæ—all indeed that remained, six hundred years ago, of that proud sepulchre of Latin greatness. But the arts were dead, and we might as well say that our own men of Great George street have found their examples in the engineering of the Pyramids and of Memphis and Thebes, as that the engineers (for all really great architects are of us) of Salisbury, of Durham, and of York, and those of Kenilworth and of Carisbrook, found theirs in Rome. It was eight hundred years, speaking roundly, after Attila, that historic "scourge of God," and the Gothic, Vandal, and Herulian cut-throats who followed him later—Alaric, Genseric, Odoacer, and their infernal crews—had crushed the mistress of the world into dust, before even Salisbury's soaring spire pierced the sky. Eight hundred years? It is no longer, unless by a few months, since Harold was thrashed at Hastings, and William the Norman came up to London on horseback, the South-eastern Railway not having then been opened for traffic, and there being, indeed, nothing on wheels to be had.

The early English engineers made thorough work of it, and we owe to their example—and what a tremendous force example is—our own solid style of building, or what was so until within the last few years, before we had taken to contractors' lines, and possibly some other works which will not bear the strictest investigation. Butter the present race of English engineers we will not; but, take them in the lot, they like good sound jobs—and we here intend the better and honest meaning of the word "job." Their works are not like the defenses of Ismail:—

> "Whether it was their engineers stupidity,
> Their haste or waste, I neither know nor care.
> Or some contractor's personal cupidity,
> Saving his soul by cheating in the ware
> Of homicide. But there was no solidity
> In the new batteries constructed there."

Modern engineering has become grand by the genius of invention, and we claim nearly all this invention as English, or let us fall back on that safe but well-nigh scouted geographical adjective, British—which north of the Tweed, we believe, however, means Scotch—beg pardon, Scottish, and Scottish only. Not that we, nor our Scottish brethren either, invented stone bridges, nor artificial harbors and docks, nor roads, canals, aqueducts, and sewers; but we have invented a good deal else that has made all these works as common among us as dykes and windmills in Holland, or temples to the holy lady and the saints at Rome. We have found out a few things in steam-engines, in railways (we are not speaking here from any personal experience as Chatham and Dover share or debenture holders), in steamships, in telegraphs, both over land and under the sea, and in gas-lighting. We have taught the rest of the world nearly all that is known of power spinning and weaving, of casting steel, of puddling and rolling iron, of working in metals and in wood by machinery (all the engineer's tools that the reader can think of) of stereotyping and steam-printing, of boiling sugar in the vacuum pan, of the chief chemical manufactures, of the hot blast, and of calico-printing, and we have been the first to make nine-tenths of all the practical applications that have ever been made of—let us have an original expression here—that mighty agent! yes, that mighty agent, steam, to the thousand purposes for which water now boils under high pressure all over the world. Yes we have the Americans in our eye, all the while, and we stick to it, *nine-tenths*; and if they say a word, we will make it ten-tenths, and perhaps eleven or twelve.

But engineering is ennobled only by continued invention or by the graces of art. We know what a rattling of dry bones and quaking of office-walls there will be in the noble thoroughfare which leads from New Palace Yard to Storey's Gate (it is marked Thieving Lane in the maps, *temp.* Henry VIII., but is now, out of compliment to the house of Hanover, named Great George street), when these awful words shall have reached there, to wit, that a great deal of the Westminsteric engineering is ignoble contracting, jockeying, pettifogging, and is not a bit more professional than the transactions of the Stock Exchange, which is as far towards Hounsditch as we care to go, or even refer to. So long as money is the end of engineering, and (just supposing such a thing to be possible) money is the great goal of the select body of masculine gentlemen, and laziness the great object of the feminine gentlemen, who practice it, so long will engineers fail to hold the position which their special administration of at least some parts of Nature's grand code of laws should deserve.

The chief stimulus of this contracting and trading spirit is the present system of parliamentary inquiry into the merits or otherwise of proposed works. Let the world suppose that the great engineer, or even the pushing engineer, is famous for his John o' Groat's and Lizard Railway, or his high-level bridge between Hampstead Heath and the Surrey hills. The world, as usual, mistakes. It is because the great or the pushing gentleman has carried a bill through committee in both Houses of Parliament. That is the true test of greatness. The trifling works which we have imagined go for nothing. The engineer gets his bill, and the Stock Exchange and Lombard street, and, with those great abodes of finance, the world, the whole universe perhaps, we should say, bows down to him. If Parliament, which is for ever uneasy to be delivered of Acts, would allow no more bills, the engineer would remain for ever great; for the greatness of swearing through one bill, tickling the tails of the opposition, and delighting the committees, is now but temporary and must be followed up by bill upon bill, until, like the great Bill of Portland, the high headland of success can break every stormy sea of opposition, towering for ever in its pride, and delighting all who behold it save the unhappy wretch who, by sailing out of his course or by the chances of storm, is dashed against it.

No; we must have continued invention, wherein, and not in copying and in drawing plans, and writing specifications, and negotiating contracts—necessary as all these things are, and no word which we have here written must be taken to hint that they are unworthy tasks, for they are not—wherein (we repeat, to catch breath in so long a sentence) the engineer has his pledge of immortality. If we cannot have invention, let us at least have taste. It may be after the reign of Victoria the Blessed, in that of King Albert Edward or King Victor, when the abominations which so many of our engineers are now practicing in their open avowed contempt of all that is artistic and beautiful, will be cut down, much as Louis Napoleon or his excavating officer, Haussmann, would cut down such ugly eyesores did they now exist in Paris, and at the same time cut through a whole *quartier* of that delightful but sinful capital. No, we won't put all the blame upon the backs of the engineers, though. We know one who laid out a fine arch over a street near Shoreditch, and was compelled by Bumbledom and Beadledom to stick in a girder in its stead. "Very good," said this modern Michael Angelo; "let it be a girder, a parallel girder, or worse, hog-backed, and let it be coal-tarred!" Coal-tarred we believe it was, and it would have been a fitting distinction for the worthy vestrymen had they been tarred also with the same brush.

A higher school of engineering art must come partly with the spread of better taste among the public, and, for the rest, from a better system of engineering instruction. The present system of pupilage has a deadening influence upon every lofty aspiration, unless the ambition to build up a "handsome practice" (we believe "fat business" is too blunt a term) be a lofty aspiration. Precious few of the sucking engineers who are now happily established in "berths" need, however, trouble themselves with visions of any such future bliss, but may smoke their cigars and write confidential notes over their tracings, and look forward to their thirty shillings a week, or, great luck, a job abroad, to be away ten years and come back unknown and uncared for to begin again almost at the beginning. Poor fellows! where they have nothing else to fall back upon, we pity them—really and truly pity them. Would that there were schools, genuine schools, where earnest, patient, and if we can make ourselves understood by saying so, *insinuating* instructors would, as such instructors only can, bring their pupils to fall in love with their studies. An engineer in practice is unfitted by circumstances, if not by nature, for imparting instruction. His work is hard—*hardening*, too—and the most he can do is commonly to advise his dear charges to "keep their eyes open, and to pick up what they can." In such schools, and with the understanding that a residence in them should be a necessary qualification for practice, we should see cultivated a higher growth of engineering thought, which, exercised with higher aims upon current practice, would give us, possibly, a new and worthier race of English engineers.—*Zerah Colburn in Engineering.*

CANADA PEAT COMPANY.

In the number of the *Journal* for April last, we alluded to the extent, and the probable importance to us as a people, of the peat bogs of Canada; and we particularly referred to Mr. Hodges' patented process for cutting and preparing the peat for fuel for domestic, manufacturing and steam fuel purposes.

The following interesting account of a visit to the scene of the Company's operations, is from a recent number of the *Montreal Gazette:*

"Starting about half-past nine, the party proceeded to Lachine, crossed the river, and were met by Mr. Hodges, with carriages, at about eighteen miles from Caughnawaga by rail. A drive of about a couple of miles took us to the border of a morass, of one thousand acres, owned by the Company, and of a depth of from fifteen to twenty feet. The country has a rough appearance in this locality, and for farming purposes a very poor one. But we have confidence there is here a wealth which, popularly at least, has hitherto not been believed to exist.

"The forests of North America have for many years been melting away under a process of most destructive waste, and with many the question has been, what shall we, in the not distant future, do for fuel? Wood is even now very dear in cities and in some country villages. It may be stated with certainty that in the utilization of the almost inexhaustible peat bogs which Canada possesses, a solution of the difficulty will be found; and we believe that Mr. Hodges' name will be forever associated, with public gratitude, with this great economic fact.

"Without, however, expending words in comment, it is better to give a simple narrative of the visit of yesterday. The appearance of the Canadian bogs, we suppose, is known to everybody in Canada. Covered with a stunted growth, principally of evergreen trees, and the plant of the blueberry, which is now in most luxuriant and beautiful bloom, they have a dreary look. Getting out of our carriages at the edge of the swamp, we walk over a rude tram-road, a few hundred yards, constructed to take material to the works. We come to a canal, which is now about a mile in length, and which increases in length about two hundred feet a day. It is twenty feet wide and six feet deep. At the terminus we approach there is a basin, sufficiently large to launch a respectable sized vessel or scow in, which is now on the stocks, nearly completed, with boiler in. At the other end of the canal her mate is busily at work, gay with branches of trees and blueberry flowers, and the Union Jack flaunting in the breeze.

"Our party embarked on a tender-scow, which first floated in the novel canal the day before, and fortunately covered with an awning, for it rained a little. We are towed along, and note with interest about a mile of peat bricks, by a width of probably a couple of hundred feet, in process of drying. Arriving at the machine, we notice that men go before with axes and scythes, to prepare ground for the reception of the peat pulp. They also throw off the surface of the canal, to prepare the way for the machine, which, like a huge monster, seems to devour the earth, and eat a passage as it proceeds.

"Projecting from its snout are two immense augurs or screws, ten feet in diameter. These are driven by steam power (twenty-horse), revolve slowly outwards, and cut with their sharp, strong knives successive slices of the bog, which they take into their mouth, as it were, and disgorge it within the scow. It is then carried to a receptacle in which there is a contrivance to deprive it of sticks and roots, by means of revolving arms of great strength, in a fixed iron frame. It is then forced by a revolving screw into another receptacle, where it is mixed with water, and ground into pulp by revolving blades, not unlike the fans of a steamboat screw. It is next, by a succession of these screws rapidly revolving, forced along a trough about fifty feet in length, and poured out on the bank of the canal, in the form of a well mixed soft mud. This is spread evenly on the bank by a horse and two or three men. About seventy feet had been spread in this way, and as many feet of the canal made, at the hour of our arrival yesterday morning.

"The large roots found in the swamp were at first found to be an obstacle, but they now make very little interruption. The revolving augurs can be raised or lowered at pleasure, and they are provided with friction gear of such a nature, that they will stop while the rest of the machinery goes on, if they come in contact with any serious obstruction. Chance of damage from breakage is thus prevented. We understood that the water could be lowered in the canal, and the scow go over the same ground again, repeating the operation until the bottom of the peat bed is reached.

"After the pulp has stiffened a little, a harrow or rake is drawn from side to side, marking it crosswise, for the required width of the bricks. A revolving knife, in the form of a circular saw, is then run over it longitudinally, cutting the pulp (now sufficiently hardened for a man to walk over) to the bottom. A single man, with a spade of the required width, now completes the cutting out of the bricks, and these are piled endways by boys for more rapid drying. The sun does the rest in a few weeks, and the peat is ready for market.

"On its great value for fuel, it is not necessary for us here to dwell. Mr. Hodges estimates that a ton of it is about equal to a cord of wood; and it can, we understand, be put down in Montreal for four and a half or five dollars per ton. But we believe the Grand Trunk Company has contracted to take the supply that can be made this summer at a much lower price. When it is stated that this swamp alone will give several millions of tons, we have here a fact of the very greatest public interest, which will exercise an important influence upon the price of fuel in favor of the consumer for many years to come. It has been said that the man who will make two blades of grass grow where only one grew before, is a benefactor; but what shall the public who live in our cities say to him whose genius has contrived means to convert our swamps into an almost illimitable supply of cheap fuel?

"After an examination of the works was completed, and the admiration of everybody expressed, of the ingenuity and simplicity of their adaptation to the end to be accomplished, the party did good justice to a collation laid out on the tender-scow. Toasts to the Queen and the Dominion were very heartily drunk. Among the other toasts, the foremost was the health of Mr. Hodges. The great success of the works, their value to the country, and the patience and perseverance of their projector, who had left the luxuries of his London house, to bury himself in our swamps, to perfect them, were recognized. Mr. Hodges, in reply, confessed that this might be called his hobby, but he stated he had an abiding faith in the great importance of the work. He believed this peat-fuel question to be more important than even the most sanguine of the gentlemen around him, who had expressed confidence in the works, would be willing to admit, and it was that belief which had induced him to spend four years in experiments with his machine in the swamps. He expressed confidence in the Company paying good dividends, and mentioned fifty per cent. as not improbable. The health of Sir W. E. Logan was proposed by Mr. Hodges, as having given him valuable information and advice. Sir William, in reply, expressed confidence in the works. Mr. Hodges proposed the health of Mr. Brydges, as having encouraged the Company in its infancy, and stated that in this as in many other things the Grand Trunk was foremost in promoting the best interests of the country. Mr. Brydges said that with regard to the peat question, he must confess that his object was a selfish one; he had in view to get cheap fuel, and saw in the utilizing of peat a means of supplying a want which he believed would before very long be created from the exhaustion of wood. He proposed Mr. Shanly's health, as having aided in the success of the peat works. Mr. Shanly replied. And there were some other toasts drunk.

"The party then returned to town, gratified with their visit, and satisfied that a new and important source of wealth had been opened up."

The *Montreal Herald* says:

"This description of peat making is attracting a great deal of attention in the United States; and one entire set of machinery is now on its way to Wisconsin."

CO-OPERATION IN CHICAGO.

We have occasionally expressed our belief, that, a system of co-operation between capital and labour, by which all profits derived from a business, over and above a certain per-centage first appropriated to the capital employed therein, should be divided between the capitalists or proprietors and the workmen, will be the only effectual remedy against *strikes*, and at the same time highly beneficial to both the employer and the employed. The *Chicago Tribune* thus notices the adoption of the principle in one of its city establishments:—"The North-western Manufacturing Company of Chicago have taken the initial step in practical co-operation with their workmen. The company and a committee of the several foremen of the shops have agreed upon a valuation of the buildings, machinery, goodwill and other property representing the capital invested in the business. The wages and salaries of all the employees of the company are to be fixed according to the scale of average prices paid in Chicago for ten hour's work. The wages of each man is to be fixed by his foreman, according to merit, with the right of appeal to the officers of the company, whose decision is final. On the 31st of March next, the accounts of the company are to be settled up, and a balance struck. From the net receipts the stockholders are to receive ten per cent interest upon the capital. The profits are then to be divided into two equal parts, one-half going to the stockholders, and the other half to the workmen. The share falling to the workmen is to be apportioned *pro rata* according to their earnings, as represented by their wages.

Details of the Plan.

"We understand that the dividends of this company last year were about $50,000; but we will assume, for the purposes of illustration, that the profits of the concern, after deducting interest on capital invested, and all expenses, are $25,000, and that the capital stock is $250,000. The share of the profits falling to the one hundred and forty workmen will be $12,500. This dividend, it should be borne in mind, is in addition to their regular wages, which they receive weekly. The men will therefore receive a bonus of twelve thousand five hundred dollars, which they would not have otherwise received, and which it is not possible for them to obtain under any other circumstances—a bonus which they may largely increase by industry and fidelity to the common enterprise. If anybody chooses to leave he can do so by selling back to the company any stock which he may have acquired, at the price which he may have paid for it.

"Demagogues will, perhaps, tell the workmen that the propietors propose first to take ten per cent interest, (which they denominate robbery,) and then one-half the profits, (which they also call robbery): and will endeavour to excite an opposition to the scheme on these grounds. But workmen who will look at the matter intelligently will see how directly they are benefitted and protected by the plan. At the close of the first year the workmen have the privilege of investing their portion of the profits in the capital stock, and to that extent of becoming proprietors. At the end of the second year, supposing the business to have been the same, they will receive their $12,500 profit, together with $1,250 interest on the profit of the previous year, and probably $1,000 from the profit on the same. At the end of the third year they will have a proprietary interest of nearly $30,000, with $3,000 interest thereon, and $1,500 additional from the profit falling to the capital, beside their own annual share of profits as workmen, which, it may be presumed, will be constantly increasing.

"Thus, at the end of three years, the workmen will hold in round numbers:

Capital stock	$30,000
Interest, 10 per cent	3,000
Dividend from profit on capital	1,500
Workmen's half of profit	12,500
Total	$47,000

"Let it be remembered that every penny of the sum thus accumulated is in addition to their wages, which will be the same as similar workmen receive in similar trades.

"The Northwestern Manufacturing Company employ one hundred and forty men when their shops are full. Since the first of May they have had oonly ne-half their usual force — the remainder having joined the eight-hour strikers, or having been intimidated by them. The articles of co-operation were signed on Saturday night by thirty-two of the workmen. Whether the others will conclude to sign also we do not know, but we do know that by a little advertising the Company can fill their shops with the picked men of the United States. Such an opportunity does not present itself every day. Thousands of men will jump at the chance to fill the places.

"The proposed system has another advantage of peculiar interest to good workmen. They will not be reduced by the arbitrary rules of trades union to a common level of wages, regardless of ability and skill. When a man's labour is worth five dollars per day to the common stock, he will be paid that sum and his share of the profits will be proportionately greater than the man whose labour is worth but three dollars per day. This shop will have attractions for skilled labour, and for industry that cannot be offered by any establishment conducted under the 'chosing' system of trades unions.

"The accumulations of one hundred and forty men in this co-operative shop, with ordinary business profits will, at the end of five years, exceed the savings of all the Trades' Unions and Assemblies in Chicago, and at the end of ten years the one hundred and forty men of the Northwestern Company will have an accumulated capital equal to the establishment of another company as successful as their own.

"We have only referred to the leading principles upon which the co-operative scheme of the Northwestern Company is projected, but the details will be found just and fair in all particulars. The interference and control of trades unions in the affairs of co-operative establishments being as inconsistent as they would be with the peace of a private family, are necessarily repudiated in the proposed arrangement. This cannot be otherwise, because each workman is himself an employer of his fellow workmen, and has an interest in the largest possible profit both to the capital and to the labour employed. We commend the example of the Northwestern Company to other establishments in Chicago and elsewhere, as presenting a practical solution of all the difficulties of the labour question.

"We must not omit to mention that the fundamental idea of the movement under discussion is an increase of production. Hence society has a direct interest in its success, for whatever tends to create additional wealth tends to multiply comforts to mankind. Viewed in this light no man can be indifferent to it."

THE LULL IN INVENTION.

The great progress of discovery and invention which has carried British commerce and our internal trade to a pitch of prosperity far beyond anything which, fifty years ago, could have been dreamed of as possible, is at last interrupted. Several years have now passed without one really great invention—an invention capable of adding millions to the national wealth. The most recent are the Bessemer process, the steam plough, submarine telegraphs, and Ransome's artificial stone; and among discoveries, the Australian gold mines, the Cleveland iron stone, and the American oil-wells, and, to go a little further back, the priceless blessings of chloroform to suffering humanity. We are, of course, cognizant of scores of other inventions; but we cannot rank the sewing machine, nor even the reaping machine, the distillation of shale, the aniline dyes, nor any recent improvement made in textile, wood-working, metal-working, brick-making, or other machinery, nor the discovery (commercially) of guano, gutta-percha, or aluminium, with those we have already named. The great inventions, those which have not improved but revolutionized trade, are, within the last century, the steam engine, with steam navigation and railways, textile machinery, iron-working machinery, electric telegraphs, and steam-printing, and we think that the four inventions named at the beginning of this article are those which, among our more recent acquisitions, are best entitled by their real importance (although is is not yet fully developed) to the distinction we have given them. The Bessemer process, which will probably be yet extended to all ordinary English irons, is effecting a revolution in the metallurgical world hardly less than was brought about by Onions' puddling furnace and Cort's rolling mill; the steam-plough is already giving us a new agriculture; submarine telegraphs are greatly extended and economizing commercial transactions; and the artificial stone, which architects and builders are so slow in understanding, is certain to effect a vast change in our whole system of fixed construction.

But, without continued invention and discovery, we may lose the prize in the great race of national competition, and, in any case, the cessation of invention must amount to the undue agggrandizement of capital and the stagnation of practical talent. We do not apprehend that any cessation of this kind is to be permanent, yet we are none the less anxious, for the sake of the general good, that the present lull in invention should soon terminate. There are many fields of discovery which offer real promise of excellent results, and there are, beyond these, a host of glittering possibilities, or what we are willing to accept as possibilities, however remote, which hold out the attractions of the grandest rewards which practical genius can ever attain. Who can reflect upon the almost immeasurable forces of solar heat and lunar attraction exercised daily upon our planet, and with visible results, without hoping, and indeed to some extent believing, that human ingenuity will yet find means for penetrating nearer and yet nearer to these tremendous mysteries of nature, and turn them into new channels for the good of man? With countless millions of tons of hydrogen in the sea and of oxygen in the air, shall we not yet find means to burn the very waters of the globe, and literally set the river on fire? With millions of tons of carbon in the earth, shall we not yet convert it, by some means, into palatable and wholesome human food? And shall we not yet find cheaper and readier means of converting the vast stores of vegetable fiber, with which nature abounds, into comely clothing, than by the present and infinitesimal spinning and weaving of thousands of yards of yarn to form a single yard of cloth? That we may yet navigate the air is hardly less likely now than was the navigation of the sea by steam seventy years ago.

Future invention must give us cheaper food, cheaper clothing, and cheaper lodging. Past invention has not sufficiently secured these, and the condition of trade and of society is now such that the majority of the population, even when working almost continuously, can gain but a decent subsistence, without any practical advance upon their necessities.

Among the great inventions of the future, we believe we may look for a highly scientific and artificial agriculture, which shall more than double the average productive power of the soil. We shall learn how to restore to the soil a great deal of the vitality of which we now rob it and turn to waste; we shall learn how to secure increased action of the sun and atmosphere, and even of stimulating gases within its substance; and we shall thus place it in a measure beyond the caprices of climate. The force of steam, and many artificial agencies, including artificial warmth and artificial moisture, will be turned to account and the production of food will become a great and highly elaborated manufacture, to be carried on with an amount of talent and cultivated skill corresponding to that now engaged upon railways or in the great textile and metal manufactures of the country.—*Engineering.*

A REMEDY FOR HYDROPHOBIA AND BLOOD POISONS.

In an article on this subject in an American Journal, the writer says:—" We call the attention of the medical profession to an extraordinary cure of a case of hydrophobia after the disease had become fully developed, by the use of Bromide of Potassa. By this treatment, the spasms of the disease became less violent from hour to hour, and the patient finally recovered. The Chicago physicians are now using the same remedy, both externally upon the wound, and internally, and great results are looked for from the treatment. It would seem from this, that the disease must be a blood poison, as the case spoken of has called out an article from Dr. Benjamin Woodward, of Galesburg, Ill., in which he says:

"The case is one of great interest to all, but especially to me, as I was the first to point out the value of this remedy in what are known as "blood poisons."

In the fall and winter of 1862 while I was in charge of the Park Barracks Hospital, in Louisville Ky., erysipelas of a very fatal character prevailed there, and the vapor of bromide was used with the best effects as a disinfectant. So marked was its value that I was led to make an extended series of experiments with the use of this remedy in blood diseases. The success was so great that Professor Goldsmith, the Medical Director, ordered me to make a full report on the subject, which was done, and a copy sent to the Surgeon General of the army, at Washington, and he published it and sent copies to all the hospitals in the North.

I used it in scarlet fever, diphtheria, erysipelas, typhoid dysentery, and hospital gangrene, and in every case where it was faithfully and promptly used, recovery took place. The experiments were carried on through two years, and in one of my reports I urged the trial of the drug in hydrophobia.

The New York Medical Times, and the London *Lancet*, republished three of my reports. While I was in charge of the gangrene hospital, known as "No. 7," in Murfreesboro, after the battle of Stone River, many gentlemen of the profession came there to watch the effect of the treatment—and among them Professor Frank Hamilton, Professor Gunn, of Ann Arbor, Professor Post, of New York and Professor Brinton, of Washington. These gentlemen remained from two to three weeks, and so highly were they pleased, that on their return to their respective homes they made reports on the subject, and Professors Post and Gunn lectured on the subject to their colleges

Since that time I have used the remedy in more than two hundred cases, and not one has died in which the remedy was used early and faithfully. I have laboured to get it in use here; but with a few exceptions it has not been noticed. Some men who have never even seen it tried, say they have no confidence in it; but the united testimony of hundreds who have used it, is, that we have no remedy of equal value, In the treatment of scrofula, the early stages of consumption, erysipelas, diptheria, scarlet fever, and gangrene, it is far beyond all other remedies. One of our most prominent physicians requested me, last fall, to go and use it in a case of gangrene of the leg, after amputation. The action of the remedy was prompt and successful, and the lady made a good recovery.

If by this article I shall succeed in getting any of our physicians, who have not used the article, to give it a fair and impartial trial in cases of scarlet fever and diptheria, now so fatal, I shall effect the object I have in writing, for I feel confident that the lives of many children will be thereby saved."

Machinery and Manufactures.

TESTING BOILERS.

For several years engineers have been in the habit of employing the hydraulic test in proving boilers, and its use daily becomes more extended. We find, however, that many individuals are still opposed to it, arguing that if pushed too far it becomes an indirect source of danger; that if not pushed far enough it is useless, and that, as a rule, there are no possible means of deciding whether the test is or is not pushed far enough. These propositions accurately embody the opinions of clever engineers and careful and successful boiler-makers. That they are honestly entertained we have no doubt, and it is worth while to consider whether they are or are not well grounded; whether, in short, they are based merely on preconceived notions of the fitness of things, or on the results of experience and direct experiment.

The most important objection which can be urged against the hydraulic test is that it is likely to injure a boiler. In undertaking the testing of any structure, whether a girder, or a roof, or a boiler, it is expedient to decide exactly what load we expect it to sustain when in regular use; and exactly how much in excess of this normal load the test is to be. In applying this to boilers, either or both of two mistakes may be committed; the working pressure may be too high, or the test may be too much in excess of the working pressure. Suppose, for example, that we decide on working a boiler up to 90 lbs., though 50 lbs. be great enough, and that we make the test pressure 270 lbs.; it is beyond question that the boiler would be exposed to a strain which might seriously endanger it: but it would be wrong to assume that the ratio of three to one existing between the test pressure and the normal pressure was excessive Again, suppose that the normal pressure was but 50 lbs., and the test six times this, or 300 lbs., then it would be wrong to assume that the working pressure was too high because the boiler suffered or gave way under the test. It unfortunately happens that the majority of boiler-makers have no definite ideas on the subject of the hydraulic test, and just such mistakes as these are made every day. It should be clear enough that the test ought to be regulated not by the pressure at which the boiler is going to be worked, but by that which the iron can bear with impunity. But this fact does not appear to be recognized, and we constantly meet with cases where a tremendous and unnecessary pressure is put on because the tester has a general idea that the strain should be three times the working pressure. Now, in a certain sense we cannot tell what the strength of a boiler is unless we tear it asunder; but we have the results of trustworthy experiments at our command, and we can in all cases by a little calculation determine pretty closely the pressure at which a boiler would burst. Having got so far, if we mean to apply the hydraulic test properly, we should next determine how near it is advisable to go to the ultimate strength of the iron. All this while we are proceeding by guess-work; in other words, we are reasoning by analogy that, because one boiler has borne such and such a pressure, another similar to it in construction and material will do the same; but we have really no definite or precise knowledge of what the boiler to be tested will or will not stand. Hydraulic pressure is put on, and is sustained by the plates and seams without injury, and at once our position is changed. We now know not by analogy but as a matter of fact what pressure the boiler will bear. It may be competent to withstand much more, but with that we have nothing to do. We are supplied by the test with a definite fact, and it then only remains to determine from this what the working pressure shall be. Applied in this way the test cannot do harm; but experience has demonstrated that it may be productive of mischief when we use it on the principle laid down in many specifications—"the working pressure is to be so and so, and the boiler must be tested to three times as much"—a stipulation which constantly brings the test up to a point which overstrains a boiler. We may select various coefficients of safety which will apply under different circumstances, but it is imprudent to make the test vary with the coefficient. We may assume that an hydraulic test equal to one-third of that which would suffice by calculation to burst the boiler, is enough. If the boiler is carefully made; is to be regularly inspected; to be worked with good water, and placed in careful hands, the nominal pressure may be half the test pressure. If, on the contrary, the boiler is to be placed in careless hands, and is liable to the operation of destructive influences, the normal should not be more than one-third, or possibly one-fourth, of the test pressure. As it is, we find boilers but too often submitted to the force-pump without a moment's thought being bestowed on the circumstances under which they will subsequently have to discharge their duties. The only system under which the hydraulic or any other test can be properly applied is embodied, as we have already said, in taking the test as a stand-point and adjusting the working pressure by it, instead of taking the pressure as a basis on which to found the amount of the test. It will possibly be urged that it is quite the same at which end of the chain we begin; that whether we settle the test by the pressure or the pressure by the test the results will be identical. But a little reflection will show that a high working pressure is frequently adopted by those who order a boiler, while they stipulate for a test which must also be high, inasmuch as its amount is expressed in terms of as many times the working pressure; the fact being the parties ordering the boiler never bestow a moment's thought on the test pressure, or the effects which it may produce; while the makers care nothing about the matter, consoling themselves with the reflection "that if the boiler is a bit strained it can't much signify, as it will only be worked up to a pressure so much less that there is nothing to fear." Both normal pressure and test pressure are, in this case, determined almost by haphazard; whereas, by employing the test in the manner in which we propose, the working pressure could be adjusted on a satisfactory basis of fact. Having demonstrated theoretically that the strength of the boiler is so much, we then proceed to test the validity of this theory up to a certain point. Having satisfied ourselves so far we may then fix the working pressure with absolute certainty; and the engineer specifying the boiler, making the test instead of the normal pressure the prominent feature, is much more likely to commit a mistake and overstrain the boiler than if he based all his calculations on the working pressure and threw in the test simply as a matter of precaution to prove the sufficiency of his calculations. The first system does something towards raising boiler-making, designing, and testing to a science; the second does nothing of the kind, and has tended very forcibly to bring boiler-testing of any kind into most unmerited discredit. Upon the whole we may dismiss the argument that the hydraulic test is injurious as being unfounded. It applies to the abuse of the practice, not to the system itself.

Nor does the statement that there are no means of determining whether the test has or has not been pushed far enough possess more force. If the test is used merely to decide what the ultimate strength of the boiler is, which is apparently the prominent idea with many boiler-makers, the objection would hold good. But the object with which the test is used should not have anything to do with the acquisition of information respecting the ultimate strength of the plates and seams. The test, as we have seen, ought to be employed solely to obtain data from which to determine the proper working pressure. We can obtain all the information which can be rendered practically useful on the first point by calculation, and the test should invariably be so much less than the calculation strength of the boiler that it may be safely taken for granted that an ample margin exists between the strain produced by the action of the force-pump and that which would suffice to rip up and destroy the plates or seams. If the test is legitimately applied, it is very easy to determine when it has been carried far enough—in other words, when it has gone so far that, still being far within the strength which by analogy the boiler possesses, it is yet so much in excess of the working pressure that an ample margin of safety is left between the test and the working pressures. We cannot reasonably require more. Whether we do or not, science fails to supply information; and having ascertained so so much, every practical purpose is served. It is also worthy of remark that those who complain that too high an hydraulic test injures boilers, seldom, if ever, put the nature of the injury done into a tangible shape. Existing notions on this subject appear to be excessively vague, and it might probably be shown that the injury done to the boiler, so long as the seams hold good, even by too high a test, has existence more in theory than in fact. If the seams give way, we find at once that the boiler has been over proved or that the workmanship and design was defective. The nature of the injury precludes the boiler from being put to work: and assertions that the plates themselves are injured by molecular disturbance must be received with great caution. In the first place, single rivited seams would give way before the plates could be strained much beyond their limit of elasticity; and in the second, even though the elasticity of the iron were in some degree impaired, it does not necessarily follow that the boiler would be the worse. We know, indeed that the breaking strength of iron may be absolutely increased by exposing it to such a strain as will render it less elastic and more brittle than it was before the strain was applied; and it is possible that a boiler, after undergoing too high a test, might in this way be stronger than it was before. A girder would be injured by too high a test, because girders have to sustain suddenly impressed strains and shocks which brittle iron is incompetent to deal with. But steady pressure and vibration and percussion are very different things, and admit of being dealt with differently. As regards the seams, again, any strain which would injure them would cause them to leak, and render the mischief done at once apparent. We do not wish to be understood to say that brittle and overstrained iron is as good as iron which is neither brittle nor overstrained for constructing boilers. What we wish to convey is, that an analogy is sometimes drawn between girders and boilers which does not really exist, and that the very vague and indifferent notions concerning the mischief done by overtesting, which does not make itself manifest in the shape of a leak or the distortion of a shell or a flue, ought to be reduced into shape by those who hold them. If there is anything in these objections, let it be put forward in such a definite form that practical men and hard thinkers can deal with them. If this cannot be done, then neither practical men or men of science can regard them as being anything but theories based, if not on ignorance, at least on a total absence of the power of discrimination.—*The Engineer.*

Enamelling Iron.

Enamelling iron is almost a new art. No metal is capable of receiving a coating of vitrified porcelain or enamel unless it is capable of withstanding a red heat in a furnace. Articles of cast-iron, as a preparation for enamelling, are first heated to a low red heat in a furnace, with sand placed between them, and they are kept at this temperature for half an hour, after which they must be allowed to cool very slowly, so as to anneal them. They are then subjected to a scouring operation with sand in warm dilute sulphuric or muriatic acid, then washed and dried, when they are ready for the first coat of enamel. This is made with 6 parts by weight of flint glass broken in small pieces, 3 parts of borax, 1 of red-lead, and 1 of the oxide of tin. These substances are first reduced to powder in a mortar, then subjected to a deep red heat for four hours in a crucible placed in a furnace, during which period they are frequently stirred to mix them thoroughly; then towards the end of the heating operation the temperature is raised so as to fuse them partially, when they are removed in a pasty condition and plunged into cold water. The sudden cooling renders the mixture very brittle and easy reduced to powder, in which condition it is called frit. One part of this frit by weight is mixed with two parts of calcined bone-dust, and ground together with water until it becomes so comminuted that no grit will be sensible to the touch when rubbed between the thumb and finger. It is then strained through a fine cloth, and should be about the consistency of cream. A suitable quantity of this semi-liquid is then poured with a spoon over the iron article, which should be warmed to be enamelled, or, if there is a sufficient quantity, the iron may be dipped into it and slightly stirred, to remove all air bubbles and permit the composition to adhere smoothly to the entire surface. The iron article thus treated is then allowed to stand until its coating is so dry that it will not drip off, when it is placed in a suitable oven, to be heated to 180° Fah., where it is kept until all the moisture is driven off. This is the first coat; it must be carefully put on, and no bare spots must be left on it. When perfectly dry the articles so coated are placed on a tray separate from one another, and when the muffle in the furnace is raised to a red heat they are placed within it and subjected to a vitrifying temperature. The furnace used is similar to that used for baking porcelain. This furnace is open for inspection, and when the enamel coat is partially fused the articles are withdrawn and laid down upon a flat iron plate to cool, and thus they have obtained their first coat of dull, white enamel, called biscuit. When perfectly cool they are wet with clean soft water, and a second coat applied like the first, but the composition is different, as it consists of 32 parts by weight of calcined bone, 16 parts of China clay, and 14 parts of feldspar. These are ground together, then made into a paste, with 8 parts of carbonate of potash dissolved in water, and the whole fired together for three hours in a reverberatory furnace, after which the compound thus obtained is reduced to frit and mixed with 16 parts flint-glass, 5½ of calcined bone, and 3 of calcined flint, and all ground to a creamy consistency with water, like the preparation for the first coat. The articles are treated and fired again, as has been described in the preparation coat, and after they come out of the furnace they resemble white earthenware. Having been twice coated, they now receive another coat and firing, to make them resemble porcelain. The composition for this purpose consists of 4 parts by weight of feldspar, 4 of clear sand, 4 of carbonate of potash, 6 of borax, and 1 each of oxyd of tin, nitre, arsenic, and fine chalk. These are roasted and fritted as before described, and then 16 parts of it are mixed with the second enamel composition described, excepting the 16 parts of flint-glass, which is left out. The application and firing are performed as in the other two operations but the heat of vitrification is elevated so as to fuse the third and second coats into one, which leaves a glazed surface, forming a beautiful white enamel. A fourth coat, similar to the third, may be put on if the enamel is not sufficiently thick. The articles may be ornamented like china-ware, by painting colored enamels on the last of the coats, and fusing them on in the furnace. A blue is formed by mixing the oxyd of cobalt with the last-named composition; the oxyd of chromium forms a green, the peroxyd of manganese makes a violet, a mixture of the protoxyd of copper and red oxyd of lead a red, the chloride of silver forms a yellow, and equal parts of the oxyd of cobalt, manganese, and copper, form a black enamel when fused. The oxyd of copper for red enamel is prepared by boiling equal weights of sugar and acetate of copper in four parts of water. The precipitate which is formed after two hours' moderate boiling is a brilliant red. The addition of calcined borax renders all enamels more fusible.—*Mechanics' Magazine.*

English Tools at the Paris Exhibition.

The special correspondent of the *Scientific American*, having given a deservedly favourable notice of "American Machine Tools" at the Paris Exhibition, says:—"The tools in the English department are models of solidity and design and excellence of workmanship. If there is any one branch of engineering in which the English particularly excel, it is in the construction of machine tools, and no one can walk through the machinery gallery of the Exhibition without being impressed with the superior judgment evidenced in the proportions of these tools compared with those by foreign makers. Messrs. Sharp, Stewart & Co., of Manchester, send a number of substantial tools, such as lathes, shaping machines and slotting drills, which show good design and workmanship. There is a good driving wheel lathe with two face plates and four tool posts, two on each side of the lathe, so that a double cut may be taken on the tires of both wheels at once. Their slotting drill differ from that made in America by Messrs. Bement & Dougherty and obtained by them from Mr. Shanks in Scotland, in that but one drill is used, and the work must therefore proceed more slowly. The tool is arranged quite differently from the other referred to, the drill in this case working vertically. Then there is that admirable tool so common in England, the radial drill. It saves an immense amount of time in drilling holes in large pieces of machinery, and has the additional advantage that it may be used for boring and work for which movable crabs such as are in use with us for similar purposes would be wholly inadequate. Why have not some of our tool makers brought it out in America?

Whitworth's Machinery.

But if we want to see perfection of design and execution we must pass on to the space allotted to Mr. Whitworth. Of course it is to praise what is already acknowledged to be of merit, but the verdict in favor of these tools is unavoidable. It seems impossible to designate a single part as either too light or too heavy, a bearing as too large or too small, or a surface as too little or too carefully scraped. Every thing that is done shows mature consideration, and no labor is wasted on unimportant parts. Among the turning lathes which he exhibits is one without any spindle at all, the work being held between two ordinary centers and rotated by a driver placed near the middle of the length of the lathe. This is a revolving drum through which the work passes, the outer edge being provided with teeth for receiving the motion of the driving pinion. Two slide rests are used, one on each side of the driver. Another interesting tool is a special one designed for planing the faces of the hexagonal shot used in Mr. Whitworth's system of ordnance. Its construction is very similar to that of an ordinary planing machine, but the sliding table is replaced by a sliding spindle to which the shot is secured, and which has six spiral grooves cut in its surface, which give it a rotatory motion as it moves forward through its bearings. Three tools are used, one above and one on each side of the upright frame, and the clutch—if so it may be called—by which the shot is held, is provided with notches properly distanced, so that the other faces may be brought properly under the action of the tools. A very simple planing machine with Whitworth's patent revolving tool holder, by which a cut is taken when the bed is in motion in either direction, is exhibited, and also a radial drill of the pattern turned out at these works. This is a simpler and more neatly designed tool than that by Messrs. Sharp, Stewart & Co., and is a beautiful specimen of work. The same may be said of a small foot lathe which stands beside it. In proportion as the surfaces become smaller we observe that the scraping is more neatly done, and this tool shows the highest degree of finish. The motion of the treadle, in accordance with the usual custom of these makers, is communicated to the crank shaft of the lathe by chain belts passing around pullies in the frame of the treadle. Three surface plates are also exhibited, and this may be considered the most suggestive part of the collection, as it is to this invention that Mr. Whitworth and the world owe the means to produce the accurate bearing surfaces now required in good tools.

But what can be said of such tools as we find in the Belgian department for example, where as a substitute for scraping, the makers have difigured the bearings of their machines with fancy patterns such as diamonds and circles? If this must be done let it be done somewhere else than on a working face. As we might expect, tools which exhibit such a barbarism as this also show throughout the very worst design and workmanship.

Professor Wheatstone's Electric Machine.

The British Journal of Photography thus describes the new electric machine of Professor Wheatstone:—

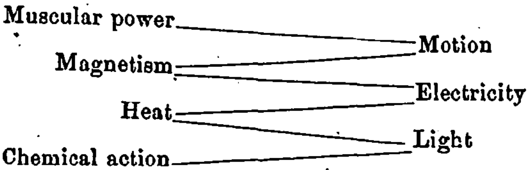
Our ideas of the electric light are almost invariably associated with the recollections of trouble and difficulty often experienced in the management of a large galvanic battery, with its accompanying fittings, acids, and fumes, detrimental alike to the clothes, hands, and olfactory organs of the operator. How different it would be if, instead of the cumbrous paraphernalia we had but to turn a wheel, and lo! our sun would send forth his brilliant beams! This is not now a matter of mere theoretical speculation, but is really *un fait accompli.*

In the new machine no magnetism, no electricity, is required to commence the action. Nothing but motion is needed to convert a mass of iron and covered wire into a magazine of intense electric power.

The new machine consists essentially of a bar of iron bent in horseshoe fashion; around this is coiled covered wire, as in an ordinary electro-magnet. Between the poles revolves a spindle carrying covered wire, insulated, but so arranged that either end will be alternately brought into contact with each terminal of the wire surrounding the iron bar. Again: the spindle is so placed that, during its revolution on its long axis, it is made to present each side in succession to either limb of the horseshoe. The spindle is driven by an endless band, which passes around the circumference of a tolerably large flywheel. This is the general construction. When the spindle is rapidly revolved the horseshoe becomes magnetized, a powerful electric current being induced in the wire helix at the same time; and as the motion is continued, the forces go on acting and reacting until a very high degree of intensity is obtained. The electricity can be taken between two terminals placed in proper position. In this respect an important point of difference exists between Mr. Wilde's machine and Prof. Wheatstone's, inasmuch as in the former any body which we wish to submit to the action of the electric current must form the terminals of the complete circuit, whereas in the new apparatus the substance to be operated upon forms a bridge or short cut for the electricity, in order to complete the circuit.

The power of this apparatus is so great that, even when of small size and easily turned by the hand, it is capable of burning a piece of iron wire thirty inches long and one-sixteenth or more in diameter. In this experiment, at the moment of separation of the fused and glowing iron, the metal scintillates in a very beautiful manner. The same result is also obtained by approaching one terminal, consisting of iron wire, to the second end; the iron immediately takes fire and burns with brilliant coruscations. When the current is made to pass between charcoal points a beautiful and steady light can be obtained. This is the point which chiefly interests us, and we have little doubt that before long we shall have a machine which will be practicably available, and enable us to realize the idea conveyed in the term "turning on the sun" whenever we need additional light.

Finally, we have in the new machine a remarkable illustration of the co-relation of the forces—the muscular power of the human arm being ultimately converted into a brilliant light, as exhibited by the following chain:—



Longitudinal strain on Screw Bolts.

Experiments have been going on for months in England, to determine the power of screw bolts to resist a sudden longitudinal strain. In repeated trials of projectiles against targets representing the armor plating of ships, it was found that the bolts which fastened the inner skin and outer plate, broke short off at a point just inside of the seat of the threads in the plate. Major Palliser conceived the idea of turning off the threads on the bolts between the points on the ends which engaged with the plates, thus reducing the diameter of the bolts. The result was almost incredible. It was found that a bolt with a thread cut its full length became much stronger, or had practically more tensile strength, when the thread between the head and the engaging points was turned off, than when it was left on the bolt. Not only so: a smooth ⅜-inch bolt suspended by one end and subjected to the fall of a sliding weight striking the nut at its lower extremity, broke at the second blow, while a similar bolt turned down to ¼ of an inch except the screw end, bore ten blows and stretched ¾ inch in 2½ inches, before breaking.

The philosophy of this curious result becomes a very interesting question. The unqualified proposition that a bar of iron is stronger after losing a portion of its material, than before, is incredible, but when a portion of that material is nicked or cut, the conditions are materially changed. It is well known to mechanics that if a slight nick be cut around a bar of iron or steel it can be broken at that point by comparatively little force. This is seen every day in the smith's shop in cutting up iron. Take a bar of one and a half inches diameter and cut a slight nick around it, and it may be broken by a few well directed blows of a sledge. But if a bar much less in diameter be attempted to be broken without first nicking it, the trial will be futile. We have seen precisely the same difference exhibited in drawing bars apart by their ends.

A very little of a substance has very little strength or power of resistance, whether contained in a large mass of the same or taken by itself. Now the force applied to break a clean bar of iron distributes itself through a considerable mass which opposes a considerable resistance. But let this force be concentrated upon a hair's breadth and that will give way as any separate hair's breadth of iron would. The formation of the nick in the surface is the means for this concentration. The forces of the blow passing through the mass, from each side, arrive at the nick, at the bottom of which they meet and unite upon an almost infinitesimal point, and the finer the point or the sharper the cut, the less the surface to offer resistance. Now in the case of the screw, the threads are nearly concentric nicks, which offer fine points for concentrating the force of a blow, being the starting of a fracture. Let these nicks be turned out, so as to present a smooth surface, and the force which would have been concentrated at one point, is generally distributed over a comparatively large surface, and the reduced diameter, smooth, actually presents more resistance than the larger diameter nicked.

There are some useful lessons to be learned from these facts. One is that a sharp V thread, weakens a bolt much more than one which has a flat bottom, as the point of the thread presents so much smaller a surface for resistance than the blunt or broad bottom. Another suggestion is that the strongest bolt of a given diameter in the screw, is that in which the body under the thread is a very little larger than the shank. Again, a bolt should not be threaded further than is required for the seat of the thread; any further threading is an invitation to a fracture.—*Scientific American.*

Dipping Acid for Brass.

There are various methods of finishing brass, as by turning and polishing in the lathe, finishing with the file and burnisher, or immersing it in a bath of acid. Oftentimes portions of brass which we wish to ornament cannot be finished in the lathe or will not pay the cost of hand-finishing; we may cast such portions of the required form at once, and then produce a beautiful surface most ingeniously and cheaply by immersing it in a bath of "dipping acid." This bath is made by mixing together nitric acid, sulphuric acid, and muriate of ammonia or sal-ammoniac. The work, if it has been in contact with oil or grease, may be heated to consume such grease and it will then be discoloured and dirty; it must be pickled in a bath of diluted nitric acid, which may be one part acid to three or four of water. The articles must not be permitted to remain too long in the pickle, as injury will result by the acid eating holes in the work; to clean the surface of the metal is all that is required. Remove the articles from the pickle and wash them clean, so as to alike remove any adhering dirt and the acid in which it has been immersed. The dipping bath is composed mostly of nitric acid, the sulphuric acid and the muriate of ammonia being present in inferior quantities. There is no certain rule by which to mix them. Much depends on the concentrated charater of the acids. A little experience will enable the operator to judge for himself of the proportion he needs. Strong nitric acid alone will do, but many prefer to add a quantity of the other ingredients. The mixture should be so strong that a momentary immersion will be sufficient to make the work bright and clear, no matter how rough it may have been. Remove the work from the bath and immediately plunge it in clean cold water and wash it well to remove the acid, and give it a final and thorough washing in hot water. If a little crude tartar be added to the hot water it will more effectually remove the acid. To dry the work it may be imbedded in fine hot saw-dust. The surface produced is beautiful and may be protected with a coat of clear varnish or lacquer, but without the lacquer the surface will be retained for a long time and withstand considerable wear and handling.—*American Artizan.*

An Electrical Automaton.

There is one giant toy in the centre of one of the avenues of the exposition, which as it cannot be classified or included with any other apparatus, may as well be described here. It is a large piece of imitation rock work, about twelve feet high, covered with rich vegetation, ferns and mosses, lichens and orchids, a spring gushes forth from one side, and feeds the pond in which it is placed, and in which gold and silver fish glitter and gambol. Peeping out of one of the cavernous openings at the bottom is a huge black and white Newfoundland dog of nature's size and nature's mold, but not of nature's life and blood. The attendant touches a secret spring, and while the admiring observer stays and stares, and feels inclined to pat Pompey's head, Pompey rolls his eyes, opens his mouth, and makes a very good imitation of the deep-mouthed welcome of some watch-dog's honest bark. Startled, but not intimidated, the observer raises his eyes and discovers carelessly sitting on a huge boulder, a hare, which immediately plays a wild tattoo on a drum placed before it, and, ere pussy ceases, a hideous and enormous baboon on one side clatters his jaws, rolls his eyes, scrathes his head, and plays a wild and savage air upon a fiddle, while on the other side of the rock some pastoral swain, decked in gorgeous ribbons,

"Recubans sub tegmine fagi,"

bows his head, carefully peeps all around, raises a pipe, and brings forth strains that would melt Coryllis, who sits not far off, had she only life, and who probably, with other figures scattered about the rock, will continue to attract crowds of excited and amused observers of this strange medley of electric agency and skill, during the continuance of the Exhibition.—*Engineering.*

The Platinum Gas-light Perfecter.

Mr. John Scholl, of London, has lately brought out a cheap and useful article which he calls the "Gas-light Perfecter," the placing of which over an ordinary fish-tail or other gas-burner increases the brilliancy of the light to an extraordinary extent. As adapted for fish-tail and bat's-wing burner's, the perfecter consists of a short brass tube or cap, which is split in order to enable it to grip the exterior of the burner when applied, and diametrically across one end of this tube there is secured a thin strip of platinum, placed edgewise. This cap is to be placed upon the burner so that the lower edge of the platinum strip may rest close upon the top of, and, in the case of a fish-tail burner, exactly between the holes, so that it may be in the middle of the flame lengthwise. In the case of a bat-wing burner, the strip should be parallel with but not immediately over the slit; and when an argand burner is used, the strip is made of an annular form, and provided with spring clips to fit the inside of the burner. The annular strip of platinum should be so adjusted as to conform to the series of hole, and be situated just sufficiently to one side thereof not to actually impede or obstruct the exit of the gas. From experiments we have made on an ordinary fish-tail burner, consuming 2½ feet of gas per hour, and giving the light of six candles, we find that the addition of the perfecter to the same burner increases the light obtained to nine candles. An important saving in gas is thus obtained, and in addition, the perfecter causes the whole of the gas to be consumed; hence all unpleasant smell and the whistling from unequal pressure is prevented. We have no hesitation in recommending the "Gas light Perfecter" to the notice of all gas-consumers. *Practical Mechanics' Magazine.*

The new banking building of the New York Park Bank, Broadway, is to have a kitchen underneath for providing mid-day meals to its employés.

Bronzed Iron.

The *Scientific American* says that "BRONZED IRON from the Tucker manufacturing Company of Boston, attracts much notice from foreigners at the Paris Exhibition. It is prepared by oiling the surface very thinly, and then heating it in a stove at the temperature which ordinarily imparts a blue tint, so as just to decompose without charring the oil, at the same moment with the blue oxidation referred to. The oxide takes a brown colour and tenacious solidity from embodying the resinous element of the oil. The surface thus formed has the lustrous metallic appearance of bronze and great durability, and seems to be reproduced under the influence of the atmosphere, if correctly represented, in spots where it is worn away by attrition. The manufacture is to be introduced in France.

Useful Receipts.

Cements.

A cement particularly adapted for attaching the brass work to petroleum lamps, is made by Puscher, by boiling three parts resin with one of caustic soda and five of water. The composition is then mixed with half its weight of plaster of Paris, and sets firmly in half to three quarters of an hour. It is said to be of great adhesive power, not permeable to petroleum, a low conductor of heat, and but superficially attacked by hot water. Zinc white, white lead, or precipitated chalk may be substituted for plaster, but hardens more slowly.

Alum and plaster of Paris well mixed together with water, and used in the liquid state, will form a very useful cement. It will be found handy in the laboratory for many purposes. It forms a very hard composition, and for fixing the brasses, etc., on paraffine lamps nothing could be better.

Dr. Juneman suggests as a new cement for luting apparatuses, etc., a mixture of two parts of sifted iron filings and one part of clay in powder. The two substances being intimately mixed together, they are made into a paste with strong vinegar

A putty of starch and chloride of zinc, hardens quickly and lasts for months, as a stopper of holes in metals.

Putty for stove joints may be made by wetting together fine salt with double its bulk of fresh hard wood ashes. If a harder cement is wanted, use iron filings with white lead and linseed oil. It should have a day or two for hardening.

A White Paste.

A white paste, adhesive to all surfaces, is said to be made as follows:—A solution of 2½ ounces gum arabic in two quarts warm water, is thickened to a paste with wheat flour; to this is added a solution of alum and sugar of lead, 720 grains each in water; the mixture is heated and stirred about to boil, and is then cooled. It may be thinned, if necessary, with the gum solution.

To bleach sponge snow white.

Soak it in diluted muriatic acid ten or twelve hours, then wash with water and immerse it in a solution of hyposulphite of soda with a small addition of diluted muriatic acid, wash and dry it. Repeated operations it is said, will render the article almost snow white.

To Preserve Cisterns.

Coal tar is recommended in the *Chemical News* as an excellent coating of cisterns and reservoirs, to protect water from the lime and other salts contained in the cement. The tarry taste, if we may believe the writer, disppears in a few days.

Crystallizing Glass.

To one quart of water add one pound of alum; boil till all the alum is dissolved; add a little indigo, and then pour it into a flat dish and place the glass in it. Let it stand till the crystals are formed, which will take about twenty-four hours. Peach-stones, cinders, heads of wheat, oats, etc., may be thus crystallized.

Practical Memoranda.

To remove Rust from Metals.

Plunge the blade in a bath of diluted hydrochloric (muriatic) acid; say one pint of the acid to one quart of water. Leave it there for twenty-four hours; then take it out and rub well with a scrubbing brush. The oxide will come off like dirt under the action of soap. Should any still remain, as is likely, in the corroded parts, return the blade to the bath for a few hours more, and repeat the scrubbing. The blade will then present the appearance of dull lead. It must then be washed in plain water several times, and thoroughly dried before a fire. Lastly, a little rubbing with oil and fine emery powder will restore the polish. Should oil or grease have mingled with the rust, as is usually the case, it will be necessary to remove it by a hot solution of soda before submitting the metal to the acid. This last attacks the rust alone, without injuring the steel; but the washing in plain water is all important, as, after the process, the metal will absorb oxygen from the atmosphere freely, if any trace of the acid be allowed to remain.

Renovating Old Files.

The March No. of this Journal for the year 1864' contained a receipt for effecting this object. The *Mechanics' Magazine* says:—A process of renovating old files, which is said to answer extremely well, is published in the last number of *Dingler's Polytechnic Journal.* The files are first thoroughly cleansed with a scratch-brush and a strong soda solution to remove all grease. They are then laid in a dish, the ends resting on wires, so that their whole surface is exposed to the water, of which enough is put in the dish to just cover the files. One-eighth part of strong nitric acid is now added to the water, and mixed by moving the dish about. The files are to remain in this liquid for twenty-five minutes. They are then to be rinsed in water, and again scrubbed with the scratch-brush, and are afterwards returned to the bath, strengthened by the addition of another eighth part of nitric acid. In this they are to remain fifty minutes. They are now to be scrubbed once more, and are finally to be placed in the bath, which, in addition to the two-eighths of nitric acid, has one-sixteenth of its bulk of strong sulphuric acid. They have now only to be washed with water, dipped in milk of lime to remove all traces of acid, rinsed again, and dried. After this treatment the files are said to be as good as new and to have a good color. Whether old files are worth the trouble and expense of the treatment our readers must determine for themselves. The acid, we may say, might be economized by having three separate baths of the composition given. They might then answer for a number of files.

Mercurial Vapors.

M. Boussingault has laid before the French Academy of Sciences his researches into the effects and counteractions of the vapors of mercury, which destroy or reduce to imbecility and misery so many lives in certain branches of manufactures. The deadly influence of these vapors on plants, and the effect of sulphur in neutralizing them, had been carefully defined. Regnault considers the best reagent against the vapors of mercury to be an iodized daguerrotype plate, but Boussingault maintain that the sensibility of the plates is as nothing compared with that of plants.

Platinized Copper Vessels.

Platinized copper vessels are being introduced into Europe, for purposes where heretofore those made entirely of platinum have been employed. The former are said to be fully as safe and reliable for containing strong acids as the latter, and are of course very much cheaper.

Acid-Holder

Stalba mentions that glass and porcelain vessels are protected from the action of the hydro-fluoric acid used for engraving on glass, by a coating of paraffine. Carefully dry and heat the vessel, melting some paraffine in it and turning it around so as to coat the whole interior. Why may not the same protector be useful in executing a design upon glass?

Organic Poisons.

Dr. Richardson states that iodine placed in a small box with a perforated lid destroys organic poisons in rooms. In cases of small-pox he has seen this method used with great benefit.

Pickling.

Pickling Vegetables, as well as salting meats and tanning leather, is effected without loss of time by the pneumatic process: exhausting the air and letting in the liquid under atmospheric pressure so as to force it instantly through the opened pores and cells.

Drying Oil.

A quick process for getting drying linseed oil is given by Dr. Dullo: boil the raw oil for two hours with binoxide of manganese and hydro-chloric acid.

Petroleum Items.

WHAT IS PETROLEUM?

The crude petroleum of Pennsylvania always issues up out of the earth mixed with inflammable gas. This gas makes an excellent fuel, and is much used for generating steam for the pumping engines. It is abundant enough to run all the engines in the oil district.

If the gas as it issues out of the wells be subjected to pressure or to a temperature of zero, a considerable percentage of it will be condensed into a liquid, the amount condensed being somewhat proportioned to the pressure and cold. Some of it, however, refuses to condense at any pressure and cold which we command, and such is consequently a permanent gas. That which condenses assumes the form of gas again as soon as the pressure is removed and it is exposed to the ordinary temperatures. The change into gas or vapor is very rapid and violent, and in fact is a case of boiling. Some of the volatile liquids will boil on ice.

It is evident from these statements that petroleum gas is in fact a mixture of several gases and vapors, which may be separated from each other by careful management of pressure and cold.

We may likewise demonstrate the fact that the liquid crude petroleum is a mixture of different liquids. The partial separation of these may readily be effected by distillation. The oil which first appears on distillation is very light in gravity and has a low boiling point. As the distillation progresses the gravity and boiling point increase with remarkable regularity; from the beginning to the end there appears to be a constant and regular progression.

The reader is now prepared to apprehend the fact that petroleum is composed of a *series* of substances having properties which differ from each other only in degree. There is a beginning and an end, a top and bottom of the series, and between them regular gradations of intermediates. The beginning or top of the series is a permanent gas; the bottom or end is a solid. Between these are gradations of consistency, gravity, and volatility.

In an arithmetical or geometrical series there is always a peculiar difference between consecutive members of the series: given one member of the series and that peculiar difference, and the whole series may be determined, or any particular member of it. Is there any such certain or interesting relation between members of the petroleum series?

The only chemical elements which enter into petroleum are carbon (C_2) and hydrogen (H_4). (Water, sulphur, nitrogen, compounds, etc., which are often found in crude petroleum are properly regarded as foreign substances). Now it is evident that the members of the series must differ by varying proportions of these elements—there must be progressive increase of one over the other.

The beginning of the series has been found to be composed of two atoms of carbon (C_2) with four atoms of hydrogen (H_4); the beginning of the series is represented thus—$C_2\ H_4$. Now it happens that this substance $C_2\ H_4$ to chemists is a familar acquaintance. It is commonly known under the name of *marsh gas*, and it is known to coal mines as fire damp. The second member of the series is C_4 H_6, and the third is C_6 H_8. The reader hardly needs to be told that the fourth is C_8 H_{10}, and he is able to determine the twentieth. The common difference of the series is C_2 H_2, and the general formula for the series is $C_n + H_{n+2}$.

We append a table showing the specific gravity and boiling point of a part of the series. The first four are gaseous at ordinary temperatures, and the specific gravities are given in comparison with air:—

		Specific gravity.	Boiling gravity
1	C_2 H_4	0·554	...
2	C_4 H_6	1·04	...
3	C_6 H_8	1·52	...
4	C_8 H_{10}	2·01	32°
5	C_{10} H_{12}	·628	86°
6	C_{12} H_{14}	·669	158°
7	C_{14} H_{16}	·699	198°
8	C_{16} H_{18}	·726	243°
9	C_{18} H_{20}	.747	278°
10	C_{20} H_{22}	·757	321°
11	C_{22} H_{24}	·766	359°
12	C_{24} H_{26}	·766	408°
13	C_{26} H_{28}	·792	423°
4	C_{28} H_{30}	·800	460°
15	C_{30} H_{32}	...	496°
16	C_{32} H_{34}	...	527°
17	C_{34} H_{36}	·825	...
25	Paraffine	·870	...

—*Scientific American.*

The Palos Petroleum Trial.

The *Scientific American* says:—"The first experimental trip of the *Palos*, June 14th, with petroleum as fuel, resulted in a total run of 25 nautical miles in I hour and 55 minutes, or a little over 13 knots an hour. The reported result is almost incredible, as the *Palos* is only an 8-knot steamer, with coal. Four barrels of oil were consumed on the trip, doing the work of eight tons of coal, The oil drips into a hot iron retort, where it is converted into gas and mingled with steam and air in exact proportions to produce entire combustion and the most intense heat, which is distributed to the heating surface of the boilers with such effect as to raise steam in 25 minutes, where three hours were required with coal. Such is the case thus far, as made out by the friends of the im- r: ement.

We add the following letter from Engineer Alban C. Stimers relative to this interesting trial and the subject of petroleum for fuel. It was addressed to the New York *Times:*

N, Y, Monday, June 17, 1867.

I observe in your editorial remarks in Minor Topics, in adverting to the Boston petroleum fuel experiments, in this morning's paper, an inquiry regarding the "original source of the steam that is taken from the boiler and passed into the retort that generates the vapors that make the heat that raises the steam in the boiler."

Having closely observed the various efforts made during the past five years to employ petroleum in lieu of coal for a steam fuel, I take the liberty to offer the following explanation in reply to your inquiry.

The introduction of superheated steam into the retort where the oil is vaporized is not essential to the making a fire and getting up steam, but it is to burning said vapor with the completeness of combustion necessary for it to compete with coal as a steam fuel. In burning the vapors of petroleum it is necessary that every particle of the vapors shall come into close contact with a corresponding particle of atmospheric air; but air and the vapors of the oils appear to have the same repellant qualities as oil and water, and do not mix enough to prevent the formation of a thick black smoke. and the heat developed is comparatively very small. All who have attempted the use of petroleum for a steam fuel, appear to have early learned the great advantage of introducing superheated steam to the vapors. When this is done, the air mixes readily with the compound, and a more complete combustion is effected.

Although, as I have already stated, steam could be raised in a boiler from burning the oil vapor only, yet it is done much more quickly and pleasantly if a supply of steam can be had, and I observed that on Friday last the fires of the *Palos* were assisted with steam from a sister vessel, the *Leyden*, which lay alongside.

The first experiments tried to test the practicaability of employing petroleum for generating steam were by Shaw and Linton, in Philadelphia.

I was member of a board of Naval Engineers, ordered by the Department to conduct and report upon the experiments. They continued during five months, and our report is dated May 5, 1863.

In that arrangement, "the apparatus used was an ordinary tubular locomotive form of boiler containing fifteen tubes, two inches in diameter and fifty-six inches in length; a small steam engine, in connection with it, operating a pump supplying water to the boiler; with an additional boiler of very small dimensions, placed in a heating apparatus, to provide a steam jet, previous to firing up with the oil, in the absence of other means for procuring the necessary artificial draft until steam was raised in the large boiler."

This would be a good arrangement fer Colonel Foote to employ with his process. The great merit of Colonel Foote's process over all those which have been tried in this country and in England, consists in his forcing the air, necessary for the combustion of the oil, directly into the retort where the latter is vaporized, and as superheated steam is introduced simultaneously, *the air becomes thoroughly mixed with the vapors before they issue from the burners* and the combustion is consequently perfect when the proper proportions of air and oil are maintained. This desideratum is never attained in any other process yet brought to my attention.

When an inventor comes to me and describes the brilliant white flame which he produces with his greatly improved petroleum burner, I know that he cannot compete with anthracite coal in economically generating steam. And Colonel Foote is the only one who has shown me a fire where all that was visible was the blue hydrogen flame, which every chemist will understand is—with such a combustible—the hottest attainable fire.

Petroleum for Steamers.

Calculations of the relative economy of coal and oil as fuel for ocean steamers, should take into account the important item of firemen and coal passers, their wages, weight and quarters, in addition to the difference in weight and space of furnaces and perhaps of boilers. In the recent experiments on board the *Palos*, at the Charlestown Navy Yard, it has been found that with three of her four boilers, and the attendance of three men, fifty per cent. more revolutions of the wheels were obtained than heretofore with coal under all four boilers, with the attendance of twenty men. But the greatest probable difference may be realized from a more perfect utilization of the force contained in the fuel. It is well known that as yet but a small per centage of the theoretical power of fuel has been obtained through steam. Coal heat is mostly applied by radiation. Oil, with proper apparatus, may be brought, in a state of combustion, mainly into direct contact with the boiler surface. How great a difference this may effect in practice, can be determined only by proper experiment. So that the question between coal and oil can not be ciphered out entirely from theoretical data.

In this experiment, petroleum was the oil supplied from two large iron tanks placed on deck, each tank having a glass gage at its side, to indicate the height of the petroleum, and a vent pipe on the top to permit the escape of vapor. From these tanks the petroleum was conducted by half-inch pipes to the boiler furnaces, dropping into iron retorts, heated by burners placed beneath them, and being instantly vaporized, This vapor, in burning, was mixed with steam—decomposed by passing through pipes partially filled with iron filings, and with air forced in by a common air pump. The heat thus generated was intense; and the combustion so perfect that no smoke was perceptible. A diminution of the supply of air or steam at once created a smoke.

Commodore Rodgers, commandant at the yard, is so well satisfied with the three days' experiment, that he has determined to apply to the department at Washington for permission to make a trial trip at sea with the *Palos*.

Petroleum as Fuel for Locomotives.

The Titusville (Pa.) *Morning Herald* describes the fourth of a series of experiments to determine the value of petroleum as fuel for locomotives. It took place at the shops of the Warren and Franklin railroad at Irvineton. The apparatus used was Sponce's burner. It is described as consisting of a pan covering the bottom of the fire-box in the locomotive, and taking the places of grates. On the pan are placed heaters or gas-generators six in number, consisting of inclined plates of cast-iron, supported at an angle of forty-five degrees, opposite to each heater is an injector conveying the oil to the heater, where it is instantly converted into gases, oxgyen being also furnished to the gases in their nascent state for combustion. The oil is contained in a tank on the tender, from which it is conveyed by feed-pipes to the injectors, each pair of injectors being controlled by a throttle by means of which the fire is regulated as readily as the light of a lamp. The locomotive used weighed thirty-one tons, and was of one hundred and fifty-horse power. No cars were attached. Under eighty-five pounds of steam the locomotive passed over four miles of track in less than eleven minutes. All in the party agree that oil may supersede wood and coal in railroad use.

Messrs. F. G. Beckett & Co.'s Machine Works.—Construction of an Immense Oil Tank.

The extensive Machine Works and Iron Foundry of Messrs. F. G. Beckett & Co., located on Simcoe street, which within a few months have grown in magnitude to become one of the most important manufacturing establishments in the Province, is one of the busiest localities in the city, and its immense facilities seem to be fully employed in the performance of heavy contracts. A number of large steam engines are in process of construction, one in particular of great power, designed for Capt. Malcolmson's new iron propeller, now approaching completion at Capt. Zealand's ship-yard. One of the latest contracts of magnitude completed at the establishment is the construction of an immense oil tank, to the order of D. McLean, Esq., of Montreal, who is the principal purchaser at Petrolia, for which locality the capacious reservoir is to be shipped. This tank which is the third completed by Messrs. Beckett & Co. for the same party, is undoubtedly the largest vessel of the kind ever set up in Canada. It is constructed of one-quarter inch boiler iron, of the best quality, and its capacity is equal to ten thousand barrels. Its dimensions are 57 feet in diameter, with a depth of 22 feet. The size of the plates used is 9½ by 4½ feet—these, when the tank is set up, being closely rivetted and caulked. Nearly twenty thousand rivets are required, the holes in the plates being punched by steam machinery of an improved description, capable of punching twenty holes a minute. The tank will be covered with an iron top, which will bear about six inches of water, an arrangement calculated to ensure the safety of the oil against fire. The manufacturers have commenced shipping the tank to-day for Petrolia, by the Great Western Railway, and some five or six weeks will be necessary to rivet and caulk and place it in order for the reception of oil. The completion of a work of such magnitude indicates the immense facilities as well as skill and enterprise, of Messrs. Beckett & Co.—*Hamilton Times*.

Tank Cars for Petroleum.

The Downer Oil Company has received an invoice of oil, which arrived here in tank cars, the first, we believe, that ever came to this city. Each car had two tanks, holding a hundred gallons, and aside from the convenience of transportation, the leakage which is avoided, if oil was at a high rate, would be sufficient to pay the freight. The oil brought in these tanks was obtained at Oil Creek, Pennsylvania, and when first secured was placed in iron reservoirs built upon the side of the railroad. The tank cars were filled in a very short space of time from these reservoirs, and then dispatched for Boston by the way of Erie, Pa., the New York Central, Western, and Wooster Railroads, a distance of nine hundred miles. If the

Marginal street railroad had been completed, the Downer Oil Company could have run cars into their refinery and pumped the oil into their vats. —*Boston Journal.*

Value of Pennsylvania Oil.

The production of the Venango (Pa.) oil region for the year 1866, according to the most reliable data to be had, amounted to two million five hundred thousand barrels of forty gallons each. This amount at three dollars per barrel, which would be a small average, would make the aggregate proceeds from Venango petroleum foot up to $7,500,000, which has been added to the wealth of the country.

Export of Petroleum.

The United States exported 67,430,451 gallons of petroleum in 1866. The total export in five years has been 162,247,387 gallons. No less than 243 vessels cleared full cargoes of petroleum from the port of Philadelphia in 1866.

Statistical Information.

COMMERCIAL ASPECT OF JERUSALEM.

The following interesting particulars, are extracted from Mr. Consul Moore's report, on the Trade and Commerce of Jerusalem, for the year 1866.

"*Trade and Commerce.*—The trade of the Sandjak (or minor province) of Jerusalem is very inconsiderable. Jerusalem, the chief town, is one of the least commercial or industrial of cities. The principal imports from England are cotton goods and some colonials. Of the former it is calculated that between 300 and 400 bales, of the value of £16,000 to £20,000, annually find their way here. The imports from foreign countries—consisting chiefly of woollen manufactures, hardware, glass, and fancy goods—are on an equally limited scale. The exports are olive oil and grain, the staple products of the district, of which the quantities and destination will be shown on the returns from Jaffa, the port of Jerusalem.

"*Agriculture.*—As above stated, the staple produce of this district is olive oil and grain, of which the principal kinds are wheat, barley, sesame, and maize, raised in rather considerable quantities. Cotton is grown in the Nablous district. Previously to the ravages of the locusts, to be presently referred to, the estimated yield for 1866, was 600,000 to 700,000 okes (the oke equals 2¾lb.) It is raised from native seed, is of an inferior quality, and is chiefly exported to Marseilles. No well-directed and sustained effort on the part of the Government has been made to promote the cultivation of cotton. It is believed that in many parts of the country, cotton might be successfully and extensively grown, with good seed and proper instructions and implements given to the peasantry. A model farm, conducted by Englishmen, would, in my opinion, be the best means of promoting cotton culture in this land.

"During the summer the country was overrun by locusts. The olive crop suffered severely, in common with the cotton plant, the vine, fruit trees, &c. The grain crops had already, for the most part, been reaped. Vegetation soon recovered however; and unless the locusts come again, the evil will have disappeared with the cause.

"The animals bred in the district are horses, camels, mules, asses, sheep, goats, and not many oxen.

"*Population and Industries.*—The population of the Sandjak may be computed at 200,000 souls, divided into the three sects of Christians, Mahomedans, and Jews, in about the following proportions:—

Mahomedans	160,000
Christians (mostly of the Greek Church)..	30,000
Jews	10,000

"The population of the city of Jerusalem is estimated at 18,000, of whom about 5,000 are Mahomedans, 8,000 to 9,000 Jews, and the rest Christians of various denominations.

"The chief native industry is the manufacture of soap, and what is called 'Jerusalem ware,' consisting of chaplets, crucifixes, beads, crosses, and the like, made principally of mother-of-pearl and olive wood, and sold to the pilgrims, who annually resort to the Holy City to the number of 6,000 to 8,000.

"No mines are worked, although it is believed that sulphur, bitumen, and rock salt abound on the shores of the Dead Sea; but security and capital are wanting, and so long as these are absent, the probable wealth to be extracted from those regions will remain unavailable. No factories are to be met with. The employment of the people in the rural districts is agriculture, which is carried on in the most primitive mode.

"A colony of Americans from the State of Maine, numbering 156 persons, arrived and settled near Jaffa in September. Their leading idea appears to be a religious one, connected with the fulfilment of prophey concerning the Holy Land. They are, for the most part, farmers, handicraftsmen, &c., bringing with them their own wooden houses, agricultural implements, and tools. If the colony contrives to escape the disastrous failure which has attended previous similar experiments, it will be interesting to watch the progress and results of the enterprise, which cannot fail to be beneficial to the country, through the introduction of their superior husbandry and workmanship.

Public Works.—It is matter of great regret it should have again to be reported that neither railway, nor what, under the circumstances, would be more advisable, carriage road, has been, or is likely to be, made between Jaffa and Jerusalem, and of which a harbour at Jaffa would much enhance the value. The dfficulty is understood to arise from the unwillingness of the Porte to grant the concession to a foreign company, while it abstains from undertaking this most necessary and profitable work itself. The roads of the first district are of a most wretched description, and with the want of security, are the main cause of the poverty and general backwardness of the country. The formation of roads would, in the nature of things, itself react upon the country, and tend to promote its security. This arises principally from the predatory Bedouin tribes inhabiting the outskirts of the district, to keep whom in check, however, military dispositions of a simple and inexpensive description might be readily made. Owing to the above causes vast and fertile plains are allowed to lie waste, or are but partially and poorly cultivated. There can be no doubt that with the agricultural capabilities of the country fully utilized, it would support a population many times larger than its scanty and poverty-stricken inhabitants.

"Izzet Pasha, the Governor of Jerusalem, has had the pools of Solomon and the ancient aqueduct repaired, with a view to supplying Jerusalem with water. This most desirable work is now completed.

"Two lines of telegraph, *viâ* Beyrout and Alexandria respectively, connect Jerusalem with Europe. Jerusalem, Jan. 16, 1867."

Exports of Iron and Steel.

The exports of steel and iron of various kinds from the United Kingdom last year was uprecedently large, amounting to 1,681,992 tons, against 1,617,509 tons in 1865, 1,502,964 tons in 1864, 1,640,949 tons in 1863, 1,501,451 tons in 1863, 1,322,694 tons in 1861, 1,442.045 tons in 1860, 1,465,191 tons in 1859, 1,349,058 tons in 1858, and 1,532,386 tons in 1857. If it be said that the increase in the ten years has not been very striking, such a remark cannot be made if the comparison is carried back for a further period of ten years. Thus, in 1856, Great Britain exported 1,438,900 tons of iron and steel, as compared with 1,092,735 tons in 1855, 1,196,663 tons in 1854, 1,261,272 tons in 1853, 1,035,884 tons in 1852, 919,479 tons in 1851, 783,424 tons in 1850, 709,492 tons in 1849. 626,141 tons in 1848, and 549,709 tons in 1847, Great Britain has thus multiplied threefold her exports of iron and steel during the last twenty years. The value of the iron and steel exported last year was £14,829,369 as compared with £13,471,359 in 1865, £13,310,484 in 1864, £13,150,936 in 1863, £11,365,150 in 1862, £10,326,646 in 1861, £12,151,997 in 1860, £12,314,437 in 1859, £11,197,072 in 1858, and £13,603,337 in 1857. In the year 1847 the value of the iron and steel exports was only £5,265,779.

The London Post Office.

In 1803, within what are called the metropolitan limits of London, 6,100,000 letters were posted and delivered; and in 1813 increased to 9,400,000, but in the following ten years they had advanced only to 10,500,000, that being the estimated number in 1823 They were almost stationary during the next ten years, notwithstanding the increase of population; indeed they rather retrograded, their number in 1833 being estimated at only 10,200,000. In 1839, the year before the introduction of the penny postage, they were only 22,480,000. In 1849 they bounded suddenly to 20,372,000, and in 1844 they reached 27,000,000. In nine years afterwards (1853) they were 43,000,000. In 1855 London was divided for postal purposes into ten districts, by which very much more rapid delivery was obtained for local letters. The consequence was that in 1858, the third complete year after the alteration, local letters had risen to 58,404,000, and in 1863 to 71,691,000. In 1865 they were about 90,000,000, of which upwards of 16,000,000 were delivered in the districts in which they were posted. At the present time the average daily delivery of letters in London is about 550,000, of which about half are local and half from the provinces and abroad. The daily number of newspapers and book-packets delivered is about 55,000. These facts and figures are a conclusive argument in favour of cheap postage.

Commerce of France.

The progress of France in fourteen years past (1851 to 1865), is illustrated by the increase of annual imports from $207,860,000 to $670,320,000, while the exports increased from $298,000,000 to $776,530,000, and the total commerce was nearly tripled; the clearances of shipping increased 50 per cent, the miles of railway were quadrupled (2,187 to 8,750), the miles of telegraph went from 1,876 up to 19,688, and the business of the Post Office and the Bank of France were each multiplied more than five times.

The Street Railroads of New York.

The Seventh Avenue Railroad of New York city employs 760 horses and 300 men. It has ninety six cars, which ran nearly 2,000,000 miles and carried 10,000,000 passengers in 1866. The annual bill for horse-shoeing amounts to $18,000. About 900 horses and 100 cars are used on the Eighth Avenue Railroad. During the year 1866 the cars carried 11,402,000 passengers, and ran 3,234,000 miles. The Second Avenue Railroad carries about 6,500,000 passengers annually. The Dry Dock and East Broadway Railroad carries 11,000,000 passengers. It is estimated that about 80,000,000 of Passengers are carried by the street-cars of New York every year, during which time only fifty accidents occur. The business is continually on the increase, and preparations are constantly being made to meet it. There is a corner on Canal street where 3,400 cars pass every twenty-four hours! Such is a glance at the street railways of New York in January, 1867.—*American Artizan.*

New York Public Slaughter House.

About 8,000 hogs, 2,000 sheep and 150 head of cattle are now slaughtered weekly at the Communipaw abattoir. The yards will hold 20,000 hogs, 15,000 sheep and 6,000 head of cattle. A new and more merciful mode adopted for slaughtering beeves, is to insert the point of a sharp lance in the back of the neck, at the base of the brain. The death of the animal is said to be instantaneous, and is of course free from terror.

English Ship-building in 1866.

The number of vessels built in England in 1866 was 807, representing a tunnage of 332,353, against 815 vessels, with a tunnage of 329,752, in the previous year. There has thus been a decrease of 8 vessels, but an increase of 2,601 tuns. These 807 vessels include 271 steamers, with a tunnage of 98,920, and 536 sailing ships, with a tunnage of 233,433—there having been an increase of 5 steamers and a decrease of 13 sailing ships during the year.

Miscellaneous.

British Art Schools.

A published government directory gives a list of ninety well established and sustained schools of art in the United Kingdom, which in the year 1865 taught no less than 16,621 pupils. The first of these schools was established in 1842, and already there is not a commercial or manufacturing town in the British Isles that is not thus provided. Parliament annually appropriates a large sum of money to this system of schools, with a view to foster British manufactures by giving them the advantage so long possessed by the French, of beauty, finish and taste in design. The whole is a regularly organized department of science and art, of which the Duke of Buckingham is President, with a large staff of secretaries and clerks, and two divisions of professional inspectors, examiners and organizers, to aid in organizing schools, to supervise them while in operation, to test their efficiency, and to judge when they are entitled to aid from the fund in charge of the department. A project is set on foot to establish an American University of Art.

Disinfecting Soap, Powder, and Solution.

A recent number of the *Grocer* thus notices some new carbolic preparations, which are likely to come into very extensive use. We can strongly recommend the powder, from actual experience of its prompt disinfecting properties:—

We have before us samples of some preparations by Messrs. McDougall Brothers which belongs to an almost new branch of trade, and one of such importance that every grocer should assist in extending it. The valuable disinfecting properties of carbolic acid are now widely known, and the firm under notice have very ingeniously adapted this substance to various uses beyond the common one of throwing it in its crude state in places whose effluvia are likely to prove dangerous to health and life. Messrs. McDougall are now making a carbolic disinfecting soap, both for toilet purposes and common domestic use. Unlike some disinfecting soaps which have been sent to this office, this is not wanting in any of the good properties of ordinary soap—that is, the general quality of the material has not been sacrificed by the amalgamation. If a knowledge of its excellent properties only spreads as rapidly as we, in the interest of humanity, desire it should do, there is not a shopkeeper in the kingdom who would not ask each of his customers to take home and continue to use some of this soap while the weather keeps us in dread of another visitation of cholera. While useful as a disinfectant, it can be applied to all purposes for which ordinary soap is used, and many more besides, such as the destruction of domestic insects, and for washing soap. In support of the very favourable opinion we have expressed, we have the fact that in the London Hospital, Guy's Hospital, and several of the large London workhouses, this soap is in constant use. We are told that the Government has displaced other disinfectants, which were poisonous, in order to adopt Messrs. McDougall's in the navy, emigration, and transport services.

Messrs. McDougall Brothers also prepare a disinfecting *powder*, which is put up in bottles, and may be used in a variety of ways. Both this and the soap are guaranteed free from any poisonous or otherwise injurious ingredient. An antiseptic and disinfecting *fluid* is also prepared, which is intended for sprinkling over floors, as a wash for sores and wounds, and by which meat and fish may be preserved from taint by washing with water to which some of this fluid has been added.

Another composition is a sheep and lamb dipping composition—an article in which many country grocers do a large trade. Carbolic acid is also an ingredient in this, and thus the use of arsenic and mercury—two dangerous poisons—is avoided. It is soluble in water, and easy of application, can be used without danger on sheep or lambs of any age, and it will not injure the skin or clothes of the person applying it. It possesses remarkable healing and antiseptic properties, rapidly cures shear wounds and sores, and prevents contagion from skin diseases; effectually destroys ticks and other vermin, and is considered the best cure for scab and the ravages of the maggot fly. In connexion with this preparation and those above mentioned the manufacturers have published a pamphlet, which, though ostensibly for advertising purposes, contains some useful information.

Catching Cold,

Says Dr. Thomas Inman, is a common phrase for an attack of catarrh, but it is a very incorrect one. One year I suffered so very severely from a series of "colds" that my attention was drawn especially to them. I was then Lecturer on Medicine, and nearly every night from five o'clock to six during the winter months, had to turn out from a warm room to go through all weathers, lecture for an hour in a theatre heated by a stove and lighted by gas, and then return again to my snuggery at home. When I felt a fresh cold beginning, I tried in vain to account for it, until I accidentally saw in Copland's dictionary that the most fertile cause of a cold was coming from a moist, cold air to a hot and dry room. This at once explained to me the reason of my frequent suffering, for I had invariably gone into my hot room straight from the cold. I of course soon changed my habit: I dawdled in the hall, while taking off my great coat, perambulated the rooms which had no fire in, went up and down stairs and the like, ere I went into my study, whose temperature was also reduced. Since then, I agree with a friend who says, "that a cold comes from catching hot;" and I am disposed to think that there is a strong analogy between a chilblain on a child's toes and a cold in a person's nose, throat, and lungs.—*Medical Mirror.*

Interesting Chemical Experiments.

(1.) By exposing a fragment of recently calcined wood charcoal under a jar filled with hydro-sulphuric acid gas for a few minutes, so that it may become saturated with the gas, and then covering it with a jar of oxygen, the latter gas will act on the former with such energy that the latter will burst into vivid combustion. The jar must not be closed air-tight at the bottom, or the sudden expansion may burst it.

(2.) If a little chlorate of potash be melted in a deflagrating spoon, and plunged into a bottle or flask containing coal-gas, the salt burns with great brilliancy, its oxygen combining with the carbon and hydrogen in the gas, which becomes in this case the *supporter of combustion.*

Power of a Horse's Scent.

There is one perception that a horse possesses to which but little attention has been paid, and that is, the power of scent. With some horses it is acute as with the dog; and for the benefit of those that have to drive at nights, such as physicians and others, this knowledge is invaluable. I never knew it to fail, and I have ridden hundreds of miles on dark nights; and in consideration of this power of scent this is my simple advice; never check your horse at nights, but give him a free head, and you may rest assured that he will never get off the road and will carry you expeditiously and safe. In regard to the power of scent in a horse, I once knew one of a pair that was stolen, and recovered mainly by the track being made out by its mate, and that after he had been absent six or eight hours.

Paper Boats.

In an article last week on the applications of paper, we might have added among its other uses, its substitution for leather, as machinery belting, a patent for which has just been granted, and its peculiar adaptability for the manufacture of shell boats for racing. A boat maker at Troy has lately constructed one thirty feet long, which weighs but forty pounds, and is in every respect superior to boats made of wood. It is thin, lighter than a wooden boat, is rendered impervious to water by a coating of oil and other compounds, and is claimed to be more durable, and that it will stand shocks that would destroy a wooden shell. Such a boat cannot be split or broken, but if a hole be made in it by accident, the perforation will be no larger than the size of the object piercing it, and could be easily mended; it will not swell nor crack, requires no caulking or pitching, and, above all, the cost is much less than a wooden boat.—*Scientific American.*

Utilization of Ozone.

Another advance has been made in the utilization of ozone, as demonstrated by the "ozone-generator" exhibited at the *Conversazione* given by the President of the Royal Society. It is described in *Chamber's Journal* as consisting of a number of flat sheets of glass, coated with tin-foil, and piled one on the other, but slightly separated. Each plate represents a Leyden jar, and when the whole number are electrified, a stream of air forced through from one end to the other becomes so strongly ozonized that breathing it is painful and dangerous. The stream of ozonized air thus produced can be used for bleaching and other chemical purposes; and this is the form of it that is turned to account in the decarbonizing of sugar on a large scale, at one of the refineries in the east of London.

The Electric Telegraph Described 150 Years ago.

The following curious lucubration regarding telegraphy appeared in No. 119 of the *Guardian*, dated London, July 28, 1713:—"One of my predecessors, named Strada, gives an account of a chimerical correspondence between two friends, by the help of a certain loadstone, which had such a virtue in it that if it touched two several needles, when one of the needles so touched began to move, the other, though at never so great a distance, moved at the same time and in the same manner. He tells us that two friends, being each of them possessed of one of these needles, made a kind of dial-plate, inscribing it with the six-and-twenty letters, in the same manner as the hours of the day are marked upon the ordinary dial plate. Then they fix one of the needles on each of these plates, in such a manner that it could move round without impediment, so as to touch any of the letters. Upon their separating from one another into distant countries, they agreed to withdraw themselves punctually into their closets at a certain hour of the day, and to converse with one another by means of this their invention. Accordingly, when they were some hundred miles asunder, each of them shut himself up in his closet at the time appointed, and immediately cast his eyes upon the dial-plate. If he had a mind to write anything to his friend, he directed his needle to every letter that formed the words which he had occasion for, making a little pause at the end of every word or sentence, to avoid confusion. The friend, in the meanwhile, saw his own sympathetic needle moving of itself to every letter which that of his correspondent pointed at. By this means they talked together across a whole continent, and conveyed their thoughts to one another in an instant over cities or mountains, seas or deserts."

Storm Signals during Harvest.

The plan of storm signals during harvest is by means of the telegraph and cannon. The telegraph is to convey the news of a coming storm to each of the county seats, hundreds of miles in advance, in the direction that the storm is travelling. Then at each county seat a cannon is to be fired three times, which will warn farmers throughout the whole country that a storm is approaching in time to get their grain or hay under cover or in a situation to shut out the rain. The plan is by A. Watson, of this city. A telegraph company, by arrangement with the county officials in several of the states, is about to put the plan into practical operation in time for the coming harvest. It is believed that a large portion of the many millions of dollars in grain and hay which are annually damaged by rain during harvest will be saved by the adoption of this simple plan throughout all the state.—*National Intelligencer.*

Co-Operative Companies.

There are now said to be in England between 2,000 and 3,000 shareholders in companies based upon the principle of uniting the interest of the capitalists with that of the workers, and there are at least 8,000 to 10,000 work people employed by these companies.